TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE

RADAR PROCESSOR INTERFACE TEST SET TS-2973A/APS-94D

(NSN 6625-01-085-4343)

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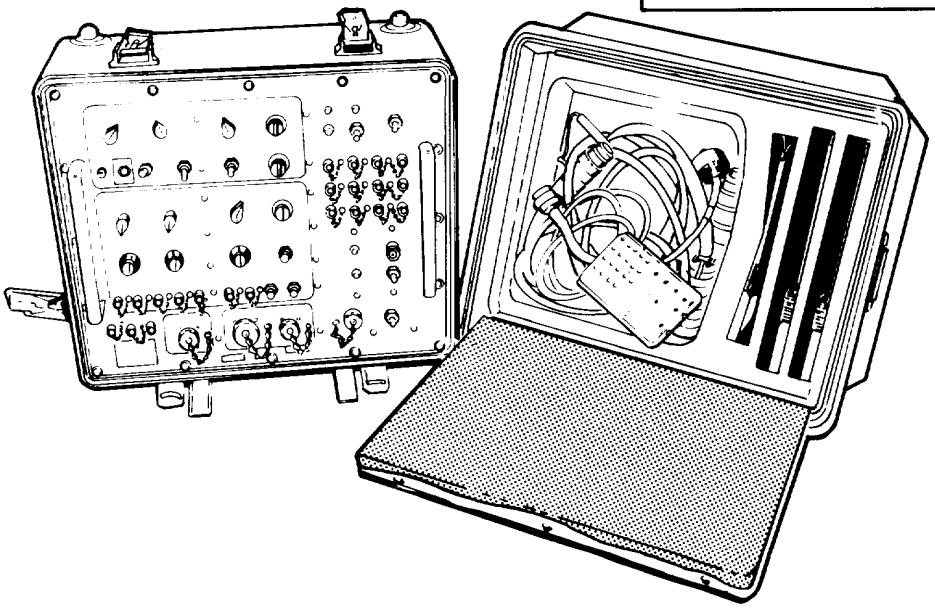

HEADQUARTERS, DEPARTMENT OF THE ARMY WASHINGTON,D.C.

JUNE 1982

WARNING

Edge of metal strap on shipping box is very sharp. Be careful when handling it.

WARNING

Adequate ventilation should be provided when using TRICHLOROTRIFLUOROE-THANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, call a physician immediately.

WARNING

Avoid shock by grounding the test set. Ensure that the ac line power plug is connected to a circuit that has a protective earth (safety) ground. Improperly ground equipment can result in hazardous voltages between equipments. Ensure that all devices connected to the test set are connected to earth ground.

WARNING

Be careful when ac voltage is applied to the equipment. Serious injury or death can result from contact with this voltage. AC voltage is present in the test set and the test set fixtures during testing.

WARNING

All operations must conform to TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment (8 August 1979).

DON'T TAKE CHANCES!

FOR ARTIFICIAL RESPIRATION REFER TO FM21-11.

Technical Manual

No. 11-6625-1831-13

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 11 June 1982

OPERATOR'S, ORGANIZATIONAL, AND DIRECT SUPPORT MAINTENANCE MANUAL RADAR PROCESSOR INTERFACE TEST SET TS-2973A/APS-94D

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 Chances to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. A reply will be furnished to you.

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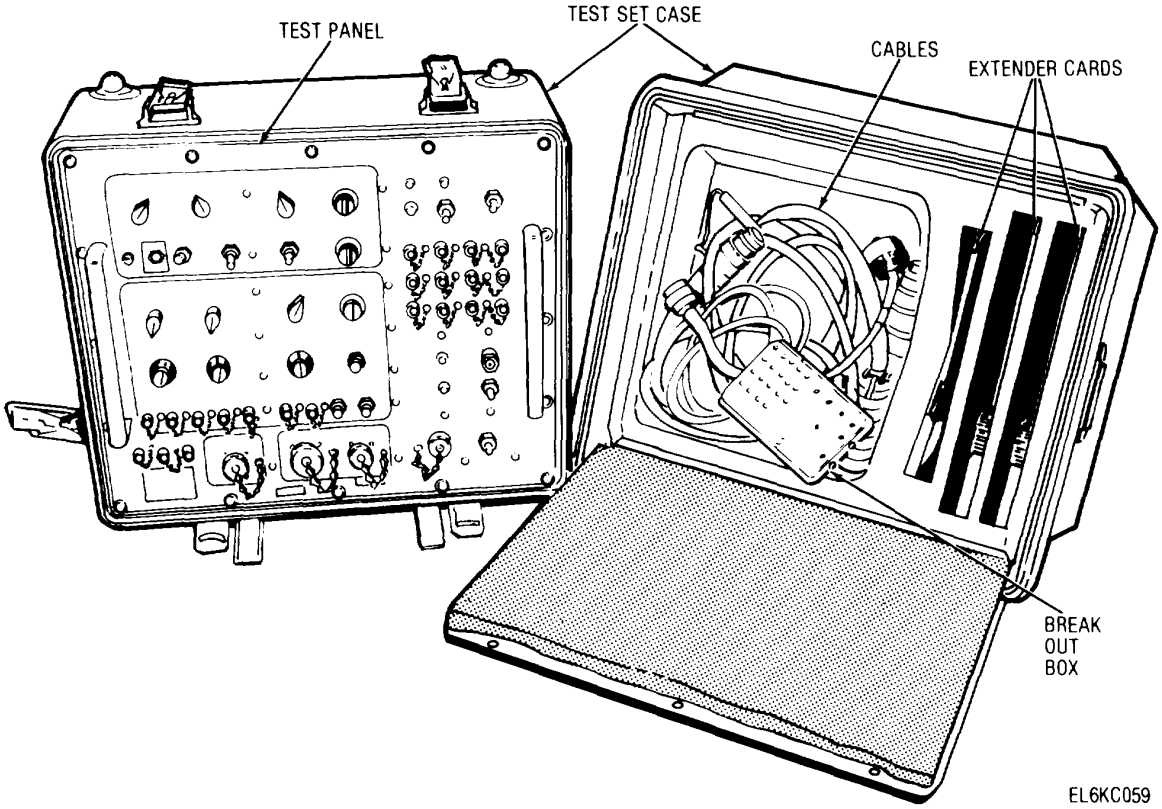

RADAR PROCESSOR INTERFACE TEST SET TS-2973A/APS-94D

CHAPTER 1
INTRODUCTION

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CHAPTER OVERVIEW

This chapter introduces the manual, gives information about Army procedures, and describes the equipment. The Chapter Index above will help you identify and locate information.

Section I. GENERAL INFORMATION

1-1. SCOPE

Type of Manual: Operator's, Organizational, and Direct Support Maintenance

Model Number and Equipment Name: Radar Processor Interface Test Set TS-2973A/APS-94D.

Purpose of Equipment: Tests Radar Signal Processor CM-374/APS-94D, a component of Radar Surveillance Set AN/APS-94E, and Radar Signal Processor CM-481/APS-94F, a component of Radar Surveillance Set AN/APS-94F.

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (Army).

b. Report of Packaging and Handling Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO 4610.19C/DLAR 4500.15.

1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

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

1-4. PREPARATION FOR STORAGE OR SHIPMENT

Refer to Chapter 3, paragraph 3-6 of this manual, for information needed to prepare the test set for storage or shipment.

1-5. NOMENCLATURE CROSS REFERENCE LIST

This listing includes nomenclature cross references used in this manual.

OFFICIAL NOMENCLATURE	COMMON NAME
Radar Signal Processor CM-374/APS-94D	Signal Processor
Radar Signal Processor CM-481/APS-94F	Signal Processor
Radar Processor Interface Test Set TS-2973A/APS-94D	Test Set
Electrical Test Panel	Test Panel
Special Purpose Electrical Cable Assemble CX-12307/U (6 ft) (cable W1)	Cable W1
Special Purpose Electrical Cable Assembly CX-12306/U (6 ft) (cable W2)	Cable W2
Electrical Power Cable Assembly CX-12308/U (6 ft) (cable W3)	Cable W3
Radio Frequency Cable Assembly CG-3618/U (3 ft) (cable W4)	Cable W4
Radio Frequency Cable Assembly CG-3618/U (3 ft) (cable W5)	Cable W5
Radio Frequency Cable Assembly CG-3618/U (3 ft) (cable W6)	Cable W6
Radio Frequency Cable Assembly CG-3618/U (6 ft) (cable W7)	Cable W7
Radio Frequency Cable Assembly CG3618/U (6 ft) (cable W8)	Cable W8
Radio Frequency Cable Assembly CG-3618/U (6 ft)(cable W9)	Cable W9
Cable Assembly W10	Cable W10
Cable Assembly W11	Cable W11
Cable Assembly W12	Cable W12
Cable Assembly W13	Cable W13
Cable Assembly W14	Cable W14
Interface Test Control-Monitor C-10857/APS-94F	Break Out Box
Test Set Case	Test Set Case
Extender Card MX-8630/APS-94D	Extender Card
Extender Card MX-8740/APS-94D	Extender Card

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your test set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiencv Report). Mail it to' Commander, U S Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703. We'll send you a reply.

1-7. HAND RECEIPT

Hand receipts for End Item/Components of End Item (COEI), Basic Issue Items (Bll), and Additional Authorized List (AAL) are published in a Hand Receipt Manual. The Hand Receipt Manual numerical designation is the same as the related Technical Manual with the letters HR added to the number. These manuals are published to aid in property accountability and are available through: Commander, U.S. Army Adjutant General Publication Center, ATTN: AGDL-OD, 1655 Woodson Road, St. Louis, MO 63114.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

CHARACTERISTICS

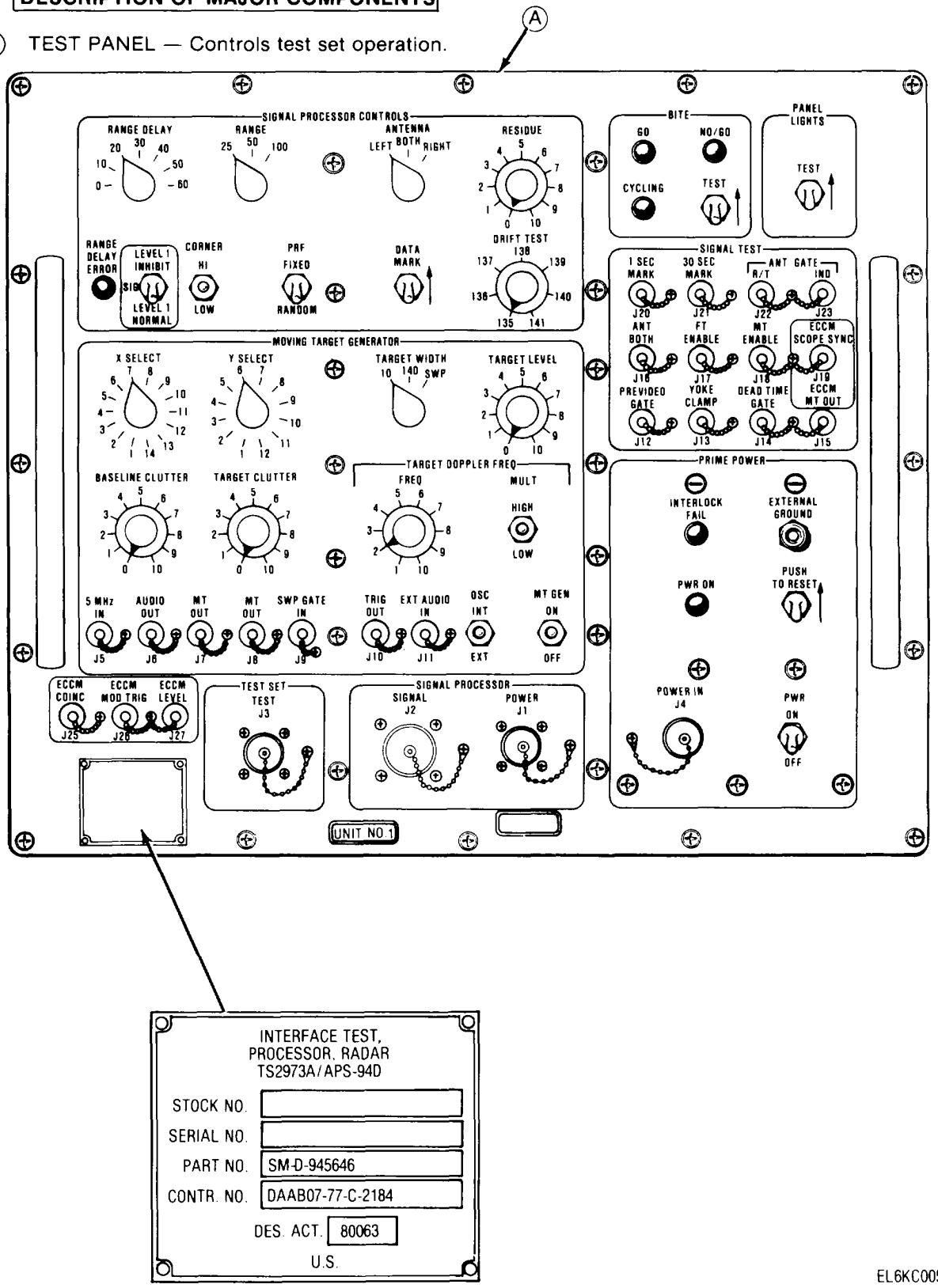
- Tests Radar Signal Processor CM-374/APS-94D and CM-481/APS-94F
- Provides electric power to signal processor during test
- Provides simulated input signals to signal processor during test
- Has test jacks to check signal processor outputs

CAPABILITIES AND FEATURES

- Isolates faults in signal processor to module level
- Self-contained and portable
- Has cover to protect test panel
- Has handles for easy carrying

1-9. DESCRIPTION OF MAJOR COMPONENTS

Ⓐ TEST PANEL — Controls test set operation.



INTERFACE TEST,
PROCESSOR, RADAR
TS2973A/APS-94D

STOCK NO.	
SERIAL NO.	
PART NO.	SM-D-945646
CONTR. NO.	DAAB07-77-C-2184
DES. ACT.	80063

U.S.

EL6KC005

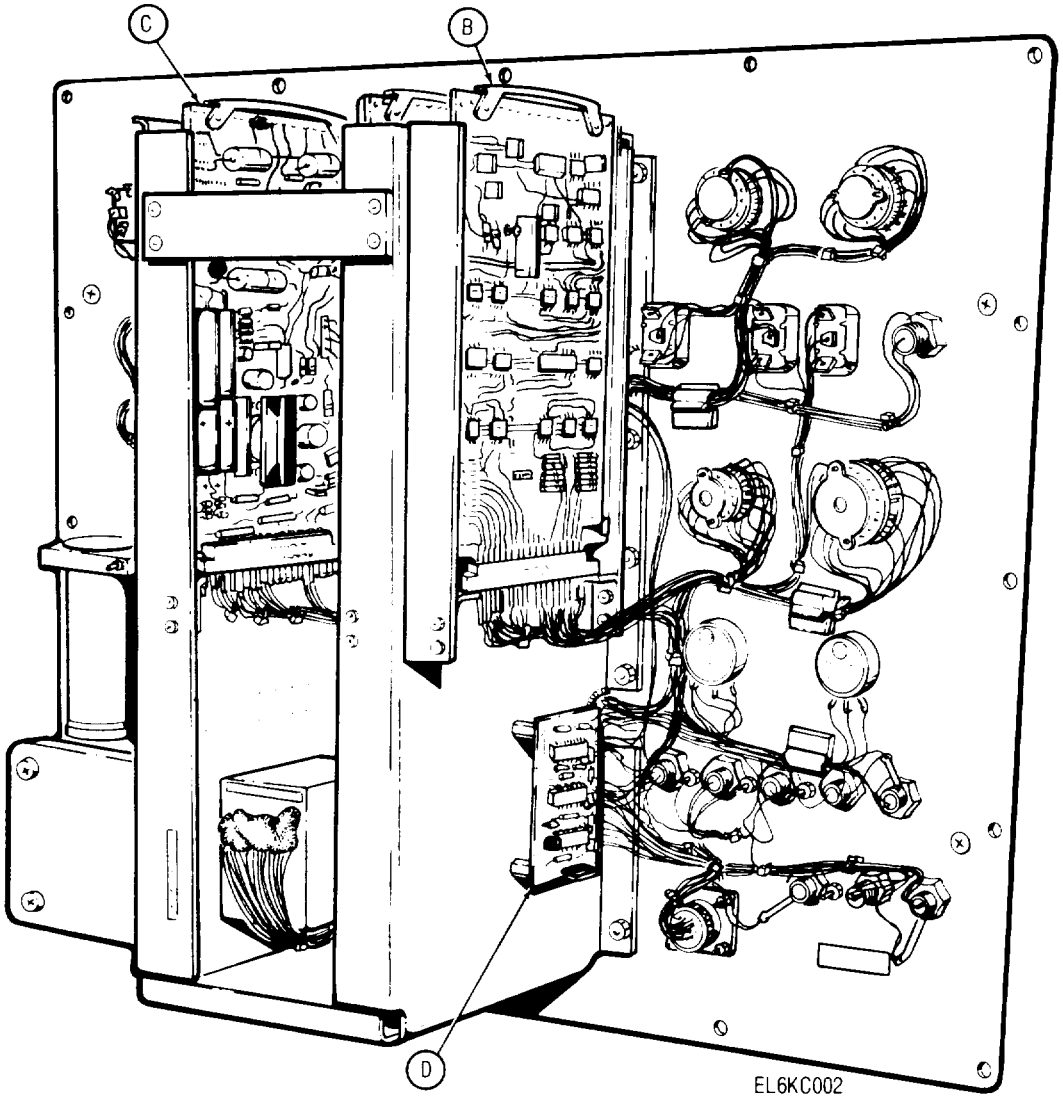
EL6KC005

1-9. DESCRIPTION OF MAJOR COMPONENTS (Cont)

(B) CLOCK AND COUNTER MODULE 1A1 - Printed Circuit Board

(C) POWER SUPPLY REGULATOR MODULE 1A3 -- Printed Circuit Board

(D) ECCM CIRCUIT CARD ASSEMBLY 1A6 - Printed Circuit Board



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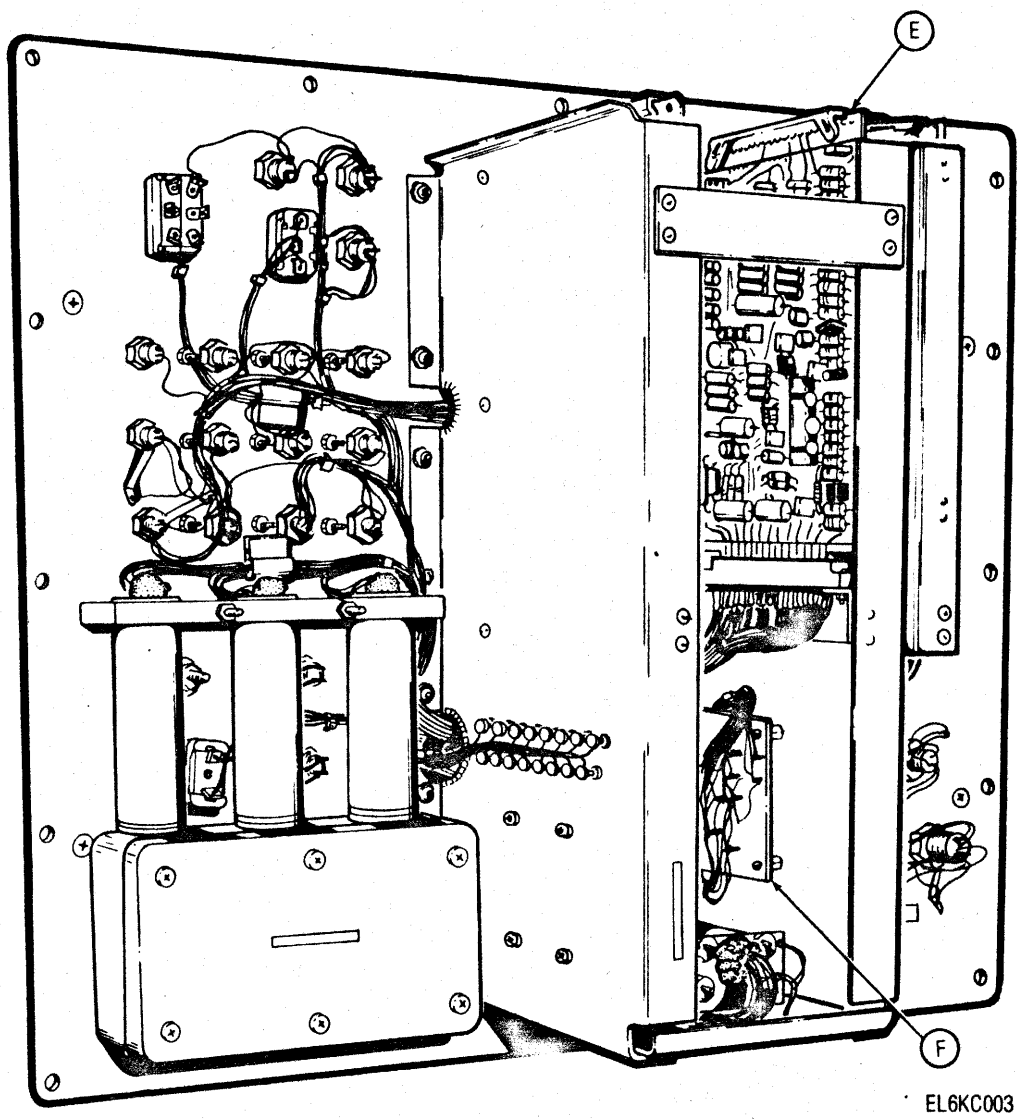
1-9. DESCRIPTION OF MAJOR COMPONENTS (Cont)

Ⓔ OSCILLATOR AND SWITCH MODULE 1A2 — Printed Circuit Board

Ⓕ ELECTRONIC COMPONENT ASSEMBLY 1TB1 — Printed Circuit Board



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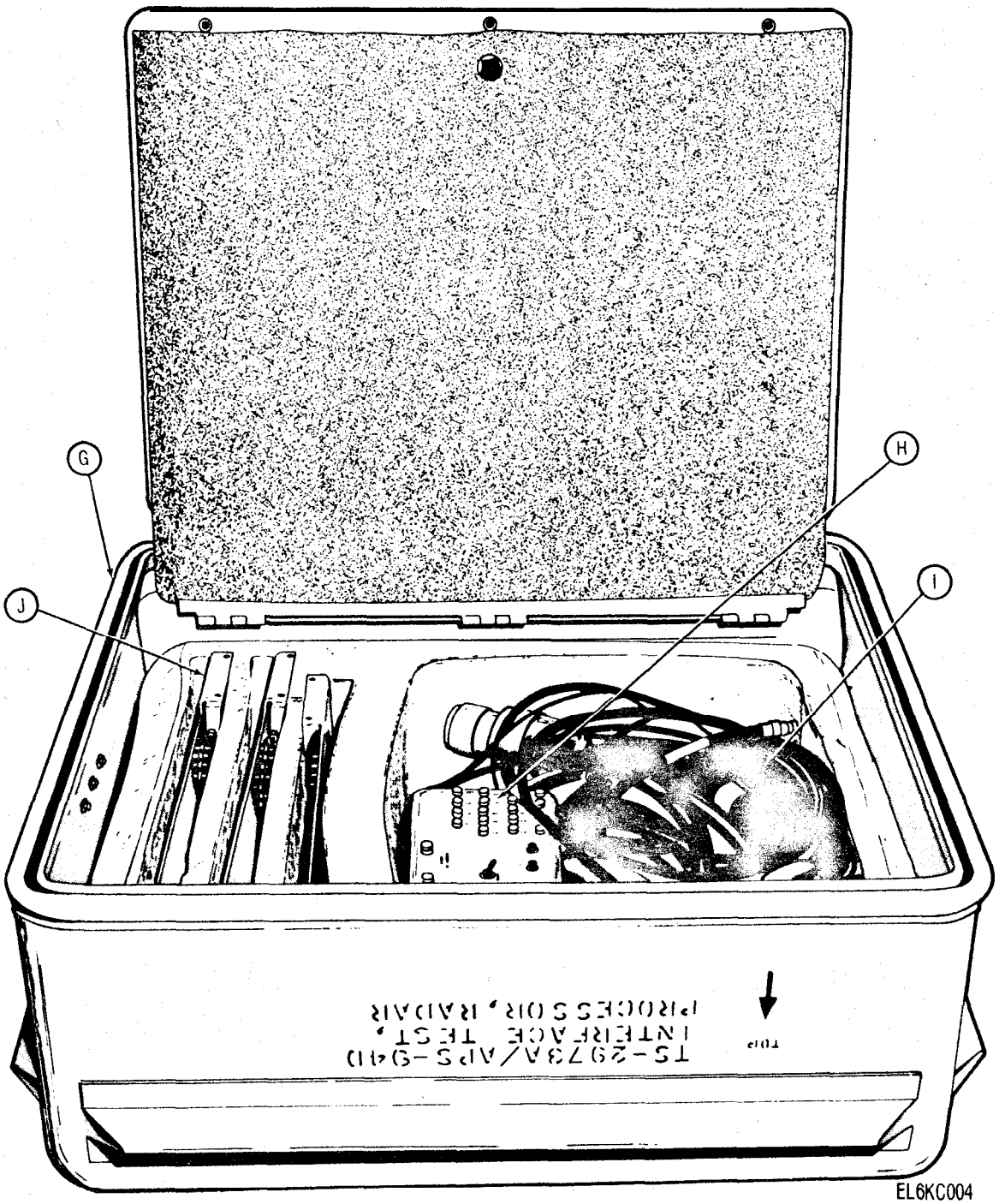
1-9. DESCRIPTION OF MAJOR COMPONENTS (Cont)

Ⓖ TEST SET COVER — Protects test set from damage. Provides storage for break out box, cables, extender cards, and card extractor.

Ⓗ BREAK OUT BOX — Used to test signal processor CM-481/APS-94F.

Ⓘ Cables W1 through W14 — Used to connect test set to signal processor.

Ⓙ EXTENDER CARDS — Used to troubleshoot printed circuit boards (pcb's). The two longest extenders are used to extend signal processor pcb's. The shortest extender card is used to extend pcb's of the test set.



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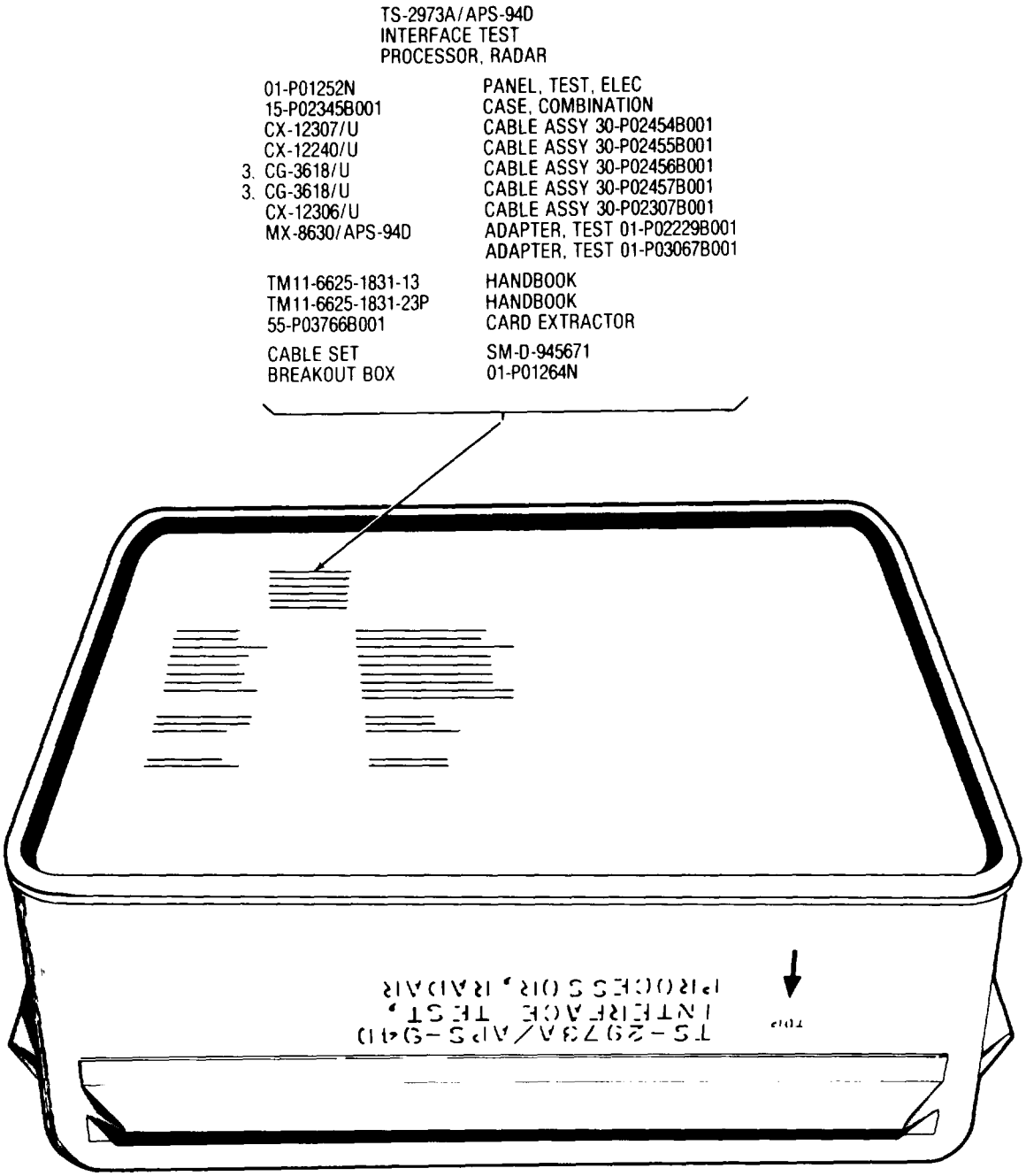
1-9. DESCRIPTION OF MAJOR COMPONENTS (Cont)

COMPONENT LIST - Stenciled on test set cover lid.



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1-10. DIFFERENCES BETWEEN MODELS

TEST SET TS-2973A/APS-94D - Tests Radar Signal Processors CM-374/APS-94D and CM-481/APS-94F.

TEST SET TS-2973/APS-94D -- Tests Radar Signal Processor CM-374/APS-94D only.

1-11. EQUIPMENT DATA

Height -- 19.25 in. (48.9 cm)

Width -- 24.25 in. (61.6 cm)

Depth -- 21.13 in. (53.7 cm)

Weight -- 60 lb (27 kg)

Power Required -- three-phase 108-118 V line-to-neutral (four-wire) 400 + 20 Hz, 0.5 A per phase

CHAPTER 2
INSTALLATION AND OPERATING INSTRUCTIONS

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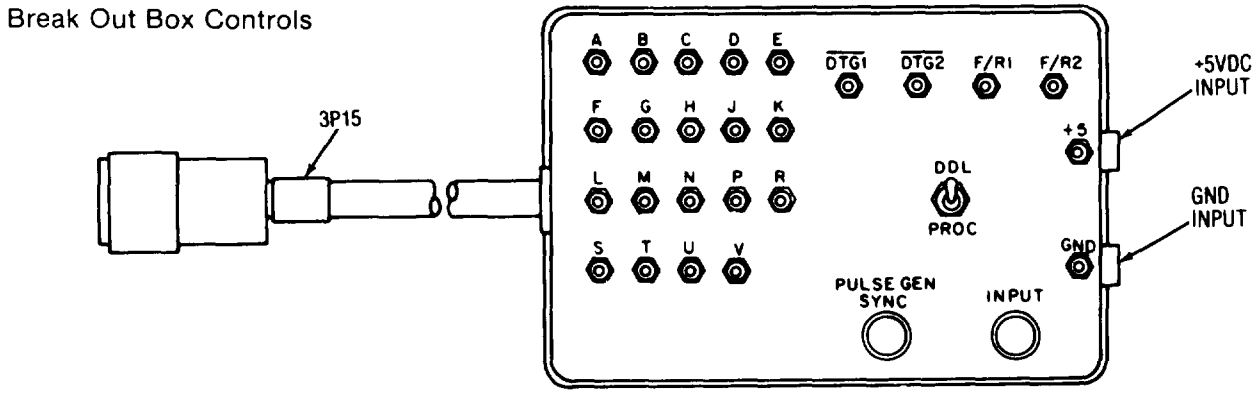
CHAPTER OVERVIEW

This chapter tells you how to get the test set ready for use and how to use it and take care of it under various operating conditions.

Section I. SERVICE UPON RECEIPT

2-1 DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS



A-V test jacks -- Allow checking of signals from signal processor DDL interface

DTG1, DTG2 jacks - Not used

F/R1, F/R2 jacks - Not used

DDL-PROC switch - Controls output of signal processor DDL interface during test

+5, GND test jacks - Allow checking of 5 volt power supply input

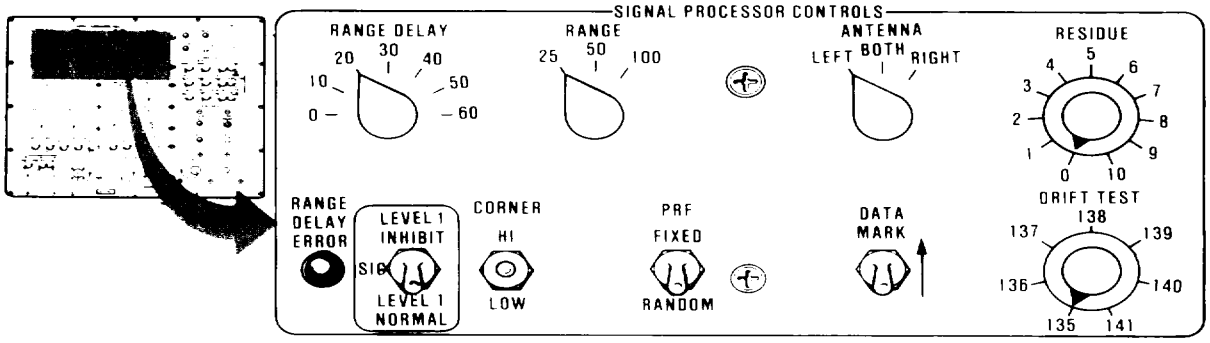
PULSE GEN SYNC jack - Provides sync signal for pulse generator

INPUT jack - Input from pulse generator

+5 VDC INPUT, GND INPUT jacks - Input from 5 volt power supply

2-1. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS (Cont)

Test Panel Controls and Indicators



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RANGE DELAY switch - Selects amount of range delay in signal processor from 0 to 60 km in 10 km steps

RANGE switch - Selects 25, 50, or 100 km range in the signal processor

ANTENNA switch - Selects either left, right, or both antennas

RESIDUE potentiometer - Changes level of fixed target residue relative to moving target video In signal processor

RANGE DELAY ERROR Indicator - Indicates combined settings of RANGE DELAY and RANGE controls exceed 100 km limit of signal processor, or setting of RANGE DELAY control exceeds setting of RANGE control

LEVEL 1 switch - Enables and disables range gated filters in signal processor

CORNER switch - Changes corner frequency In the signal processor range gated filter to a higher or lower frequency

PRF switch - Selects either fixed or pseudo-random prf operation of signal processor

DATA MARK switch - Causes signal processor to generate data reference marks

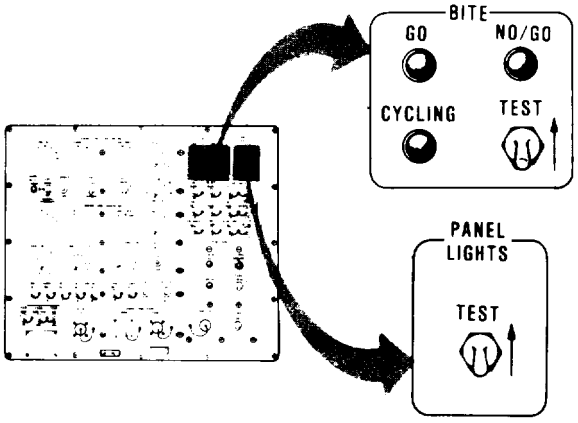
DRIFT TEST potentiometer - Controls distance of first range mark relative to system trigger pulse (135 to 141 μs).

GO indicator - Indicates BITE circuits in signal processors are okay

CYCLING indicator - Indicates BITE test is being performed

NO/GO indicator - Indicates BITE circuits in signal processor are not okay

TEST switch - STARTS bite test



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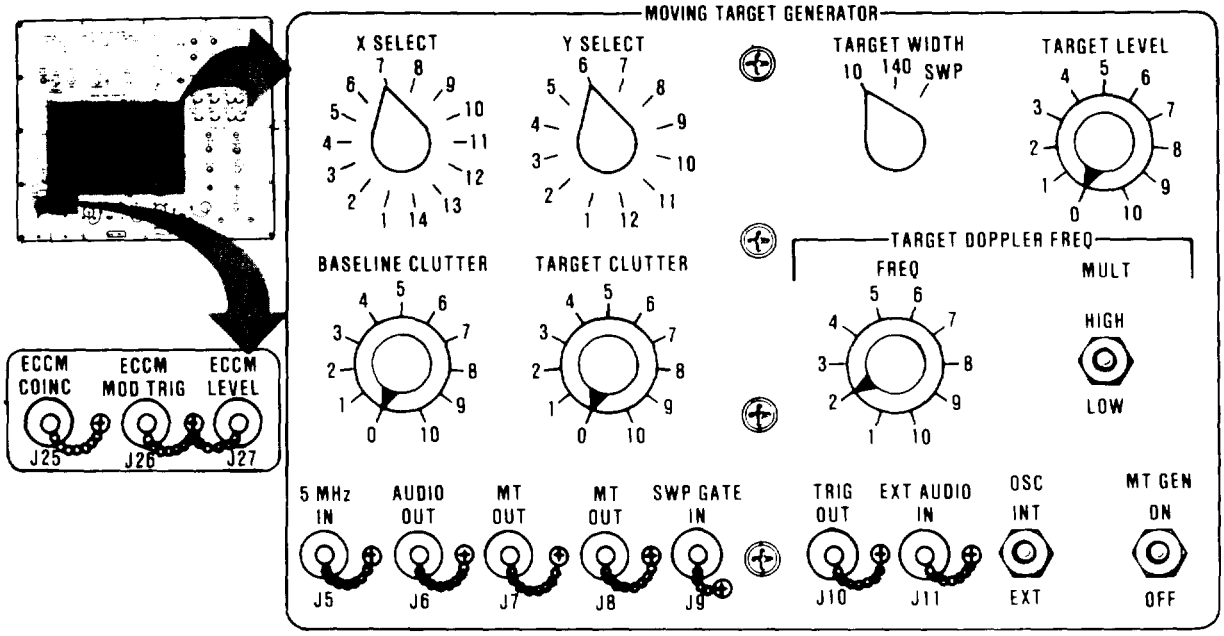
TEST switch - Lights all indicator lamps on test panel

2-1. DESCRIPTION AND USE OF OPERATORS CONTROLS AND INDICATORS (Cont)



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X SELECT switch - Breaks the Y segments into 14 parts of the position selected on the Y SELECT switch (used only with TARGET WIDTH switch in position 10)

Y SELECT switch - Selects target video from any of 12 selected Y sweep segments (used only with TARGET WIDTH switch in positions 10 or 140)

TARGET WIDTH switch - Selects width of simulated target video pulse. (With RANGE switch in positions 25 or 50, pulse width can be set to 10 range segments, 140 range segments, or full sweep gate width; with RANGE switch in position 100, the above pulse widths are doubled)

TARGET LEVEL potentiometer - Controls height of simulated moving target video

BASELINE CLUTTER potentiometer - Controls height of baseline clutter video signal

TARGET CLUTTER potentiometer - Controls reference level of baseline clutter video signal

TARGET DOPPLER FREQ potentiometer- Controls frequency of simulated moving target video

MULT switch - Selects frequency range of MT video (HIGH position provides 100 to 1000 Hz range, LOW position provides 10 to 100 Hz range)

5 MHz IN J5 jack - Clock signal input

AUDIO OUT J6 jack - Simulated moving target' signal output

MT OUT J7, J8 jacks - Simulated moving target video output

SWP GATE IN J9 jack - Sweep gate signal input

TRIG OUT J10 jack - Trigger pulse output for oscilloscope

EXT AUDIO IN J11 jack-- Input from external audio generator for simulating moving target video doppler

OSC switch -- Selects source of moving target video doppler (INT position selects built-in test set oscillator, EXT position selects external audio generator through jack J11)

MT GEN switch - Allows generation of simulated receiver video signal

ECCM COINC J25 jack - Used for CM-481/APS-94F signal processor testing

ECCM MOD TRIG J26 jack - Input from signal processor

ECCM LEVEL J27 jack - Output to signal processor

2-1. DESCRIPTION AND USE OF OPERATORS CONTROLS AND INDICATORS (Cont)

INTERLOCK FAIL indicator — Indicates thermal or over-voltage failure in signal processor

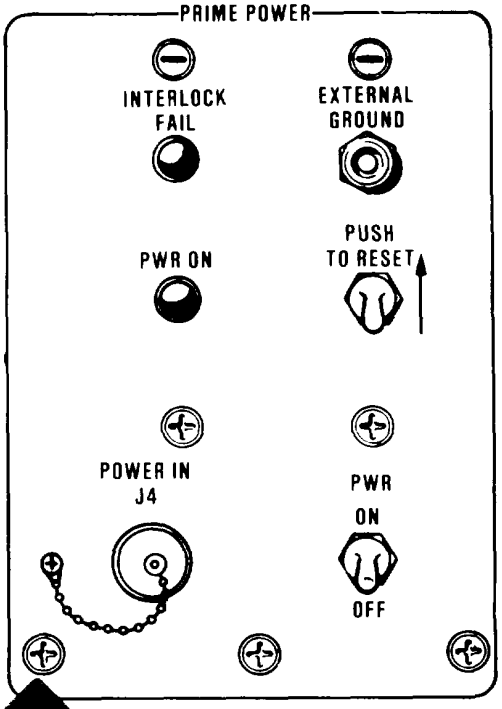
EXTERNAL GROUND jack — Frame ground connector

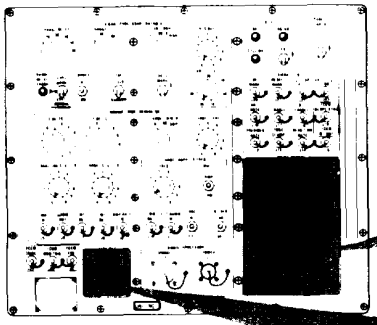
PWR ON indicator — indicates test set has power

PUSH TO RESET switch — Reconnects ac power to signal processor after thermal or overvoltage failure (if signal processor interlock is closed)

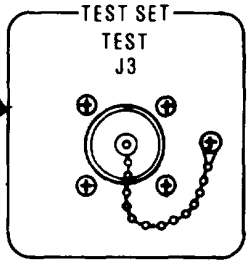
POWER IN J4 jack — Input for 115-volt, 3-phase, 400-Hz prime power

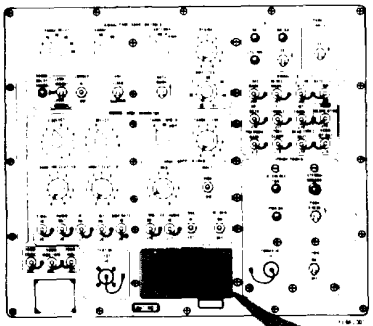
PWR switch — Applies power to test set and signal processor





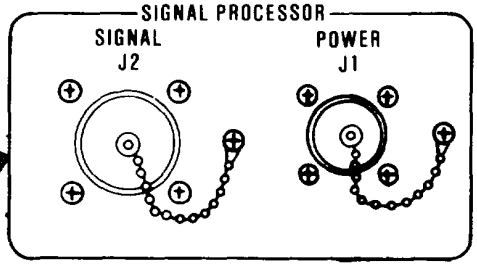
Test J3 jack — Connects to special test fixture for testing test set





SIGNAL J2 jack — Carries signals to and from signal processor

POWER J1 jack — Carries power to signal processor



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2-1. DESCRIPTION AND USE OF OPERATORS CONTROLS AND INDICATORS (Cont)

1 SEC MARK J20 jack - 1 second mark signal from signal processor

30 SEC MARK J21 jack - 30 second mark signal from signal processor

ANT GATE, R/T J22 jack - Receiver/transmitter unit antenna gate signal from signal processor

ANT GATE IND J23 jack - Indicator unit antenna gate signal from signal processor

ANT BOTH J16 jack - Signal from signal processor indicating both antennas are selected

FT ENABLE J17 jack - Fixed target enable signal from signal processor

MT ENABLE J18 jack - Moving target enable signal from signal processor

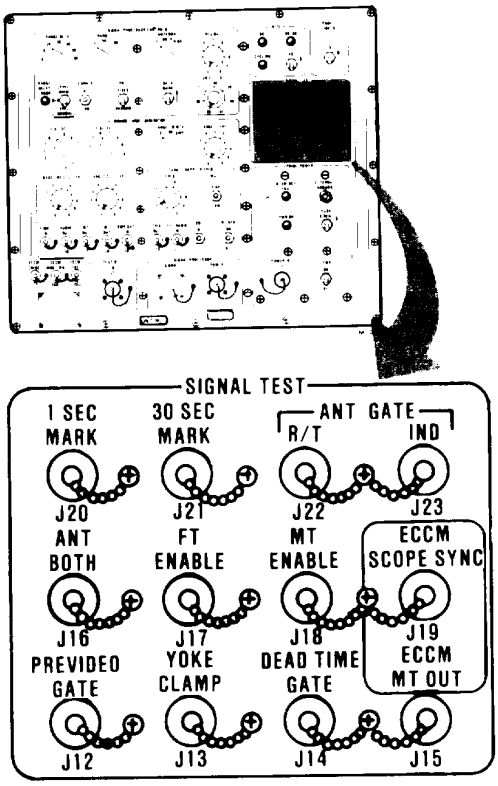
ECCM SCOPE SYNC J19 jack - Trigger signal for oscilloscope

PREVIDEO GATE J12 jack - Prevideo gate signal from signal processor

YOKE CLAMP J13 jack - Yoke clamp signal from signal processor

DEAD TIME GATE J14 jack -- Dead time gate signal
from signal processor

ECCM MT OUT J15 jack - Simulated moving target signal output to signal processor



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2-2. SERVICE UPON RECEIPT

Use this procedure to check out new equipment when it is received.

a. To unpack the test set, follow the unpacking instructions in paragraph 2-4.

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

c. Check the equipment against the packing slip to see if the equipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

d. Check to see whether the equipment has been modified. Check DA PAM 310-4 for any MWO's that should be installed.

e. If possible, make sure that test set operates by using it to test a signal processor that is known to be good (refer to applicable technical manual, Appendix A, for signal processor test procedures).

Section II. OPERATION

2-3. ASSEMBLY AND PREPARATION FOR USE

The component test set is packed for shipment or long-term storage in a plywood shipping box. The box is nailed together and wrapped with metal straps.

2-4. UNPACKING INSTRUCTIONS

This task covers:

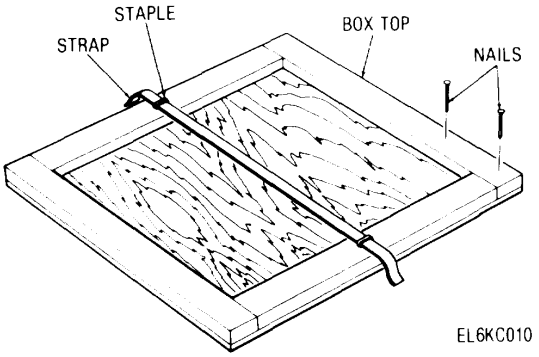
Unpacking and removing test set from shipping box

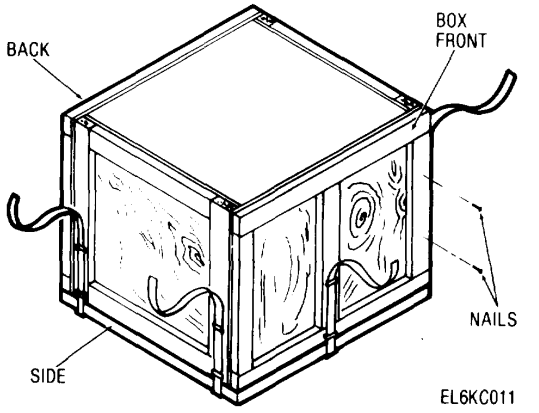
LOCATION/ ITEM	ACTION	REMARKS
1. BOX TOP		
a. Staples	Remove.	NOTE Do not damage the shipping box. It can be used again.

WARNING

Edge of metal strap is very sharp. Be careful when handling it.

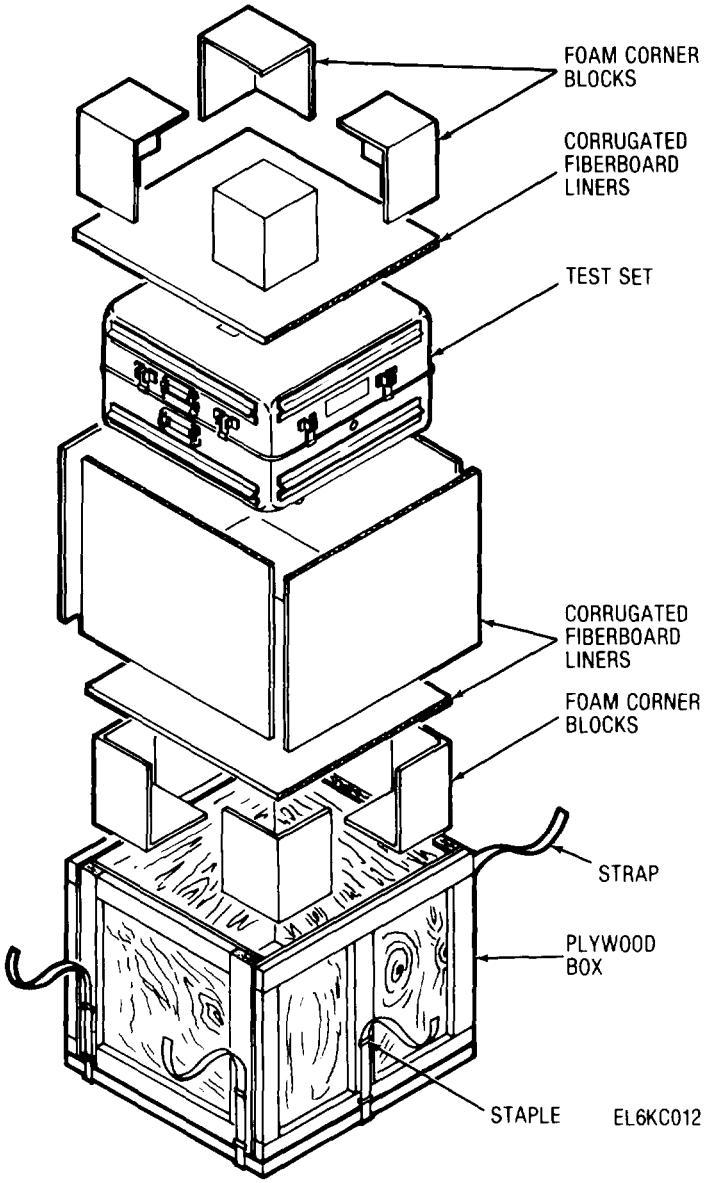
b. Metal straps	Cut.	
c. Nails	Remove.	
d. Box top	Lift from box.	





2-4. UNPACKING INSTRUCTIONS (Cont)

LOCATION/ ITEM	ACTION	REMARKS
2. BOX Front and back	Remove all nails holding front and back to sides.	
3. BOX a. Front, back, and sides.	Spread away from each other.	To provide access to packing materials



b. Packing materials	Remove.	Foam corner blocks, corrugated fiberboard liners.
c. Test set	Lift out of box.	Get another person's help, if needed
d. All parts and packing materials (except straps)	Save.	Shipping box can be used again.

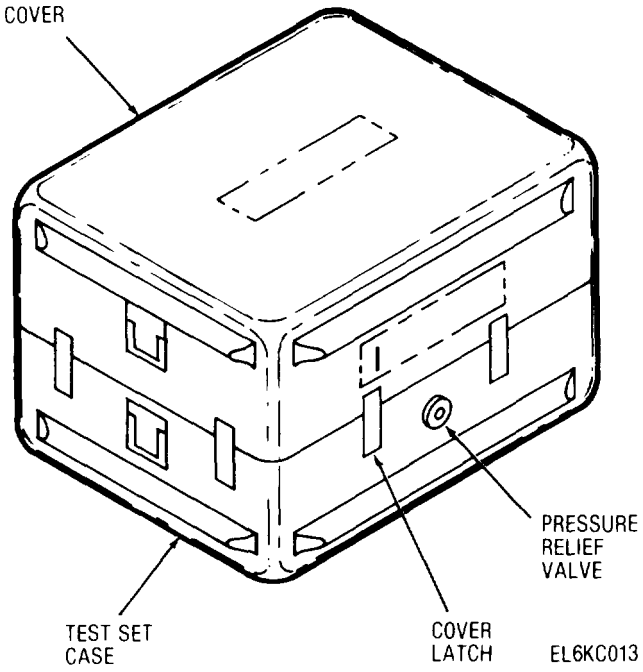
2-5. INSTALLATION AND PREPARATION FOR USE

This task covers:

a. Installation

b. Connection to power

LOCATION/ ITEM	ACTION	REMARKS
INSTALLATION		
1. TEST SET CASE		
a. Pressure Relief Valve	Press.	Makes air pressure equal inside case



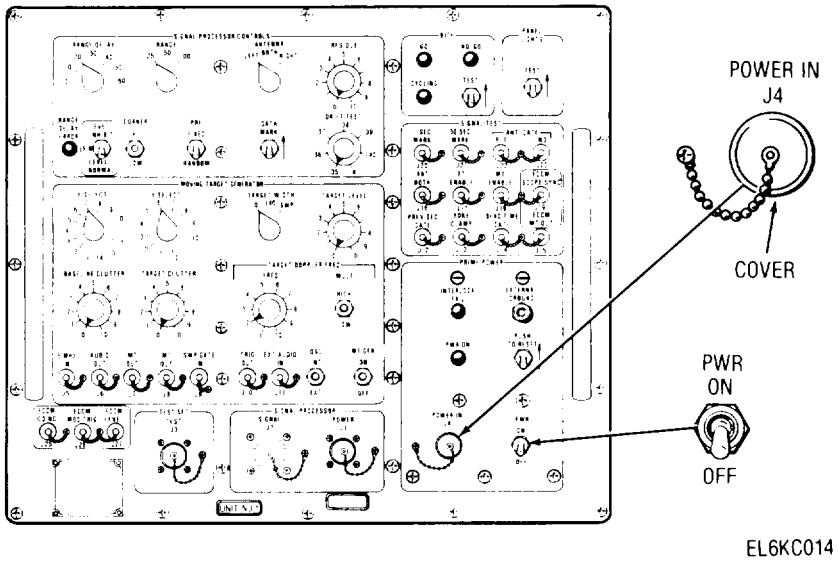
b. Eight cover latches	Pull down. Release from cover.	
c. Cover	Remove.	
2. COVER		
a. Hinged lid	Push three fasteners in. Pull lid open.	
b. Storage compartment	Remove Cable W3.	Cables are marked with ID numbers.

2.5 INSTALLATION AND PREPARATION FOR USE (Cont)

LOCATION/ ITEM	ACTION	REMARKS
CONNECTION TO POWER		

3. TEST PANEL

a.	POWER IN J4 jack	Unscrew cover.	
b.	PWR switch	Set to OFF.	



4. CABLE W3

a.	Plug P2	Connect to POWER IN J4 jack.	
b.	Plug P1	Connect to power source.	Test set needs 115-volt line-to-neutral 3-phase, 400-Hz power

5. TEST PANEL

a.	PWR switch	Set to ON.	
b.	PANEL LIGHTS TEST switch	Momentarily set to TEST (up). Check that all panel lights illuminate.	Test panel lamp test.
c.	PWR switch	Set to OFF until test set is ready for use.	

2-6. OPERATING PROCEDURE

To test a signal processor with the test set:

FIRST - Prepare test set for use in accordance with paragraph 2-5.

THEN - If you are testing a CM-374/APS-94D, refer to TM 11-5895-967-34 for operating instructions.

OR - If you are testing a CM-481/APS-94F, refer to TM 11-5895-1078-30 for operating instructions

2-7. PREPARATION FOR MOVEMENT

Before moving test set:

1. Be sure test panel PWR switch is set to OFF.
2. Disconnect all cables. Replace protective covers on test panel cable connectors
3. Put all cables in test set cover storage compartment. Close and latch hinged lid
4. Install cover on test set Lock eight cover latches.

2-8. OPERATION IN UNUSUAL ENVIRONMENT

You can use the test set in any weather However, always replace the cover on the set as soon as possible after using It That helps keep dirt, dust, and moisture out of the test set.

When using the test set under the following conditions, change the PMCS schedule as indicated.

Extreme Heat or Cold - When using the test set in these weather conditions, increase the weekly organizational maintenance schedule to daily Increase the monthly schedule to weekly.

Salt Air and Sea Spray-- Do not expose the test set to these conditions for long periods of time Replace the cover on the test set Immediately after each use.

Sand Storms and Dust Storms - When the test set is operated under these conditions, clean the test set more often Replace the cover Immediately after each use.

2-9. EMERGENCY PROCEDURES

Under emergency conditions, you can use the test set even though some parts are damaged or unserviceable.

The test set will operate even if test panel control knobs are cracked or broken (but be sure they are tight enough on the control shaft to show their true setting) Cables with cracks or breaks in their covering materials may be used as long as the conductors are not visibly damaged. Indicator lamp lenses may be cracked or broken as long as the lamp operates (refer to paragraph 2-11 and use the PANEL LIGHTS TEST switch to test the lamps).

Section III. OPERATOR/CREW MAINTENANCE

2-10. INTRODUCTION

You must perform Preventive Maintenance Checks and Services (PMCS), and some maintenance procedures on the test set to keep it operating properly. Use the PMCS chart in paragraph 2-11 to check the test panel indicators before and during operation. Use the maintenance chart in paragraph 2-12 to replace a defective indicator or lens.

Each chart in this section has an INITIAL SETUP section. This section gives information you need before you start the procedure.

In this INITIAL SETUP section, resources required are not listed unless they apply to the procedure. Personnel are listed only if the task requires more than one. If PERSONNEL is not listed, it means one person can do the task. The normal standard equipment condition to start a maintenance task is with power off EQUIPMENT CONDITION is not listed unless some other condition is required besides the power being off.

2-11. OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

This task covers:

Preventive maintenance procedures

INITIAL SETUP

Test Equipment

None

Special Environmental Conditions

None

General Safety Instructions

None

B = Before use D = During use

Item No.	Interval B	Interval D	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
			Test Panel		
1.	•		Panel Indicators	Check for loose or cracked lamp lenses. If loose, screw lens in until tight.	Any lens is cracked
		•	Panel Indicators	Turn on PANEL LIGHTS TEST switch. Check that all indicators light.	Any indicator does not light

2-12. OPERATOR/CREW MAINTENANCE

This task covers:

Removal and installation of panel indicators and lenses

INITIAL SETUP

General Safety Instructions

None

Special Tools	Test Equipment	Special Environmental Conditions
None	None	None

LOCATION/ ITEM	ACTION	REMARKS
REMOVAL		
1. ALL INDICATORS		
a Lens	Unscrew fully. Then pull lens and indicator from panel socket.	
b. Indicator	Pull straight out of lens.	Do not turn indicator while pulling It out
INSTALLATION		
2. ALL INDICATORS		
a. Indicator	Push into lens.	Do not turn indicator
b. Lens	Push into panel socket. Then screw lens in fully.	

CHAPTER 3
ORGANIZATIONAL MAINTENANCE

	Page		Page
Chapter Overview	3-1	Organizational Preventive Maintenance Checks and Services	3-3
Introduction	3-1	Organizational Maintenance	3-6
Repair Parts, Tools, and Support Equipment	3-2	Preparation for Storage or Shipment	3-7
Repainting and Refinishing	3-2		

CHAPTER OVERVIEW

This chapter describes the maintenance to be performed at the organizational level.

3-1. INTRODUCTION

Organizational maintenance persons are responsible for inspecting the test set on a regular schedule. Use the Preventive Maintenance Checks and Services chart in paragraph 3-4 as a guide.

No organizational troubleshooting is required.

The only organizational maintenance procedure needed is cleaning the test set. These instructions are in paragraph 3-5.

Organizational maintenance persons can repaint and refinish the test set case if needed. The necessary information is in paragraph 3-3.

Each table in this chapter has an INITIAL SETUP section. This section gives information you need before you start the procedure.

Resources required are not listed unless they apply to the procedure.

Personnel are listed only if the task required more than one. If PERSONNEL is not listed, it means one person can do the task.

The normal standard equipment condition to start a maintenance task is with power off. EQUIPMENT CONDITION is not listed unless some other condition is required besides the power being off.

3-2. REPAIR PARTS, TOOLS, AND SUPPORT EQUIPMENT

For information on repair parts, tools and support equipment, refer to TM 11-6625-1831-23P, Organizational and Direct Support Repair Parts and Special Tools List.

3-3. REPAINTING AND REFINISHING

This task covers:

Preparation for repainting and refinishing the test set case

INITIAL SETUP:

Materials/Parts	Special Environmental Conditions
Sandpaper (fine grade)	None
Primer, color Y per MIL-P-8585	General Safety Instructions
Enamel, semigloss gray, type III, class II, per MIL-E-15090	None
Paint Brush	

LOCATION/ITEM	ACTION	REMARKS
TEST SET CASE Rust and corrosion	Remove by lightly sanding with sandpaper.	Do not sand any more than Necessary to remove the rust or corrosion.

For detailing painting instructions, refer to TB 43-0118.

3-4. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES

This task covers:

Test set case maintenance

INITIAL SETUP

Test Equipment

None

Special Environmental Conditions

None

General Safety Instructions

None

W=WEEKLY M=MONTHLY Q=QUARTERLY

Item No.	Interval W	Interval M	Interval Q	Item to be Inspected	Procedures	Equipment is repaired	Not Ready/ Available if:	Check for and have or adjusted as necessary
EXTERIOR INSPECTION								
1.	•			All surfaces of test set case and cover	Inspect for dirt, corrosion, and fungus. Clean if necessary according to paragraph 3-5.			Dirt, corrosion, or fungus are heavy enough to stop normal operation.
HARDWARE INSPECTION								
2.		•		Test set case and cover	Inspect handles, latches, hinges, and other exterior items for looseness or damage. Refer to Direct Support Maintenance for needed repairs.			Any damaged item would prevent normal operation.

3-4. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES (Cont)

This task covers:

Electrical cable maintenance

INITIAL SETUP: Same

W=WEEKLY M=MONTHLY Q=QUARTERLY

	Interval				Procedures	Equipment is
	W	M	Q	Item to be Inspected	Check for and have repaired or adjusted as necessary	Not Ready/ Available if:
3.	•			All Cables	Inspect for breaks, cuts, or cracks. Replace cable if damaged.	Cable cannot be used.
4.	•			Connectors, Jacks, Plugs	Inspect for corrosion, bent pins, or thread damage. Replace cable if damaged.	Cable cannot be used.
This task covers: Test panel maintenance						
INITIAL SETUP: Same						
5.		•		All Controls	Check for smooth operating action. Refer to Direct Support Maintenance for repair.	Control does not operate properly.
6.			•	All Controls	Check for loose or broken knobs. Refer to Direct Support Maintenance for repair.	Control cannot be set because of loose or broken knob.

3-4. ORGANIZATIONAL PREVENTATIVE MAINTENANCE CHECKS AND SERVICES (Cont)

This task covers:

Publication maintenance

INITIAL SETUP: Same

W=WEEKLY M=MONTHLY Q=QUARTERLY

	Interval			Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
	W	M	Q			
7.			•	All Publications	Make sure all are complete, serviceable, and current.	Publications cannot be used because they are incomplete or damaged.

This task covers:

Modification inspection

INITIAL SETUP: Same

8.			•	Modification Bulletin	Check DA PAM 310-4 to determine if new MWO's have been published for this test set.	Modifications are required.

3-5. ORGANIZATIONAL MAINTENANCE

This task covers:

Cleaning the test set

INITIAL SETUP:

Special Environmental Conditions

Adequate ventilation when using trichlorotrifluoroethane

Materials/Parts

Clean lint-free cloths

Trichlorotrifluoroethane cleaning fluid

small cleaning brush

General Safety Instruction

None

LOCATION/ITEM	ACTION	REMARKS

WARNING

Adequate ventilation should be provided when using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, call a physician immediately.

1. TEST SET Exterior surfaces, Extender cards, Break out box	a. Remove dirt, corrosion and fungus with cloth dampened with trichlorotrifluoroethane. b. Remove moisture with dry cloth.	Cloth should be damp but not wet.
2. TEST SET Cable connectors, plugs, jacks	a. Remove dirt, corrosion and fungus with brush, dampened with trichlorotrifluoroethane if necessary. b. Remove moisture with dry cloth.	
3 TEST SET Panel controls	Remove dirt with dry cloth.	

3-6. PREPARATION FOR STORAGE OR SHIPMENT

The preparation procedure depends on how long the test set will be in storage.

The following charts give procedures for short-term, intermediate, and long-term storage. To prepare the test set for shipment, use the long-term procedure.

SHORT-TERM (ADMINISTRATIVE) STORAGE

This task covers: Preparing test set for storage for 1 to 45 days.

INITIAL SETUP:

Special Environmental Conditions

None

General Safety Instructions

None

LOCATION/ITEM	ACTION	REMARKS
1. TEST SET		
a. Organizational PMCS procedures	Perform before putting test set into storage.	Next scheduled organizational PMCS procedures
b. Cover	Install and lock in place.	

NOTE

Store the test set where it will be protected from weather.

INTERMEDIATE STORAGE

This task covers: Preparing test set for storage for 46 to 180 days.

INITIAL SETUP: Same

LOCATION/ITEM	ACTION	REMARKS
2. TEST SET		
a. Cover	Install and lock on.	
b.Organizational PMCS procedures	Perform after removing test set from storage.	All scheduled organizational PMCS procedures. Make all needed repairs before placing into service.

NOTE

Store the test set where it will be protected from weather.

3-6. PREPARATION FOR STORAGE OR SHIPMENT (Cont)

LONG-TERM STORAGE OR SHIPMENT

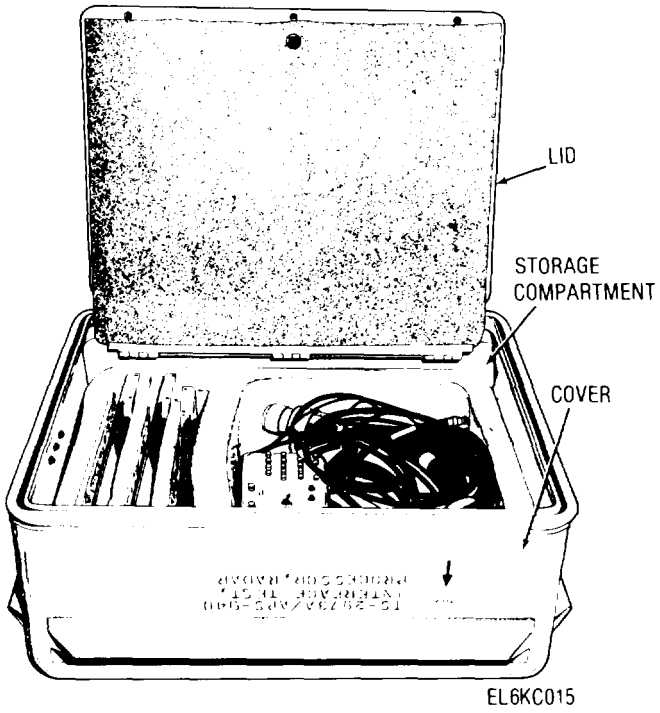
This task covers:

Preparing test set for storage for more than 180 days; and
Preparing test set for shipment

INITIAL SETUP

Materials/Parts	Special Tools
Shipping Box	Metal Strapping Machine
Packing Materials	
General Safety Instructions	**Special Environmental Conditions**
None	None

LOCATION/ITEM	ACTION	REMARKS
3. TEST SET		
a. Components of End Items List (Appendix B)	Be sure test set contains all required items.	



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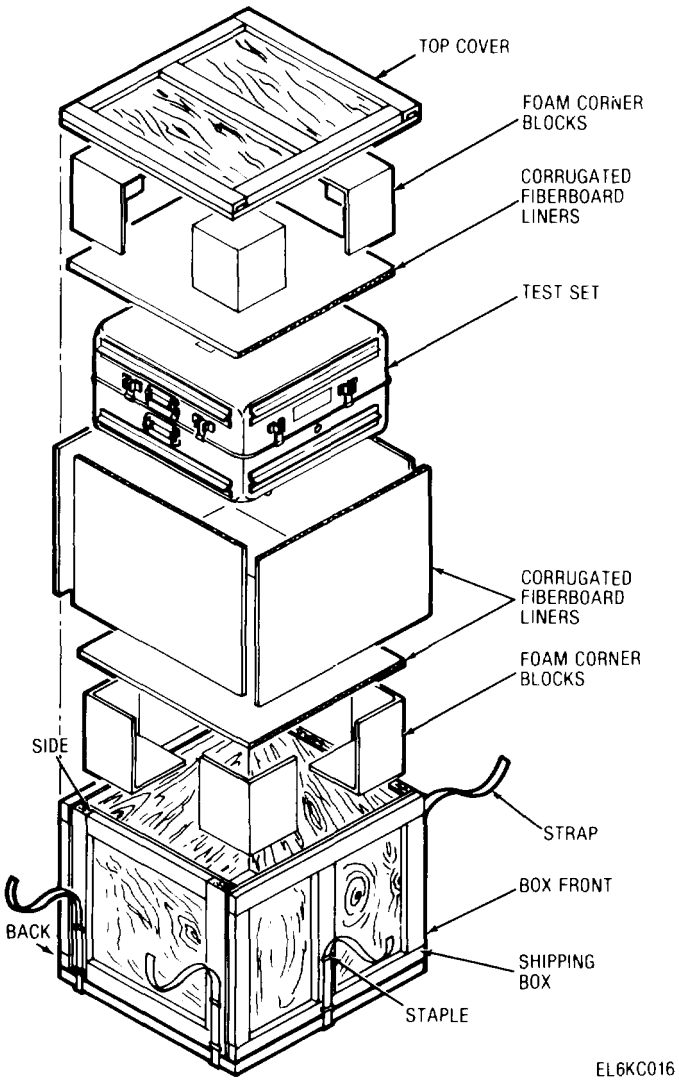
3-6. PREPARATION FOR STORAGE OR SHIPMENT (Cont)

LOCATION/ITEM	ACTION	REMARKS
3. TEST SET (Cont)		
b. Cover storage compartment	Fill spaces with packing material.	Use dry, soft material.
c. Cover	Close and latch lid. Install cover and lock on.	
4. SHIPPING BOX		
a. Front, back, and sides	Spread away from each other.	Use box that test set was received in.
b. Test set	Put into box.	Get another person's help, if needed.



3-6. PREPARATION FOR STORAGE OR SHIPMENT (Cont)

LOCATION/ITEM	ACTION	REMARKS
5. PACKING MATERIALS		
a. Corrugated fiberboard liners	Place on top and sides of test set.	
b. Foam corner blocks	Place on upper corners of liners.	
6. SHIPPING BOX		
a. Front, back, and sides	Push together. Nail front and back to sides.	
b. Top cover	Install and nail into place.	
c. Metal straps	Install around outside of box.	If strapping machine is available
d. Staples	Install over straps.	

CHAPTER 4
PRINCIPLES OF OPERATION

	Page		Page
Chapter Overview	4-1	Description of Cable Assemblies	4-12
Physical Description	4-2	Description of Test Set Case	4-14
Test Set Functional Description	4-3	Description of Extender Card MX8630/APS-94D	4-15
Module Functional Description	4-4	Description of Extender Card MX8740/APS-94D	4-16
Description of Electronic Component Assembly	4-8	Description of Break Out Box	4-17
Description of Electrical Test Panel	4-9		

CHAPTER OVERVIEW

This chapter explains the test set. It tells how the test set operates, and gives a detailed description of each assembly that you can repair.

4-1. PHYSICAL DESCRIPTION

a. Physical construction

(A) TEST SET CASE — Contains test panel. Has two steel feet to stand on when test set is in upright position. Also has two sets of four rubber bumpers for use when test set is laid down or when stacked during storage. Has two carrying handles.

(B) COVER LATCHES (8) — Hold test set cover in place for storage or shipment. Tension on each latch is adjustable to provide air-tight seal between test set and test set cover.

(C) TEST PANEL — Contains controls and indicators to operate test set and signal processor during test.

(D) TEST SET COVER — Protects test set when not in use. Contains two handles for lifting cover from test set. Contains storage compartment.

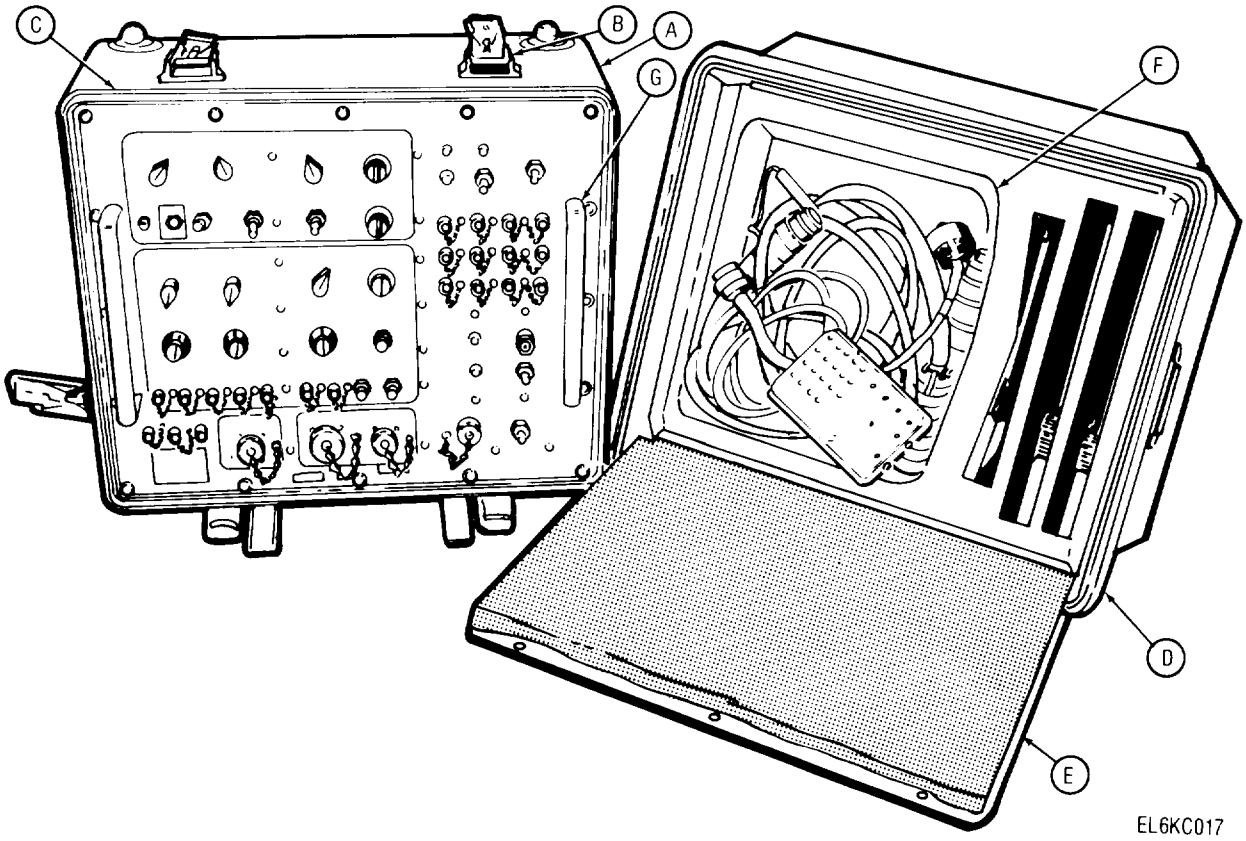
(E) HINGED LID — Closes storage compartment. Has three fasteners to hold it closed.

(F) STORAGE COMPARTMENT — Provides cushioned storage space for break out box, cables, extender cards, and card extractor.

(G) HANDLE — Allows test set to be lifted to upright position for use.

b. Physical dimensions.

Height	Width	Depth	Weight
19.25 in. (48.9 cm)	24.25 in. (61.6 cm)	21.13 in. (53.7 cm)	60 lbs. (27 kg)

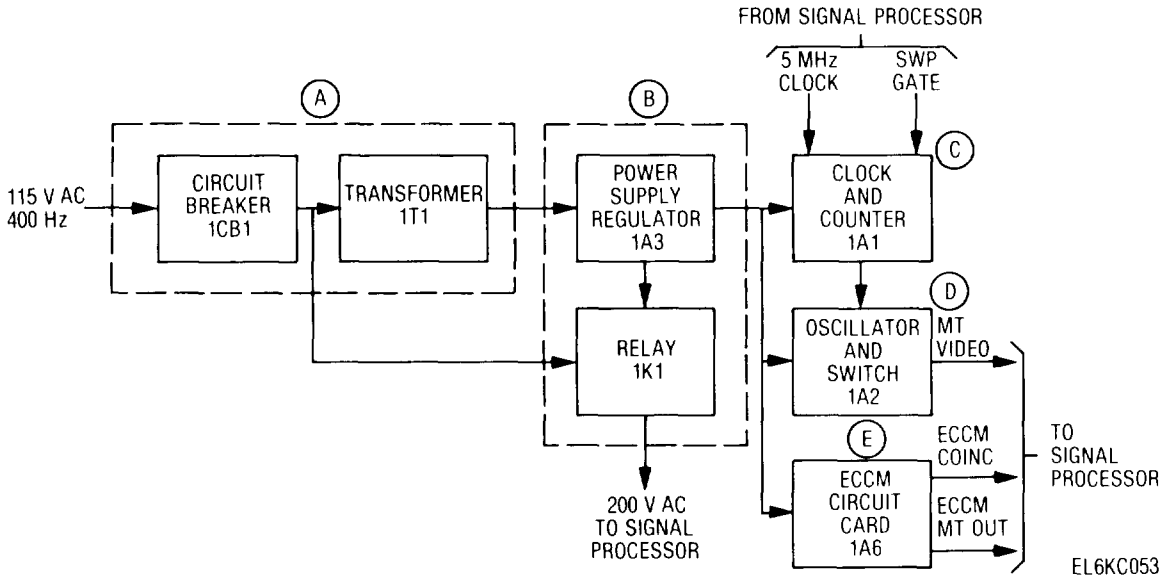


4-2. TEST SET FUNCTIONAL DESCRIPTION

a. Introduction. The test set is part of a group of special test equipment used to maintain Radar Surveillance Sets AN/APS-94E and AN/APS-94F. The test set is used to test Radar Signal Processors CM-374/APS-94D and CM-481/APS-94F, and can be used to isolate faults in the signal processor to the module level. The test set performs the following functions:

- Generates simulated moving target video signals at selected ranges up to 100 km.
- Simulates radar system inputs needed for signal processor operation.
- Provides front panel test jacks for monitoring signal processor test responses.
- Provides ac power to the signal processor under test.

b. Test Set Block Diagram.



(A) PRIME POWER APPLICATION — 115 volt, line-to-neutral, 400 Hz, 3-phase input to test set controlled by circuit breaker 1CB1. With 1 CB1 set to ON, 200-volt line-to-line power is applied to transformer 1 T1 and relay 1K1.

(B) POWER DISTRIBUTION — Outputs from 1T1 applied to power supply regulator module 1A3. DC outputs from 1A3 supplied to 1A1, 1A2, 1A6 modules and relay 1K1 1K1 supplies 200-volt line-to-line power to signal processor.

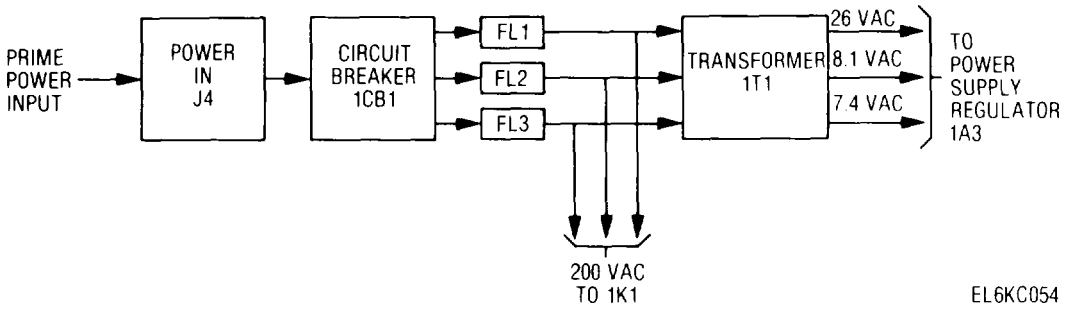
(C) CLOCK AND COUNTER MODULE 1A1 — Creates switch gate signal for oscillator and switch module.

(D) OSCILLATOR AND SWITCH MODULE 1A2 — Creates simulated moving target video signals for signal processor.

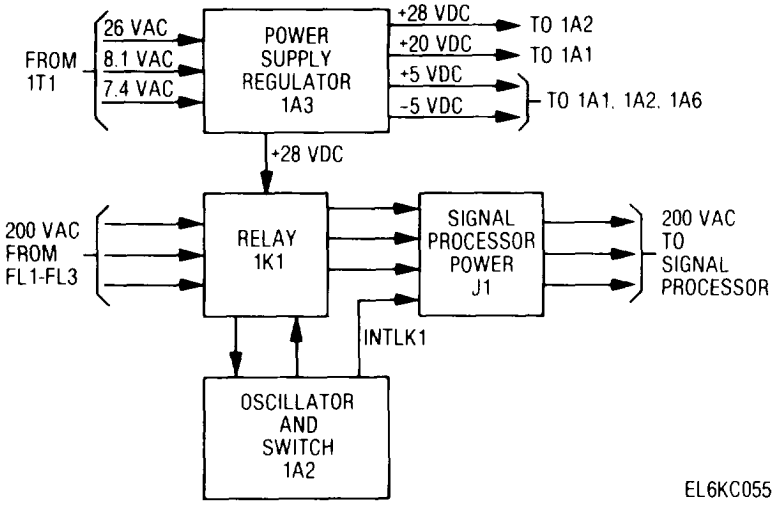
(E) ECCM CIRCUIT CARD ASSEMBLY 1A6 — Creates coincidence pulse and ECCM moving target video signals for signal processor.

4-3. MODULE FUNCTIONAL DESCRIPTION

PRIME POWER APPLICATION — Prime power is 115-volt line-to-neutral, 400 Hz, 3-phase. Power is applied to test set through POWER IN J4 jack. Because test set does not use a neutral line, power within the test set Is 200-volts, measured line-to-line. Circuit breaker 1CB1 supplies power to the test set and provides circuit protection. Filters FL1, FL2, and FL3 remove rf signals and electrical noise from power lines. When 1CB1 is set to ON, 200-volts line-to-line is applied through filters to primary of 1T1 and to contacts of relay 1K1. Transformer 1T1 supplies three 3-phase outputs to power supply regulator module 1A3: 2 6 Vac, 8.1 Vac, and 7.4 Vac.

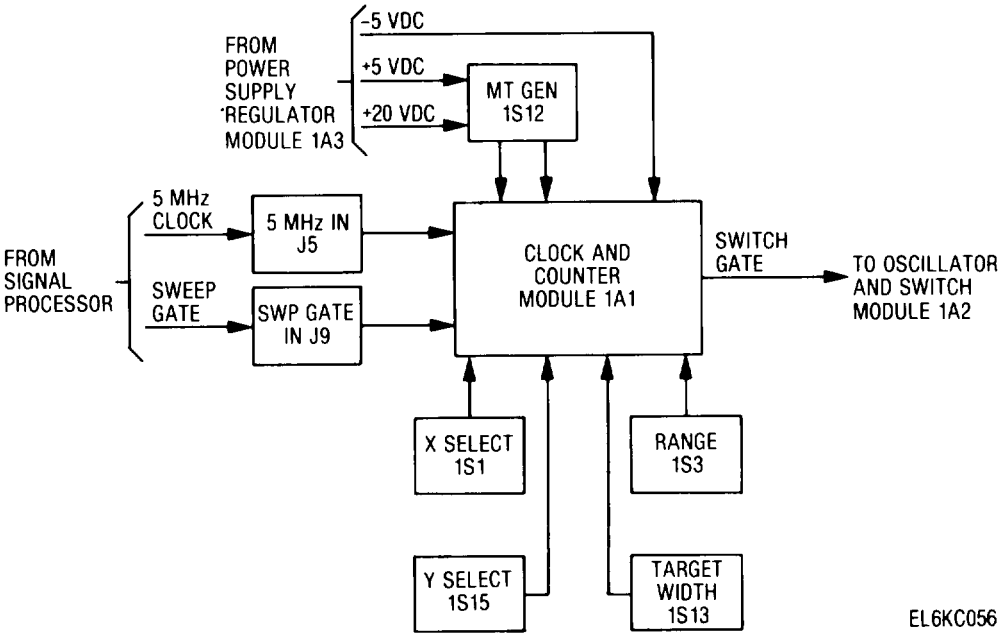


POWER DISTRIBUTION — With three secondary voltages from 1T1 applied to power supply regulator module 1A3, 1A3 generates four dc voltages: +28V, +20V, +5V, and -5V. If a short circuit occurs In any dc circuit, 1A3 turns off that dc output. Relay 1K1, with +28Vdc from 1A3 applied to its coil, energizes and provides 200 Vac line-to-line to signal processor through SIGNAL PROCESSOR POWER J1 If a signal processor is not connected to J1 jack, an interlock circuit (INTLK1) on oscillator and switch module 1A2 de-energizes 1K1 to remove 200 Vac from J1.



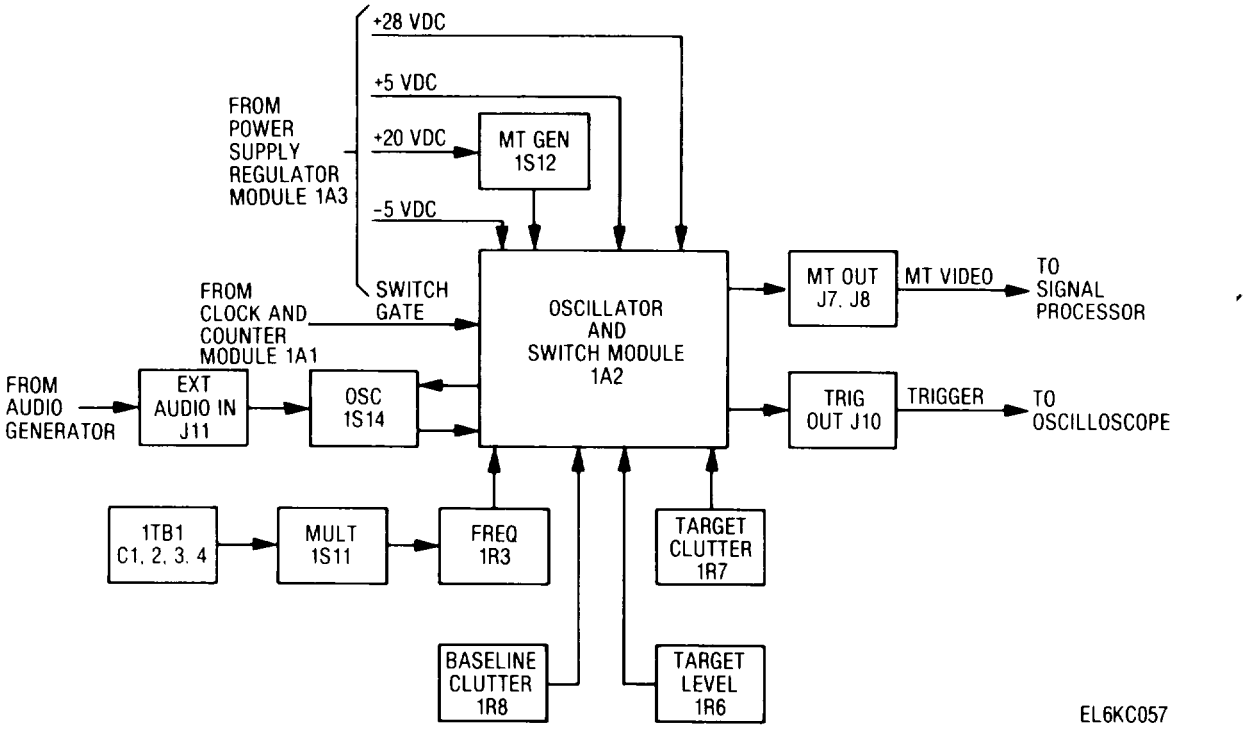
4-3. MODULE FUNCTIONAL DESCRIPTION (Cont)

CLOCK AND COUNTER MODULE 1A1 — Generates range pulses when 5 MHz clock and sweep gate signals are applied from signal processor. Range pulses represent targets occurring at ranges up to 100 km. During each sweep gate time, one range pulse is output on the switch gate line to oscillator and switch module 1 A2. The target range represented by the range pulse is determined by the settings of X SELECT, Y SELECT, TARGET WIDTH, and RANGE switches. MT GEN switch controls +5 Vdc and +20 Vdc to the clock and counter module. Setting MT GEN switch to OFF position disables switch gate signal.



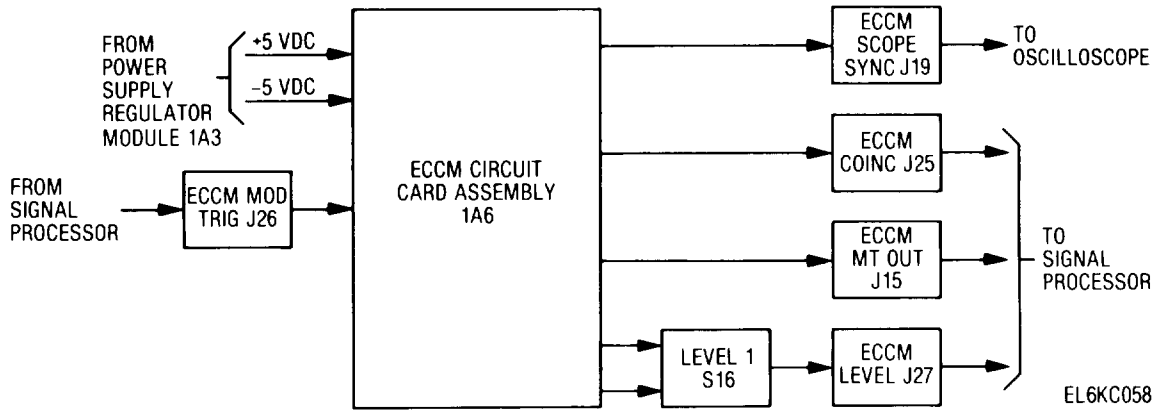
4-3. MODULE FUNCTIONAL DESCRIPTION (Cont)

OSCILLATOR AND SWITCH MODULE 1A2 - Generates moving target video and trigger signals when switch gate signal is applied from clock and counter module 1Al. Moving target video is sent to signal processor to simulate detected moving targets. Trigger signal is sent to test panel to trigger external oscilloscope. OSC switch selects either internal oscillator circuit or external audio generator to create doppler signal for moving target video. FREQ potentiometer, MULT switch and capacitors 1TB1-C1, C2, C3 and C4 select frequency of internal oscillator. BASELINE CLUTTER potentiometer controls simulated ground clutter in moving target , video signal. TARGET LEVEL and TARGET CLUTTER potentiometers control MT portion of moving target video signal. MT GEN switch controls + 20 Vdc to oscillator and switch module. Setting MT GEN switch to OFF position disables moving target video and trigger signals.



4-3. MODULE FUNCTIONAL DESCRIPTION (Cont)

ECCM CIRCUIT CARD ASSEMBLY 1A6 — Generates coincidence pulse, ECCM moving target signal, and ECCM scope sync signal when MOD TRIG pulse is applied from signal processor. Coincidence pulse and moving target signals go to signal processor under test. ECCM scope sync can be used to trigger external oscilloscope. A delay circuit on ECCM circuit card creates one pulse at ECCM SCOPE SYNC jack and one pulse at ECCM COINC jack 9 us after each pulse of ECCM MOD TRIG jack. ECCM moving target signal changes state 9 us after each pulse at MOD TRIG jack input. ECCM circuit card supplies +5 Vdc to ECCM LEVEL jack when LEVEL 1 switch is set to INHIBIT; it supplies 0 Vdc to ECCM LEVEL jack when LEVEL 1 switch is set to NORMAL.



4-4. DESCRIPTION OF ELECTRONIC COMPONENT ASSEMBLY 1TB1

CHARACTERISTICS —

Attached to chassis by four screws.

Electrical connections made through wires soldered to terminal posts.

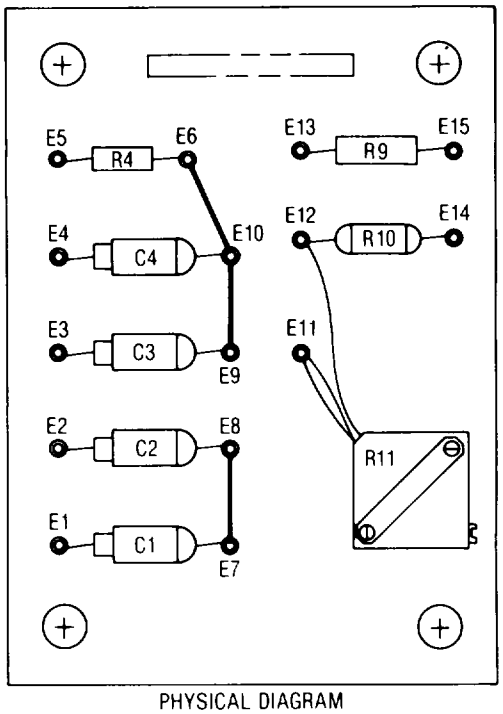
COMPONENT FUNCTIONS -

C1, C4, R4 — Determine frequency of moving target video when MULT switch S11 is set to HIGH.

C2, C3, R4 — Determine frequency of moving target video when MULT switch S11 is set to LOW.

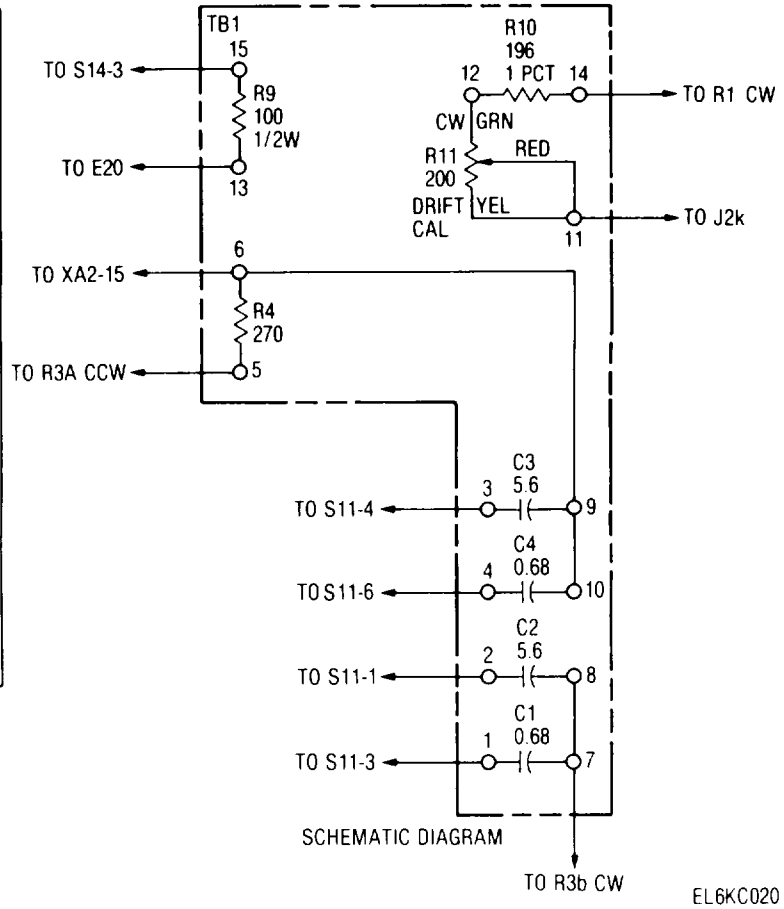
R9 — Provides stable input to OSC circuit when EXT AUDIO IN jack J11 is selected.

R10, R11 — Provide circuit to calibrate DRIFT TEST potentiometer R1.



PHYSICAL DIAGRAM

NOTE: FOR COMPLETE REFERENCE DESIGNATION PREFIX WITH 1TB1



SCHEMATIC DIAGRAM

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4-5. DESCRIPTION OF ELECTRICAL TEST PANEL

CHARACTERISTICS —

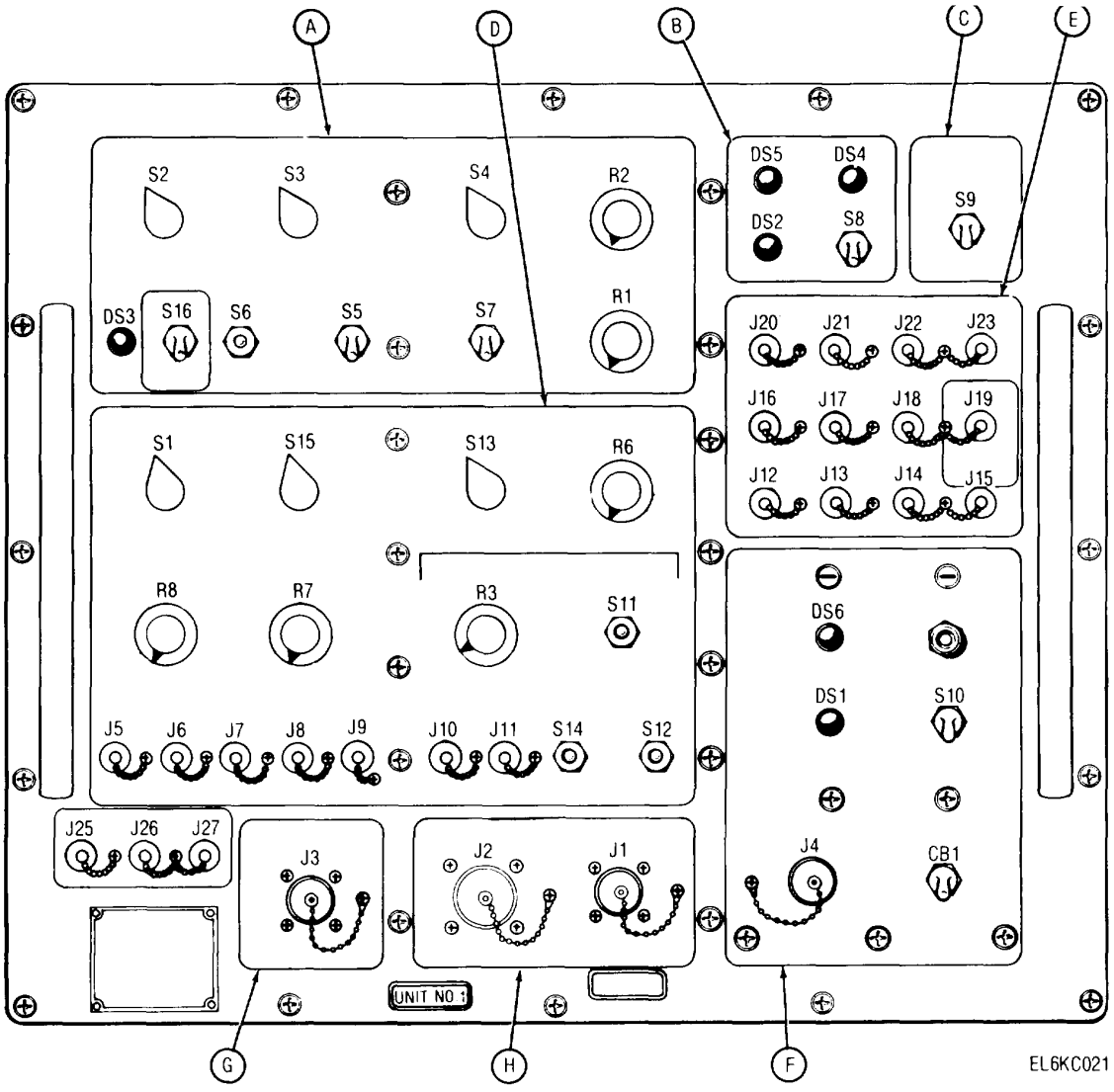
Attached to test set case by 16 screws. Operator controls (switches, potentiometers, jacks, indicators) mounted on front panel. Other components (filters, transformer, relay) mounted on back of panel. Other test set modules mounted on chassis on back of test panel.

OPERATOR CONTROL FIELD FUNCTIONS —

Operator controls are arranged in fields on test panel according to their use.

(A) SIGNAL PROCESSOR CONTROLS Field (DS3, R1, R2, S2-S7, S16) — Provides inputs to signal processor that normally come from aircraft radar control panel.

(B) BITE Field (DS2, DS4, DS5, S8) — Controls BITE test circuits in signal processor.



4-9

4-5. DESCRIPTION OF ELECTRICAL TEST PANEL (Cont)

(C) PANEL LIGHTS Field (S9) — Provides test of test panel indicators.

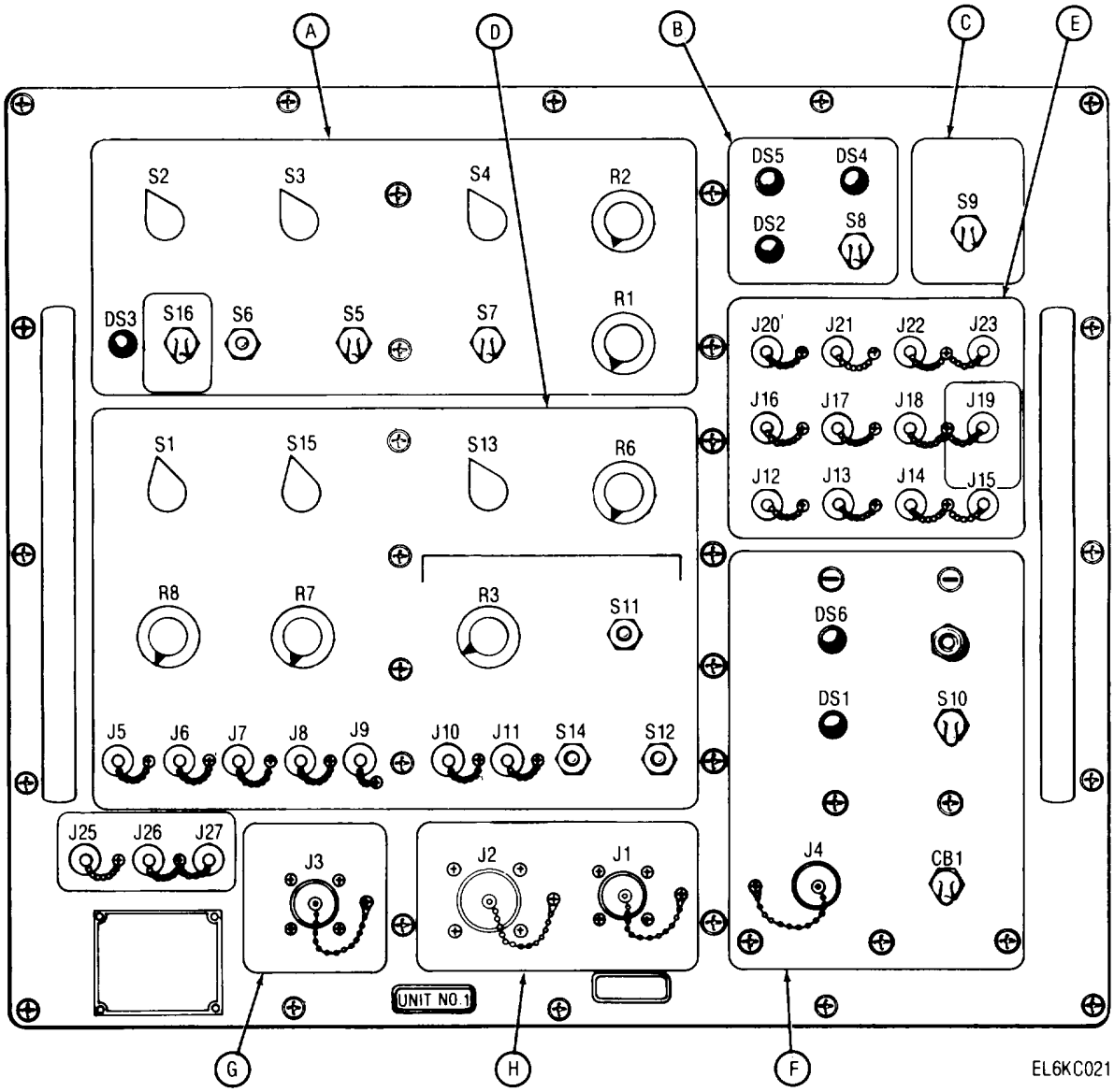
(D) MOVING TARGET GENERATOR Field (J5-J11, J25-J27, R3, R6-8, S1, S11-S15) - Provides inputs to signal processor that normally come from aircraft radar receiver-transmitter.

(E) SIGNAL TEST Field (J12-J23) — Carries signal processor signals to test panel where they can be observed with oscilloscope.

(F) PRIME POWER Field (CB1, DS1, DS6, J4, S10) — Connects test set to prime power. Controls distribution of power to test set and signal processor.

(G) TEST SET TEST Field (J3) — Connects to special test fixture to help troubleshoot test set.

(H) SIGNAL PROCESSOR Field (J1, J2) — Carries power and signals to signal processor.



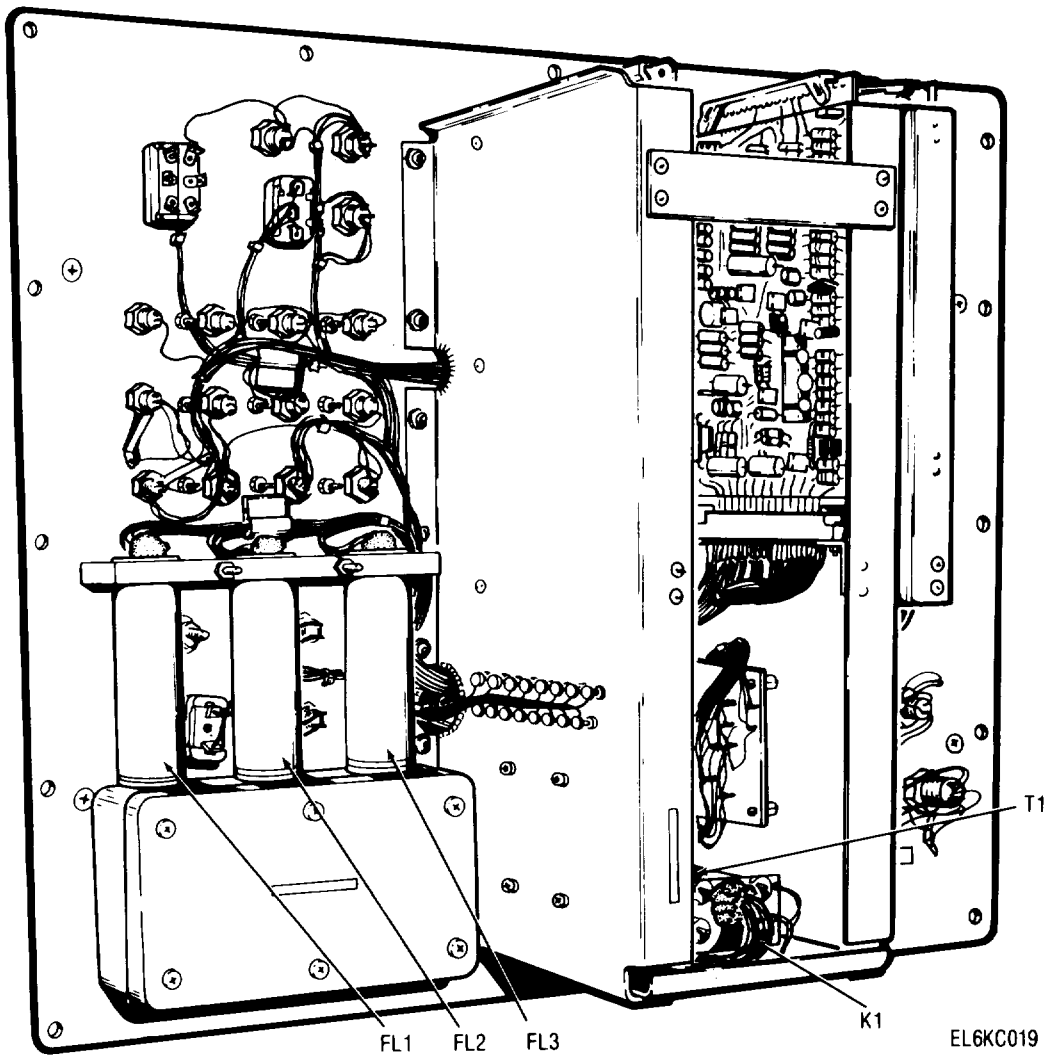
4-5. DESCRIPTION OF ELECTRICAL TEST PANEL (Cont)

COMPONENT FUNCTIONS

FILTERS FL1-FL3 — Remove unwanted electrical signals and noise from prime power input lines (through circuit breaker CB1). Provide clean ac power to T1 and K1.

TRANSFORMER T1 — Uses prime power from filters FL1-FL3 for primary input. Outputs three secondary voltages (7.4 Vac, 8.1 Vac, and 26 Vac) to power supply regulator module 1A3.

RELAY K1 — Connects prime ac power from filters FL1-FL3 to signal processor under test. Energized by +28 Vdc from power supply regulator module.



4-5. DESCRIPTION OF ELECTRICAL TEST PANEL (Cont)

ELECTRICAL TEST PANEL SCHEMATIC DIAGRAMS

A schematic diagram of the test set, including all repairable electrical assemblies, is on a foldout page (figure FO-1) located at the end of this manual.

4-6. DESCRIPTION OF CABLE ASSEMBLIES

This list describes cables used with the component test set. Each end of each cable is marked with its connection point.

Cable Assembly W1 - 22-wire cable, 72 inches long. Ends are marked P1 and 3P1.

Cable Assembly W2 - 41-wire cable, 72 inches long. Ends are marked P2 and 3P2.

Cable Assembly W3 - 4-wire cable, 36 inches long. Ends are marked P1 and P4.

Cable Assembly W4 - 2-conductor coaxial cable, 36 inches long. Ends are marked P5 and P14.

Cable Assembly W5 - 2-conductor coaxial cable, 36 inches long. Ends are marked P7 and P9.

Cable Assembly W6 - 2-conductor coaxial cable, 36 inches long. Ends are marked P9 and P5

Cable Assembly W7 - 2-conductor coaxial cable, 72 inches long. Ends are marked P1 and P2.

Cable Assembly W8 - 2-conductor coaxial cable, 72 inches long. Ends are marked P1 and P2

Cable Assembly W9 - 2-conductor coaxial cable, 72 inches long. Ends are marked P1 and P2.

Cable Assembly W10 - 2-conductor coaxial cable, 72 inches long. Ends are marked 1P26 and 3P4.

Cable Assembly W1l — 2-conductor coaxial cable, 72 inches long. Ends are marked 1P25 and 3P11.

Cable Assembly W12 — 2-conductor coaxial cable, 72 inches long. Ends are marked 1P7 and 3P9

Cable Assembly W13-2-conductor coaxial cable, 72 inches long. Ends are marked 1P27 and 3P10

Cable Assembly W14-2-conductor coaxial cable, 72 inches long. Ends are marked 3P3 and 3P13

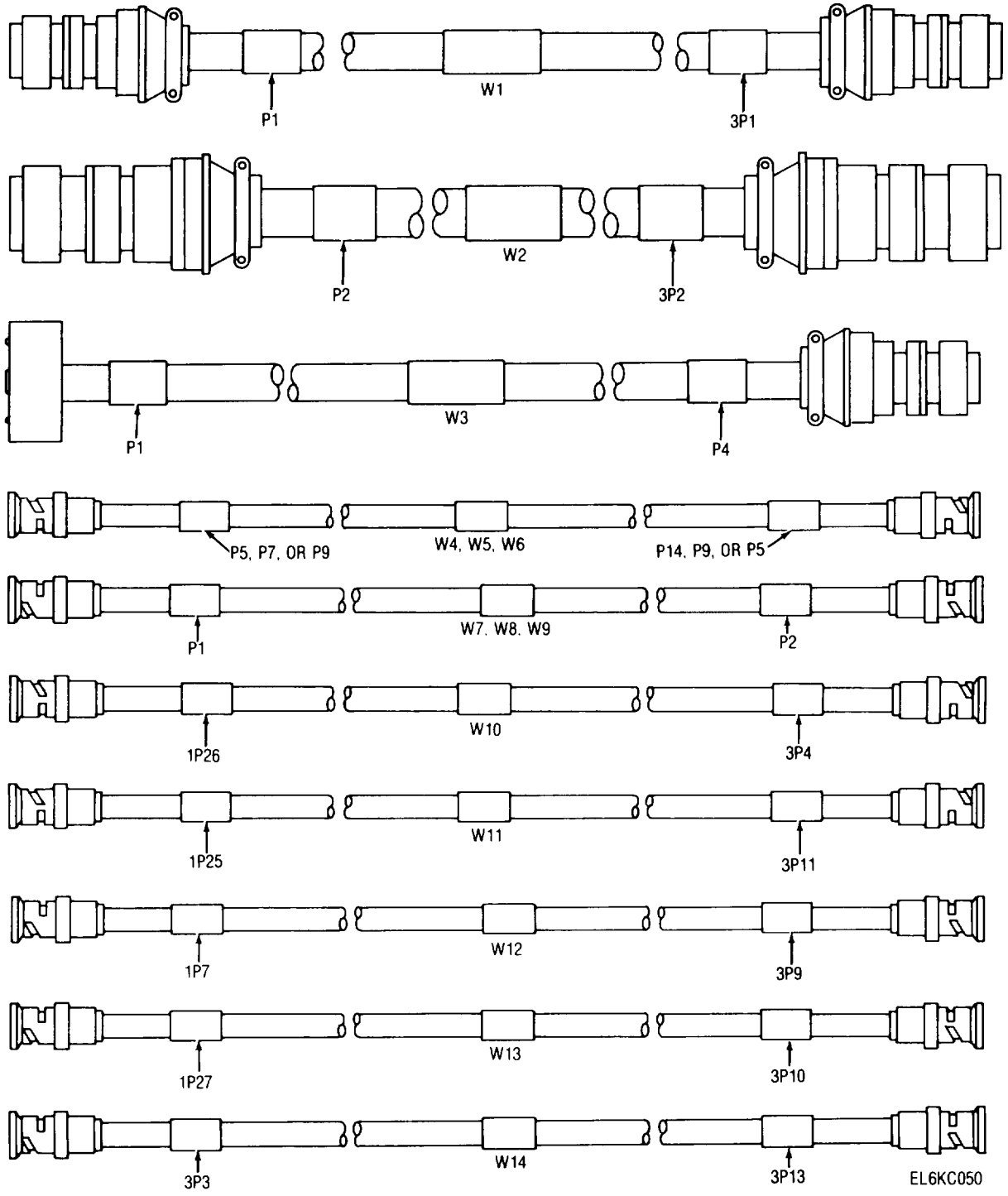
ELECTRICAL DESCRIPTION

Coaxial cables — The center conductor and shield each have continuity from one connector to the other

Multiple conductor cables — Each pin in one connector has continuity to the pin having the same number In the other connector.

4-6. DESCRIPTION OF CABLE ASSEMBLIES (Cont)

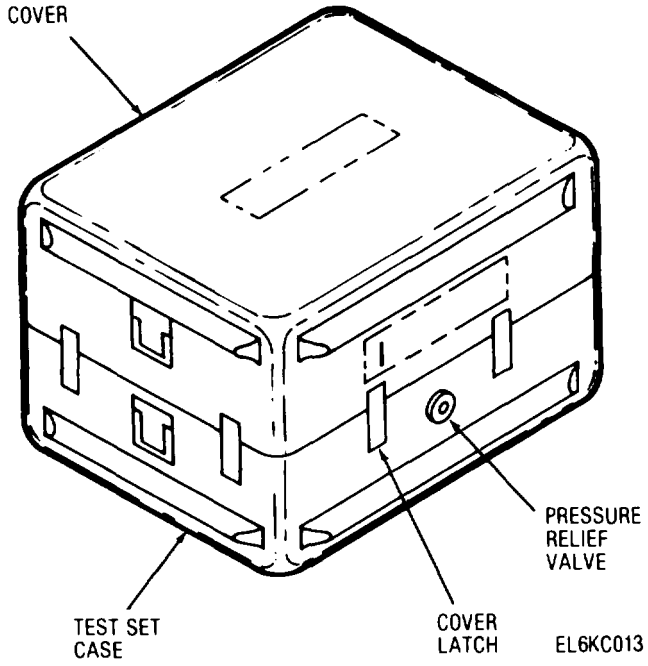
CABLE ASSEMBLIES W1-W14



4-7. DESCRIPTION OF TEST SET CASE

CHARACTERISTICS

- Two carrying handles
- Eight latches to hold cover on to case
- Waterproof when cover is attached
- Pressure relief valve to control air pressure



FUNCTIONS AND FEATURES

- Protects test set from damage
- Cover latches are replaceable
- Carrying handles are premanently attached
- Cover gasket is replaceable
- Pressure relief valve Is replaceable

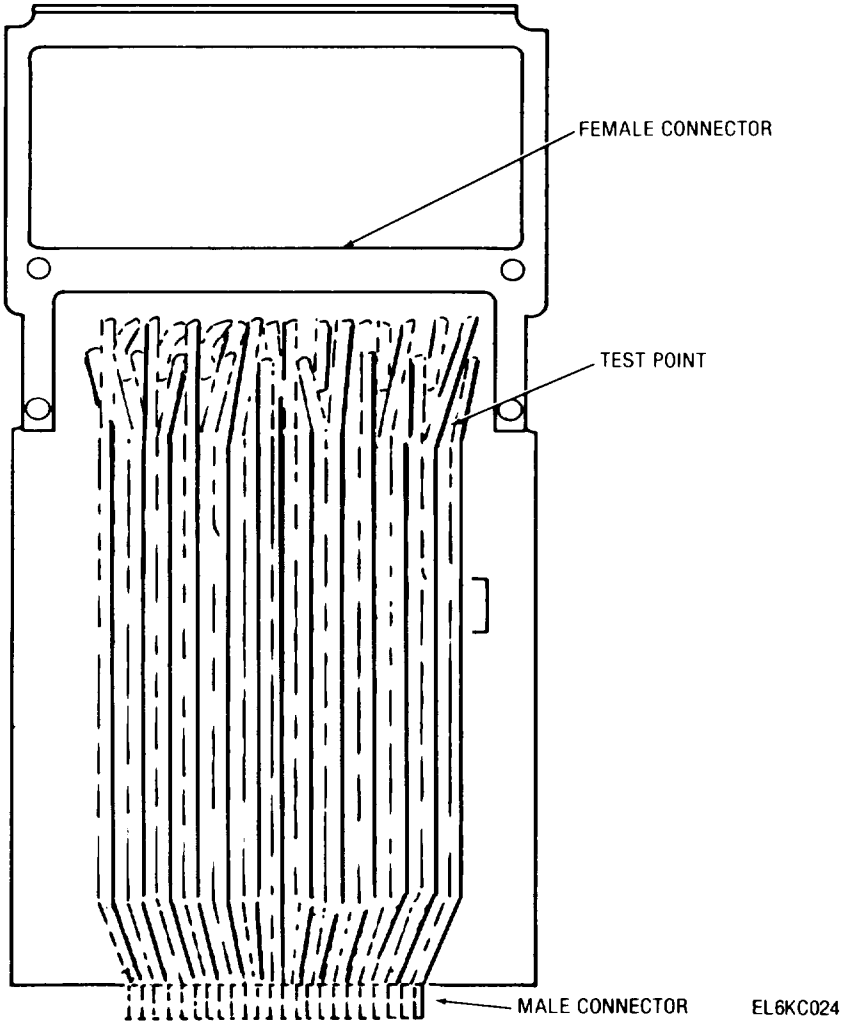
4-8. DESCRIPTION OF EXTENDER CARD MX8630/APS-94D

CHARACTERISTICS TM 11-6625-1831-13

- Extends plug-in printed circuit board out to provide access to the board
- Provides straight-through continuity of signal paths
- Provides test points in signal paths to connect oscilloscope

FUNCTIONS

- Used at Depot maintenance to troubleshoot 1Al, 1A2, and 1A3 modules of test set
- Male connector plugs into connector on test panel chassis
- Printed circuit board plugs into female connector



ELECTRICAL DESCRIPTION

- Each pin on the male connector is connected to the pin having the same number in the female connector.

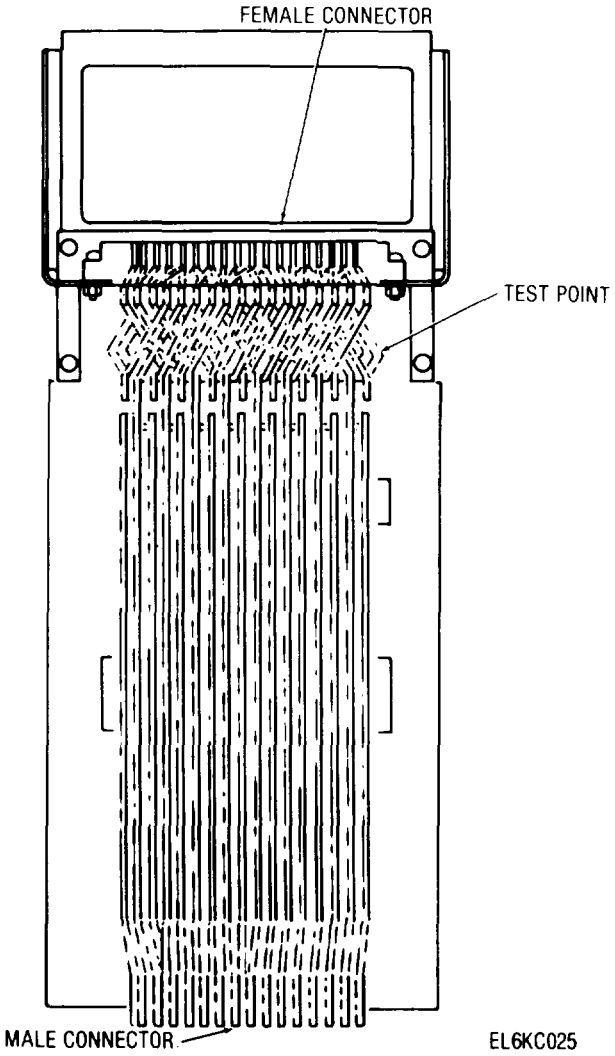
4-9. DESCRIPTION OF EXTENDER CARD MX8740/APS-94D

CHARACTERISTICS

- Extends plug-in printed circuit board out to provide access to the board
- Provides straight-through continuity of signal paths
- Provides test points in signal paths to connect oscilloscope

FUNCTIONS

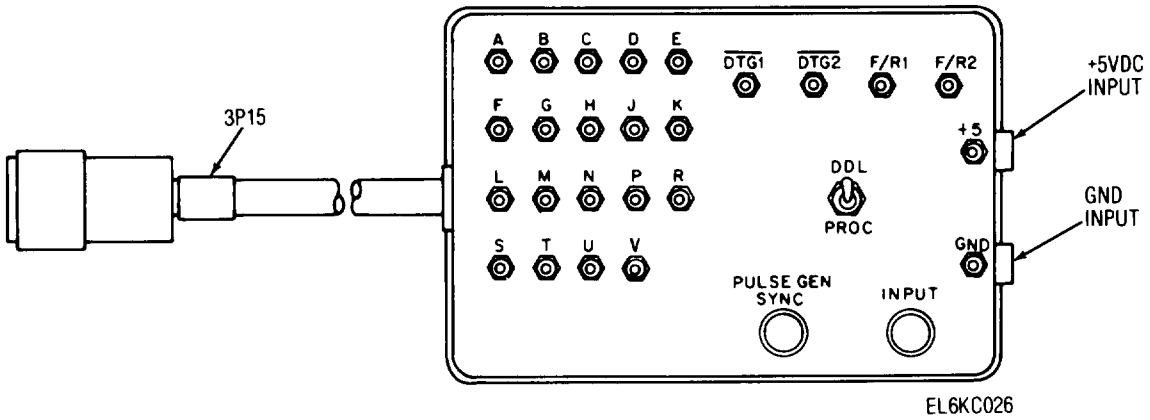
- Used to troubleshoot plug-in printed circuit boards in the signal processor
- Male connector plugs into connector on signal processor chassis
- Signal processor printed circuit board plugs into female connector



ELECTRICAL DESCRIPTION

- Each pin on the male connector is connected to the pin having the same number in the female connector.

4-10. DESCRIPTION OF BREAK OUT BOX



PHYSICAL DESCRIPTION

- Length = 6 inches
- Width = 4 inches
- Depth = 2 inches

CHARACTERISTICS

- Controls mounted on front panel
- Cable plug marked 3P15

FUNCTIONS

- Tests Radar Signal Processor CM-481/APS-94F only
- Carries signals from signal processor to test jacks for connection to oscilloscope

SCHEMATIC DIAGRAM

- Located at the end of this manual (figure FO-2).

CHAPTER 5
DIRECT SUPPORT MAINTENANCE

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CHAPTER OVERVIEW

This chapter explains testing, troubleshooting and repairing the test set. All operations that can be performed by direct support maintenance are explained here.

Section I. DIRECT SUPPORT TROUBLESHOOTING

5-1. REPAIR PARTS, TOOLS, AND SUPPORT EQUIPMENT

For information on repair parts, tools, and support equipment, refer to TM 11-6625-1831-23P, Organizational and Direct Support Repair Parts and Special Tools List.

5-2. TESTING

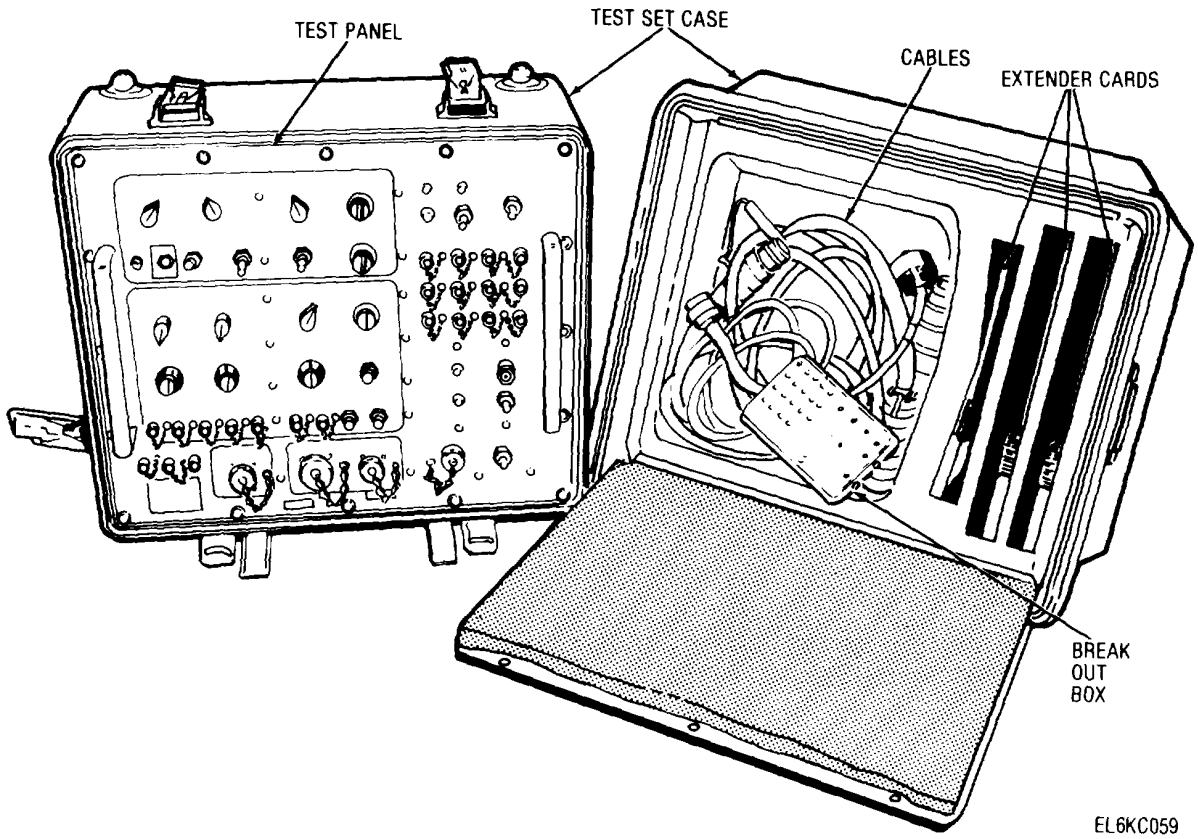
Each table in this chapter has an INITIAL SETUP section. This section gives information you need before you start the procedure.

Resources required are not listed unless they apply to the procedure.

Personnel are listed only if the task requires more than one. If PERSONNEL is not listed, it means one person can do the task.

The normal standard equipment condition to start a maintenance task is with power off. EQUIPMENT CONDITION is not listed unless some other condition is required besides the power being off.

5-2. TESTING (Cont)



5-2a. Visual Inspection and Physical Test

This task covers:

a. Visual inspection of test set
b. Physical test

INITIAL SETUP	Equipment Condition	Special Environmental Conditions
	Test set cover removed (para 5-4a)	None
Test Equipment		General Safety Instructions
None		None

NOTE

This procedure contains step-by-step instructions for inspecting and testing the test set. Each test has a malfunction number listed in the REMARKS column. If any test fails, use that malfunction number to find the correct troubleshooting procedure in paragraph 5-3a.

5-2a. Visual Inspection and Physical Test (Cont)

LOCATION/ITEM	ACTION	REMARKS
VISUAL INSPECTION		
1. TEST PANEL		
a. All assemblies	Check for loose or missing screws, bolts, or nuts.	Malfunction 1
b. Electrical connectors, plugs, jacks, switches	Check for looseness, damage, missing covers.	Malfunction 2
2. BREAKOUT BOX		
a. Controls, cover loose controls.	Check for loose or missing screws,	Malfunction 3
b. Electrical cable, plug	Check for damage, cracks, loose-ness.	Malfunction 4
3. TEST SET CASE		
Exterior	Check for damage, loose or missing parts.	Malfunction 5
4. EXTENDER CARDS		
Entire card	Check for damage	Malfunction 6
5. ALL CABLES (14)		
Cable and connectors	Check for damage	Malfunction 7
PHYSICAL TEST		
6. TEST PANEL		
a. LEVEL 1, CORNER, PRF, MULT, OSC, MT GEN, PWR, toggle switches.	Check for smooth operation in each direction.	Malfunction 8
b. DATA MARK, BITE TEST, PANEL LIGHTS TEST, PUSH TO RESET spring-loaded switches	Check for smooth operation and automatic return to OFF position.	Malfunction 8
c. All rotary switches and potentiometers.	Check for smooth operation to all positions.	Malfunction 8
7. BREAKOUT BOX		
DDL-PROC switch	Check for smooth operation in each direction.	Malfunction 9

END OF TEST

5-2b. Electrical Test of Test Panel

This task covers:

Electrical test of test panel

INITIAL SETUP

Test Equipment	Tools	Equipment Condition
Multimeter AN/USM-223	None	Test set cover removed (para 5-4a.)
Pulse Generator SG-1 105/U (2 each)		
Oscilloscope AN/USM-281C		
Electronic Counter, Digital/ Readout (Frequency Counter) AN/USM-207A		
Power Supply PP-3940/G		
Digital Voltmeter AN/ GSM-64B		
Processor Test Fixture No. 1	NOTE Test fixtures must be locally fabricated. See Appendix F.	
Processor Test Fixture No. 2		
Processor Test Fixture No. 3		
100-ohm Termination, H.P. Mod 10100B (Termination) (3 each)		

WARNING
General Safety Instructions
Be careful of high voltage in test set and test fixtures during test.

NOTE

This procedure contains step-by-step instructions for testing electrical functions of the Test Panel. Each test has a malfunction number listed in the REMARKS column If any test fails, use that malfunction number to find the correct troubleshooting procedure in paragraph 5-3b.

NOTE

Set all switches and controls to their OFF or counterclockwise position before starting the test.

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
1. TEST EQUIPMENT	Connect to test set as follows:	See illustration, next page.
a. Pulse generator No. 1	Connect through 100-ohm termination to J5.	
b. Pulse generator No. 2	Connect through 100-ohm termination to J9.	
c. Test fixture No. 1	Connect to J3.	
d. Test fixture No. 2	Connect to J1.	
e. Test fixture No. 3	Connect to J2.	
f. Power supply	Connect to +5 Vdc and GND jacks on test fixture No. 3.	

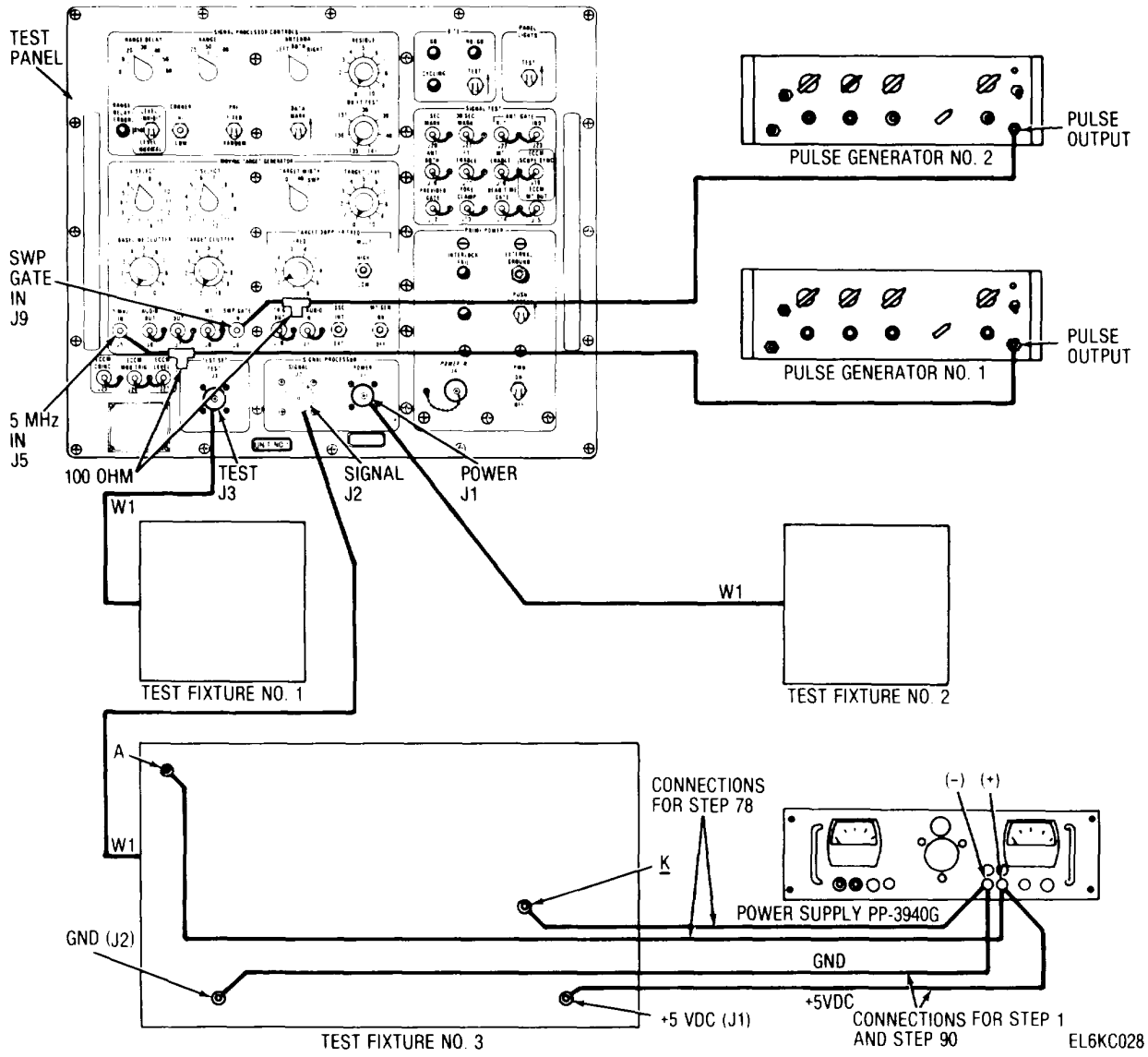
WARNING

Avoid shock, ground the test set. Ensure that the ac line power plug is connected to a circuit that has a protective earth (safety) ground. Improperly grounded equipment can result in hazardous voltage differences between pieces of equipment. Ensure that all devices connected to the test set are connected to earth ground.

2. TEST EQUIPMENT	Prepare as follows:	
a. Pulse generator No. 1	Connect to ac power. Set power switch to ON. Set for 5.0 + 0.01 MHz, 5.0 + 0.1V peak-to-peak positive-going square-wave.	Use oscilloscope and frequency counter to set.
b. Power Supply	Connect to ac power. Set power switch to ON. Set for 5.0 + 0.1 Vdc output.	
c. Pulse generator No. 2	Connect to ac power	
3. MULTIMETER		
Function selector	Set to resistance	RX100 range

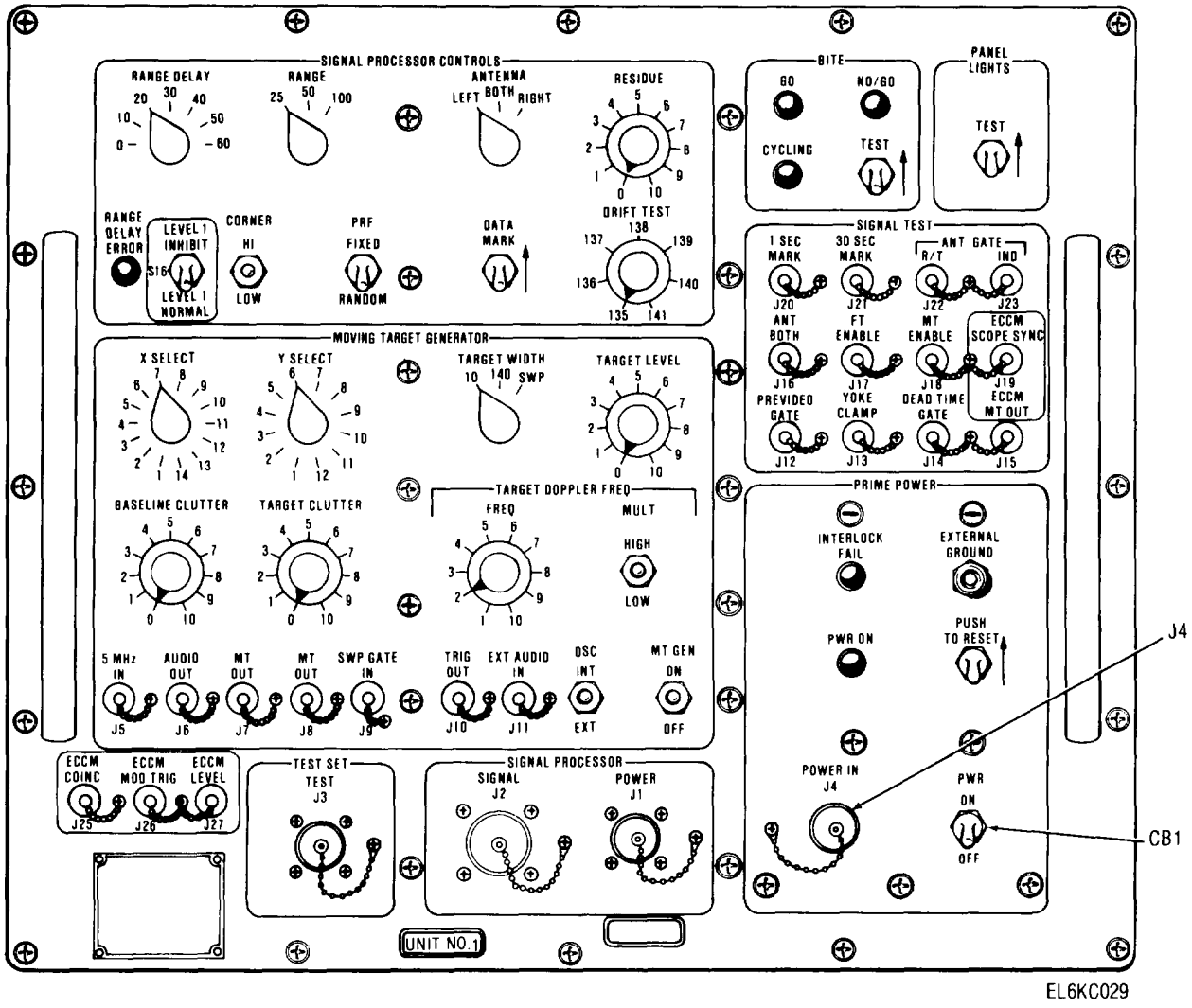
5-2b. Electrical Test of Test Panel (Cont)

LOCATION / ITEM	ACTION	REMARKS



5-2b. Electrical Test of Test Panel (Cont)

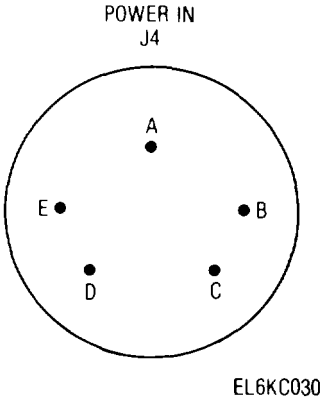
LOCATION/ITEM	ACTION	REMARKS



4. TEST PANEL

a. PWR switch (CB1)	Set to OFF	Primary input circuits check See next page for illustration of POWER IN J4.
b. POWER IN J4 jack pins A and B	Check resistance. Should be 10 megohms or more.	Malfunction 1
c. POWER IN J4 pins A and C.	Check for 10 megohms or more.	Malfunction 1
d. POWER IN J4 pins B and C	Check for 10 megohms or more.	Malfunction 1

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ ITEM	ACTION	REMARKS
4. TEST PANELS (Cont) e. PWR switch	Set to ON.	
		 EL6KC030
g. POWER IN J4 pins A and C.	Check for 30 to 40 ohms.	Malfunction 2,3
h. POWER IN J4 pins B and C.	Check for 30 to 40 ohms	Malfunction 2,3
i. PWR switch	Set to OFF.	
5. TEST SET COVER STORAGE COMPARTMENT		
Cable W3	Remove and connect to POWER IN J4. Connect to ac power.	Power required three-phase 108-118V line-to-neutral, 400 Hz.
6. TEST FIXTURE No. 1		
a. INTERLOCK switch	Set to OPEN.	
b. INTERLOCK BYPASS switch.	Set to OFF.	
7. TEST FIXTURE No. 3		
a. RGP CYCLE switch	Set to OFF	
b. RGP FAULT switch	Set to OFF.	
c. RANGE DELAY ERROR switch.	Set to OFF.	

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
8. TEST PANEL		
a. PWR switch	Set to ON.	
b. PWR ON indicator (DS1)	Check-should be on.	Even if any indicator fails to light, go on to step 9.
c. INTERLOCK FAIL indicator (DS6)	Check-should be on.	
d. BITE GO (DS5) indicator	Check-should be on.	
9. MULTIMETER	Set to 250 Vac range.	
Function Selector		
10. TEST FIXTURE No. 2		
a. Jacks N and R	Check for 0.0 Vac.	Malfunction 4
b Jacks N and T	Check for 0.0 Vac.	Malfunction 4
c. Jacks R and T	Check for 0.0 Vac.	Malfunction 4
11. TEST FIXTURE No. 1		
a. INTERLOCK BYPASS switch.		Set to ON.
12. TEST FIXTURE No. 2		
a. Jacks N and R	Check for 200+10 Vac.	Malfunction 5
b. Jacks N and T	Check for 200+10 Vac.	Malfunction 5
c. Jacks R and T	Check for 200+10 Vac.	Malfunction 5
13. TEST FIXTURE No. 1		
a. INTERLOCK BYPASS switch	Set to OFF.	
b. INTERLOCK switch	Set to CLOSED	

WARNING

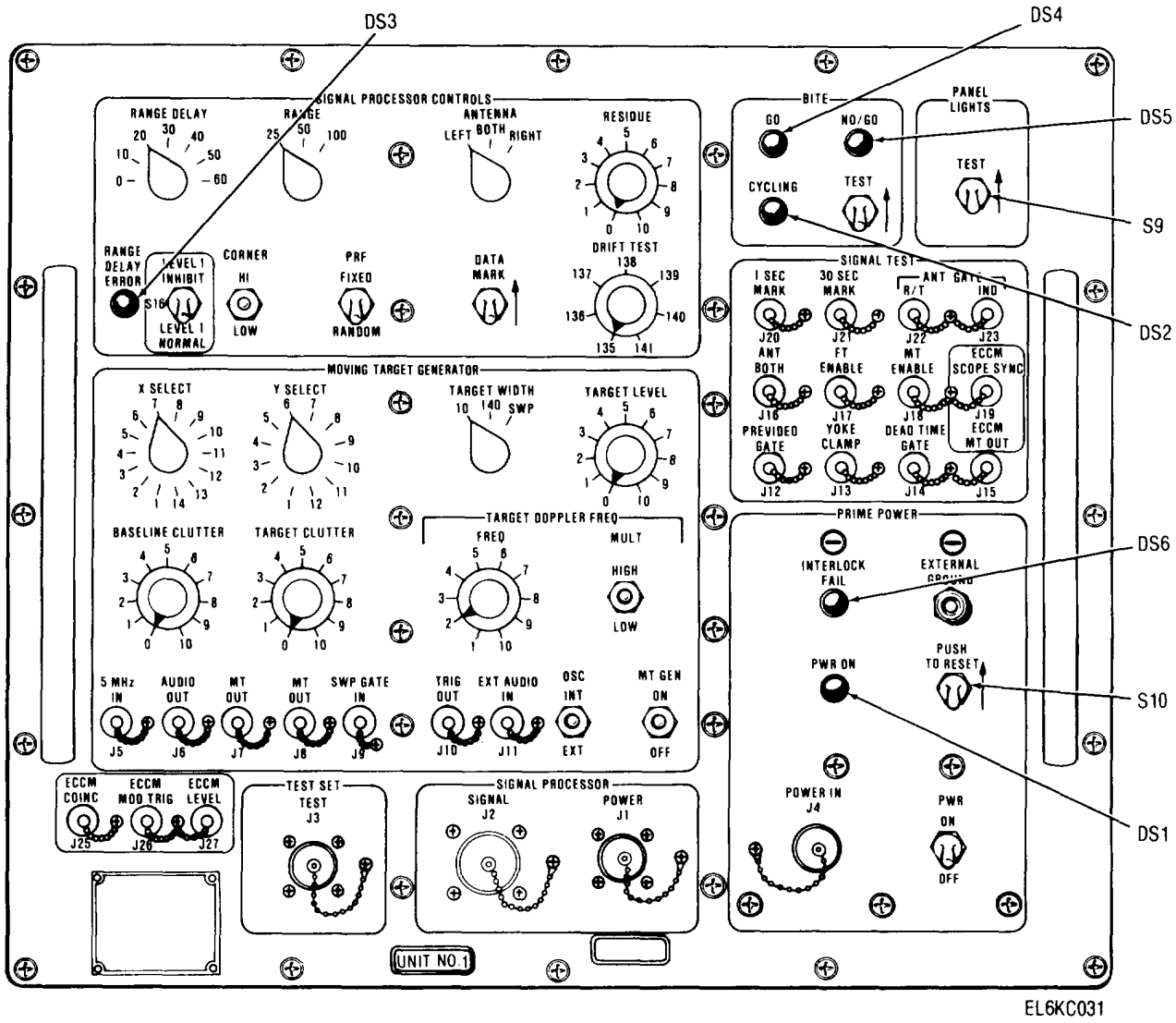
Be careful when ac voltage is applied to the equipment. Serious injury or death can result from contact with this voltage. AC voltage is present in the test set and the test fixtures during this test.

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
14. TEST PANEL		
a. PUSH TO RESET switch (S10)	Press and release	
b. INTERLOCK FAIL indicator.	Check-should be off	Malfunction 6.
15. MULTIMETER		
Function selector	Set to 50 Vdc	DC Output check.
	NOTE	
When measuring dc voltage, connect + probe to jack with (+), connect - probe to jack with (-).		
16. TEST FIXTURE No.	1	
a. Jacks A (+) and E (-)	Check for +28+2 Vdc.	Malfunction 7
b. Jacks B (+) and E (-)	Check for +20+2 Vdc.	Malfunction 7
c. Jacks C (+) and E (-)	Check for +5+1 Vdc.	Malfunction 7
d. Jacks D (-) and E (+)	Check for -5+1 Vdc.	Malfunction 7
17. TEST FIXTURE No.	3	
RGP CYCLE switch	Set to ON.	
18. TEST PANEL		
BITE CYCLING indicator (DS2)	Check-should be on	Malfunction 8
19 TEST FIXTURE No.	3	
RGP CYCLE switch.	Set to OFF.	
20. TEST PANEL		
BITE CYCLING indicator	Check-should be off.	Malfunction 9
21. TEST FIXTURE No.	3	
RANGE DELAY ERROR switch	Set to ON	

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS



EL6KC031

22.	TEST PANEL RANGE/DELAY ERROR indicator (DS3)	Check - should be on.	Malfunction 10
23.	TEST FIXTURE NO. 3 RANGE DELAY ERROR switch	Set to OFF	
24.	TEST PANEL RANGE/DELAY ERROR indicator	Check - should be off.	Malfunction 11
25.	TEST FIXTURE NO. 3 RGP FAULT switch	Set to ON	

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
26. TEST PANEL		
a BITE GO indicator	Check - should be off.	Malfunction 12
b. BITE NO/GO indicator (DS4)	Check - should be on.	Malfunction 13
27. TEST FIXTURE NO. 3 RGP FAULT switch		Set to OFF.
28. TEST PANEL		
a. BITE NO/GO indicator	Check - should be off.	Malfunction 14
b. BITE GO indicator	Check - should be on.	
c. PANEL LIGHTS TEST switch (S9)	Press and hold.	
d. All indicators	Check - should be on.	Malfunction 15, 16
e. PANEL LIGHTS TEST switch	Release.	
f. PWR ON, BITE GO indicators	Check - should remain on.	Malfunction 16. 17
g. All other indicators	Check - should be off.	Malfunction 18
29. MULTIMETER	Set to 50 Vdc scale.	
30. TEST PANEL RANGE DELAY switch (S2).	Set to position 0	RANGE DELAY switch check
31. TEST FIXTURE NO 3 Jacks a (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19
32. TEST PANEL RANGE DELAY switch	Set to position 10.	
33. TEST FIXTURE NO. 3 Jacks b (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19
34. TEST PANEL RANGE DELAY switch	Set to position 20.	
35. TEST FIXTURE NO. 3 Jacks c (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
36. TEST PANEL RANGE DELAY switch	Set to position 30.	
37 TEST FIXTURE NO. 3 Jacks d (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19
38. TEST PANEL RANGE DELAY switch	Set to position 40.	
39. TEST FIXTURE NO 3 Jacks e (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19
40. TEST PANEL RANGE DELAY switch	Set to position 50.	
41. TEST FIXTURE NO. 3 Jacks f (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 19
42. TEST PANEL RANGE DELAY switch	Set to position 60.	
43. TEST FIXTURE NO. 3 Jacks g (+) and t (-)	Check for 20 + 2 Vdc	Malfunction 19
44. TEST PANEL RANGE switch (S3)	Set to position 25.	RANGE switch check
45. TEST FIXTURE NO. 3 Jacks h (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 20
46 TEST PANEL RANGE switch	Set to position 50.	
47. TEST FIXTURE NO. 3 Jacks i (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 20
48. TEST PANEL RANGE switch	Set to position 100.	
49. TEST FIXTURE NO. 3 Jacks j (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 20
50. TEST PANEL ANTENNA switch (S4)	Set to LEFT.	ANTENNA switch check
51. TEST FIXTURE NO. 3 Jacks q (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 21
52. TEST PANEL ANTENNA switch	Set to BOTH.	
53. TEST FIXTURE NO. 3 Jacks M (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 21

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
54. TEST PANEL ANTENNA switch	Set to RIGHT.	
55. TEST FIXTURE NO. 3 Jacks s (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 21
56. TEST PANEL PRF switch (S5)	Set to FIXED.	PRF switch check
57. TEST FIXTURE NO. 3 Jacks H (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 22
58. TEST PANEL PRF switch	Set to RANDOM.	
59. TEST FIXTURE NO. 3 Jacks H (+) and t (-)	Check for 0.0 Vdc.	Malfunction 23
60. TEST PANEL CORNER switch (S6)	Set to HI	CORNER switch check
61. TEST FIXTURE NO. 3 Jacks L (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 24
62. TEST PANEL CORNER switch	Set to LOW.	
63. TEST FIXTURE NO. 3		
a. Jacks L (+) and t (-)	Check for 0.0 Vdc.	Malfunction 25
b. Jacks V (+) and t (-)	Check for 0.0 Vdc.	Malfunction 26
64. TEST PANEL DATA MARK switch (S7)	Press and hold	DATA MARK switch check
65. TEST FIXTURE NO. 3 Jacks V (+) and t (-)	Check for 20 + 2 Vdc.	Malfunction 27
66. TEST PANEL DATA MARK switch		Release.
67 TEST FIXTURE NO 3 Jacks n (+) and t (-)	Check for 0.0 Vdc	Malfunction 28
68. TEST PANEL BITE TEST switch (S8)	Press and hold.	BITE TEST switch check
69. TEST FIXTURE NO. 3 Jacks n (+) and t (-)	Check for 20 + 2 Vdc	Malfunction 29

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
70. TEST PANEL		
a.	BITE TEST switch	Release.
b.	PWR switch	Set to OFF.
c.	All indicators Malfunction 30	Check - should be off.
71. MULTIMETER Function switch	Set to resistance.	R X 1 Range
72. TEST PANEL RESIDUE potentiometer (R2)	Turn fully clockwise.	RESIDUE potentiometer check
73. TEST FIXTURE NO. Jacks Y and Z	Check resistance - should be 0 to	3 Malfunction 31 20 ohms.
74. MULTIMETER Function switch	Set to Resistance.	R X 100 Range
75. TEST PANEL RESIDUE potentiometer	Turn fully counterclockwise	
76. TEST FIXTURE NO. Jacks Y and Z	Check for 500 + 100 ohms.	3 Malfunction 32
77. DIGITAL VOLTMETER Set POWER switch to ON.	Connect to ac power.	
78. POWER SUPPLY		
a. Output connections	Disconnect from J1 and J2 of test fixture No 3. Connect to test fixture No. 3 Jacks A (+) and k (-).	
b. Output voltage	Set to 4.70 + 0.05 Vdc using digital voltmeter.	
79. TEST FIXTURE NO. 3 Jacks A (+) and k (-).	Check for 4.70 + 0 05 Vdc.	
80. TEST PANEL DRIFT TEST potentiometer (R1)	Set to position 135	DRIFT TEST potentiometer check
81. TEST FIXTURE NO. Jacks A (+) and X (-)	Measure voltage with digital volt-	3 Malfunction 33 meter - should be 0.0 + 0.01 Vdc.

5-2b. Electrical Test of Test Panel (Cont)

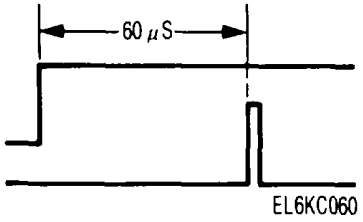
LOCATION/ITEM	ACTION	REMARKS
82. TEST PANEL DRIFT TEST potentiometer		Set to position 138.
83. TEST FIXTURE NO. 3 Jacks A (+) and X (-)	Check for 1.60 + 0.05 Vdc.	Malfunction 33
84. TEST PANEL DRIFT TEST potentiometer	Set to position 141.	
85. TEST FIXTURE NO. 3 Jacks A (+) and X (-)	Check for 3.20 _ 0.1 Vdc.	Malfunction 33
86. TEST EQUIPMENT		Test panel jack check
a. Power supply	Set power switch to OFF.	
b. Multimeter	Set to R X 1 range.	
87. TEST PANEL		
a. 1 SEC MARK J20 jack	Check for zero ohms to test fixture	Malfunction 34 No. 2 jack A.
b. ANT GATE R/T J22 jack	Check for zero ohms to test fixture	Malfunction 34 No. 2 jack J.
c. ANT BOTH J16 jack	Check for zero ohms to test fixture	Malfunction 34 No 2 jack B.
d. DEAD TIME GATE J14 jack	Check for zero ohms to test fixture No. 2 jack G.	Malfunction 34
e. 30 SEC MARK J21 jack	Check for zero ohms to test fixture No. 3 jack K.	Malfunction 35
f. ANT GATE IND J23 jack	Check for zero ohms to test fixture No. 3 jack G.	Malfunction 35
g. FT ENABLE J17 jack	Check for zero ohms to test fixture No. 3 jack p.	Malfunction 35
h. MT ENABLE J18 jack	Check for zero ohms to test fixture No 3 jack m.	Malfunction 35
i. PRE-VIDEO GATE J12 jack	Check for zero ohms to test fixture No. 3 jack N.	Malfunction 35
j. YOKE CLAMP J13 jack	Check for zero ohms to test fixture No. 3 jack R.	Malfunction 35
88. PULSE GENERATOR No. 1	Set for 5 MHz ±500 Hz, 4V, 0.1µs clock pulse.	Test set output check

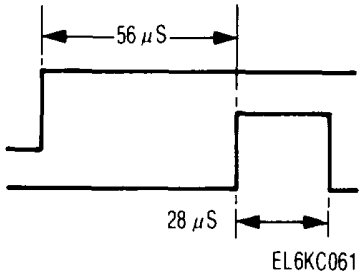
5-2b. Electrical Test of Test Panel (Cont)

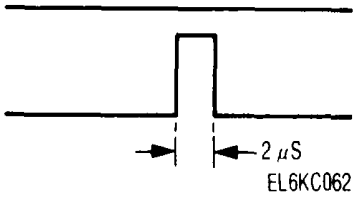
LOCATION/ITEM	ACTION	REMARKS
89. PULSE GENERATOR No. 2		
a. Power switch	Set to ON.	
b. Output	Set for 166µs, 4V pulse, 1333µs cycle time.	Use oscilloscope and frequency counter to set output.
90. POWER SUPPLY		
a. Output connections	Disconnect from test fixture No. 3 jacks A and K Connect to test fixture No. 3 +5 VDC and GND jacks.	
b. Power switch	Set to ON.	
c. Output voltage	Set to +5.0 ± 0.1 Vdc.	
91. TEST PANEL		
a. PWR switch	Set to ON.	
b. MT GEN switch (S12)	Set to ON.	
c. RANGE switch	Set to position 25.	
d. X SELECT switch (S1)	Set to position 3.	
e. Y SELECT switch (S15)	Set to position 3.	
f. ANTENNA switch	Set to RIGHT.	
g. TARGET WIDTH switch (S13)	Set to position 10.	
92. OSCILLOSCOPE		
a A input	Connect to SWP GATE IN jack J9. Set to 2 V/cm.	
b. B input	Connect to TRIG OUT jack J10. Set to 5 V/cm.	
c. Sweep time	Set to 10 µs/cm	

5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
93. TEST PANEL		
a. SWP GATE IN J9 jack	Measure time from leading edge of this signal to leading edge of signal at TRIG OUT jack - should be 60 ± 0.4 µs. See illustration.	Malfunction 36
b. TARGET WIDTH switch	Set to position 140.	
c. SWP GATE IN J9 jack	Measure time from leading edge of this signal to leading edge of signal at TRIG OUT jack - should be 56 + 0.5 µs. See illustration.	Malfunction 37
d. TRIG OUT J10 jack	Measure time interval between leading and trailing edges should be (28 ± 0.5µs)	
e. TARGET WIDTH switch	Set to position 10.	
f. TRIG OUT J10 jack	Measure time interval between leading and trailing edge-should be 2.0 ± 0.3 µs. See illustration.	Malfunction 38
94. PULSE GENERATOR NO. 2	Set pulse width to 669.6 µs.	
95. TEST PANEL		Malfunction 39
a. RANGE switch	Set to position 100.	
b. TRIG OUT J10 jack	Measure time interval between leading and trailing edges - should be 4.0 ± 0.3 µs.	



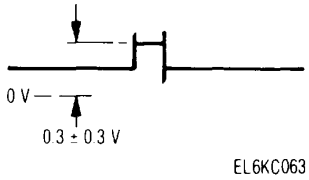
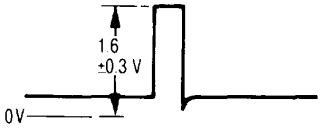
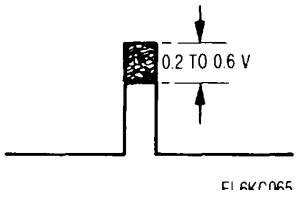




5-2b. Electrical Test of Test Panel (Cont)

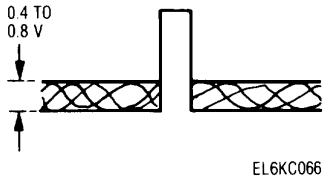
LOCATION/ITEM	ACTION	REMARKS
c. Pulse Generator No. 1	Disconnect from test set.	
d. Pulse Generator No. 2	Disconnect from test set.	
e. OSC Switch (S14)	Set to INT.	
f. TARGET LEVEL potentiometer (R6)	Set to position 10.	
g. MULT switch (S11)	Set to LOW.	
h. FREQ potentiometer (R3)	Set to position 1.	
i. AUDIO OUT J6 jack	With counter, measure signal frequency - should be 8 to 15 Hz.	Malfunction 41.
j. FREQ potentiometer	Set to position 10.	
k. AUDIO OUT J6 jack	Measure signal frequency - should be 100 to 140 Hz.	Malfunction 42
l. MULT switch	Set to HIGH.	
m. AUDIO OUT J6 jack	Measure signal frequency - should be 700 to 1300 Hz.	Malfunction 43
n. FREQ potentiometer	Set to position 1.	
o. AUDIO OUT J6 jack	Measure signal frequency - should be equal to or less than the result of step k.	Malfunction 44
p. Pulse generator No. 1	Connect to 5 MHz IN jack.	
q. Pulse generator No. 2	Connect to SWP GATE IN J9 jack.	
r. BASELINE CLUTTER potentiometer (R8)	Set to position 0.	
s. MT OUT J7 jack	Connect 100-ohm termination.	
t. TARGET CLUTTER potentiometer (R7)	Set to position 0.	

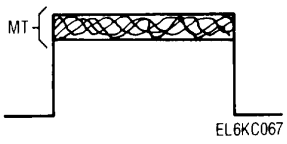
5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
u. TARGET LEVEL potentiometer	Set to position 0.	
v. OSC switch	Set to EXT.	
96. OSCILLOSCOPE		
a. Sweep time	Set to 5 µs/cm.	
b. Amplitude	Set to 0.5 V/cm.	
c. A input	Connect to MT OUT J8 jack.	
d. Display	Check pedestal - should be 0.3 ±0.3V. See illustration.	Malfunction 45  EL6KC063
97. TEST PANEL TARGET CLUTTER potentiometer	Set to position 10.	
98. OSCILLOSCOPE	Check pedestal - should be 1.6 ±0.3V. See illustration.	Malfunction 45.  EL6KC064
99. TEST PANEL		
a. OSC switch	Set to INT.	
b FREQ potentiometer	Set to position 5.	
c. TARGET LEVEL potentiometer	Set to position 10.	
100. OSCILLOSCOPE	Measure amplitude of doppler sine wave-should be 0 2 to 0.6V. See illustration.	Malfunction 46.  EL6KC065
101. TEST PANEL		
a. BASELINE CLUTTER potentiometer	Set to position 10.	
b. TARGET LEVEL potentiometer	Set to position 10.	

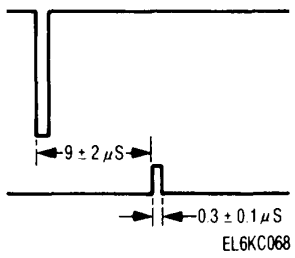
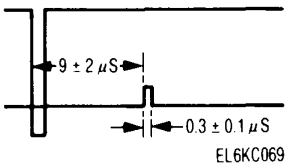
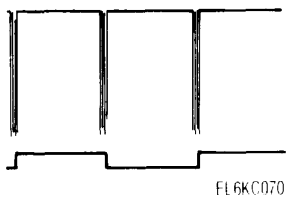
5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
102. OSCILLOSCOPE	Measure amplitude of doppler sine wave-should be 0.4 to 0.8V. See illustration.	Malfunction 47
103. TEST PANEL		
a. TARGET WIDTH switch	Set to SWP.	
b. RANGE switch	Set to position 100.	
c. BASELINE CLUTTER potentiometer	Set to position 0.	
d. TARGET LEVEL potentiometer.	Set to position 10.	
104. OSCILLOSCOPE		
a. Ext trigger	Connect to TRIG OUT J10 jack.	
b. Sweep time	Set to 0.1 ms/cm.	
c. A input	Connect to MT OUT J8 jack.	
d. Display	Check that the MT signal is present only during the trigger output. See illustration.	Malfunction 48
105. MULTIMETER	Set to dc volts.	5-volt range
106. TEST PANEL		
a. LEVEL 1 switch (S16)	Set to INHIBIT.	
b. ECCM LEVEL J27 jack should be +5 Vdc to ground.	Measure voltage with multimeter -	Malfunction 49
c. LEVEL 1 switch	Set to NORMAL.	
d. ECCM LEVEL jack to ground.	Measure voltage-should be 0.0 Vdc	Malfunction 50
107. TEST EQUIPMENT		
a. Pulse Generator No. 1	Disconnect from J5.	





5-2b. Electrical Test of Test Panel (Cont)

LOCATION/ITEM	ACTION	REMARKS
b. Pulse generator No. 2	Disconnect from J9. Connect to ECCM MOD TRIG J26 jack. Set output for: 750ns wide, 4.5 ± 0.45V negative pulse, 1667 + 70 µ repetition rate.	
c. Oscilloscope	Connect A input to ECCM MOD TRIG J26 jack. Connect B input to ECCM COINC J25 jack. Trigger from A input. Check for 9 +, µs from A signal to B signal. Check pulse width of B signal-should be0. ± 0.1 µs. See illustration.	Malfunction 51 ECCM circuit card check 
	Move B input to ECCM SCOPE SYNC J19 jack. Check for 9 ± 2 µs from A signal to signal. Check pulse width of B signal - should be 0.3 ± 0.1 µs. See illustration.	Malfunction 51 
	Set sweep time to 0.5 ms/cm. Move B input to ECCM MT OUT J1 jack. Check that the B signal toggles wit each pulse oil the A signal. See illustration.	Malfunction 51 
d. All test equipment Disconnect.	Set power switch to OFF.	

5-2c ELECTRICAL TEST OF BREAK OUT BOX

This task covers:

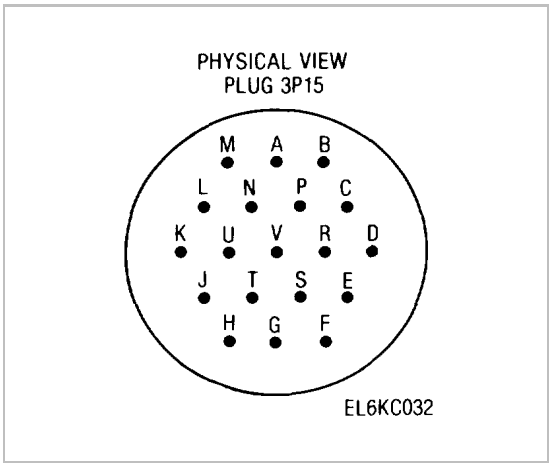
Electrical test of break out box

INITIAL SETUP:

Test Equipment	Special Environmental Conditions
Multimeter AN/USM-223	None
	General Safety Instructions
	None

NOTE

This procedure contains step-by-step instructions for testing electrical functions of the break out box. Each test has a malfunction number listed in the REMARKS column. If any test fails use that malfunction number to find the correct troubleshooting procedure in paragraph 5-3c.

LOCATION/ITEM	ACTION	REMARKS
1. MULTIMETER Function selector	Set to Resistance	To check continuity from cable plug to front panel jacks.
		
2. CABLE PLUG 3P15		
a. Pin A	Check for less than 0.1 ohm to front panel jack A.	Malfunction 1
b Pin B	Check for less than 0.1 ohm to jack B.	Malfunction 1
c. Pin C	Check for less than 0 1 ohm to jack C.	Malfunction 1

5-2c. Electrical Test of Break Out Box (Cont)

LOCATION/ITEM	ACTION	REMARKS
d. Pin D	Check for less than 0.1 ohm to jack D.	Malfunction 1
e. Pin E	Check for less than	Malfunction 1 0.1 ohm to jack E.
f. Pin F	Check for less than 0.1 ohm to jack F.	Malfunction 1
g. Pin G	Check for less than 0.1 ohm to jack G.	Malfunction 1
h. Pin H	Check for less than	Malfunction 1 0.1 ohm to jack H.
i. Pin J	Check for less than 0.1 ohm to jack J.	Malfunction 1
j. Pin K	Check for less than 0.1 ohm to jack K.	Malfunction 1
k. Pin L	Check for less than 0.1 ohm to jack L.	Malfunction 1
I. Pin M	Check for less than 0.1 ohm to jack M.	Malfunction 1
m. Pin N	Check for less than 0.1 ohm to jack N.	Malfunction 1
n. Pin P	Check for less than 0.1 ohm to jack P.	Malfunction 1
o. Pin R	Check for less than 0.1 ohm to jack R.	Malfunction 1
p. Pin S	Check for less than 0.1 ohm to jack S.	Malfunction 1
q. Pin T	Check for less than 0.1 ohm to jack T.	Malfunction 1
r. Pin U	Check for less than 0.1 ohm to jack U.	Malfunction 1
s. Pin V	Check for less than 0.1 ohm to jack V.	Malfunction 1

5-2c. Electrical Test of Break Out Box (Cont)

LOCATION/ITEM	ACTION	REMARKS
3. FRONT PANEL		
a. Jack L	Check for less than 0.1 ohm to jack DTG 1.	Malfunction 2
b. Jack M	Check for less than 0.1 ohm to jack DTG2.	Malfunction 2
c. Jack N	Check for less than 0.1 ohm to jack F/R1.	Malfunction 2
d. Jack P	Check for less than 0.1 ohm to jack F/R2.	Malfunction 2
e. Jack L	Check for less than 0.1 ohm to PULSE GEN SYNC jack.	Malfunction 2
f. Jack T	Check for less than 0.1 ohm to INPUT jack.	Malfunction 2
g. DDL-PROC switch (S1)	Set to PROC position.	
h. Jack R	Check for at least 1 megohm to ±5 VDC jack.	Malfunction 3
i. DDL-PROC switch	Set to DDL position.	
j. Jack R ohms to +5 VDC jack.	Check for 560 ± 56	Malfunction 4
k. Jack L ohms to ground.	Check for 100 ± 10	Malfunction 5
I. Jack M ohm to ground.	Check for 100 ± 10	Malfunction 6
m. Jack N ohms to ground.	Check for 100+10	Malfunction 7
n. Jack P ohms to ground.	Check for 100+10	Malfunction 8
o. Jack A 0.1 ohm to ground.	Check for less than	Malfunction 9

5-3. TROUBLESHOOTING

5-3a. Troubleshooting Test Set

This task covers:

Correcting malfunctions found during visual and physical test.

INITIAL SETUP

Tools

Electronic Equipment
Tool Kit TK-105/G

Special Environmental Conditions

None

General Safety Instructions

None

Equipment Condition

Test set cover removed (par 5-4a)

Test panel removed (para 5-4a)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. LOOSE OR MISSING ITEMS ON TEST PANEL. Check inside test set case for missing parts. Replace or tighten parts as necessary (para 5-6).
2. LOOSE OR DAMAGED ELECTRICAL COMPONENTS. Check inside test set case storage compartment for missing parts. Replace missing or damaged items. Tighten as necessary (para 5-6).
3. LOOSE OR MISSING ITEMS ON BREAK OUT BOX. Check inside test set cover storage compartment for missing items. Replace or tighten as necessary (para 5-10).
4. BREAK OUT BOX CABLE OR PLUG DAMAGED OR LOOSE. Check extent of damage. Repair or replace as necessary (para 5-10).
5. DAMAGED, LOOSE OR MISSING PARTS ON TEST SET CASE. If damaged item is replaceable, replace it. Install new item, repair or tighten as needed (para 5-8).
6. EXTENDER CARD DAMAGED. Check extent of damage. Repair as necessary (para 5-9).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
7. CABLE DAMAGED. Check extent of damage. Repair or replace cable as necessary (para 5-7).
8. OPERATOR CONTROL (SWITCH, POTENTIOMETER) FAILS TO OPERATE SMOOTHLY. Inspect for damage. Replace control if necessary (para 5-6).
9. DDL-PROC SWITCH FAILS TO OPERATE SMOOTHLY. Inspect for damage. Replace switch if defective (para 5-10).

5-3b. Troubleshooting Test Panel

This task covers:

Correcting malfunctions found during electrical test of test panel

INITIAL SETUP:

Test Equipment

Multimeter AN/USM-223

Tools

Electronic Equipment Tool Kit
TK-105/G (Tool Kit)

Screwdriver, No. 2
Phillips

Offset Screwdriver,
No. 1 Phillips

Printed Wiring Board
Repair Kit MX-772/U

Electronic Card Extractor
(in storage compartment)

Special Environmental Conditions

None

General Safety Instructions

None

Equipment Condition

Test set cover removed (para 5-4a)
Test panel removed (para 5-4a)

References
Para 5-14
Fig. FO-1 and FO-2

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. Resistance between POWER IN J4 pins low.
Step 1. Check for foreign object between pins of J4. Remove foreign object.
Step 2. Check for foreign object on back side of J4 and CB1. Remove six screws and cover from back of J4 and CB1. Remove foreign object.
Step 3. Check for short circuit inside CB1. Remove wires from CB1 and check continuity from terminals 2 to 4, 2 to 6, and 4 to 6. If any reading is less than 1 megohm, replace CB1 (para 5-6).
Step 4. Check whether problem still exists. Replace J4 jack (para 5-6).
2. Resistance between POWER IN J4 pins low.
Step 1. Check transformer T1 for short circuit. Remove wires from T1. Check resistance from terminals 1 to 2, 1 to 3, 2 to 3. If any reading is less than 30 ohms, replace T1 (para 5-6).
Step 2. Check relay K1 for short circuit. Remove wires from K1 terminals A2, B2 and C2 Measure resistance from A2 to B2, A2 to C2, and B2 to C2. If any reading is less than 1 megohm, replace K1 (para 5-6).
Step 3. Check for short circuit in wiring between CB1, K1 and T1 Repair as necessary (para 5-14).
3. Resistance between POWER IN J4 pins high.
Step 1. Check for open circuit breaker CB1 Remove six screws and cover from back of J4 and CB1 Turn on CB1 Check resistance between terminals 1 to 2, 3 to 4, 5 to 6. If any reading is not zero ohms, replace CB1 (para 5-6).
Step 2. Check filters FL1, FL2, and FL3 for open circuit. Check resistance between the two terminals of each filter. If any reading shows open circuit, replace that filter (para 5-6).
Step 3. Check transformer T1 for open circuit. Remove wires from T1 terminals 1, 2, and 3 Check resistance from terminals 1 to 2, 1 to 3, and 2 to 3. If any reading shows open circuit, replace T1 (para 5-6).
Step 4. Check wiring between J4, CB1, FL1, FL2, FL3, and T1. Repair as necessary (para 5-14).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. Voltage present at POWER J1 jack with INTERLOCK BYPASS off.

   Check if K1 is energized electrically. Set multimeter to dc volts. Measure voltage between test jacks J and E of test fixture No. 1.
   - A. If +28 Vdc is measured, replace K1 (para 5-6).
   - B. If 0.0 Vdc is measured, check for short circuit to ground in wiring between K1-E2 and TEST SET TEST J3 jack-pin J. Repair as needed (para 5-14).

5. 200 Vac not present at POWER J1 jack.

   Step 1. Check output of K1. Measure voltage between K1-Al to B1, Al to C1 and B1 to C1
   - A. If every reading is 200 Vac, check for break in wiring between K1-Al and J1-P. K1-B1 and J1-S, and K1-Ci and J1-T. Repair as necessary (para 5-14).
   - B. If any reading is not 200 Vac go to step 2.

   Step 2. Check input to K1. Measure voltage between K1 terminals A2 to B2, A2 to C2, and B2 to C2. Each reading should be 200 Vac.
   - A. If any reading is not 200 Vac, check for break in wiring from FL1 to K1-A2, FL2 to K1-B2, or FL3 to K1-C2. Repair as needed (para 5-14).
   - B. If every reading is 200 Vac, go to step 3.

   Step 3. Check for +28 Vdc from K1 terminals El(+) to E2(-).
   - A. If reading is +28 Vdc, replace K1 (para 5-6).
   - B. If reading is 0.0 Vdc, check for break in wiring between +28V at XA3-H and K1 -El. Also check for break between J3-J to K1-E2. Repair wiring as necessary (para 5-14).

6. INTERLOCK FAIL indicator stays on.

   Step 1. Check PUSH TO RESET switch. Set multimeter function to Resistance. Disconnect ac power Press and hold PUSH TO RESET switch. Check continuity from one switch terminal to the other.
   If reading is not zero ohms, replace switch (para 5-6).

   Step 2. Check Oscillator and Switch Module 1A2 by replacing it.
   Install new module (para 5-6).

   Step 3. Check wiring. Test continuity between PUSH TO RESET switch and XA2-X
   Repair as necessary (para 5-14).

7. DC voltages not present.

   Step 1. Check Power Supply Regulator Module 1A3 by replacing it.
   Install new module (para 5-6).

5-3B. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check transformer T1 outputs. Check for 26 +8 Vac between T1 terminals 4 to 5, 5 to 6, and 4 to 6 (used for +28 Vdc and +20 Vdc supplies). Check for 7.4 + 1.5 Vac between T1 terminals 7 to 8, 8 to 9, 7 to 9 (used for +5 Vdc supply). Check for 8.1 +0.8 Vac between T1 terminals 10 to 11. 11 to 12, 10 to 12 (used for -5 Vdc supply).

A. If all readings are correct, check for open circuit between T1 and XA3 connector See schematic for pin numbers. Repair as necessary (para 5-14).
B. If any reading is not correct, go to step 3.

Step 3. Check inputs to T1. Check for 200 Vac between T1 terminals 1 to 2, 1 to 3, and 2 to 3.

A. If all readings are correct, replace T1 (para 5-6).
B. If any reading is not correct, check for break in wiring between filters FL1, FL2, FL3 and T1. Repair as necessary (para 5-14).

8. BITE CYCLING indicator fails to turn on.

Step 1. Check indicator by replacing it.
Replace if defective (para 5-6).

Step 2. Check Oscillator and Switch Module 1A2 by replacing it.
Replace if defective (para 5-6).

Step 3. Check for open circuit in wiring. Test continuity from XA2-16 to BITE CYCLING indicator.
Test continuity from XA2-17 to pin C of SIGNAL J2 jack.
Repair wiring as necessary (para 5-14).

9. BITE CYCLING indicator fails to turn off.

Check Oscillator and Switch Module 1A2 by replacing it.
Replace if defective (para 5-6).

10. RANGE/DELAY ERROR indicator fails to turn on.

Step 1. Check indicator by replacing it.
Replace if defective (para 5-6).

Step 2. Check Oscillator and Switch Module 1A2 by replacing it.
Replace if defective (para 5-6).

Step 3. Check wiring. Test continuity from XA2-R to RANGE/DELAY ERROR indicator. Test continuity from XA2-5 to pin r of SIGNAL J2 jack.
Repair wiring as necessary (para 5-14).

11. RANGE/DELAY ERROR indicator fails to turn off.

Check Oscillator and Switch Module 1A2 by replacing it.
Replace if defective (para 5-6).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
12. BITE GO indicator fails to turn off.
Step 1. Check Oscillator and Switch Module 1A2 by replacing it. Replace if defective (para 5-6).
Step 2. Check wiring. Test for a short circuit to ground between test set ground (XA2-15) and XA2-U (output to BITE GO indicator). Repair short circuit (para 5-14).
13. BITE NO/GO indicator fails to light.
Step 1. Check indicator by replacing it. Replace if defective (para 5-6).
Step 2. Check Oscillator and Switch Module 1A2 by replacing it. Replace if defective (para 5-6).
Step 3. Check wiring. Test for open circuit between XA2-T and BITE NO/GO indicator Repair open circuit (para 5-14).
14. BITE NO/GO indicator fails to turn off.
Check Oscillator and Switch Module 1A2 by replacing it. Replace if defective (para 5-6).
15. Indicators fail to light (except PWR ON).
Step 1. Check PANEL LIGHTS TEST switch. Press and hold PANEL LIGHTS TEST switch S9. Test for continuity between terminals 2 and 3 of the switch. Replace switch if defective (para 5-6).
Step 2. Check Oscillator and Switch Module 1A2 by replacing it. Replace if defective (para 5-6).
Step 3. Check indicator by replacing it. Replace if defective (para 5-6).
Step 4. Check wiring. Test continuity between XA2 and indicator. See schematic for pin number. Repair open circuit as necessary (para 5-14).
16. PWR ON indicator fails to turn on.
Step 1. Check indicator by replacing it. Replace if defective (para 5-6).
Step 2. Check wiring. Test for open circuit between XA3-H and one terminal of PWR ON indicator. Also test between the other indicator terminal and test set ground. Repair open circuit as required (para 5-14).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

17. BITE GO indicator fails to remain on.

    Check Oscillator and Switch Module 1A2 by replacing it.
    Replace if defective (para 5-6).

18. Indicators fail to turn off.

    Check Oscillator and Switch Module 1A2 by replacing it.
    Replace if defective (para 5-6).

19. Open circuit through RANGE DELAY switch.

    Step 1. Check wiring. Test for open circuit from +20V line at XA3-E to RANGE DELAY switch S2-13 Also test for open circuit from the switch position that failed to SIGNAL J2 jack (see schematic for pin numbers)
    A. If open circuit is found, repair as necessary (para 5-14).
    B. If no open circuit is found, go to step 2.

    Step 2. Replace RANGE DELAY switch S2.
    Install new switch (para 5-6).

20. Open circuit through RANGE switch.

    Step 1. Check wiring. Test for open circuit from +20V line at XA3-E to RANGE switch S3-8. Test for open circuit from the switch position that failed to SIGNAL J2 jack (see schematic for pin numbers).
    A. If open circuit is found, repair as necessary (para 5-14).
    B. If no open circuit is found, go to step 2.

    Step 2. Replace RANGE switch S3.
    Install new switch (para 5-6).

21. Open circuit through ANTENNA switch.

    Step 1 Check wiring. Test for open circuit from XA3-E to ANTENNA switch S4. Also test for open circuit from the switch position that failed to SIGNAL J2 jack (see schematic for pin numbers).
    A. If open circuit is found, repair as necessary (para 5-14).
    B. If no open circuit is found, go to step 2.

    Step 2. Replace ANTENNA switch S4.
    Install new switch (para 5-6).

22. Open circuit through PRF switch.

    Step 1. Check switch for proper circuit. Test continuity from PRF switch terminals S5-1 to S5-2. Should be zero ohms.
    Replace switch if defective (para 5-6).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Check wiring. Test for open circuit from +20 volt line XA3-E to S5-2 Test for open circuit from S5-1 to SIGNAL J2 jack J2-H.
Repair wiring (para 5-14).

23. Voltage present with PRF switch in RANDOM position.

Replace PRF switch S5.
Install new switch (para 5-6).

24. Open circuit through CORNER switch.

Step 1. Check switch S6 for open circuit. Test continuity from CORNER switch terminals S6-1 to S6-2.
Replace switch if defective (para 5-6).

Step 2. Check wiring. Test for open circuit from +20 volt line XA3-E to S6-2 Test for proper circuit from S6-1 to SIGNAL J2 jack J2-L.
Repair wiring (para 5-14).

25. Voltage present with CORNER switch in LOW position.

Replace CORNER switch S6.
Install new switch (para 5-6).

26. Voltage present with DATA MARK switch OFF.

Replace DATA MARK switch S7.
Install new switch (para 5-6).

27. Open circuit through DATA MARK switch.

Step 1. Check switch S7 for open circuit. Push and hold switch S7 Test continuity from S7-1 to S7-3
Replace switch if defective (para 5-6).

Step 2. Check wiring. Test for open circuit from +20volt lineXA3-EtoS7-1. Test for open circuit from S7-3 to SIGNAL J2 jack J2V.
Repair wiring (para 5-14).

28. Voltage present with BITE TEST switch OFF.

Replace BITE TEST switch S8.
Install new switch (para 5-6).

5-3B. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
29. Open circuit through BITE TEST switch.
Step 1. Check switch S8 for open circuit. Push and hold BITE TEST switch. Test continuity from S8-1 to S8-3. Replace switch if defective (para 5-6).
Step 2. Check wiring. Test for open circuit from +20 volt line XA3-E to S8-1. Test for open circuit from S8-3 to SIGNAL J2 jack J2-n. Repair wiring (para 5-14).
30. Indicators fail to turn off.
Replace circuit breaker CB1. Install new circuit breaker (para 5-6).
31. High resistance through RESIDUE potentiometer R2.
Step 1. Check wiring. Test for open circuit from terminal CW of R2 to SIGNAL J2 jack J2-Y. Test for open circuit from R2-CCW to J2-Z. Repair wiring (para 5-14).
Step 2. Replace potentiometer R2. Install new potentiometer (para 5-6).
32. Low resistance through RESIDUE potentiometer R2.
Replace potentiometer R2. Install new potentiometer (para 5-6).
33. Wrong voltage at DRIFT TEST potentiometer R1.
Step 1. Adjust potentiometer iTB1-R11. See para 5-12 for instructions.
Step 2. Replace DRIFT TEST potentiometer R1. Install new potentiometer (para 5-6), then adjust 1TB1-R11 (para. 5-12).
Step 3. Check 1TB1-R10 and R11. See schematic of 1TB1 for pin numbers and values. Replace defective components (para 5-5).
34. Open circuit from test panel jack to test fixture No. 2.
Check wiring. Test for open circuit from test panel jack to SIGNAL PROCESSOR POWER J1 jack (see schematic for pin numbers). Repair wiring (para 5-14).
35. Open circuit from test panel jack to test fixture No. 3.
Check wiring. Test for open circuit from test panel jack to SIGNAL PROCESSOR SIGNAL J2 jack (see schematic for pin numbers). Repair wiring (para 5-14).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
36. Time from SWP GATE IN to TRIG OUT signals is not 60 ± 0.5 µs.
Step 1. Check X SELECT switch S1, Y SELECT switch S15, TARGET WIDTH switch S13, RANGE switch S3, and MT GEN switch S12. Remove Clock and Counter Module 1A1. Test for open circuit from XA1 through each switch (see schematic for pin numbers). Repair wiring or replace switch as necessary (para 5-14, 5-6).
Step 2. Check Clock and Counter Module 1Al by replacing it. Install new module (para 5-6).
Step 3. Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
37. Time from SWP GATE IN to TRIG OUT signals is not 56 ± 0.5 µs.
Check TARGET WIDTH switch S13. Remove Clock and Counter Module 1Al. Test for open circuit through S13 from XA1-14 to XA3-W. Repair wiring or replace switch as necessary (para 5-14, 5-6).
38. TRIG OUT signal is not 28 ± 0.5 µs.
Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
39. TRIG OUT signal is not 2 ± 0.3 µs.
Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
40. TRIG OUT signal is not 4 ± 0.3 µs. Check RANGE switch S3. Remove Clock and Counter Module 1A1. Test for open circuit through S3 from XA1-Y to XA3-W. Reading should be zero ohms. Repair wiring or replace switch as necessary (para 5-14, 5-6).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
41. AUDIO OUT signal frequency is not 8 to 15 Hz
Step 1. Check OSC switch S14 and MULT switch S11. Remove Oscillator and Switch Module 1A2 Test for open circuit through S14 from XA2-E to XA2-7. Test for open circuit through S11 from XA2-5 to 1TB1-3, and also from XA2-6 to 1TB1-2. Each reading should be zero ohms. Repair wiring or replace switch as necessary (para 5-14, 5-6).
Step 2. Check TARGET LEVEL potentiometer R6 and FREQ potentiometers R3A and R3B Remove Oscillator and Switch Module 1A2. Test resistance through R6, R3A, and R3B from XA2 connector See schematic for pin numbers and resistance values. Repair wiring or replace potentiometer as necessary (para 5-14, 5-6).
Step 3. Check capacitors C2 and C3, and resistor R4 (located on 1TB1). See schematic for pin numbers and values. Replace defective components (para 5-5).
Step 4. Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
42. AUDIO OUT signal frequency is not 100 to 140 Hz.
Step 1 Check FREQ potentiometers R3A and R3B. Remove Oscillator and Switch Module 1 A2. Test resistance through R3A from XA2-5 to TB1-5. Test resistance through R3B from XA2-5 to TB1-7. Each reading should change from 0 to 2500 ohms as the knob is turned Replace defective potentiometer (para 5-6).
Step 2. Check Oscillator and Switch Module 1A2 by replacing it Install new module (para 5-6).
43 AUDIO OUT signal frequency is not 700 to 1300 Hz.
Step 1. Check MULT switch S11. Remove Oscillator and Switch Module 1 A2. Test continuity through S11 from XA2-5 to TB1-4, and from XA2-6 to TB1-1. Each reading should be zero ohms Repair wiring or replace switch as necessary (para 5-14, 5-6).
Step 2. Check capacitors C1 and C4 (on 1TB1) See schematic for pin numbers and values Replace defective components (para 5-5).
Step 3. Check Oscillator and Switch Module 1A2 by replacing it Install new module (para 5-6).
44. AUDIO OUT signal too high.
Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
45. MT OUT J8 display not correct.
Step 1. Check TARGET CLUTTER potentiometer R7, TARGET LEVEL potentiometer R6, and BASELINE CLUTTER potentiometer R8. Remove Oscillator and Switch Module 1A2 Measure resistance through R7, R6 and R8 from XA2. Check resistance with knobs at minimum and maximum settings. See schematic for pin numbers and values Repair wiring or replace potentiometer as needed (para 5-14, 5-6).
Step 2. Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
46. Doppler sine wave not correct.
Step 1. Check FREQ potentiometers R3A and R3B. Remove Oscillator and Switch Module 1A2 Measure resistance through R3A from XA2-5 to TB1-5, and R3B from XA2-5 to TB1-7 Each reading should change from 0 to 2500 ohms as the knob is turned Replace defective potentiometer (para 5-6).
Step 1. Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
47. Doppler sine wave not correct.
Step 1. Check BASELINE CLUTTER potentiometer R8 and TARGET LEVEL potentiometer R6 Remove Oscillator and Switch Module 1A2. Measure resistance through R8 and R6 at XA2 See schematic for pin numbers and values. Replace defective potentiometer (para 5-6).
Step 2. Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
48. High frequency display is not present during trigger output (only)
Check Oscillator and Switch Module 1A2 by replacing it. Install new module (para 5-6).
49.+5 volts not present at ECCM LEVEL jack.
Step 1. Check wiring. Test for open circuit between ECCM LEVEL jack and ECCM Circuit Card 1A6-E8. Test for open circuit between +5 volt line at XA3-V and 1A6-E11 Repair as necessary (para 5-14).
Step 2. Check ECCM Circuit Card 1A6 by replacing it. Install new card (para 5-6).
50. Voltage at ECCM LEVEL jack is not 0.0 Vdc.
Check LEVEL 1 switch S16 by replacing it. Install new switch (para 5-6).

5-3b. Troubleshooting Test Panel (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
51. Display of ECCM signals not correct.
Step 1. Check ECCM Circuit Card 1A6 by replacing it. Install new card (para 5-6).
Step 2. Check wiring. Test continuity from ECCM Circuit Card to test panel jacks (see schematic for pin numbers). Repair defective wiring (para 5-14).

5-3c. Troubleshooting Break Out Box

This task covers:

Correcting malfunctions found during Break Out Box electrical test (paragraph 5-2c).

INITIAL SETUP:	Special Environmental Conditions
	None
Tools	General Safety Instructions
Electronic Equipment Tool Kit, TK-105/G	None
Test Equipment	Equipment Condition
Multimeter AN/USM 223	Break Out Box cover removed (para 5-4b)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. No continuity from test jack to cable plug.
Step 1. Check test jack and wire connection. Replace jack or repair wire as necessary (para 5-10, 5-14).
Step 2. Check connection at cable plug 3P15. Repair as necessary (para 5-10).
2. No continuity between front panel jacks.
Step 1. Check connection at each jack. Repair as necessary (para 5-10).
Step 2. Check wire between jacks. Repair as necessary (para 5-14).
3. Continuity through DDL-PROC switch.
Check switch. Measure resistance from terminals 2 to 3 of DDL-PROC switch; should be infinity Replace switch if defective (para 5-10).
4. Wrong resistance from jack R through R5 and DDL-PROC switch.
Step 1. Check wiring. Check continuity from 3P15-R to resistor R5, from R5 to terminal 2 of DDL-PROC switch, and from terminal 3 of switch to +5 jack. Repair as necessary (para 5-14).
Step 2. Check components. Measure resistance of R5-should be 560 ohms. Measure resistance from terminals 2 to 3 of switch; should be zero ohms. Replace defective components (para 5-10).

5-3c. Troubleshooting Break Out Box (Cont)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. Wrong resistance from jack L to ground.

   Step 1. Check resistor R1. Measure resistance; should be 100 ohms.
   Replace if defective (para 5-10).

   Step 2. Check wiring.
   Repair as necessary (para 5-14).

6. Wrong resistance from jack M to ground.

   Step 1. Check resistor R2. Measure resistance; should be 100 ohms.
   Replace if defective (para 5-10).

   Step 2. Check wiring.
   Repair as necessary (para 5-14).

7. Wrong resistance from jack N to ground.

   Step 1. Check resistor R3. Measure resistance; should be 100 ohms
   Replace if defective (para 5-10).

   Step 2. Check wiring.
   Repair as necessary (para 5-14).

8. Wrong resistance from jack P to ground.

   Step 1. Check resistor R4 Measure resistance; should be 100 ohms.
   Replace if defective (para 5-10).

   Step 2. Check wiring.
   Repair as necessary (para 5-14).

9. Wrong resistance from jack A to ground

   Check wiring Measure resistance from 3P15-A to ground (test box housing), and from E1 to ground Both readings should be zero ohms.
   Repair as necessary (para 5-14).

Section II. DIRECT SUPPORT MAINTENANCE

5-4. DISASSEMBLY

5-4a. Test Set Disassembly

This task covers:

a. Cover removal b. Test panel removal

INITIAL SETUP

Tools

Electronic Equipment Tool Kit TK-105/G
Screwdriver, No. 2 Phillips
Screwdriver, No. 1 Phillips, Offset
Electronic Card Extractor

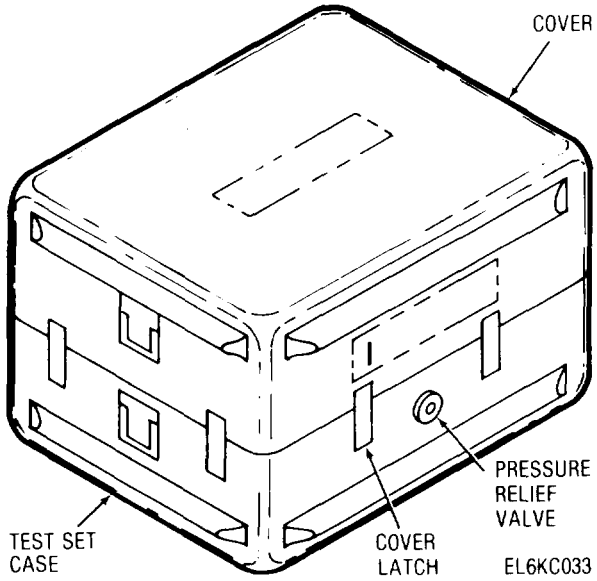
Special Environmental Conditions

None

General Safety Instructions

Make sure ac power is disconnected before disassembly

LOCATION/ITEM	ACTION	REMARKS
COVER REMOVAL		
1. TEST SET CASE		
a. Pressure Relief Valve	Press.	Makes air pressure equal inside case



b. Eight cover latches	Pull down. Release from cover	
c. Cover	Lift off	

5-4a. Test Set Disassembly (Cont)

LOCATION/ITEM	ACTION	REMARKS

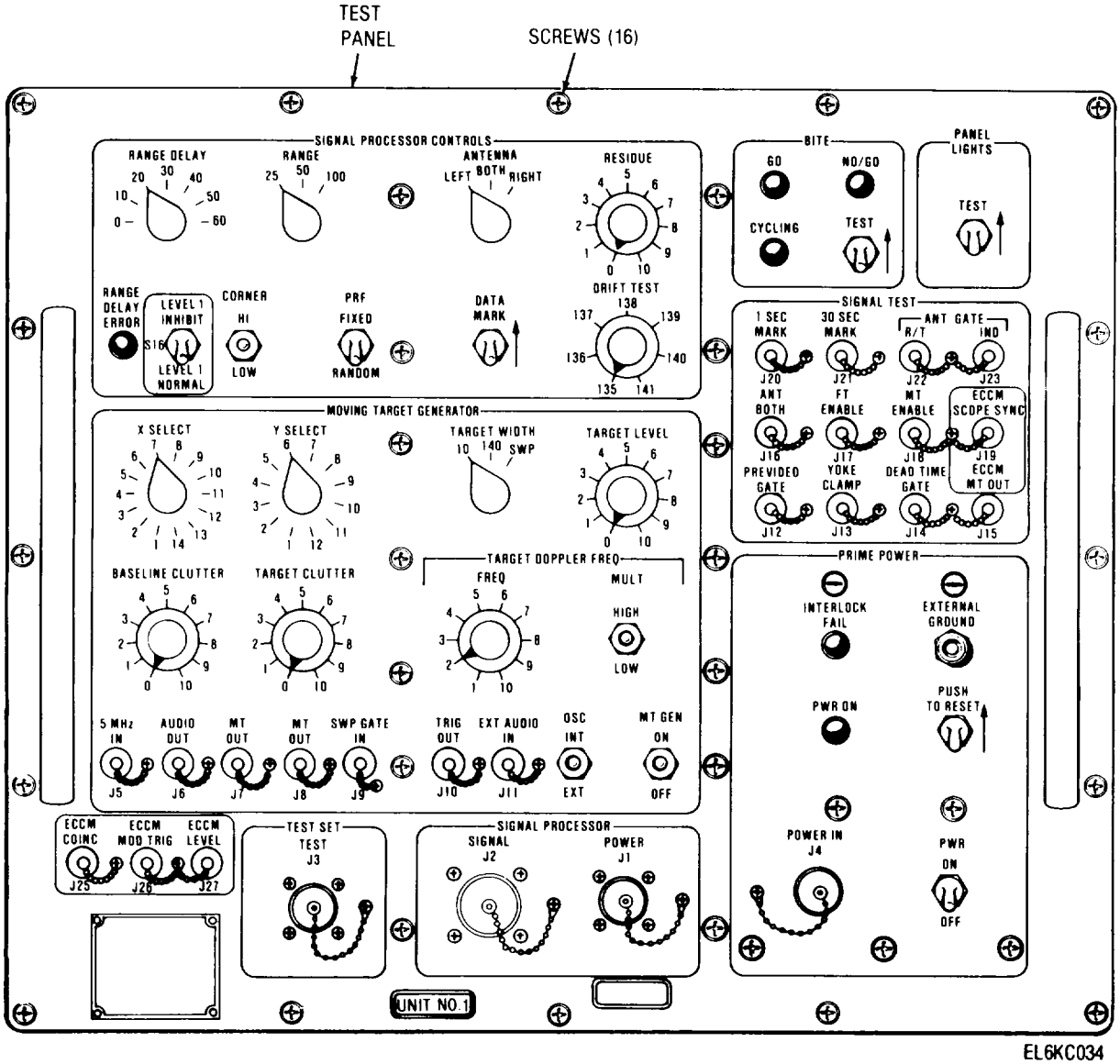
2. TEST PANEL

   a. 16 screws — Remove.

   b. 16 finishing washers — Remove.

3. TEST SET CASE

   Test panel — Lift out.
   Set on work surface.



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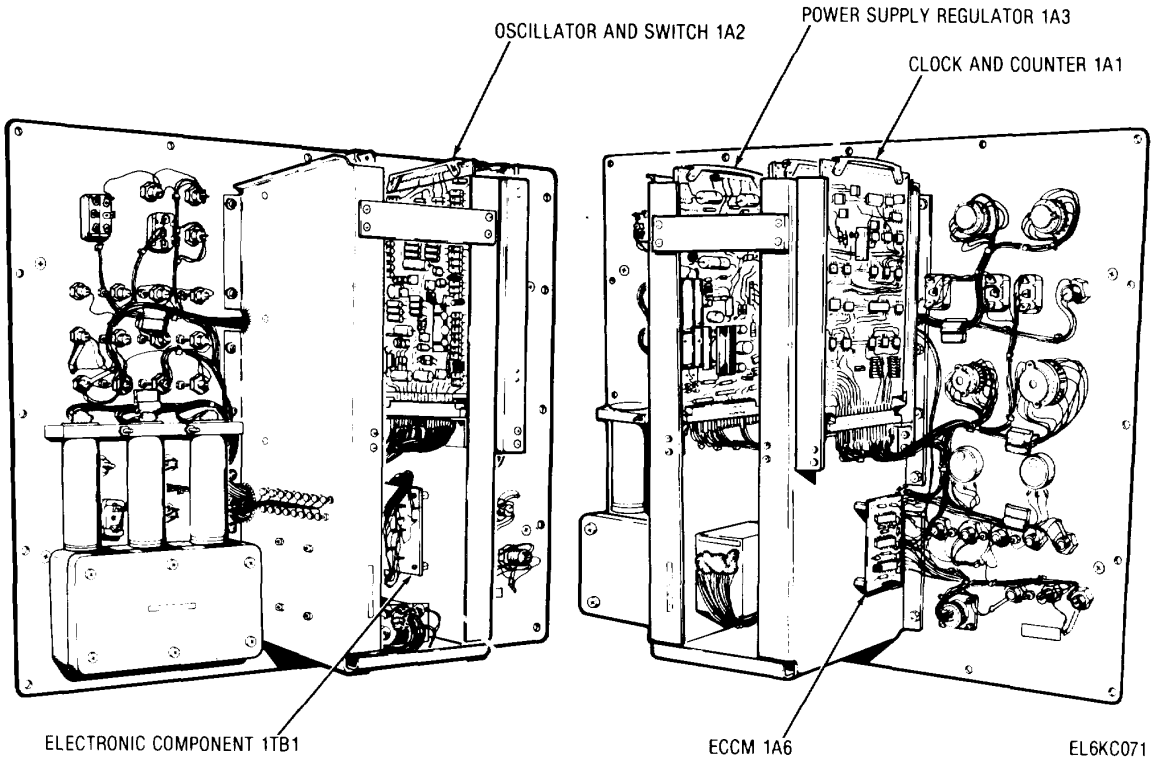
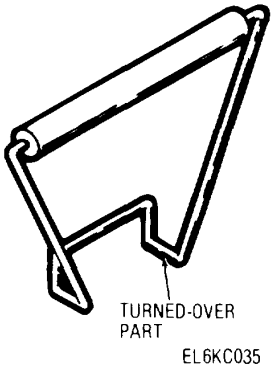
5-4a. Test Set Disassembly (Cont)

LOCATION/ITEM	ACTION	REMARKS
4. TEST PANEL		
a. Clock and Counter Module 1Al	Pull out with card extractor.	Clock and Counter Module is a plug-in circuit card.





NOTE

To use card extractor, hook the turned-over part on the top of the module. Pull the module out of its connector.

5-4a. Test Set Disassembly (Cont)

LOCATION/ITEM	ACTION	REMARKS
4. TEST PANEL (Cont)		
b. Oscillator and Switch Module 1A2	Pull out.	Oscillator and Switch Module is a plug-in circuit card.
c. Power Supply Regalia-for Module 1A3	Pull out.	Power Supply Regulator Module is a plug-in circuit card.
d. Electronic Component Assy 1TB1	Remove four screws, flat washers, and lock washers. Tag and unsolder 12 wires.	Electronic Component Assembly is a wired-in circuit card.
e. ECCM Circuit Card Assy 1A6	Tag and unsolder 12 wires. Remove four screws, flat washers, and lock washers.	ECCM Circuit Card is a wired-in circuit card

5.4b. BREAK OUT BOX DISASSEMBLY

This task covers:

Cover removal

INITIAL SETUP

Special Environment Conditions

None

Tools

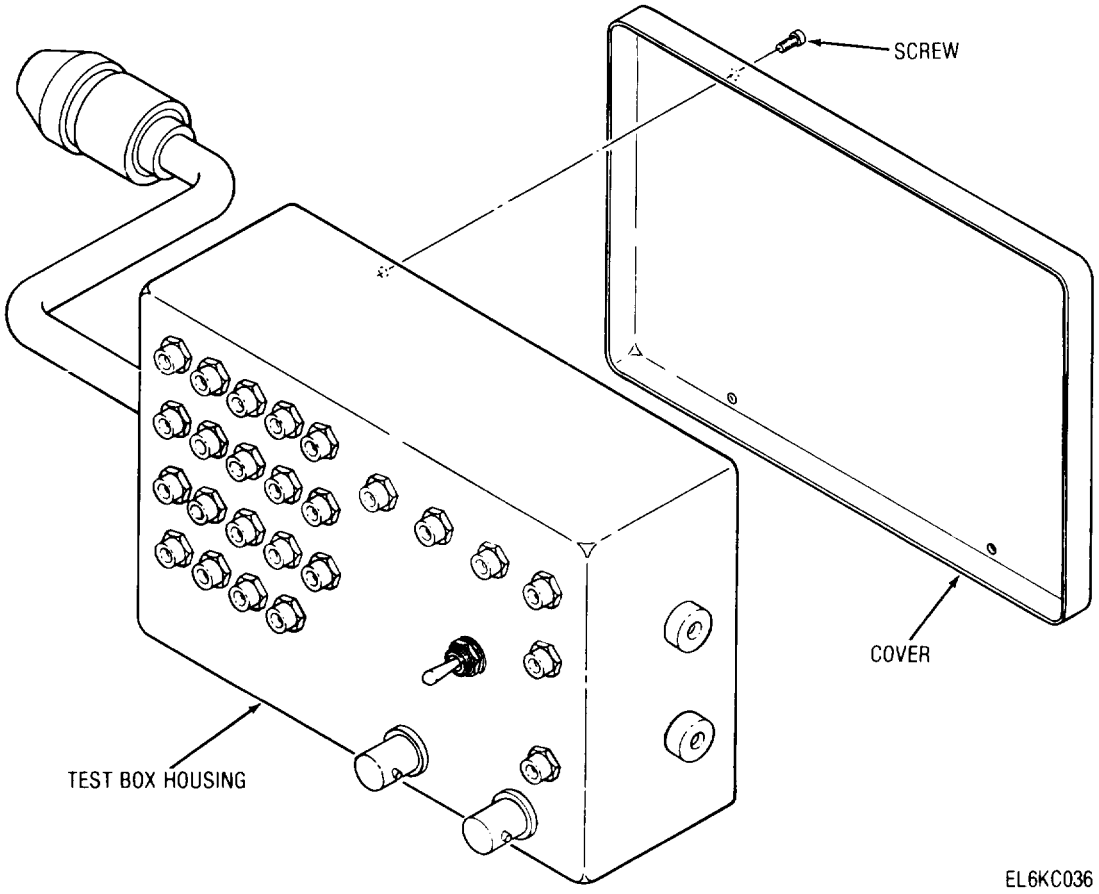
Electronic Equipment Tool Kit TK-105/G
Screwdriver, flat blade

General Safety Instructions

None

5-4a. Test Set Disassembly (Cont)

LOCATION/ITEM	ACTION	REMARKS
		NOTE Do not damage switch when you lay the box down.
1. COVER	Remove four screws	Screws should stay in cover.
2. TEST BOX HOUSING	Remove cover.	

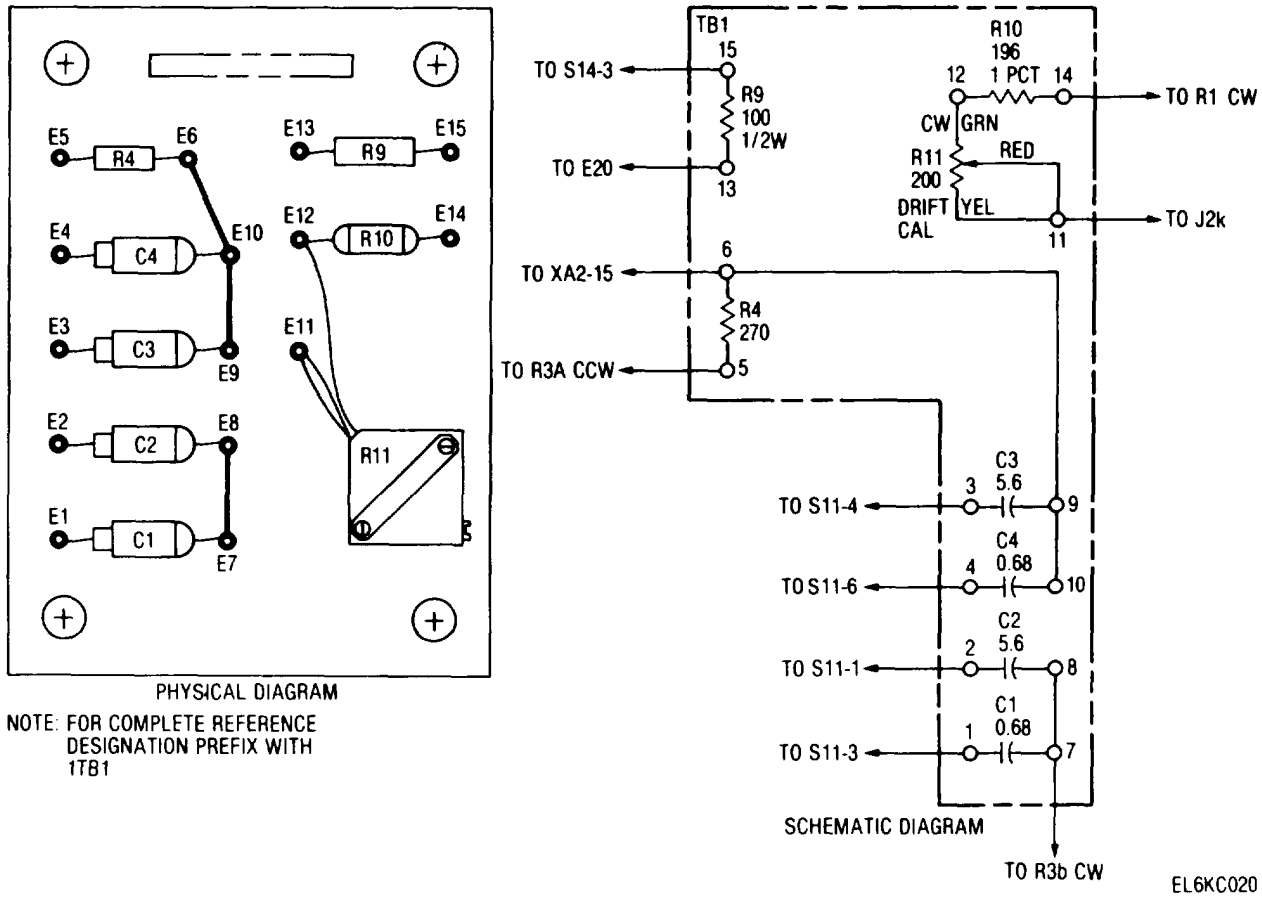


5-5. ELECTRONIC COMPONENT ASSEMBLY REPAIR

The Electronic Component Assembly ITB1 is repaired by replacing defective electrical components or by replacing the entire assembly. No special instructions are needed for unsoldering, replacing. and soldering

NOTE

If resistor R10, potentiometer R11, or the entire assembly is replaced, adjust R11 according to instructions in paragraph 5-12.



PHYSICAL DIAGRAM

NOTE: FOR COMPLETE REFERENCE DESIGNATION PREFIX WITH 1TB1

SCHEMATIC DIAGRAM

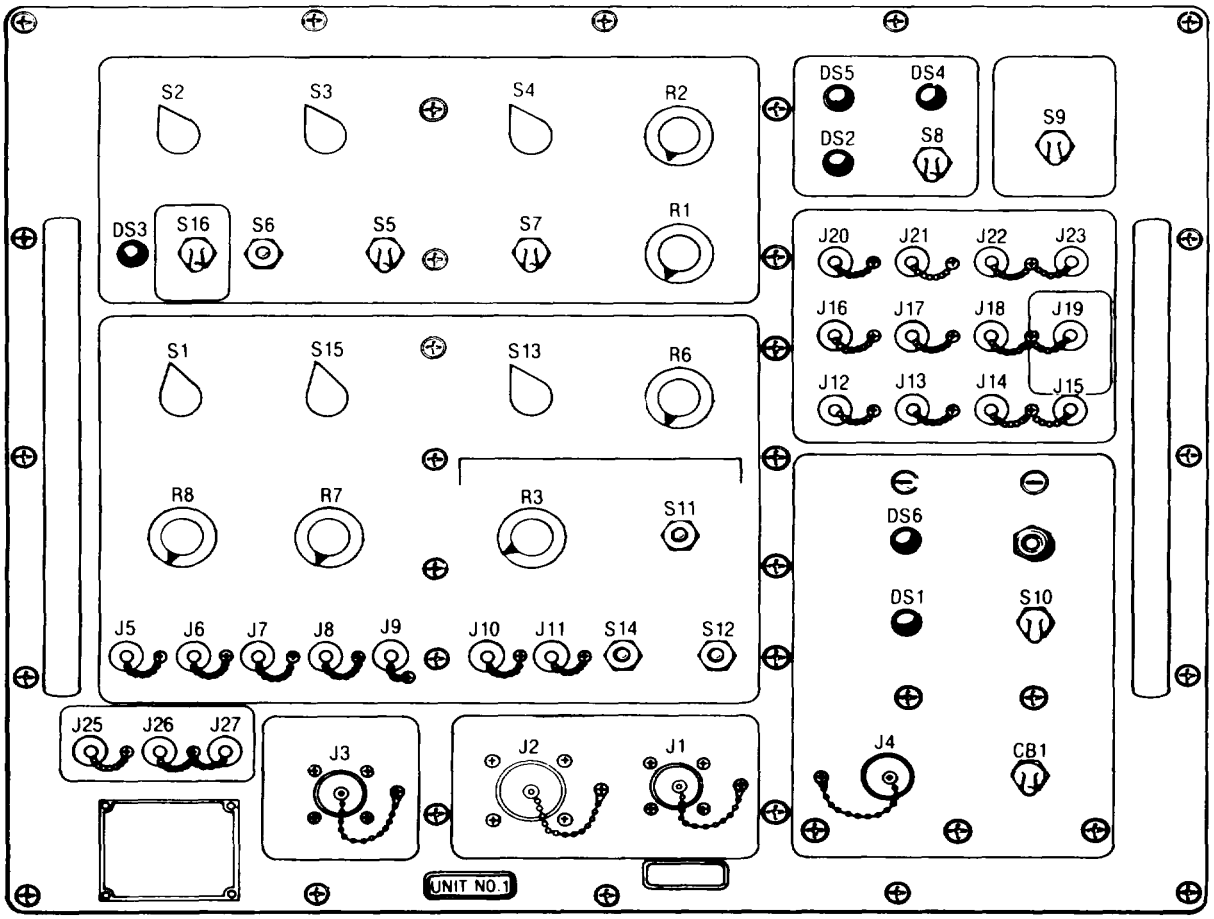
5-6. ELECTRICAL TEST PANEL REPAIR

Repairs on Electrical Test Panel at Direct Support level are limited to the following:

1. Replace modules 1Al, 1A2, 1A3, 1A6.
2. Repair or replace module 1TB1.
3. Replace chassis-mounted components.
4. Repair wiring
5. Replace entire test panel.

NOTE

Refer to paragraphs 5-4 and 5-11 for disassembly and reassembly instructions. Always tag all wires before unsoldering them. Be careful when soldering wires to switch terminals. Terminals are easily broken.



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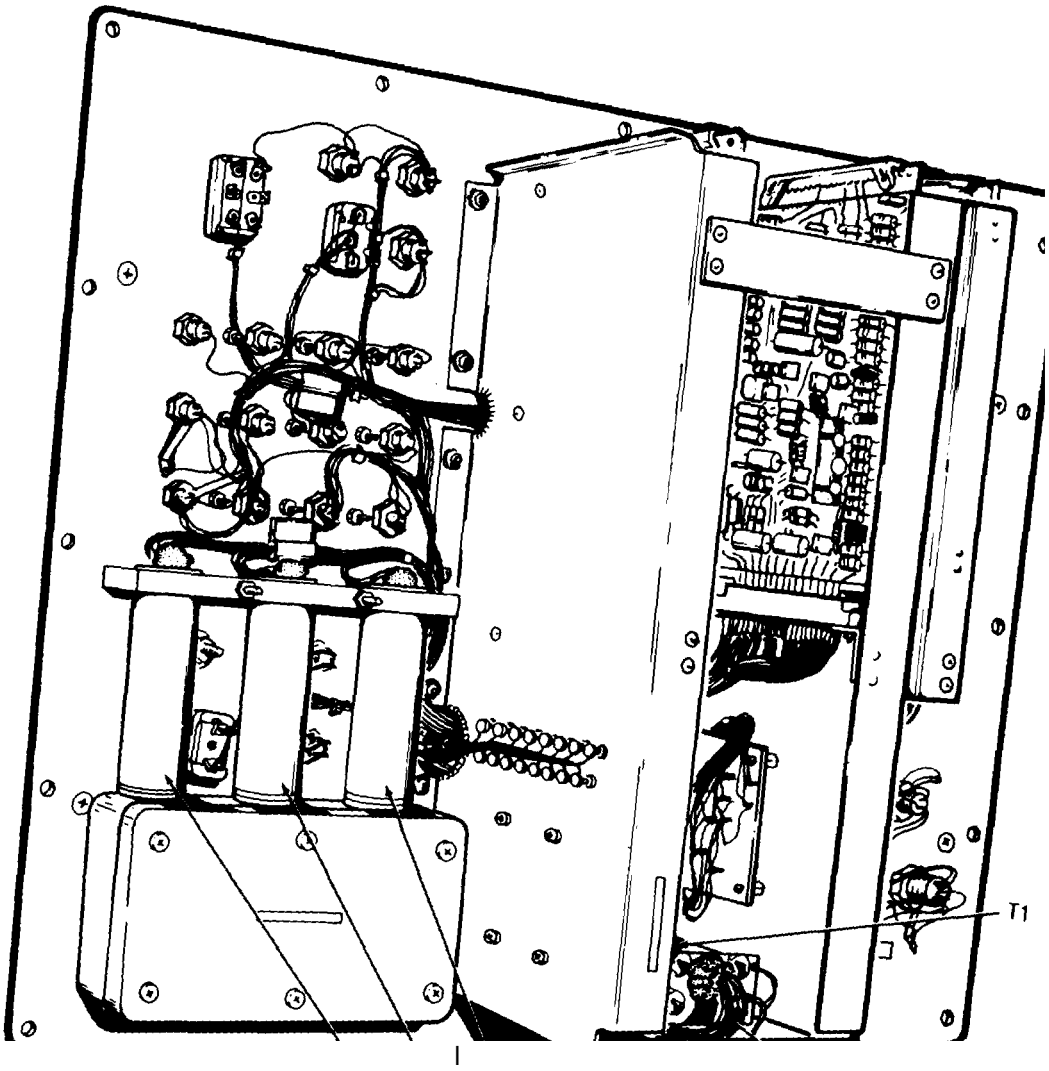
5-6 ELECTRICAL TEST PANEL REPAIR (Cont)



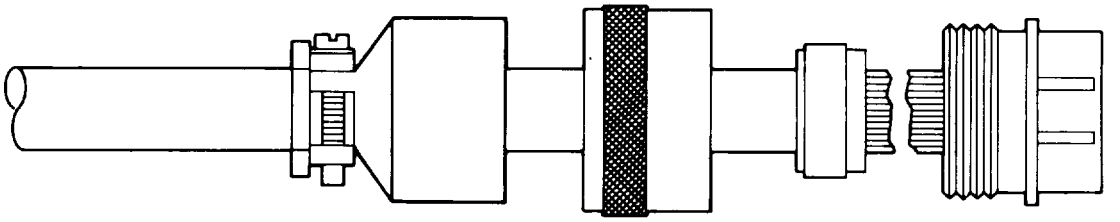
LOCATION OF PARTS, INTERIOR VIEW

5-7. 1 CABLE ASSEMBLY REPAIRS

Cable repairs are limited to checking continuity of wires, replacing damaged connectors, and resoldering wires to pins inside connectors. If there is an open circuit inside the cable, the entire cable must be replaced.

Refer to TM 55-1500-323-24 for general cable repair techniques.

Multiconductor cable connectors and BNC type coaxial cable connectors are replaced using standard shop



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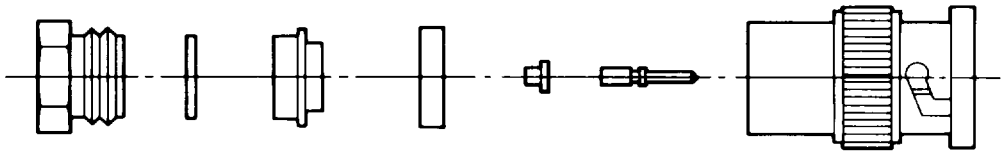

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5-8.1 TEST SET CASE REPAIR

Repairs on the test set case include replacing damaged items (cover latches, pressure relief valve, cover gasket), and repainting and refinishing exterior surfaces.

To replace an item on the case, you may have to remove the test panel from the case first. See paragraph 5-4 for instructions. No other special instructions are needed for repairs.

To repaint and refinish the case, see paragraph 3-3 for instructions.

5-9. EXTENDER CARD REPAIR

Extender card repairs include repairing broken solder runs and repairing the connectors. No special instructions are needed for these repairs.

5-10 BREAK OUT BOX REPAIR

Repairs to the Break Out Box include replacing defective components mounted on the test box housing, and repairing defective wiring. No special instructions are needed for these repairs.

5-11 ASSEMBLY

5-11a. Test Set Assembly

This task covers:

a. Test panel installation b.Cover installation

INITIAL SETUP

Tools

Electronic Equipment Tool Kit TK-105/G
Screwdriver, No. 2 Phillips
Screwdriver, No. 1 Phillips, Offset

Special Environmental Conditions

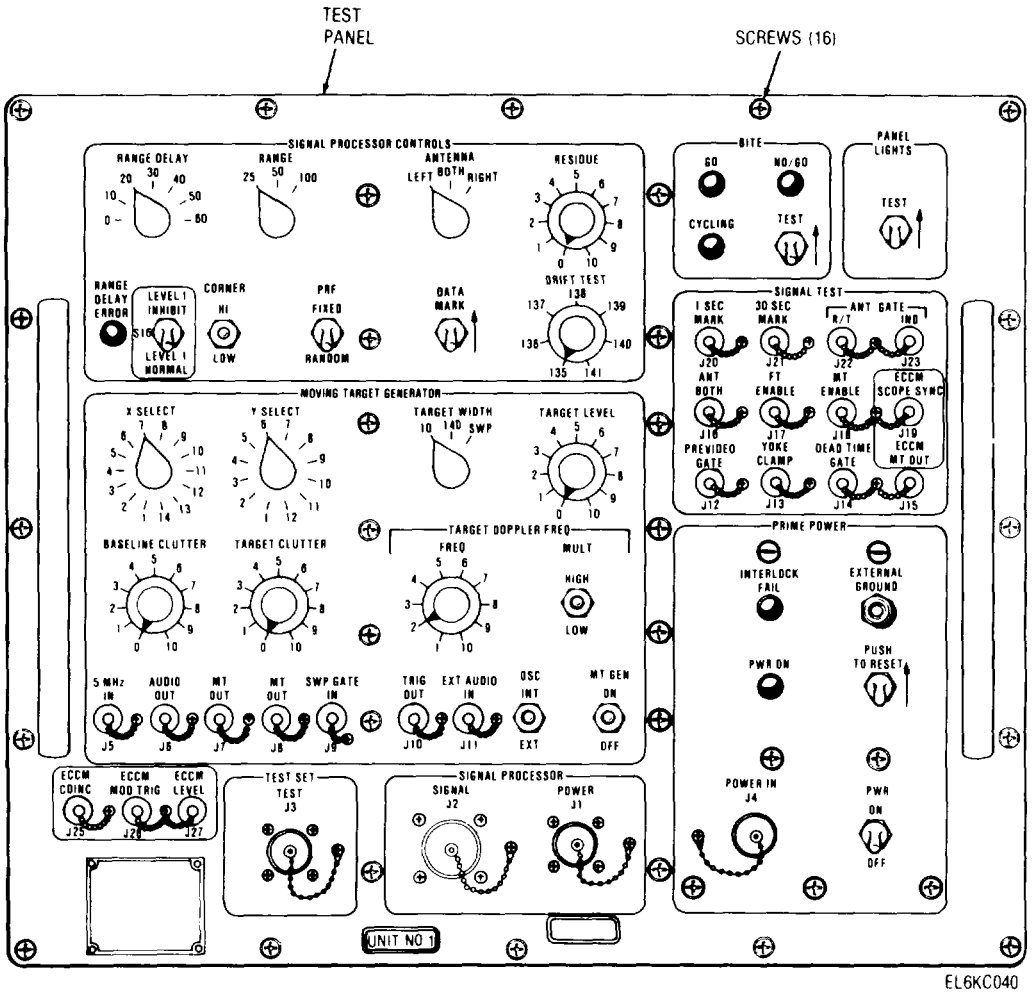
None

General Safety Instructions

None

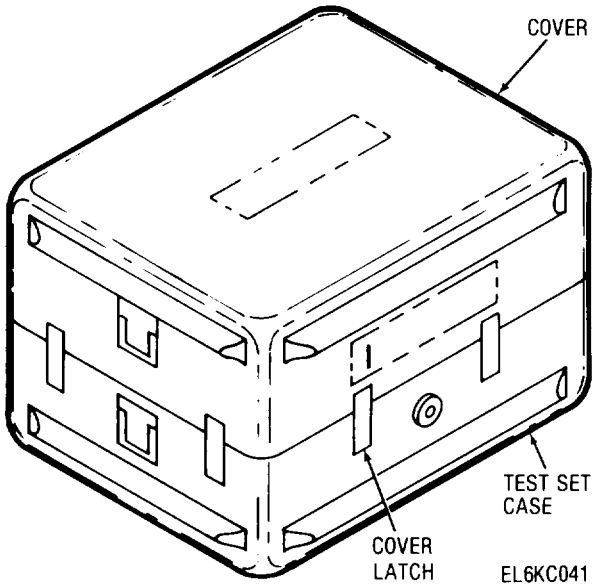
5-11a. Test Set Assembly (Cont)

LOCATION / ITEM	ACTION	REMARKS
TEST PANEL INSTALLATION		
1. TEST PANEL a. Plug-in Circuit cards	Make sure all are in place and secure.	
b. Wired-in circuit cards 1A6, 1TB1	Solder 12 wires. Install four screws, flat washers and lock washers.	
2. TEST PANEL	Install in test set case.	Test panel should be installed so that when test set is stood up, the two metal feet will be on the bottom.
3. TEST PANEL	Install 16 screws and	Install all screws before



5-11a. Test Set Assembly (Cont)

LOCATION/ITEM	ACTION	REMARKS
COVER INSTALLATION		
4. TEST SET CASE		
a. Storage compartment Lid	Close and latch.	
b. Cover	Install	
c. Eight cover latches	Engage cover. Push up to lock on	



5-11b. Break Out Box Assembly
This task covers:

Cover installation

INITIAL SETUP

Tools

Electronic Equipment Tool Kit TK-105/G
Screwdriver, flat blade

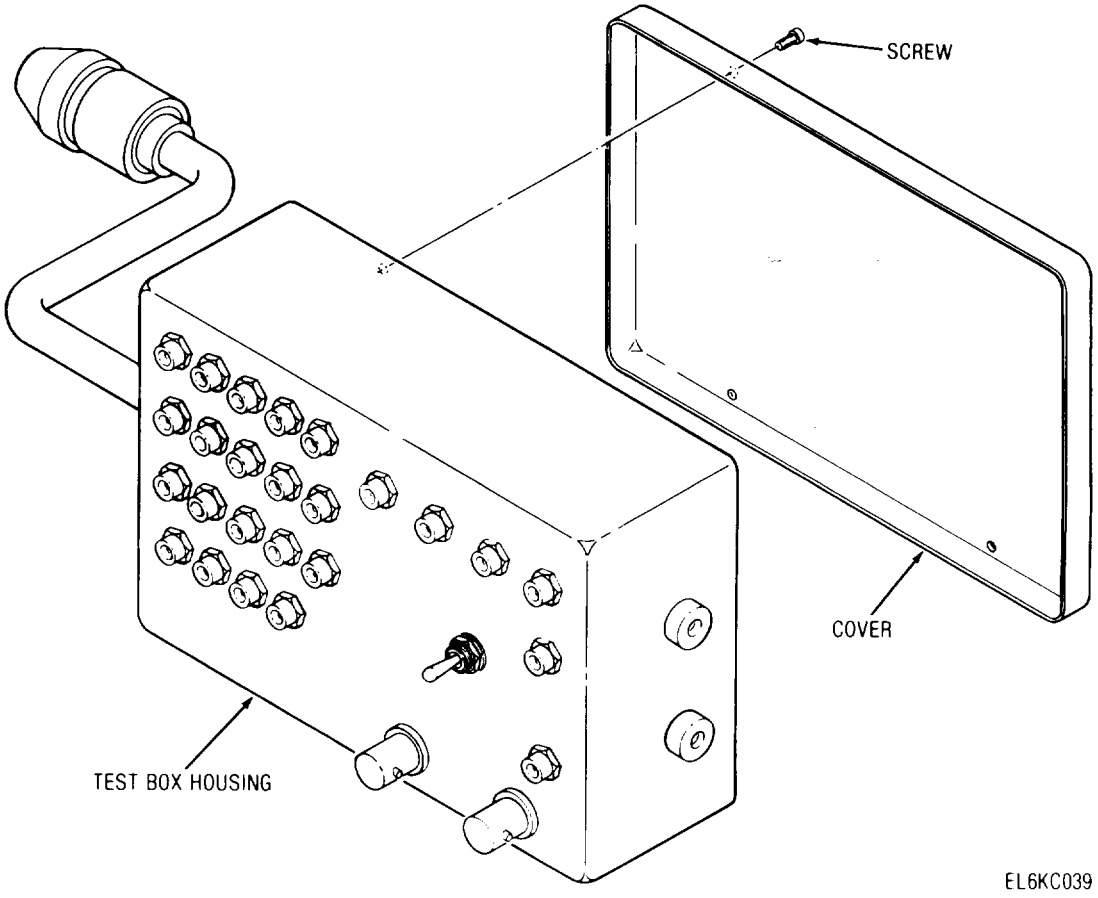
Special Environment Conditions

None

General Safety Instructions

None

LOCATION/ITEM	ACTION	REMARKS
1 TEST BOX HOUSING	Install cover.	
2. COVER	Install four screws.	



15-12. ADJUSTMENT

This task covers:

Adjustment of potentiometer 1TB1-R11.

INITIAL SETUP

TOOLS

Electronic Equipment Tool Kit TK-105/G

Test Equipment

Power Supply PP-3940/G

Processor Test Fixture No. 3
(locally fabricated, Appendix F)

Digital Voltmeter AN/GSM-64B

Multimeter AN/USM-223

Special Environmental Conditions

None

General Safety Instructions

None

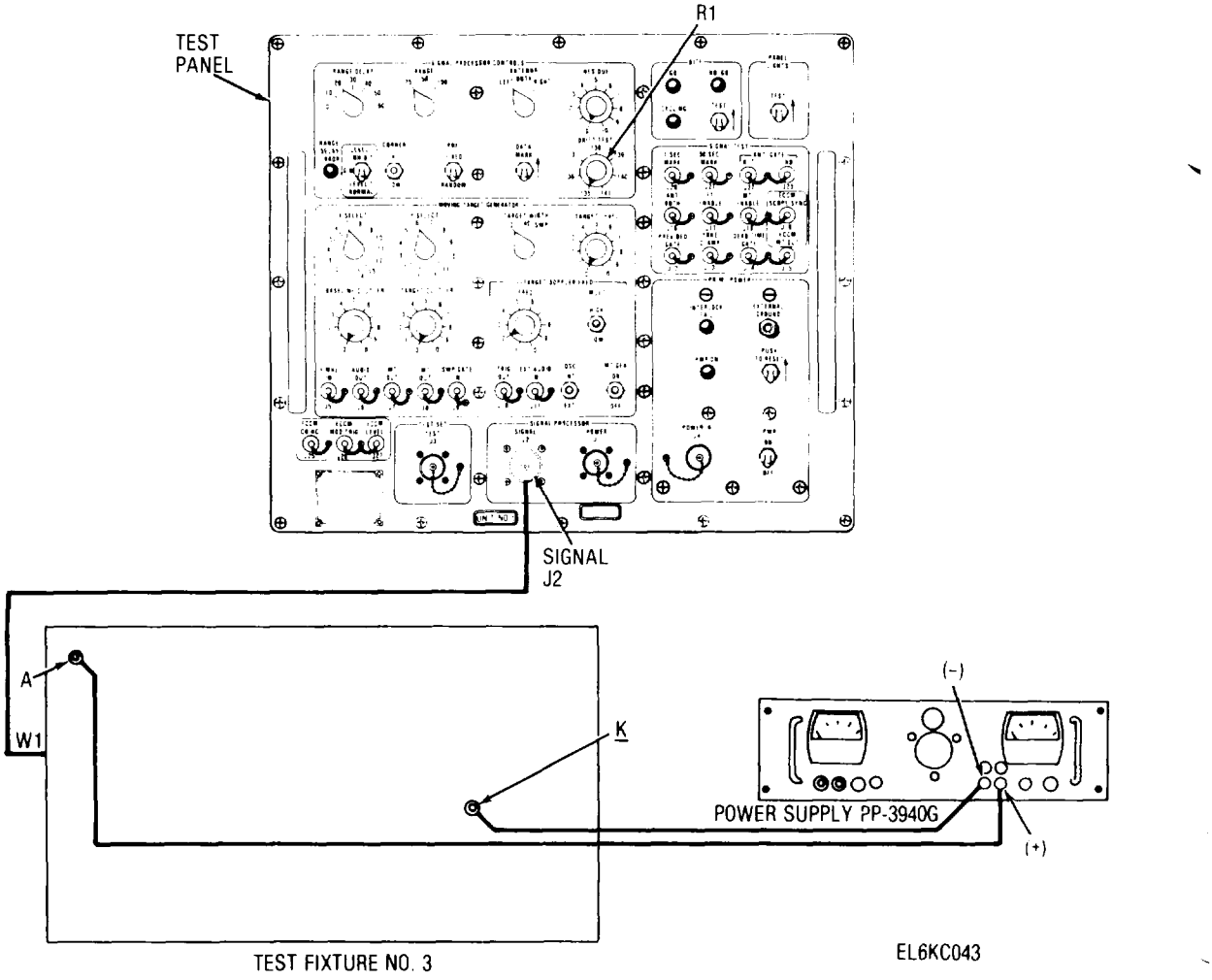
Equipment Condition

Test set cover removed (para 5-4a)

Test panel removed (para 5-4a)

5-12. ADJUSTMENT (Cont)

LOCATION/ITEM	ACTION	REMARKS
1. TEST EQUIPMENT		
Test fixture No. 3	Connect to test panel SIGNAL J2 jack as shown.	
2. TEST PANEL		
DRIFT TEST potentiometer (R1)	Set to position 135.	
3. TEST EQUIPMENT		
Multimeter	Set to Resistance (RX1 scale)	

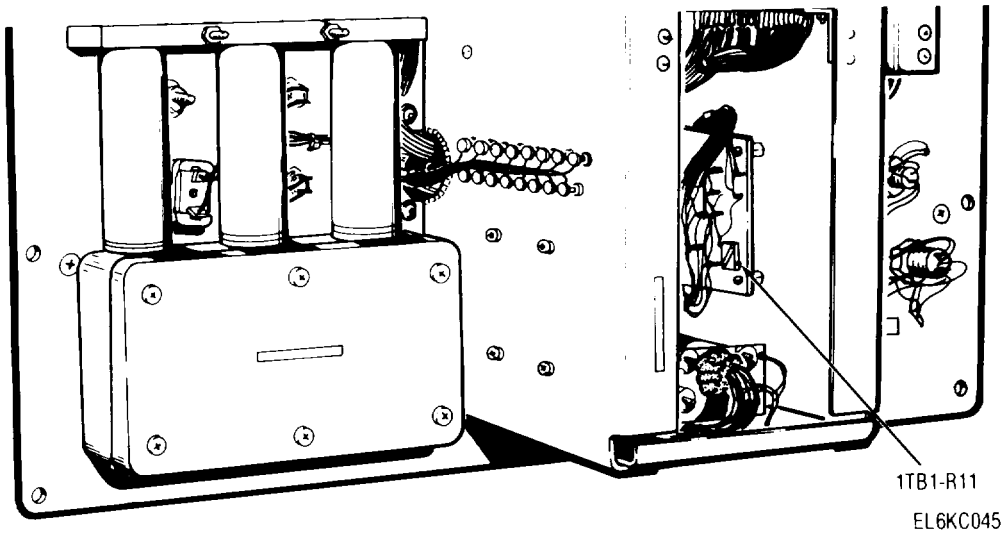


5-12. ADJUSTMENT (Cont)

LOCATION/ITEM	ACTION	REMARKS
4. TEST FIXTURE NO. 3		
Test jacks A (+) and X (-)	Connect multimeter.	
5. TEST PANEL		
a. DRIFT TEST potentiometeras possible.	Turn until resistance is as low of DRIFT TEST potentiometer	This is the initial setting ometer R1
	Check position of knob - should read exactly 135.	If reading is exactly 135, go to step 7.
b. DRIFT TEST knob	Loosen setscrews. Turn knob until pointer is set to 135. Tighten setscrews.	Do not turn potentiometer shaft.
6. TEST FIXTURE NO. 3		
Test jacks A (+) and X (-)	Check resistance again: should be the lowest possible reading when DRIFT TEST is set to 135.	Remove multimeter.
7. TEST EQUIPMENT		
Power supply	Connect to power. Turn on. Connect output to test fixture No. 3 jacks A (+) and k (-) as shown. With digital voltmeter, set output to 4.70 + 0.05 Vdc.	
8. TEST PANEL		
DRIFT TEST potentiometer	Set to 138.	
9. TEST FIXTURE NO. 3		
Test jacks A (+) and X (-) +1.6 + 0.05 Vdc.	Measure voltage; should be go to step 11.	If voltage is +1.6 + 0.05 Vdc

5-12 ADJUSTMENT (Cont)

LOCATION/ITEM	ACTION	REMARKS



10. ELECTRONIC COMPONENT ASSEMBLY 1TB1

Potentiometer R11	Adjust until voltage in step 9 is +1.6 + 0.01 Vdc.

11 TEST PANEL

DRIFT TEST potentiometer	Set to 135.

12. TEST FIXTURE NO 3

Test jacks A (+) and X (-)	Check for 0.0 + 0.01 Vdc.

13. TEST PANEL

DRIFT TEST potentiometer	Set to 141.

14. TEST FIXTURE NO. 3

Test jacks A (+) and X (-)	Check for 3 2 $\pm$ 0 1 Vdc

15. TEST EQUIPMENT — Disconnect.

5-13. FINAL TEST

After repairing or adjusting the test set, you can give it a functional test by following the test procedures in paragraph 5-2. All tests should result in normal indications.

5-14. WIRE LISTS

The following wire lists are provided to help you check continuity and repair wiring during troubleshooting procedures (para 5-3).

The first wire list is for the test panel, and the second list is for the break out box.

NOTE

The extent of wire repair to be performed by direct support personnel is limited to resoldering broken or loose wire connections. Repairs requiring replacement of harness wires should be referred to higher level maintenance.

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
223	A6-E1	J26			RG-187A/U
-----	A6-E2	E22	Black	22	W223 Shield
-----	A6-E3	E24	Black	22	W224 Shield
224	A6-E4	J25			RG-187A/U
-----	A6-E5	E26	Black	22	W226 Shield
226	A6-E6	J19			RG-187A/U
231	A6-E7	XA3-4	White	22	
227	A6-E8	S16-3	White	22	
225	A6-E9	J15			RG187A/U
----	A6-E10	E25	Black	22	W225 Shield
230	A6-E11	XA3-V	White	22	
232	A6-E12	E21	White	22	
229	A6-E12	S16-1	White	22	
104	CB1-1	FL1			
101	CB1-2	J4-A			
105	CB1-3	FL2			
102	CB1-4	J4-B			
106	CB1-5	FL3			
103	CB1-6	J4-C			
55	CR1-E2	XA2-21			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
68	DS1-NEG	E9			
138	E1	K1-X1			
139	E1	XA2-W			
139	E1	XA3-H			
218	E2	K1-X2			
175	E3	J2-t			
173	E4	XA3-1			
172	E5	XA3-6			
171	E6	XA3-16			
170	E7	S9-3			
169	E8	S10-3			
168	E9	DS1-NEG			
174	E10	J3-E			
167	E11	XA2-A			
166	E12	XA1-A			
165	E13	S3-1			
164	E14	S15-W1			
163	E15	S1-W1			
122	E16	T1-13			
178	E17	J1-V			
177	E18	J1-L			
181	E19	179 SHLD			
176	E20	TB1-13			
232	E21	A6-E12	White	22	
193	E21	180 Shld			
	E22	A6-E2	Black	22	W223 Shield

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
----	E24	A6-E3	Black	22	W224 Shield
----	E25	A6-E10	Black	22	W225 Shield
----	E26	A6-E5	Black	22	W226 Shield
104	FL1	CB1-1l			
110	FL1	K1-A2			
111	FL1	K1-A2			
107	FL1	T1-1			
105	FL2	CB1-3			
112	FL2	K1-B2			
113	FL2	K1-B2			
108	FL2	T1-2			
106	FL3	CB1-5			
114	FL3	K1-C2			
115	FL3	K1-C2			
109	FL3	T1-3			
73	J1-A	J20			
74	J1-B	J16			
---	J1-C	NC			
----	J1-D	NC			
60	J1-E	XA2-Y			
----	J1-F	NC			
182	J1-G	J14			
184	J1-H	183 SHLD			
183	J 1-J	J22			
----	J1-K	NC			
177	J1-L	E18			

5-14 WIRE LISTS (Cont)

Test Panel Wire List (Cont

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
----	J1-M	NC			
116	J1-N	K1-A1			
117	J1-P	K1-A1			
118	J1-R	K1-B1			
119	J1-S	K1-B1			
120	J1-T	K1-C1			
121	J1-U	K1-C1			
178	J1-V	E17			
189B	J2-A	R1-CCW			
190	J2-B	189 SHLD			
59	J2-C	XA2-17			
192	J2-D	191 SHLD			
57	J2-E	XA2-V			
198	J2-F	J2-J			
75	J2-G	J23			
92	J2-H	S5-1			
198	J2-J	J2-F			
76	J2-K	J21			
93	J2-L	S6-1			
90	J2-M	S4-2			
185	J2-N	J12			
----	J2-	NC			
106	J2-R	J13			
188	J2-S	186 SHLD			
----	J2-T	NC			
----	J2-U	NC			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
94	J2-V	S7-3			
----	J2-W	NC			
189A	J2-X	R1-WIPER			
191B	J2-Y	R2-CW			
191A	J2-Z	R2-CCW			
79	J2-a	S2-1			
80	J2-b	S2-2			
81	J2-c	S2-3			
82	J2-d	S2-4			
83	J2-e	S2-5			
84	J2-f	S2-6			
85	J2-g	S2-7			
86	J2-h	S3-5			
87	J2-i	S3-6			
88	J2-j	S3-7			
96	J2-k	TB1-11			
77	J2-m	J18			
95	J2-n	S8-3			
78	J2-p	J17			
89	J2-q	S4-1			
58	J2-r	XA2-S			
91	J2-4	4-3			
175	J2-t	ES			
141	J3-A	XOS3-POS			
149	J3-B	S2-13			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
159	J3-C	S12-5			
162	J3-D	XA1-P			
174	J3-E	E10			
----	J3-F	NC			
----	J3-G	NC			
----	J3-H	NC			
56	J3-J	XA2-21			
31	J3-K	XA1-R			
----	J3-L	NC			
61	J3-M	XA2-Y			
----	J3-N	NC			
----	J3-P	NC			
----	J3-R	NC			
----	J3-S	NC			
----	J3-T	NC			
----	J3-U	NC			
----	J3-V	NC			
101	J4-A	CB1-2			
102	J4-B	CB1-4			
103	J4-C	CB1-6			
----	J4-D	NC			RG-187A/U
----	J4-D	NC			
----	J4-E	NC			
179	J5	XA1-M			
39	J6	XA2-4			
32	J7	J8			RG-1 87A/U
32	J7	J8			
	32	J8		J7	

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
33	J8	XA2-N			
180	J9	XA1-L			
38	J 10	XA2-K			
34	J11	S14-3			
185	J12	J2-N			
186	J13	J2-R			
182	J14	J1-G			
225	J15	A6-E9			RG-187A/U
74	J16	J1-B			
78	J17	J2-p			
77	J18	J2-m			
226	J19	A6-E6			RG-187A/U
73	J20	J1-A			
76	J21	J2-K			
183	J22	J1-J			
75	J23	J2-G			
224	J25	A6-E4			RG-187A/U
223	J26	A6-E1			RG-187A/U
228	J27	S16-2	White	22	
116	K1-Al	J1-N			
117	K1-Al	J1-P			
110	K1-A2	FL1			
111	K1-A2	FL1			
118	K1-B1	J1-R			
119	K1-B1	J1-S			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
112	K1 -B2	FL2			
113	K1-B2	FL2			
120	K1-C1	J1-T			
121	K1-C1	J1-U			
114	K1-C2	FL3			
115	K1-C2	FL3			
138	K1-X1	El			
218	K1-X2	E2			
----	NC	J1-C			
----	NC	J1-D			
----	NC	J1-F			
----	NC	J1-K			
----	NC	J1-M			
----	NC	J2-P			
----	NC	J2-T			
----	NC	J2-U			
----	NC	J2-W			
----	NC	J3-F			
----	NC	J3-G			
----	NC	J3-H			
----	NC	J3-L			
----	NC	J3-N			
----	NC	J3-P			
----	NC	J3-R			
----	NC	J3-S			
----	NC	J3-T			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
----	NC	J3-U			
----	NC	J3-V			
----	NC	J4-D			
----	NC	J4-E			
----	NC	J15			
----	NC	J19			
----	NC	XA1-6			
----	NC	XA1-10			
----	NC	XA1-11			
----	NC	XA1-17			
----	NC	XA2-F			
----	NC	XA2-9			
----	NC	XA2-10			
----	NC	XA2-11			
----	NC	XA2-12			
----	NC	XA2-13			
----	NC	XA3-D			
----	NC	XA3-F			
-----	NC	XA3-N			
----	NC	XA3-P			
----	NC	XA3-R			
----	NC	XA3-S			
----	NC	XA3-T			
-----	NC	XA3-U			
-----	NC	XA3-X			
----	NC	XA3-Y			

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
—	NC	XA3-Z			
—	NC	XA3-2			
—	NC	XA3-3			
—	NC	XA3-5			
—	NC	XA3-6			
—	NC	XA3-7			
—	NC	XA3-8			
	NC	XA3-9			
—	NC	XA3-10			
—	NC	XA3-11			
—	NC	XA3-12			
—	NC	XA3-13			
—	NC	XA3-14			
—	NC	XA3-15			
—	NC	XA3-17			
—	NC	XA3-18			
—	NC	XA3-19			
97	R1-CW	TB1-14			
189B	R1 -ccw	32-A			
189A	RI-WIPER	J2-X			
191A	R2-CCW	J2-Z			
191A	R2-CCW	R2-Z			
217	R2-CCW	R2-WI PER			
191B	R-2CW	J2-Y			
191B	R2-CW	R2-Y			
191B	R2-Y	R2-CW			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
191A	R2-Z	R2-CCW			
217	R2-WIPER	R2-CCW			
48	R6-CCW	TB1-6			
45	R6-CW	XA2-8			
46	R6-WIPER	XA2-18			
51	R7-CCW	XA2-L			
49	R7-CW	XA2-M			
50	R7-WIPER	XA2-P			
54	R8-CCW	XA2-H			
52	R8-CW	XA2-J			
53	R8-WIPER	XA2-D			
220	R11-CCW	TB1-11			
221	R11-CW	TB1-12			
219	R11-WIPER	TB1-11			
197	R3A-CCW	R3A-WIPER			
68	R3A-CCW	TB1-5			
196	R3A-CW	R3B-WIPER			
65	R3A-CW	S11-5			
197	R3A-WIPER	R3A-CCW			
195	R3A-WIPER	R3B-CCW			
195	R3B-CCW	R3A-WIPER			
64	R3B-CCW	XA2-5			
67	R3B-CW	TB1-7			
196	R3B-WIPER	R3A-CW			
163	S1-W1	E15			
1	S1-2	XA1-3			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
2	S1-3	XA1-5			
3	S1-4	XA1-4			
4	S1-5	XA1-2			
5	S1-6	XA1-C			
6	S1-7	XA1-E			
7	S1-8	XA1-7			
8	S1-9	XA1-J			
9	S1-10	XA1-8			
10	S1-11	XA1-K			
11	S1-12	XA1-D			
12	S1-13	XA1-H			
13	S1-14	XA1-F			
79	S2-1	J2-a			
80	S2-2	J2-b			
81	S2-3	J2-c			
82	S2-4	J2-d			
83	S2-5	J2-e			
84	S2-6	J2-f			
85	S2-7	J2-g			
149	S2-13	J3-B			
148	S2-13	S3-8			
209	S3-1	S3-2			
209	S3-2	S3-1			
155	S3-3	S13-2			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
25	S3-4	XA1-Y			
86	S3-5	J2-h			
87	S3-6	J2-i			
88	S3-7	J2-j			
148	S3-8	S2-13			
147	S3-8	S6-2			
89	S4-1	J2-q			
90	S4-2	J2-M			
91	S4-3	J2-s			
144	S4-4	S7-1			
143	S4-4	XA3-E			
92	S5-1	J2-H			
146	S5-2	S6-2			
145	S5-2	S7-1			
93	S6-1	J2-L			
147	S6-2	S5-2			
146	S6-2	S5-2			
144	S7-1	S4-4			
145	S7-1	S5-2			
94	S7-3	J2-V			
151	S8-1	S12-2			
95	S8-3	J2-n			
142	S9-1	XDS4-POS			
63	S9-2	XA2-19			
170	S9-3	E7			
62	S10-1	XA2-X			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
169	S10-3	E8			
69	S11-I	TB1-2			
66	S11-2	XA2-6			
70	S11-3	TB1-1			
71	S11-4	TB1-3			
65	S11-5	R3A-CW			
72	S11-6	TB1-4			
151	S12-2	S8-1			
150	S12-2	XA3-E			
152	S12-3	XA2-2			
159	S12-5	J3-C			
157	S12-5	XA3-V			
158	S12-6	XA1-22			
29	S13-1	XA1-B			
155	S13-2	S3-3			
204	S13-2	S13-3			
204	S13-3	S13-2			
203	S13-3	S13-7			
28	S13-4	XA1-14			
194	S13-5	S13-6			
194	S13-6	S13-5			
27	S13-6	XA1-9			
203	S13-7	S13-3			
156	S13-7	XA2-22			
154	S13-7	XA3-W			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
26	S13-8	XA1-15			
36	S14-1	XA2-E			
37	S14-2	XA2-7			
34	S14-3	J11			
35	S14-3	TB1-15			
164	S15-W1	E14			
14	S15-2	XA1-S			
15	S15-3	XA1-W			
16	S15-4	XA1-T			
17	S15-5	XA1-20			
18	S15-6	XA1-V			
19	S15-7	XA1-X			
20	S15-8	XA1-U			
21	S15-9	XA1-21			
22	S15-10	XA1-18			
23	S15-11	XA1-19			
24	S15-12	XA1-16			
229	S16-1	A6-E12	White	22	
228	S16-2	J27	White	22	
227	S16-3	A6-E8	White	22	
70	TB1-1	S11-3			
69	TB1-2	S11-1			
71	TB1-3	S11-4			
72	TB1-4	S11-6			
68	TB1-5	R3A-CCW			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
48	TB1-6	R6-CCW			
222	TB1-6	TB1-9			
47	TB1-6	XA2-15			
67	TB1-7	R3B-CW			
224	TB1-7	TB1-8			
224	TB1-8	TB1-7			
222	TB1-9	TB1-6			
223	TB1-9	TB1-10			
223	TB1-10	TB1-9			
96	TBl-11	J2-k			
220	TBl-11	R11-CCW			
219	TB1-11	R11-WIPER			
221	TB1-12	R11-CW			
176	TB1-13	E20			
97	TB1-14	R1-CW			
35	TB1-15	S14-3			
107	T1-1	FL1			
108	T1-2	FL2			
109	T1-3	FL3			
123	T1-4	XA3-A			
124	T1-5	XA3-B			
125	T1-6	XA3-C			
126	T1-7	XA3-K			
127	T1-8	XA3-L			
128	T1-9	XA3-M			
129	T1-10	XA3-20			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
130	T1-11	XA3-21			
131	T1-12	XA3-22			
122	T1-13	E16			
166	XA1-A	E12			
210	XA1-A	XA1-1			
212	XA1-A	29 SHLD			
29	XA1-B	S13-1			
5	XA1-C	S1-6			
11	XA1-D	S1-12			
6	XA1-E	S1-7			
13	XA1-F	S1-14			
12	XA1-H	S1-13			
8	XA1-J	S1-9			
10	XA1-K	S1-11			
180	XA1-L	J9			
179	XA1-M	J5			
201	XA1-N	XA1-12			
162	XA1-P	J3-D			
208	XA1-P	XA1-13			
31	XA1-R	J3-K			
30	XA1-R	XA2-14			
14	XA1-S	S15-2			
16	XA1-T	S15-4			
20	XA1-U	S15-8			
18	XA1-V	S15-6			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
15	XA1-W	S15-3			
19	XA1-X	S15-7			
25	XA1-Y	S3-4			
206	XA1-Z	XA1-22			
210	XA1-1	XA1-A			
211	XA1-1	27 SHLD			
4	XA1-2	S1-5			
1	XA1-3	S1-2			
3	XA1-4	S1-4			
2	XA1-5	S1-3			
----	XA1-6	NC			
7	XA1-7	S1-8			
9	XA1-8	S1-10			
27	XA1-9	S13-6			
----	XA1-10	NC			
----	XA1-11	NC			
201	XA1-12	XA1-N			
153	XA1-12	XA2-B			
208	XA1-13	XA1-P			
161	XA1-13	XA2-C			
28	XA1-14	S13-4			
26	XA1-15	S13-8			
24	XA1-16	S15-12			
----	XA1-17	NC			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
22	XA1-18	S15-10			
23	XA1-19	S15-11			
17	XA1-20	S15-5			
21	XA1-21	S15-9			
158	XA1-22	S12-6			
206	XA1-22	XA1-Z			
167	XA2-A	Ell			
213	XA2-A	XA2-1			
215	XA2-A	33 SHLD			
153	XA2-B	XA1-12			
200	XA2-B	XA2-2			
161	XA2-C	XA1-13			
207	XA2-C	XA2-3			
53	XA2-D	R8-WIPER			
36	XA2-E	S14-1			
----	XA2-F	NC			
54	XA2-H	R8-CCW			
52	XA2-J	R8-CW			
38	XA2-K	J10			
51	XA2-L	R7-CCW			
49	XA2-M	R7-CW			
33	XA2-N	J8			
50	XA2-P	R7-WIPER			
41	XA2-R	XDS3-NEG			
58	XA2-S	J2-r			

5-14. WIRE LISTS (Cont)

Test Panel Wire List (Cont)

WIRE NO.	FROM	TO	COLOR	SIZE (AWG)	REMARKS
42	XA2-T	XDS4-NEG			
43	XA2-U	XDS5-NEG			
57	XA2 V	J2-E			
139	XA2-W	E1			
140	XA2-W	XDS3-POS			
62	XA2-X	S10-1			
60	XA2-Y	J1-E			
61	XA2-Y	J3-M			
205	XA2-Z	XA2-22			
213	XA2-1	XA2-A			
----	XA2-1	XA2-14			
214	XA2-1	30 SHLD			
152	XA2-2	S12-3			
200	XA2-2	XA2-B			
207	XA2-3	XA2-C			
160	XA2-3	XA3-4			
39	XA2-4	J6			
64	XA2-5	R3B-CCW			
66	XA2-6	S11-2			
37	XA2-7	S14-2			
45	XA2-8	R6-CW			
----	XA2-9	NC			
----	XA2-10	NC			
----	XA2-11	NC			
----	XA2-12	NC			
----	XA2-13	NC			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
30	XA2-14	XA1-R			
--	XA2-14	XA2-1			
47	XA2-15	TB1-6			
40	XA2-16	XDS2-NEG			
59	XA2-17	J2-C			
46	XA2-18	R6-WIPER			
63	XA2-19	S9-2			
44	XA2-20	XDS6-NEG			
55	XA2-21	CR1-E2			
56	XA2-21	J3-J			
156	XA2-22	S13-7			
205	XA2-22	XA2-Z			
123	XA3-A	T1-4			
124	XA3-B	T1-5			
125	XA3-C	T1-6			
-	XA3-D	NC			
143	XA3 E	S4-4			
150	XA3-E	S12-2			
-	XA3-F	NC			
137	XA3-H	El			
199	XA3-H	XA3-J			
199	XA3-J	XA3-H			
132	XA3-J	XDS1-POS			
126	XA3-K	T1-7			
127	XA3-L	T1-8			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
128	XA3-M	T1-9			
-	XA3-N	NC			
-	XA3-P	NC			
-	XA3-R	NC			
-	XA3-S	NC			
-	XA3-T	NC			
-	XA3-U	NC			
230	XA3-V	A6-E11	White	22	
157	XA3-V	S12-5			
202	XA3-V	XA3-W			
154	XA3-W	S13-7			
202	XA3-W	XA3-V			
-	XA3-X	NC			
--	XA3-Y	NC			
-	XA3-Z	NC			
173	XA3-1	E4			
--	XA3-2	NC			
--	XA3-3	NC			
231	XA3-4	A6-E7	White	22	
160	XA3-4	XA2-3			
-	XA3-5	NC			
172	XA3-6	E5			
-	XA3-6	NC			
--	XA3-7	NC			
--	XA3-8	NC			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
-	XA3-9	NC			
-	XA3-10	NC			
-	XA3-11	NC			
-	XA3-12	NC			
-	XA3-13	NC			
-	XA3-14	NC			
-	XA3-15	NC			
171	XA3-16	E6			
-	XA3-17	NC			
--	XA3-18	NC			
-	XA3-19	NC			
129	XA3-20	T1-10			
130	XA3-21	T1-11			
131	XA3-22	T1-12			
132	XDS1-POS	XA3-J			
133	XDS1-POS	XDS6-POS			
40	XDS2-NEG	XA2-16			
135	XDS2-POS	XDS5-POS			
134	XDS2-POS	XDS6-POS			
41	XDS3-NEG	XA2-R			
141	XDS3-POS	J3-A			
140	XDS3-POS	XA2-W			
42	XDS4-NEG	XA2-T			
142	XDS4-POS	S9-1			
136	XDS4-POS	XDS5-POS			
43	XDS5-NEG	XA2-U			

5-14. WIRE LISTS (Cont)

Test Panel Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
135	XDS5-POS	XDS2-POS			
136	XDS5-POS	XDS4-POS			
44	XDS6-NEG	XA2-20			
133	XDS6-POS	XDS1-POS			
134	XDS6-POS	XDS2-POS			
211	27 SHLD	XA1-1			
212	29 SHLD	XA1-A			
214	30 SHLD	XA2-1			
15	33 SHLD	XA2-A			
181	179 SHLD	E19			
193	180 SHLD	E21			
216	182 SHLD	183 SHLD			
184	183 SHLD	J1-H			
216	183 SHLD	182 SHLD			
187	185 SHLD	186 SHLD			
188	186 SHLD	J2-S			
187	186 SHLD	185 SHLD			
190	189 SHLD	J2-B			
192	191 SHLD	J2-D			

5-14 WIRE LISTS (Cont)

Break Out Box Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
3	El	TP-GND	White	22	
4	GND INPUT jack	TP-GND	White	22	
27	INPUT jack	TP-T	White	22	
16	PULSE GEN SYNC jack	TP-DTG1	White	22	
24	R5	TP-R	White	22	
30	S1-3	TP-+5	White	22	
2	TP-A	TP-GND	White	22	
1	TP-A	3P15-A	White	22	
5	TP-B	3P15-B	White	22	
6	TP-C	3P15-C	White	22	
7	TP-D	3P15-D	White	22	
16	TP-DTG1	PULSE GEN SYNC jack	White	22	
15	TP-DTG1	TP-L	White	22	
18	TP-DTG2	TP-M	White	22	
8	TP-E	3P15-E	White	22	
9	TP-F	3P15-F	White	22	
20	TP-F/R1	TP-N	White	22	
22	TP-F/R2	TP-P	White	22	
10	TP-G	3P15-G	White	22	
3	TP-GND	El	White	22	
4	TP-GND	GND INPUT jack	White	22	
2	TP-GND	TP-A	White	22	
11	TP-H	3P15-H	White	22	
12	TP-J	3P15-J	White	22	

5-14. WIRE LISTS (Cont)

Break Out Box Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
13	TP-K	3P15-K	White	22	
15	TP-L	TP-DTG1	White	22	
14	TP-L	3P15-L	White	22	
18	TP-M	TP-DTG2	White	22	
17	TP-M	3P15-M	White	22	
20	TP-N	TP-F/R1	White	22	
19	TP-N	3P15-N	White	22	
22	TP-P	TP-F/R2	White	22	
21	TP-P	3P15-P	White	22	
24	TP-R	R5	White	22	
23	TP-R	3P15-R	White	22	
25	TP-S	3P15-S	White	22	
27	TP-T	INPUT jack	White	22	
26	TP-T	3P15-T	White	22	
28	TP-U	3P15-U	White	22	
29	TP-V	3P15-V	White	22	
30	TP-+5	S1-3	White	22	
31	TP-+5	+5VDC INPUT jack	White	22	
1	3P15-A	TP-A	White	22	
5	3P15-B	TP-B	White	22	
6	3P15-C	TP-C	White	22	
7	3P15-D	TP-D	White	22	
8	3P15-E	TP-E	White	22	
9	3P15-F	TP-F	White	22	
10	3P15-G	TP-G	White	22	

5-14. WIRE LISTS (Cont)

Break Out Box Wire List

WIRE NO.	FROM	TO	COLOR	SIZE	REMARKS
11	3P15-H	TP-H	White	22	
12	3P15-J	TP-J	White	22	
13	3P15-K	TP-K	White	22	
14	3P15-L	TP-L	White	22	
17	3P15-M	TP-M	White	22	
19	3P15-N	TP-N	White	22	
21	3P15-P	TP-P	White	22	
23	3P15-R	TP-R	White	22	
25	3P15-S	TP-S	White	22	
26	3P15-T	TP-T	White	22	
28	3P15-U	TP-U	White	22	
29	3P15-V	TP-V	White	22	
31	+5VDC INPUT jack	TP-+5	White	22	

APPENDIX A

REFERENCES

DA PAM 310-4	Index of Technical Publications.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Shelters.
TB 385-4	Safety Precautions for Maintenance of Electrical/Electronic Equipment.
TM 11-5895-967-34	Direct Support and General Support Maintenance Manual Radar Surveillance Set AN/APS-94E (NSN 5841-01-040-3873).
TM 11-5895-1078-30	Direct Support Maintenance Manual, Radar Surveillance Set AN/APS-94F.
TM 11-6130-247-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual Power Supply PP-3940/G.
TM 11-6625-654-14	Operator's, Organizational, Direct Support, and General Support Maintenance and Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools List) for Multimeter AN/USM-223 (NSN 6625-00-999-7465).
TM 11-6625-1831-23P	Organizational and Direct Support Maintenance Repair Parts and Special Tools List for Interface Test, Processor, Radar TS-2973A/APS-94D (NSN 6625-01-071-8579).
TM 11-6625-2658-14	Operator's, Organizational, Direct Support, and General Maintenance Manual for Oscilloscope AN/USM-281C(NSN 6625-00-106-9622)
TM 38-750	The Army Maintenance Management System (TAMMS)
TM 55-1500-323-24	Organizational DS, and GS Maintenance Manual: Installation Practices for Aircraft Electric and Electronic Wiring. (to be published).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists intergral components of and basic issue items for the TS-2973A/APS-94D to help you inventory items required for safe and efficient operation.

B-2. General

This Components of End Item List is divided into the following sections:

a. **Section II. Integral Components of the End Item**. These items, when assembled, comprise the TS-2973A/APS-94D and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. **Section III. Basic Issue Items**. These are the minimum essential items required to place the TS-2973A/APS-94D in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the TS-2973A/APS-94D during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on TOEIMTOE authorization of the end item.

B-3. Explanation of Columns

a. **Illustration**. This column is divided as follows:

(1) **Figure number**. Indicates the figure number of the illustration on which the item is shown.

(2) **Item number**. The number used to identify item called out in the illustration.

b. **National Stock Number**. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. **Part Number**. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. Following the part number, the Federal Supply Code for Manufacturers (FSCM) is shown in parentheses.

d. **Description**. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. **Location**. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. **Usable on Code**. Not applicable.

g. **Quantity Required (Qty Reqd).** This column lists the quantity of each item required for a complete major item.

h. **Quantity**. This column is left blank for use during an inventory. Under the Rcvd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

APPENDIX D

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

D-1. General

This appendix provides a summary of the maintenance operations for the TS-2973A/APS-94D. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

D-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. **Inspect**. To determine the serviceability of an item by comparing it physical, mechanical, and/or electrical characteristics with established standards through examination.

b. **Test**. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. **Service**. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

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

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

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

g. **Install**. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. **Replace** The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. **Repair**. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

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

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

D-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

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

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s). the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operation conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew
O - Organizational
F - Direct Support
H - General Support
D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test. and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

D-4. Tool and Test Equipment Requirements (Sect. III)

a. Tool and Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

D-5. Remarks (Sect. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

APPENDIX E
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the TS-2973A/APS-94D. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. Explanation of Columns

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g "Use cleaning compound, item 5, App. D").

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

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

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

d. Column 4 - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

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

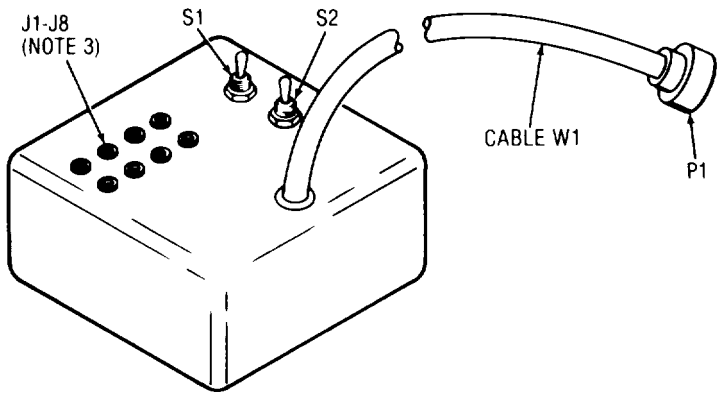
APPENDIX F

ILLUSTRATED LIST OF MANUFACTURED ITEMS

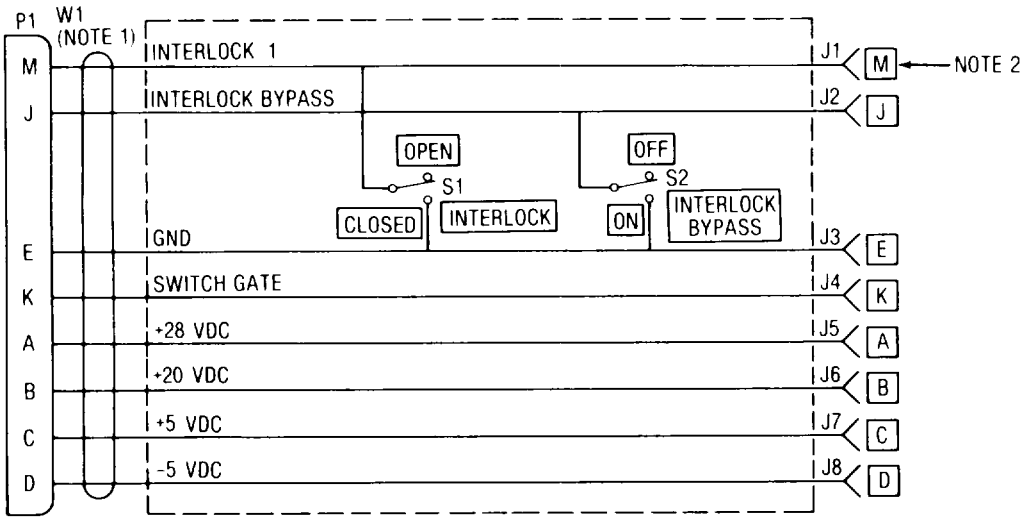
This appendix includes complete instructions for making items authorized to be manufactured or fabricated at Direct Support maintenance.

All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

TEST FIXTURE NO. 1



ELECTRICAL CONNECTIONS



PARTS LIST

P1	CONNECTOR, ELECTRICAL MS3116F14-19P
J1-J8	JACK, TIP MS16108-1A
S1-S2	SWITCH. TOGGLE MS35058-22
	WIRE, HOOKUP NO 16 AWG
	CHASSIS, ALUMINUM,4X4X2NCHES

NOTES

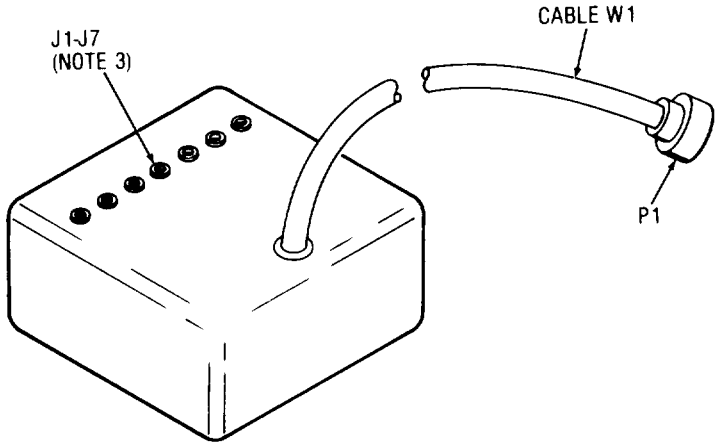
1 MAKE CABLE WI AT LEAST 18 INCHES LONG

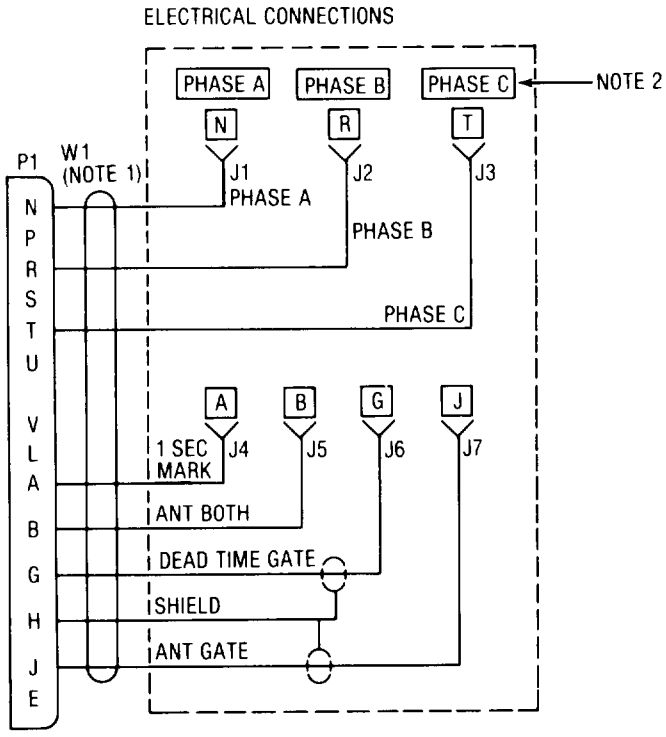
2. ▭ INDICATES EQUIPMENT MARKINGS

3 THE EXACT LOCATION OF EACH COMPONENT IS NOT IMPORTANT

EL6KC046

TEST FIXTURE NO. 2





PARTS LIST

P1	CONNECTOR, ELECTRICAL MS3116F14-19PX
J1-J7	JACK, TIP MS16108-1A
	WIRE, HOOKUP NO 16 AWG
	CHASSIS, ALUMINUM, 4 X 4 X 2 INCHES

NOTES:

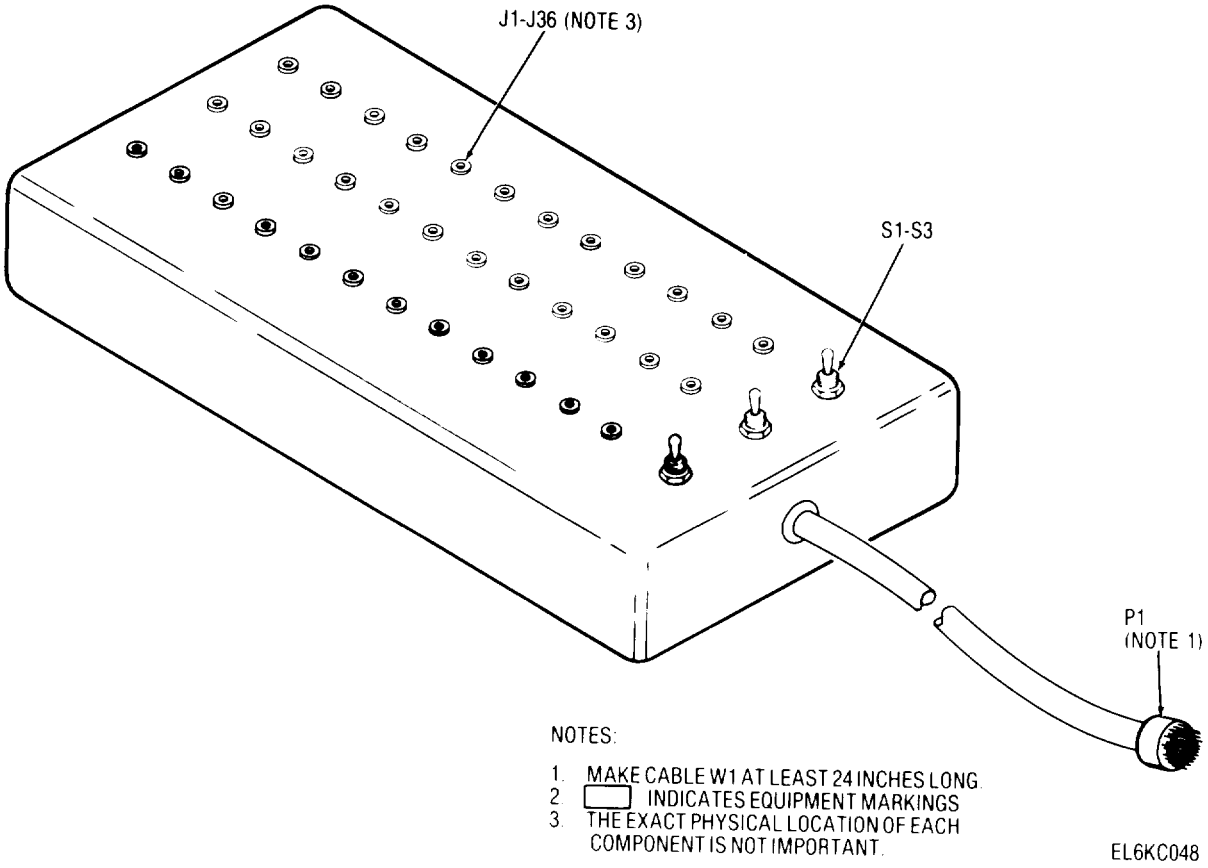
1 MAKE CABLE W1 AT LEAST 18 INCHES LONG

2 ☐ INDICATES EOUIPMENT MARKINGS

3 THEEXACTPHYSICALLOCATIONOFEACH COMPONENT IS NOT IMPORTANT

EL6KC047

TEST FIXTURE NO. 3

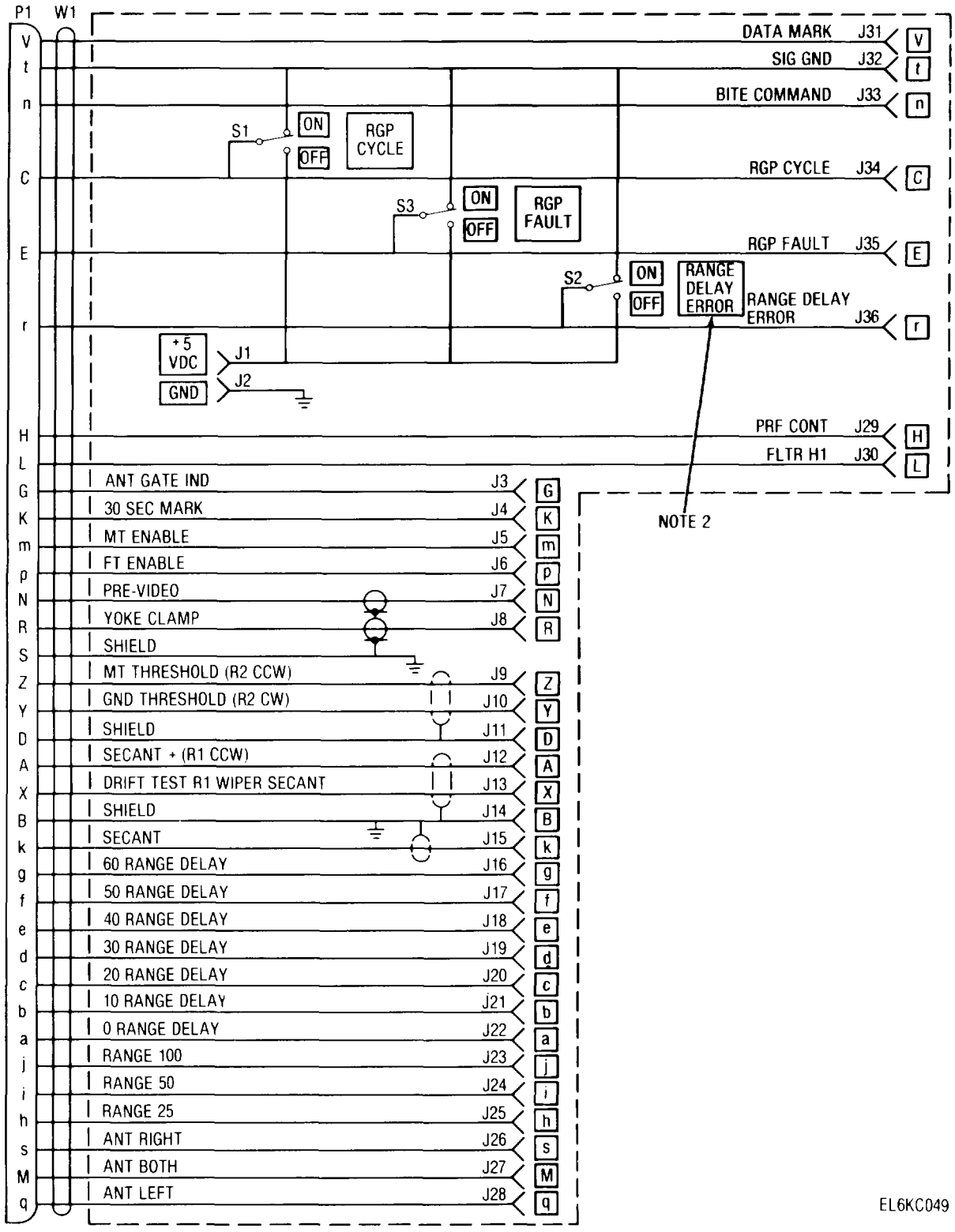


PARTS LIST:

J1-J36	JACK, TIP MS16108-1A
S1-S3	SWITCH, TOGGLE MS35058-22
P1	CONNECTOR, ELECTICAL MS3116F20-41PW
	WIRE, HOOKUP, NO. 16 AWG
	SHIELD, WIRE BRAID, AS REQUIRED
	CHASSIS, ALUMINUM 6X12X2 INCHES

TEST FIXTURE NO. 3

ELECTRICAL CONNECTIONS



GLOSSARY

ABBREVIATIONS

ac	Alternating current
dc	Direct current
Hz	Hertz
km	Kilometer
MHz	Megahertz
u s	Microsecond
V	Volts
Vac	Volts alternating current
Vdc	Volts direct current

DEFINITION OF UNUSUAL TERMS

Module - Assembly or subassembly of a machine.

Signal Processor - Unit of a radar set.

Test Set - Machine to test or troubleshoot another machine.

Test Set Group - A number of test sets. Each tests a different function of a system.

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* U.S. GOVERNMENT PRINTING OFFICE: 1984 0 - 432-997 (673)

By Order of the Secretary of the Army:

E. C. Meyer
General, United States Army
Chief of Staff

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