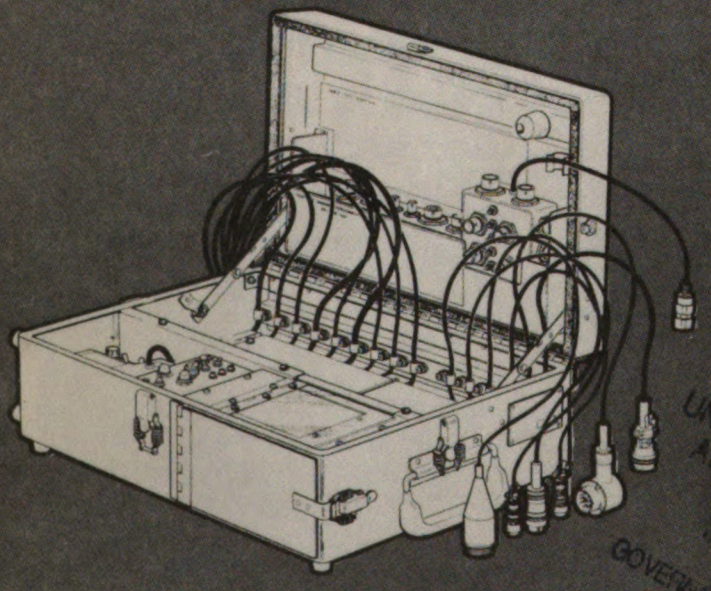
TM 11-5810-345-34
Supersedes Copy Dated
7 July 1981

technical manual

INTERMEDIATE DIRECT SUPPORT AND SPECIALIZED REPAIR ACTIVITY MAINTENANCE MANUAL for

VINSON INTERCONNECTING BOX TEST SET AN/USM - 481

(NSN 6625-01-106-4296)

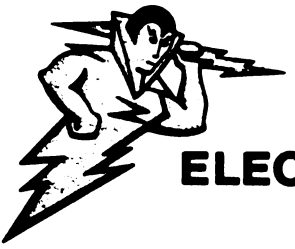


Adequate ventiiation shouid be provided whiie using TRICHLOROTRIFLUOROETHANE. Proionged breathing of vapor should be avoided. The soivent shouid not be used near heat or open fiame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissoives natural oils, proionged contact with skin should be avoided. When necessary, use gioves which the soivent cannot penetrate. If the soivent is taken internaiiy, consuit a physician immediateiy.

A lithium battery may be used in this equipment. It is potentially hazardous if misused or tampered with before, after or during discharge. The following precautions must be strictly adhered to in order to prevent possible injury to personnel or equipment damage, DO NOT heat incinerate, crush puncture, disassemble, or otherwise mutilate the battery. DO NOT short circuit, recharge, or by-pass internal fuse. DO NOT store in equipment during long periods of non-use in excess of 30 days. DO NOT transport the battery on any passenger carrying aircraft. Turn off the equipment immediately if you detect battery compartment becoming unduly hot, hear battery cells venting (hissing sound) or smell irritating sulphur dioxide gas. Remove and dispose of battery only after it is cool (30-60 minutes).

5 Safety Steps to Follow if Someone is the Victim of Electrical Shock

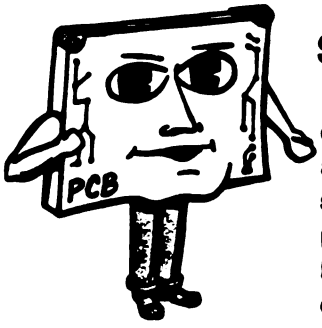
1. Do not try to pull or grab the individual
2. If possible, turn OFF the electrical power
3. If you cannot turn off the electrical power, pull, push, or lift the person to safety using a wooden pole or a rope or some other insulating material
4. Send for help as soon as possible
5. After the injured person is free of contact with the source of electrical shock, move the person a short distance away and immediately start artificial resuscitation



STATIC ELECTRICITY

Get To Know It — because when it gets on semiconductor devices it'll **ZAP**'em for sure. It can certainly **DEGRADE** and even **DESTROY** your *Printed Circuit Boards (PCBs).* A discharge as low as 100 to 200 Volts will zap a PCB, and it can build up to a level of 39,000 Volts. It's created by the contact and separation of materials. It can be generated by *work surfaces, floors, chairs, clothing, paper, work order holders, packaging material and personnel.* Your body can carry a charge up to 4,000 Volts and you'll never even know it. Here's what you can generate when you're:

- **Walking on a carpet** - 12,000 to 39,000 VOLTS
- **Walking across a floor** - 4,000 to 13,000 VOLTS
- **Working at a bench** - 500 to 3,000 VOLTS



See Why You Must Protect Us!!

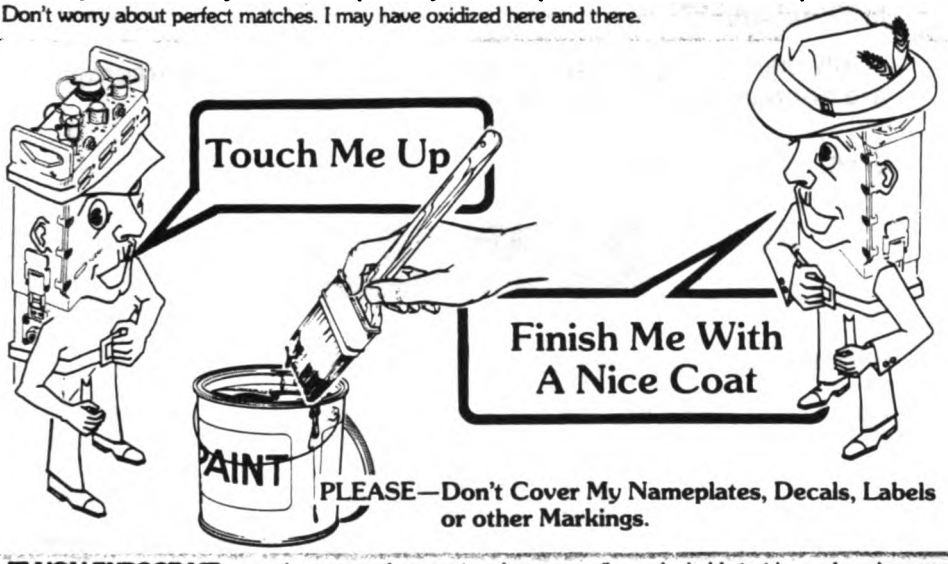
Remember - people, plastics, styrofoam, dust, lint, all carry large charges of static electricity and must not be allowed to touch sensitive semiconductor devices. The static charge can even reach us through test points. To protect us from getting zapped, proper grounding and handling is required. Follow these instructions and more of us will be available to keep your equipment in service.

1. STORE and TRANSPORT PCBs in conductive materials - not plastic "snow" or plastic trays.
2. Do not wear CLOTHING material which can store static electricity, i.e. nylon.
3. GROUND yourself, using a WRISTSTRAP as shown below, when unpacking, handling and replacing PCBs or removing equipment cover.

4. If a GROUNDED BENCH AREA is not available always place PCBs on an antistatic surface mat. The known good PCBs must be removed from the protective packing and immediately installed or placed on the antistatic surface mat. The replaced PCBs must also be placed on the antistatic surface mat or immediately placed in protective packaging.

INTERMEDIATE DIRECT SUPPORT PRESERVATION

DON'T LET ME BE EXPOSED—touch me up. Weather, moisture, fungus and corrosion will hurt my exposed metal or damaged coat. ***CLEAN ME, SCRAPE ME AND SAND MY BARE METAL.*** Prime me and then finish me with a nice coat. My coat must be at least 0.8 mils thick, so touch me twice if necessary. The materials you need to improve my looks and performance are listed in this publication. Don't worry about perfect matches. I may have oxidized here and there.



PLEASE—Don't Cover My Nameplates, Decals, Labels or other Markings.

IF YOU EXPOSE ME—to salt spray or drop me in salt water, pull my pluckable insides and wash me with fresh warm water. Be gentle with my insides, pressure tickles if under 40 psi but hurts me if higher. Dry me with gentle air pressure or in a ventilated oven at 135°F or less. Then spray me with water displacing compound, let me sit for 20 minutes and dry me again. Tag me and send me to your nearest specialized repair activity or LBAD, Lexington, KY for more cleaning and testing.

HOW TO USE THIS MANUAL

This manual is broken down into CHAPTERS, SECTIONS, PARAGRAPHS, and APPENDIXES. An INDEX, placed in the back of the book, is provided to help you find specific tasks or information.

Only main paragraph headings are numbered. Subparagraphs are not numbered. An example is—

2-16. CLEANING

EXTERIOR SURFACE

Remove dust and loose dirt with a soft cloth.

CONNECTORS

Clean all connectors.....

and

are given as special reminders for:

- Doing your task properly.
- Giving additional and special instructions.
- Protecting your equipment.
- Protecting yourself.

To find SPECIFIC TASKS/INFORMATION, look in the INDEX. Tasks and information are listed alphabetically and refer you to the page number within the book.

Alway read through a complete procedure/task before you actually perform the procedure/task.

Technical Manual
No. 11-5810-345-34

TM 11-5810-345-34
HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 10 September 1987

INTERMEDIATE DIRECT SUPPORT AND SPECIALIZED REPAIR ACTIVITY MAINTENANCE MANUAL FOR

VINSON INTERCONNECTING BOX

TEST SET AN/USM-481 (NSN 6625-01-106-4296)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2, located in the back of this manual, direct to Commander, US Army Communications Security Logistics Activity, ATTN: SELCL-NMP-TP, Fort Huachuca, Arizona 85613-7090. A reply will be furnished to you.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

SECTION I GENERAL INFORMATION

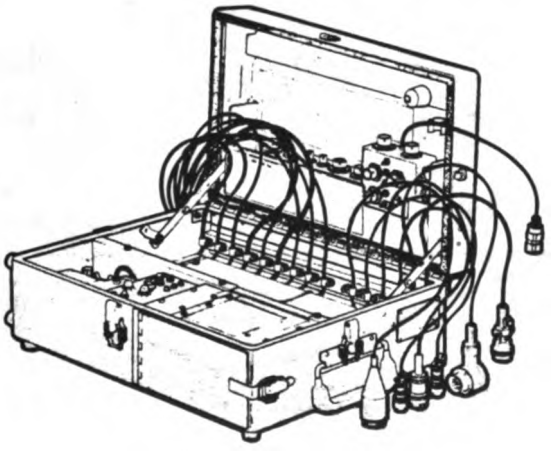
1-1 SCOPE

TYPE OF MANUAL

This manual is for use by Intermediate Direct Support and Specialized Repair Activity maintenance personnel maintaining the Vinson Interconnecting Box Test Set for the J-3513A or J-3514A boxes and the related Vinson interconnecting cables.

MODEL NUMBER AND EQUIPMENT NAME

Vinson Interconnecting Box Test Set, AN/USM-481.

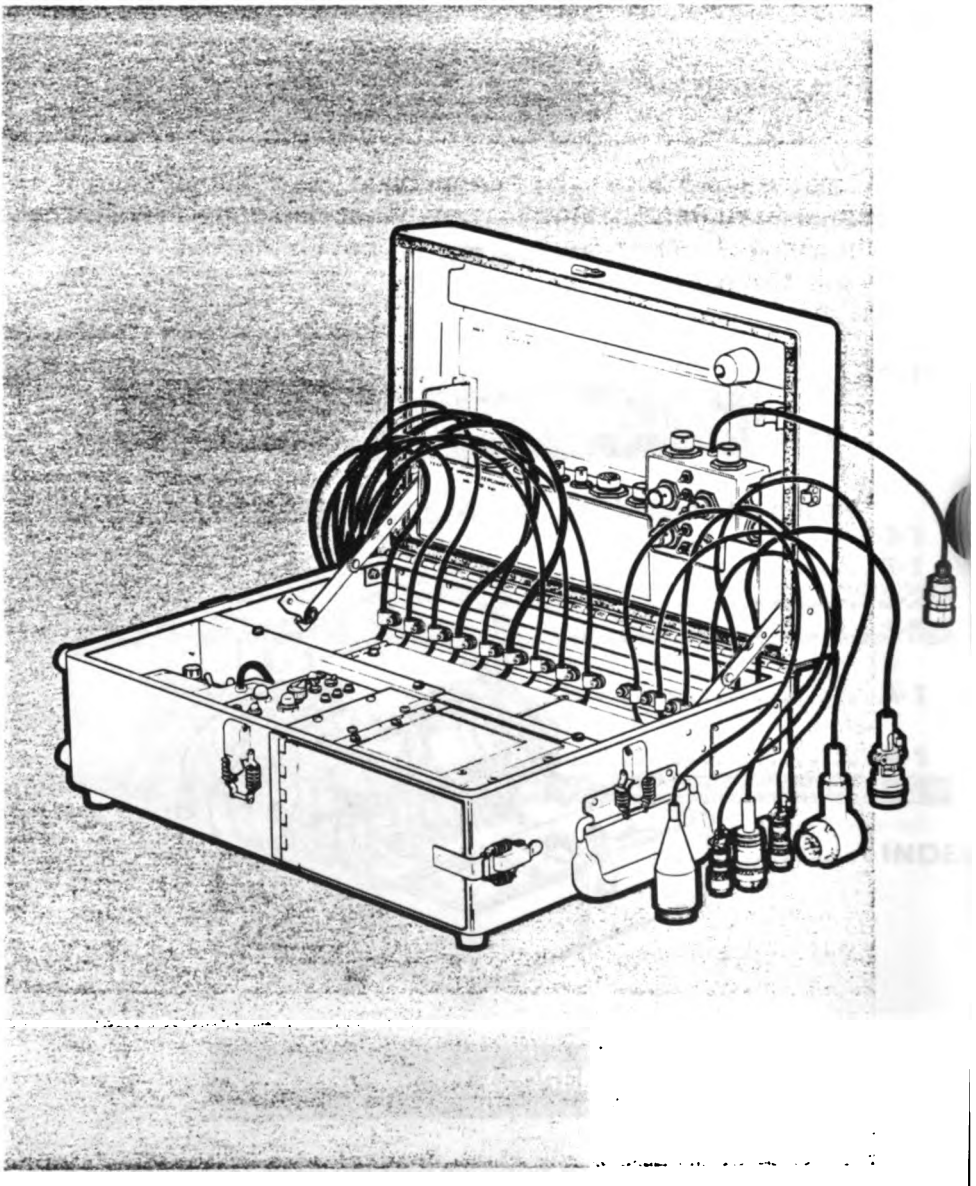


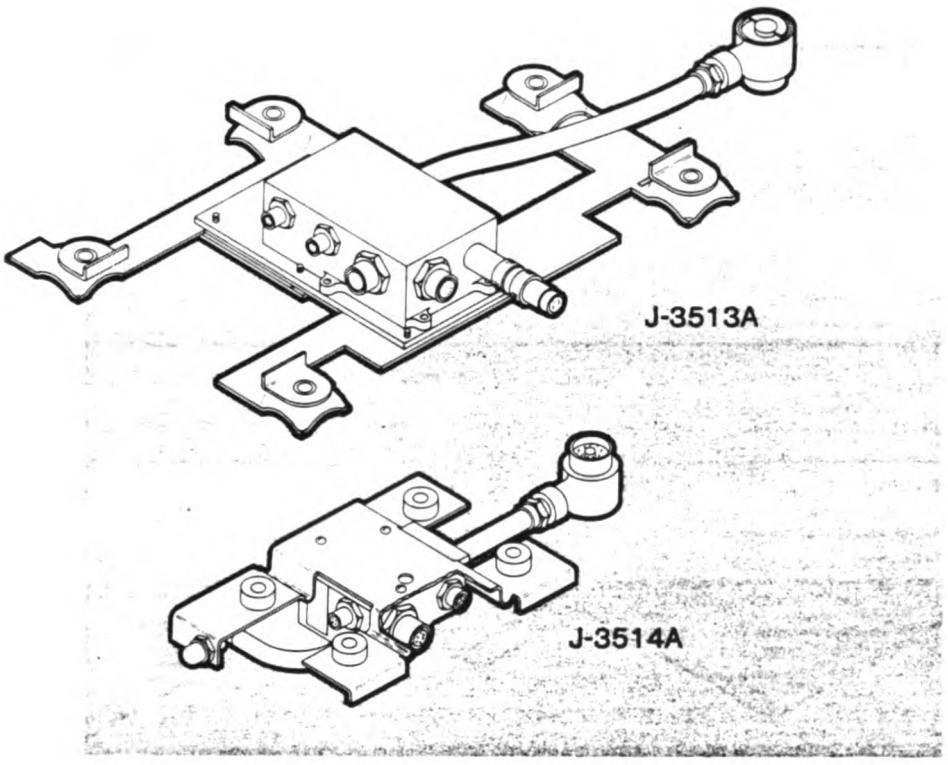
PURPOSE OF EQUIPMENT

The AN/USM-481 is a portable test set used for troubleshooting Vinson interconnecting boxes J-3513A and J-3514A, and the Vinson interconnecting cables.

ASSOCIATED TECHNICAL MANUALS

Other technical manuals for this test set include TM 11-5810-345-12 and TM 11-5810-345-24P.





VINSON INTERCONNECTING BOXES
J-3513A AND J-3514A (BOTTOM VIEW)

1-2. EQUIPMENT PUBLICATIONS

References. Appendix A contains references to other publications that should be kept readily available to COMSEC equipment maintenance personnel.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS

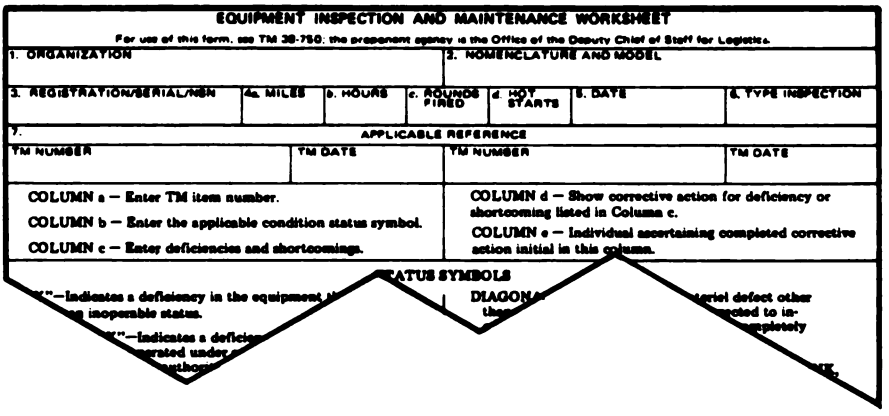
Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pamphlet 738-750, The Maintenance Management Update.

MAINTENANCE AND IMPROVEMENTS

The following forms will be used in accordance with DA PAM 738-750:

DA FORM 2404 for recording inspection results and periodic maintenance services.

DA Form 2404



EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION						2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
7. APPLICABLE REFERENCE							
TM NUMBER	TM DATE	TM NUMBER	TM DATE				

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"/"—Indicates a deficiency in the equipment ... inoperable status.

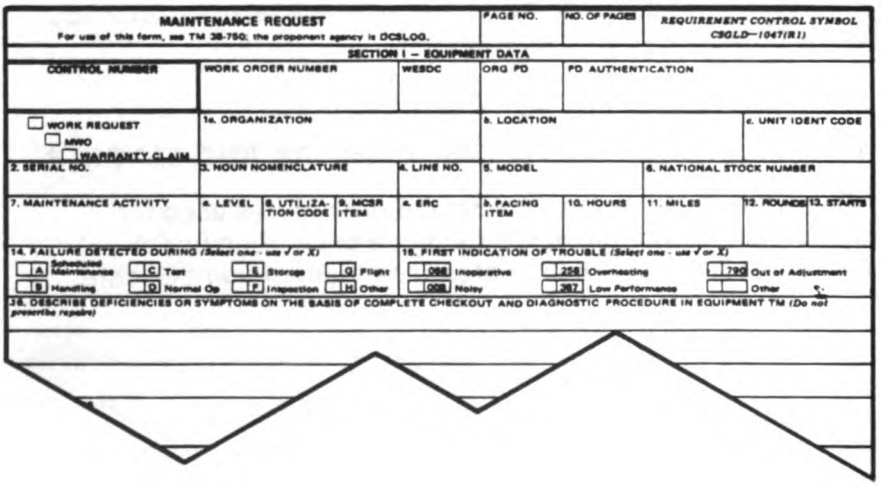
DIAGONA... ...terial defect other ...rected to in- ...mpletely

"/"—Indicates a deficie... ...erated under ... authori...

...IK,

DA FORM 2407 for requesting maintenance support, recording maintenance performed and reporting accomplishment of modification work orders (MWOs) on all Army equipment.

DA Form 2407



MAINTENANCE REQUEST

For use of this form, see TM 38-750; the proponent agency is DCSLOG.

PAGE NO. | NO. OF PAGES | REQUIREMENT CONTROL SYMBOL CSGLD-1047(R1)

SECTION I — EQUIPMENT DATA

CONTROL NUMBER	WORK ORDER NUMBER	WESOC	ORG PD	PD AUTHENTICATION

☐ WORK REQUEST ☐ MWO ☐ WARRANTY CLAIM	1a. ORGANIZATION	b. LOCATION	c. UNIT IDENT CODE

2. SERIAL NO.	3. NOUN NOMENCLATURE	4. LINE NO.	5. MODEL	6. NATIONAL STOCK NUMBER

7. MAINTENANCE ACTIVITY	a. LEVEL	b. UTILIZATION CODE	9. MCSR ITEM	c. ERC	b. PACING ITEM	10. HOURS	11. MILES	12. ROUNDS	13. STARTS

14. FAILURE DETECTED DURING (Select one - use ✓ or X)

☐ A Scheduled Maintenance ☐ C Test ☐ E Storage ☐ G Flight

☐ B Handling ☐ D Normal Op ☐ F Inspection ☐ H Other

15. FIRST INDICATION OF TROUBLE (Select one - use ✓ or X)

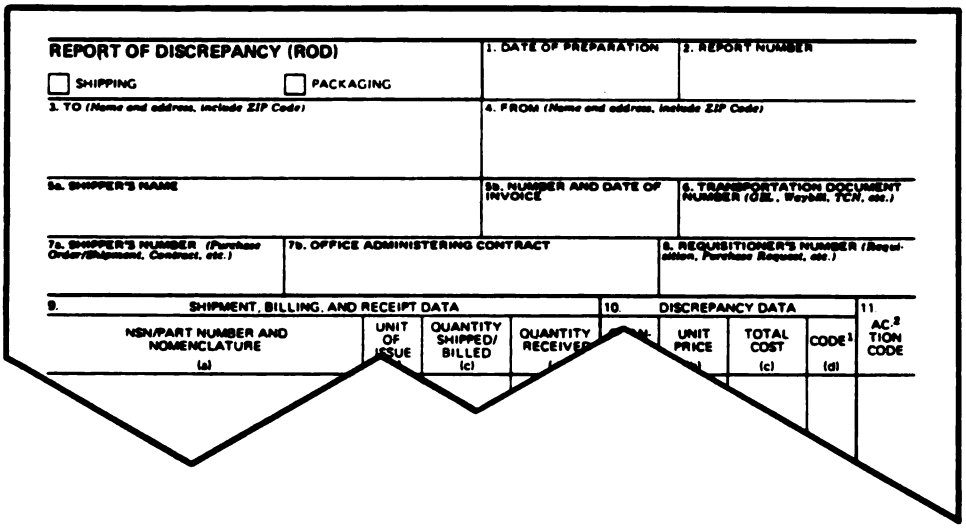
☐ 098 Inoperative ☐ 258 Overheating ☐ 790 Out of Adjustment

☐ 008 Noisy ☐ 387 Low Performance ☐ Other

16. DESCRIBE DEFICIENCIES OR SYMPTOMS ON THE BASIS OF COMPLETE CHECKOUT AND DIAGNOSTIC PROCEDURE IN EQUIPMENT TM (Do not prescribe repairs)

REPORTING OF DISCREPANCIES ATTRIBUTABLE TO SHIPPERS. Use SF 364 as prescribed in AR 735-11-2 or DA Pamphlet 700-3.

SF 364



REPORT OF DISCREPANCY (ROD)

☐ SHIPPING ☐ PACKAGING

1. DATE OF PREPARATION | 2. REPORT NUMBER

3. TO (Name and address, include ZIP Code) | 4. FROM (Name and address, include ZIP Code)

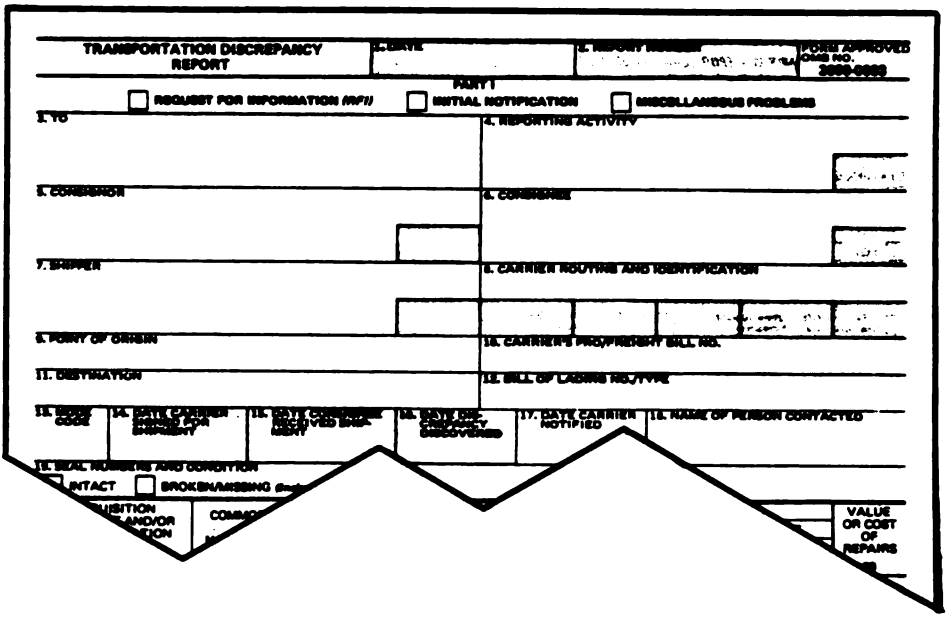
5a. SHIPPER'S NAME | 5b. NUMBER AND DATE OF INVOICE | 5c. TRANSPORTATION DOCUMENT NUMBER (GBL, Waybill, TCN, etc.)

7a. SHIPPER'S NUMBER (Purchase Order/Shipment, Contract, etc.) | 7b. OFFICE ADMINISTERING CONTRACT | 8. REQUISITIONER'S NUMBER (Requisition, Purchase Request, etc.)

9. SHIPMENT, BILLING, AND RECEIPT DATA				10. DISCREPANCY DATA				11
NSN/PART NUMBER AND NOMENCLATURE (a)	UNIT OF ISSUE	QUANTITY SHIPPED/ BILLED (c)	QUANTITY RECEIVED		UNIT PRICE	TOTAL COST (c)	CODE[1] (d)	AC.[2] TION CODE

REPORTING DISCREPANCIES IN SHIPMENT. Refer to AR 55-38 and use SF 361.

SF 361



TRANSPORTATION DISCREPANCY REPORT

2. DATE | 3. REPORT NUMBER | FORM APPROVED OMB NO. 2000-0000

PART I

☐ REQUEST FOR INFORMATION (RFI) ☐ INITIAL NOTIFICATION ☐ MISCELLANEOUS PROBLEMS

1. TO | 4. REPORTING ACTIVITY

5. CONSIGNOR | 6. CONSIGNEE

7. SHIPPER | 8. CARRIER ROUTING AND IDENTIFICATION

9. POINT OF ORIGIN | 10. CARRIER'S PRO/FREIGHT BILL NO.

11. DESTINATION | 12. BILL OF LADING NO./TYPE

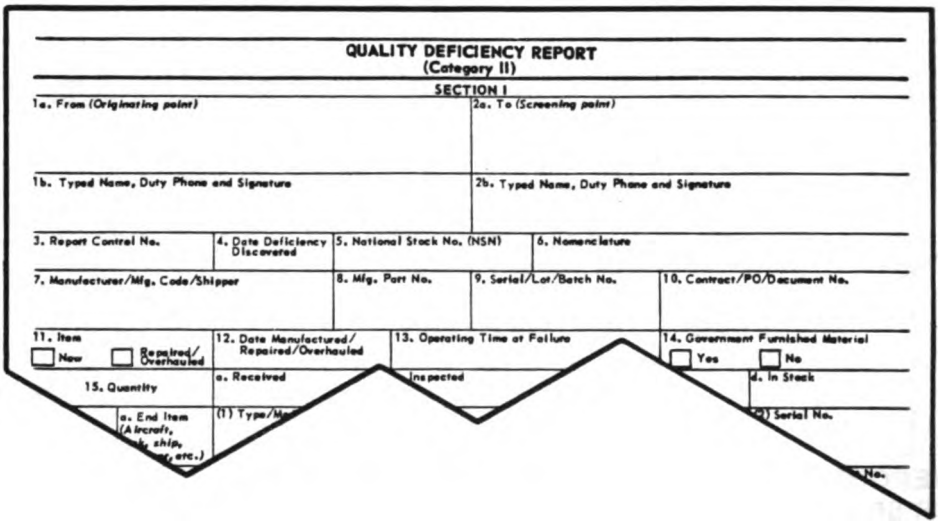
13. MODE CODE | 14. DATE CARRIER TAKING FOR SHIPMENT | 15. DATE CONSIGNEE RECEIVED SHIPMENT | 16. DATE DISCREPANCY DISCOVERED | 17. DATE CARRIER NOTIFIED | 18. NAME OF PERSON CONTACTED

19. SEAL NUMBERS AND CONDITION ☐ INTACT ☐ BROKEN/MISSING (Explain)

...QUISITION ...AND/OR ...TION | COMMO... | VALUE OR COST OF REPAIRS

STANDARD FORM (SF) 368 for submitting equipment faults in design, operations and manufacture (category II, quality deficiency report (QDR)); for submitting equipment improvement recommendations (EIRs) and for reporting new equipment received which is below standard quality workmanship.

SF 368



QUALITY DEFICIENCY REPORT
(Category II)

SECTION I

1a. From (Originating point)			2a. To (Screening point)	
1b. Typed Name, Duty Phone and Signature			2b. Typed Name, Duty Phone and Signature	
3. Report Control No.	4. Date Deficiency Discovered	5. National Stock No. (NSN)	6. Nomenclature	
7. Manufacturer/Mfg. Code/Shipper		8. Mfg. Part No.	9. Serial/Lot/Batch No.	10. Contract/PO/Document No.
11. Item ☐ New ☐ Repaired/Overhauled	12. Date Manufactured/ Repaired/Overhauled	13. Operating Time at Failure		14. Government Furnished Material ☐ Yes ☐ No
15. Quantity	a. Received	Inspected		d. In Stock
a. End Item (Aircraft, ship, etc.)	(1) Type/Mo			(2) Serial No.

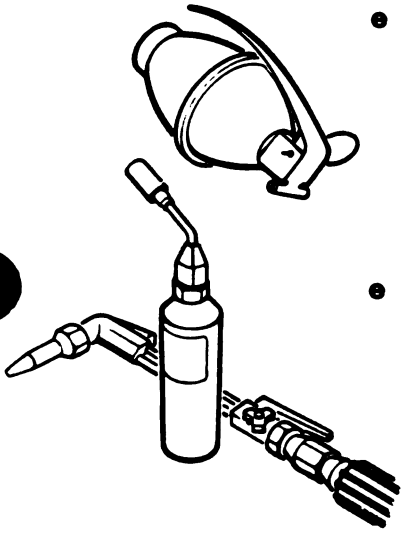
No.

1-4. ACCESS AND SECURITY REQUIREMENTS

The AN/USM-481 is an unclassified piece of test equipment and should be treated as such. There are no special security requirements needed for this equipment.

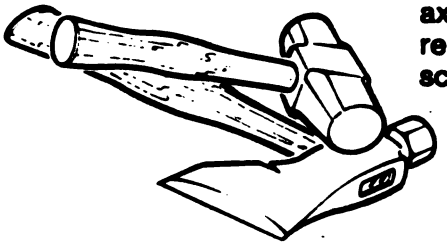
1-5. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

Methods and Materials.
The selection of adequate destruction materials to be used in an emergency is the responsibility of the commander, and should be based on a comprehensive evaluation of conditions. Incendiary destroyers designed for destruction of the AN/USM-481 are listed in SB 725-1300-1. The following are approved and effective methods for the emergency destruction of the AN/USM-481.



- Incendiary Hand Grenade TH3, AN-M14 is authorized for use outside the continental United States.

- Incinerators may be used for destruction of printed circuit boards. However, it may be necessary to break up the boards after they have been removed from the incinerator.

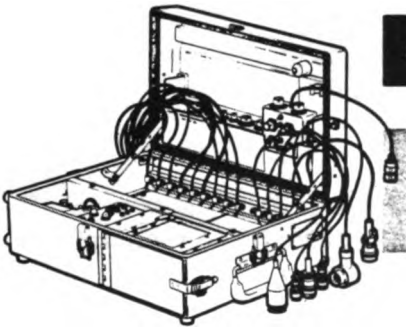


- Acetylene torches, sledge hammers, fire axes, etc. Printed circuit boards may be rendered unusable by hacking with an ax and scattering the pieces.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

To store or ship the AN/USM-481, turn off all power to the test set. Remove the lithium battery.

1-7. OFFICIAL NOMENCLATURE, NAMES AND DESIGNATIONS



COMMON NAME	NOMENCLATURE
Vinson Interconnecting Box Test Set	AN/USM-481

1-8. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS

If your AN/USM-481 needs improvement let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about our equipment. Let us know why you don't like the design or the performance. Put it on an SF-368 (Quality Deficiency Report). Mail it to us at Commander, US Army Communications Security Logistic Activity, ATTN: SELCL-NMP-TP, Fort Huachuca, Arizona 85613-7090. We will send you a reply.

QUALITY DEFICIENCY REPORT
(Category II)

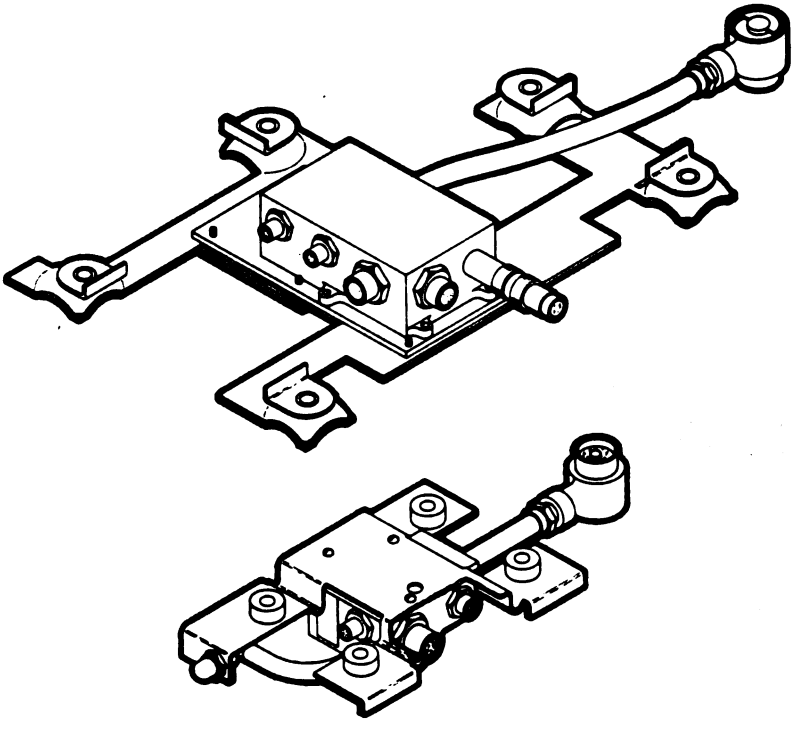
SECTION I

1a. From (Originating point)		2a. To (Screening point)	
1b. Typed Name, Duty Phone and Signature		2b. Typed Name, Duty Phone and Signature	
3. Report Control No.	4. Date Deficiency Discovered	5. National Stock No. (NSN)	6. Nomenclature
7. Manufacturer/Mfg. Code/Shipper	8. Mfg. Part No.	9. Serial/Lot/Batch No.	10. Contract/PO/Document No.
11. Item ☐ New ☐ Repaired/Overhauled	12. Date Manufactured/ Repaired/Overhauled	13. Operating Time at Failure	14. Government Furnished Material ☐ Yes ☐ No
15. Quantity	a. Received		d. In Stock
e. End Item	(1) Type		Serial No.

SECTION II EQUIPMENT DESCRIPTION AND DATA

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

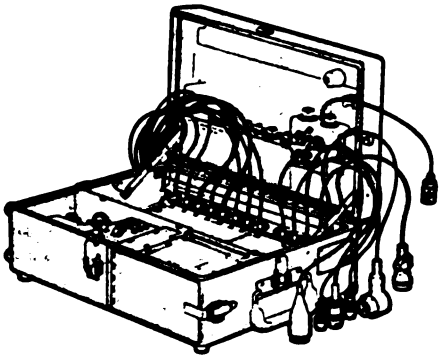
This test set is a lightweight portable instrument that is fully self-contained. It is used for troubleshooting; it checks for continuity and for short circuits in connectors. It also checks the wiring harness, printed circuit boards of the J-3513A and J-3514A. It has the additional capability to check the Vinson interface cables for continuity and short circuits by means of adapter plugs on a cable test adapter. The test set has a removable cable test adapter unit located in the cover. It can be operated by using a lithium battery or the AC power supply, which now comes with the test set.



1-10. EQUIPMENT DATA

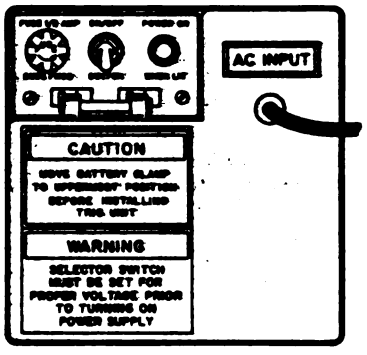
TEST SET

Height	6 in. (including lid)
Depth	14.5 in.
Width	18 in. (w/o handles)
Weight	26.5 lbs. (w/battery or Power Supply)
Power	12 and 24 Vdc
Output Voltages	12 Vdc and 18 Vdc



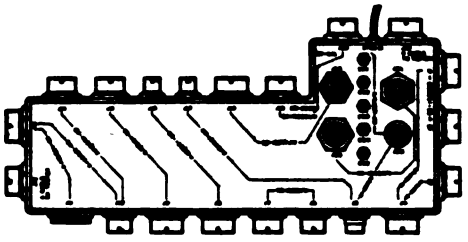
POWER SUPPLY

Height	2.5 in.
Depth	4.96 in.
Width	4.34 in.
Input Voltage	115/230 Vac
Input Frequency	50-400 Hz
Output Current	480 ma (at 12 Vdc)



CABLE TEST ADAPTER

Height	1.66 in.
Depth	5.50 in. (max) 3.37 (min)
Width	13.00 in. (max) 4.00 in. (min)



26 various connectors to check 15 different cables.

1-11. ANCILLARY EQUIPMENT

POWER SUPPLY

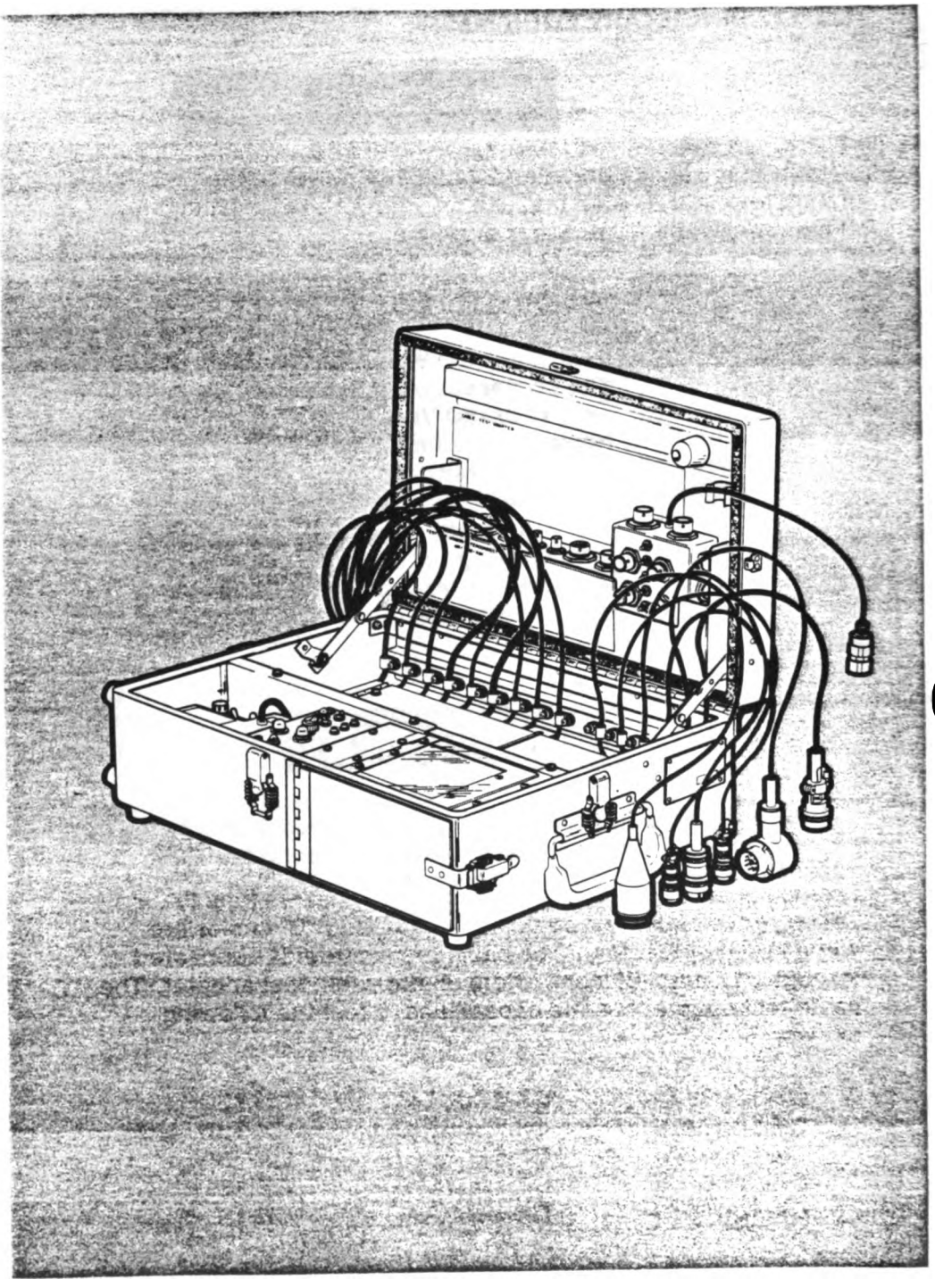
This unit is used to provide 12V and 24V power to the AN/USM-481 IK Tester, and can be used as a replacement for the battery when AC power is available.

The power supply can be operated on 115/230 Vac, 50 to 400 Hz, however, the line cord supplied is for the standard three prong receptacles (two wire and ground). There is no provisioning for 230 Vac, such as an adapter from the plug on the unit to the receptacle.

CABLE TEST ADAPTER

The cable test adapter must be used in conjunction with the IK Tester and provides the means for rapidly testing the cable assemblies associated with the Vinson IKs. This is accomplished by attaching the "A" and "B" cables from the IK Tester to the cable test adapter. The "A" and "B" cables are wired into the IK Tester. The cable test adapter is connected through J12 and J22 connectors on the cable test adapter. The cable test adapter has the capabilities to test the following cables:

CX-13061/U	CS-13067/U	CX-13073/U
CX-13062/U	CX-13068/U	CX-13074/U
CX-13063/U	CX-13069/U	CX-13075/U
CX-13064/U	CX-13071/U	CX-12991/U
CX-13065/U	CX-13072/U	CX-13100/U



CHAPTER 2
INTERMEDIATE DIRECT SUPPORT MAINTENANCE

SECTION I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

2-1 COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment refer to the Maintenance Allocation Chart in the Operator's and Unit Maintenance Manual, TM 11-5810-345-12.

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

For authorized special tools, TMDE, and support equipment refer to the Repair Parts and Special Tools List, TM 11-5810-345-24P.

2-3. REPAIR PARTS

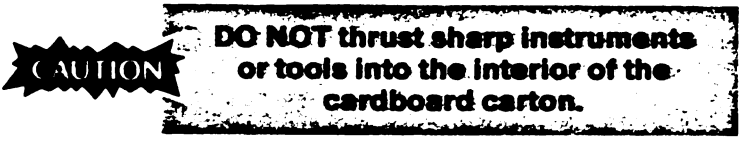
Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-5810-345-24P.

SECTION II SERVICE UPON RECEIPT

GENERAL

2-4. UNPACKING

When packaged for shipment, the AN/USM-481 Test Set is packed in a cardboard carton. The AC power supply and the cable test adapter are contained within the test set itself.



REMOVING CONTENTS

- Open the cardboard carton and remove the contents.
- Save the carton, inner blocking and fillers for future shipment or storage of the equipment.

INSPECTION

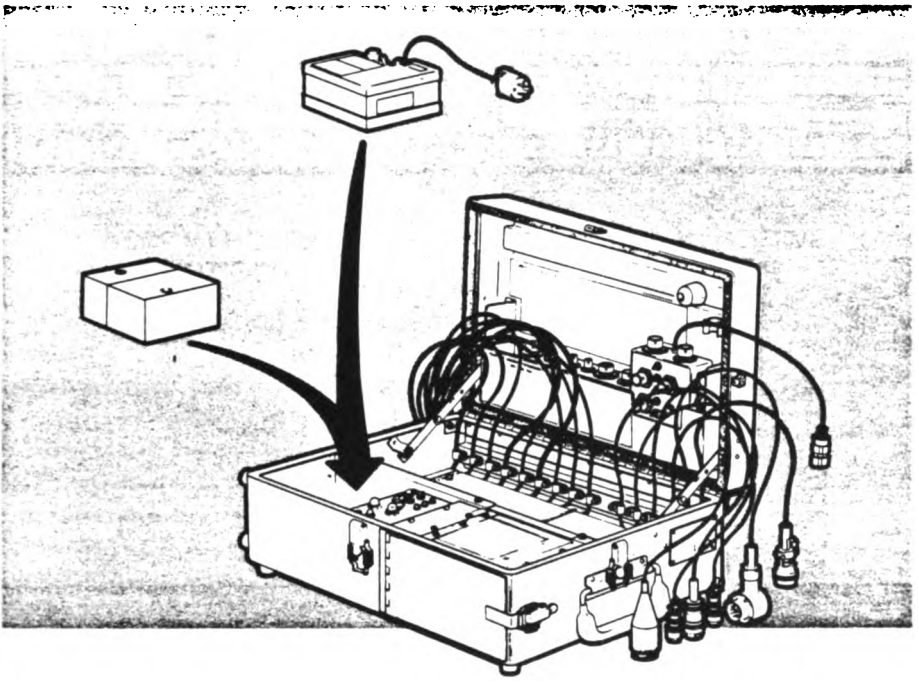
Check the equipment against the packing list to see if the shipment is complete. Report any missing items on SF 361, Transportation Discrepancy Report.

Inspect the equipment for any damage that might have happened during shipment. Look for dents, cracks, broken or loose parts, and chipped or scratched paint. Make sure connector pins are straight. Check cables for cracks. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy.

2-5. INSTALLATION

Installation of the AN/USM-481 consists of inserting a lithium battery or an AC power supply into the test set.

The battery/AC power supply compartment is located in the left front corner of the test set with access from the top.

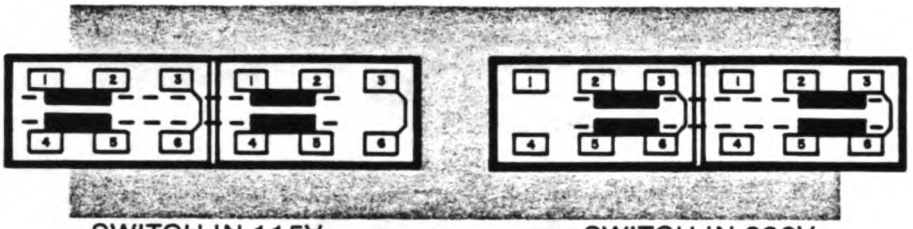


To install battery/AC power supply:

- Lower battery or power supply into the compartment.
- Make sure battery/power supply connector and test set connector are properly mated.
- Secure battery/power supply with the hinged metal strap.
- Tighten captive knurled knob on threaded post.
- If AC power supply is being used, insert three-prong connector plug into power source.

CAUTION

The AC power supply is switch selectable for both 115 Vac and 230 Vac. Make sure the voltage selector switch, located on the main body of the power supply, is set to the proper voltage (115 Vac or 230 Vac) before turning on the power supply. An incorrect setting can damage the power supply.



SWITCH IN 115V POSITION

SWITCH IN 230V POSITION

WARNING

A lithium organic battery may be used in this equipment. It is potentially hazardous if misused or tampered with before, during, or after discharge. The following precautions must be strictly observed to prevent possible injury to personnel or equipment damage: DO NOT heat, incinerate, crush, puncture, disassemble, or otherwise mutilate the battery. DO NOT short circuit, recharge, or bypass internal fuse. DO NOT store in equipment during long period of nonuse in excess of 30 days. DO NOT transport the battery either separately or in the equipment on any passenger-carrying aircraft. TURN OFF the equipment immediately if you detect battery compartment becoming unduly hot, hear battery cells venting (hissing sound), or smell irritating sulphur dioxide gas. Remove and dispose of the battery only after it is cool (30-60 minutes).

SECTION III PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

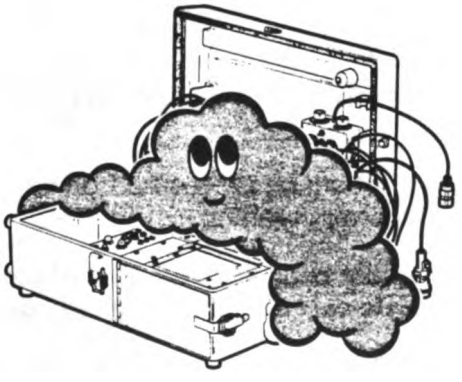
2-6. GENERAL

To ensure that the test set is always ready for operation, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure.

Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment.

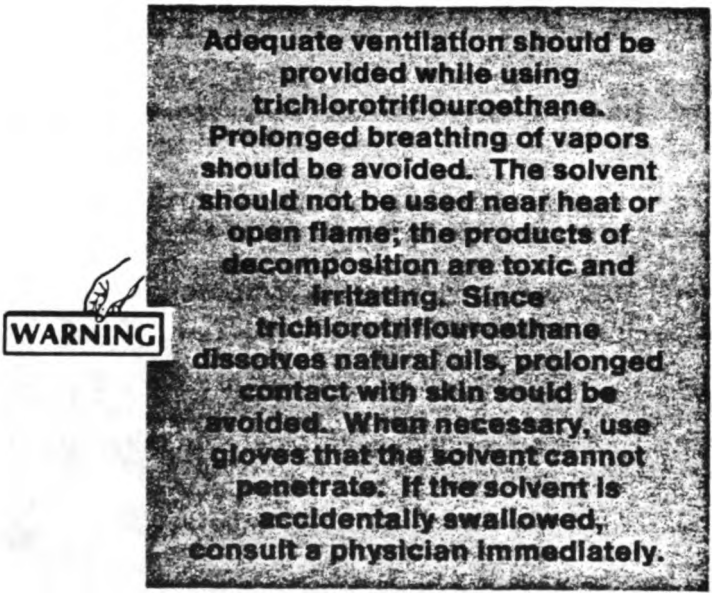
2-7. PMCS

- See that the test set is complete as shown in the packing list.
- Check knobs and switches for proper mechanical action. Set to each of the possible settings. Action must be positive without binding or scraping.
- Check all controls and mechanical assemblies for loose or missing screws, nuts, or bolts.
- Check all connectors, plugs, and receptacles for looseness and damage.
- Check test step indicator for proper display. Check End of Test (EOT) indicator for proper operation
- Inspect cables for breaks, cuts, kinks, deterioration, strain, and fraying.
- Check external hardware for looseness of latches, hinges, and handle.
- Inspect exposed metal surfaces for rust and corrosion.
- Check to see that unit is clean and dry, free of grease, dirt, and fungus.



CLEANING

The following cleaning instructions are provided as a minimum requirement to restore the equipment to a serviceable state. If trichlorotriflouroethane is used, the following warning should be observed.



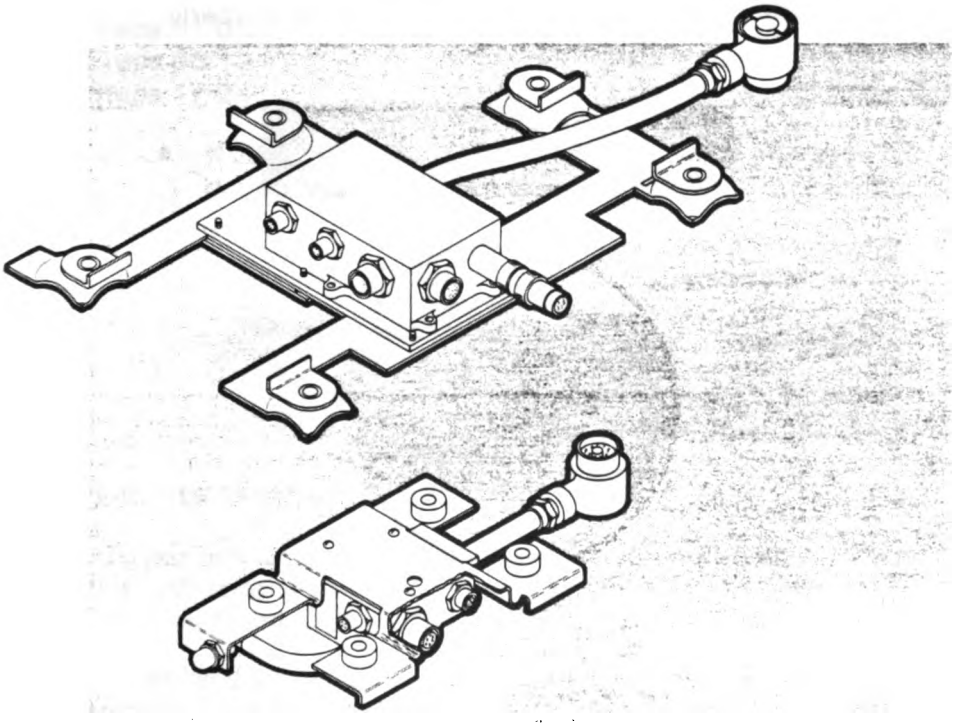
- Remove dirt, dust, grease, rust, and fungus from all parts.
- Metal parts should be protected from rusting immediately after cleaning.
- Remove all dust and dirt from all surfaces, components and wiring. Be careful not to damage delicate parts.
- Clean electrical components with a cloth that has been dampened (not wet) with approved cleaning compound. After cleaning be certain to wipe dry.

SECTION IV OPERATIONAL CHECK PROCEDURES

2-8 TESTING J-BOXES

The test set should first be connected to a known good J-3513A and after testing it, then it should be connected to a known good J-3514A. To perform operational checks using the J-Boxes, follow the instructions in paragraph 2-4 of the Operator's and Unit Maintenance Manual (TM 11-5810-345-12).

Run the known good interconnecting box J-3513A through all of its steps. Since the interconnecting box is a known good one, the test set should run through all of its steps and the End of Test (EOT) light should light. When this occurs, disconnect the J-3513A and connect the J-3514A and repeat the same operation.

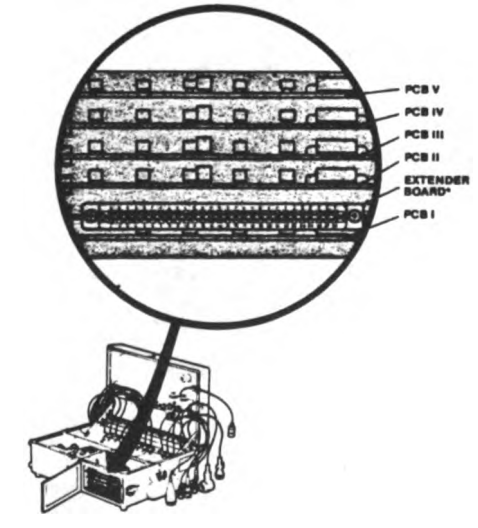


Upon completion of the tests, the EOT light should come on, and you can then assume that the test set is functioning properly. If the EOT light does not come on or the test set stops at one of the steps, check the following:

- Battery/Power Supply connection.
- Voltage.
- Battery Indicator light.
- Battery Switch.
- Cable connections.
- Positions of switches.
- The five printed circuit boards (PCBs).

If any of the above items had to be corrected, run the known good J-3513A and J-3514A through the same test again. If the EOT light comes on in testing both known good interconnecting boxes, the test set is functioning properly.

REMOVE AND REPLACE PRINTED CIRCUIT BOARDS



If the EOT light fails to come on after the above tests, take the following steps:

- The known good J-3513A should be run through the test again and the steps on which it failed noted:

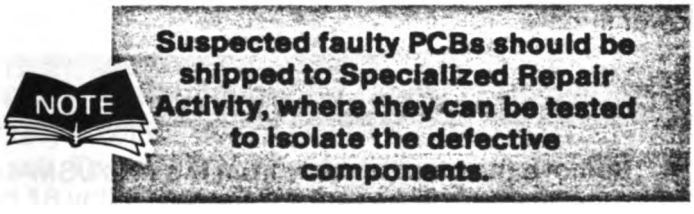
If it fails on	then take the following action
Steps 01-04	Replace PCB No. IV, Repeat Test
Steps 05-27	Replace PCB No. I, Repeat Test
Steps 28-35	Replace PCB No. II, Repeat Test
Steps 36-48	Replace PCB No. III, Repeat Test

- If after repeating the tests, the test set still does not function to the EOT on the known good J-3513A, leave the new PCB's in place.

- Disconnect the J-3513A and connect the known good J-3514A. Run the J-3514A through the test again and note the steps on which it fails:

If it fails on	then take the following action
Steps 01-04	Replace PCB No. IV, Repeat Test
Steps 05-16	Replace PCB No. I, Repeat Test
Steps 17-24	Replace PCB No. IV, Repeat Test

- If after repeating the tests, the EOT light still does not come on, refer the test set to higher level maintenance.



2-9. TESTING CABLES

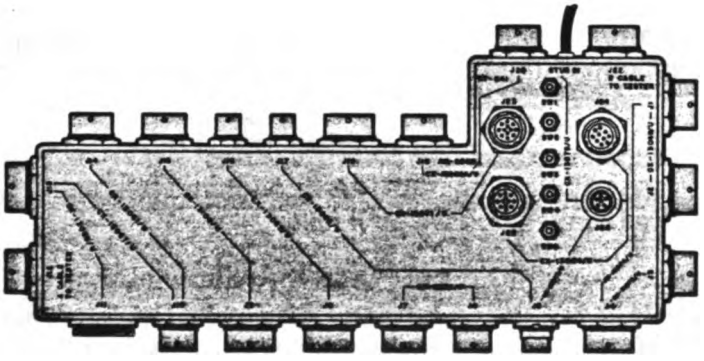
To perform operational checks on the test set's cables, follow the instructions beginning in paragraph 2-4 of the Operator's and Unit Maintenance Manual (TM 11-5810-345-12).

If cables do not pass operational checks, they should be removed and replaced according to the maintenance procedures described in paragraph 2-23.

2-10. TESTING THE CABLE TEST ADAPTER

The best and only means of testing the cable test adapter is by attaching "Known Good Cables" to the tester to determine if the cable test adapter has any electrical faults such as broken wires, faulty switches or faulty diodes.

The mechanical condition of the cable test adapter can be determined by a visual inspection.

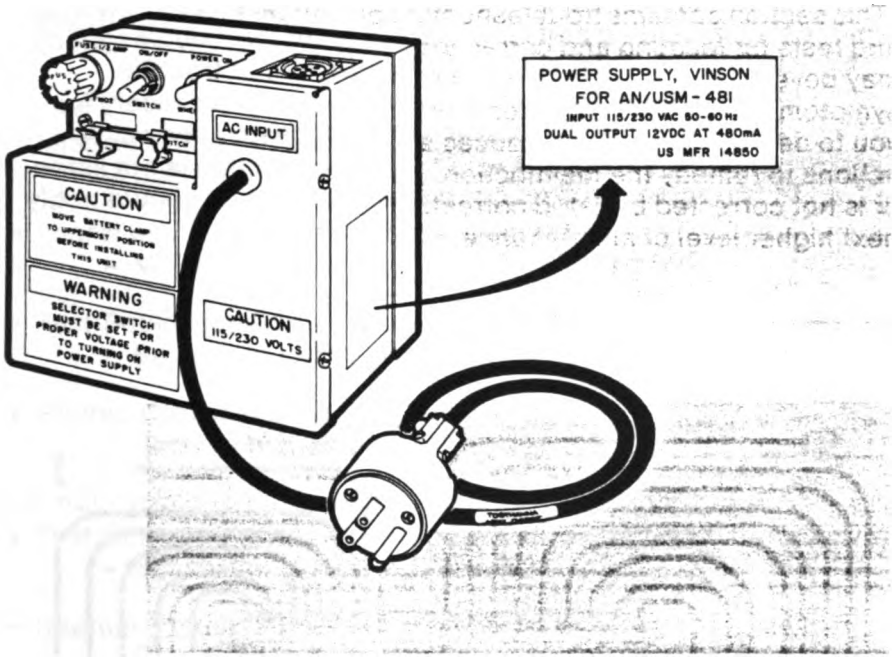


2-11. TESTING THE AC POWER SUPPLY

A digital multimeter is the only equipment needed to test the AC power supply.

To test the power supply for proper output voltage:

- Remove the power supply from the AN/USM-481.
- Set the 115/230 Vac selector switch to the proper setting.
- Insert the unit's three-prong plug into your power source.
- Using the digital multimeter, measure for 12 Vdc between pins 1 and 4, then 2 and 5 on the output connector.



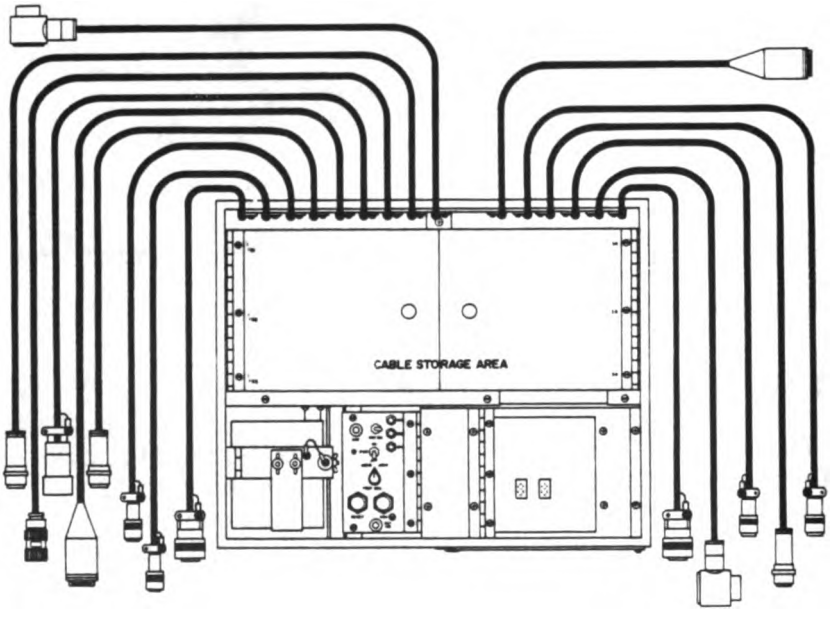
2-12. TESTING THE BATTERY

The battery provides the 12 and 24 volts required to power the test set. The test set converts these voltages to 12 volts and 18 volts internally. These voltages can be measured at the 12V and 18V jacks on the control panel by using a digital multimeter.

SECTION V TROUBLESHOOTING

2-13. SCOPE

This section contains troubleshooting or malfunction information and tests for locating and correcting most of the troubles which may develop in the test set. Each malfunction or trouble symptom is followed by the tests or inspections necessary for you to determine probable causes and suggested corrective actions to remedy the malfunction. If a malfunction is not listed or is not corrected by listed corrective actions, you should notify next higher level of maintenance.



2-14. TROUBLESHOOTING TABLE

MALFUNCTION
- **PROBABLE CAUSE**
  - **CORRECTIVE ACTION**

Inoperative
- **Missing battery or power supply.**
  - **Install battery or power supply.**
- **Improperly installed battery or power supply.**
  - **Make sure connectors are properly mated.**
- **Test Set incomplete.**
  - **Be certain all five printed circuit boards are in card cage.**
- **Printed Circuit Boards malfunctioning.**
  - **Refer to higher level of maintenance.**

Test Set not cycling to EOT when connected to a known good.
- **Test SEL switch not set for proper unit under test.**
  - **Set switch to proper position.**
- **Internal circuitry must be reset to start of cycle.**
  - **Press and release RESET.**
- **Connectors not properly attached to unit under test.**
  - **Check for proper connection.**
- **Test Set has checked that J-3514 PTT is functional but test indicator stops at step 17.**
  - **Press and release PTT on J-3514.**
- **Printed Circuit Board is bad.**
  - **Refer to higher level of maintenance.**

Test Set will not cycle past step 37 with J-3513 or step 16 with J-3514.
- **Unit under test is defective.**
  - **Unit under test must be repaired then retest from step "00".**

Power Supply Indicator not lit.
- **Blown fuse in the power supply.**
  - **Replace fuse.**

SECTION VI MAINTENANCE PROCEDURES

2-15. GENERAL

Intermediate Direct Support Maintenance is responsible for:

- Assessing the operating condition of equipment.
- Repair by removal and replacement of authorized components.
- Forwarding equipment to Specialized Repair Activities (SRA).
- Performing operational check procedures to verify the equipment's operational capabilities.

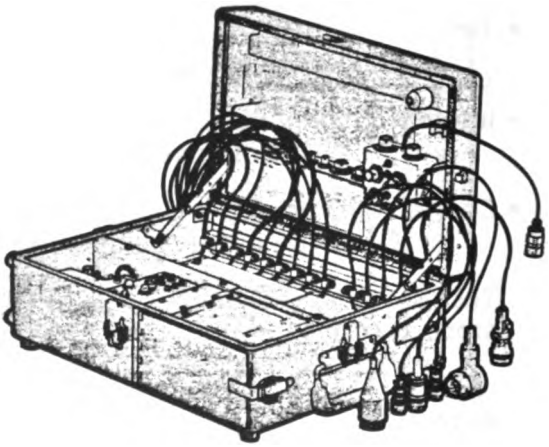
Intermediate Direct Support Maintenance is limited to:

INSPECTION

- External.
- Visual.

TESTING

- Operational Checks.



REPLACEMENT

- Knobs.
- Switches.
- Cable assemblies.
- Connectors.
- Wiring.
- PCB's.

2-16. INSPECTION

To perform a visual inspection of equipment, follow the recommendations provided in Preventive Maintenance Checks and Services, Paragraph 2-7, and Inspection of Printed Circuit Boards, Paragraph 2-24.

2-17. TESTING

Testing at the Intermediate Direct Support level is limited to the operational check procedures of Section IV, this chapter.

2-18. REPLACEMENT

Intermediate Direct Support Maintenance procedures consist of repair by removal and replacement of:

- AC Power Supply Components.
- Control Panel Components.
- Cable Test Adapter Connectors and Wiring.
- Cable Assemblies and Connectors.
- Printed Circuit Boards.

Although some wires in the test set are referred to by specific color, these colors may NOT be the same for the wires in your particular piece of equipment. Therefore, when desoldering or soldering wires, label the wires to assure proper identification.

Make sure ALL power to the AN/USM-481 is removed before performing removal and replacement procedures.

2-19. BATTERY

Intermediate Direct Support Maintenance for the battery consists of operational check procedures.

TOOLS AND EQUIPMENT

- Digital Multimeter

OPERATIONAL CHECK PROCEDURES

To perform operational check procedures on the battery, refer to paragraph 2-12, Testing the Battery.

2-20. AC POWER SUPPLY

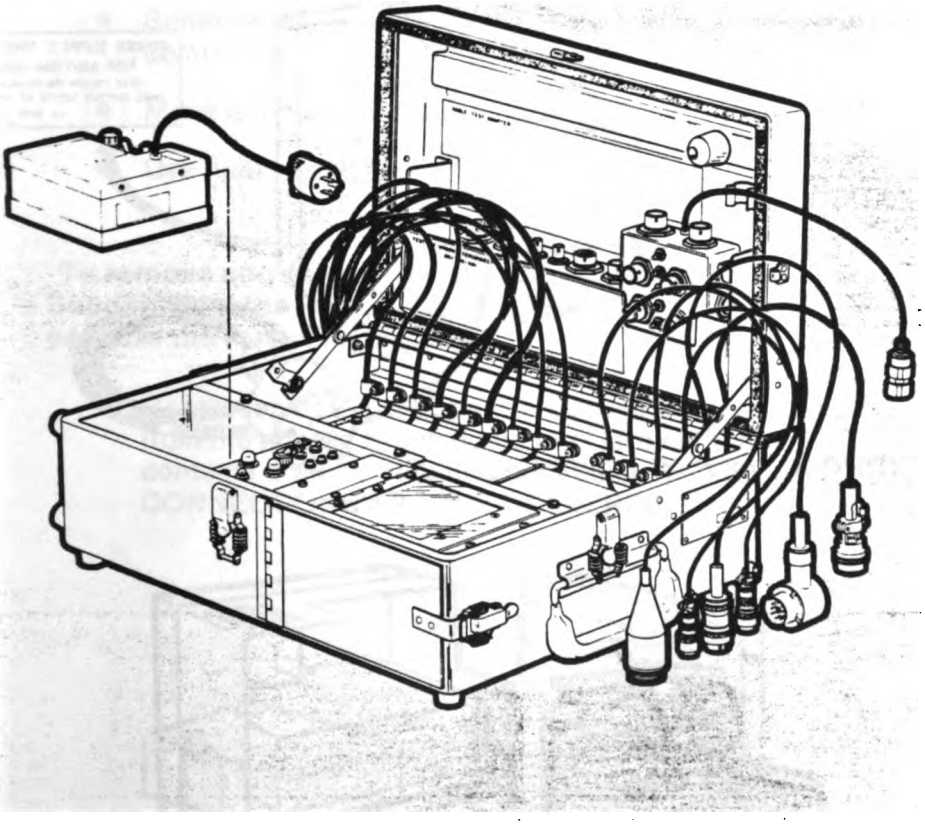
Intermediate Direct Support Maintenance for the AC power supply also consists of operational check procedures, removal and replacement of authorized components.

TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-105G.

OPERATIONAL CHECK PROCEDURES

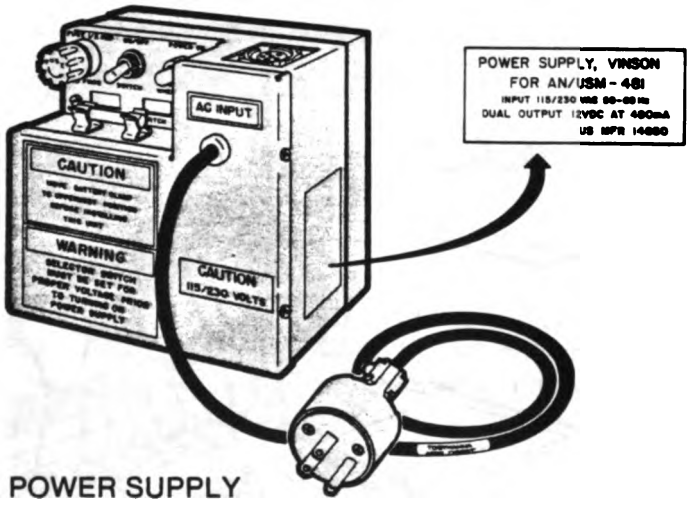
To perform operational check procedures on the AC power supply, refer to paragraph 2-11, Testing the AC Power Supply.



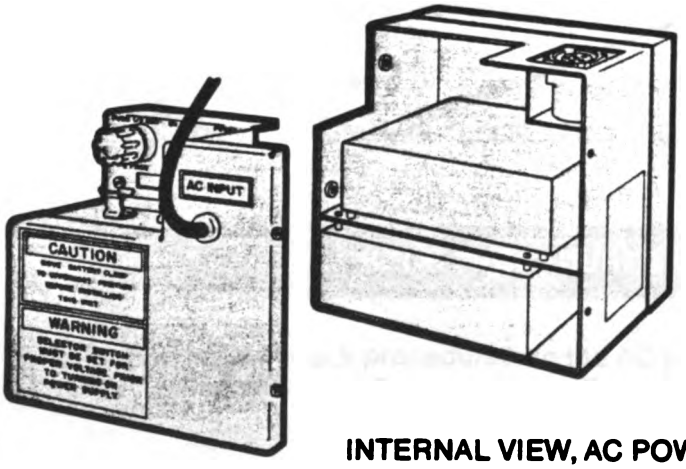
REMOVAL AND REPLACEMENT

To gain access to the AC power supply's internal components:

- Remove the four screws from the cover.
- GENTLY lift cover to prevent damaging wiring connections.



EXTERNAL VIEW AC POWER SUPPLY



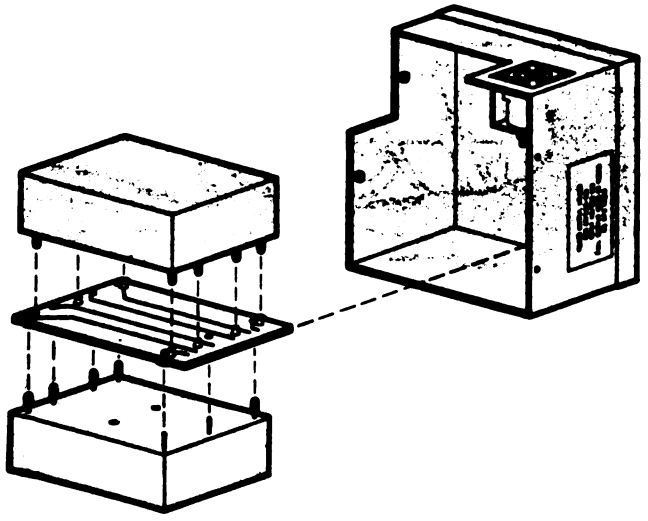
INTERNAL VIEW, AC POWER SUPPLY

To remove and replace battery/power supply connector, fuseholder, POWER ON lamp, ON/OFF SWITCH, or 115/230 Vac SWITCH, perform the following steps:

- Using a small knife, cut and remove the heat shrinkable tubing from the connections.
- Desolder wires and remove them from the connections.
- Remove damaged component.
- Put heat shrinkable tubing on wires.
- Solder wires to appropriate connection on replacement component.
- Move tubing up over connection.
- Use heat gun to shrink the tubing.

To remove and replace the internal Power Supplies and the Printed Circuit Board, perform the following steps:

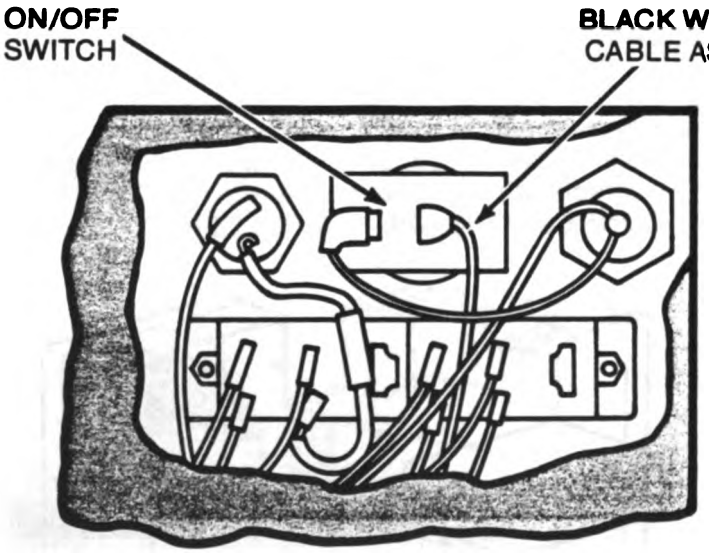
- Gently separate the uppermost power supply from the printed circuit board until all electrical contacts are free from their standoffs. THESE CONNECTIONS ARE NOT SOLDERED.



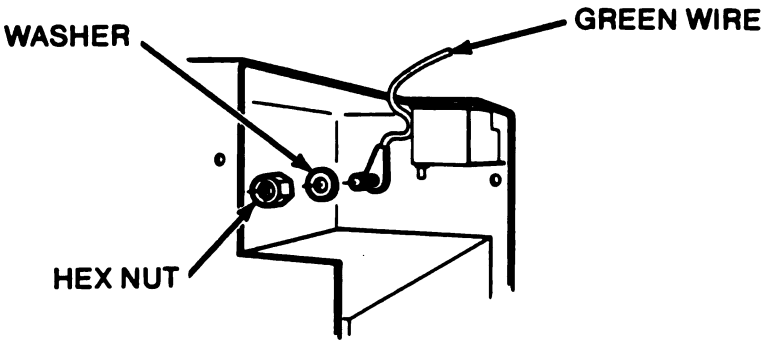
- The printed circuit board is removed the same way by separating the board from the contacts on the lower power supply.
- Use proper desoldering and soldering methods to disconnect and reconnect wires to the printed circuit board. For help in locating the wiring connections on the printed circuit board, refer to the wiring diagram for PCB hookup on page 2-23.
- Replace the printed circuit board and the power supplies by reversing the disassembly procedure.

To remove cable assembly, perform the following steps:

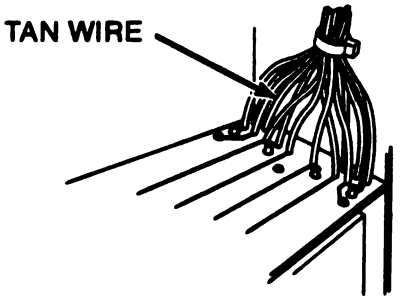
- Desolder black wire of cable assembly from appropriate side of ON/OFF SWITCH.



- Remove hex nut from ground on housing assembly. Remove terminal lug from ground. Desolder green wire from terminal lug.



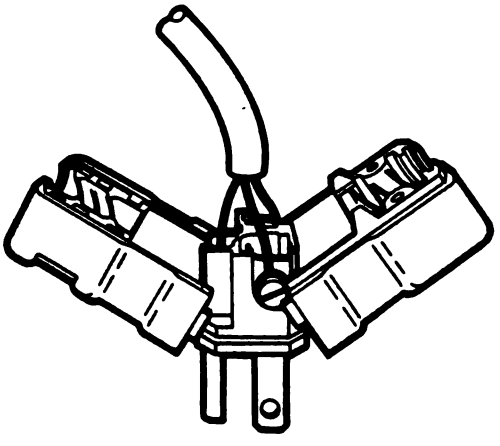
- Desolder tan wire from AC IN WHT on printed circuit board.



- Remove bushing and cable assembly.

To replace the cable assembly, reverse the disassembly procedure.

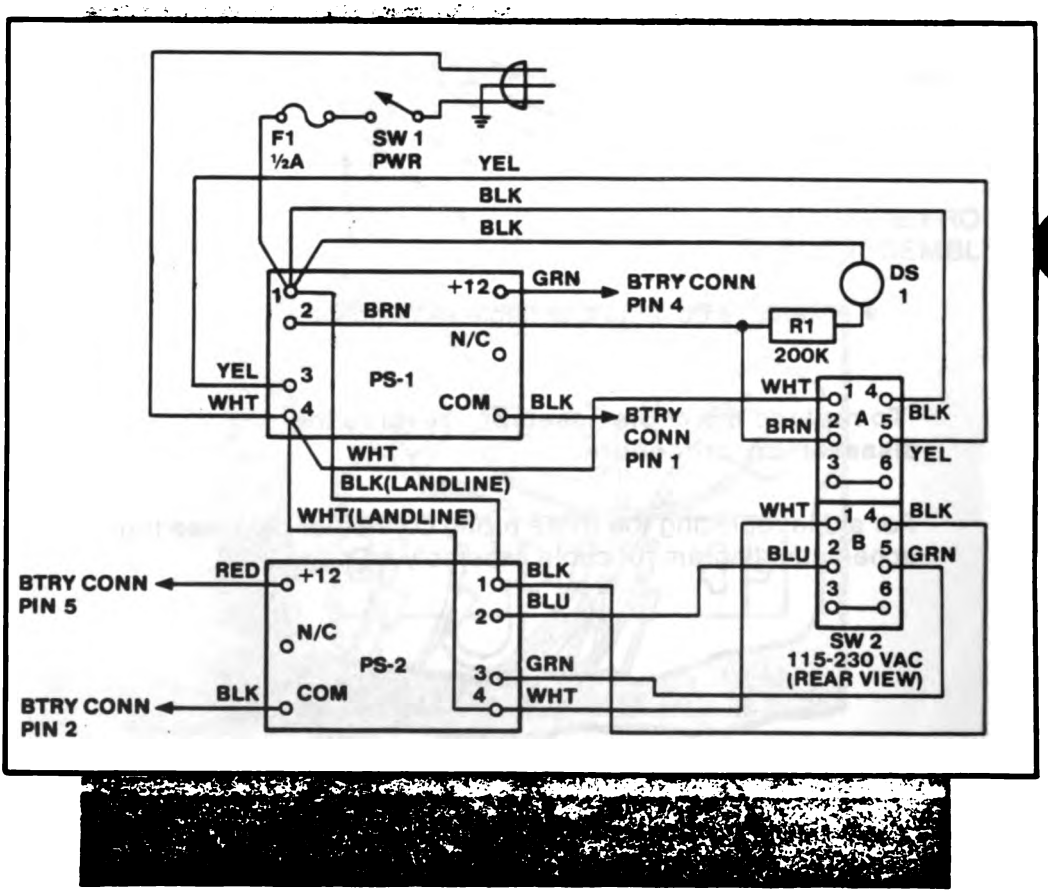
For aid in replacing the three prong connector plug, see the schematic diagram for cable assembly on page 2-23.



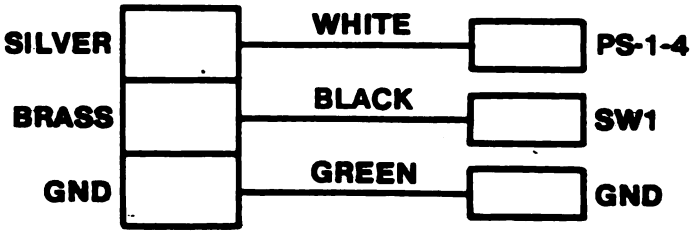
DIAGRAMS

The following diagrams are provided to assist in the maintenance of the AC power supply.

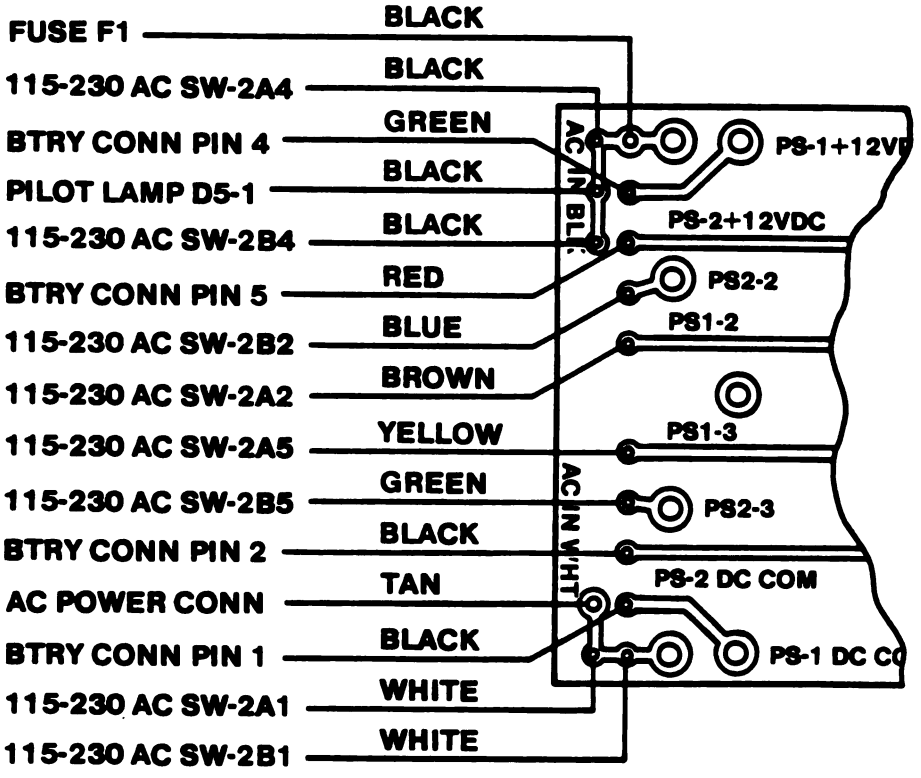
- Schematic diagram for the power supply.
- Schematic diagram for the cable assembly.
- Wiring diagram for the printed circuit board hookup.



SCHEMATIC DIAGRAM FOR POWER SUPPLY, I.K. TESTER



SCHEMATIC DIAGRAM FOR CABLE ASSEMBLY



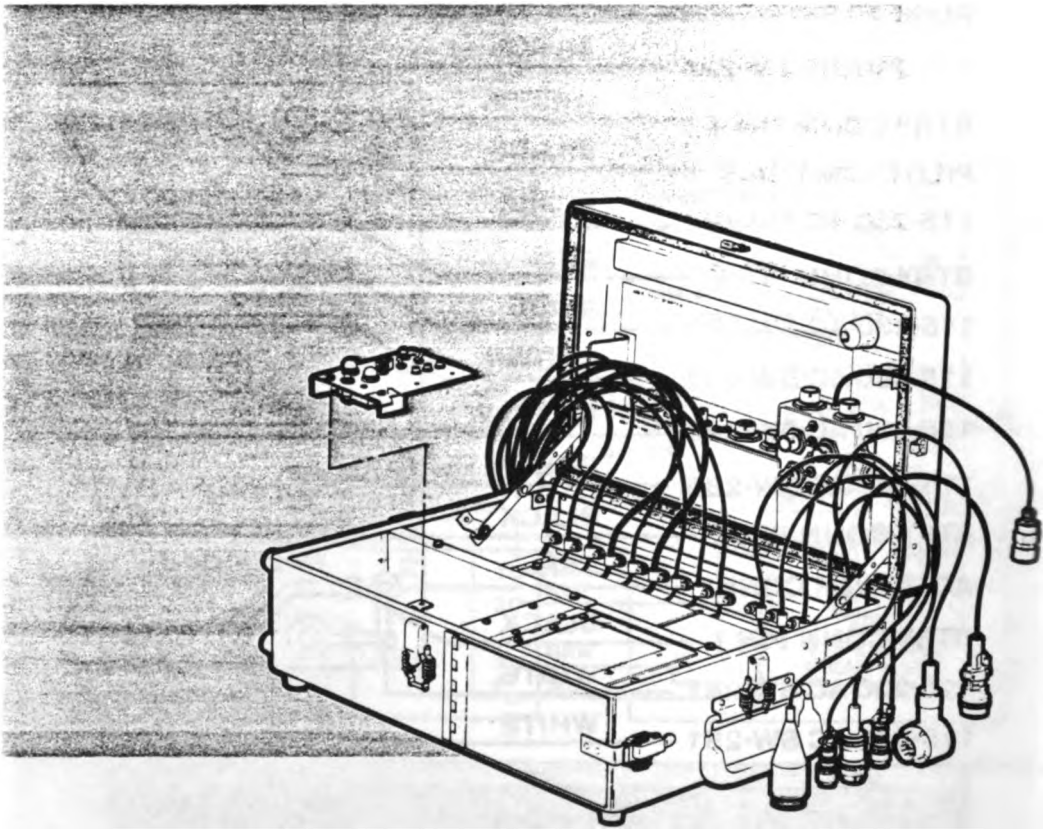
WIRING DIAGRAM FOR PRINTED CIRCUIT BOARD HOOKUP

2-21. CONTROL PANEL

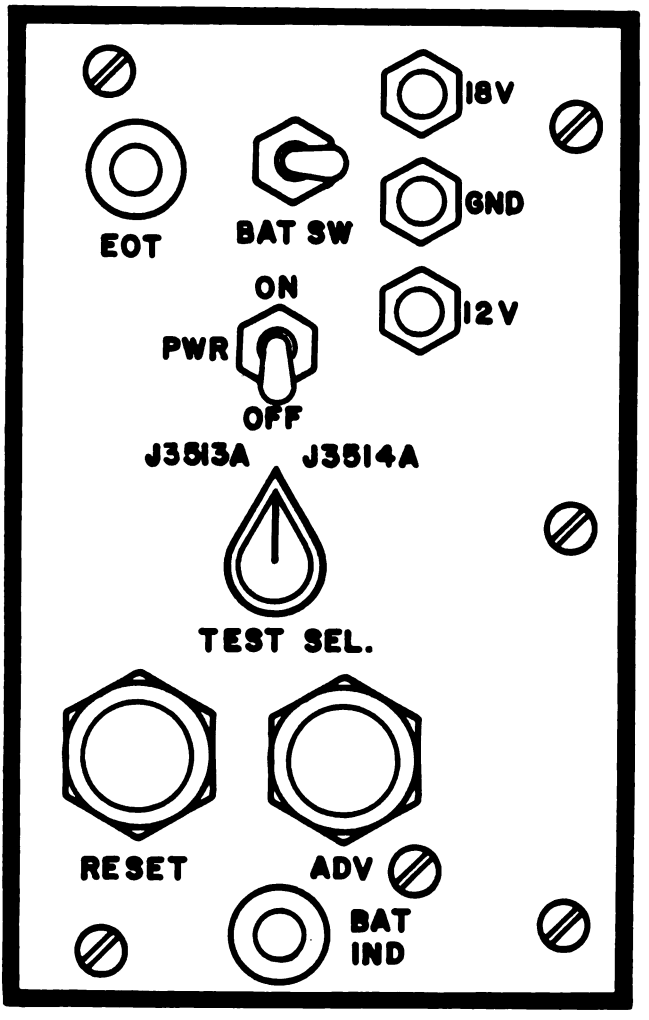
Intermediate Direct Support Maintenance for the control panel consists of removal and replacement of switches, LED's and jacks.

TOOLS AND EQUIPMENT

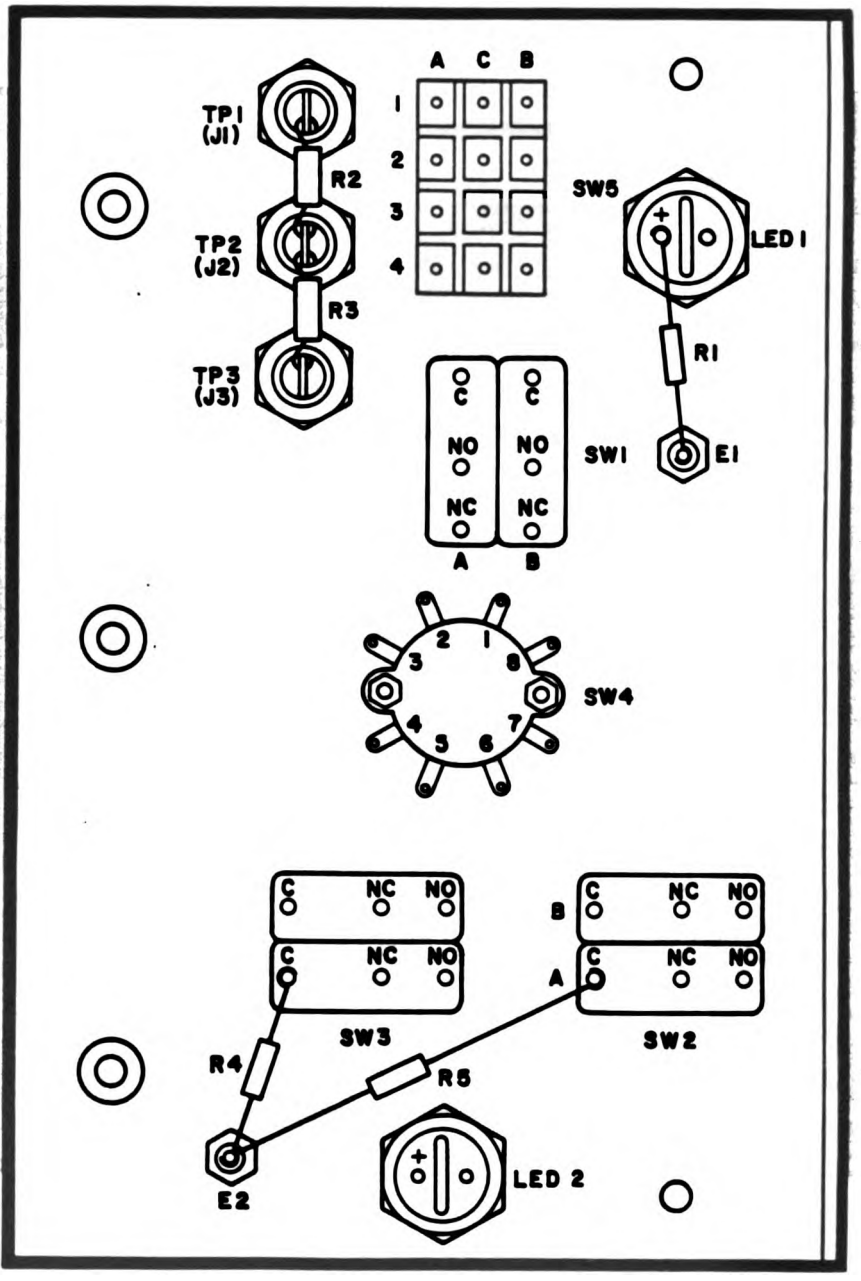
- Digital Multimeter
- Electronic Equipment Tool Kit, TK-105G



REMOVAL AND REPLACEMENT



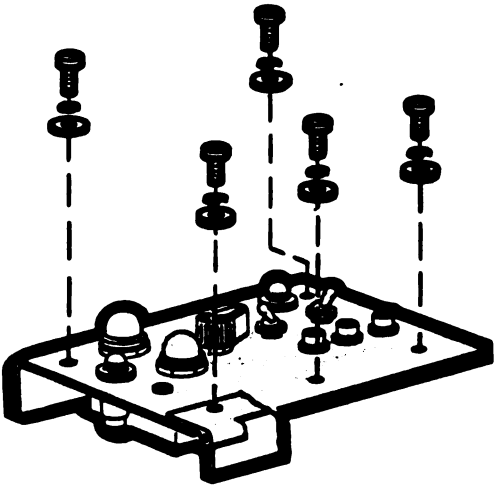
CONTROL PANEL, TOP VIEW



CONTROL PANEL, BOTTOM VIEW

To remove and replace TEST SEL switch knob, perform the following steps:

- Note pointer position (J-3513A or J-3514A) of damaged knob.
- Loosen two set screws using hexagon wrench No. 4.
- Remove damaged knob.
- Set replacement knob in appropriate position and tighten snugly.



In order to access switches, LEDs or jacks, remove the five screws and washers holding the control panel assembly to its mounting.

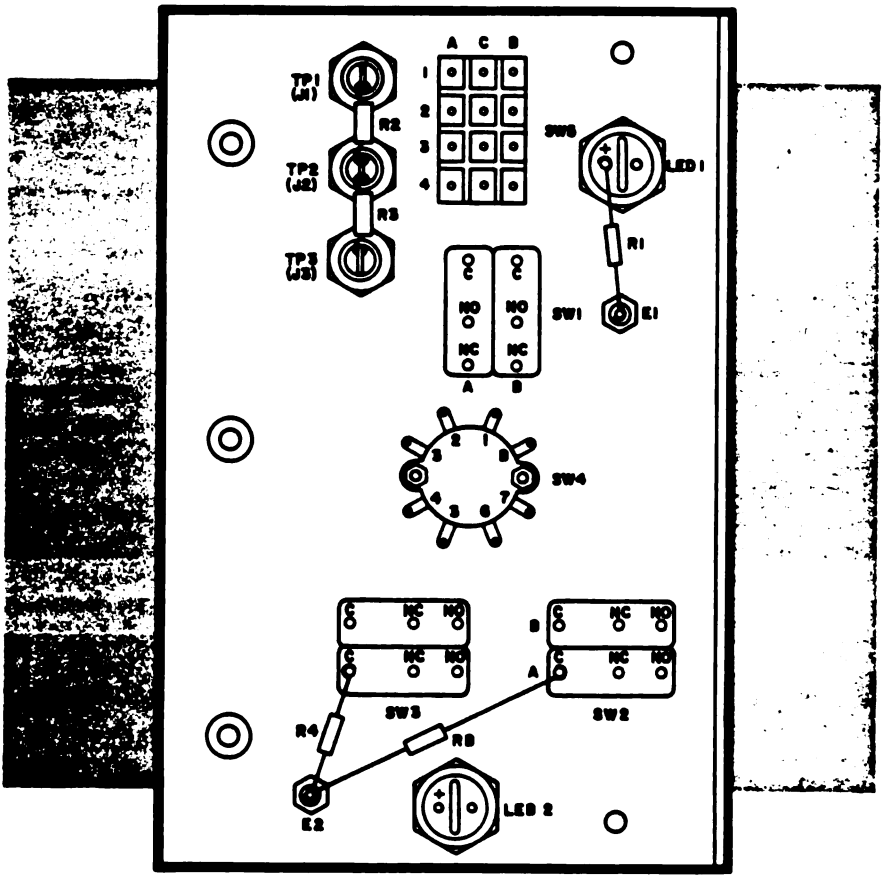
To remove and replace switches, LEDs, or jacks, perform the following steps:

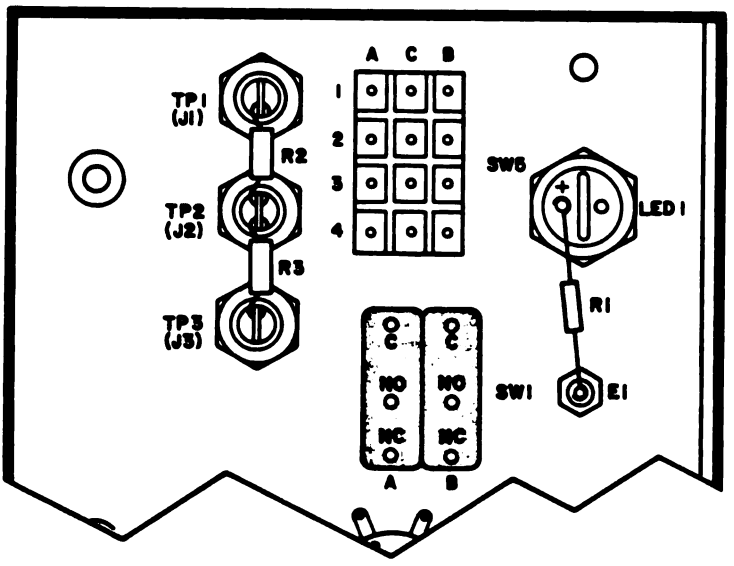
- Dust boots on RESET, ADV, ON/OFF, or BAT SW should be removed first before any further work is done on these switches.
- Use the appropriate wrench to loosen nuts or collars on switches, LEDs, or jacks.
- All components should be removed and replaced using proper soldering methods.

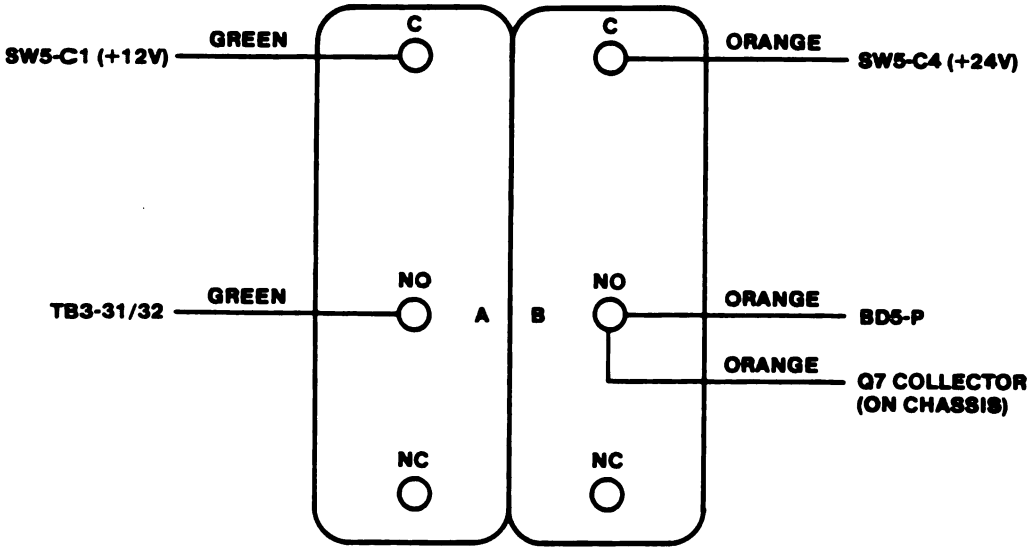
DIAGRAMS

The following wiring diagrams are provided to assist in the maintenance of the control panel.

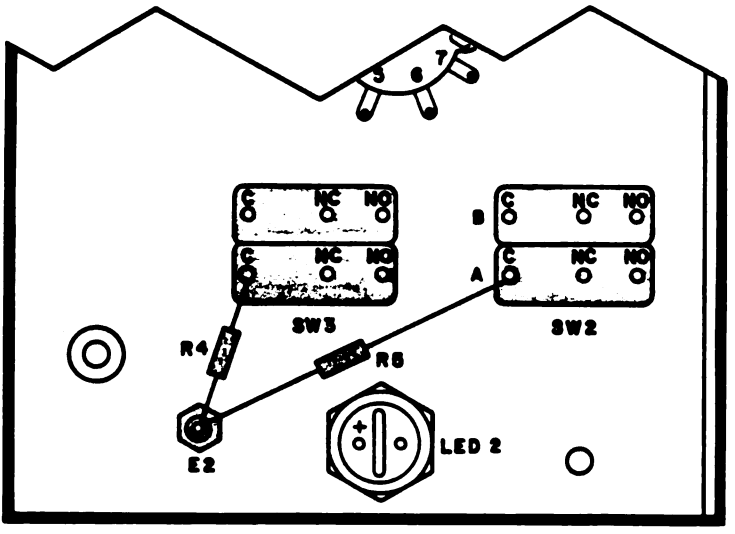
- The ON/OFF (SW1) switch.
- The standoff E2
- The RESET (SW2) pushbutton.
- The ADV (SW3) pushbutton.
- The TEST SEL (SW4) switch.
- The BAT SW (SW5) switch.
- The test jacks, TP1, TP2, and TP3.
- The EOT and BAT IND LED lights.

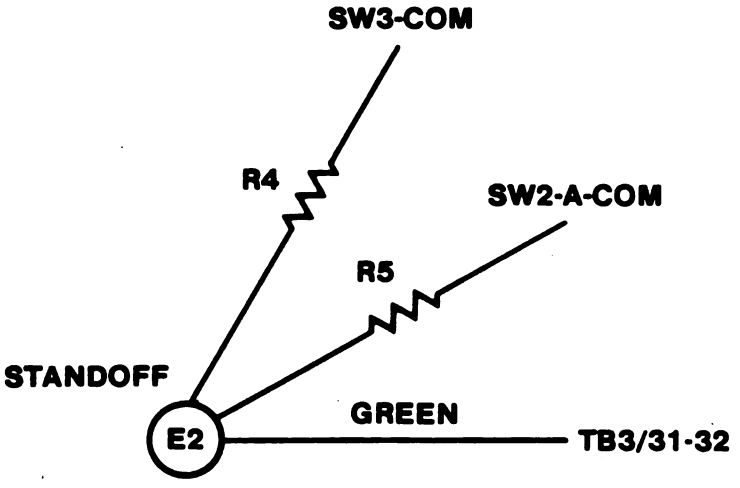




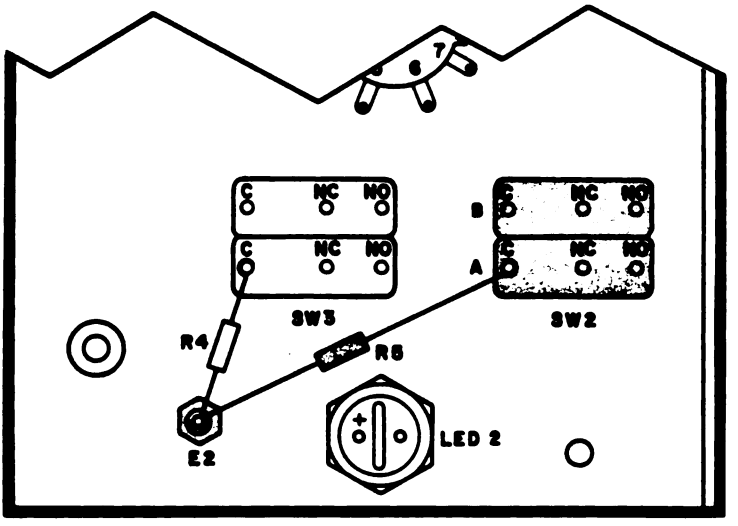


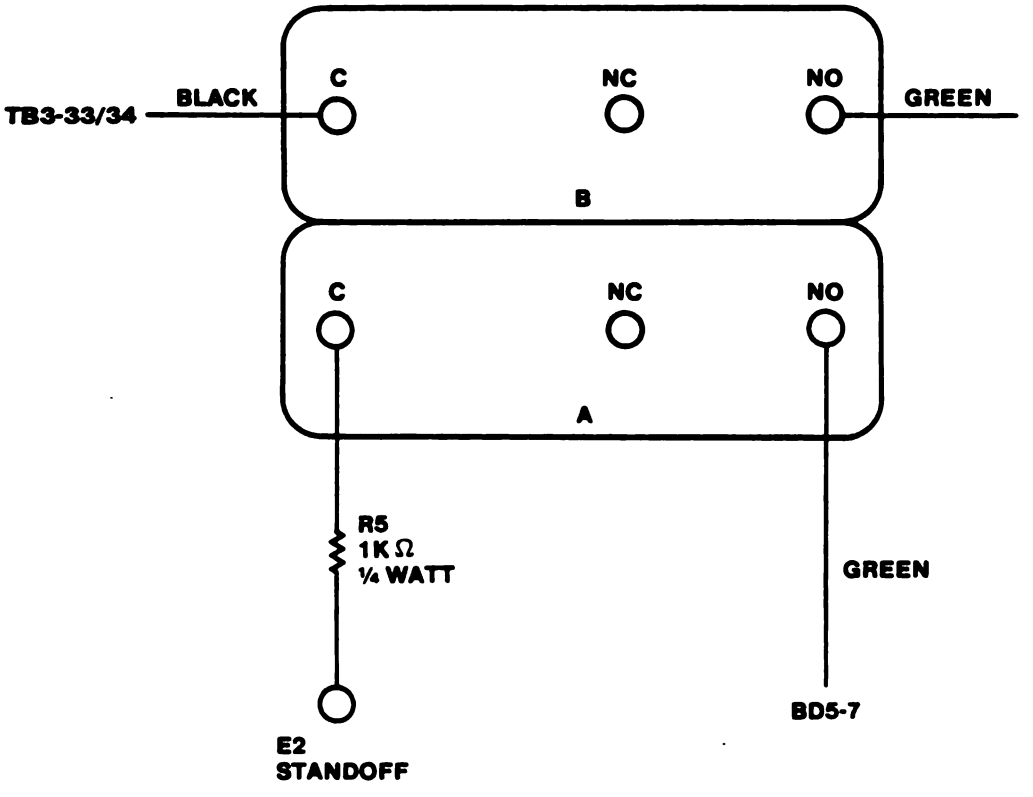
WIRING DIAGRAM OF ON/OFF POWER SWITCH (SW1)
ON CONTROL PANEL



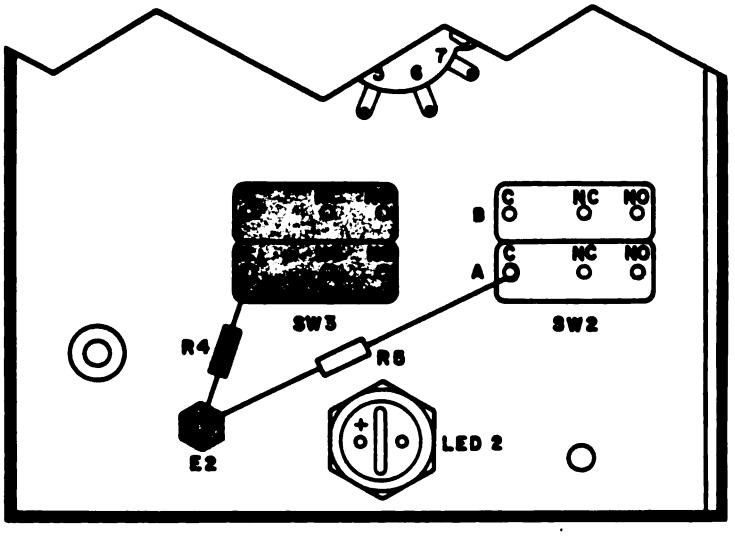


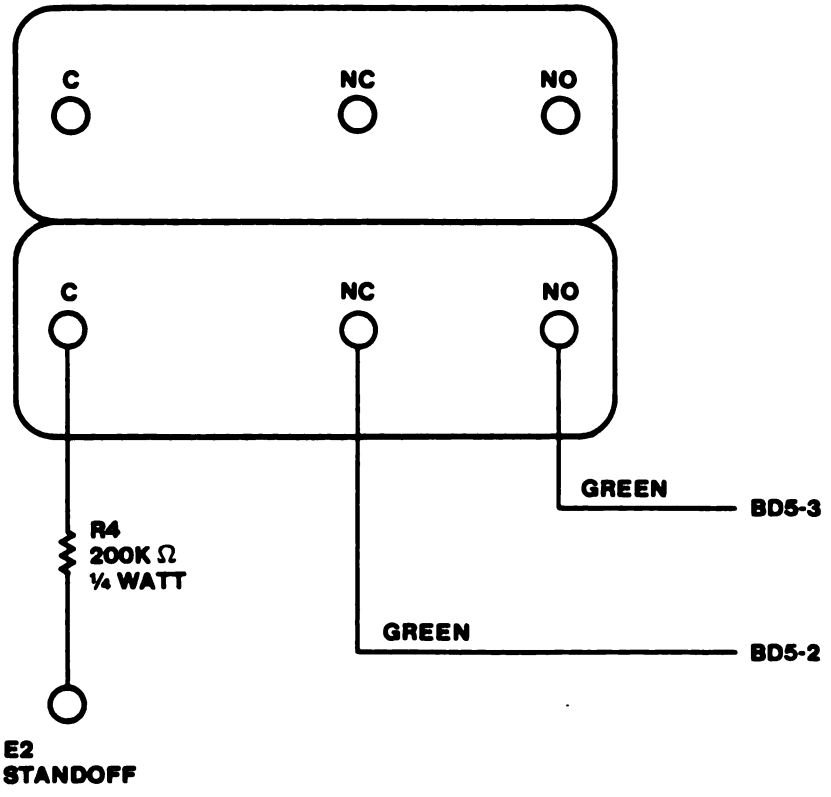
WIRING DIAGRAM FOR STANDOFF E2



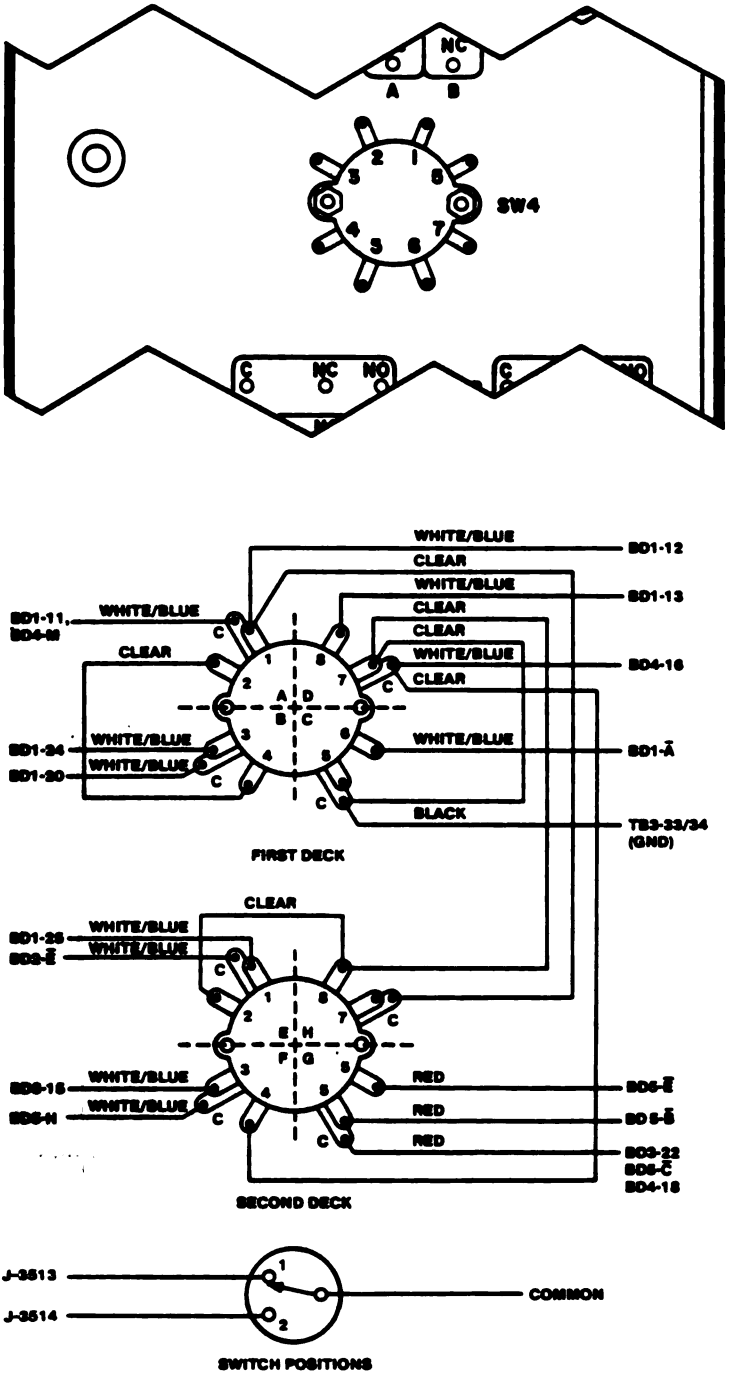


WIRING DIAGRAM OF RESET PUSHBUTTON (SW2)
ON CONTROL PANEL

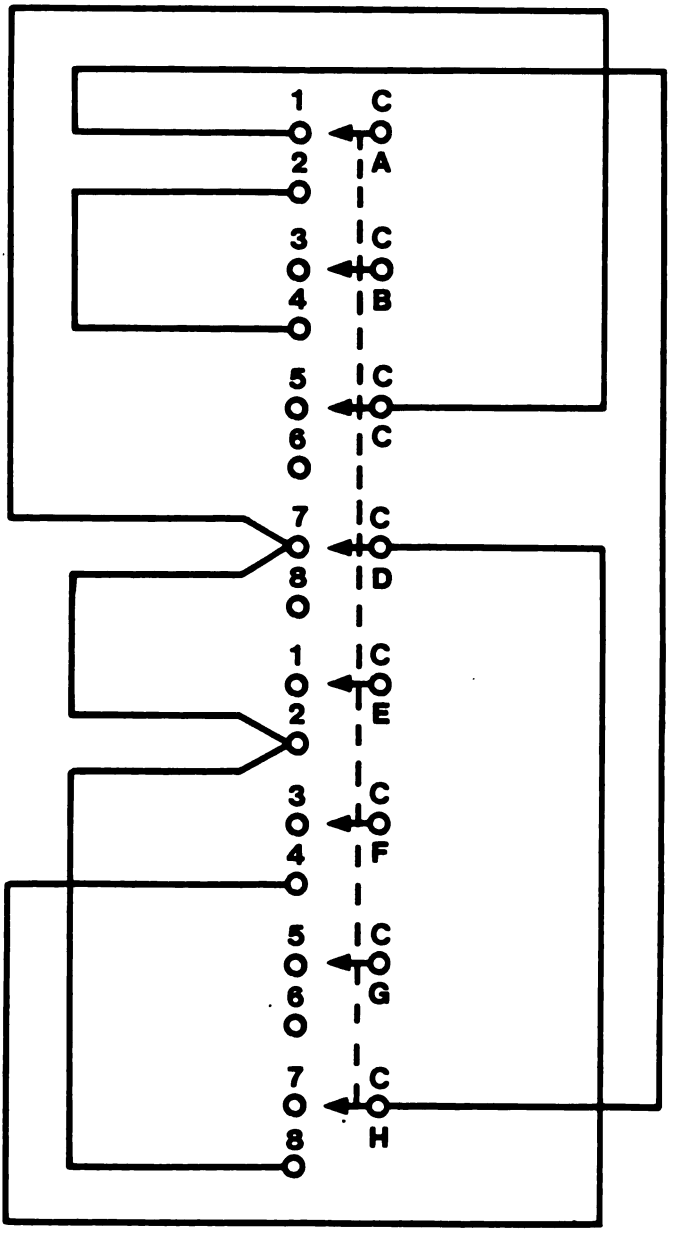




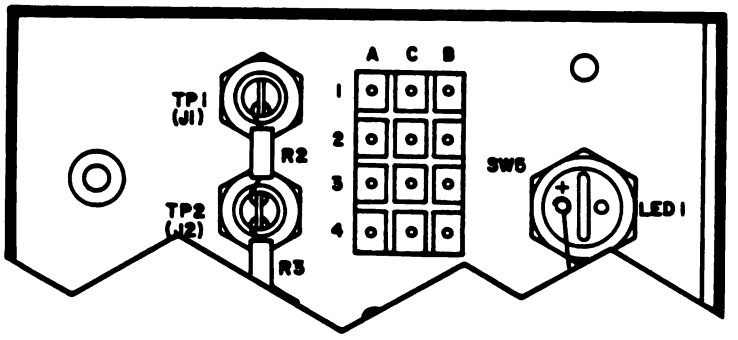
WIRING DIAGRAM OF ADV PUSHBUTTON (SW3)
ON CONTROL PANEL

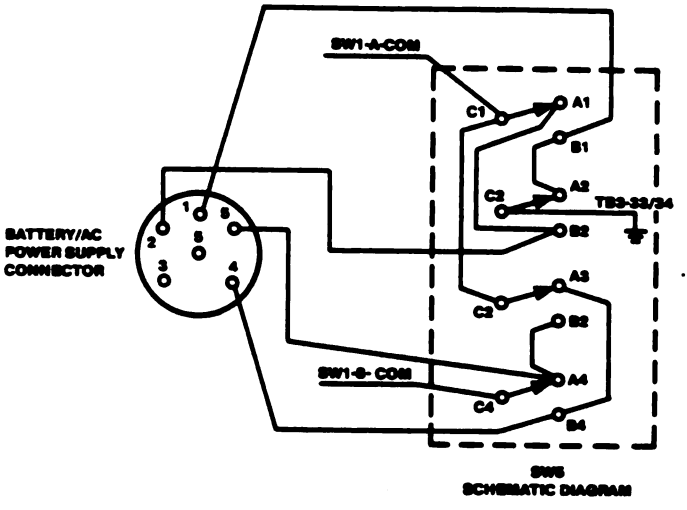


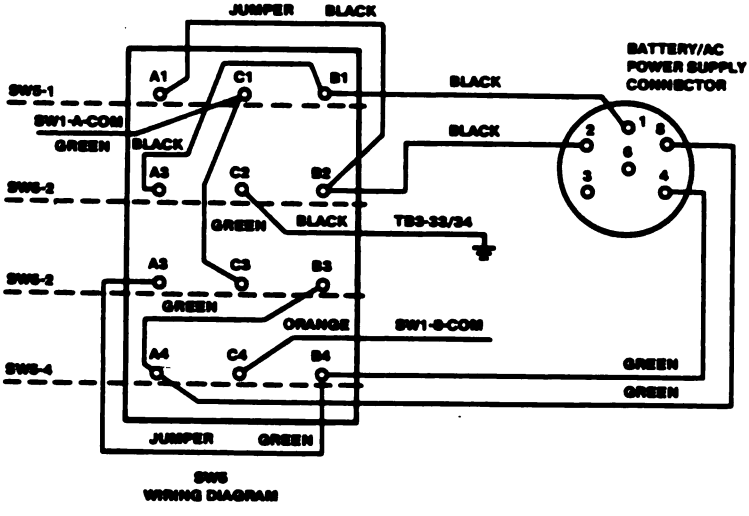
WIRING DIAGRAM OF TEST SEL SWITCH (SW4) ON CONTROL PANEL, PART 1



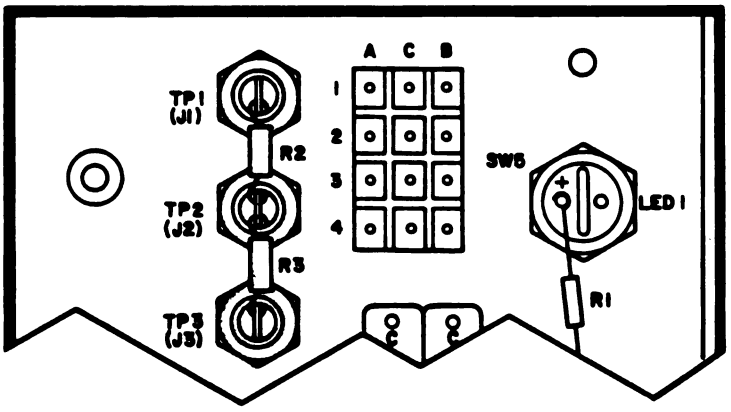
WIRING DIAGRAM OF SW4, PART 2.

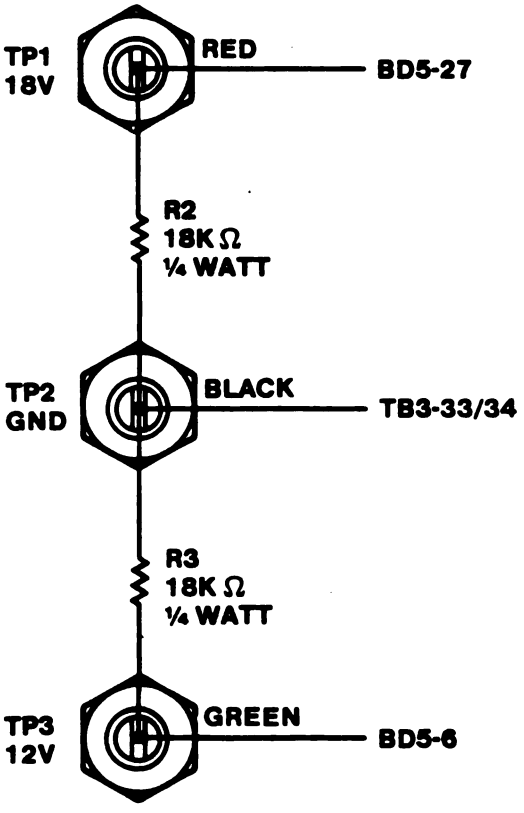




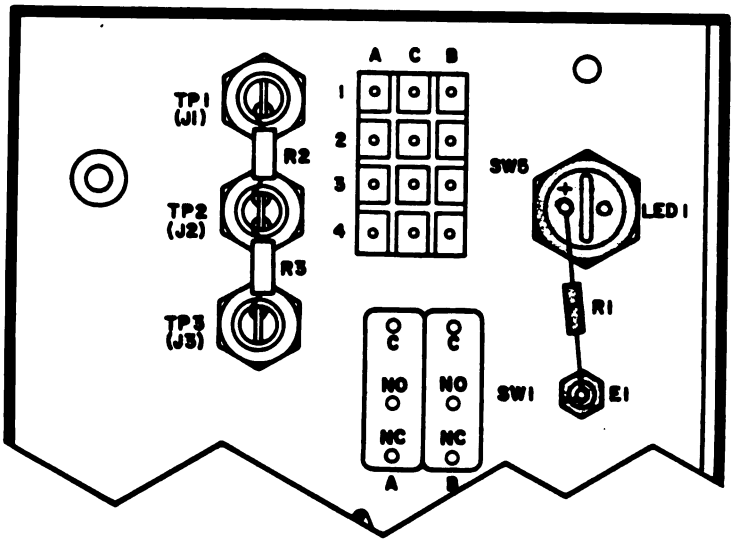


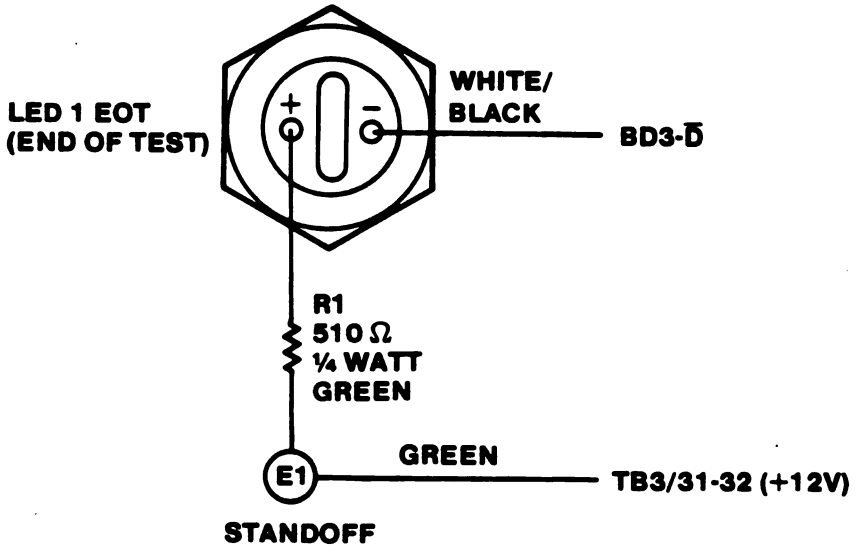
SCHEMATIC AND WIRING DIAGRAM OF BAT SW (SW5) ON CONTROL PANEL



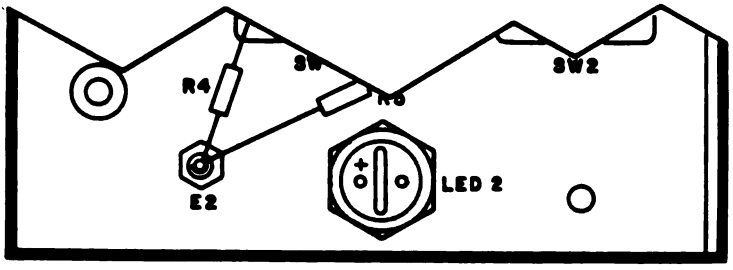


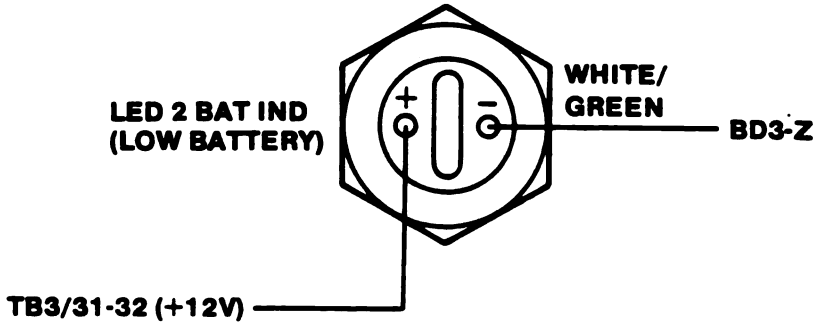
WIRING DIAGRAM FOR TP1, TP2, AND TP3 JACKS ON CONTROL PANEL





WIRING DIAGRAM FOR EOT LIGHT





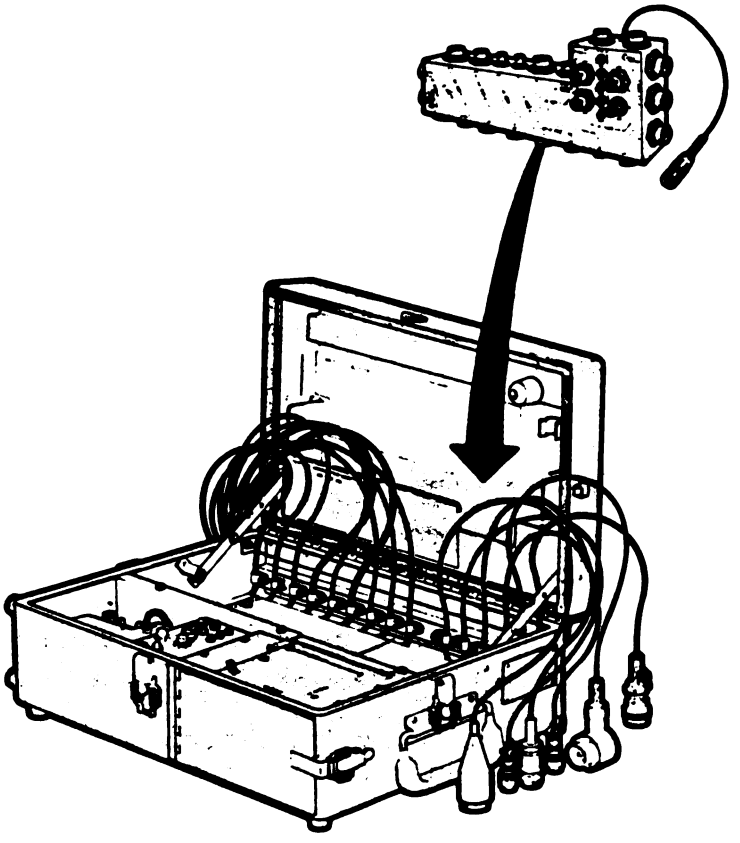
WIRING DIAGRAM FOR BAT IND LIGHT.

2-22. CABLE TEST ADAPTER

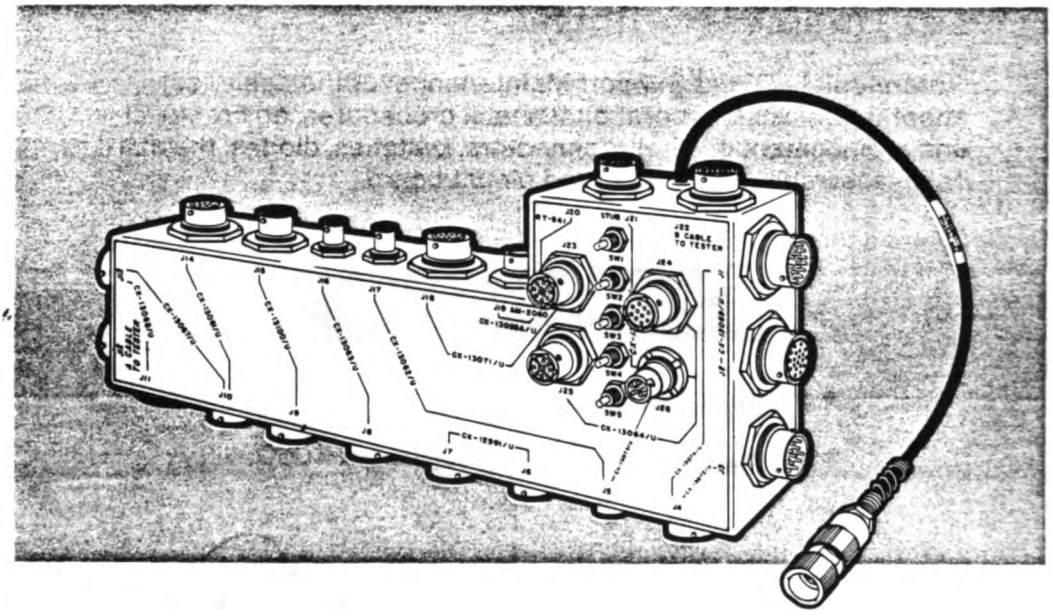
Intermediate Direct Support Maintenance for the cable test adapter consists of operational check procedures, and removal and replacement of wires, connectors, switches, diodes, the J21 cable assembly, and the printed circuit board.

TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-105G.



TEST SET FOR VINSON INTERCONNECTING BOX AN/USM-481



OPERATIONAL CHECK PROCEDURES

To perform operational check procedures on the cable test adapter, follow the instructions in paragraph 2-10, Testing the Cable Test Adapter.

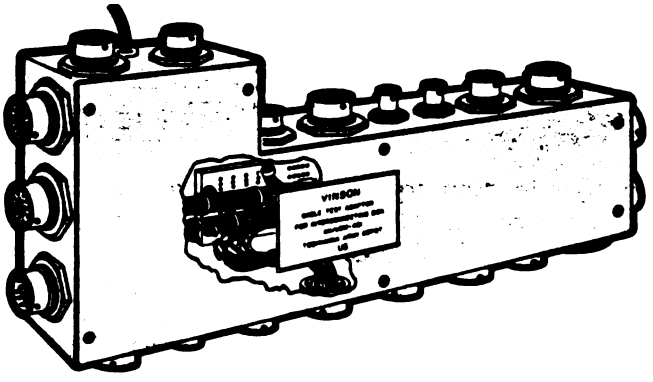
REMOVAL AND REPLACEMENT

To gain access to the cable test adapter's internal components:

- **Remove the seven screws from the cover assembly at the rear of the adapter. Remove cover.**

To remove wires, perform the following steps:

- Trace the wires to be removed to their terminations. For help in locating these terminations, refer to Wiring List 13, Cable Test Adapter, Appendix C; and Foldout No. 2.
- Cut and remove the heat shrinkable tubing from the connections.
- Use proper desoldering methods to disconnect wires from their connector pins.
- Remove tie wraps from the appropriate wiring harness.
- Again use proper desoldering methods to disconnect wires from their terminations.
- Remove damaged wires.



To replace wires, perform the following steps:

- Route the replacement wires along the appropriate wiring harness to their terminations. For help in locating the wiring connections in the cable test adapter, refer to Wiring List 13, Cable Test Adapter, Appendix C; and Foldout No. 2.
- Put heat shrinkable tubing on wires.

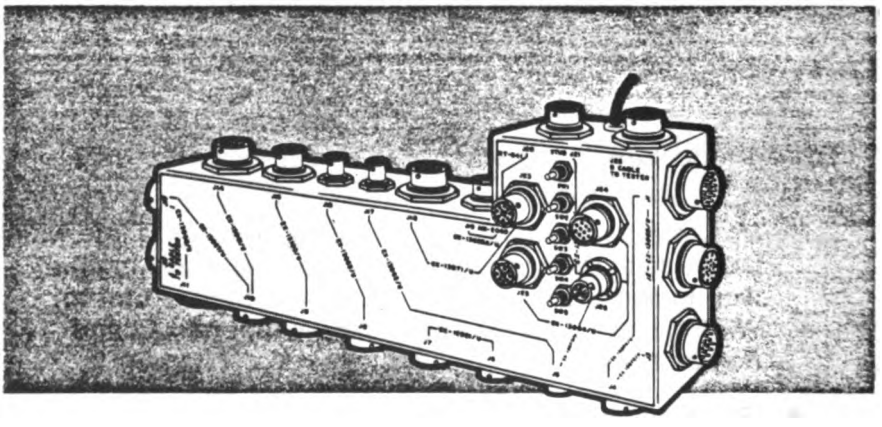
- Use proper soldering methods to connect wires to their connector pins.
- Move heat shrinkable tubing up over connection.
- Use heat gun to shrink the tubing.
- Secure the wires to the wiring harness with tie wraps.
- Again use proper soldering methods to connect wires to their terminations. Apply heat shrinkable tubing where necessary.

NOTE

If there is extensive damage to the wiring, ship the entire Cable Test Adapter to Specialized Repair Activity for replacement of the wiring harness.

To remove and replace connectors and pushbutton switches, perform the following steps:

- For help in locating the wiring connections in the cable test adapter, refer to Wiring List 13, Cable Test Adapter, Appendix C; and Foldout No. 2



- Remove hex nuts on connectors and switches.
- Cut and remove the heat shrinkable tubing from the wire connections.
- Use proper desoldering methods to disconnect wires from their connector pins.
- Remove damaged connectors and switches.
- Put heat shrinkable tubing on wires.
- Use proper soldering methods to reconnect wires to their connector pins on the replacement connectors and switches.
- Move heat shrinkable tubing up over connection.
- Use heat gun to shrink the tubing.
- Install connectors and switches. Tighten hex nuts to secure connectors and switches to the cable test adapter.

To remove and replace the printed circuit board (PCB), perform the following steps:

- For help in locating the wire terminations on the PCB, refer to Wiring List 13, Cable Test Adapter; Wiring List 14, Cable J21, in Appendix C; and Foldout No. 2.
- Use proper desoldering methods to disconnect wires from their terminations on the PCB.
- Remove the three self-locking nuts holding the PCB to the body of the cable test adapter. Remove damaged PCB.
- Tighten the three self-locking nuts to secure the replacement PCB to the cable test adapter.
- Use proper soldering methods to reconnect wires to their terminations.

To remove and replace the J21 cable assembly, perform the following steps:

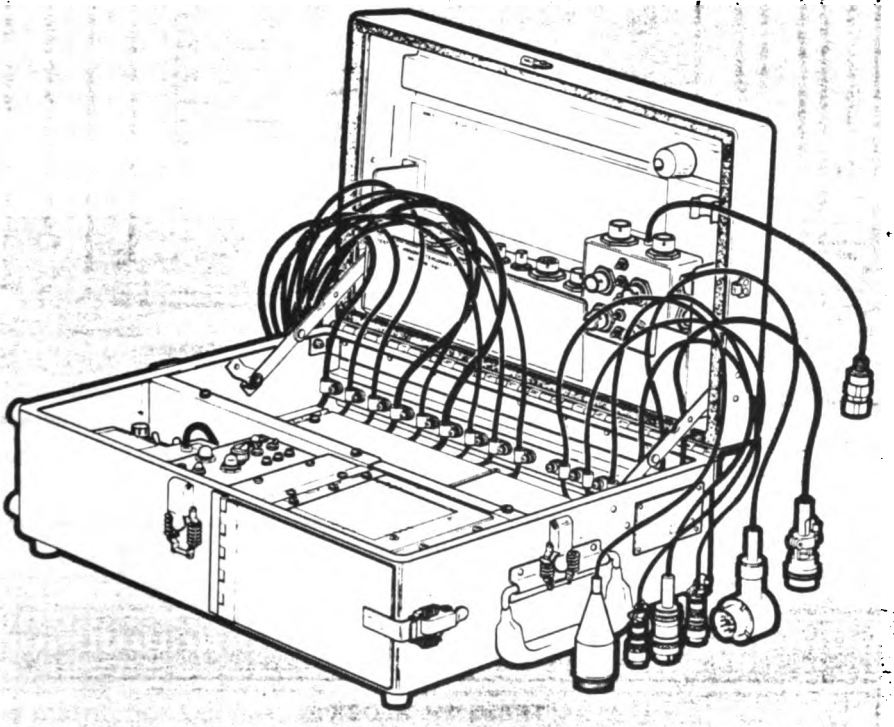
- Remove tie wraps from appropriate wiring harness.
- Trace the wires from the cable to their terminations on the PCB. For help in locating these terminations, refer to Wiring List 14, Cable J21, Appendix C; and Foldout No. 2.
- Using proper desoldering methods, disconnect wires from their terminations.
- Remove bushing and cable assembly.
- Install replacement bushing.
- Insert replacement cable through bushing.
- Route cable wires along the appropriate wiring harness to their terminations on the PCB.
- Secure the wires to the wiring harness with tie wraps.
- Use proper soldering methods to connect wires to their terminations.

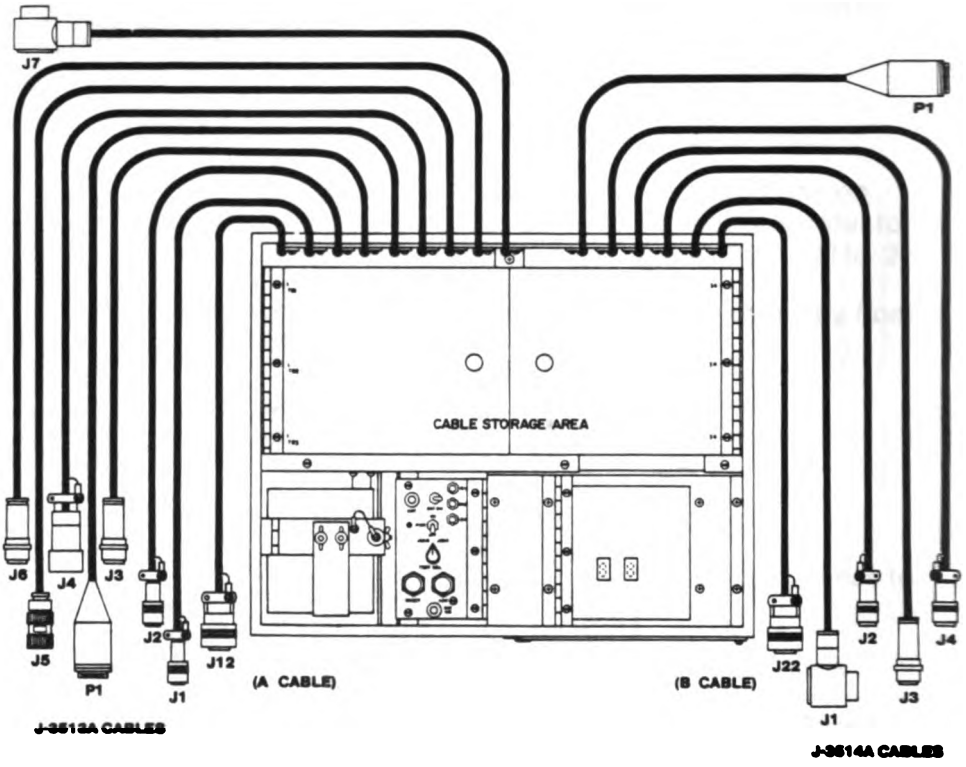
2-23. CABLES AND CONNECTORS

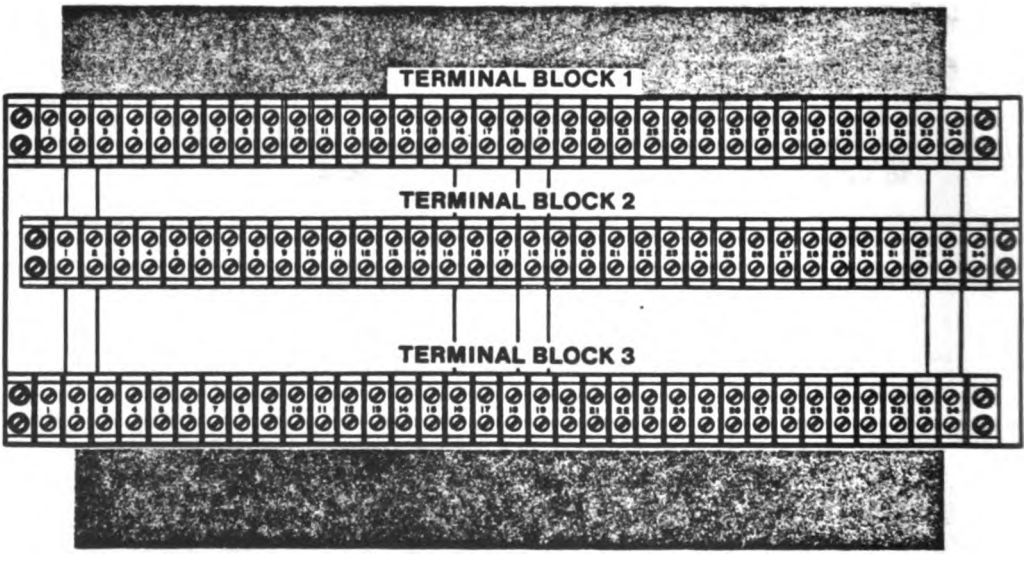
Intermediate Direct Support Maintenance for cables and connectors consists of troubleshooting, operational check procedures, and removal and replacement of the connector or the entire cable assembly.

TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-105G.
- Electronic Equipment Tool Kit, TK-100G.







TEST SET TERMINAL BLOCK CONNECTOR LOCATIONS

TROUBLESHOOTING

Troubleshooting locates the cable defect to be repaired. Possible defects to look for are-open cable conductors, cable conductors that are shorted together, broken or misaligned connector pins and broken or cracked connector sheils. Except for the shorted or open cables, other defects are found by close visual inspection of the cable assembly. The shorted or open conductors must be located by the use of a multimeter.

Since the cables are short and readily accessible, they should be checked from connector to terminal block. Proceed by taking the connector and, with the use of Wiring Lists 1, 2, and 3, determine if each wire has continuity by placing it in the ohmmeter circuit. Normally this is done by setting the ohmmeter to the RXI scale and placing each meter lead on either the pin or socket of each connector and the terminal board connection. If the meter indicates zero or low (less than 1 or 2 ohms) the wire has continuity. Shorted wires are located in much the same way by placing the ohmmeter leads on pins or sockets that are shown on the cable wiring list to have no connection. When an open or short is located in a cable, repair by replacement of the entire cable assembly or authorized components.

OPERATIONAL CHECK PROCEDURES

To perform operational check procedures on the cables, follow the instructions in paragraph 2-4 of the Operator's and Unit Maintenance Manual (TM 11-5810-345-12).

REMOVAL AND REPLACEMENT-CABLE ASSEMBLY

To remove an entire cable assembly (cable, connector and wiring), perform the following steps:

- Remove crossbar assembly over terminal blocks.
- Remove screws at each end of Terminal Block 1 and Terminal Block 2. Lift out the terminal blocks to gain access to the wiring harness.
- Remove screw on loop clamp. Remove cable from clamp.
- Remove tie wraps from appropriate wiring harness.
- Trace the wires from the cable to their connections on the terminal block. For help in locating the wiring connections on the terminal block, refer to Wiring Lists 1, 2, and 3, Appendix C.
- Remove appropriate terminal lugs from the terminal block.
- Remove cable assembly from the test set.

To replace an entire cable assembly (cable, connector, and wiring), perform the following steps:

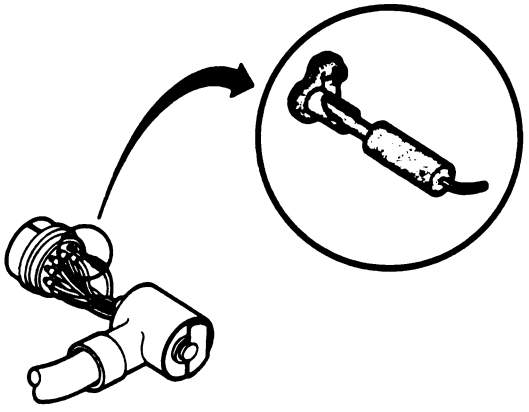
- Insert cable assembly in loop clamp and secure with screw.
- Route cable wires along existing wiring harness to their connections on the terminal block. For help in locating the wiring connections on the terminal block, refer to Wiring Lists 1, 2, and 3, Appendix C.
- Secure the wires to the wiring harness with tie wraps.
- Put heat-shrinkable identification band on each wire.
- If necessary, insert each wire into a terminal lug.

- Using a crimping tool, crimp each terminal lug to establish the connection.
- Reposition terminal blocks. Tighten screws at each end.
- Attach each terminal lug to the appropriate connector location on the terminal block. Refer to Wiring Lists 1, 2, and 3, Appendix C.
- Replace crossbar assembly and tighten screws.

REMOVAL AND REPLACEMENT-CONNECTORS

To remove and replace a connector, perform the following steps:

- Loosen or remove any screws, ground clamps, gland nuts, locking rings, packing, etc., in order to pull plug from plug housing.



- With wire connections exposed, use proper desoldering methods to disconnect wires from their pins.
- Label each wire as you remove it. Refer to Wiring Lists 1, 2, and 3 as an aid to identification.

- After wires have been disconnected from their pins, remove the plug housing from the cable.
- Install replacement plug housing.
- Using proper soldering methods, resolder wires to their appropriate pins on the plug.
- Push plug into plug housing.
- Pull cable to eliminate slack in the plug housing.
- Insert and tighten any screws, nuts, or various components needed to secure connector to cable.

2-24. PRINTED CIRCUIT BOARDS

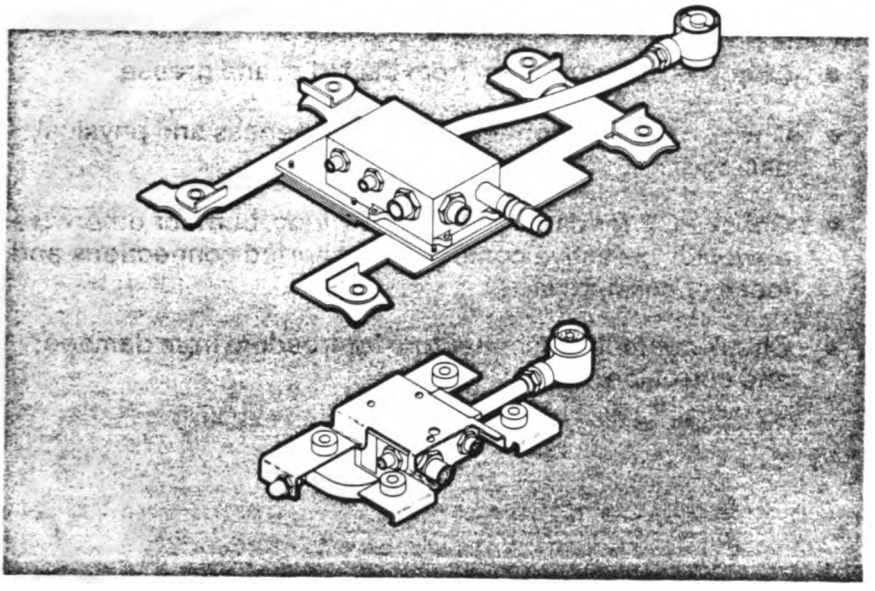
Intermediate Direct Support Maintenance for printed circuit boards (PCBs) consists of visual inspection, operational check procedures, and removal and replacement of PCBs and tiedown straps.

TOOLS AND EQUIPMENT

- Interconnecting Box J-3513A
- Interconnecting Box J-3514A

CAUTION

When removing or replacing PCB's make sure PWR switch is off (down) and the AC power supply is disconnected from power source.



INSPECTION

A number of conditions can cause a printed circuit board to fail. Some of these conditions can be seen by a change in the physical appearance of the board material, components, covers, plated metals, etc.

If you see a change in the appearance of a PCB, report it to your supervisor. You may have to replace it.

Look for the following conditions:

- Corrosion on metal surfaces (looks like pitting, eroding of the metal, or as a white or colored residue).
- Dendritic Growth - an electrolytic transfer of metal from one conductor to another (looks like a stalk with branches).
- Laminate Degradation - white spots or discoloration in the board material itself.
- Cracked solder joints, broken wires, cracked components. A magnifying glass assists in these visual inspections.

Visual inspection of the PCB's should also include the following:

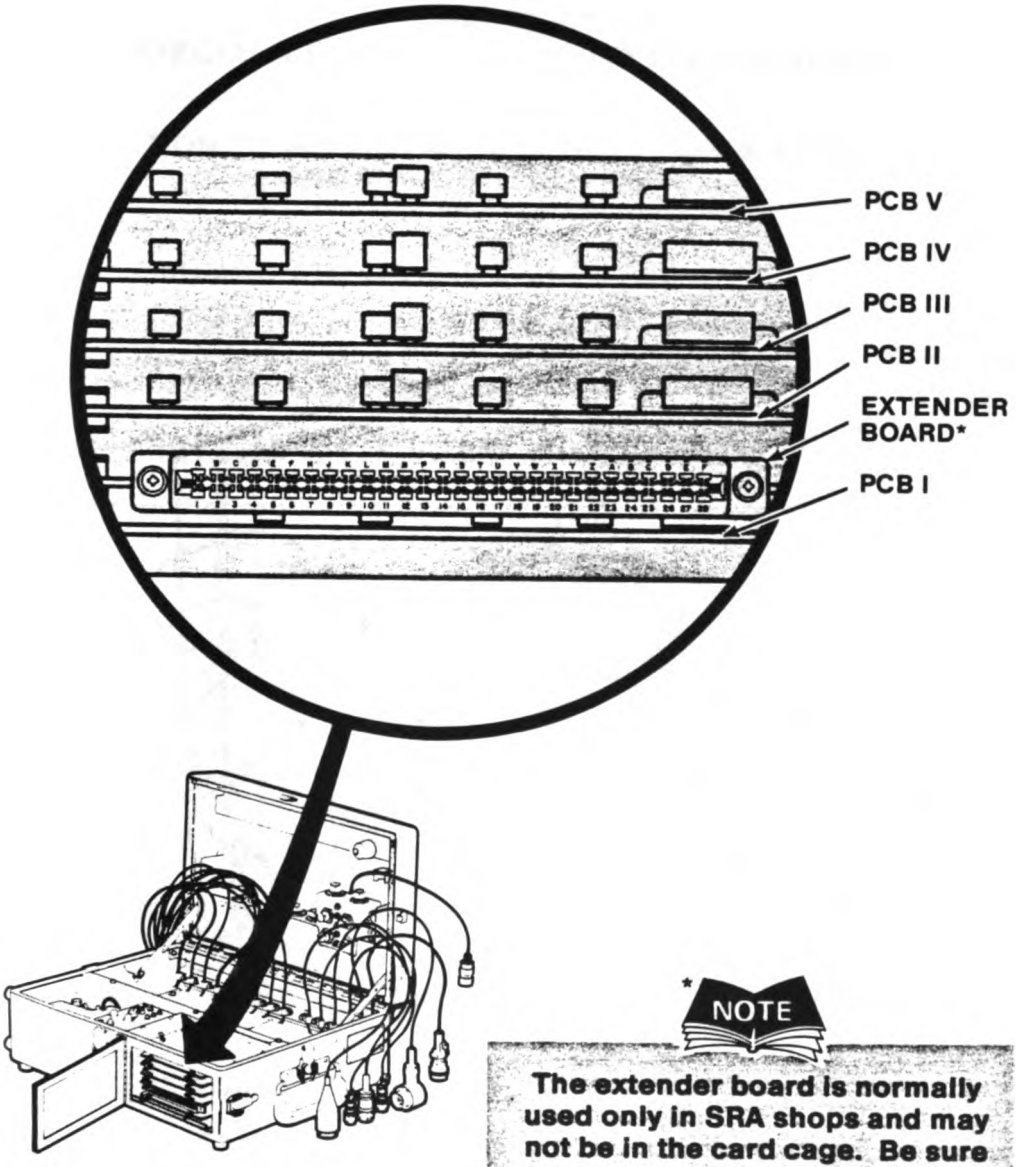
- Check PCB for freedom from dust, dirt, and grease.
- Check parts and connections for looseness and physical damage.
- Check PCB for damaged printed wiring, burnt or otherwise obviously defective components, shorted connections and loose or missing parts.
- Check contacts of connectors for freedom from damage and corrosion.

OPERATIONAL CHECK PROCEDURES

To perform operational check procedures on the PCB's, refer to paragraph 2-8 this chapter.

REMOVAL AND REPLACEMENT

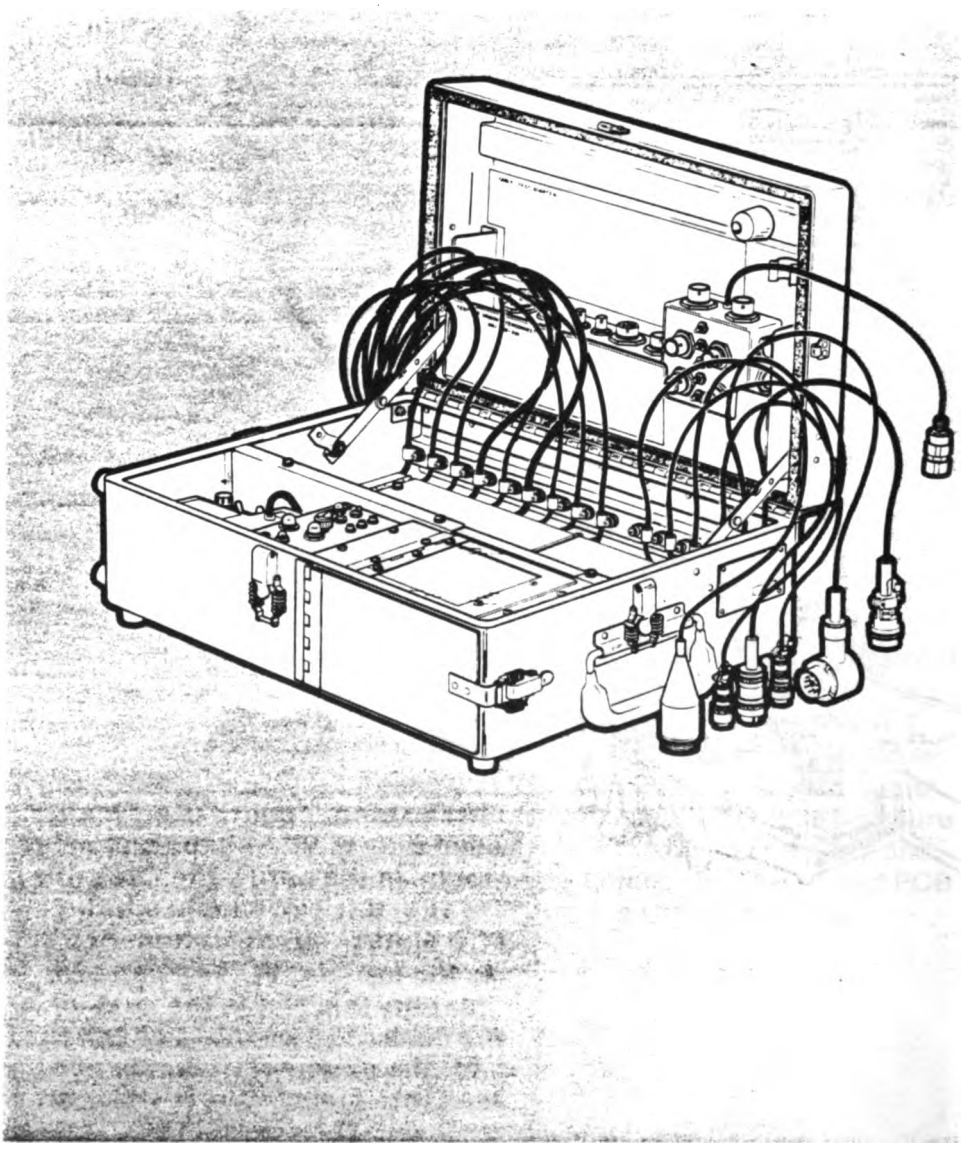
The PCBs are keyed with slots which will permit only the correct PCB to go into each of the five PCB connecting sockets in the rear of the card cage. When changing boards be sure the test set power switch is OFF. Identify the number of the board (in roman numerals I through V on the board itself) and slide it into the correct slot. Do not force the board in place. Gentle pressure on it will put it in place and engage it in the socket connections. If excessive resistance is encountered, make sure the correct PCB is in the proper slot position and that it is sliding in on the correct channels.



*NOTE

The extender board is normally used only in SRA shops and may not be in the card cage. Be sure to skip this slot when counting PCB slots from the bottom (No. I) to the top (No. V). You can also identify this slot in the back of the card cage because channels for the extender board do not lead into connectors in the rear.

TEST SET CARD CAGE AND PRINTED CIRCUIT BOARDS



CHAPTER 3
SPECIALIZED REPAIR ACTIVITY MAINTENANCE

SECTION I REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

3-1. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment refer to the Maintenance Allocation Chart in the Operator's and Unit Maintenance Manual, TM 11-5810-345-12.

3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

For authorized special tools, TMDE, and support equipment refer to the Repair Parts and Special Tools List, TM 11-5810-345-24P.

3-3. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-5810-345-24P.

SECTION II SERVICE UPON RECEIPT

3-4. UNPACKING

Refer to Chapter 2, paragraph **2-4** of this manual for unpacking information.

3-5. INSTALLATION

Refer to Chapter 2, paragraph **2-5** of this manual for installation information.

SECTION III MAINTENANCE PROCEDURES

3-6. GENERAL

Specialized Repair Activity (SRA) Maintenance is responsible for:

- Repair by removal and replacement of authorized components.
- Troubleshooting individual printed circuit boards to isolate defective components.
- Performing electrical checks to determine the reliability of the equipment's electrical circuits.

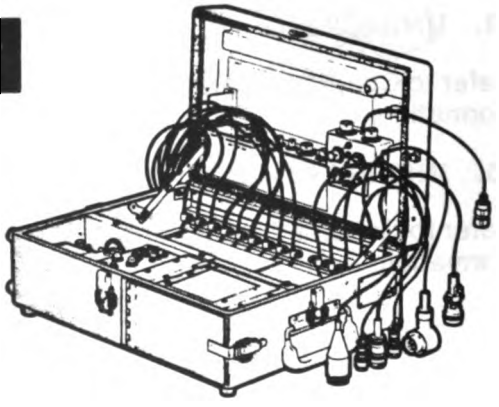
Specialized Repair Activity Maintenance is limited to:

TESTING

- Electrical Checks.
- PCB Troubleshooting.

REPLACEMENT

- Information Plates.
- Wiring Harness.
- Card Cage.
- Terminal Blocks.
- PCB Components.



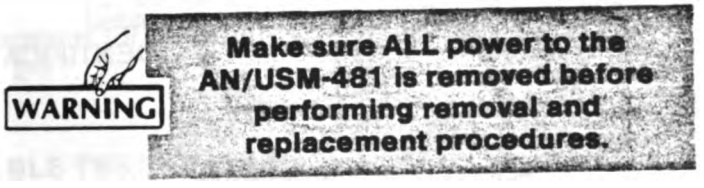
3-7. TESTING

Testing at the Specialized Repair Activity level is limited to printed circuit board troubleshooting, paragraph 3-15, and electrical checks, Section IV, this chapter.

3-8. REPLACEMENT

Specialized Repair Activity Maintenance procedures consist of repair by removal and replacement of:

AC Power Supply Identification Plate
AC Power Supply Mount Assembly for Connector
Cable Test Adapter Wiring Harness
Cable Test Adapter Cable Plate
Card Cage Assembly
Card Cage Connectors
Receptacle Connector for Power Supply or Battery
Transistor
Terminal Blocks and Terminal Strips
Printed Circuit Board Components
Extender Board



3-9. AC POWER SUPPLY

SRA Maintenance for the AC power supply consists of electrical checks and removal and replacement of the identification plate and the mount assembly for the connector.

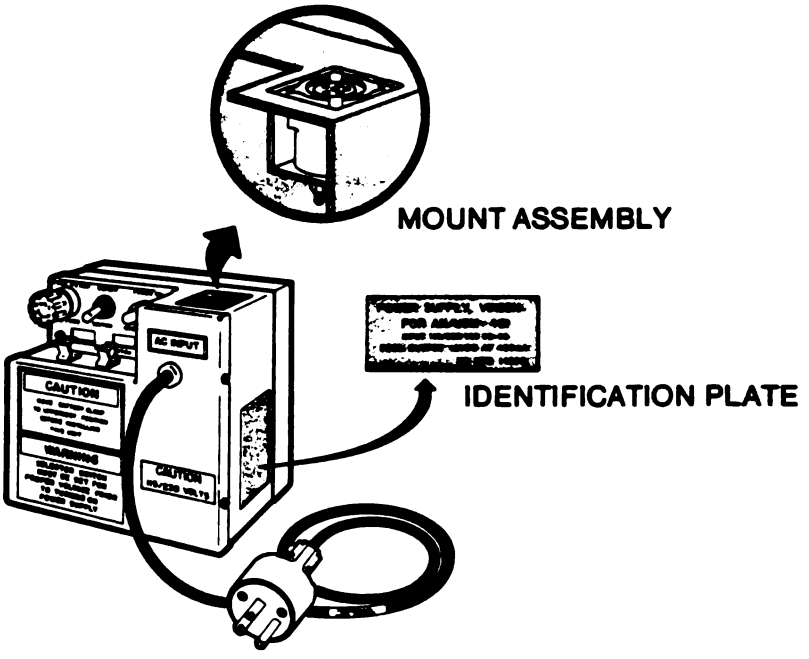
TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-100G.

ELECTRICAL CHECKS

To perform electrical check procedures on the AC power supply, refer to paragraph 3-19, Voltage Check (12 Vdc).

REMOVAL AND REPLACEMENT



WIRING DIAGRAMS

As an aid to maintaining the AC power supply, wiring diagrams are provided in paragraph 2-20.

3-10. CONTROL PANEL

SRA Maintenance for the control panel consists of electrical checks.

ELECTRICAL CHECKS

To perform electrical check procedures on the control panel, refer to paragraph 3-17 Battery Switch (SW5) Check, and paragraph 3-18 Low Battery Voltage Indicator Check.

WIRING LISTS

As an aid to verify proper electrical connections, wiring lists are provided in Appendix C.

Wiring data for the control panel may be found in Wiring List 6, Control Panel.

Wiring diagrams for the control panel may be found in paragraph 2-21.

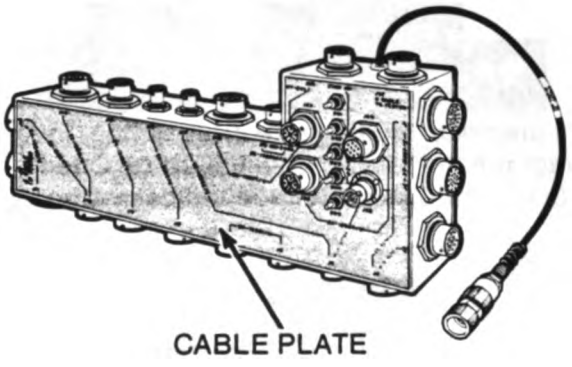
3-11. CABLE TEST ADAPTER

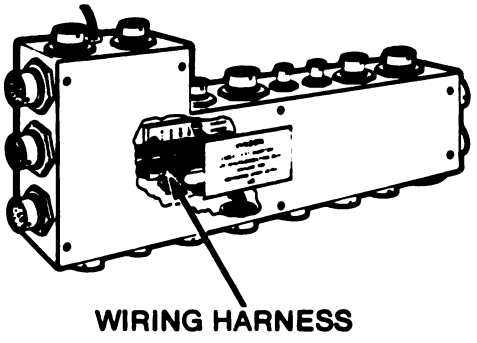
SRA Maintenance for the cable test adapter consists of removal and replacement of the wiring harness and the cable plate.

TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-100G.
- Pace Kit, PRC-350C.

REMOVAL AND REPLACEMENT





WIRING LISTS

As an aid to verify proper electrical connections, wiring lists are provided in Appendix C.

Wiring data for the Cable Test Adapter may be found in Wiring List 13, Cable Test Adapter, and Wiring List 14, Cable J21 on Cable Test Adapter.

Refer to Foldout No. 2 for a wiring diagram of the PCB in the cable test adapter.

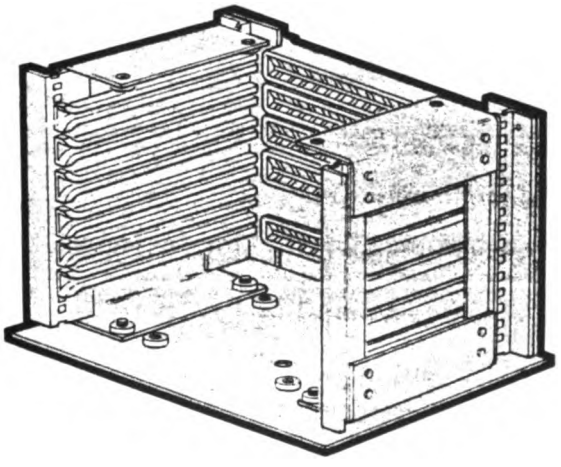
3-12. CARD CAGE ASSEMBLY, CARD CAGE CONNECTORS

SRA Maintenance includes removal and replacement of the card cage assembly and the card cage connectors.

TOOLS AND EQUIPMENT

- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-100G.
- Electronic Equipment Tool Kit, TK-105G.
- Pace Kit, PRC-350C.

REMOVAL AND REPLACEMENT



CARD CAGE ASSEMBLY

WIRING LISTS

As an aid to verify proper electrical connections, wiring lists are provided in Appendix C.

Wiring data for the card cage connectors may be found in Wiring List 7, Terminal Block, PCB, and Cable Connections; and Wiring Lists 8 through 12, Printed Circuit Board Connections.

3-13. TRANSISTOR, RECEPTACLE CONNECTOR, TERMINAL BLOCKS AND TERMINAL STRIPS

SRA maintenance includes electrical checks for the terminal blocks and removal and replacement of the following components:

- Transistor.
- Terminal Blocks.
- Terminal Strips.
- Receptacle Connector for Power Supply or Battery.

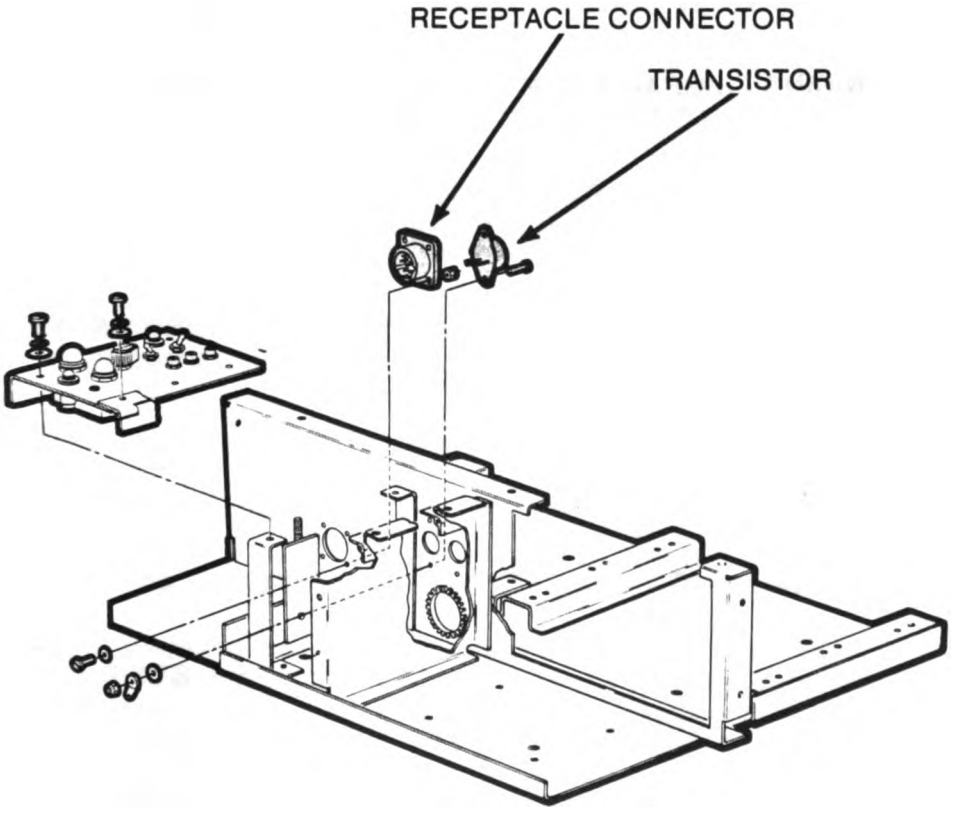
TOOLS AND EQUIPMENT

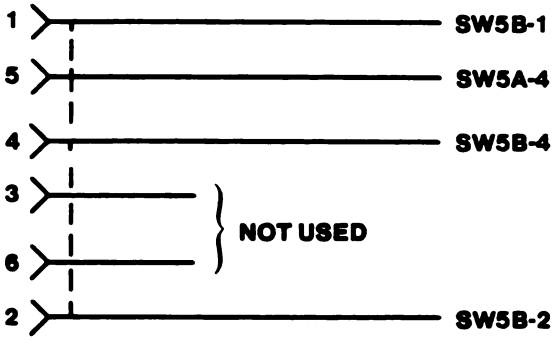
- Interconnecting Box J-3513A.
- Interconnecting Box J-3514A.
- Digital Multimeter.
- Electronic Equipment Tool Kit, TK-100G.
- Electronic Equipment Tool Kit, TK-105G.
- Extender Board.
- Pace Kit, PRC-350C.

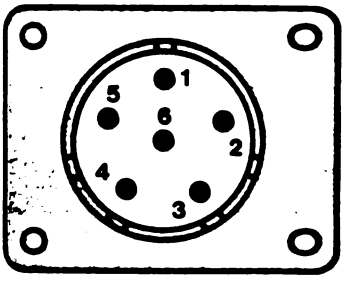
ELECTRICAL CHECKS

To perform electrical check procedures on the terminal blocks, refer to paragraph 3-23, Terminal Block Interconnection Check.

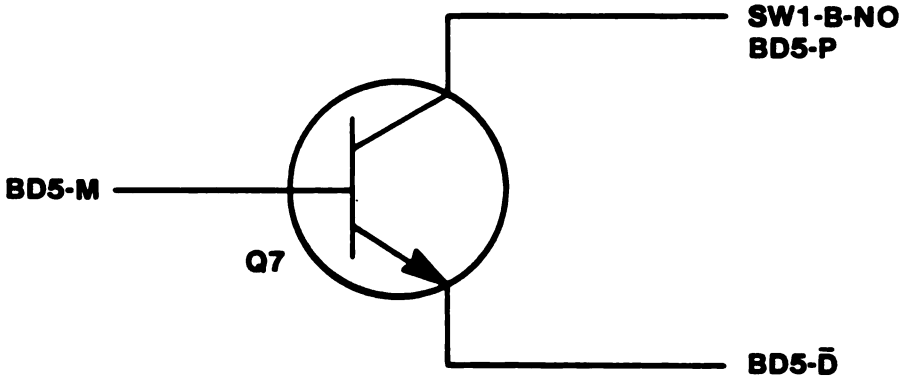
REMOVAL AND REPLACEMENT





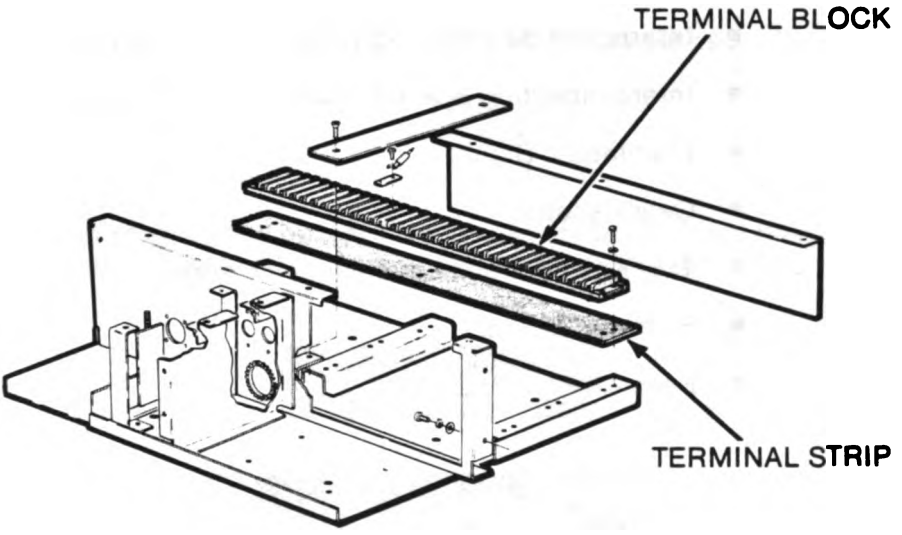


WIRING DIAGRAM FOR RECEPTACLE CONNECTOR FOR AC POWER SUPPLY OR BATTERY



CHASSIS MOUNTED

WIRING DIAGRAM FOR CHASSIS MOUNTED TRANSISTOR Q7



WIRING LISTS

As an aid to verify proper electrical connections, wiring lists for the terminal blocks are provided in Appendix C.

3-14. CABLES AND CONNECTORS

There is no SRA Maintenance for cables and connectors.

3-15. PRINTED CIRCUIT BOARDS, EXTENDER BOARD

SRA Maintenance for printed circuit boards (PCB's) consists of electrical checks, operational checks and troubleshooting to isolate faulty components, and removal and replacement of faulty components.

SRA Maintenance for the extender board for the PCB's consists of repairing the traces and removal and replacement of the connector.

TOOLS AND EQUIPMENT

- Interconnecting Box J-3513A.
- Interconnecting Box J-3514A.
- Multimeter, Digital.
- Oscilloscope.
- Tool Kit, Electronic Equipment TK-100G.
- Extender Board.
- Pace Kit PRC-350C.

ELECTRICAL CHECKS

To perform a transistor and diode check, and a control logic check, refer to paragraphs **3-21** and **3-22.**

TROUBLESHOOTING

Troubleshooting PCBs begins with the operational check procedures in paragraph 2-4 of the Operator's and Unit Maintenance Manual (TM 11-5810-345-12).

A known good J-3513A should be run through its steps and the step on which the test set stops should be noted:

If it fails on	This PCB may be bad
Steps 01-04	PCB No. IV
Steps 05-27	PCB No. I
Steps 28-35	PCB No. II
Steps 36-48	PCB No. III

If a known good J-3514A is being tested the test set should run through its steps and the step on which the test set stops should be noted:

If it fails on	This PCB may be bad
Steps 01-04	PCB No. IV
Steps 05-16	PCB No. I
Steps 17-24	PCB No. IV

Swap known good boards for the suspect faulty board then run through the tests again and be certain the EOT light comes on.

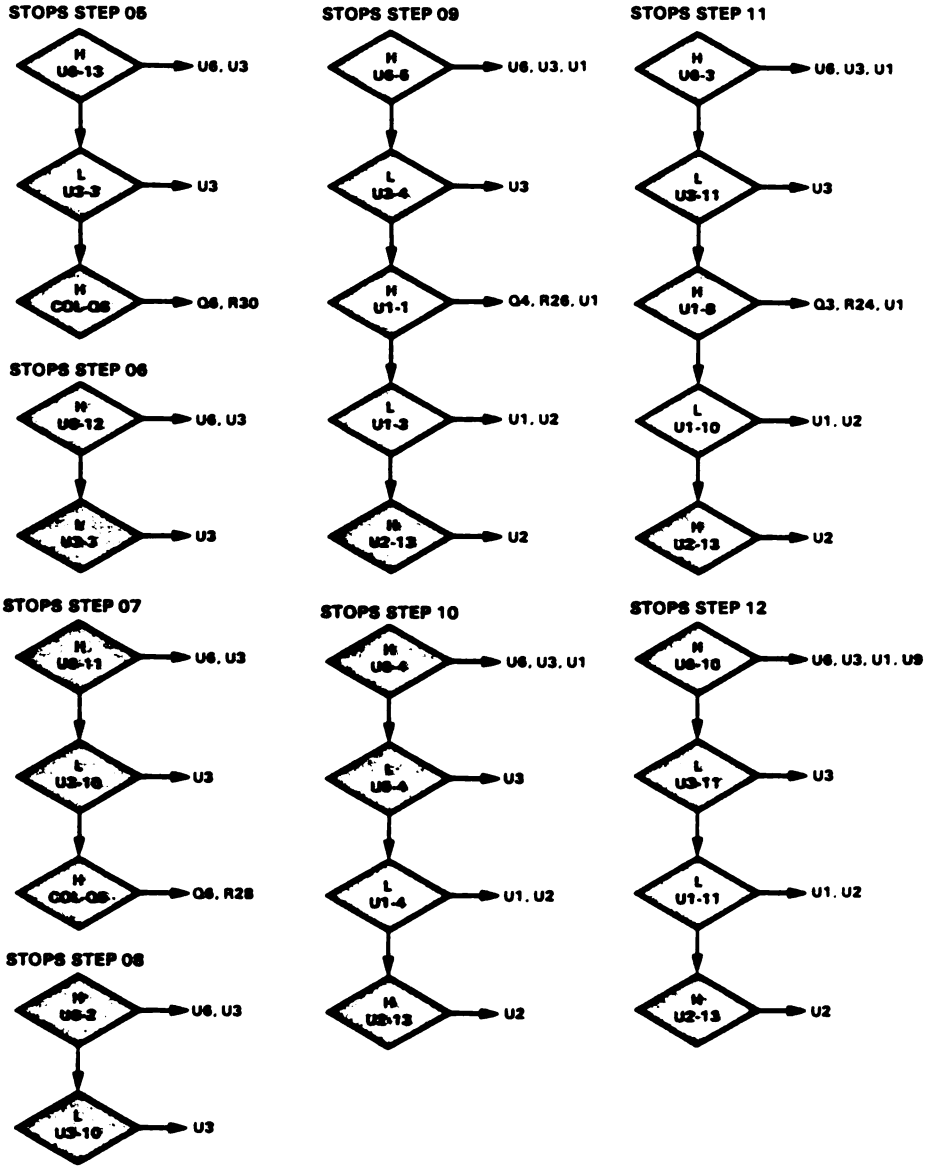
LOGIC DIAGRAMS

The faulty boards should then be tested using the following logic diagrams to isolate the defective component. These diagrams are laid out in a go/no-go format for testing the individual boards. For this testing be certain to use a known good J-3513A and when specified use a known good J-3514A.

The following information is necessary to be used with these procedures:

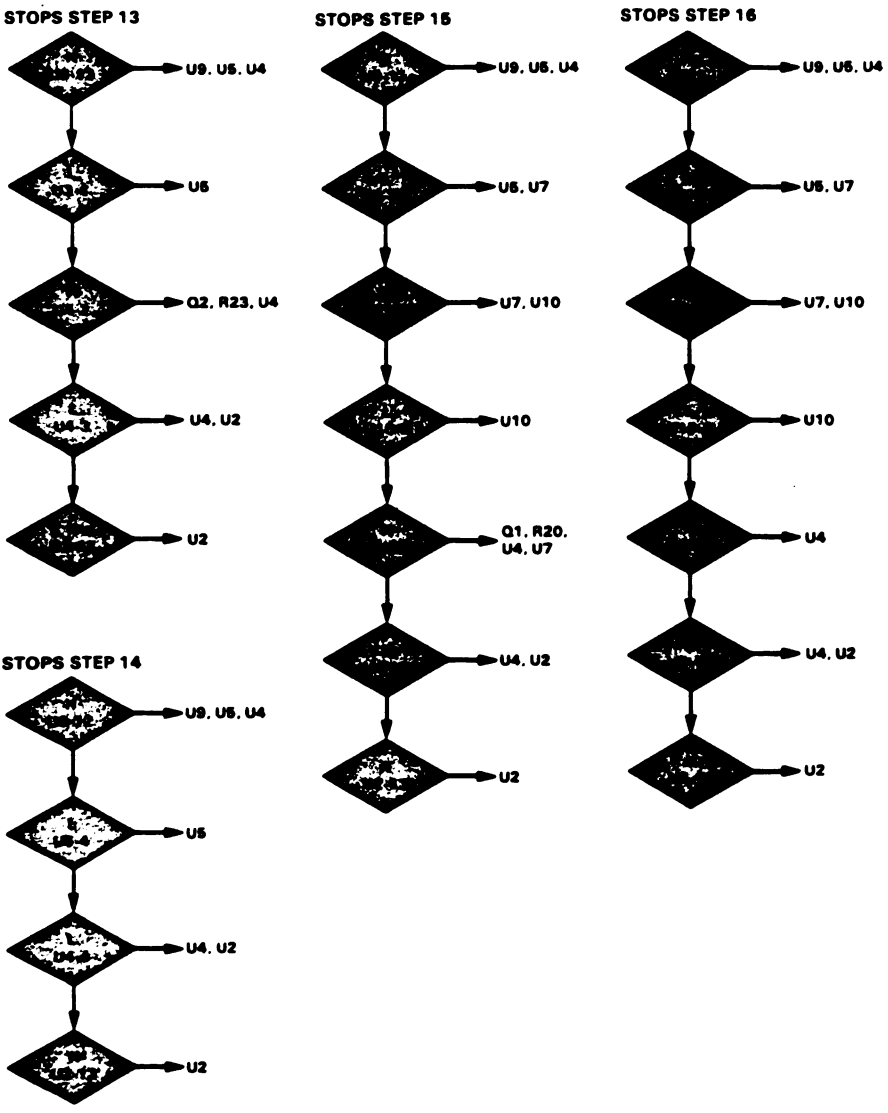
- Each board is broken out to the steps that may have been displayed and the components on that board that are considered the probable cause.
- The component and the testing point are indicated in the decision block.
- "H" indicates a "one" or a high.
- "L" indicates a "zero" or a low.
- Follow the logic that if the proper voltage is not found at this point the probable bad components are indicated to the right.
- If the proper voltage is found continue to the next component.

Logic Diagram for Printed Circuit Board No. I



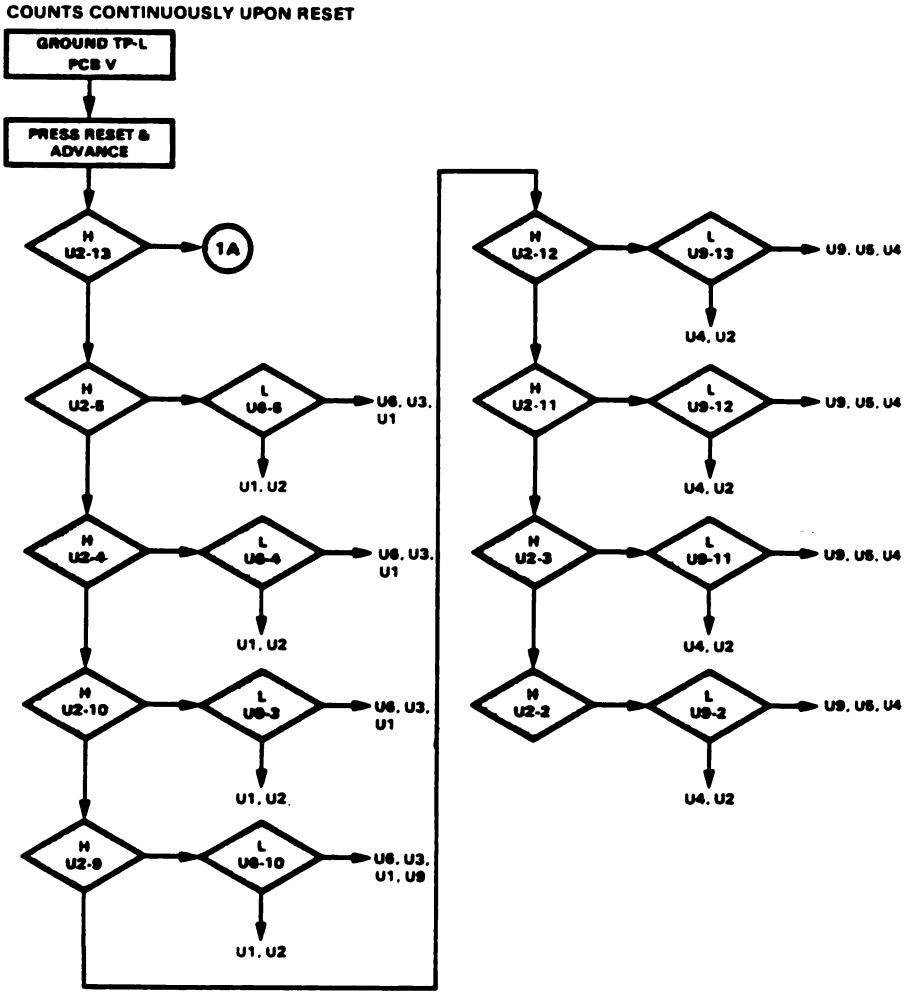
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. I
SHEET 1 OF 7

(Continued)



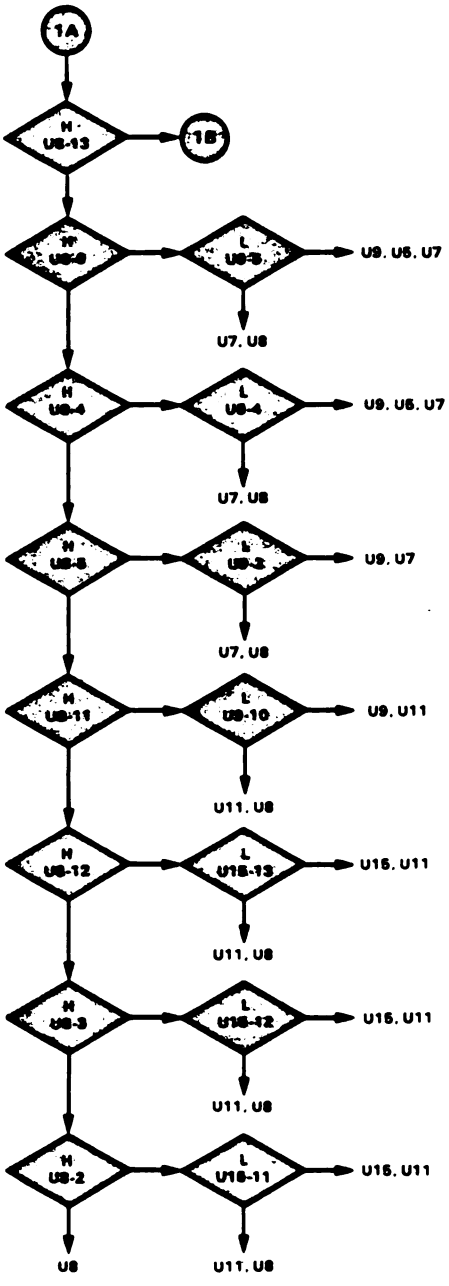
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. I
SHEET 2 OF 7

(Continued)



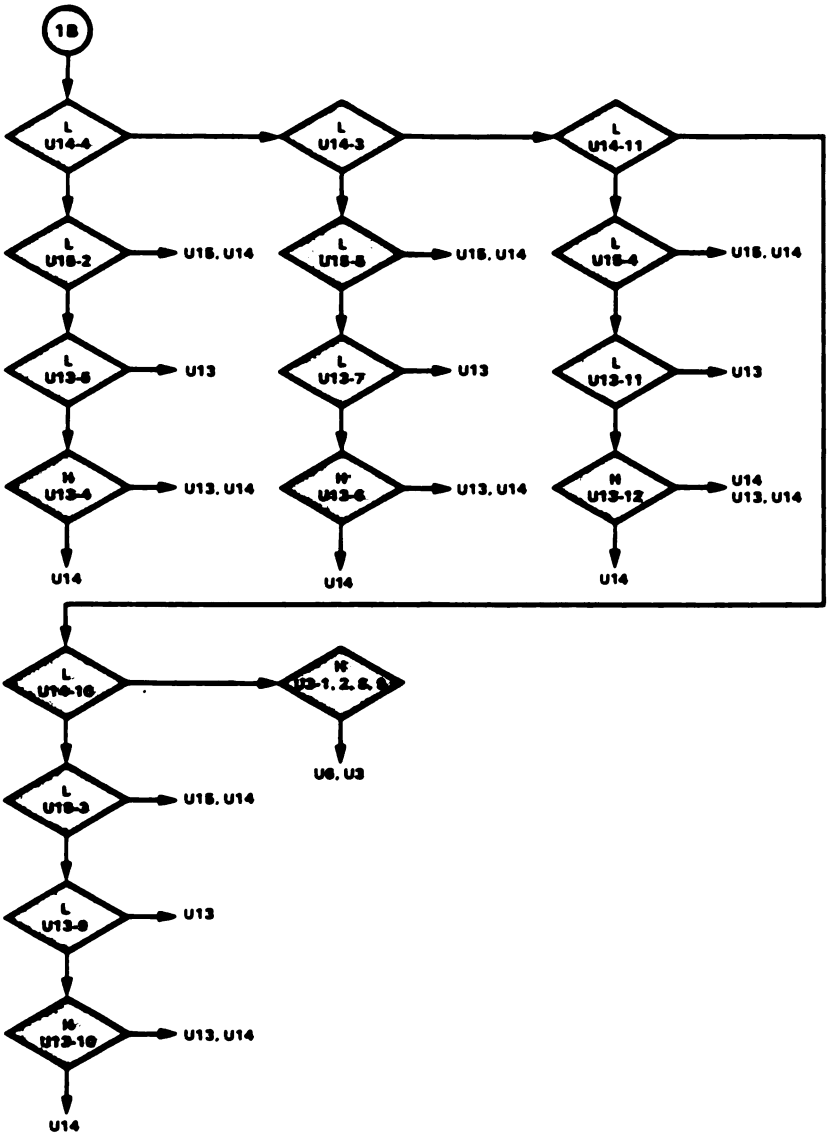
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. I
SHEET 5 OF 7

(Continued)



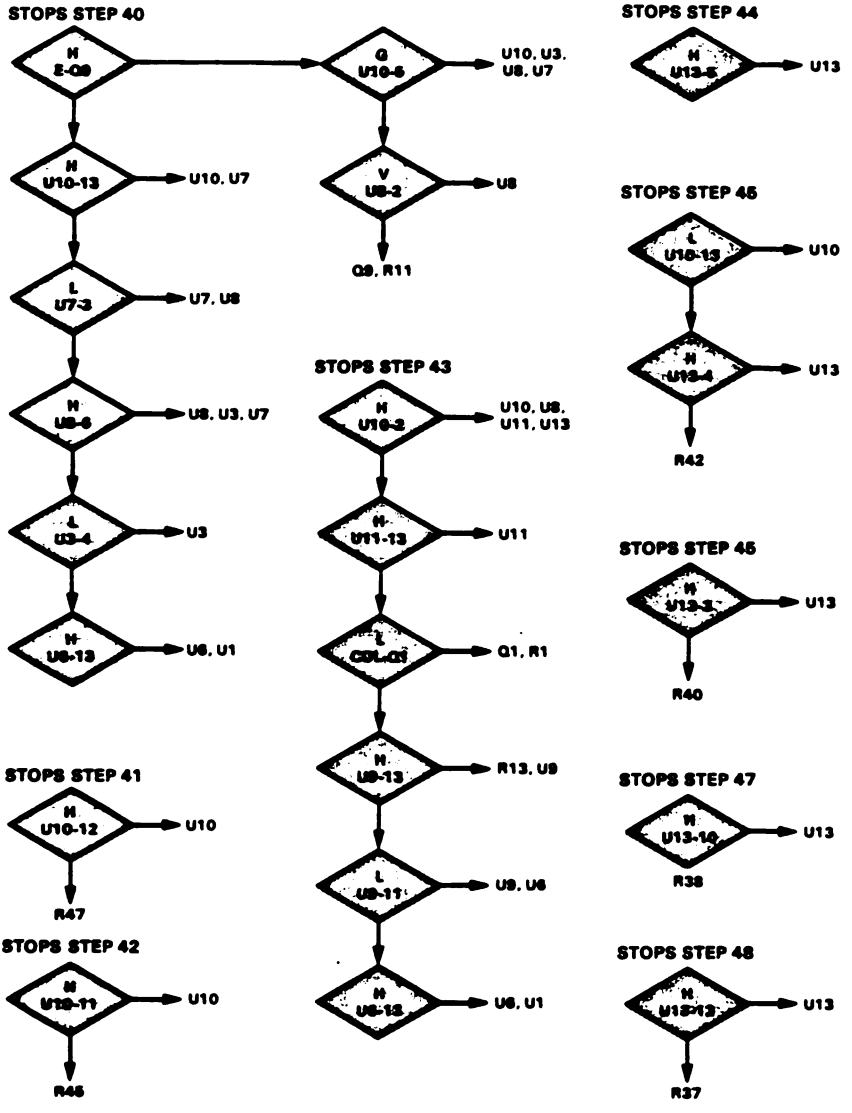
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. I
SHEET 6 OF 7

(Continued)



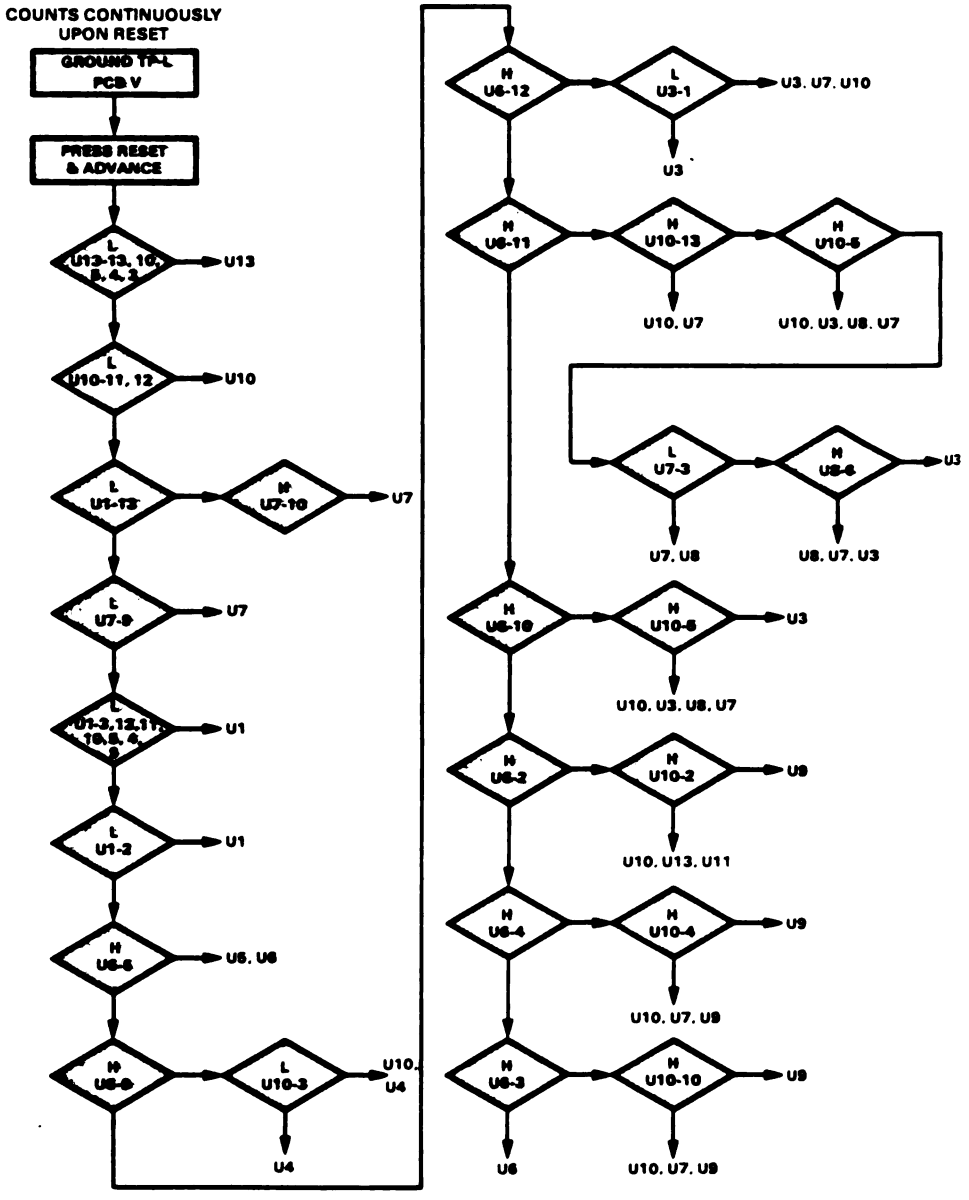
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. I
SHEET 7 OF 7

(Continued)



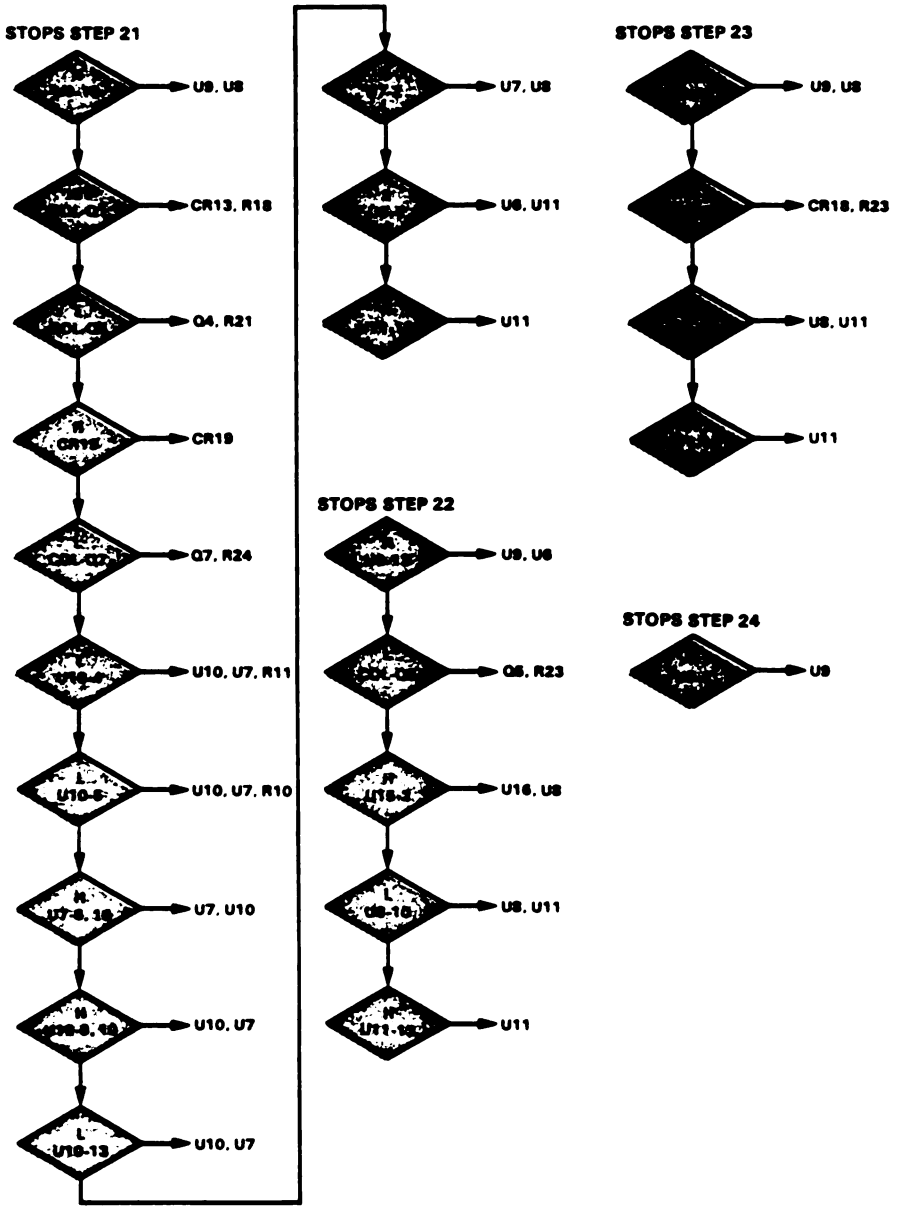
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. III
SHEET 3 OF 4

(Continued)



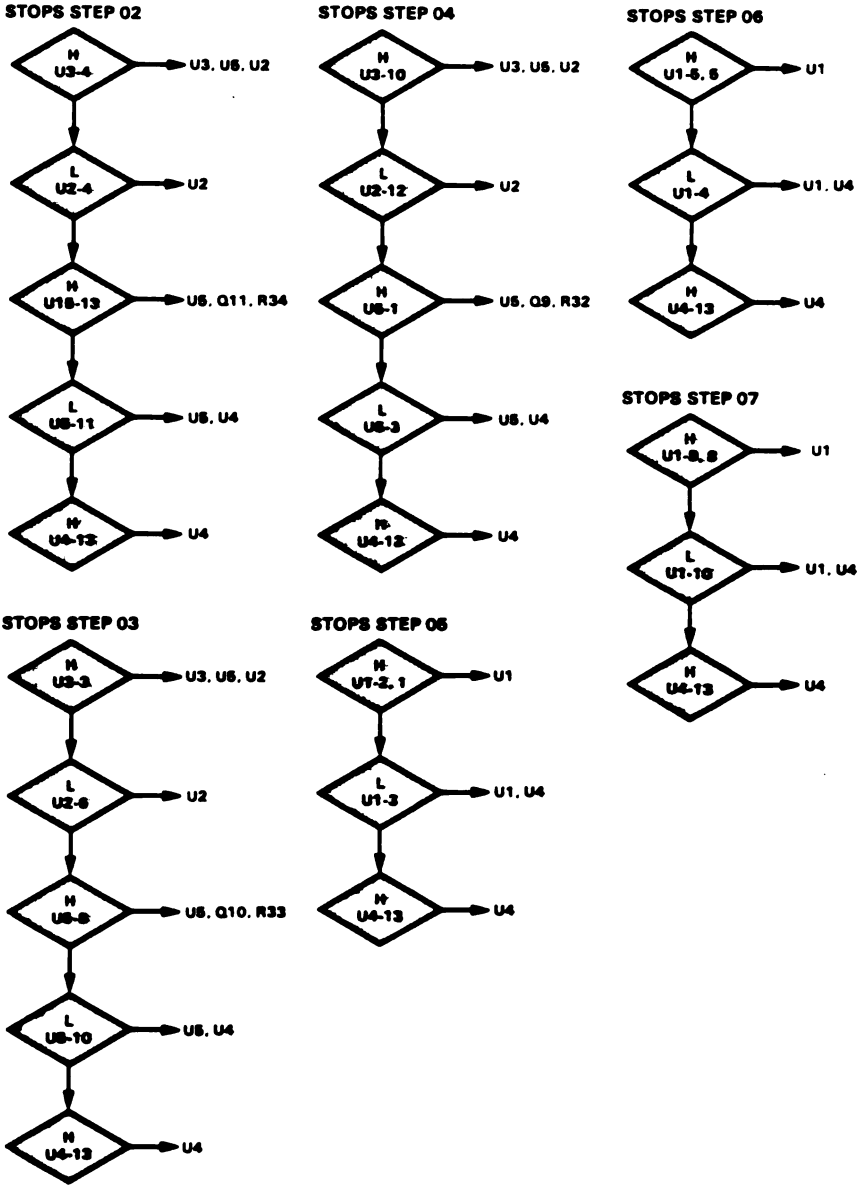
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. III
SHEET 4 OF 4

(Continued)



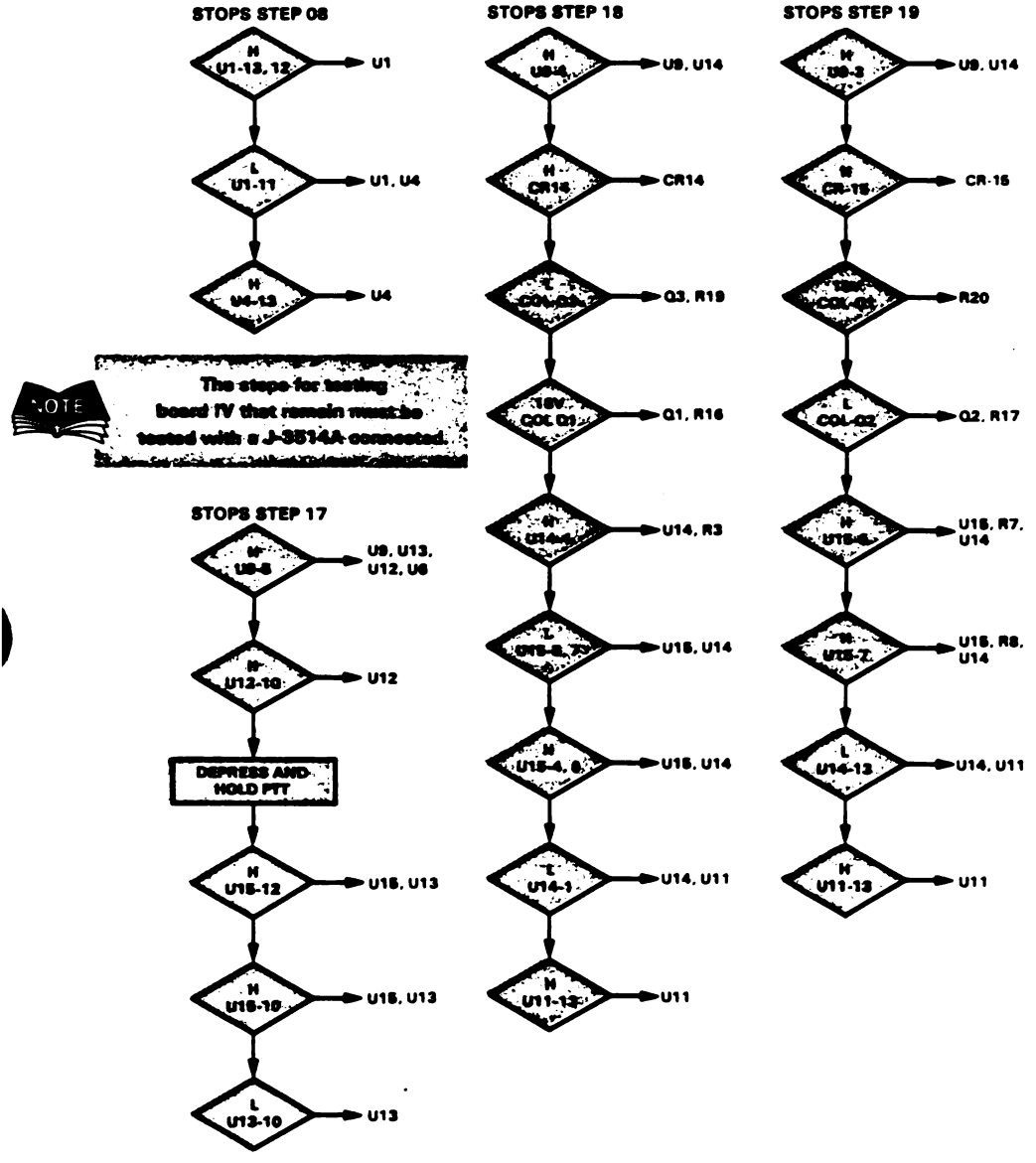
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 5 OF 7

(Continued)



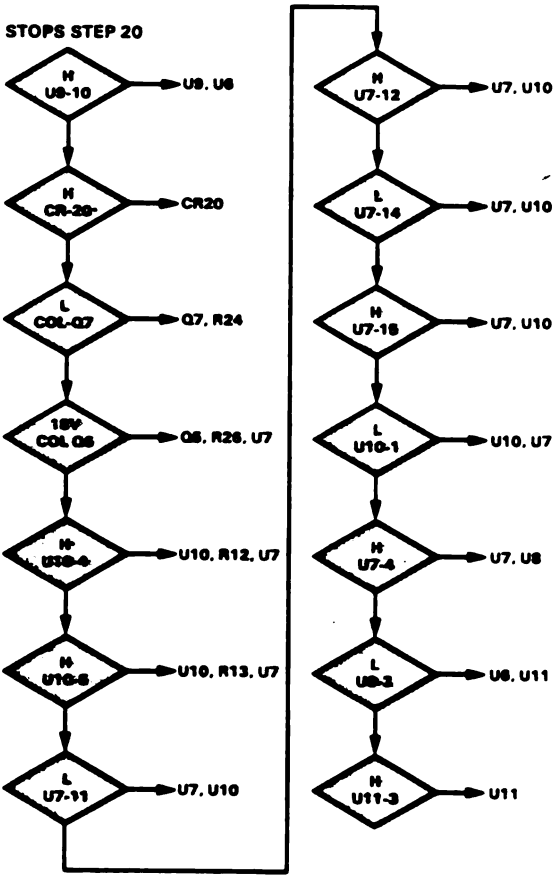
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 2 OF 7

(Continued)



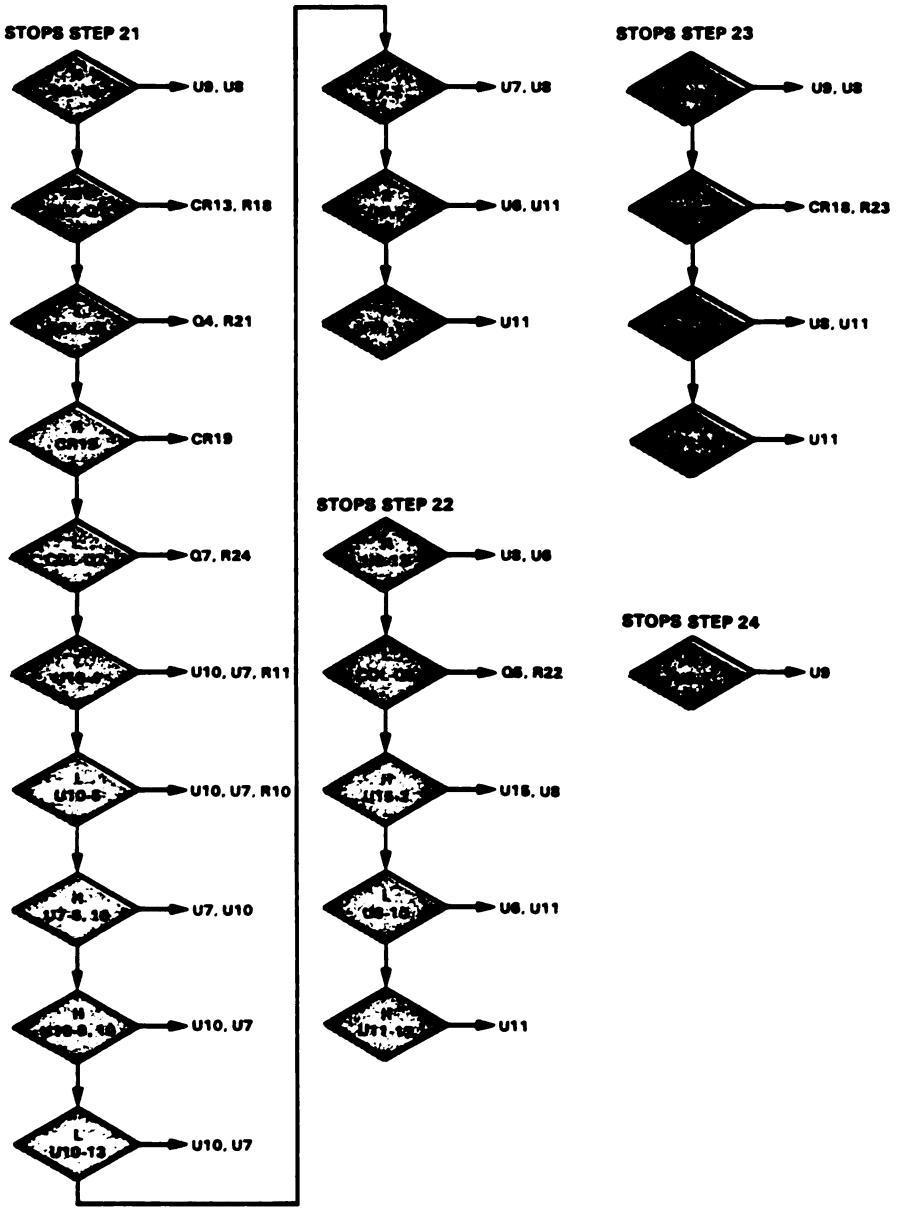
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 3 OF 7

(Continued)



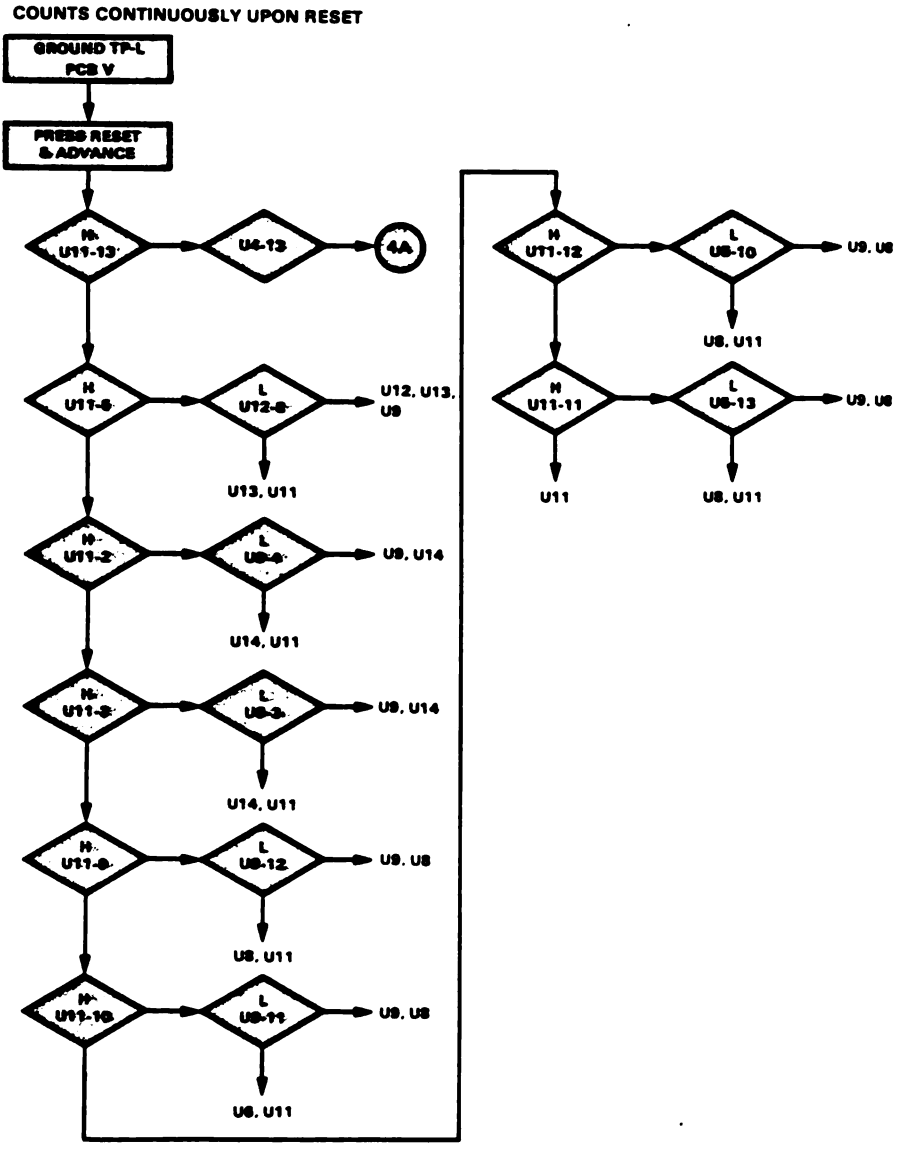
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 4 OF 7

(Continued)



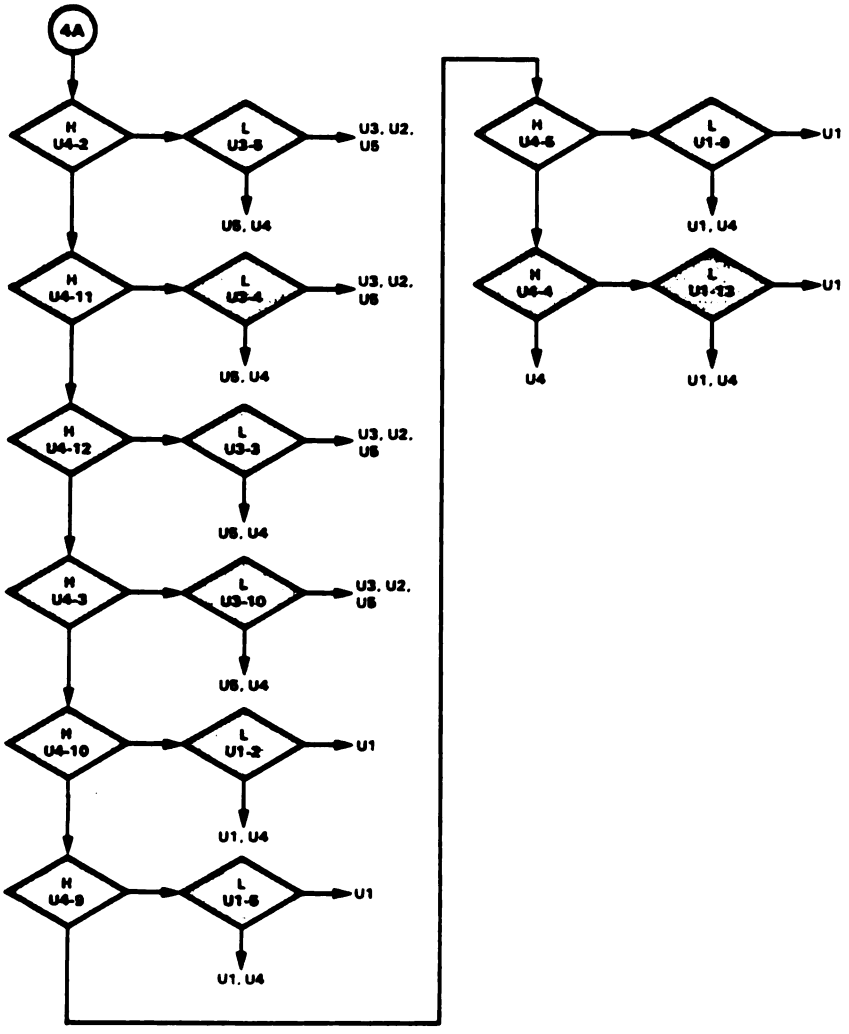
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 5 OF 7

(Continued)



LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 6 OF 7

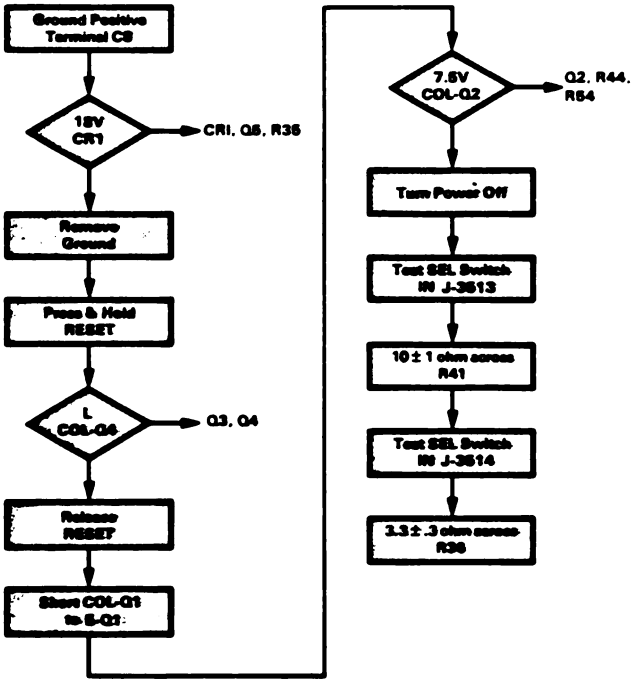
(Continued)



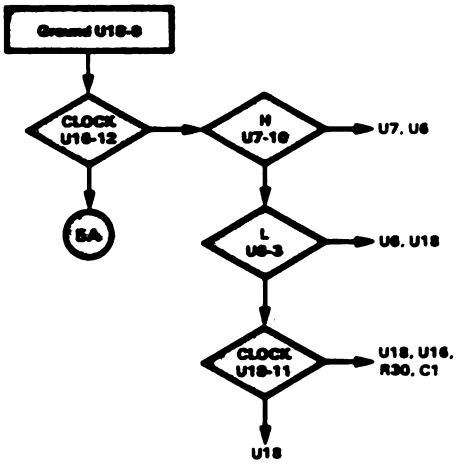
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. IV
SHEET 7 OF 7

Logic Diagram for Printed Circuit Board No. V

This section is to check the regulation circuitry on Board V.



This section is used to establish if the necessary clock signals are present.

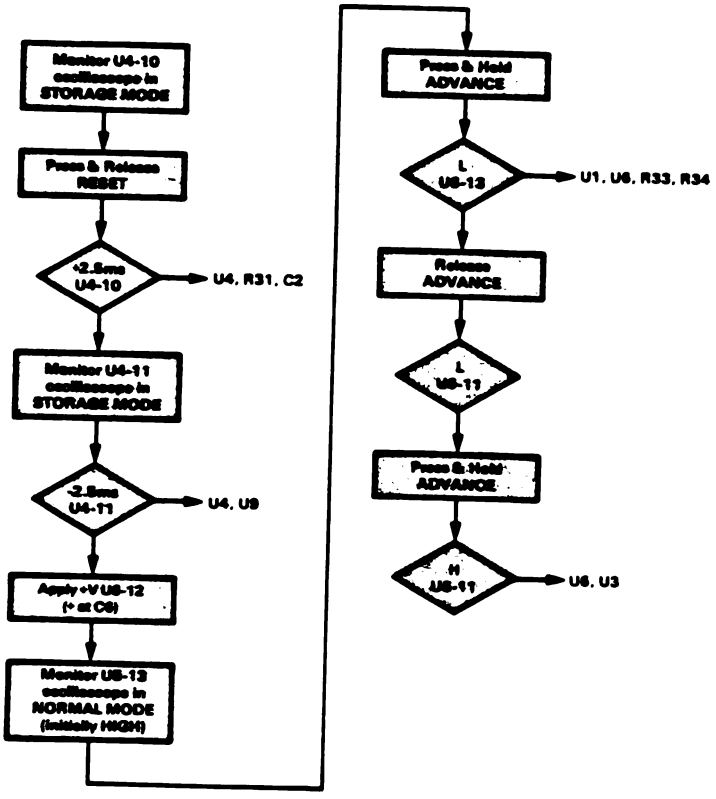


It is necessary to use a dual trace scope for this section. In each pair of signals, the upper signal has been established to be present, the second should have timing relationship shown. The most probable defects are listed with each pair.

LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. V
SHEET 1 OF 4

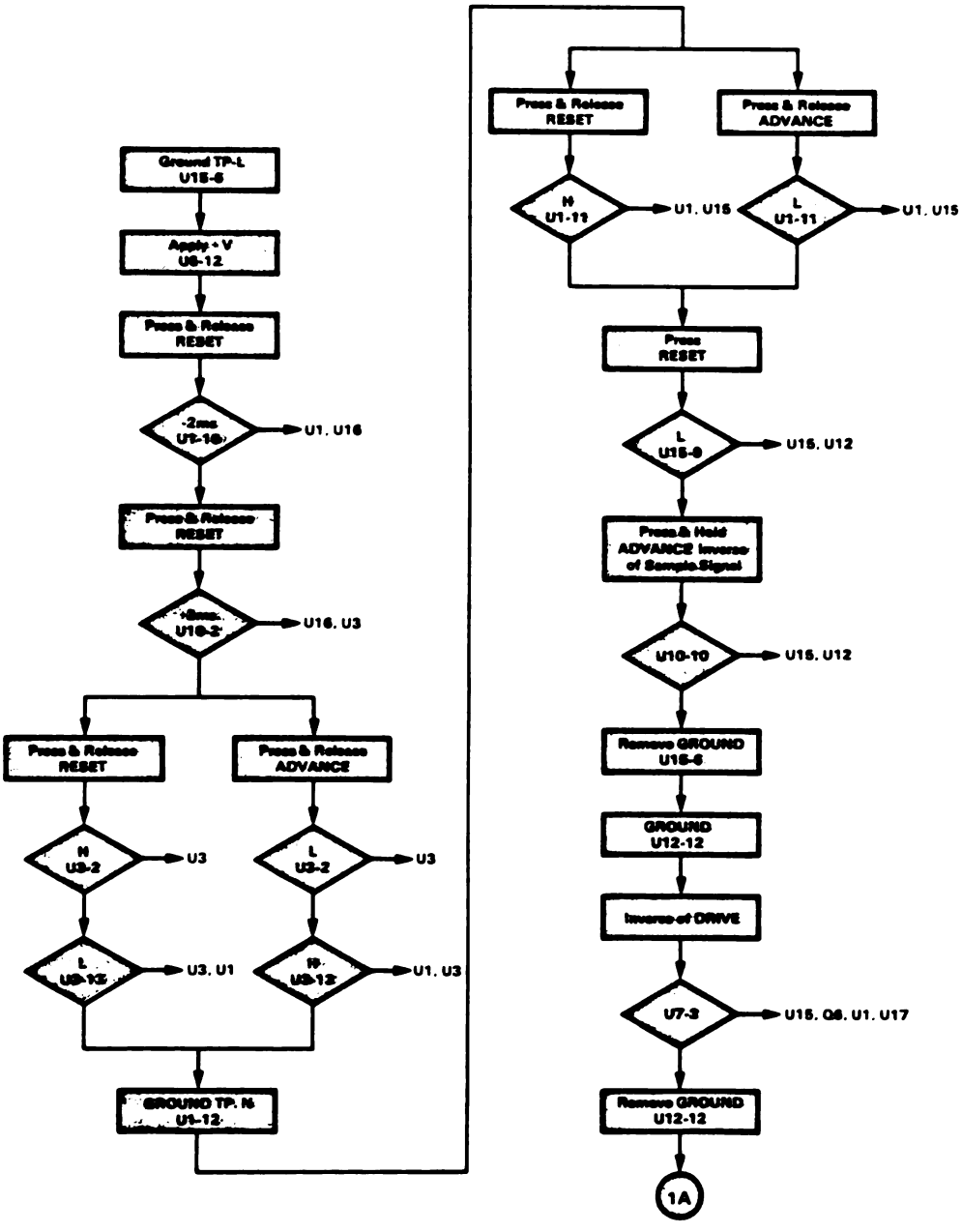
(Continued)

This section is used to insure the RESET and ADVANCE circuitry ARE functipning properly. An oscilloscope must be used to monitor.



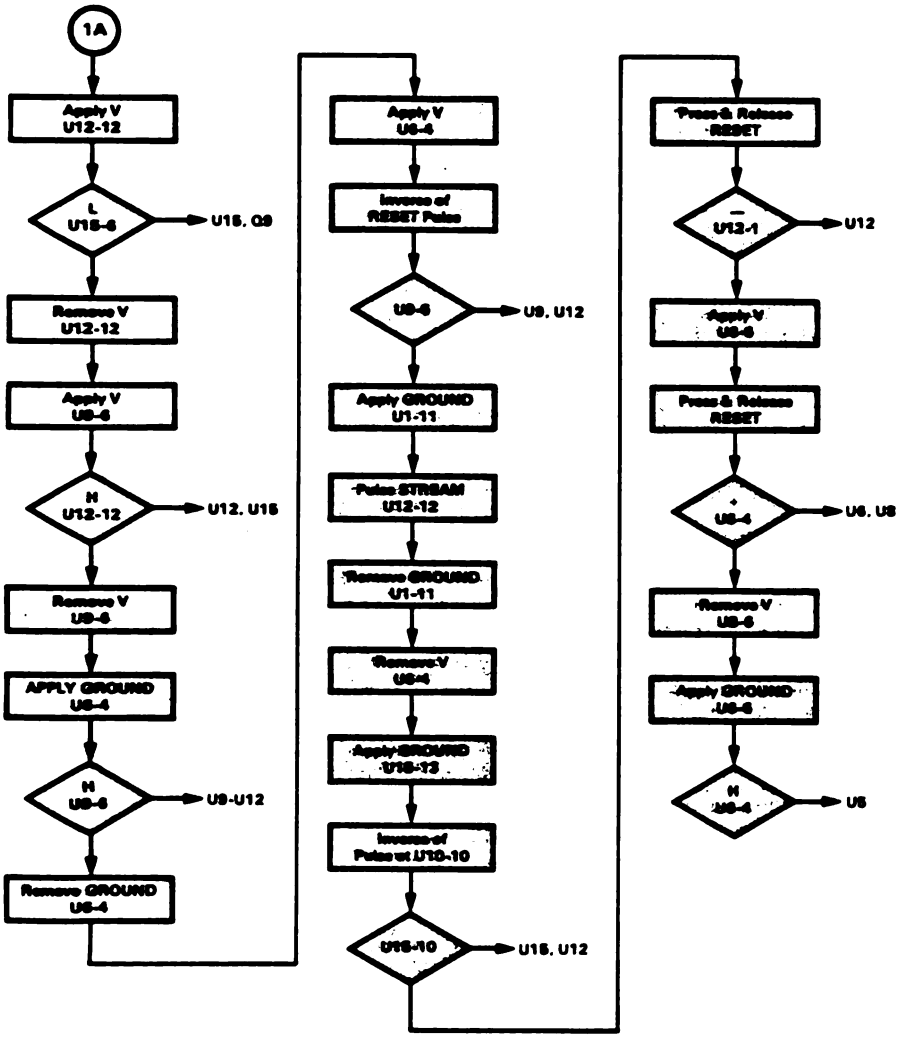
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. V
SHEET 2 OF 4

(Continued)



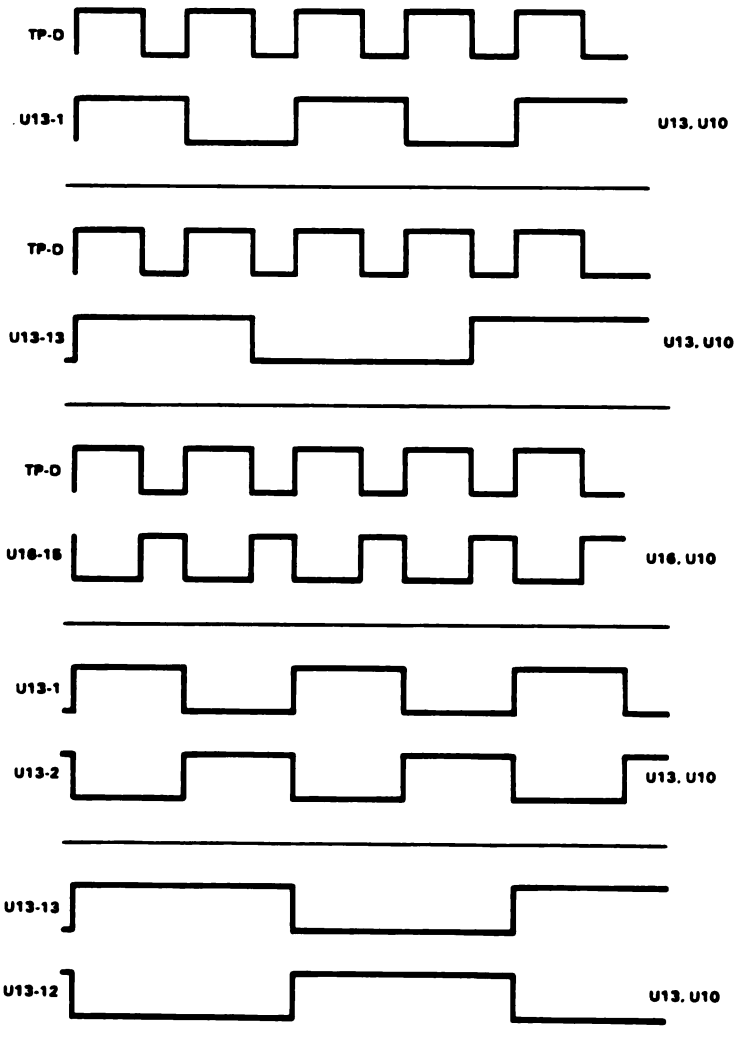
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. V
SHEET 3 OF 4

(Continued)



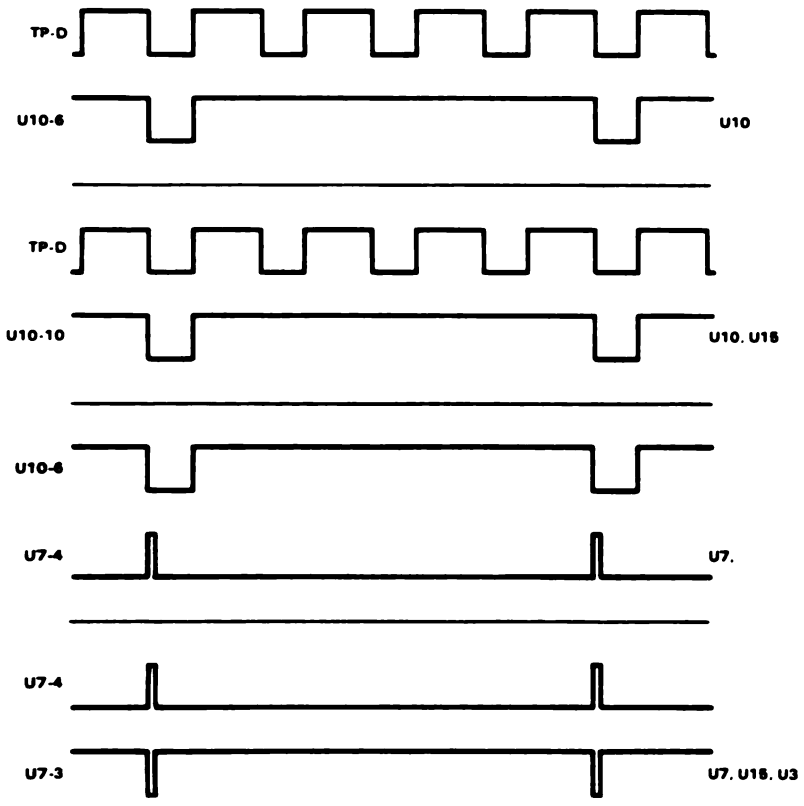
LOGIC DIAGRAM FOR PRINTED CIRCUIT BOARD NO. V
SHEET 4 OF 4

TIMING DIAGRAMS



SHEET 1 OF 2

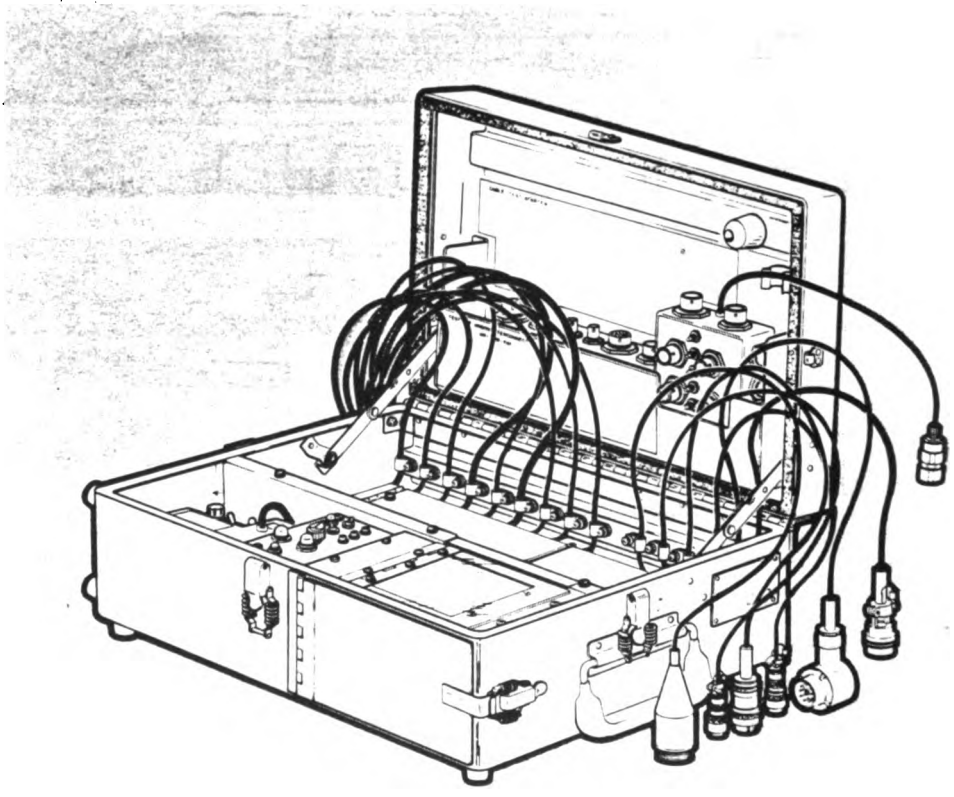
(Continued)



NOTE

The waveforms at U10-10 and U10-6 have the same basic characteristics, but are NOT in phase with one another.

SHEET 2 OF 2



WIRING LISTS

As an aid to verify proper electrical connections, wiring lists for PCBs are provided in Appendix C.

LINE DRAWINGS AND SCHEMATICS

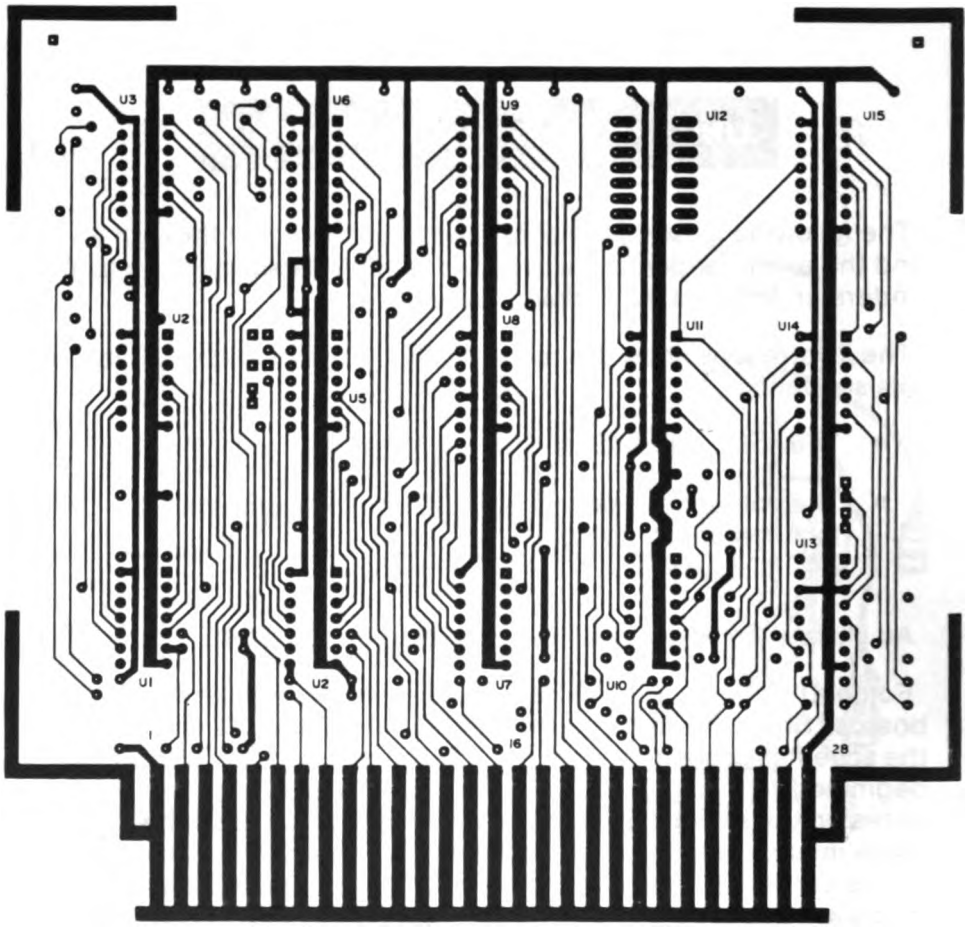
The following illustrations of printed circuit boards I through V and the extender board are provided to SRA personnel to help in understanding and maintaining the test set.

The illustrations show the following two views of each PCB in this sequence:

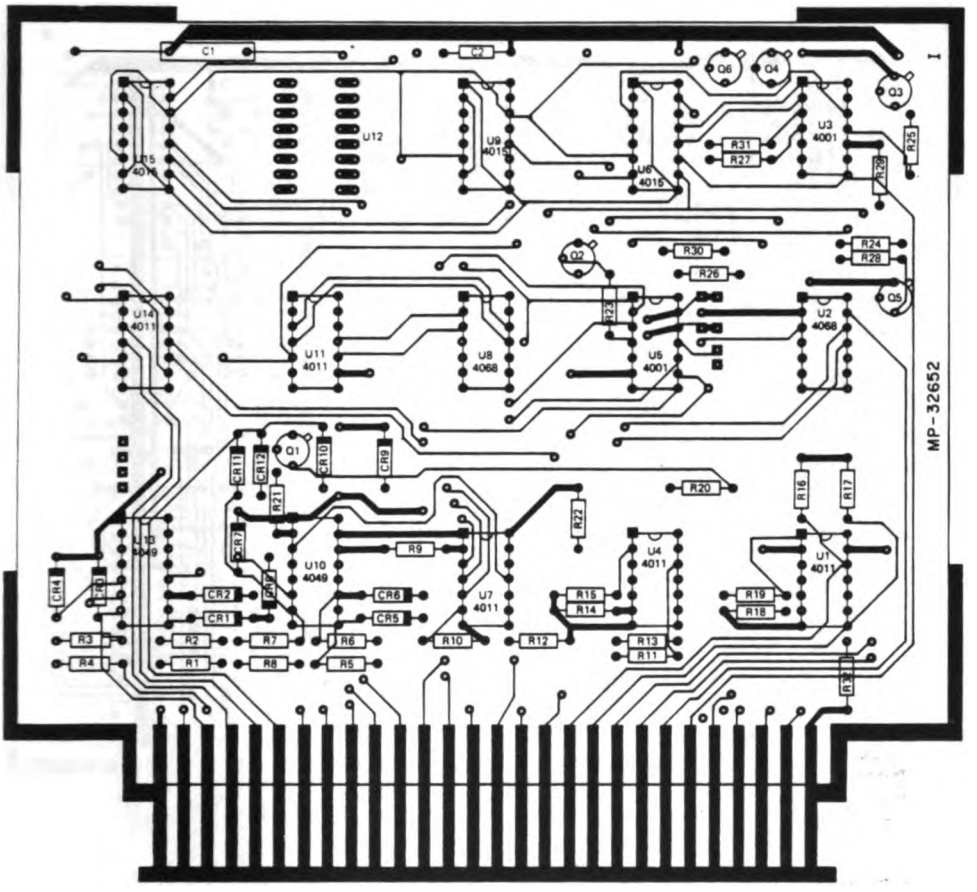
- The solder side of the PCB.
- The component side of the PCB showing component location and circuitry.

An illustration of the extender board is also provided.

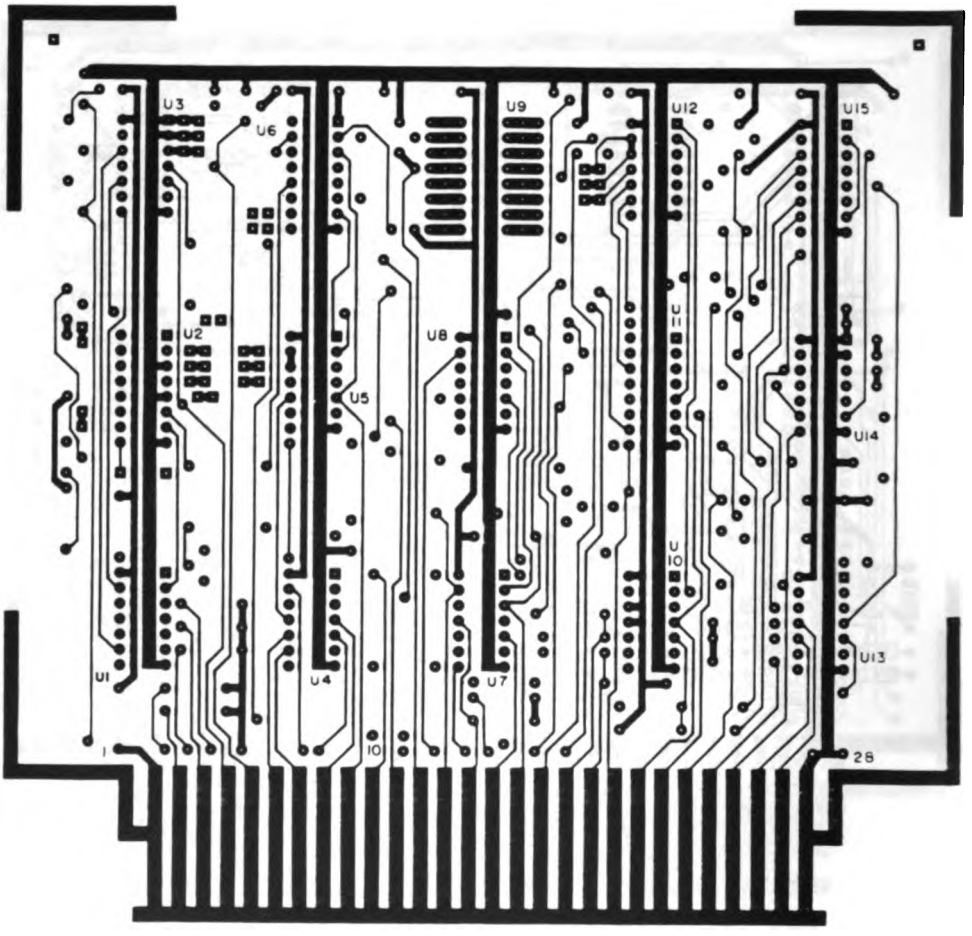
Foldout 1 (sheets 1 to 4) shows the schematics for all five boards. Sheet 1 foldout starts with part of PCB No. IV because the schematics are arranged to follow the test set's step indicators beginning with step 01 on both the J-3513A and J-3514A. The notes on the sheet 1 foldout explain how to distinguish the steps in each sequence for each interconnecting box. Since indicator step 01 starts on PCB No. IV, the schematics begin that way. Because of their fold-out size, these schematics are inserted inside the back cover of the manual.



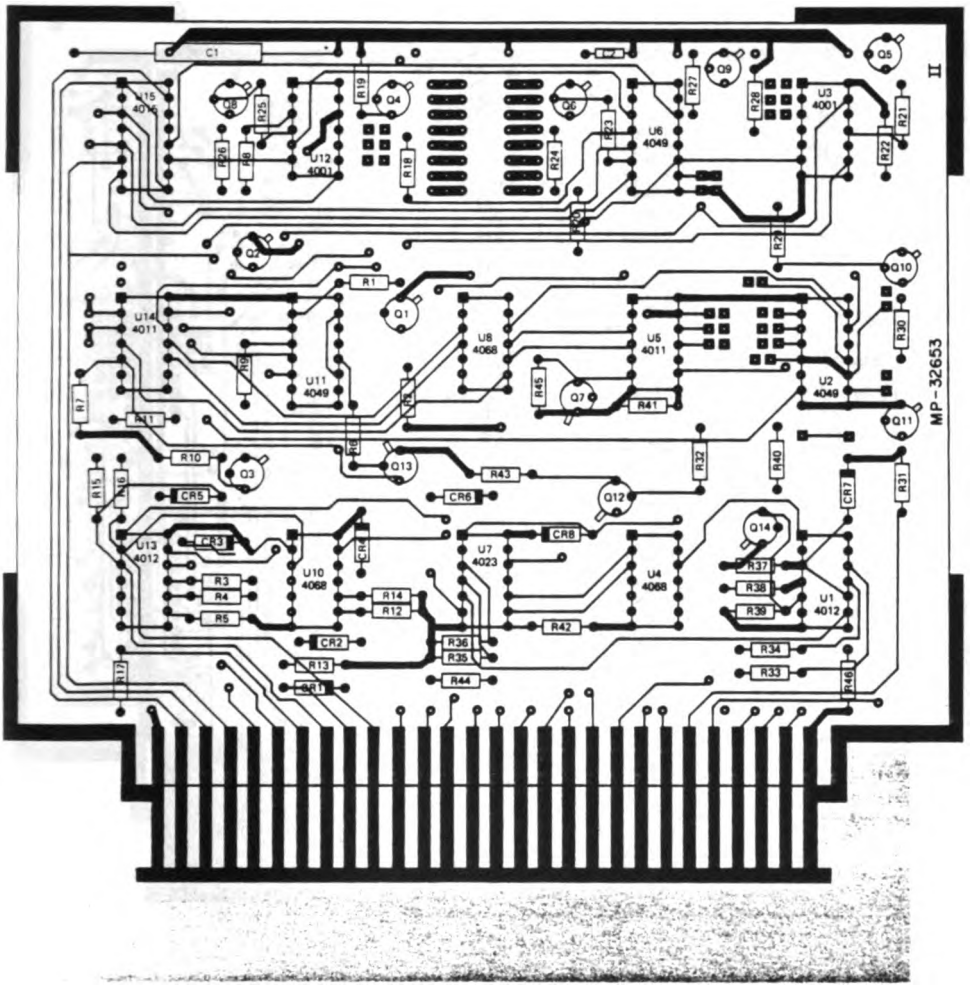
PCB I, SOLDER SIDE



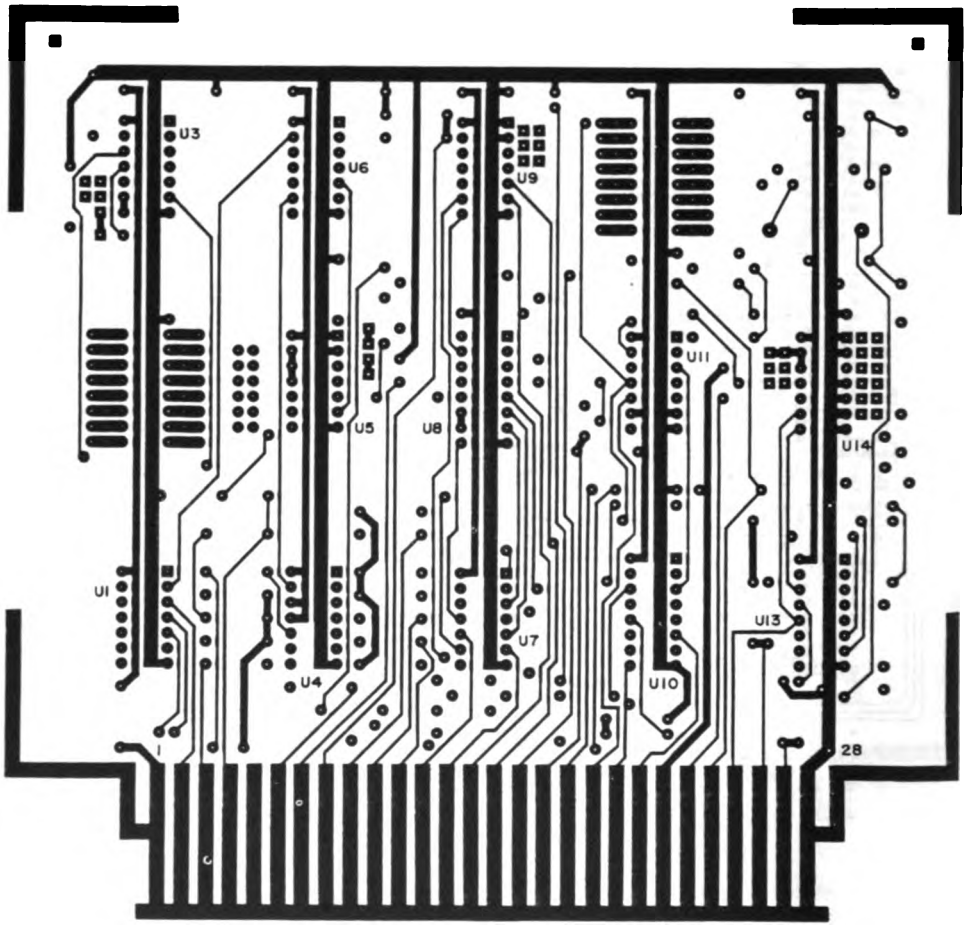
PCB I, COMPONENT SIDE



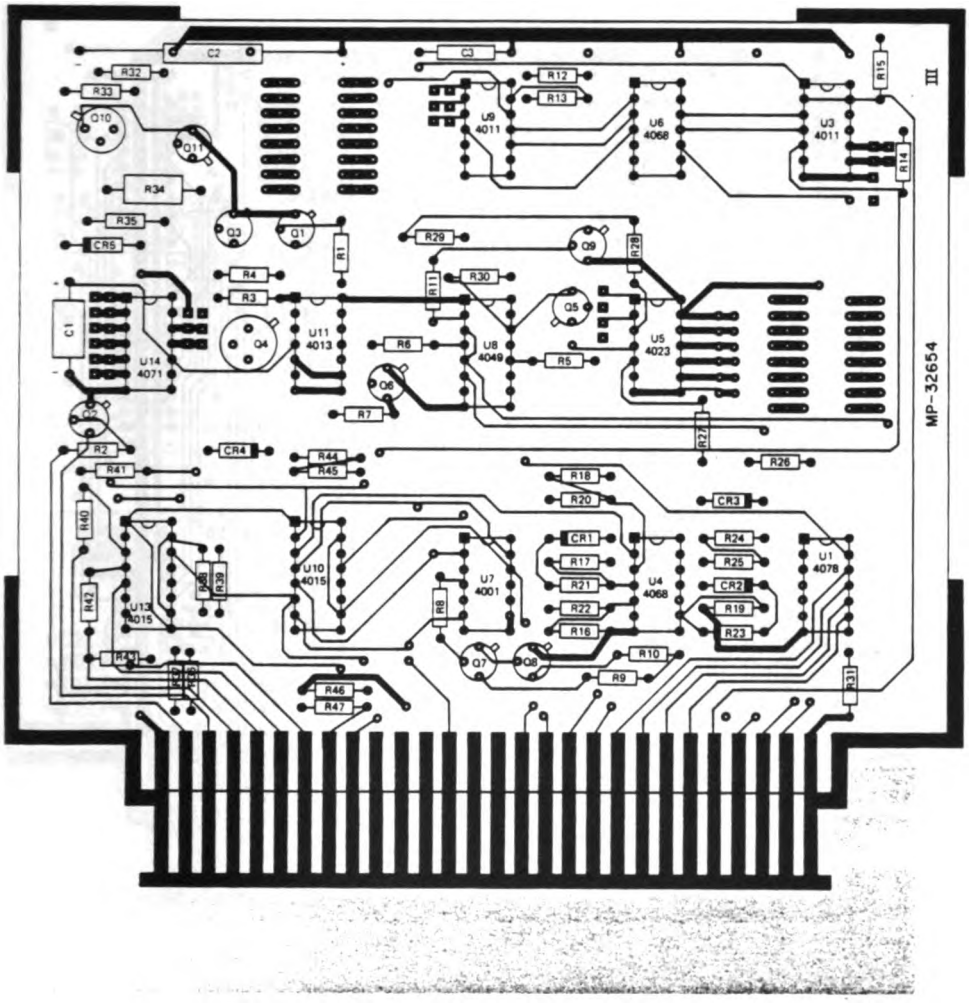
PCB II, SOLDER SIDE



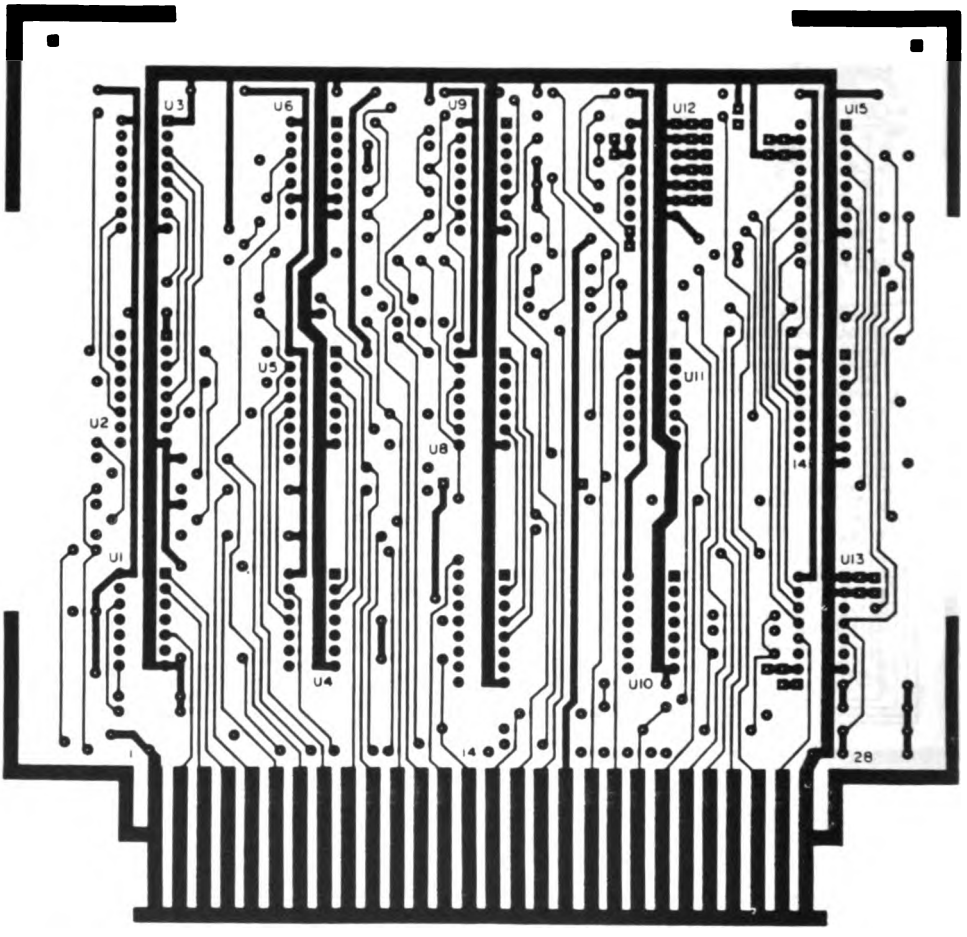
PCB II, COMPONENT SIDE



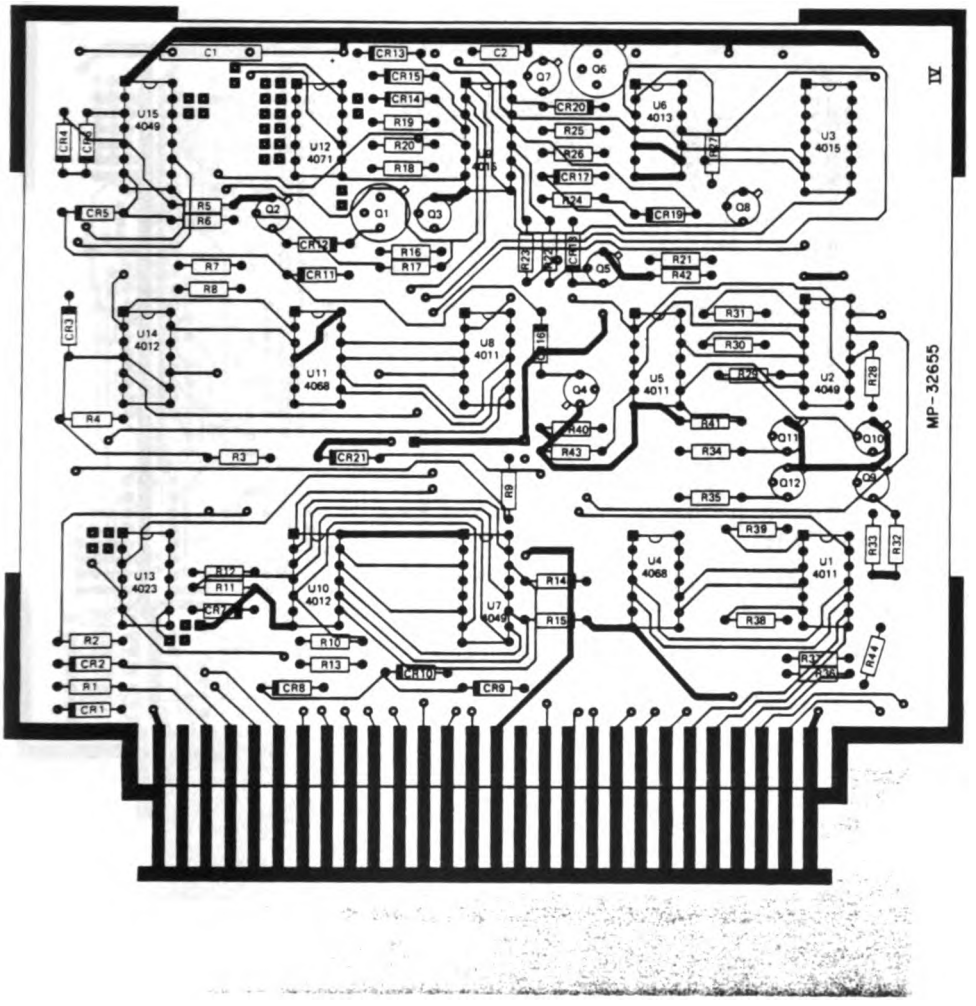
PCB III, SOLDER SIDE



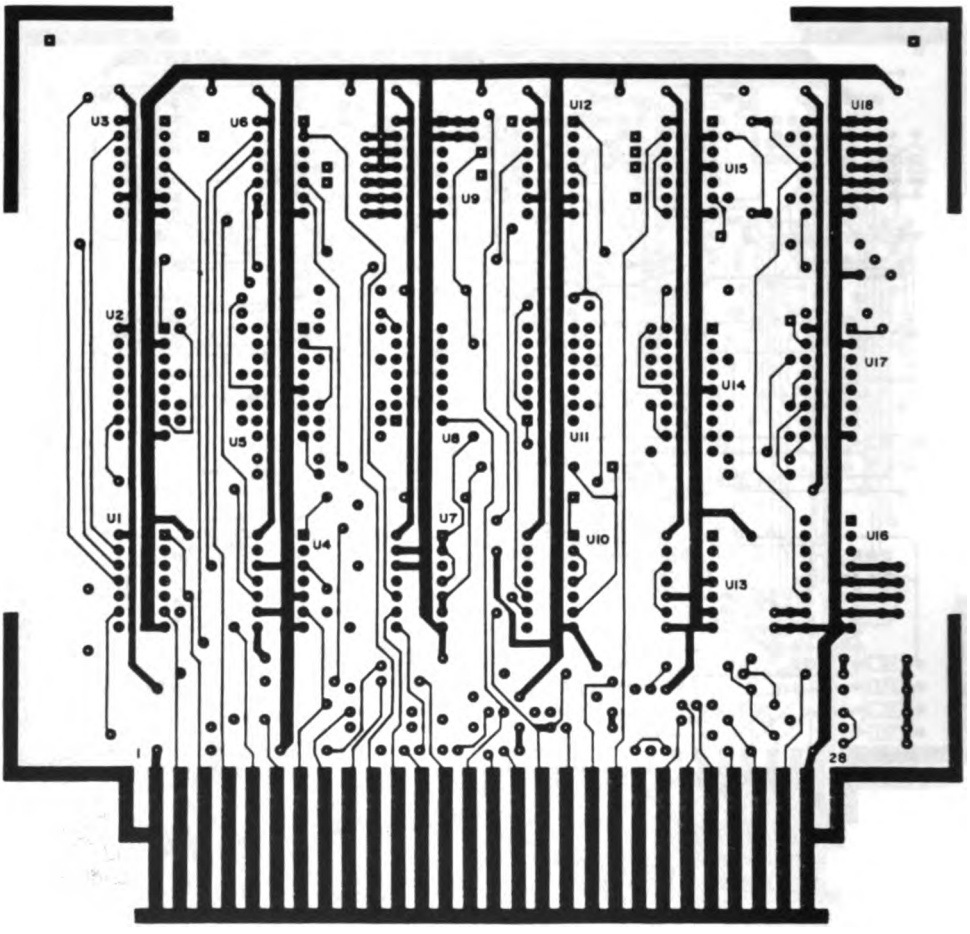
PCB III, COMPONENT SIDE



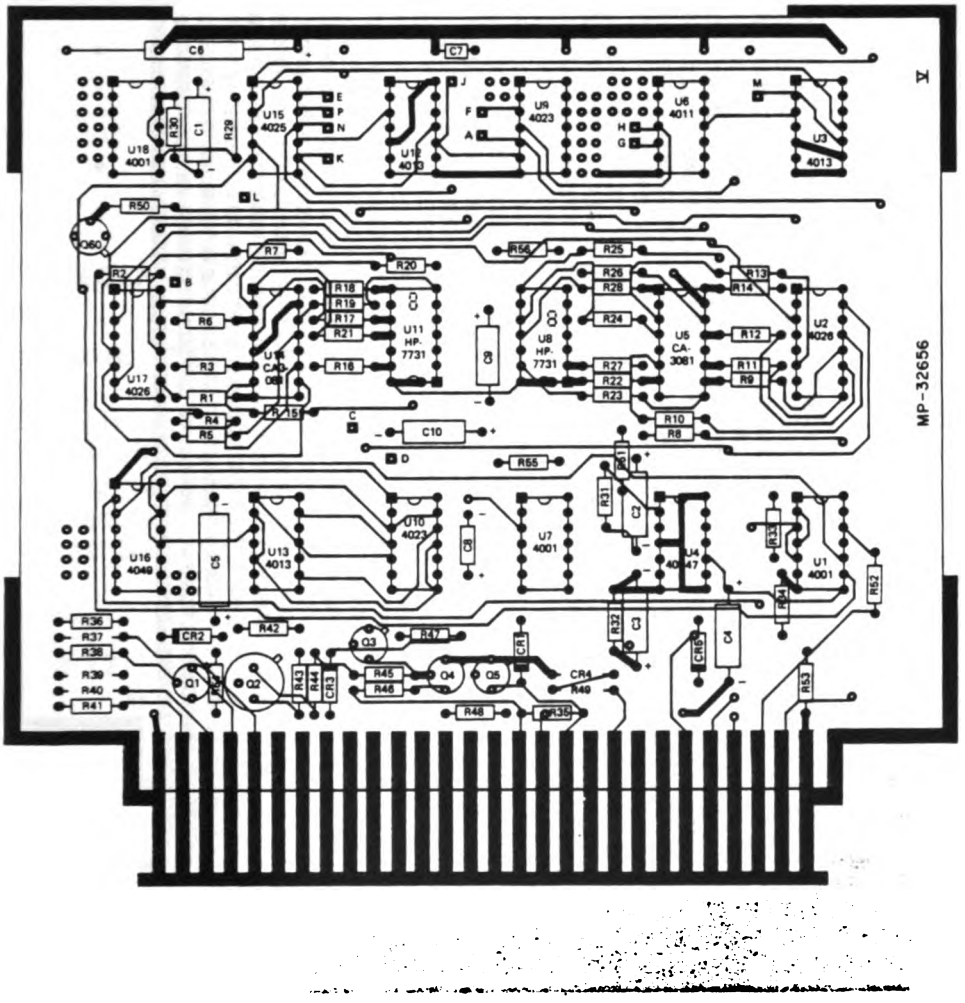
PCB IV, SOLDER SIDE



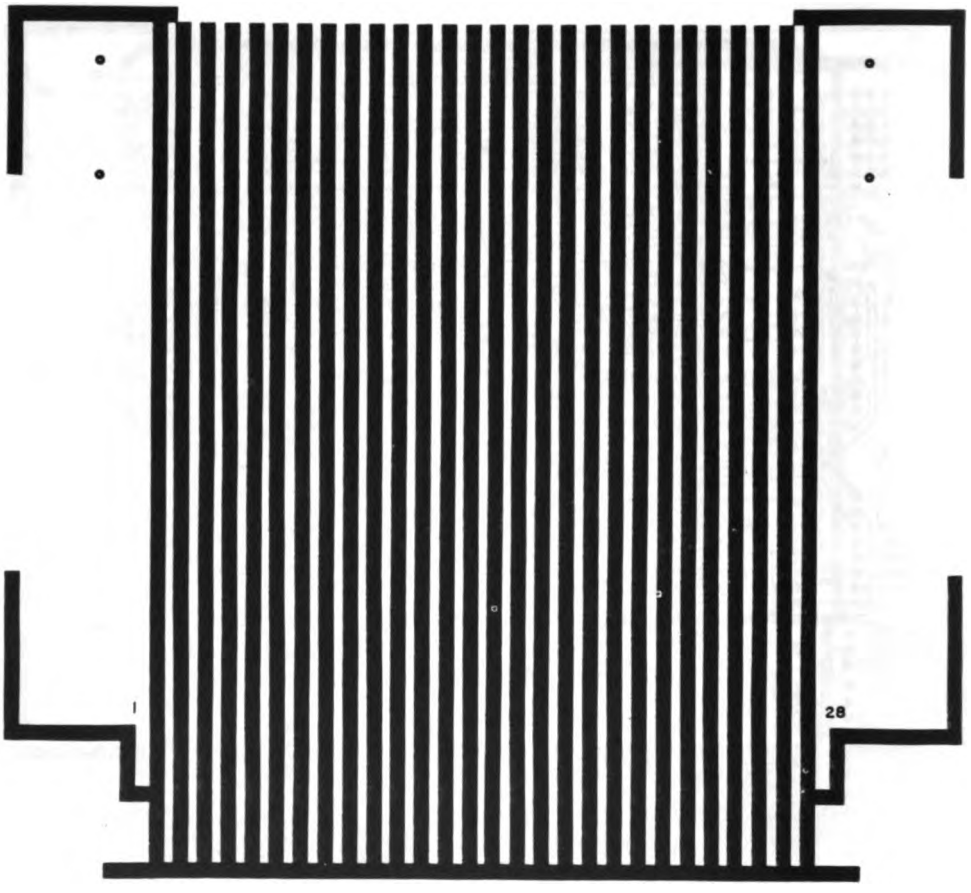
PCB IV, COMPONENT SIDE



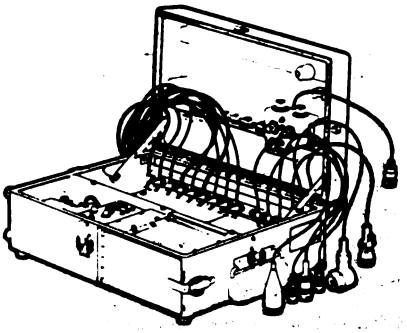
PCB V, SOLDER SIDE



PCB V, COMPONENT SIDE



EXTENDER BOARD



SECTION IV ELECTRICAL CHECKS

3-16. GENERAL

This section contains SRA instructions for conducting the electrical tests. It is sequenced to match that of the technicians who make the electrical tests on each test set immediately after manufacture and prior to issuing it to the field. It is advisable that SRA use this same sequence.

3-17. BATTERY SWITCH (SW5) CHECK

TEST EQUIPMENT AND MATERIALS

- Digital Multimeter.
- Battery BA-3590/U or BA-5590/U.
- External Power Supply.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good AC power supply or battery. All five printed circuit boards must be properly installed in the test set.

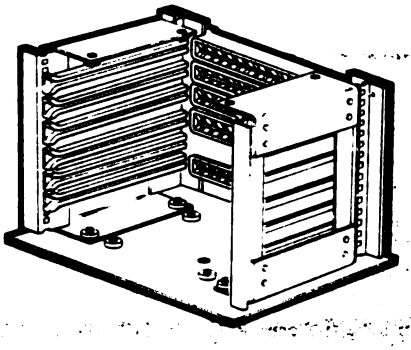
PROCEDURES

PROCEDURES FOR BATTERY SWITCH (SW5) CHECK.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	External power supply off.	PWR switch off (down). BAT SW in left hand position.	a. Connect external power supply to battery connector pins 1 (negative) and 4 (positive).	a. Power supply is connected as stated.
	External power supply on.		b. Adjust external power supply for 12 volts ± .5 Vdc.	b. Power supply is supplying 12 volts ± .5 Vdc.
	Digital voltmeter.		c. Connect digital voltmeter to (+) TB3-31/32 and (−) TB3-33/34.	c. Voltmeter is connected as stated.
		PWR switch on (up).	d. Observe test step indicator on PCB No. V.	d. Test step indicator should read 00.
		Press RESET button.	e. Observe voltmeter connected to TB3.	e. Voltmeter should read 12 volts ± .5 Vdc.
		PWR switch off (down).		
2		BAT SW to right hand position.	a. Observe test step indicator on PCB No. V.	a. LED test step indicator should not illuminate.
		PWR switch on (up). Press RESET button.	b. Observe voltmeter connected to TB3.	b. Voltmeter should read 0 volts or less.
	External power supply off.	PWR switch off (down).	c. Disconnect external power supply from battery connector pins 1 and 4.	c. Power supply is connected to nothing.
3	Digital voltmeter.		a. Connect external power supply to battery connector pins 2 (negative) and 5 (positive).	a. Power supply is connected as stated.
		Press RESET button.		

PROCEDURES FOR BATTERY SWITCH (SW5) CHECK (CONTINUED)

Step No.	Control settings		Test procedures	Performance standard
	Test equipment	Equipment under test		
	External power supply on.	BAT SW still in right hand position.	b. Observe test step indicator on PCB No. V.	b. Test step indicator should read read 00.
		PWR switch on (up). Press RESET button.	c. Observe voltmeter connected to TB3.	c. Voltmeter should read 12 volts ± .5 Vdc.
4		BAT SW to left hand position.	a. Observe test step indicator on PCB No. V.	a. LED test step indicator should not illuminate.
		Press RESET button.	b. Observe voltmeter connected to TB3.	b. Voltmeter should read 0 volts or less.
5	Jumper from GND Test Point to the Tester Chassis.	BAT SW to both right hand and left hand positions.	a. Check for shorts in DC line to chassis.	a. Test step indicators should read 00.
		Press RESET button.		
	External power supply off.	PWR switch off (down).	b. Disconnect external power supply from battery connector pins 2 and 5.	b. Power supply is connected to nothing.



3-18. LOW BATTERY VOLTAGE INDICATOR CHECK

TEST EQUIPMENT AND MATERIALS

- External Power Supply.
- Battery BA-3590/U or BA-5590/U.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good AC power supply or battery. All five printed circuit boards must be properly installed in the test set.

PROCEDURES

PROCEDURES FOR LOW BATTERY VOLTAGE INDICATOR (LED 2) CHECK

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	External power supply off.	PWR switch off (down).	a. Connect a 12 Vdc variable power supply to TB3-32 (+12V) and TB3-34 (GND).	a. Power supply is connected as stated.
	External power supply on.		b. Adjust external power supply for 12 volts ± .5 Vdc.	b. Power supply is supplying 12 volts ± .5 Vdc.
		PWR switch on (up).	c. Observe the low BAT IND LED2.	c. The LED2 low BAT IND light is off.
2			a. Slowly decrease the external power supply to 8 Vdc.	a. Power supply is supplying 8 Vdc.
			b. Observe the low BAT IND LED2.	b. The LED2 low BAT IND light should glow amber when or before the 8 Vdc is reached.

3-19. VOLTAGE CHECK (12 Vdc)

TEST EQUIPMENT AND MATERIALS

- Digital Multimeter.
- AC Power Supply or Battery BA-3590/U or BA-5590/U.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good battery. All five printed circuit boards must be properly installed in the test set.

PROCEDURES

PROCEDURES FOR VOLTAGE CHECK (12 Vdc)

Step No.	Control settings		Test procedures	Performence standard
	Test equipment	Equipment under test		
1	Digital Volt/ Ohm meter set to read 12 Vdc.	PWR switch on (up). Press and release RESET pushbutton.	Measure voltage across 100 µd filter capacitor located at right front of each PCB.	
			PCB No. I (bottom) C1	11.7 V± 0.5
			PCB No. II C1	11.4 V± 0.5
			PCB No.III C2	11.4 V± 0.5
			PCB No. IV C1	11.5 V ± 0.5
			PCB No.V (top) C6	11.2 V± 0.5

The difference between the highest and lowest voltages should not exceed 1.0 Vdc.

3-20. REGULATOR CHECK (18 Vdc)

TEST EQUIPMENT AND MATERIALS

- Interconnecting Boxes J-3513A and J-3514A.
- Digital Multimeter.
- Clip Leads.
- AC Power Supply or Battery BA-3590/U or BA-5590/U.
- Extender Board.
- The following resistors:

130 ohm 2 watt
150 ohm 2 watt
180 ohm 2 watt
390 ohm 2 watt
680 ohm 2 watt

In place of the resistors listed above, a resistance decade box may be used.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good AC power supply or battery. Extend printed circuit board No. V (top) using test set extender board. Be sure PWR switch is off whenever removing or replacing printed circuit boards.

PROCEDURES

PROCEDURES FOR REGULATOR CHECK (18 Vdc)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	Digital Volt/ Ohm meter set to read 18 Vdc.	PWR switch to on (up).	a. Measure voltage at pin $\overline{C}$ of PCB No. V.	a. Voltage at pin $\overline{C}$ should be between 16 and 18 Vdc.
		TEST SEL switch to J-3513A.		
		Press and release RESET pushbutton.		
			b. Connect 150 Ohm resistor between pin $\overline{C}$ and ground and measure voltage.	b. Voltage at pin $\overline{C}$ should be within +0 to −1 volt of reading obtained in 1a, above.
			c. Connect 180 Ohm resistor in parallel with 150 Ohm resistor installed in b. above and measure voltage.	c. Voltage at pin $\overline{C}$ should drop to 0 Vdc and remain.
		Press and hold RESET push-button.	d. Measure voltage at pin $\overline{C}$ of PCB No. V connector.	d. Voltage at pin $\overline{C}$ should be within +0 to −1 volt of reading obtained in 1b, above, and remain while RESET pushbutton is depressed.
		Release RESET pushbutton.	e. Remove 180 Ohm resistor.	e. Resistor removed.
		Press RESET pushbutton momentarily and release.	f. Observe voltage at pin $\overline{C}$.	f. Voltage at pin $\overline{C}$ should return to reading obtained in 1b, above.
			g. Remove 150 Ohm resistor installed in step 1b, above.	g. Resistor removed.
2		Set TEST SEL switch to J-3514A.	a. Connect 390 Ohm resistor between pin $\overline{C}$ and ground.	a. Voltage at pin $\overline{C}$ should be between 15 and 18 Vdc.
			b. Connect 680 Ohm resistor in parallel with 390 Ohm resistor installed in a. above.	b. Voltage at pin $\overline{C}$ should drop to 0 Vdc.
		Press and hold RESET push-button.	c. Observe voltage at pin $\overline{C}$.	c. Voltage at pin $\overline{C}$ should be within +0 to −1 volt of reading obtained in step 2c, above and remain while RESET pushbutton is depressed.

PROCEDURES FOR REGULATOR CHECK (18 Vdc) (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		Release RESET pushbutton.	d. Remove 680 Ohm resistor.	d. None.
		Press RESET pushbutton momentarily and release.	e. Observe voltage at pin C.	e. Voltage at pin $\overline{C}$ should return to the reading obtained in step 2a, above.
			f. Remove 390 Ohm resistor installed in step 2a, above.	f. Resistor removed.
3		Set TEST SEL switch to J-3513A.	a. Connect test set to a known good J-3513A junction box, and connect 130 Ohm resistor between 18 V test jack on control panel and ground.	a. None.
		Press RESET pushbutton.	b. Observe voltage at 18 V test jack.	b. Voltage at 18 V test jack should be 15 to 17.5 Vdc.
		Press and release ADV pushbutton once.	c. Counter will start counting.	c. Test set step indicators should count to step 38 and stop. Voltage at 18 V test jack should be 0 Vdc.
			Disconnect J-3513A interconnecting box and 130 Ohm resistor installed in step 3a above.	
4		Set TEST SEL switch to J-3514A.	a. Connect test set to a known good J-3514A interconnecting box and connect 390 Ohm resistor between 18 V test jack on control panel and ground.	a. None.
		Press and release RESET pushbutton.	b. Observe voltage at 18 V test jack.	b. Voltage at 18 V test jack should be 15 to 17.5 Vdc.
		Press ADV push button once.	c. Counter will start counting.	c. Test set step indicators should count to step 17 and stop. Press the alarm clear on the J-3514A and the indicators should advance to 19. Voltage at 18 V test jack should be 0 Vdc.
		PWR switch to off (down).	d. Disconnect J-3514A interconnecting box and 390 Ohm resistor installed in step 4a, above.	d. None.

3-21. TRANSISTOR AND DIODE CHECK

TEST EQUIPMENT AND MATERIALS

- Digital Multimeter.
- 620 Ohm Resistor or Resistor Decade Box.
- AC Power Supply or Battery BA-3590/U or BA-5590/U.
- Extender Board.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good AC power supply or battery. Be sure PWR switch is off whenever removing or replacing PCBs. All transistors referenced in this transistor and diode check are JAN 2N2222A. The case of the transistor is the collector. Replace any transistor not within tolerance.

PROCEDURES

PROCEDURES FOR TRANSISTOR AND DIODE CHECK

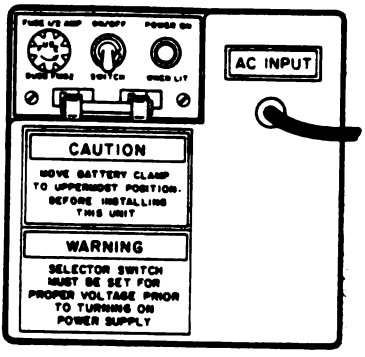
Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1		PWR switch off (down) when moving PCB boards.	Extend PCB No. I.	
		PWR switch on (up).	Apply +12 Vdc ± .5 through 620 Ohm resistor to Q1, Q2, Q3, Q4, Q5 and Q6 collector (case) in turn.	
		Press RESET pushbutton.	Measure voltage between collectors and ground.	Voltage drop should be less than .3 Vdc

PROCEDURES FOR TRANSISTOR AND DIODE CHECK (Continued)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		PWR switch off (down) when moving PCB boards.	Replace PCB No. I into test set card cage.	
2			Extend PCB No. II.	
		PWR switch on (up).	Apply +12 Vdc ± .5 through 620 Ohm resistor to Q1, Q2, Q4, Q5, Q6, Q7, Q9, and Q13 collector (case) in turn.	
		Push RESET pushbutton.	Measure voltage between collectors and ground.	Voltage drop should be less than .3 Vdc.
			Replace PCB No. II into test set card cage.	
3		PWR switch off (down) when moving PCB boards.	Extend PCB No. III	
		PWR switch on (up).	Apply 12 Vdc through 620 Ohm resistor to Q5, Q6, and Q8 collector (case) in turn.	
		Press RESET pushbutton.	Measure voltage between collectors and ground.	Voltage drop should be less than .3 Vdc.
		PWR switch off (down) when moving PCB boards.	Replace PCB No. III into test set card cage.	
4			Extend PCB No. IV.	
		PWR switch on (up).	Apply 12 Vdc through 620 Ohm resistor to Q6, Q9, Q10, Q11 and Q12 collector (case) in turn.	
		Press RESET pushbutton.	Measure voltage between collectors and ground.	Voltage drop should be less than .3 Vdc.
		PWR switch off (down).	Replace PCB No. IV into test set card cage.	
5			Extend PCB No. V.	
		PWR switch on (up).	Apply 12 Vdc through 620 Ohm resistor to Q6 collector (case).	

PROCEDURES FOR TRANSISTOR AND DIODE CHECK (Continued)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		Press RESET pushbutton.	Measure voltage between collector and ground.	Voltage drop should be less than .3 Vdc.
		PWR switch off (down) when moving PCB boards.	Replace PCB No. V into test set card cage.	
6			Extend PCB No. III.	
		PWR switch on (up).	a. Place a ground on TB2-14 (J4P) and apply +12 Vdc #.5 through a 620 Ohm resistor to anode of CR3 (on BD3), TB1-9 (J3C).	a. The voltage drop from anode to ground should be no greater than 0.85 Vdc ± 0.1 Vdc.
		Press RESET button.	b. Check voltage on TP1 (+18V test jack on the control panel).	b. Voltage should be approximately +16 Vdc to +18 Vdc.
			c. Place a momentary ground on TP1.	c. Voltage should go toward zero (less than .01 Vdc) and remain there. If it does not, this is a problem with the +18 V regulator which must be corrected before continuing.
			d. Place a permanent ground on the cathode of CR4 (on BD3). Apply +12 Vdc through a 620 ohm resistor to anode of CR4, TB2-20 (J4W).	d. The voltage should be no greater than .85 Vdc.
			e. Remove the ground on the cathode of CR4 (on BD3).	e. N/A
		Press RESET pushbutton.	f. Observe voltage on TP1.	f. The voltage will return to approximately +16 to +18 Vdc.
7			a. Place a ground on TB3-23 (J1C) and apply +12 Vdc through a 620 Ohm resistor to anode of CR12 (on BD4), TB3-25 (J3H).	a. The voltage drop should be no greater than 0.85 Vdc.
			b. Leave ground on TB3-23 (J1C) and apply +12 Vdc through a 620 Ohm resistor to anode of CR21 (on BD4), TB3-26 (J3L).	b. The voltage drop should be no greater than 0.85 Vdc.
		PWR switch off (down).	c. Remove ground on TB3-23.	



3-22. CONTROL LOGIC CHECK

TEST EQUIPMENT AND MATERIALS

- Oscilloscope.
- AC Power Supply or Battery BA-3590/U or BA-5590/U.
- Interconnecting Box J-3513A.
- Extender Board.

TEST CONNECTIONS AND CONDITIONS

The test set must contain a known good AC power supply or battery. Connect test set to a known good J-3513A interconnecting box. Extend test set printed circuit board No. IV or V (when required) using test set extender board. Be sure PWR switch is off whenever removing or replacing printed circuit boards.

PROCEDURES

PCB NO. V TEST POINTS

TEST POINT	TYPE OF PULSE	CHIP	PIN
A	$\overline{\text{MPR}}$	U4	11
B	MPR	U4	10
C	DRIVE	U10	6
D	CLOCK	U16	12
E	DATA	U15	13
F		U9	3
G		U6	5
H		U6	4
J	RESET	U9	6
K		U15	9
L	ADV	U15	6
M		U3	2
N	FAULT	U15	11
P	SAMPLE	U10	10

PROCEDURES FOR CONTROL LOGIC CHECK

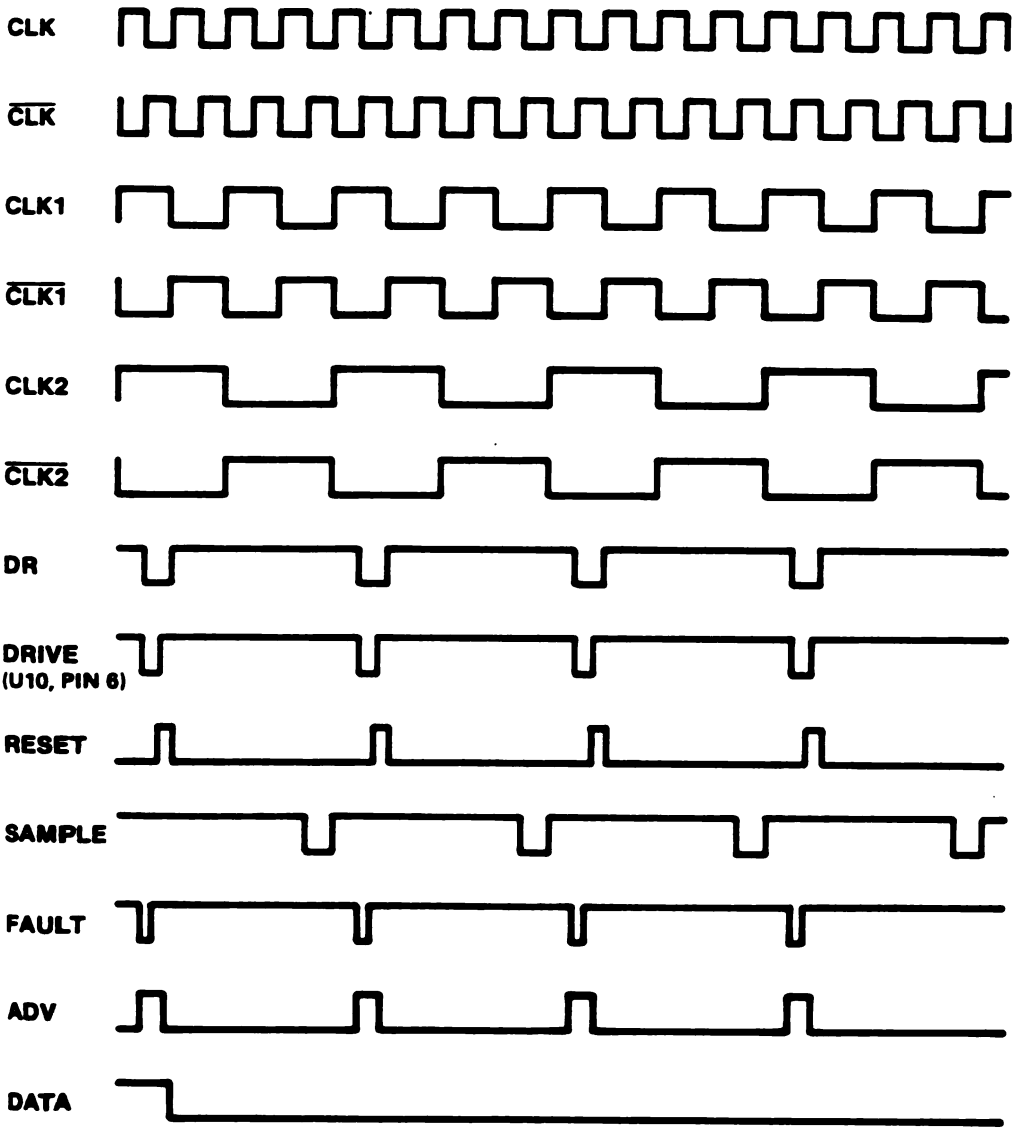
Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	Set Oscilloscope controls as required.	PWR switch to on (up). TEST SEL switch to J-3613A.	a. Extend PCB No. V and observe Master Pulse Reset (MPR) on U4, pin 10 (C4) at test point (TP) B, and $\overline{\text{MPR}}$ on U4, pin 11 at TP A (U9), pin 5 at TP A while pressing and releasing RESET pushbutton. NOTE Alternate test points above are in parentheses.	a. MPR should be positive 12 volt pulse approximately 3 msec wide. $\overline{\text{MPR}}$ should be negative 12 volt pulse approximately 3 msec wide. NOTE A second pulse may be seen on U4, pin 10, as RESET pushbutton is released.
2			a. Observe Clock Pulse (CLK) on U16, pin 12, TP D.	a. CLK positive pulses should be 2.5 to 7.5 msec wide and 12 volts in amplitude. NOTE C1 and/or R30 may be changed to correct clock pulse width.

PROCEDURES FOR CONTROL LOGIC CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
3			Refer to control logic diagram and verify the relationships and pulse widths of the following signals.	
			a. DRIVE. U10, pin 6 (C10).	a. Negative 12 V pulse, 2.5 to 7.5 msec. Jitter between consecutive pulses should be less than 1 msec.
			b. DRIVE. U7, pin 3. It must not exceed 1.9 milliseconds.	b. Negative 12 V pulse, 0.5 to 1.5 msec.
			c. RESET. U9, pin 6, TP J. It must not exceed 1.9 milliseconds.	c. Positive 12 V pulse, 0.5 to 1.5 msec.
			d. SAMPLE. U10, pin 10 TP P.	d. Negative 12 V pulse, 2.5 to 7.5 msec.
4		Press ADV pushbutton as required.	a. Ground U15, pin 11. Place the oscilloscope probe on ADV U15, pin 6, TP L.	a. One pulse will be present each time ADV pushbutton is pressed. NOTE This pulse should coincide with and be the same width as the drive pulse on U7, pin 3.
			b. Remove the ground on U15, pin 11.	b. None.
5		Press RESET pushbutton.	a. Replace PCB No. V into card cage and extend PCB No. IV. Observe signal level at U6, pin 12 with the oscilloscope.	a. Signal should go to +12 volt level.
		Press ADV.	b. Observe signal at U6, pin 12.	b. Signal should go to 0 volt level with first advance pulse and remain until the RESET pushbutton is pressed again.
		PWR switch to off.	c. Replace PCB No. IV into card cage.	

NOTE

For troubleshooting purposes only: a ground on U15, pin 11, allows the test step indicator to be advanced one step at a time. A ground on U8, pin 6, inhibits the test step indicator from stopping at steps 37 or 18 if there is a fault.



CONTROL LOGIC TIMING DIAGRAM

3-23. TERMINAL BLOCK INTERCONNECTION CHECK

TEST EQUIPMENT AND MATERIALS

- Digital Multimeter.
- Clip Leads.
- 620 Ohm Resistor.
- 10K Ohm Resistor.
- Interconnecting Box J-3513A
- Interconnecting Box J-3514A
- AC Power Supply or Battery BA-3590/U or BA-5590/U.
- Extender Board.

TEST CONNECTIONS AND CONDITIONS

The center brace over the three terminal blocks must be removed. The test set must contain a known good AC power supply or battery. All transistors referenced in this terminal block interconnection check are JAN 2N2222A. The case of the transistor is the collector. Replace any transistor not within tolerance. Be sure PWR switch is off whenever removing or replacing printed circuit boards.

PROCEDURES

- Disconnect the wires attached to terminal blocks 1, 2, and 3 one at a time as listed in the procedures below. Replace wire after each test except when instructed otherwise.
- Use digital multimeter to measure terminal or wire voltage.

- The terminals should read 0 volts with the test set RESET pushbutton pressed. The test step indicator on PCB No. V should indicate 00.
- Pressing the ADV pushbutton will cause either the terminal block connection or the wire removed to go to a positive level after the test set step indicator has advanced to the listed step and stopped. Press RESET and ADV pushbutton several times to ensure proper operations.
- If the test step indicator on PCB No. V does not advance to the proper step, troubleshoot according to the theory of operation.
- The 12 Vdc required for certain tests can be obtained from the test set 12 V test jack on the control panel.

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
1	Digital Volt/ Ohm meter set for DC operation.	PWR switch on (up). TEST SEL switch to J-3513A. Press RESET and then ADV pushbutton for each test in step 1.	Connect test set to a known good J-3513A interconnecting box and disconnect wire to:	Test step indicator should stop at:
			TB2-16	01
			TB2-19	02
			TB2-11	03
			TB1-29	04
			TB3-18	05
			TB2-26	06
			TB3-17	07
			TB2-18	08
			TB3-21	09
			TB2-6	10
			TB3-13	11
			TB2-9	12
			TB3-15	13
			TB2-4	14
			TB3-16	15
			TB2-1	16
			TB1-8	17
			TB2-28	18
			TB1-5	19
			TB1-7	20
			TB1-12	21
			TB2-24	22
			TB2-7	23
			TB3-1	24
			TB3-4	25

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
			TB3-12	26
			TB1-21	27
			TB1-20	28
			TB2-22	28
			TB3-8	29
			TB1-15	29
			TB3-10	30
			TB2-10	30
			TB3-8	30
			TB3-9	31
			TB3-3	32
			TB2-30	32
			TB2-15	32
			TB3-20	33
			TB2-3	33
			TB1-3	33
			TB2-23	35 and 36
			TB1-28	36
			TB1-13	36
			TB2-14	38
			TB3-14	38
			TB2-5	38
			TB2-8	38
			NOTE Do not reconnect wire to TB2-28 for next step.	
2		PWR switch off (down) while moving PCB board.		
			Extend PCB No. III and verify that collector (case) of Q3 is at ground potential.	
		PWR switch on (up).	While stopped at step 38, apply 12 Vdc through 620 Ohm resistor to Q3 collector (case).	Voltage drop should be less than 0.2 Vdc.
			Reconnect TB2-8 wire.	
3		Press RESET and then ADV pushbutton for each test in step 3.	Disconnect wire connected to:	Test step indicator should stop at:
			TB1-30	39
			TB2-17	40
			TB2-2	42
			TB1-6	43

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
			NOTE Do not reconnect wire to TB1-6 for next test.	
4			Verify that collector (case) of Q1 is at ground potential.	
			While stopped at step 43, apply 12 Vdc through 620 Ohm resistor to Q1 collector.	Voltage drop should be less than 0.2 Vdc.
		PWR switch off (down).	Replace PCB No. III into test set card cage and reconnect TB1-6 wire.	
5		PWR switch on (up).		
		Press RESET and then ADV pushbutton for each test in step 5.	Disconnect wire connected to: TB2-25 TB1-9 TB3-7 TB2-12 TB1-4 TB1-1 TB1-14 TB2-13 TB2-27 TB3-22 TB2-22	Test step indicator should stop at: 44 44 45 46 46 46 47 47 47 48 28
			NOTE Do not reconnect wire to TB2-22 for next test.	
6		PWR switch off (down) while moving PCB board.	Extend PCB No. II	
		PWR switch on (up).	Apply approximately 12 Vdc through 620 Ohm resistor to Q11 collector (case).	
		Press RESET pushbutton.	Observe test step indicator and measure the voltage between Q11 collector and ground.	Test step indicator will display 00 and voltage should be less than 0.2 Vdc.

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		Press and release ADV pushbutton.	Observe test step indicator and Q11 voltage change.	Test step indicator will advance to step 28 and voltage will go to 12 Vdc.
7.			Apply approximately 12 Vdc through 620 Ohm resistor to Q12 collector (case).	
		Press RESET pushbutton.	Measure voltage between Q12 collector and ground.	Voltage should be less than 0.2 Vdc.
		Press ADV pushbutton.	Observe test step indicator and Q12 voltage change.	Test step indicator will advance to step 28 and voltage will go to 12 Vdc.
			Reconnect wire to TB2-22.	
8.			Disconnect wire from TB3-6 and apply approximately 12 Vdc through 620 Ohm resistor to Q8 collector (case).	
		Press RESET pushbutton.	Measure voltage between Q8 collector and ground.	Voltage should be less than 0.2 Vdc.
		Press ADV pushbutton.	Observe test step indicator and Q8 voltage change.	Test step indicator will advance to step 30 and voltage will go to 12 Vdc.
9.			Apply approximately 12 Vdc through 620 Ohm resistor to Q14 collector (case).	
		Press RESET pushbutton.	Measure voltage between Q14 collector and ground.	Voltage should be less than 0.2 Vdc.
		Press ADV pushbutton.	Observe test step indicator and Q14 voltage change.	Test step indicator will advance to step 30 and voltage will go to 12 Vdc.
		PWR switch off (down).	Reconnect wire to TB3-6 and replace PCB No. II into card cage.	
10			Extend PCB No. V.	
		PWR switch on (up).	Apply ground to U6, pin 6.	

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		Press RESET and then ADV pushbutton for each test in step 10.	Disconnect wire connected to: TB3-8 TB3-9 TB2-30 TB3-6	Test step indicator should stop at: 29 and 41 31 and 46 32 and 47 30 and 46
		PWR switch off (down).	Remove ground from U6, pin 6 and replace PCB No. V into card cage.	
11		PWR switch on (up).	Apply ground to TB3-7.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should advance to 34.
			Remove ground from TB3-7.	
12			Apply ground to TB1-30.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should advance to 37.
			Remove ground from TB1-30.	
		PWR switch off (down).	Remove J-3513A interconnecting box from test set.	
13		PWR switch on (up).	Connect test set to a known good J-3514A interconnecting box and disconnect wire attached to:	Test step indicator should stop at:
		TEST SEL switch to J-3514A.	TB2-16	S01
		Press RESET and then ADV pushbutton for each test in step 13.	TB2-19	S02
			TB2-11	S03
			TB1-29	S04
			TB3-18	S05
			TB2-28	S06
			TB3-17	S07
			TB2-18	S08
			TB2-7	S11
			TB3-1	S12
			TB3-4	S13
			TB3-12	S14
			TB1-21	S15
			TB3-24	S17
			TB1-33	S17

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
				NOTE Alarm clear on the J-3514A must be pressed to advance past step 17 (S17).
			TB2-31	S18 and S19
			TB3-30	S19
			TB3-27	S19
			TB3-28	S20
			TB2-32	S20
			TB3-29	S21
			TB1-34	S21
			TB2-34	S22
			TB3-25	S19
			NOTE Do not reconnect wire to TB3-25 for next step.	
14		PWR switch off (down). PWR switch on (up). Press RESET and then ADV pushbutton.	Extend PCB No. IV.	Step indicator stops at step 19.
			Apply 12 Vdc through 620 Ohm resistor to Q2 collector (case).	
			Measure voltage between Q2 collector and ground.	Voltage should be less than 0.2 Vdc.
			Apply 12 Vdc through 620 Ohm resistor to Q3 collector (case).	
			Measure voltage between Q3 collector and ground.	Voltage should be less than 0.2 Vdc.
			Reconnect wire to TB3-25.	
15			Disconnect wire attached to TB3-26.	

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

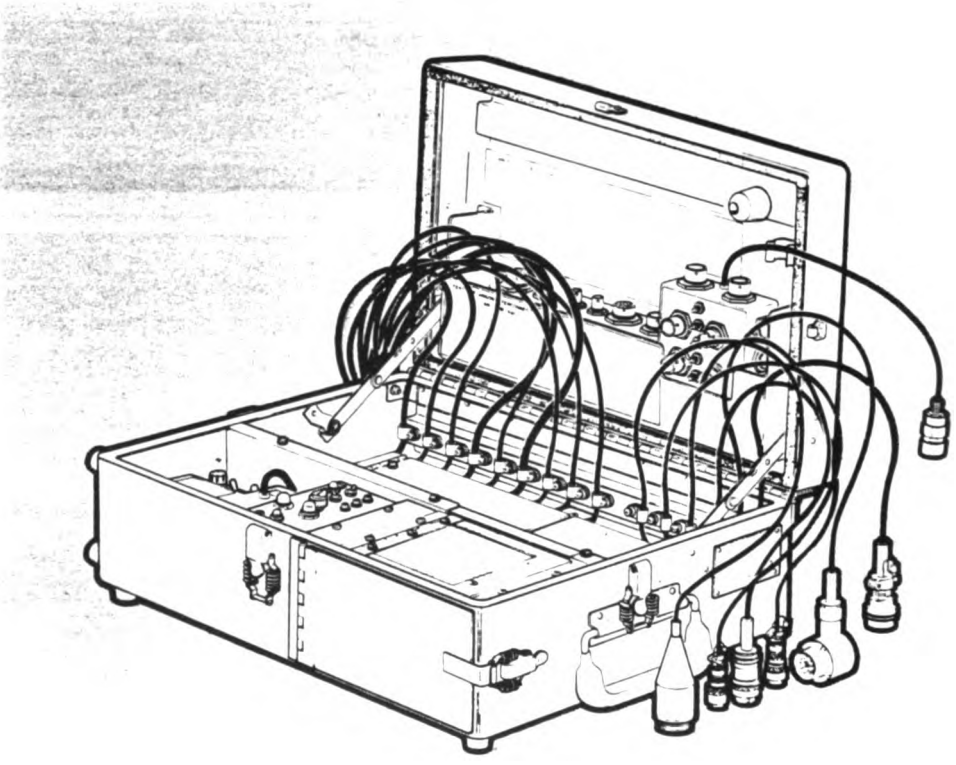
Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
		Press RESET and then ADV pushbuttons.		Test step indicator should step at step 21.
			Apply 12 Vdc through 620 Ohm resistor to Q4 collector (case).	
			Measure voltage between Q4 collector and ground.	Voltage should be less than 0.2 Vdc.
		Press ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at step 22.
16			Apply 12 Vdc through 620 Ohm resistor to Q5 collector (case).	
			Measure voltage between Q5 collector and ground.	Voltage should be less than 0.2 Vdc.
			Reconnect wire to TB3-26.	
17			Disconnect wire attached to TB2-33.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 20 and 21.
18			Apply 12 Vdc through 620 Ohm resistor to Q7 collector (case).	
			Measure voltage between Q7 collector and ground.	Voltage should be less than 0.2 Vdc.
		PWR switch off (down).	Replace PCB No. IV into card cage.	
			Reconnect wire to TB2-33.	
			NOTE Do not disconnect wires from terminals or monitor voltage in the following tests.	

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
19		PWR switch on (up).	Connect test lead between ground and TB3-24.	
		Press RESET and then ADV pushbutton several times.	Observe test step indicators.	Test step indicator should stop at 16.
			Disconnect ground lead from TB3-24 terminal and ground TB1-33 terminal.	
		Press RESET and then ADV pushbutton several times.	Observe test step indicator.	Test step indicator shoud stop at 16.
			Disconnect ground lead from TB1-33.	
20			Apply 12 Vdc through 10K Ohm resistor to TB3-30	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 18.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
21			Apply 12 Vdc through 10K Ohm resistor to TB3-27.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 18.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
22			Apply 12 Vdc through 10K Ohm resistor to TB3-28.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 21.

PROCEDURES FOR TERMINAL BLOCK INTERCONNECTION CHECK (CONTINUED)

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedures	Performance standard
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
23			Apply 12 Vdc through 10K Ohm resistor to TB2-32.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 21.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
24			Apply 12 Vdc through 620 Ohm resistor to TB3-29.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 20.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
25			Apply 12 Vdc through 620 Ohm resistor to TB1-34.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 20.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
26			Place a jumper wire between TB3-26 and TB2-34.	
		Press RESET and then ADV pushbutton.	Observe test step indicator.	Test step indicator should stop at 22.
			Alarm clear on J-3514A must be pressed to advance test step indicator.	
		PWR switch off (down).	Remove jumper wire.	



APPENDIX A
REFERENCES

A-1. INTRODUCTION

Following is a list of all forms, Army Regulations, technical bulletins, technical manuals, and maintenance manuals referenced in this manual.

A-2. FORMS

DA Form 2028	Recommended Changes to Publications and Blank Forms.
DA Form 2404	Equipment Inspection and Maintenance Worksheet.
DA Form 2407	Maintenance Request.
DD Form 1348M	DOD Single Line Item Requisition System Document (Mechanical).
Form SF-361	Transportation Discrepancy Report.
Form SF-364	Report of Discrepancy (ROD).
Form SF-368	Quality Deficiency Report.

A-3. ARMY REGULATIONS

AR 55-38	Report of Transportation Discrepancies in Shipments.
AR 735-11-2	Reporting of Item and Packaging Discrepancies.

A-4. DA PAMPHLETS

DA PAM 700-3	When and How to Use SF 364.
DA PAM 738-750	Maintenance Management Update.

A-5. TECHNICAL BULLETINS

TB 750-11	General Inspection Standards for Overhaul/Repair of Communications Security Equipment.
TB 750-12	Repair Procedures and Inspection Standards for Communications Security Equipment, Printed Circuit Boards.

A-6. TECHNICAL MANUALS

TM 11-5810-345-12	Operator's and Unit Maintenance Manual for Vinson Interconnecting Box, Test Set AN/USM-481.
TM 11-5810-345-24P	Unit, Intermediate Direct Support and Specialized Repair Activity Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools), Vinson Interconnecting Box, Test Set AN/USM-481.

APPENDIX B
EXPENDABLE SUPPLIES AND MATERIALS LIST

SECTION I INTRODUCTION

B-1. INTRODUCTION

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/USM-481. These items are authorized you by CTA 50-970, Expendable Items.

B-2. EXPLANATION OF COLUMNS

LEVEL Shows the lowest level of maintenance that needs the listed item. Enter as applicable:
F - Direct Support Maintenance
L - Specialized Repair Activity

NATIONAL STOCK NUMBER Shows the National Stock Number assigned to the item; use it to request or requisition the item.

DESCRIPTION Shows the Federal item name and, if required a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

UNIT OF MEASURE (U/M) Shows the measure used in performing the actual maintenance function. This measure is shown by a two-letter abbreviation (for example, EA, SH, IN). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy requirements.

SECTION II EXPENDABLE SUPPLIES AND MATERIALS LIST

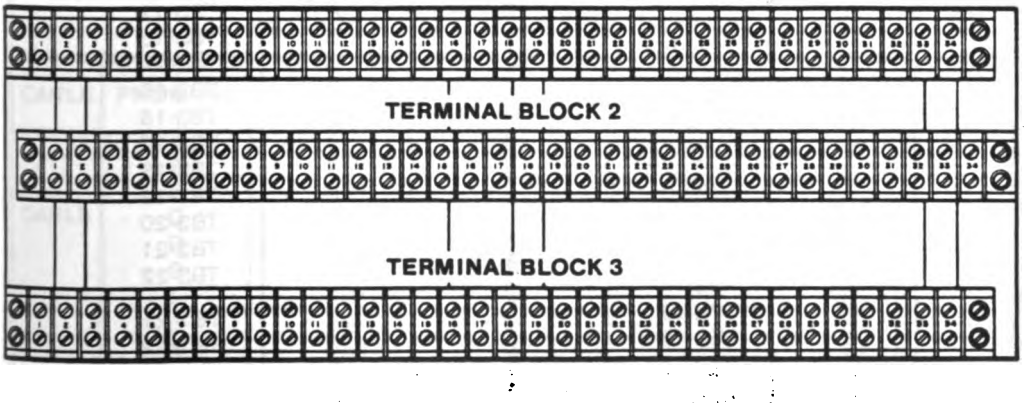
(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	F	8010-00-816-9947	Paint (Gray) (92528)	QT
2	L		Poly Spray #65-16 MIL-I-46058A (Injectorall Electronics Corp.)	PT
3	L		Silicone Heat Shrink Compound Type Z9 Cat. 8109-S (56996) B4030521 (8030 FSC)	OZ
4	F	8305-00-205-3496	Cloth, Cotton Cheesecloth (81348) CCCC 440	PKG
5	F	8020-00-224-8010	Brush, Soft Bristled (81348) H-B-118	EA
6	F	5350-00-235-0124	Sandpaper #000	PKG
7	F	5970-00-419-4291	Tape, Electrical (83905)	RL
8	F	6850-00-105-3084	Cleaning Compound, Freon Type TF (18598)	PT

APPENDIX C
WIRING LISTS

The information in this appendix consists of Wiring Lists needed to verify the proper connections as follows:

- Between pins on cable connectors and terminal boards.
- Between terminal boards and PCB connectors.
- A wiring list for the control panel with its switches, indicator lamps, etc.
- Wiring lists for the cable test adapter.

These Wiring Lists (Lists 1 through 14) would be used as a guide in troubleshooting for broken wires. This information would also be used when the test set has undergone a complete overhaul which would require new wiring.



TEST SET TERMINAL BLOCK CONNECTOR LOCATIONS

WIRING LIST 1. J-3513A FROM CABLE CONNECTORS TO TERMINAL BLOCK

CABLE	FROM PIN	TO TERMINAL BLOCK
J1	A	TB1-1
	B	TB1-2
	C	TB1-3
	D	TB1-4
	SHELL	TB3-33/34 (GND)
J2	A	TB1-5
	B	TB1-6
	C	
	SHELL	TB3-33/34 (GND)
J3	A	TB1-7
	B	TB1-8
	C	TB1-9
	D	TB1-10
	E	TB1-11
	F	TB1-12
	H	TB1-13
	J	TB1-14
	K	TB1-15
	L	TB1-16
J3	M	TB1-17
	N	TB1-18
	P	TB1-19
	R	TB1-20
J4	A	TB2-1
	B	TB2-2
	C	TB2-3
	D	TB2-4
	E	TB2-5
	F	TB2-6
	G	TB2-7
	H	TB2-8
	J	TB2-9
	K	TB2-10
	L	TB2-11
	M	TB2-12
	N	TB2-13
	P	TB2-14
	R	TB2-15
	S	TB2-16
	T	TB2-17
	U	TB2-18
	V	TB2-19
	W	TB2-20
	X	TB2-21
	Y	TB2-22

CABLE	FROM PIN	TO TERMINAL BLOCK
	Z	TB2-23
	a	TB2-24
	b	TB2-25
	c	TB2-26
	SHELL	TB3-33/34 (GND)
J5	A	TB2-27
	B	TB2-28
	C	TB2-29
	D	TB2-30
	E	
J6	A	TB3-1
	B	TB3-2
	C	
	D	TB3-3
	E	
	F	TB3-4
	H	
	J	TB3-5
	K	TB3-6
	L	TB3-7
	M	TB3-8
	N	TB3-9
	P	TB3-10
	R	TB3-11
J7	A	TB3-12
	B	TB3-13
	C	TB3-14
	D	TB3-15
	H	TB3-16
	J	TB3-17
	K	TB3-18
	R	TB3-19
	S	TB3-20
	T	TB3-21
	U	TB3-22
P1	A	TB1-21
	B	TB1-22
	C	TB1-23
	D	TB1-24
	H	TB1-25
	J	TB1-26
	K	TB1-27
	P	TB1-28
	R	TB1-29
	S	TB1-30
	T	TB1-31

WIRING LIST 2. J-3514A FROM CABLE CONNECTORS TO TERMINAL BLOCK

CABLE	FROM PIN	TO TERMINAL BLOCK	CABLE	FROM PIN	TO TERMINAL BLOCK
J1	A	TB2-7		H	TB3-25
	B	TB1-11		K	TB3-27
	C	TB3-23		L	TB3-26
	D	TB3-24		M	TB2-26
	E	TB3-18		N	TB1-29
	F	TB3-19		P	TB3-28
	H	TB3-17			
	J	TB1-18	J4	A	TB3-12
	K	TB1-17		B	TB3-30
				C	TB1-27
J2	A			D	
	B	TB1-34		Shell	TB3-33/34 (GND)
	C	TB1-33			
	D		P1	A	TB1-21
	Shell	TB3-33/34 (GND)		B	TB2-16
				C	TB2-31
J3	A	TB3-1		D	TB2-32
	B	TB2-18		E	TB2-33
	C			F	TB2-34
	D	TB3-29		H	TB1-26
	E			J	TB2-19, BD4-8
	F	TB3-4		K	TB2-11, BD4-J

WIRING LIST 3. CABLE TEST ADAPTER CABLES FROM CABLE CONNECTORS TO TERMINATION

CABLE	FROM PIN	TO TERMINATION	CABLE	FROM PIN	TO TERMINATION
J12	A	TB1-11	J22	SHELL	TB3-33-34
A	E	TB1-17	B	GND	
CABLE	C	TB1-18	CABLE	G	TB1-29
	R	TB1-22		T	TB2-26
	S	TB1-24		N	TB3-21
	L	TB1-26		C	TB2-19
	J	TB1-27		B	TB2-18
	N	TB1-31		A	TB2-16
	G	TB3-19		J	TB3-18
	SHELL	TB3-33-34		L	TB3-17
	GND			S	TB3-15
	J	PIN T		E	TB2-11
	L	PIN B		R	TB3-13
	N	PIN F		W	TB2-9
	R	PIN W		F	TB2-6
	S	PIN X		X	TB2-4

WIRING LIST 4. PIN AND TERMINAL BLOCK CONNECTIONS FOR THE J-3513A

TEST STEP INDICATOR	PIN AND TERMINAL BLOCK CONNECTIONS
01	J3E (TB1-11) to J4S (TB2-16)
02	J3N (TB1-18) to J4V (TB2-19)
03	J3M (TB1-17) to J4L (TB2-11)
04	J7R (TB3-19) to P1R (TB1-29)
05	P1K (TB1-27) to J7K (TB3-18)
06	P1K (TB2-27) to J4c (TB2-26)
07	P1J (TB1-26) to J7J (TB3-17)
08	P1J (TB1-26) to J4U (TB2-18)
09	P1T (TB1-31) to J7T (TB3-21)
10	P1T (TB1-31) to J4F (TB2-6)
11	P1B (TB1-22) to J7B (TB3-13)
12	P1B (TB1-22) to J4J (TB2-9)
13	P1D (TB1-24) to J7D (TB3-15)
14	P1D (TB1-24) to J4D (TB2-4)
15	P1H (TB1-25) to J7H (TB3-16)
16	P1H (TB1-25) to J4A (TB2-1)
17	P1H (TB1-25) to J3B (TB1-8)
18	P1H (TB1-25) to J5B (TB2-28)
19	J2A (TB1-5) to GND
20	J3A (TB1-7) to GND
21	J3F (TB1-12) to GND
22	J4a (TB2-24) to GND
23	J4G (TB2-7) to GND
24	J6A (TB3-1) to GND
25	J6F (TB3-4) to GND
26	J7A (TB3-12) to GND
27	P1A (TB1-21) to GND
28	J6R (TB3-11) to J3R (TB1-20)and J4Y (TB2-22)
29	J4X (TB2-21) to J6M (TB3-8) and J3K (TB1-15)
30	J3P (TB1-19) to J6P (TB3-10) and J4K (TB2-10) and J6K (TB3-6)
31	J6B (TB3-2) to J6N (TB3-9)
32	J3D (TB1-10) to J6D (TB3-3) and J5D (TB2-30) and J4R (TB2-15)
33	J5C (TB2-29) to J7S (TB3-20) and J4C (TB2-3) and J1C (TB1-3)
34	J6L (TB3-7) to OPEN
35	J3L (TB1-16) to J4Z (TB2-23)
36	P1P (TB1-28) to J4Z (TB2-23)
37	P1S (TB1-30) to OPEN
38	P1C (TB1-23) to J3H (TB1-13) and J4P (TB2-14) and J7C (TB3-14) and J4E (TB2-5) and J4H (TB2-8)
39	P1S (TB1-30) to GND
40	J3L (TB1-16) to J4T (TB2-17)
41	J6R (TB3-11) to J6M (TB3-8)
42	J3P (TB1-19) to J4B (TB2-2)

WIRING LIST 4. PIN AND TERMINAL BLOCK CONNECTIONS FOR THE J-3513A (CONTINUED)

TEST STEP INDICATOR	PIN AND TERMINAL BLOCK CONNECTIONS
43	J4W (TB2-20) to K5 Relay; P1C (TB1-23) to J2B (TB1-6)
44	P1C (TB1-23) to J4b (TB2-25) and J3C (TB1-9)
45	J6L (TB3-7) to GND
46	J1B (TB1-2) to J6K (TB3-6) and J6N (TB3-9) and J4M (TB2-12) and J1D (TB1-4) and J1A (TB1-1)
47	J6J (TB3-5) to J5D (TB2-30) and J3J (TB1-14) and J4N (TB2-13) and J5A (TB2-27) and J7U (TB3-22)
48	J1B (TB1-2) to J7U (TB3-22)

WIRING LIST 5. PIN AND TERMINAL BLOCK CONNECTIONS FOR THE J-3514A

TEST STEP INDICATOR	PIN AND TERMINAL BLOCK CONNECTIONS
01	J1B (TB1-11) to P1B (TB2-16)
02	J1J (TB1-18) to P1J (TB2-19)
03	J1K (TB1-17) to P1K (TB2-11)
04	J1F (TB3-19) to J3N (TB1-29)
05	J4C (TB1-27) to J1E (TB3-18)
06	J4C (TB1-27) to J3M (TB2-26)
07	P1H (TB1-26) to J1H (TB3-17)
08	P1H (TB1-26) to J3B (TB2-18)
09	
10	
11	J1A (TB2-7) to GND
12	J3A (TB3-1) to GND
13	J3F (TB3-4) to GND
14	J4A (TB3-12) to GND
15	P1A (TB1-21) to GND
16	J1D (TB3-24) and J2C (TB1-33) are OPEN
17	J1D (TB3-24) and J2C (TB1-33) are at GND
18	J1C (TB3-23) to P1C (TB2-31); also J4B (TB3-30) and J3K (TB3-27) are OPEN
19	J1C (TB3-23) to P1C (TB2-31) and J4B (TB3-30) and J3K (TB3-27); also J3H (TB3-25) to K1 relay
20	P1E (TB2-33) to J3P (TB3-28) and P1D (TB2-32); also J3D (TB3-29) and J2B (TB1-34) are OPEN
21	P1E (TB2-33) to J3D (TB3-29) and J2B (TB1-34); also J3P (TB3-28) and P1D (TB2-32) are OPEN; and J3L (TB3-26) to K2 relay
22	P1F (TB2-24) to J3L (TB3-26) (through diode in interconnecting box)
23	J3L (TB3-26) to P1F is OPEN (due to diode in interconnecting box)

WIRING LIST 6. CONTROL PANEL

LEGEND

SW = SWITCH
TB = TERMINAL BLOCK
BD = BOARD(PRINTED CIRCUIT BOARD)
COM = COMMON
NO = NORMALLY OPEN
NC = NORMALLY CLOSED

ITEM	FROM	TO
Battery connector	Pin 1	SW5-B-1 (+12V)
	Pin 2	SW5-B-2 (GND)
	Pin 3	Not used
	Pin 4	SW5-B-4 (+24V)
	Pin 5	SW5-A-4 (+12V)
	Pin 6	Not used
PWR switch (SW1)	A-COM	SW5-C-1 (+12V)
	A-NO	TB3-31/32 (+12V)
	B-COM	SW5-C-4 (+24V)
	B-NO	BD5-P/CP, collector of Q7
RESET switch (SW2)	A-COM	TB3-31/32 (+12V)
	A-NO	BD5-7
	B-COM	TB3-33/34 (GND)
	B-NO	BD5-19
ADV switch (SW3)	COM	TB3-31/32 (+12V)
	NO	BD5-3
	NC	BD5-2
TEST SEL switch (SW4)	A-COM	BD1-11/BD4-M
	A-1	BD1-12/SW4-H-COM
	A-2	SW4-B-4
	B-COM	BD1-20
	B-3	BD1-24
	B-4	SW4-A-2
	C-COM	SW4-H-8/TB3-33/34/(GND)
	C-5	
	C-6	B1-$\overline{A}$
	D-COM	BD4-16/SW4-F-4
	D-7	TB3-33/34 (GND)
	D-8	BD1-13
	E-COM	BD2-$\overline{E}$
	E-1	BD1-25
	E-2	TB3-33/34 (GND)
	F-COM	BD5-H
	F-3	BD3-15
	F-4	SW4-D-COM/BD4-16

WIRING LIST 6. CONTROL PANEL (CONTINUED)

ITEM	FROM	TO
	G-COM	BD3-22/BD4-18/BD5-$\overline{C}$ (+18V)
	G-5	BD5-$\overline{B}$
	G-6	BD5-$\overline{E}$
	H-COM	BD-1-12, SW4-A-1
	H-7	
	H-8	SW4-C-COM, TB3-33/34 (GND)
BAT SW (SW5)	A-1	SW5-B-2
	B-2	Battery connector pin 2
	C-1	SW1-A-COM
	C-1	SW5-C-3
	B-1	SW5-A-2
	B-1	Battery connector pin 1
	C-2	TB3-33/34 (GND)
	A-3	SW5-B-4
	B-4	Battery connector pin 4
	B-3	SW5-A-4
	A-4	Battery connector pin 5
	C-4	SW1-B-COM
+18V test jack (TP1)	TP1	BD5-27 through 18K resistor to TP2
GND test jack (TP2)	TP2	TB3-33/34 (GND)
+12V test jack (TP3)	TP3	BD5-6 through 18K resistor to TP2
EOT lamp	−LED1	BD3-$\overline{D}$ through 510 ohms to E1 and
	+LED1	then to TB3-31/32 (+12V)
BAT IND lamp	−LED2	BD3-Z
	+LED2	TB3-31/32 (+12V)
Transistor Q7 (chassis mounted)	Emitter	BD5-$\overline{D}$
	Collector	SW1-B-NO, BD5-P
	Base	BD5-M

PRINTED CIRCUIT BOARD CONNECTOR (FRONT VIEW)

WIRING LIST 7. TERMINAL BLOCK, PCB, AND CABLE CONNECTIONS

LEGEND

BD = PRINTED CIRCUIT BOARD
TP = TEST POINT
COM = COMMON
SW = SWITCH
NO = NORMALLY OPEN
CTA = CABLE TEST ADAPTER

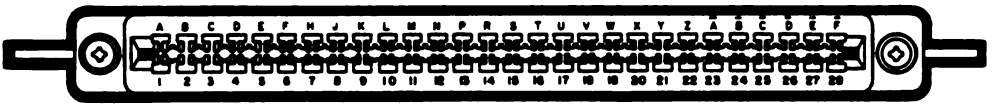
FROM	TO			
	PCB	J-3513A	J-3514A	CTA CABLE CONNECTIONS
Terminal Block 1				
1	BD2-B	J1A		
2	BD2-E	J1B		
3	BD2-27	J1C		
4	BD2-S	J1D		
5	BD1-21	J2A		
6	BD3-8	J2B		
7	BD1-23	J3A		
8	BD1-S	J3B		
9	BD3-4	J3C		
10	BD2-17	J3D		
11	BD4-6	J3E	J1B	A Cable, J12A
12	BD1-22	J3F		
13	BD3-D	J3H		
14	BD2-18	J3J		
15	BD2-R	J3K		
16	BD3-6	J3L		
17	BD4-B	J3M	J1K	A Cable, J12E
18	Bd4-5	J3N	J1J	A Cable, J12C
19	BD2-$\overline{A}$	J3P		
20	BD2-13	J3R		
21	BD1-$\overline{E}$	P1A	P1A	
22	BD1-J	P1B		A Cable, J12R & W
23	BD3-23	P1C		
24	BD1-N	P1D		A Cable, J12S & W
25	BD1-D	P1H		
26	BD1-K	P1J	P1H	A cable, J12L & B
27	BD1-E	P1K	J4C	A Cable, J12J & T
28	BD3-17	P1P		

WIRING LIST 7. TERMINAL BLOCK, PCB, AND CABLE CONNECTIONS (CONTINUED)

FROM	TO			
	PCB	J-3513A	J-3514A	CTA CABLE CONNECTIONS
29	BD4-10	P1R	J3N	B Cable, J22G
30	BD3-14	P1S		
31	BD1-4	P1T		A Cable, J12N & F
32	OPEN			
33	BD4-$\overline{D}$		J2C	
34	BD4-15		J2B	
Terminal Block 2				
1	BD1-7	J4A		
2	BD2-11	J4B		
3	BD2-26	J4C		
4	BD1-9	J4D		B Cable, J22X
5	BD3-10	J4E		
6	BD1-B	J4F		B Cable, J22F
7	BD1-Z	J4G	J1A	
8	BD3-11	J4H		
9	BD1-M	J4J		B Cable, J22W
10	BD2-3	J4K		
11	BD4-J	J4L	P1K	B Cable, J22E
12	BD2-2	J4M		
13	BD2-19	J4N		
14	BD3-3	J4P		
15	BD2-Y	J4R		
16	BD4-9	J4S	P1B	B Cable, J22A
17	BD3-18	J4T		
18	BD4-D	J4U	J3B	B Cable, J22B
19	BD4-8	J4V	P1J	B Cable, J22C
20	BD3-24	J4W		
21	BD2-5	J4X		
22	BD2-14	J4Y		
23	BD3-E	J4Z		
24	BD1-Y	J4a		
25	BD3-16	J4b		
26	BD4-H	J4c	J3M	B Cable, J22T
27	BD2-X	J5A		
28	BD1-17	J5B		
29	BD2-U	J5C		
30	BD2-W	J5D		
31	BD4-22		P1C	
32	BD4-21		P1D	
33	BD4-12		P1E	
34	BD4-13		P1F	

WIRING LIST 7. TERMINAL BLOCK, PCB, AND CABLE CONNECTIONS (CONTINUED)

FROM	TO			
	PCB	J-3513A	J-3514A	CTA CABLE CONNECTIONS
Terminal Block 3				
1	BD1-26	J6A	J3A	
2	BD2-12	J6B		
3	BD2-Z	J6D		
4	BD1-$\overline{D}$	J6F	J3F	
5	BD2-23	J6J		
6	BD2-D	J6K		
7	BD2-20	J6L		
8	BD2-10	J6M		
9	BD2-16	J6N		
10	BD2-C	J6P		
11	BD2-F	J6R		
12	BD1-27	J7A	J4A	
13	BD1-L	J7B		B Cable, J22R
14	BD3-9	J7C		
15	BD1-10	J7D		B Cable, J22S
16	BD1-8	J7H		
17	BD4-E	J7J	J1H	B Cable, J22L
18	BD4-4	J7K	J1E	B Cable, J22J
19	BD4-C	J7R	J1F	A Cable, J12G
20	BD2-24	J7S		
21	BD1-2	J7T		B Cable, J22N
22	BD2-25	J7U		
23	BD4-19		J1C	
24	BD4-$\overline{C}$		J1D	
25	BD4-23		J3H	
26	BD4-11		J3L	
27	BD4-25		J3K	
28	BD4-$\overline{B}$		J3P	
29	BD4-14		J3D	
30	BD4-26		J4B	
31, 32 +12V	BD1-A&1, BD2-A&1, TP3, +LED2, SW1-A-NO, E1, E2, BD3-A&1, BD4-A&1, BD5-A&1			
33, 34 GND	BD1-$\overline{F}$&28, BD2-$\overline{F}$&28, BD3-$\overline{F}$&28, SW4-C-COM, SW2-B-COM, TP2, BD4-$\overline{F}$&28, BD5-$\overline{F}$&28, BAT CON PIN 2			
33, 34 GND		SHELL J1, J2, J4	SHELL J2, J4	SHELL J12, J22



PRINTED CIRCUIT BOARD CONNECTOR (FRONT VIEW)

The following Wiring Lists (lists 8 through 12) show connections for each printed circuit board.

WIRING LIST 8. PRINTED CIRCUIT BOARD NO. I CONNECTIONS

LEGEND

BD = PRINTED CIRCUIT BOARD	E = EMITTER
TB = TERMINAL BLOCK	B = BASE
NO = NORMALLY OPEN	C = COLLECTOR
NC = NORMALLY CLOSED	SW = SWITCH
CP = CONTROL PANEL	LED = LIGHT EMITTING DIODE
COM = COMMON	

FROM PIN	TO
A	TB3-31/32 (+12V)
B	TB2-6, J4F (3513), J22F
C	BD4-2
D	TB1-25, P1H (3513)
E	TB1-27, P1K (3513), J4C (3514) J12J & T
F	BD4-F
H	BD3-B
J	TB1-22, P1B (3513), J12R & W
K	TB1-26, P1J (3513)P1H (3514), J12L & B
L	TB3-13, J7B (3513), J22R
M	TB2-9, J4J (3513), J22W
N	TB1-24, P1D (3513), J12S & W
P	
R	
S	TB1-8, J3B (3513)

WIRING LIST 9. PRINTED CIRCUIT BOARD NO.II CONNECTIONS (CONTINUED)

FROM PIN	TO
Y	TB2-15, J4R (3513)
Z	TB3-3, J6D (3513)
$\overline{A}$	TB1-19, J3P (3513)
$\overline{B}$	BD3-13
$\overline{C}$	BD1-19, BD3-19 & 21, BD4-7, BD5-5
$\overline{D}$	BD1-18, BD3-20, BD4-L, BD5-B
$\overline{E}$	SW4-E, COM
$\overline{F}$	TB3-33/34 (GND)
1	TB3-31/32 (+12V)
2	TB2-12, J4M (3513)
3	TB2-10, J4K (3513)
4	BD3-Y
5	TB2-21, J4X (3513)
6	BD1-$\overline{C}$
7	BD1-$\overline{B}$
8	BD1-14
9	BD3-X
10	TB3-8, J6M (3513)
11	TB2-2, J4B (3513)
12	TB3-2, J6B (3513)
13	TB1-20, J3R (3513)
14	TB2-22, J4Y (3513)
15	BD3-$\overline{C}$
16	TB3-9, J6N (3513)
17	TB1-10, J3D (3513)
18	TB1-14, J3J (3513)
19	TB2-13, J4N (3513)
20	TB3-7, J6L (3513)
21	BD3-26
22	BD3-F
23	TB3-5, J6J (3513)
24	TB3-20, J7S (3513)
25	TB3-22, J7U (3513)
26	TB2-3, J4C (3513)
27	TB1-3, J1C (3513)
28	TB3-33/34 (GND)

PRINTED CIRCUIT BOARD CONNECTOR (FRONT VIEW)

WIRING LIST 10. PRINTED CIRCUIT BOARD NO. III CONNECTIONS

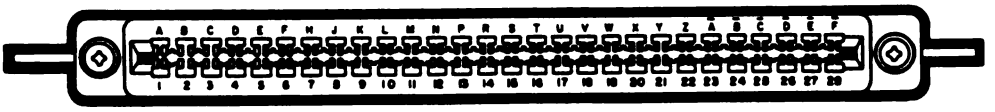
LEGEND

BD = PRINTED CIRCUIT BOARD
TB = TERMINAL BLOCK
NO = NORMALLY OPEN
NC = NORMALLY CLOSED
CP = CONTROL PANEL
COM = COMMON
E = EMITTER
B = BASE
C = COLLECTOR
SW = SWITCH
LED = LIGHT EMITTING DIODE

FROM PIN	TO
A	TB3-31/32 (+12V)
B	BD1-H
C	BD1-15
D	TB1-13, J3H (3513)
E	TB2-23, J4Z (3513)
F	BD2-22
H	BD2-H
J	BD2-P
K	BD4-K
L	
M	
N	
P	

WIRING LIST 10. PRINTED CIRCUIT BOARD NO.III CONNECTIONS (CONTINUED)

FROM PIN	TO
R	
S	
T	
U	
V	
W	
X	BD2-9
Y	BD2-4
Z	−LED2 (CP)
$\overline{A}$	BD3-7
$\overline{B}$	BD2-V
$\overline{C}$	BD2-15
$\overline{D}$	−LED1 (CP)
$\overline{E}$	BD5-10
$\overline{F}$	TB3-33/34 (GND)
1	TB3-31/32 (+10V)
2	BD4-20
3	TB2-14, J4P (3513)
4	TB1-9, J3C (3513)
5	
6	TB1-16, J3L (3513)
7	BD3-$\overline{A}$
8	TB1-6, J2B (3513)
9	TB3-14, J7C (3513)
10	TB2-5, J4E (3513)
11	TB2-8, J4H (3513)
12	BD5-C
13	BD2-$\overline{B}$
14	TB1-30, P1S (3513)
15	SW4-F-3
16	TB2-25, J4b (3513)
17	TB1-28, P1P (3513)
18	TB2-17, J4T (3513)
19	BD1-19, BD2-$\overline{C}$, BD4-7, BD5-5
20	BD1-18, BD2-$\overline{D}$, BD4-L, BD5-B
21	BD1-19, BD2-$\overline{C}$, BD4-7, BD5-5
22	BD4-18, BD5-$\overline{C}$, SW4-G-COM (+18V)
23	TB1-23, P1C (3513)
24	TB2-20, J4W (3513)
25	BD5-N
26	BD2-21
27	BD2-K
28	TB3-33/34 (GND)



PRINTED CIRCUIT BOARD CONNECTOR (FRONT VIEW)

WIRING LIST 11. PRINTED CIRCUIT BOARD NO. IV CONNECTIONS

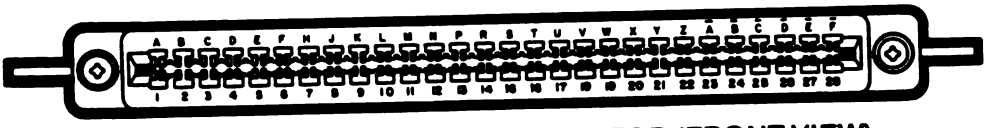
LEGEND

BD = PRINTED CIRCUIT BOARD
TB = TERMINAL BLOCK
NO = NORMALLY OPEN
NC = NORMALLY CLOSED
CP = CONTROL PANEL
COM = COMMON
E = EMITTER
B = BASE
C = COLLECTOR
SW = SWITCH
LED = LIGHT EMITTING DIODE

FROM PIN	TO
A	TB3-31/32 (+12V)
B	TB1-17, J3M (3513), J1K (3514), J12E
C	TB3-19, J7R (3513), J1F (3514), J12G
D	TB2-18, J4U (3513), J3B (3514), J22B
E	TB3-17, J7J (3513), J1H (3514), J22L
F	BD1-F
H	TB2-26, J4c (3513), J3M (3514), J22T
J	TB2-11, J4L (3513), P1K (3514), J22E
K	BD3-K
L	BD1-18, BD2-$\overline{D}$, BD3-20, BD5-B
M	BD1-11, SW4-A-COM
N	BD1-6
P	
R	
S	
T	

WIRING LIST 11. PRINTED CIRCUIT BOARD NO.IV CONNECTIONS (CONTINUED)

FROM PIN	TO
U	BD5-20
V	
W	
X	
Y	
Z	
$\overline{A}$	
$\overline{B}$	TB3-28, J3P (3514)
$\overline{C}$	TB3-24, J1D (3514)
$\overline{D}$	TB1-33, J2C (3514)
$\overline{E}$	
$\overline{F}$	TB3-33/34 (GND)
1	TB3-31/32 (+12V)
2	BD1-C
3	BD1-3
4	TB3-18, J7K (3513), J1E (3514), J22J
5	TB1-18, J3N (3513), J1J (3514), J12C
6	TB1-11, J3E (3513), J1B (3514), J12A
7	BD1-19, BD2-$\overline{C}$, BD3-19&21, BD5-5
8	TB2-19, J4V (3513), P1J (3514), J22C
9	TB2-16, J4S (3513), P1B (3514), J22A
10	TB1-29, P1R (3513), J3N (3514), J22G
11	TB3-26, J3L (3514)
12	TB2-33, P1E (3514)
13	TB2-34, P1F (3514)
14	TB3-29, J3D (3514)
15	TB1-34, J2B (3514)
16	SW4-D-COM, SW4-F-4
17	BD5-11
18	BD3-22, BD5-$\overline{C}$, SW4-G-COM (+18V)
19	TB3-23, J1C (3514)
20	BD3-2
21	TB2-32, P1D (3514)
22	TB2-31, P1C (3514)
23	TB3-25, J3H (3514)
24	
25	TB3-27, J3K (3514)
26	TB3-30, J4B (3514)
27	BD5-4
28	TB3-33/34 (GND)



PRINTED CIRCUIT BOARD CONNECTOR (FRONT VIEW)

WIRING LIST 12. PRINTED CIRCUIT BOARD NO. V CONNECTIONS

LEGEND

BD = PRINTED CIRCUIT BOARD
TB = TERMINAL BLOCK
NO = NORMALLY OPEN
NC = NORMALLY CLOSED
CP = CONTROL PANEL
COM = COMMON
E = EMITTER
B = BASE
C = COLLECTOR
SW = SWITCH
LED = LIGHT EMITTING DIODE

FROM PIN	TO
A	TB3-31/32, P1N 14 (+12V)
B	BD1-18, BD2-$\overline{D}$, BD3-20, BD4-L
C	BD3-12
D	
E	
F	SW4-F-COM
H	
J	
K	
L	B-Q7(CP)
M	BD3-25
N	C-Q7 (CP), SW1-B-NO (+12V)
P	
R	
S	
T	

WIRING LIST 12. PRINTED CIRCUIT BOARD NO.V CONNECTIONS (CONTINUED)

FROM PIN	TO
U	
V	
W	
X	
Y	
Z	
$\overline{A}$	
$\overline{B}$	SW4-G-5
$\overline{C}$	BD3-22, BD4-18, SW4-G-COM (+18V)
$\overline{D}$	E-Q7 (CP)
$\overline{E}$	SW4-G-6
$\overline{F}$	TB3-33/34 (GND)
1	TB3-31/32 (+12V)
2	SW3-NC
3	SW3-NO
4	BD4-27
5	BD1-19, BD2-$\overline{C}$, BD3-19 & 21, BD4-7
6	TP3 (CP,+12V TEST POINT)
7	SW2-A-NO
8	
9	
10	BD3-$\overline{E}$
11	BD4-17
12	
13	
14	P1N A (+12V)
15	
16	
17	
18	
19	SW2-B-NO
20	BD4-U
21	
22	
23	
24	
25	
26	
27	TP1 (CP, +18V TEST POINT)
28	TB3-33/34 (GND)

WIRING LIST 13. CABLE TEST ADAPTER

LEGEND

SW = SWITCH | Cable A is J12 | Cable B is J22

FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH	FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH
J1-A	TB1 ("A" Cable) B	J4-H	TB1 ("B" Cable) N
J1-B	TB1 ("A" Cable) A-Anode	J4-G	TB1 ("B" Cable) G
J1-F	TB1 ("A" Cable) L-Anode	J4-K	TB1 ("B" Cable) C
J1-K	TB1 ("A" Cable) J	J4-L	TB1 ("B" Cable) A
J1-L	TB1 ("A" Cable) N	J4-M	J4-U
J1-M	TB1 ("A" Cable) E-Anode	J4-U	TB1 ("B" Cable) T
J1-N	TB1 ("A" Cable) G-Cathode	J4-P	J4-V
J1-V	TB1 ("A" Cable) R	J4-P	SW-3
J1-X	TB1 ("A" Cable) C-Cathode	SW-3	TB1 ("B" Cable) J
J1-Y	TB1 ("A" Cable) T	J4-S	TB1 ("B" Cable) E
J1-Z	TB1 ("A" Cable) F	J4-T	TB1 ("B" Cable) B
J1-X	J1-P	J4-b	TB1 ("B" Cable) J
J1-N	J1-G	J5-A	TB1 ("B" Cable) A
J1-Y	J1-S	J5-B	TB1 ("B" Cable) G
J1-F	J1-T	J5-C	TB1 ("B" Cable) E
J2-F	TB1 ("B" Cable) N	J5-D	TB1 ("B" Cable) C
J2-G	TB1 ("B" Cable) C	J5-E	TB1 ("B" Cable) J
J2-K	TB1 ("B" Cable) J	J5-F	TB1 ("B" Cable) T
J2-N	TB1 ("B" Cable) T	J6-A	TB1 ("B" Cable) T
J2-R	TB1 ("B" Cable) F	J6-B	TB1 ("B" Cable) A
J2-W	TB1 ("B" Cable) R	J6-C	TB1 ("B" Cable) C
J2-X	TB1 ("B" Cable) L	J6-D	TB1 ("B" Cable) E
J2-Y	TB1 ("B" Cable) G	J6-E	J6-R
J2-Z	TB1 ("B" Cable) B	J6-F	TB1 ("B" Cable) J
J2-b	TB1 ("B" Cable) A	J6-J	TB1 ("B" Cable) G
J2-c	TB1 ("B" Cable) E	J6-L	TB1 ("B" Cable) L
J3-A	J3-J	J6-P	TB1 ("B" Cable) N
J3-C	TB1 ("A" Cable) E-Anode	J7-A	TB1 ("A" Cable) N
J3-F	TB1 ("A" Cable) T	J7-B	J7-H
J3-G	TB1 ("A" Cable) L-Anode	J7-D	TB1 ("A" Cable) J
J3-L	TB1 ("A" Cable) G-Anode	J7-E	TB1 ("A" Cable) L-Anode
J3-M	TB1 ("A" Cable) N	J7-G	TB1 ("A" Cable) T
J3-N	TB1 ("A" Cable) J	J7-L	TB1 ("A" Cable) G-Anode
J3-S	TB1 ("A" Cable) A-Anode	J7-M	TB1 ("A" Cable) E-Anode
J3-T	TB1 ("A" Cable) B	J7-N	TB1 ("A" Cable) A-Anode
J3-D	TB1 ("A" Cable) C-Anode	J7-S	TB1 ("A" Cable) C-Anode
J4-A	J4-J	J7-T	TB1 ("A" Cable) B
J4-J	TB1 ("B" Cable) L	J8-A	TB1 ("B" Cable) C
J4-B	J4-H	J8-B	TB1 ("B" Cable) A

WIRING LIST 13. CABLE TEST ADAPTER (CONTINUED)

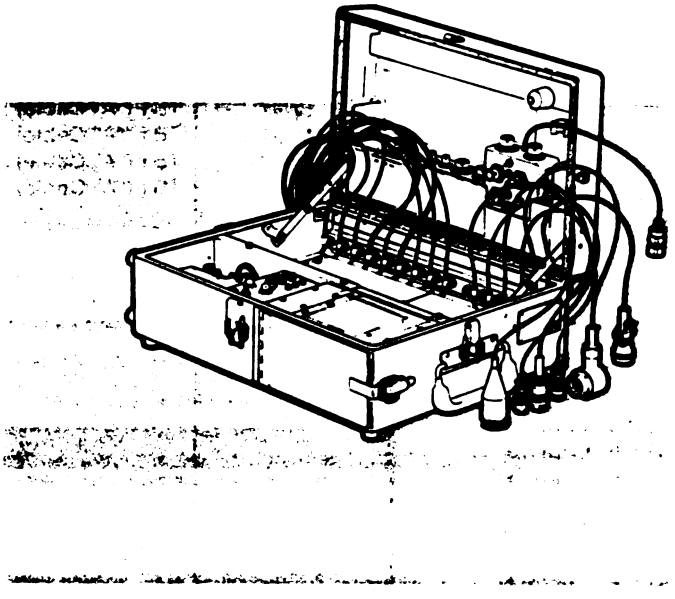
FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH	FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH
J8-E	TB1 ("B" Cable) E	J12-J	TB1 ("A" Cable) J
J9-A	TB1 ("B" Cable) E	J12-L	TB1 ("A" Cable) L-Anode
J9-A	SW-5	J12-N	TB1 ("A" Cable) N
J9-C	TB1 ("B" Cable) G	J12-R	TB1 ("A" Cable) R
J9-C	SW-5	J12-S	TB1 ("A" Cable) S
J9-D	TB1 ("B" Cable) J	J12-T	TB1 ("A" Cable) T
J9-G	TB1 ("B" Cable) L	J12-W	TB1 ("A" Cable) N
J9-J	TB1 ("B" Cable) C	J12-X	TB1 ("A" Cable) X
J9-J	SW-4	J13-£	TB1 ("A" Cable) W
J9-S	TB1 ("B" Cable) T	J13-B	TB1 ("A" Cable) C-Anode
J9-T	TB1 ("B" Cable) A	J13-F	TB1 ("A" Cable) N
J9-T	SW-4	J13-G	TB1 ("A" Cable) A-Anode
J10-A	TB1 ("B" Cable) A	J13-H	TB1 ("A" Cable) B
J10-B	TB1 ("B" Cable) W	J13-K	J13-E
J10-C	TB1 ("B" Cable) F	J13-K	TB1 ("A" Cable) J
J10-D	TB1 ("B" Cable) T	J13-P	TB1 ("A" Cable) E-Anode
J10-E	TB1 ("B" Cable) R	J13-R	J13-M
J10-H	TB1 ("B" Cable) L	J13-R	TB1 ("A" Cable) T
SW-1	TB1 ("B" Cable) L	J13-S	TB1 ("A" Cable) L-Anode
SW-1	TB1 ("B" Cable) B	J13-X	TB1 ("A" Cable) R
J10-J	TB1 ("B" Cable) N	J13-Y	J13-T
J10-K	TB1 ("B" Cable) E	J13-Y	TB1 ("A" Cable) G-Anode
J10-L	TB1 ("B" Cable) G	J13-Z	TB1 ("A" Cable) S
J10-M	TB1 ("B" Cable) J	J13-b	TB1 ("A" Cable) F
J10-N	TB1 ("B" Cable) X	J14-A	TB1 ("A" Cable) C-Anode
J10-P	TB1 ("B" Cable) C	J14-B	TB1 ("A" Cable) R
J10-R	TB1 ("B" Cable) S	J14-C	TB1 ("A" Cable) W
J11-A	TB1 ("B" Cable) W	J14-D	TB1 ("A" Cable) S
J11-B	TB1 ("B" Cable) C	J14-E	TB1 ("A" Cable) E-Anode
J11-C	TB1 ("B" Cable) F	J14-G	TB1 ("A" Cable) A-Anode
J11-F	TB1 ("B" Cable) N	J14-H	TB1 ("A" Cable) B
J11-H	TB1 ("B" Cable) B	J14-L	TB1 ("A" Cable) N
J11-K	TB1 ("B" Cable) J	J14-M	TB1 ("A" Cable) T
J11-N	TB1 ("B" Cable) A	J14-N	TB1 ("A" Cable) L-Anode
J11-P	TB1 ("B" Cable) E	J14-R	TB1 ("A" Cable) J
J11-R	TB1 ("B" Cable) T	J14-S	TB1 ("A" Cable) F
J11-S	TB1 ("B" Cable) L	J14-T	TB1 ("A" Cable) G-Anode
J11-T	TB1 ("B" Cable) R	J14-V	TB1 ("A" Cable) X
J11-U	TB1 ("B" Cable) G	J15-A	TB1 ("A" Cable) E-Cathode
J11-V	TB1 ("B" Cable) S	J15-C	TB1 ("A" Cable) G-Cathode
J12-A	TB1 ("A" Cable) A-Anode	J15-D	TB1 ("A" Cable) A-Cathode
J12-B	TB1 ("A" Cable) B	J15-E	TB1 ("A" Cable) J
J12-C	TB1 ("A" Cable) C-Anode	J15-F	TB1 ("A" Cable) L-Anode
J12-E	TB1 ("A" Cable) E-Anode	J15-J	TB1 ("A" Cable) C-Cathode
J12-F	TB1 ("A" Cable) F	J15-K	TB1 ("A" Cable) T
J12-G	TB1 ("A" Cable) G-Anode	J16-A	TB1 ("A" Cable) A-Anode

WIRING LIST 13. CABLE TEST ADAPTER (CONTINUED)

FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH	FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD, CONNECTOR PIN, OR SWITCH
J16-B	TB1 ("A" Cable) C-Anode	J23-C	TB1 ("B" Cable) L
J16-C	TB1 ("A" Cable) E-Anode	SW-2	TB1 ("B" Cable) L
J17-A	TB1 ("A" Cable) A-Anode	J23-D	TB1 ("B" Cable) E
J17-B	TB1 ("A" Cable) G-Anode	J23-F	J23-K
J17-C	TB1 ("A" Cable) E-Anode	J23-J	TB1 ("B" Cable) J
J17-D	TB1 ("A" Cable) L-Anode	J23-L	TB1 ("B" Cable) B
J18-A	TB1 ("A" Cable) B	J23-N	J23-E
J18-B	TB1 ("A" Cable) L-Anode	J23-N	TB1 ("B" Cable) C
J18-J	TB1 ("A" Cable) A-Anode	J23-P	TB1 ("B" Cable) G
J18-K	TB1 ("A" Cable) G-Anode	J23-R	TB1 ("B" Cable) T
J18-M	TB1 ("A" Cable) N	J24-A	TB1 ("A" Cable) T
J18-N	TB1 ("A" Cable) T	J24-C	TB1 ("A" Cable) N
J18-R	J18-V	J24-D	TB1 ("A" Cable) L-Anode
J18-X	TB1 ("A" Cable) C-Anode	J24-E	TB1 ("A" Cable) G-Anode
J18-Y	TB1 ("A" Cable) J	J24-F	TB1 ("A" Cable) E-Anode
J18-Z	TB1 ("A" Cable) E-Anode	J24-G	TB1 ("A" Cable) J
J19-A	TB1 ("A" Cable) A-Cathode	J24-J	TB1 ("A" Cable) B
J19-B	TB1 ("A" Cable) C-Anode	J25-A	TB1 ("B" Cable) E
J19-C	TB1 ("A" Cable) T	J25-D	TB1 ("B" Cable) C
J19-E	TB1 ("A" Cable) G-Anode	J25-J	TB1 ("B" Cable) A
J19-K	TB1 ("A" Cable) J	J25-K	TB1 ("B" Cable) N
J19-N	TB1 ("A" Cable) E-Anode	J25-L	TB1 ("B" Cable) L
J20-A	TB1 ("A" Cable) L-Cathode	J25-M	TB1 ("B" Cable) J
J20-B	TB1 ("A" Cable) N	J25-P	TB1 ("B" Cable) T
J20-C	J20-R	J25-R	TB1 ("B" Cable) G
J20-D	J20-N	J26-A	TB1 ("A" Cable) A-Anode
J20-E	J20-P	J26-B	TB1 ("A" Cable) G-Anode
J20-J	J20-K	J26-C	TB1 ("A" Cable) E-Anode
J20-L	TB1 ("A" Cable) B	J26-D	TB1 ("A" Cable) C-Anode
J22-A	TB1 ("B" Cable) A	J26-E	TB1 ("A" Cable) J
J22-B	TB1 ("B" Cable) B	J26-F	TB1 ("A" Cable) T
J22-C	TB1 ("B" Cable) C		
J22-E	TB1 ("B" Cable) E		
J22-F	TB1 ("B" Cable) F		
J22-G	TB1 ("B" Cable) G		
J22-J	TB1 ("B" Cable) J		
J22-L	TB1 ("B" Cable) L		
J22-N	TB1 ("B" Cable) N		
J22-R	TB1 ("B" Cable) R		
J22-S	TB1 ("B" Cable) S		
J22-T	TB1 ("B" Cable) T		
J22-W	TB1 ("B" Cable) W		
J22-X	TB1 ("B" Cable) X		
J23-A	TB1 ("B" Cable) A		
SW-2	TB1 ("B" Cable) A		
J23-B	TB1 ("B" Cable) N		

WIRING LIST 14. CABLE J21 ON CABLE TEST ADAPTER

FROM CONNECTOR PIN	TO PRINTED CIRCUIT BOARD
A	B Cable A
B	B Cable G
C	B Cable E
D	B Cable C
E	B Cable J
F	B Cable T



INDEX

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM. TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 11-5810-345-34		Test Set, Vinson Interconnecting Box, AN/USM-481

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

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

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° LFT antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpirito 999-1776

SIGN HERE:
SSG. I.M. DeSpirito

DA FORM 2028-2

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "PRONTO," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5810-345-34		Test Set, Vinson Interconnecting Box, AN/USM-481

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA, FORM 2028-2 JUL 70

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

CUT ALONG DOTTED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

CUT ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5810-345-34		Test Set, Vinson Interconnecting Box, AN/USM-481

BE EXACT. . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA, FORM 1 JUL 70 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

CUT ALONG DOTTED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

CUT ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5810-345-34		Test Set, Vinson Interconnecting Box, AN/USM-481

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA, FORM 1, JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

CUT ALONG DOTTED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD 314

CUT ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

By Order of the Secretary of the Army:

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

Official:

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

Distribution:

To be distributed in accordance with DA Form 12-43, Direct and General Support Maintenance requirements for AN/USM-481.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1987 0 - 190-114 QL 3

WIRING DIAGRAM OF PRINTED CIRCUIT
BOARD IN CABLE TEST ADAPTER

SHEET 1 OF 1

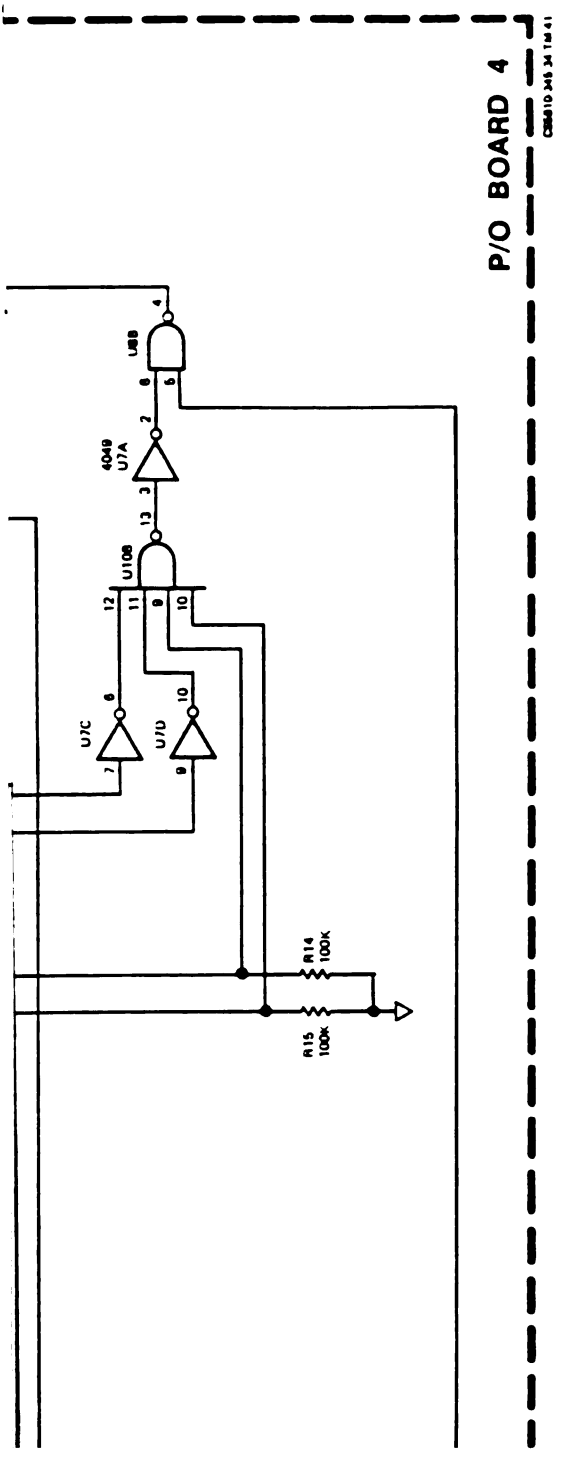
F NO. 1. SCHEMATIC FOR TEST SET, VINSON INTERCONNECTING BOX, AN/USM-481

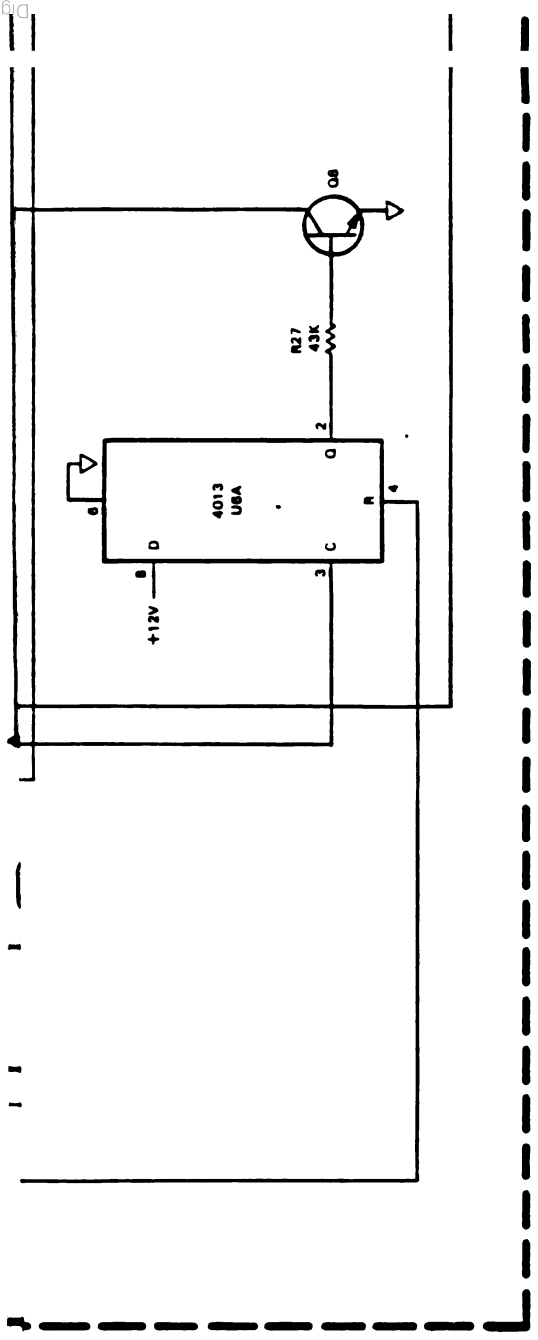
SHEET 1 OF 4

SHEET 2 OF 4

SHEET 3 OF 4

1. SCHEMATIC FOR TEST SET, VINSON INTERCONNECTING BOX, AN/USM-481





SHEET 4 OF 4

. 1. · SCHEMATIC FOR TEST SET, VINSON INTERCONNECTING BOX, AN/USM-481