TECHNICAL MANUAL

OPERATOR'S
AVIATION UNIT AND INTERMEDIATE
MAINTENANCE MANUAL

FOR

AUXILIARY POWER UNIT
ELECTRONIC SEQUENCE UNIT
MULTI-PURPOSE TEST SET
P/N 161226-200
NSN 4920-01-121-0605

HEADQUARTERS, DEPARTMENT OF THE ARMY

31 MARCH 1983

HIGH VOLTAGE

High voltage is used in operation of test equipment. Death on contact can result if personnel fail to observe safety precautions.

TM 55-4920-431-13
C 1

CHANGE NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 26 August 1985

Operator's
Aviation Unit and Intermediate
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for
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TM 55-4920-431-13, 31 March 1983, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
1-3 and 1-4	1-3 and 1-4
4-17 and 4-18	4-17 and 4-18
A-1 through A-8	A-1/A-2
---	B-1 through B-7/B-8
Index 1 and Index 2	Index 1 and Index 2

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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TECHNICAL MANUAL

NO. 55-4920-431-13

OPERATOR'S, AVIATION UNIT, AND INTERMEDIATE MAINTENANCE MANUAL FOR AUXILIARY POWER UNIT ELECTRONIC SEQUENCE UNIT MULTI-PURPOSE TEST SET P/N 161226-200 NSN 4920-01-121-0605

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: U. S. Army Aviation Systems Command, ATTN: AMSAV-MPSD, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. Purpose. Auxiliary Power Unit Electronic Sequence Unit Multi-Purpose Test Set, Part No. 161226-200 referred to herein as the tester figure 1-1, is used to troubleshoot an Auxiliary Power Unit (APU) and Electronic Sequence Unit (ESU), either in the aircraft or in a maintenance shop or test cell.

1-2. Capabilities. The tester allows the user to dynamically test the APU and ESU independent of all aircraft controls and to isolate a fault to a malfunctioning component or part. Refer to fault logic tree in the applicable maintenance manual.

1-3. The tester can be used to control the APU and monitor all functions, to test the APU in a test cell after overhaul or repair.

1-4. The tester can be used in a maintenance shop for troubleshooting or repair of the ESU.

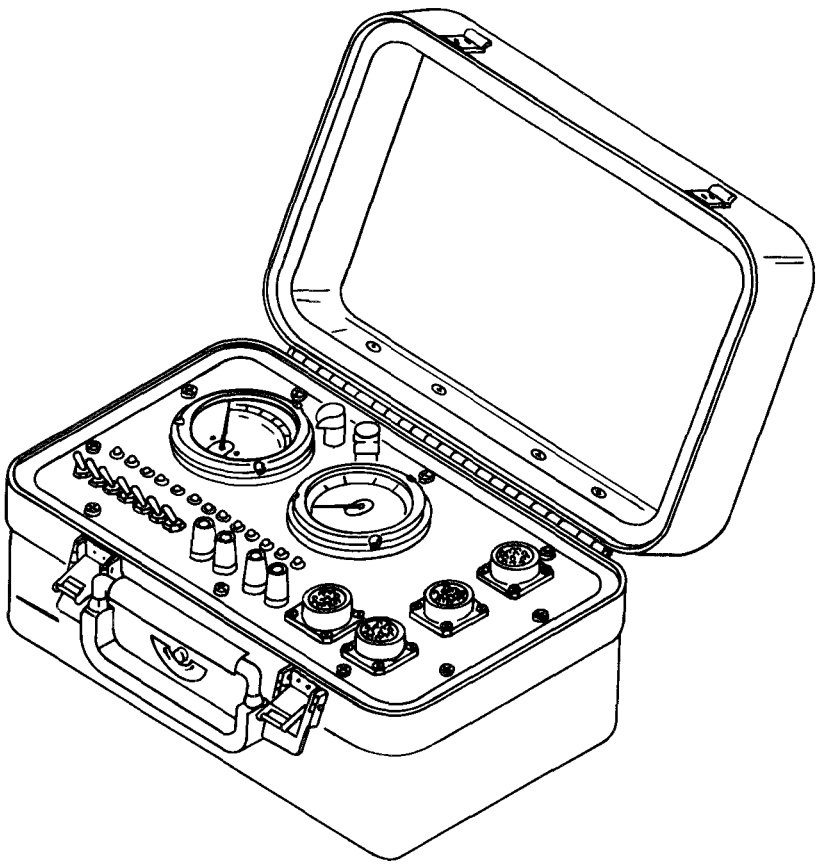


Figure 1-1. Tester

1-5. Items Furnished. The following are furnished with the tester and are stored in the case lid.

Harness - P5, Part No. 161227-200
Harness - P1, Part No. 161228-200
Harness - P2, Part No. 161229-200

1-6. Tools and Test Equipment. Standard tools necessary to maintain the tester are contained in table 1-1.

Table 1-1. Tools and Test Equipment

Description	Minimum Use Specifications	Part/Model No. or Equivalent
Signal Converter		Turbomach Part No. ST93480
Oscillator	405 to 5693 Hz	HP-204D
DC Power Supply	0 to 24V	HP-6224B
Counter	405 to 5693 Hz	HP-5315A
Digital Multimeter	32 to 204 ua	Fluke 8024B
Simulation Device		Turbomach Part No. ST93930
Millivolt Supply	0 to 50 mv, variable	Thermo Electric Digimite/Multimite TE-404S
VOM		Triplett 630NA
Calibration Repair Kit		7669-911 NSN 5180-00-670-7123
Tool Kit		JTK 17A-LAL NSN 4931-01-073-3845
Electrical Repairman's Tool Kit		NSN 5180-00-323-4915

1-7. Expendable Supplies and Materials. Bulk and consumable materials required are listed in table 1-2.

Table 1-2. Expendable Supplies and Materials List

National Stock Number	Description
5970-00-543-1098	Insulated Sleeving, Type F, Form U, Grade A, Class I, Category I, Clear, per MIL-I-631
	Thermocouple Wire K/ALKTW-20F-KK, Thermo Electric Co., Inc., Saddle Brook, NY
	Shielded Pair Wire, Teflon Coated, Type E, per MIL-W-16878
6145-00-062-5699	Wire, Type E, 20 AWG, per MIL-W-16878
	T/C Wire, M5846-1-B-1/24A and M5846-1-B-1/24C per MIL-W-5846/1
6145-00-623-7224	Wire, Type 3, 22 AWG, per MIL-W-16878
8010-00-721-9744	Paint, Yellow, Color Number 13538 per TT-L-50
8010-00-290-6984	Paint, Gloss Black, Color Number 17038 per TT-L-50
3439-00-224-3567	Solder
5975-00-482-3954	Strap, Tiedown, Identification, Adjustable, MS3368-5-9E
5975-01-013-2742	Strap, Tiedown, Adjustable, MS3367-1-9
	Shrink Tubing
	Crimp-On Terminal Lugs

1-8. **WARRANTY.** The tester is warranted by Turbomach for two years. Warranty starts on the date found on DA Form 2410 or DA Form 2408-16 in the logbook. Report all defects in material or workmanship to your supervisor who will take appropriate action.

1-9. **MAINTENANCE FORMS AND RECORDS.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, the Army Maintenance Management System.

1-10. **DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.** Destroy tester when evacuation to safety is not possible. Refer to TM 750-244-1-4.

1-11. **QUALITY ASSURANCE/QUALITY CONTROL (QA/QC).** Refer to FM 55-411.

1-12. **REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).** If your tester needs improvement, let us know. Send us an EIR. You, the user are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design. Put in on SF368 Quality Deficiency Report (QDR). Mail it to us at:

Commander
USAAVSCOM
ATTN: AMSAV-MPSD
4300 Goodfellow Blvd.
St. Louis, MO 63120-1798

Section II. EQUIPMENT DESCRIPTION AND DATA

1-13. Equipment Description. The tester is contained in a case, equipped with a hinged lid and carrying handle. The front panel of the tester contains all the controls and indicators required to operate the tester. Three harnesses are provided for connection of the tester to the equipment or system to be tested. The harnesses are normally stowed in the case lid.

1-14. The front panel contains two high contrast, easy-to-read analog meters (SPEED and TEMP), seven function switches, and twelve color-coded LED indicator lights.

NOTE

Some of the function switches and LED indicator lights, although part of the tester, are not used. Refer to the description of controls and indicators in Chapter 2.

1-15. Specifications. Table 1-3 lists the principle features and characteristics of the tester.

Table 1-3. Specifications

Power Required	28 VDC ± 4V
Instruments	
Speed	0-120% RPM, ±2% resolution
Temperature	0-1500°F ±35 degrees resolution
Environment	
Temperature	32°F(0°C) to 122°F(50°C)
Relative Humidity	90% max
Dimensions	8 by 13-1/2 in. (20 by 34 cm)
Weight	22 pounds (10gm)

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-16. General. Refer to figure 2-1 and table 2-1. The electronic sequence unit (ESU) is a part of the APU system in the aircraft. The ESU controls the start sequence of the APU, monitors its operation, and provides Built-In Test Equipment (BITE) indications of system condition and failure modes. The tester is used for troubleshooting the ESU and electrical components of the APU, either in the aircraft or in a test cell.

1-17. Power. When used in the aircraft, 28 VDC power to the tester is provided by the aircraft through Harness-J2, connected to the aircraft harness. MASTER switch (3) controls 28 VDC power to both the Tester and ESU. When power is on, MAIN POWER indicator (12b) is illuminated.

1-18. Function Switches. In addition to MASTER SWITCH (3), there are six function switches. Three of these, BLEED AIR OPEN/CLOSE switch (5), MAX. AIR switch (7), and ECONO AIR switch (8), are used only for testing systems equipped with a modulating bleed air valve. Harness-J2 provided with the tester, has no connector for a bleed valve, and these three switches are not used.

1-19. LOCAL/REMOTE switch (9) is provided for selecting either the analog converter in an aircraft or the analog converter in the tester. Harness-J2 provided with the tester has no connector for a local analog converter; therefore, the tester is used with LOCAL/REMOTE switch (9) in the UP or REMOTE position. This energizes a relay to apply speed and temperature signals from the ESU to the analog converter in the tester. The conditioned signals are then applied to meters (1 and 2) on the tester panel.

1-20. When placed in the START/RUN position, START/RUN/STOP switch (4) applies a signal to the ESU through J2-1 to initiate the start sequence. The ESU in turn provides a start signal to the tester. This signal is routed through fused and display circuitry and then outputed through Harness–J2 to the APU start relay.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT

2-1. Unpacking. The tester is shipped in a container designed for its protection. Three harness assemblies are provided with the tester and are stored in the lid of the instrument case. Unpack as follows:

a. Remove tester from shipping container.

b. Remove harnesses from lid of instrument case.

c. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

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

e. Check to see whether equipment has been modified.

Section II. DESCRIPTION AND USE OF OPERATORS CONTROLS AND INDICATORS

2-2. Controls and Indicators. Operators controls and indicators are identified in figure 2-1 and described in table 2-1.

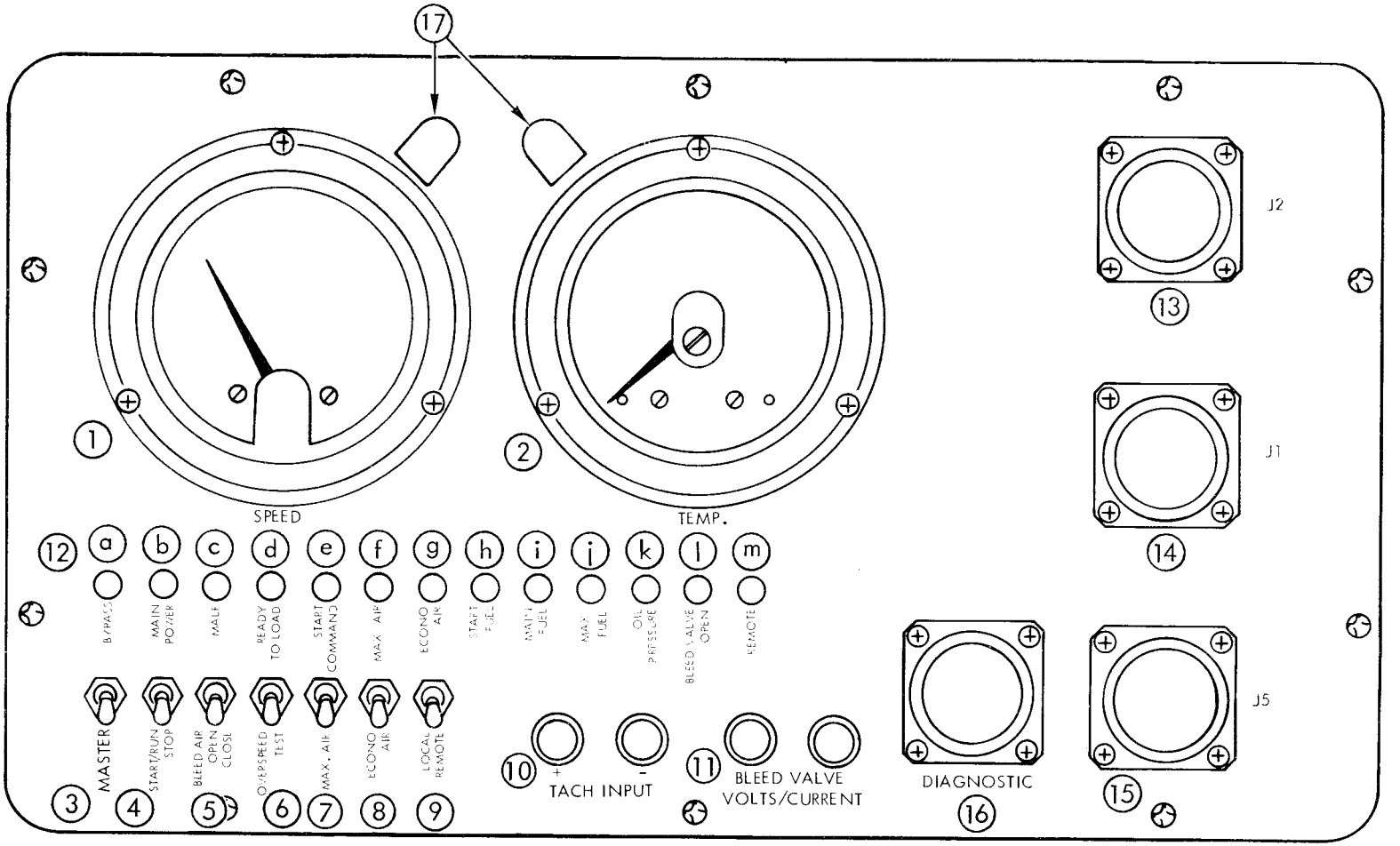


Figure 2-1. Controls and Indicators

Table 2-1. Controls and Indicators

Item (Fig. 2-1)	Nomenclature	Function
1	SPEED meter	Displays % engine speed from 0 to 120
2	TEMP meter	Displays exhaust gas temperature (EGT) in °F from 0 to 1500
3	MASTER switch	Controls ±28 VDC power to tester and ESU
4	START/RUN/STOP switch	Initiates start sequence of ESU and generates start signal input to tester
5	BLEED AIR OPEN/ CLOSE switch	(Not applicable)
6	OVERSPEED TEST switch	(Not applicable)
7	MAX. AIR switch	(Not applicable)
8	ECONO AIR switch	(Not applicable)
9	LOCAL/REMOTE switch	Selects local or remote analog converter. LOCAL (down position) selects analog converter in aircraft. REMOTE (up position) selects analog converter in tester. Always left in the REMOTE position.
10	TACH INPUT jacks	To monitor magnetic pickup input and input simulation signals
11	BLEED VALVE VOLTS/CURRENT jacks	(Not applicable)
12	Color coded LED indicators	
	a. BYPASS	Lighted – indicates voltage is applied to start bypass valve.
	b. MAIN POWER	Lighted – indicates main power is on
	c. MALF	Lighted – indicates malfunction has occurred and unit is shut down. Bite indication on ESU is checked for cause
	d. READY TO LOAD	Lighted – indicates APU is ready to accept load

Table 2-1. Controls and Indicators - Continued

Item (Fig. 2-1)	Nomenclature	Function
	e. START COMMAND	Lighted – indicates start command is initiated
	f. MAX. AIR	(Not applicable)
	g. ECONO AIR	(Not applicable)
	h. START FUEL	Lighted – indicates start fuel voltage on approximately 5% RPM
	i. MAIN FUEL	Lighted – indicates main fuel voltage on, approximately 14% RPM
	j. MAX. FUEL	Lighted – indicates max. fuel voltage on, approximately 90% RPM + 5 sec. time out
	k. OIL PRESSURE	(Not applicable)
	l. BLEED VALVE OPEN	(Not applicable)
	m. REMOTE	Lighted – indicates remote analog converter selected
13	Connector J2	Input/output connector for harness connection to ESU and aircraft harness
14	Connector J1	Input connector for harness connection to ESU
15	Connector J5	Output connector for harness connection to APU
16	DIAGNOSTIC connector	(Not applicable)
17	Panel Light	Illuminates meters

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-3. Introduction. Refer to table 2-2 for Operator Preventive Maintenance Checks and Services (PMCS).

a. Before You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See TM 38-750.

e. Item Number Column. Checks and services are numbered in order regardless of interval. This column shall be used as a source of the item numbers for the "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

f. Interval Column. A dot in this column indicates the interval at which a check or service is to be performed.

g. Item to Be Inspected Column. The items to be inspected are listed in this column.

h. Procedures Column. This column contains a description of the procedure to be used to accomplish the checks and services.

i. Equipment is Not Ready/Available IF Column. This column contains the criteria that will cause the equipment to be classified as not ready/available because of inability to perform its primary mission.

Table 2-2. Operator Preventive Maintenance Checks and Services

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before D - During A - After

Item No.	Interval			Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment Is Not Ready/ Available If:
	B	D	A			
1	•		•	Meters	Cover glasses dirty, cracked or broken. Hands bent or missing. Meter must read zero.	Hand missing or bent, does not read zero
2	•			Switches	Check that switches are securely mounted to panel and operate properly	Switch not operational
3	•			Indicators	Check that LED indicators are clean and not broken	LED is broken
4	•			Meter Lamps	Check that lamps are clean and not broken; lampholders are not cracked, chipped, or broken	
5	•			Binding Posts	Check that plastic caps are not cracked or chipped, caps turn freely, posts are free of dirt and grease	
6	•			Front Panel	Check that panel is clean, lettering is clean and legible, all screws are installed and tight	
7	•			Connectors	Check for bent or broken pins. Check that mounting screws are installed and tight	Connector is damaged
8	•			Harnesses	Check for kinks, twists, deteriorated insulation or sleeving. Check that harness and panel connectors mate properly	Harness is damaged
9	•			Case	Check hinges and latches for damage. Check for cracks and breaks	

Section IV. OPERATION UNDER USUAL CONDITIONS

2-4. Preparation for Use.

a. Turn pressure equalizer knob to OPEN. Open case. Turn knob to CLOSE.

b. Remove harnesses from case lid.

c. Connect harnesses as shown in figures 2-2 or 2-3.

d. Zero meters.

e. Perform your before (B) PMCS.

2-5. APU Test. Connect the tester for use in the aircraft in accordance with figure 2-2. Perform test in accordance with the applicable maintenance manual.

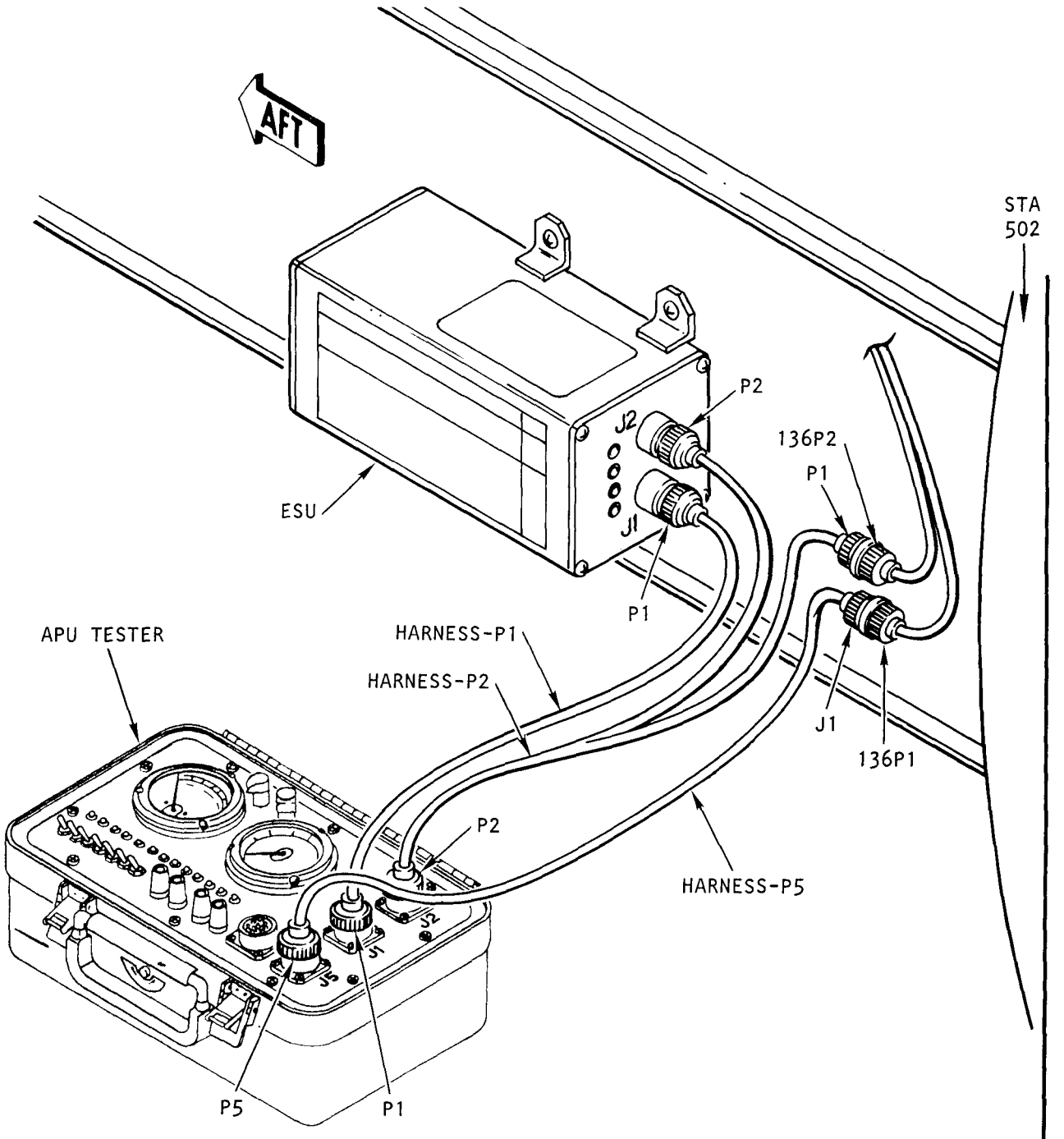
NOTE

During tests, leave BLEED AIR OPEN/CLOSE switch, MAX. AIR switch, and ECONO AIR switch in down position.

2-6. ESU Test. Bench test of the ESU is accomplished by using an oscillator to simulate the tach input from the magnetic pickup in the APU. Millivolt supplies are used to simulate EGT thermocouple inputs from the APU. Connections are made through the ST93930 simulation device as shown in figure 2-3. Perform check in accordance with TM 55-1520-240-T.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

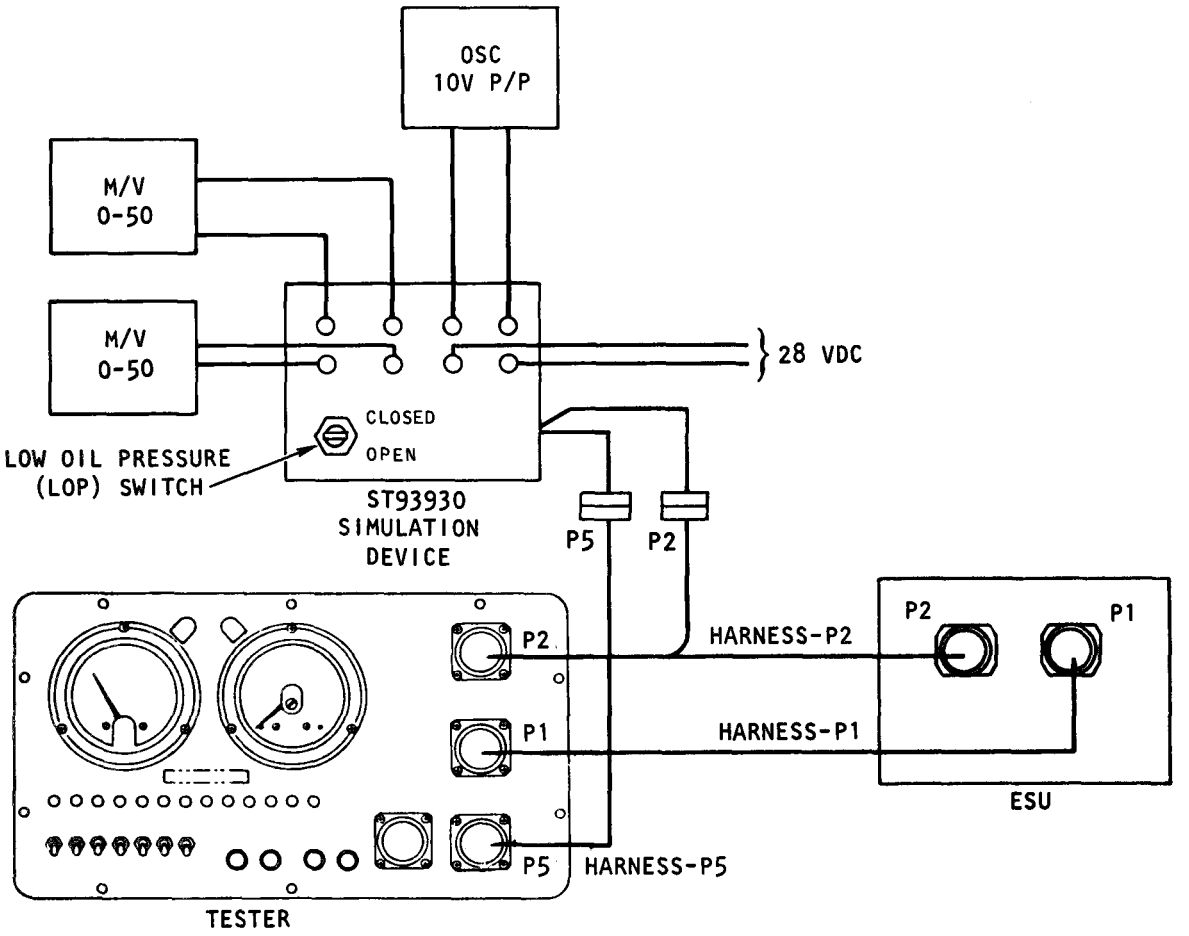
Not applicable.



NOTES:

DISCONNECT 136P2 FROM ESU J2 AND CONNECT TO TESTER AS SHOWN.
DISCONNECT 136P1 FROM ESU J1 AND CONNECT TO TESTER AS SHOWN.
136P2 AND 136P1 ARE AIRCRAFT CONNECTORS. ALL OTHER DESIGNATIONS APPLY TO APU TESTER HARNESSES.

Figure 2-2. Connecting Tester for Use in Aircraft



NOTE: PERFORM TESTS WITH LOP SWITCH IN CLOSED (UP) POSITION.

Figure 2-3. Connecting Tester for Bench-Check of ESU

CHAPTER 3

AVUM MAINTENANCE INSTRUCTIONS

Section I. REQUIREMENTS

3-1. Personnel. Maintenance procedure in this chapter will be performed by:

68F Aircraft Electrician.

3-2. Parts. Replaceable parts are listed and illustrated in Chapter 5. When requisitioning parts, refer to TM 55-4920-431-23P.

Section II. TROUBLESHOOTING

3-3. Introduction. The following troubleshooting procedures are to find faults in the tester itself, and not in the APU or ESU being tested. The troubles covered are those that may be encountered with the tester connected for use as shown in figure 2-2 or 2-3. Refer to figure 3-1 for identification of connector contacts.

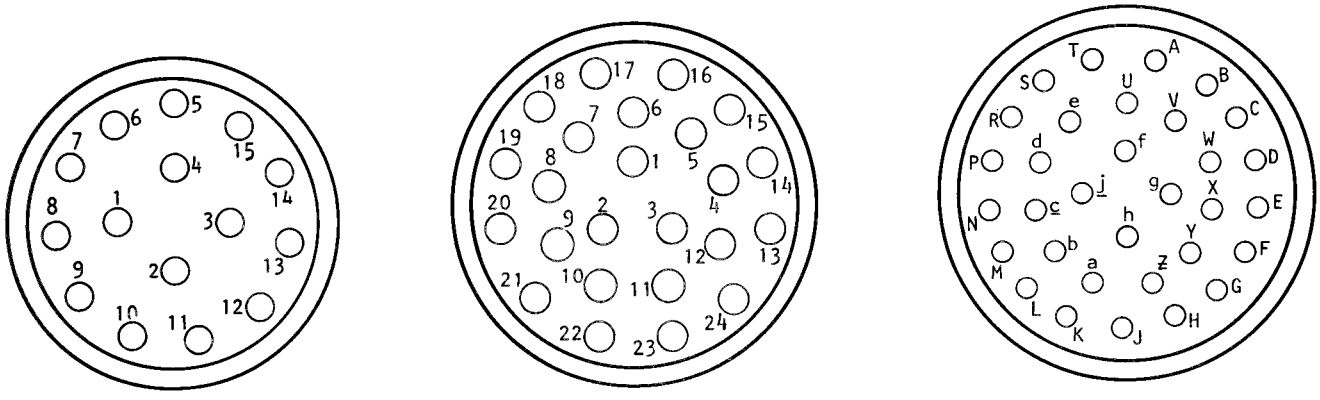
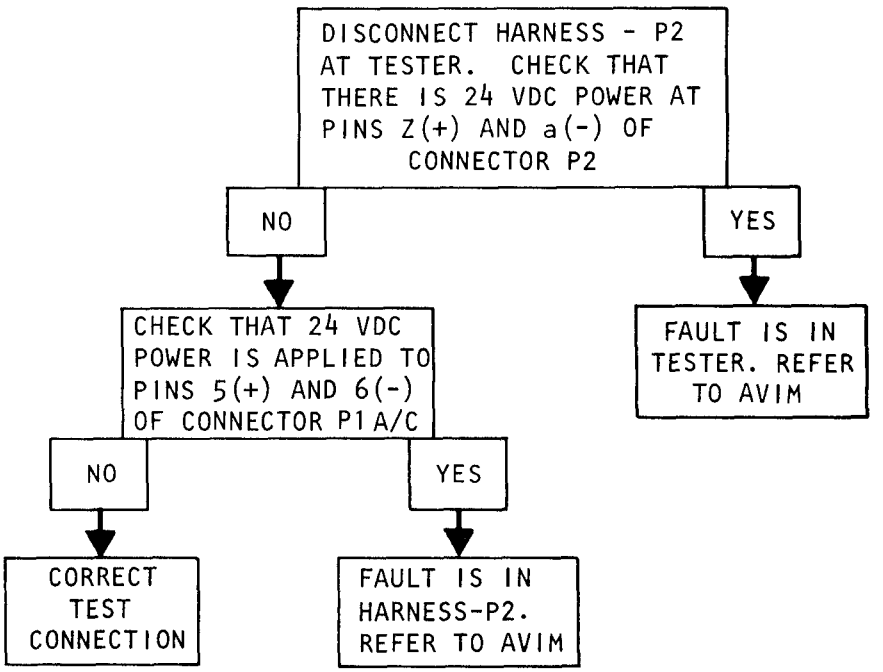
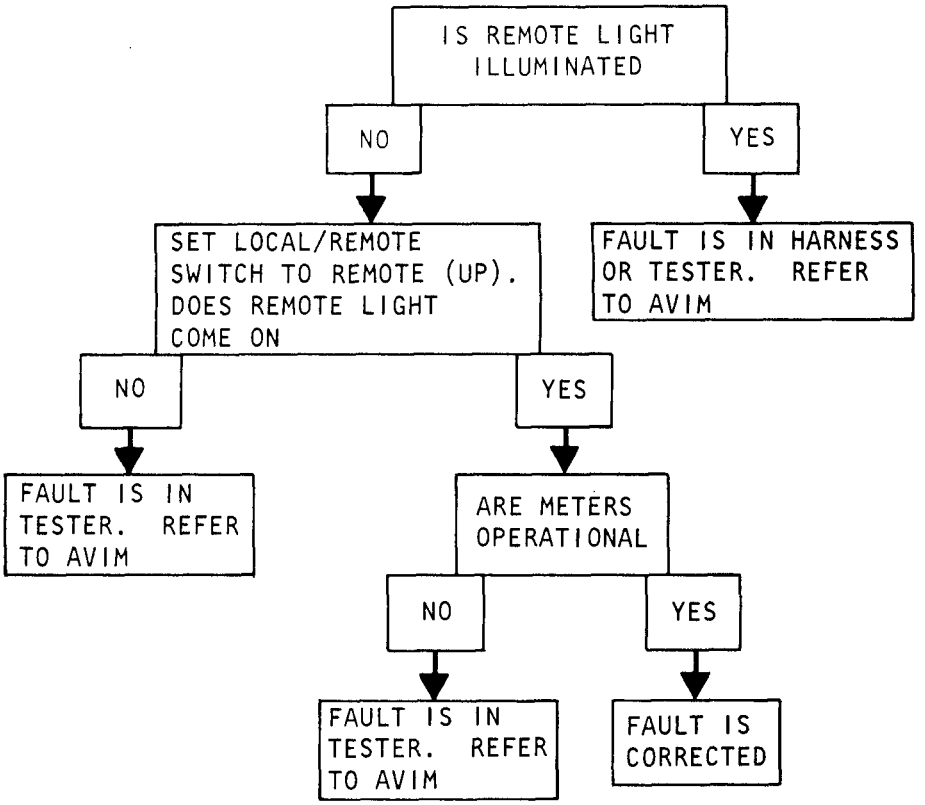


Figure 3-1. Connector Contact Arrangement

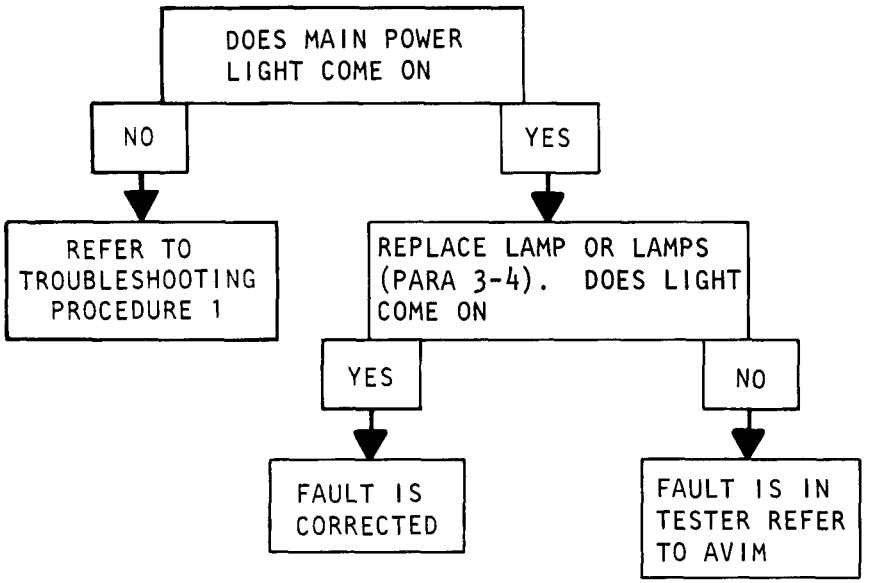
TROUBLESHOOTING PROCEDURE 1. MAIN POWER LIGHT DOES NOT ILLUMINATE



TROUBLE SHOOTING PROCEDURE 2. METER DOES NOT INDICATE ENGINE SPEED OR TEMP



TROUBLESHOOTING PROCEDURE 3. METER LIGHT DOES NOT COME ON



Section III. MAINTENANCE PROCEDURES

3-4. Meter Lamp Replacement.

a. Open case lid.

b. Pull up on top of lampholder (21, figure 5-2) and remove top with lamp (20).

c. Remove lamp and discard. Install replacement lamp into top of lampholder.

d. Press top of lampholder into base and seat.

e. Close case lid.

CHAPTER 4

AVIM (CRC) MAINTENANCE INSTRUCTIONS

Section I. REQUIREMENTS

4-1. Personnel. Maintenance procedures in this chapter will be performed by:

35H Calibration Specialist

4-2. Tools. Refer to paragraph 1-6 and table 1-1 for complete identification.

4-3. Parts. Replaceable parts are listed and illustrated in Chapter 5.

4-4. Materials. Expendable supplies and materials required for repair are identified in the applicable repair instructions. Refer to paragraph 1-7 and table 1-2 for complete identification.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-5. Introduction. Refer to table 4-1 for preventive maintenance checks and services. Following is an explanation of the columns and codes used in the table.

a. Item Number Column. Checks and services are numbered in order regardless of interval. This column shall be used as a source of the item numbers for the “TM Number” Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

b. Items to be Inspected Column. The items to be inspected are listed in this column.

c. Procedures Column. This column contains a description of the procedure to be used to accomplish the checks and services. Appropriate references to the applicable maintenance instructions for repair or replacement are included.

Table 4-1. Preventive Maintenance Checks and Services
A-Annually

Item No.	Interval A	Item To Be Inspected	Procedures
			NOTE Procedures for gaining access to inside of case are described in paragraph 4-7.
1	•	Relay (1, fig 5-3)	Check for tightness in socket and that hold down spring is in place. Check for loose wire connections
2	•	Analog Converter (19, fig 5-1)	Check that harness is properly attached. Check for broken wires and deteriorated insulation. Check screws (20, fig 5-1) for tightness.
3	•	Fuses (7, fig 5-3)	Check that fuses are proper size and type and in place in fuseblock (11, fig 5-3)
4	•	Meters (1, 2, fig 5-2)	Verify accuracy in accordance with paragraph 4-30.

NOTE

Foldouts are located at back of manual

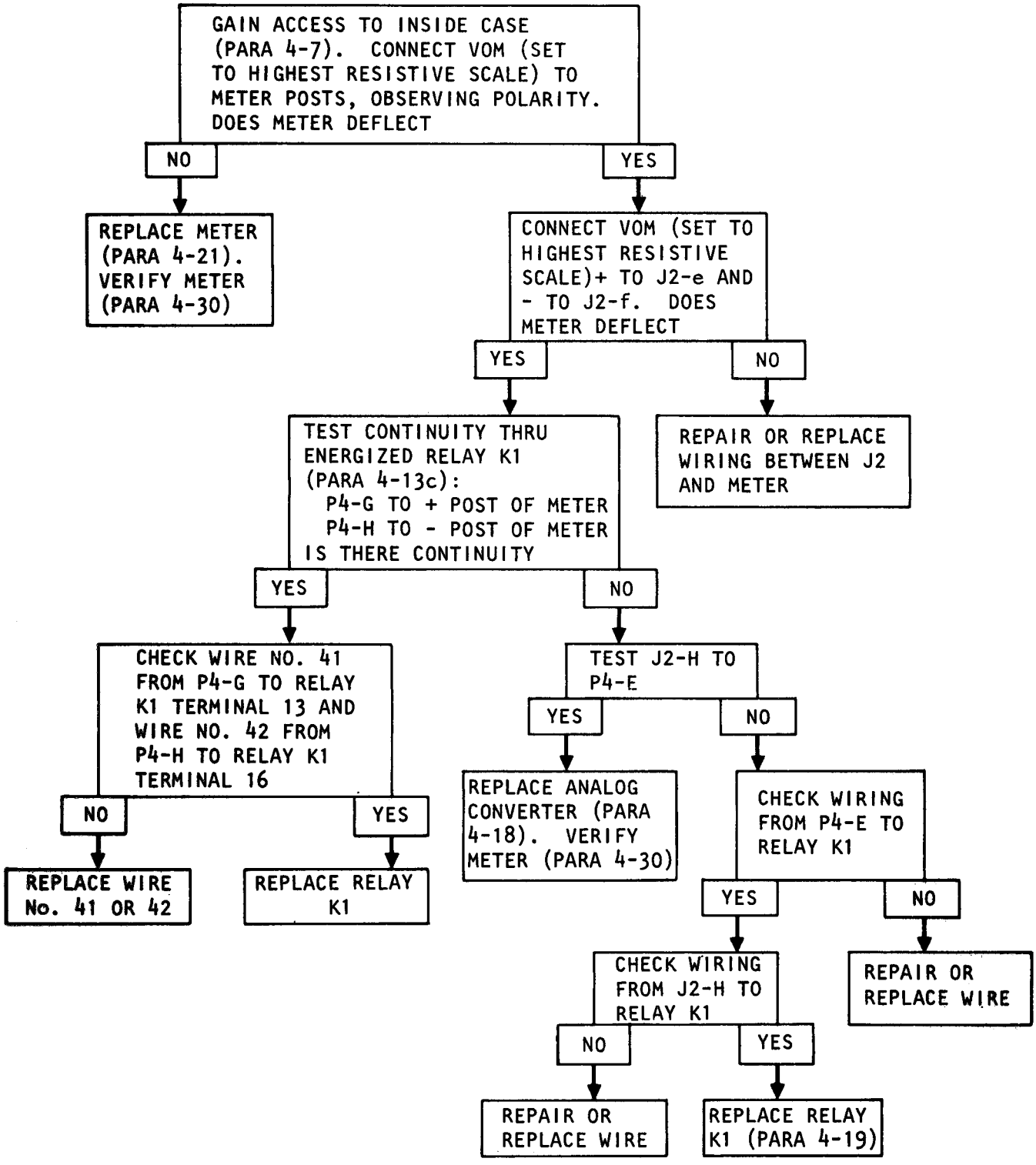
Section III. TROUBLESHOOTING

4-6. Introduction. The following troubleshooting procedures are to find and correct faults in the tester itself, and not in the APU or ESU being tested. Additional continuity checks can be performed by using schematic diagram, figure FO-1 and wiring diagram, figure FO-2, and by testing in accordance with paragraph 4-8. Refer to figure 3-1 for identification of connector contacts.

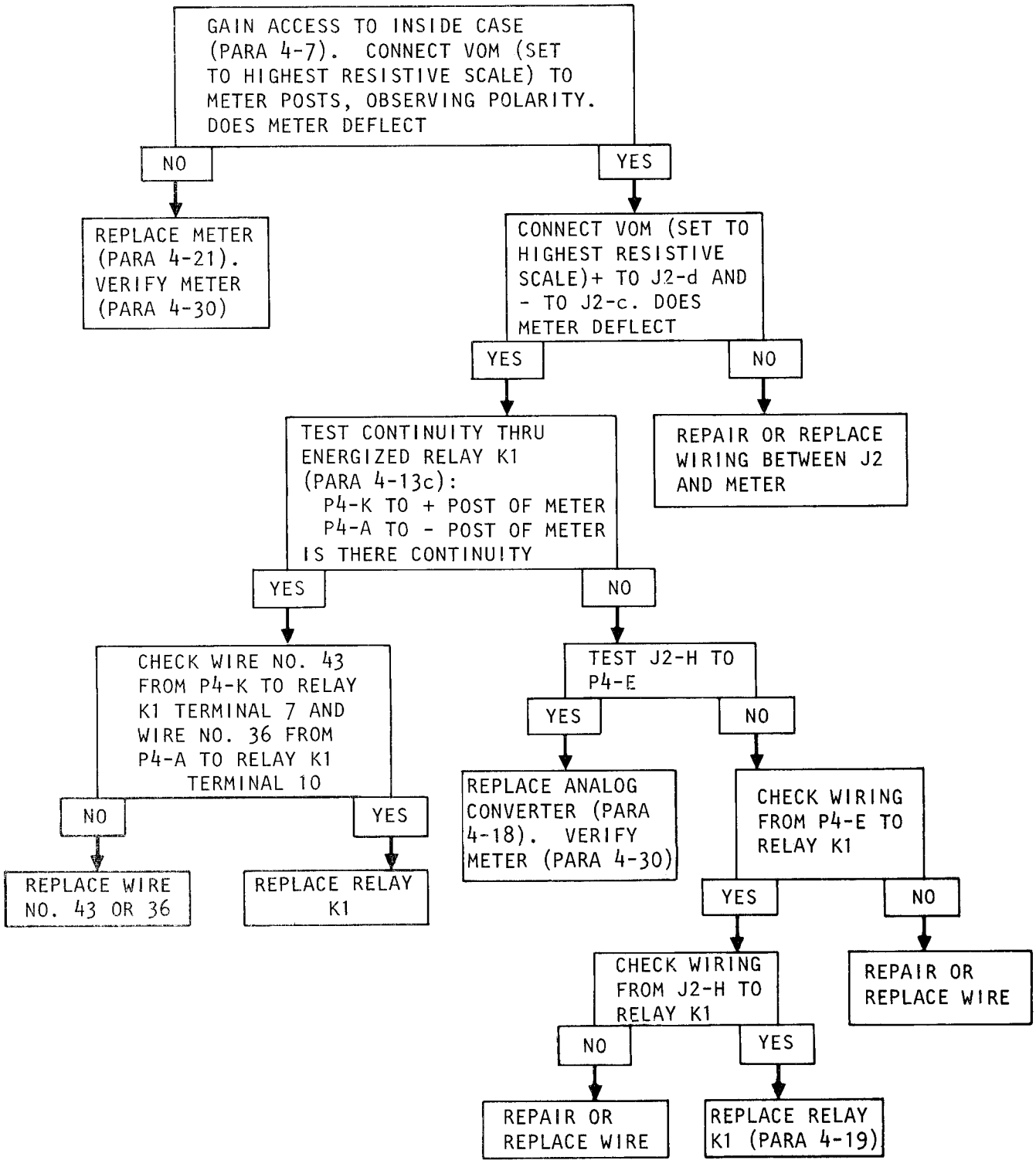
NOTE

Refer to wiring diagram, figure FO-2 to locate components, wires, connectors, pins and terminals where test connections are to be made. The wiring diagram covers only internal wiring of the tester. Refer to schematic diagram, figure FO-1, for wiring of harnesses.

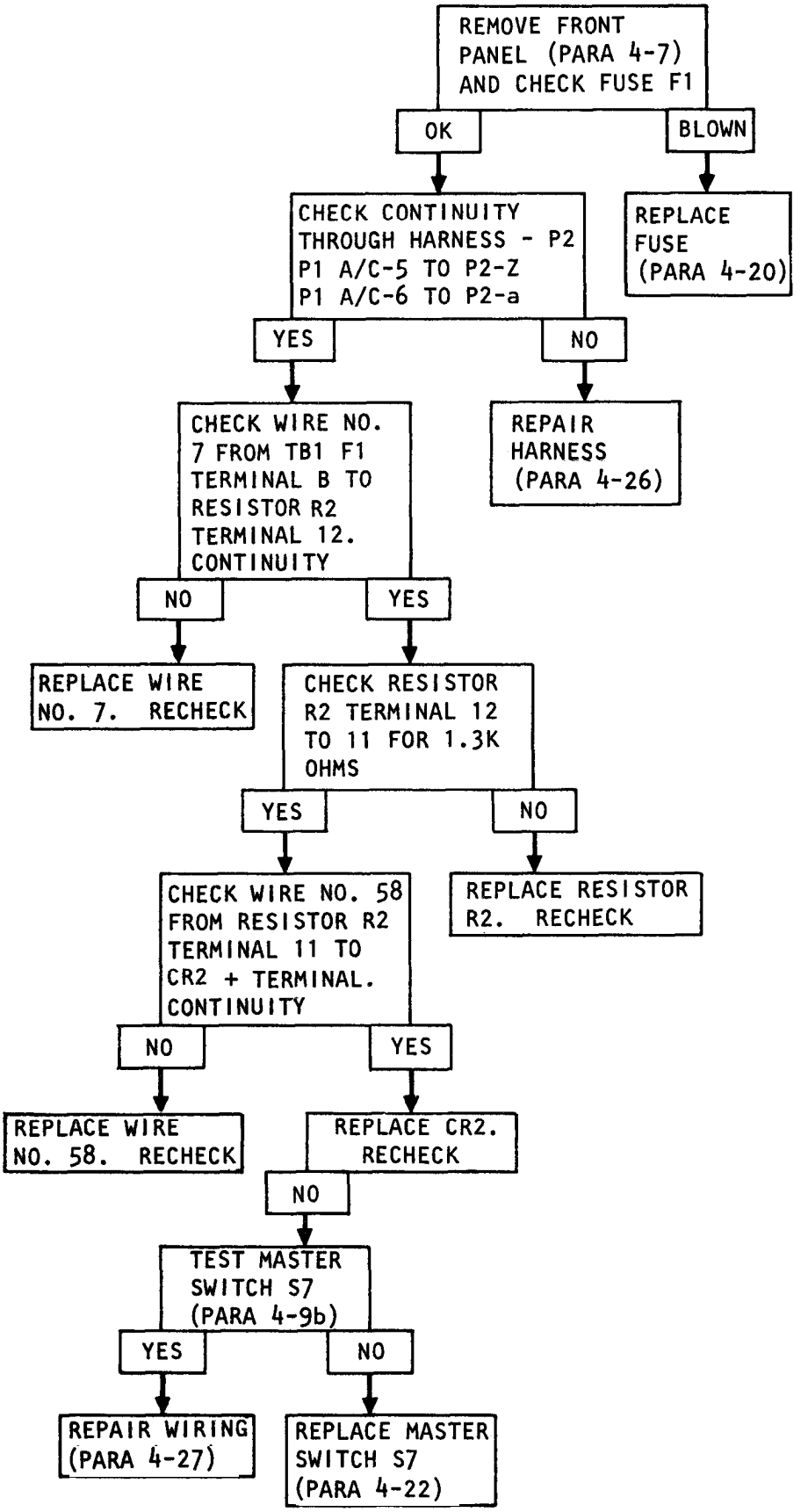
TROUBLESHOOTING PROCEDURE 1. METER DOES NOT INDICATE ENGINE SPEED



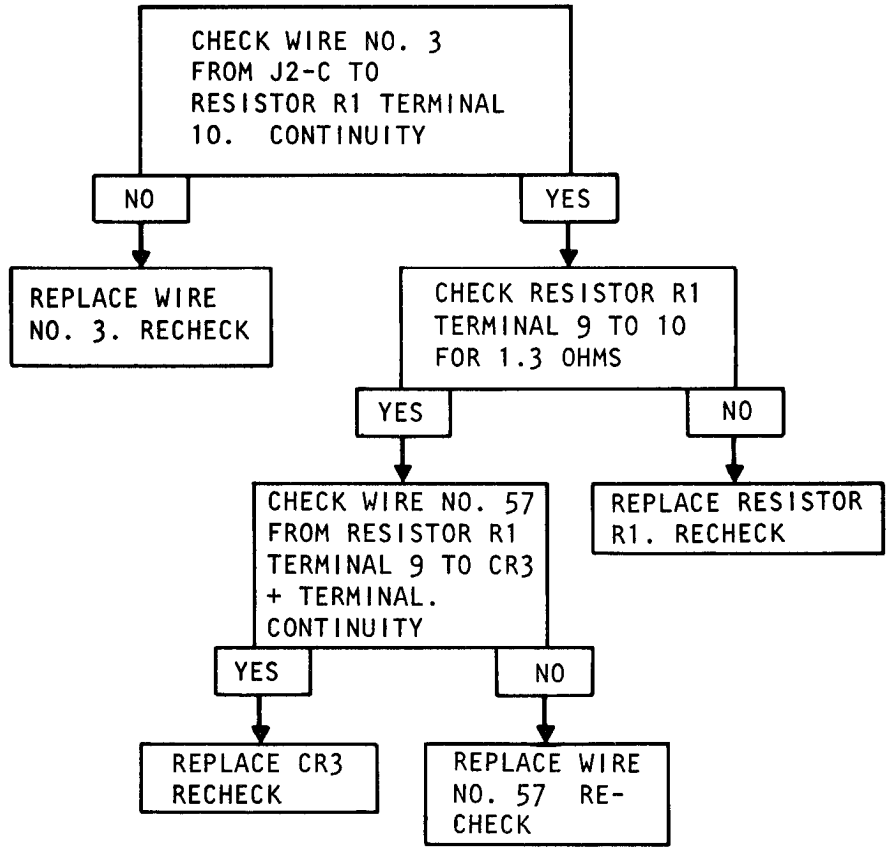
TROUBLESHOOTING PROCEDURE 2. METER DOES NOT INDICATE TEMP



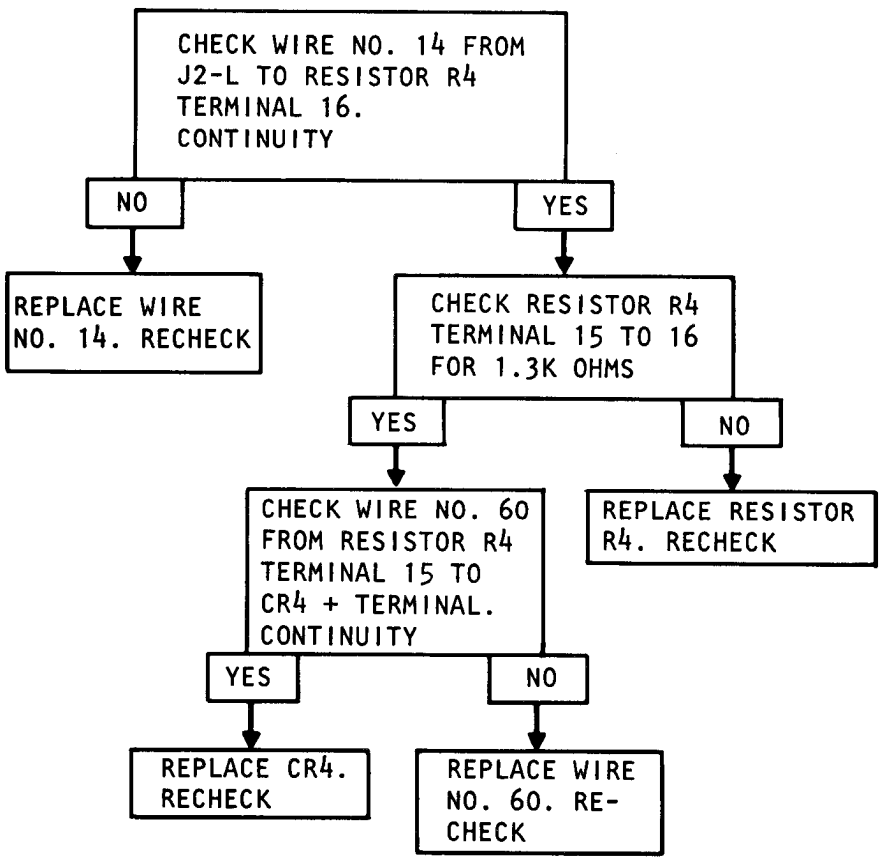
TROUBLESHOOTING PROCEDURE 3. MAIN POWER LED INDICATOR CR2 DOES NOT COME ON



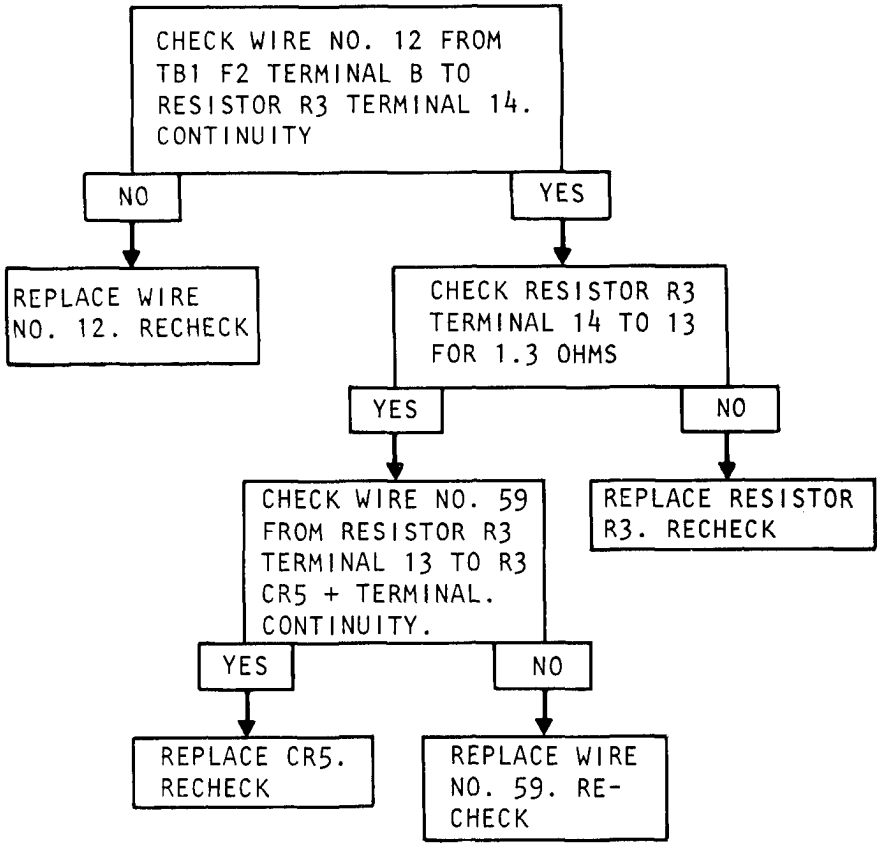
TROUBLESHOOTING PROCEDURE 4. MAIN LED INDICATOR CR3 DOES NOT COME ON



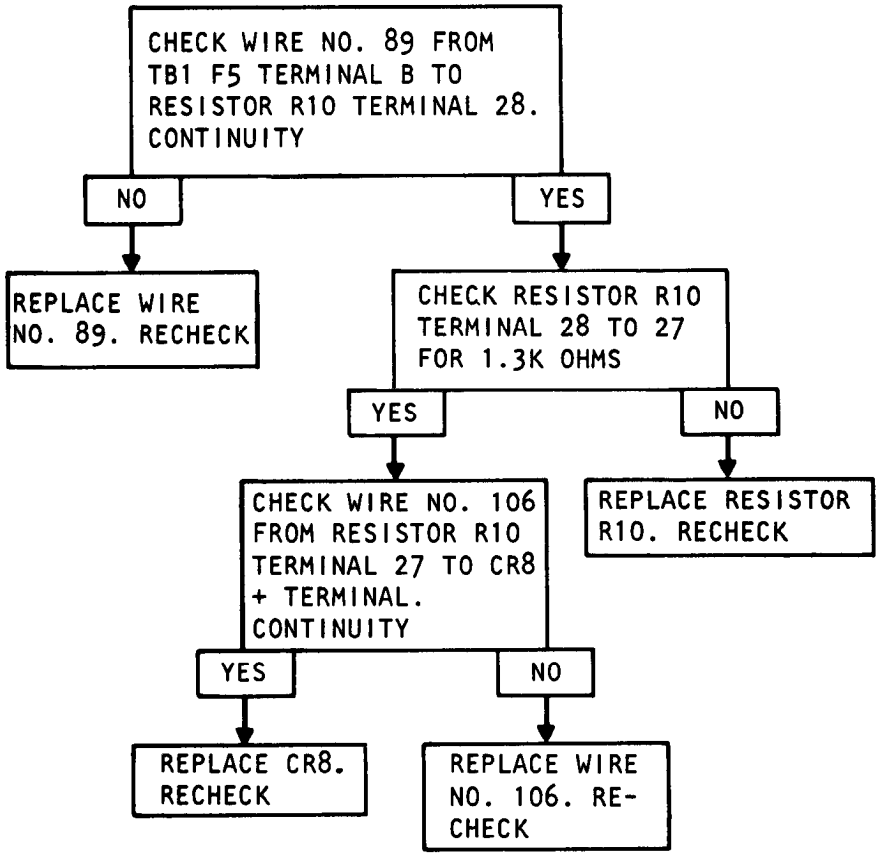
TROUBLESHOOTING PROCEDURE NO. 5.
READY TO LOAD LED INDICATOR CR4 DOES
NOT COME ON



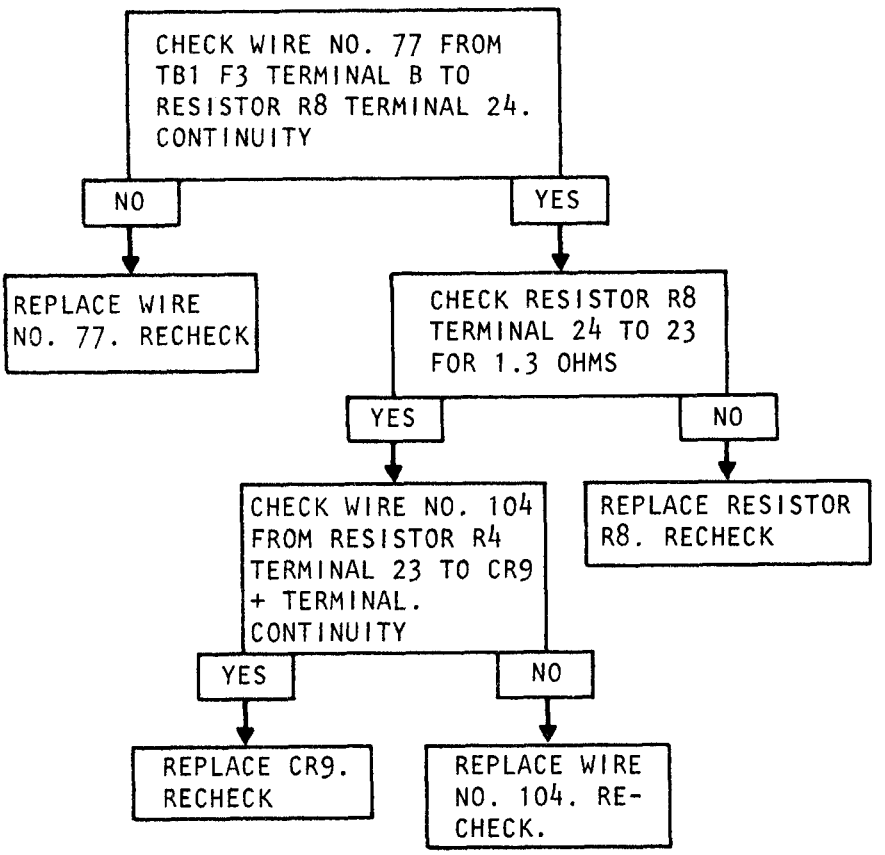
TROUBLESHOOTING PROCEDURE NO. 6
START COMMAND LED INDICATOR CR5 DOES NOT COME ON



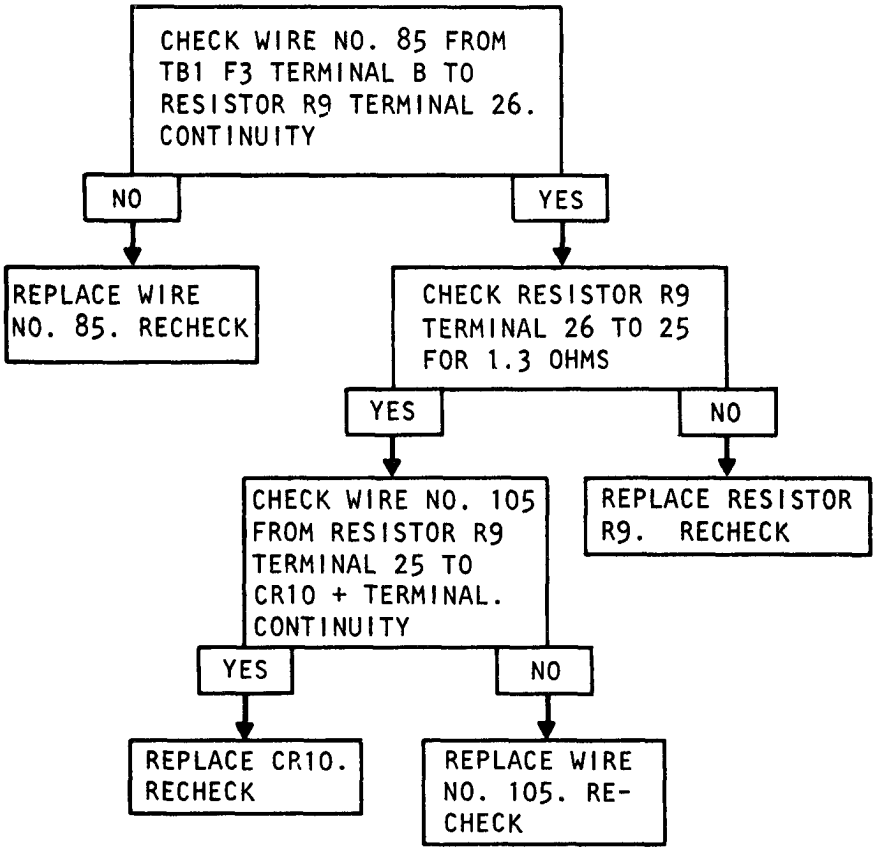
TROUBLESHOOTING PROCEDURE NO. 7. START FUEL LED INDICATOR CR8 DOES NOT COME ON



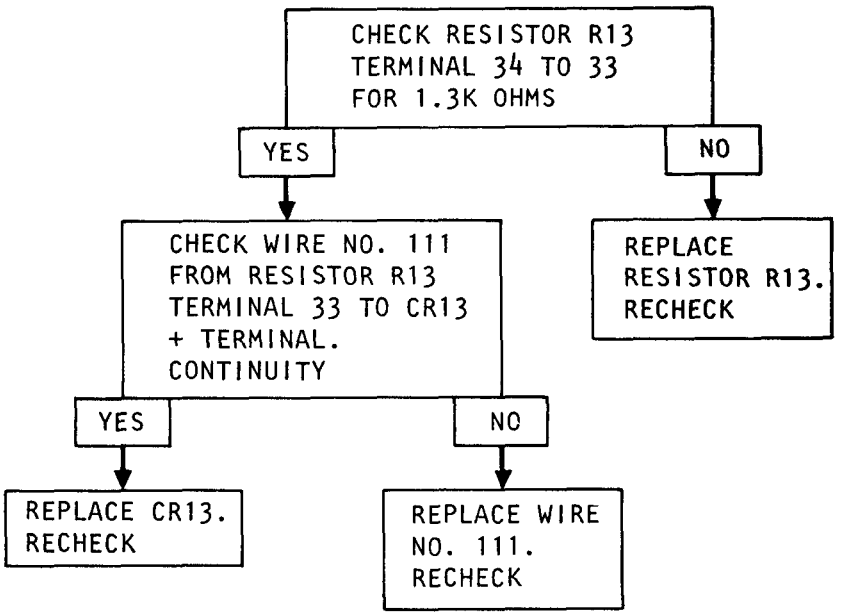
TROUBLESHOOTING PROCEDURE NO. 8. MAIN FUEL LED INDICATOR CR9 DOES NOT COME ON



TROUBLESHOOTING PROCEDURE NO. 9. MAX FUEL LED INDICATOR CR10 DOES NOT COME ON



TROUBLESHOOTING PROCEDURE NO. 10. REMOTE LED INDICATOR CR13 DOES NOT COME ON



Section IV. MAINTENANCE PROCEDURES

4-7. Access to Inside Case for Maintenance. Gain access to inside the case for maintenance purposes, as follows:

a. Turn pressure equalizer knob to OPEN.

b. Open two butterfly fasteners on front of case. Open lid, fold back, and remove from case.

c. Turn pressure equalizer knob to CLOSE.

d. Remove ten screws (17, figure 5-1) and washers (18) securing front panel assembly (16) to case (26).

e. Lift front panel assembly from case and lay over for access to components for maintenance.

f. After completion of maintenance, lift front panel assembly back into position in case aligning holes for retaining screws.

g. Reinstall ten screws and washers.

h. Install lid on case. Close lid and secure butterfly fasteners.

4-8. Testing. The following paragraphs describe tests that may be performed in conjunction with troubleshooting to isolate a faulty component or wiring.

4-9. Test Switches. Refer to wiring diagram, figure FO-2. Test switches as follows:

a. Gain access to inside of case per paragraph 4-7.

CAUTION

Be sure outside electrical power is not applied to tester during continuity checks. Damage to meters and other components can result.

b. Test MASTER Switch (S7).

1. Unsolder wire no. 109 at switch.

2. Connect VOM + lead to switch (S7) center terminal and - lead to switch (S7) lower terminal.

3. With switch toggle in down position, the VOM should read infinite ohms. With switch toggle in up position, the VOM should read zero ohms.

4. Disconnect VOM and resolder wire no. 109.

c. Test START/RUN/STOP Switch (S1).

1. Connect VOM + lead to switch (S1) center terminal and - lead to switch (S1) lower terminal.

2. With switch toggle in down position, the VOM should read infinite ohms. With switch toggle in up position, the VOM should read zero ohms.

3. Move VOM - lead to switch (S1) upper terminal. The VOM should read infinite ohms.

4. Move switch toggle to down position. The VOM should read zero ohms.

5. Disconnect VOM.

d. Test LOCAL/REMOTE Switch (S6).

1. Unsolder wire no. 52 at switch.

2. Connect VOM + lead to switch (S6) center terminal and - lead to switch (S6) lower terminal.

3. With switch toggle in down position, the VOM should read infinite ohms. With switch toggle in up position, the VOM should read zero ohms.

4. Disconnect VOM and resolder wire no. 52 to lower terminal of switch (S6).

4-10. Test LED Indicators. If an LED indicator fails to light when it is supposed to, test in accordance with the troubleshooting procedures in Section III.

4-11. Test Meter Lamp Holder. Apply 24 VDC to J2-Z and J2-a. Both meter lamps (DS1 and DS2) should light. Isolate trouble to wiring or lamp holder. Repair wiring (para 4-27) or replace lamp holder (para 4-16), as required.

4-12. Test Fuses. Perform continuity test of each fuse to determine if they are blown. If blown, replace fuses (para 4-20).

4-13. Test Relay. Perform continuity test of relay (K1) as follows:

a. Gain access to inside of case per paragraph 4-7.

b. Set VOM to OHM scale X1. Zero VOM. Refer to wiring diagram, figure FO-2. Check continuity as follows:

J2-c to -post M2	J2-X to J2-H
J2-d to +post M2	J2-Y to J2-G
J2-e to +post M1	J2-T to J3-G
J2-t to -post M1	J2-U to J3-H

NOTE

Remove power between checks. Only (K1) is energized for following test.

c. Refer to wiring diagram, figure FO-2. Disconnect P4 from analog converter. Connect 28 vdc to unused terminal of LOCAL/REMOTE switch S6. Connect ground lead to ground buss indicator lights. Check continuity as follows:

P4-A to - post M2	P4-E to J2-H
P4-K to + post M2	P4-F to J2-G
P4-G to + post M1	P4-C to J3-G
P4-H to - post M1	P4-D to J3-H

d. Replace relay if defective (para 4-19). Reconnect P4 to analog convertor.

4-14. Test Harnesses. Perform continuity test of harness – P1, harness – P2, and harness - P5. Refer to schematic diagram, figure FO-1, and check each wire.

4-15. Replacement. The following paragraphs describe procedures for replacement of components.

4-16. Lampholder Replacement.

a. Gain access to inside of case per paragraph 4-7.

b. Unscrew electrical connector to lamp holder (21, figure 5-2) and remove.

c. Loosen retaining nut on lamp holder and remove nut.

d. Remove lampholder from panel.

e. Install replacement lampholder into panel.

f. Install retaining nut on lampholder and tighten.

g. Remove top of lampholder and install lamp. Reinstall onto base.

h. Reinstall front panel and case lid.

4-17. Binding Post Replacement.

a. Gain access to inside of case per paragraph 4-7.

b. Unsolder wires from binding post (10 or 11, figure 5-2).

c. Remove retaining nut mounting binding post to panel. Remove binding post and insulator from panel.

d. Install replacement binding post with insulator onto panel. Install retaining nut and tighten.

e. Solder wire leads to binding post.

f. Reinstall panel and case lid.

4-18. Analog Converter Replacement.

a. Gain access to inside of case per paragraph 4-7.

b. Disconnect electrical connector (P4) from control assembly (19, figure 5-1).

c. Remove top four screws (20), washers (21), and control assembly (19).

d. Install replacement control assembly (19) and secure with four screws (20) and washers (21).

e. Connect electrical connector (P4) to control assembly (19).

f. Verify meter operation in accordance with paragraph 4-30.

g. Reinstall panel and case lid.

4-19. Relay Replacement.

a. Gain access to inside case per paragraph 4-7.

b. Lift relay hold down spring (5, figure 5-3) from socket (4).

c. Pull relay (1) out of socket (4).

d. Install replacement relay (1) into socket (4). Reinstall relay hold down spring (5) over relay.

e. Reinstall panel and case lid.

4-20. Fuse Replacement.

a. Gain access to inside case per paragraph 4-7.

b. Lift fuse (7, figure 5-3) from fuse block (11).

c. Install replacement fuse.

d. Reinstall panel and case lid.

4-21. Meter Replacement.

a. Gain access to inside case per paragraph 4-7.

b. Refer to wiring diagram, figure FO-2 and identify wire leads to be disconnected from meter. Wires 45, 46, and 47 connect to TEMP meter (M2). Wires 48, 49, and 50 connect to SPEED meter (M1).

c. Loosen and remove nuts from meter posts. Remove wire leads from posts.

d. Remove three retaining screws and nuts mounting the SPEED meter (M1) (1, figure 5-2) or TEMP meter (M2) (2, figure 5-2) to the panel.

e. Note the meter position and remove meter from panel.

f. Install replacement meter, noting previous meter position.

g. Install three retaining screws and nuts to secure meter to panel.

h. Refer to wiring diagram, figure FO-2. Connect wire leads to meter posts and install nuts on posts. Tighten nuts.

i. Verify meter in accordance with paragraph 4-30.

j. Reinstall panel and case lid.

4-22. Switch Replacement.

a. Gain access to inside case per paragraph 4-7.

b. Refer to wiring diagram, figure FO-2. Identify wire leads at switch to be replaced.

c. Unsolder wire leads from switch terminals.

d. Remove retaining nut mounting switch (12, figure 5-2) to panel. Remove switch noting index position.

e. Install replacement switch, insuring proper indexing.

f. Install retaining nut on switch.

g. Refer to wiring diagram, figure FO-2. Solder wire leads to switch terminals.

h. Reinstall panel and case lid.

4-23. LED Indicator Replacement.

a. Gain access to inside case per paragraph 4-7.

b. Refer to wiring diagram, figure FO-2. Identify wire leads to defective LED indicator (CR1 through CR12) to be replaced. Unsolder wire leads.

c. Press on rear of LED indicator (17, 18, or 19, figure 5-2) to remove from panel.

d. Install replacement LED indicator by pressing through front of panel.

e. Refer to wiring diagram, figure FO-2. Solder wire leads to LED indicator.

f. Install cap (13, 14, 15, or 16) on LED indicators.

g. Reinstall panel and case lid.

4-24. Instrument Case Replacement.

a. Remove ten screws (17, figure 5-1) and washers (18) securing front panel assembly (16) to case (26).

b. Lift front panel assembly (16) out of case (26).

c. Disconnect electrical connector (P4) from control assembly (19).

d. Remove four screws (24) securing plate assembly (23) to case (26).

e. Lift front panel assembly (16) and plate assembly (23) from case (26).

f. Remove screws (20), washers (21), spacers (22) and control assembly (19).

g. Install control assembly (19) into replacement case (26) and secure with screws (20), washers (21), and spacers (22).

h. Install plate assembly (23) in case (26) and secure with four screws (24).

i. Connect electrical connector (P4) to control assembly (19).

j. Install front panel assembly (16) into case (26) and secure with ten screws (17) and washers (18).

4-25. **REPAIR.** The following paragraphs describe repair of the tester.

4-26. **HARNESS REPAIR.** Refer to figure FO-1 for wiring of harness connectors. Replace damaged or deteriorated wire, sleeving, and pins. Refer to General Aircraft Maintenance Manual TM 55-1500-204-25/1 to repair connectors. Use following materials as required (ref table 1-2).

Pins

Insulated Sleeving, Type F, Form U, Grade A, Class I, Category I, Black, per MIL-I-631

Thermocouple Wire K/ALKTW-20F-KK, Thermo Electric Co., Inc. Saddle Brook, NY

Shielded Pair Wire, Teflon Coated, Type E, per MIL-W-16878

Wire, Type E, 20 AWG, per MIL-W-16878

Strap, Tiedown, Identification, Adjustable, MS3368-5-9E

4-27. **TESTER WIRING.** Refer to wiring diagram, figure FO-2. Replace all damaged or deteriorated wiring. Use following materials as required (ref table 1-2).

T/C Wire, M5846-1-B-1/24A and M5846-1-B-1/24C per MIL-W-5846/1

Wire, Type 3, 22 AWG, per MIL-W-16878

Strap, Tiedown, Adjustable, MS3367-1-9

Shrink Tubing

Crimp-On Terminal Lugs

4-28. **PAINTING.** Refinish exterior of case (26, figure 5-1) as required. Paint yellow, color number 13538 per FED-STD-595A. Renew lettering in gloss black, color number 17038 per FED-STD-595A.

4-29. **FRONT PANEL MARKINGS.** Renew nomenclature on front panel. Silkscreen black per MIL-STD-130.

4-30. Verification. Verification of the meters shall be checked annually, and following replacement of the analog converter or a meter. If the condition of a tester is unknown, a verification shall be performed before using the tester. Perform verification as follows. Refer to figure 4-1 for test setup.

a. Gain access to inside of case per paragraph 4-7.

b. Disconnect negative terminal wire (wire no. 50) from SPEED meter.

c. Connect digital multimeter in series with the SPEED meter and disconnected wire, observing polarity.

d. Set the multimeter mode selector switch to read amperes.

CAUTION

Be careful not to disconnect test wiring or short out leads. Damage to components or faulty readings can result.

e. Lay front panel assembly on case.

f. Mechanically zero SPEED and TEMP meters.

g. Connect signal converter ST93480 to tester connector J2.

h. Position dc power supply adjacent to tester. Turn output knob fully counterclockwise.

i. Connect power output terminals to dc voltage input terminals of signal converter ST93480 observing polarity.

WARNING

High voltage is used in operation of test equipment. Death on contact may result if personnel fail to observe safety precautions.

j. Be sure power switch is in off position and connect power cord to 100 volt source.

k. Connect oscillator frequency output to speed frequency input terminals of signal converter ST93480.

l. Turn variable attenuator knob to maximum.

m. Turn attenuator select switch to 5 volt peak-to-peak setting.

n. Turn vernier frequency dial to zero Hertz.

o. Turn Hertz multiplier power switch to on.

p. Connect oscillator power cable to 110 volt source.

q. Turn gage select switch of frequency counter to AUTO.

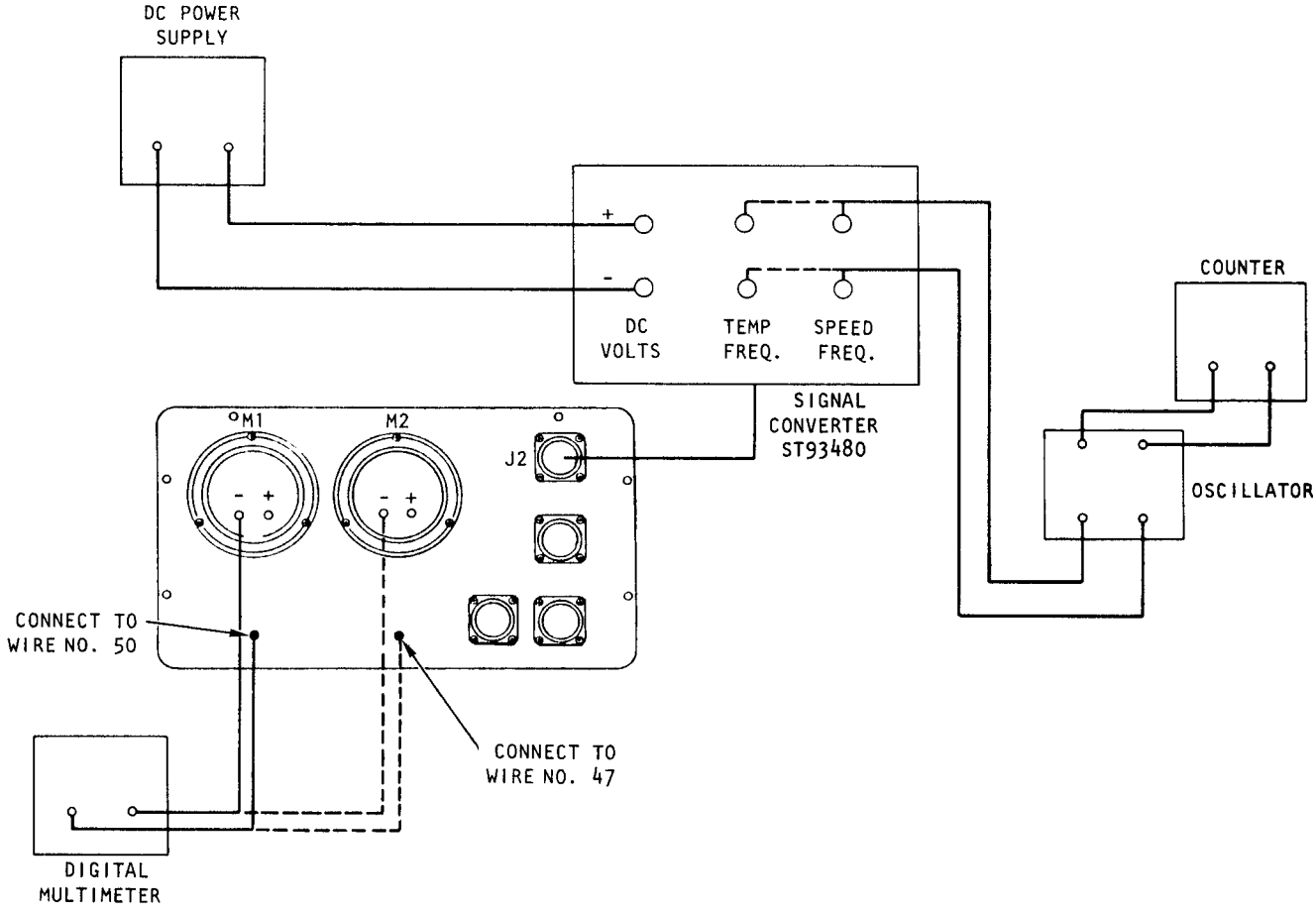


Figure 4-1. Test Setup for Verification

r. Turn wave form select switch to sine-wave setting.

s. Turn sensitivity knob to mid-scale range setting.

t. Connect output terminals of oscillator to input terminals of counter.

u. Connect counter power cable to 110 volt source.

v. Place LOCAL/REMOTE switch on tester to REMOTE.

w. Turn dc power supply on.

x. Turn variable output voltage knob clockwise until output meter indicates 24 volts.

y. Set counter power switch to on.

z. Set MASTER switch on tester to on (up). Verify that MAIN POWER LED indicator light comes on.

aa. Adjust oscillator to each % RPM indication shown in table 4-2 and check input frequency and current readings.

ab. Decrease the oscillator frequency to zero.

ac. Set MASTER switch on tester to off (down).

ad. Disconnect leads from speed frequency input terminals of signal converter ST93480 and connect to temperature frequency input terminals.

ac. Reconnect negative terminal wire (wire no. 50) to negative terminal of SPEED meter.

af. Disconnect negative terminal wire (wire no. 47) from TEMP meter.

ag. Connect digital multimeter in series with TEMP meter and disconnected wire.

ah. Check that multimeter mode selector switch is set to read amperes.

CAUTION

Be careful not to disconnect test wiring or short out leads. Damage to components or faulty readings can result.

ai. Lay front panel assembly back on case.

aj. Set MASTER switch on tester to on (up).

ak. Adjust oscillator to each °F indication shown in table 4-3 and check input frequency and current readings.

al. Set MASTER switch on tester to off (down).

am. Disconnect meter leads from TEMP meter circuit.

an. Reconnect negative terminal wire to negative terminal of TEMP meter.

ao. Replace front panel assembly in case.

ap. Disconnect test equipment.

Table 4-2. SPEED Meter Verification

TACH METER % RPM	INPUT FREQUENCY		CURRENT (μa)	
	LOW	HIGH	LOW	HIGH
20	840	1027	32	34
40	1773	1960	65	68
60	2706	2893	98	102
80	3640	3826	130	136
100	4573	4759	163	170
120	5506	5693	196	204

TOLERANCE: ±2%

Table 4-3. TEMP Meter Verification

TEMP METER °F	INPUT FREQUENCY		CURRENT (μa)	
	LOW	HIGH	LOW	HIGH
300	405	443	35	44
600	571	610	75	84
900	737	775	115	124
1200	904	942	155	164
1500	1068	1110	195	204

TOLERANCE: ±35°F

Section V. PREPARATION FOR STORAGE OR SHIPMENT

4-31. Packing for Shipment or Storage. The original shipping container should be used for packing the tester. If the original container is not available, pack the tester in a suitably padded box or carton.

CHAPTER 5

PARTS LIST

5-1. Introduction.

a. The illustrated parts breakdown is comprised of group assembly parts lists and illustrations (figure 5-1 through 5-4) in exploded view form to provide complete identification of all replaceable parts comprising the tester. The breakdown lists all parts in their sequence of disassembly as nearly as practicable. The parts are indexed for reference to the associated illustrations.

b. In the USABLE ON CODE column the part number applicability to the tester is indicated by a letter symbol. When no symbol is shown, the part is used on all models.

c. Items that are purchased by Turbomach and used without alteration are identified by the vendor's part numbers. The vendor's name and address is indicated in the DESCRIPTION column by use of a five-digit code number, following the part nomenclature. The codes for the following listed vendors are in accordance with the Federal Supply Code for Manufacturers, Cataloging Handbook H4-1.

d. The absence of a five-digit code number following the part in the DESCRIPTION column indicates that the part is a prime contractor's (Turbomach) part, or a Government standard part.

Code	Vendor	Code	Vendor
02762	Grimes Company Dallas, TX	77342	AMF Inc., Potter and Brumfield Div. Princeton, IN
53031	T. A. Instrument Case Co. Los Angeles, CA	83330	Herman H. Smith, Inc. Brooklyn, NY
72619	Dialight Div. Amperex Electronic Corp. Brooklyn, NY	88245	Litton Systems Inc. USECO Div. Van Nuys, CA
75915	Littlefuse, Inc. Des Plaines, IL	95146	Alto Electronic Products, Inc. North Andover, MA

NOTE

Parts breakdown is to be used for identification only. See TM 55-4920-431-23P for requisitioning parts.

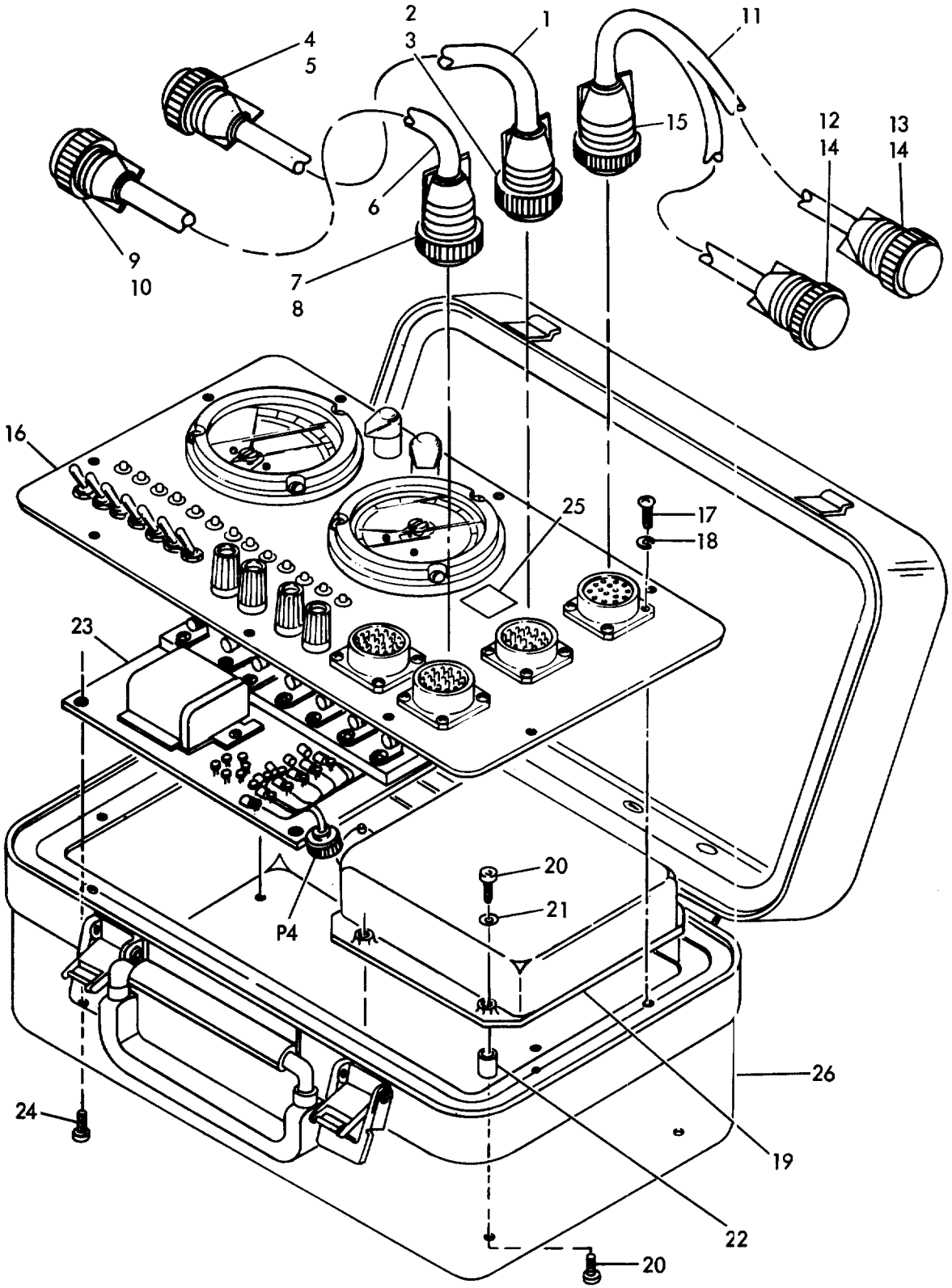


Figure 5-1. APU Tester

FIGURE & INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
5-1	161226-200	TESTER, APU	REF	
-1	161228-200	. HARNESS ASSEMBLY - P1.....	1	
-2	MS3476L18-32S	. . CONNECTOR (P1 REMOTE .... CONTROL BOX	1	
-3	MS3417-18N	. . ADAPTER	1	
-4	M83723-87R1524N	. . CONNECTOR (P1 ESU)	1	
-5	MS3417-16N	. . ADAPTER	1	
-6	161227-200	. HARNESS ASSEMBLY - P5	1	
-7	MS3476L18-32S	. . CONNECTOR (P5 REMOTE . . . CONTROL BOX)	1	
-8	MS3417-18N	. . ADAPTER	1	
-9	M83723-82R1624N	. . CONNECTOR (J1 ENGINE .... HARNESS)	1	
-10	MS3417-16N	. . ADAPTER	1	
-11	161229-200	. HARNESS ASSEMBLY - P2	1	
-12	M83723-83R1415N	. . CONNECTOR (A/C HARNESS)	1	
-13	M83723-86R1415N	. . CONNECTOR (P2 ESU)	1	
-14	MS3417-14N	. . ADAPTER.....	2	
-15	MS3476L18-32P	. . CONNECTOR (P2 REMOTE .... CONTROL BOX)	1	
-16	161220-100	. FRONT PANEL ASSEMBLY ..... (See figure 5-2 for breakdown) (ATTACHING PARTS)	1	
-17	MS27039C08-06	. SCREW	10	
-18	MS35333-155	. WASHER, Lock..... ---*---	10	
-19	160240-400	. CONTROL ASSEMBLY..... (ATTACHING PARTS)	1	
-20	MS3212-23	. SCREW	8	
-21	MS23187-7	. WASHER.....	4	
-22	NAS1786C08-12	. SPACER..... ---*---	4	
-23	161223-100	. PLATE ASSEMBLY, Mounting.. (See figure 5-3 for breakdown) (ATTACHING PARTS)	1	
-24	MS3212-11	. SCREW..... ---*---	4	
-25	162197-1	. PLATE, Identification	1	
-26	161221-1	. CASE, Instrument (See figure . . . 5-4 for breakdown)	1	

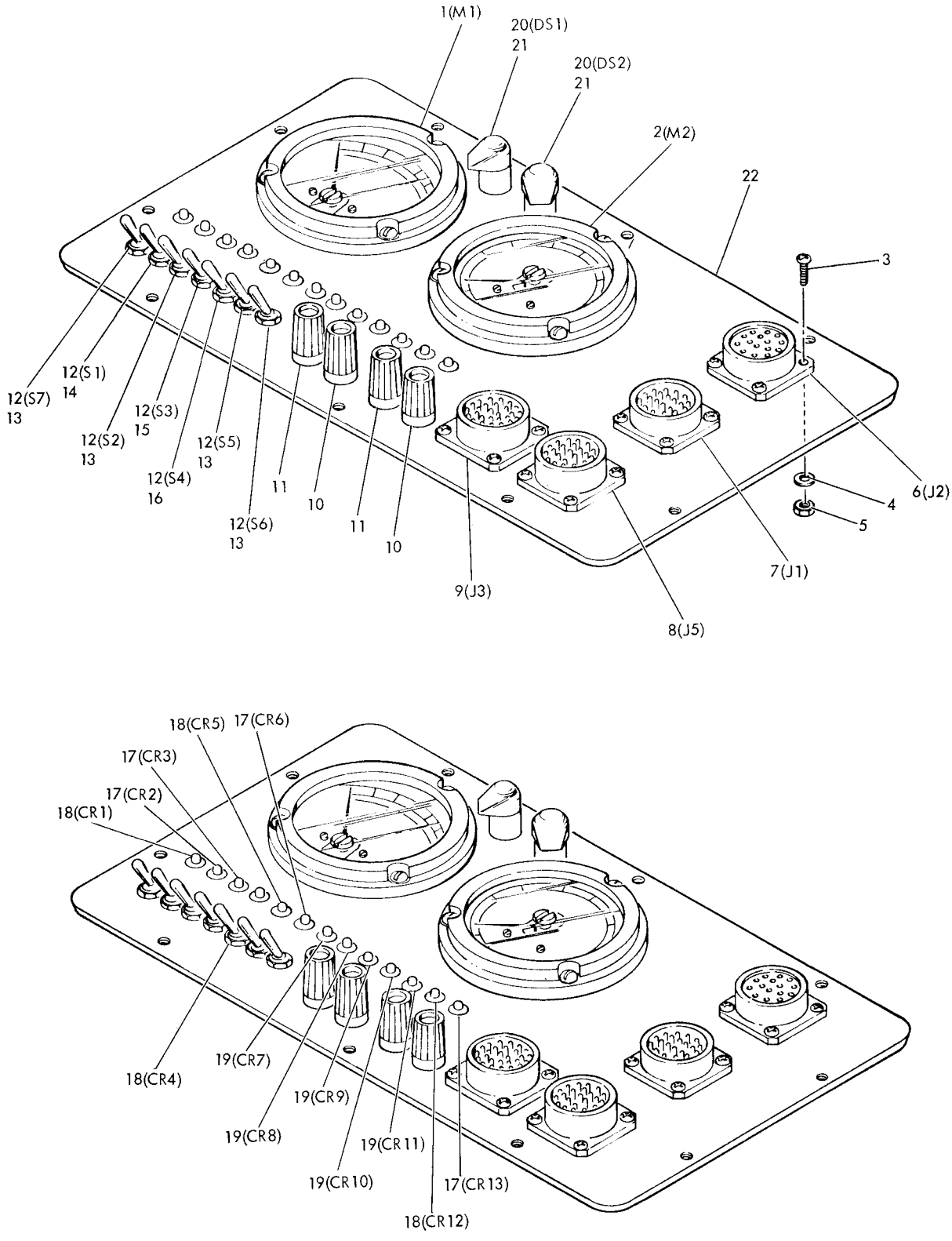


Figure 5-2. Front Panel Assembly

FIGURE & INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
5-2-	161220-100	FRONT PANEL ASSEMBLY (See figure 5-1, index 16)	REF	
-1	906781C1	. METER, Tach (M 1)	1	
-2	911623C1	. METER, Temp (M2)	1	
-3	MS51957-15	. SCREW	16	
-4	MS35333-4	. WASHER, Lock	16	
-5	MS35649-244	. NUT	16	
-6	MS3470L-18-32S	. CONNECTOR, Receptacle (J2)	1	
-7	MS3470L-18-32P	. CONNECTOR, Plug (J1)	1	
-8	MS3470L-18-32P	. CONNECTOR, Plug (J5	1	
-9	MS3470L-18-32P	. CONNECTOR, Plug (J3)	1	
-10	1514-102	. POST, Binding, red (83330)	2	
-11	1514-103	. POST, Binding, black (83330)	2	
-12	MST-105D	. SWITCH, Toggle, SPDT (S1- S7) 95146)	7	
-13	C-10RED	. CAP, Red (95146)	4	
-14	C-10GRN	. CAP, Green (95146)	1	
-15	C-10BLK	. CAP, Black (95146)	1	
-16	C-10YEL	. CAP, Yellow (95146)	1	
-17	559-0101-001	. INDICATOR, Led, Red (CR2,3,6,13) (72619)	4	
-18	559-0201-001	. INDICATOR, Led, Grn (CR1,4,5,12) (72619)	4	
-19	559-0301-001	. INDICATOR, Led, Yel (CR7,8,9,10,11) (72619)	5	
-20	MS25237-327	. LAMP (DS1, DS2)	2	
-21	A-8970-1-327	. LAMPHOLDER (02762)	2	
-22	161219-1	. FRONT PANEL	1	

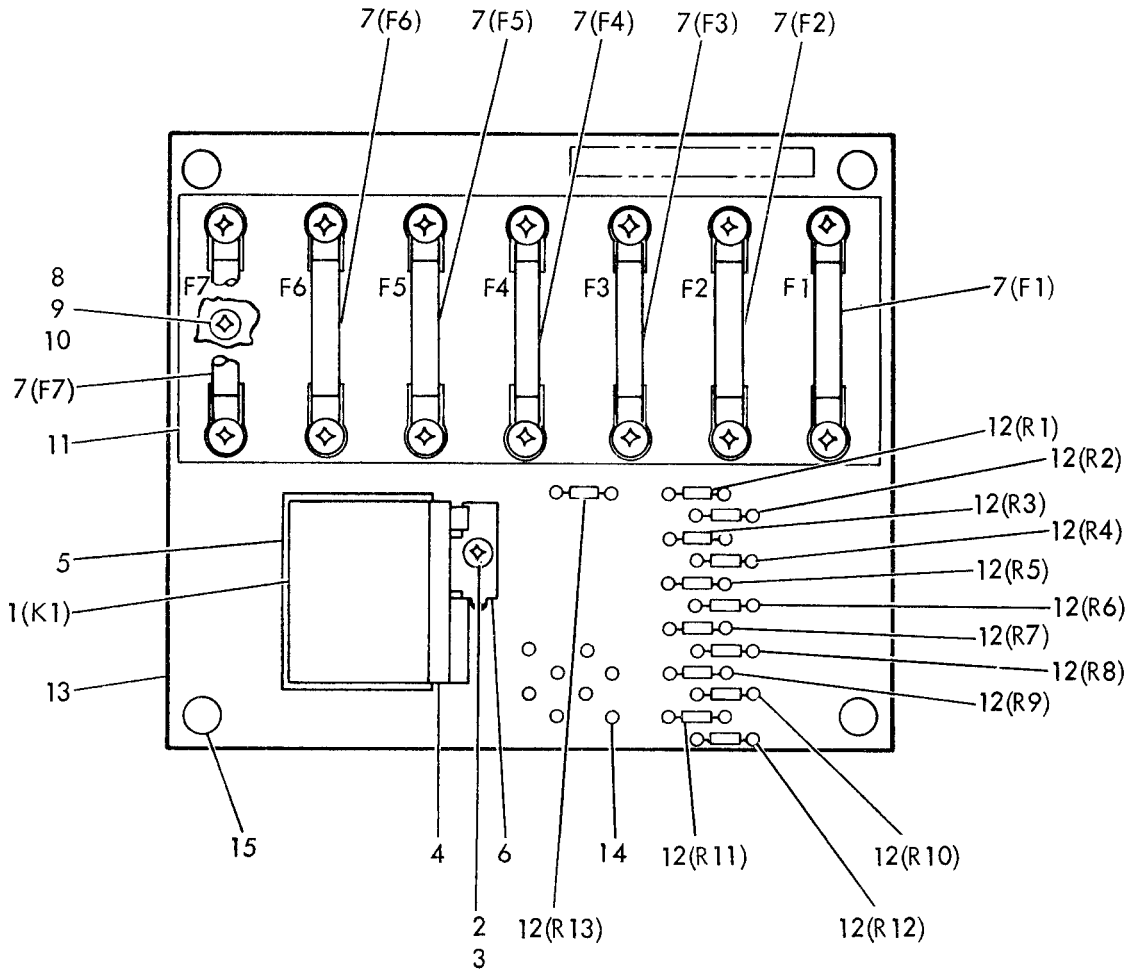


Figure 5-3. Mounting Plate Assembly

FIGURE & INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
5-3-	161223-100	PLATE ASSEMBLY, Mounting . . . . (See figure 5-1, Index 23)	REF	
-1	R10-E1X8V350DC	. RELAY, 24 VDC, SPDT (K1) (77342)	1	
-2	MS51957-26	. SCREW	1	
-3	MS35333-154	. WASHER, Lock	1	
-4	27E211	. SOCKET, Relay (77342)	1	
-5	20C266	. SPRING, Relay hold down (77342)	1	
-6	27E152	. MOUNTING BRACKET, Relay socket (77342)	1	
-7	3AG3AMP	. FUSE (F1-F7) (75915)	7	
-8	MS51959-30	. SCREW	3	
-9	MS35333-154	. WASHER, Lock	3	
-10	MS21044C06	. NUT	3	
-11	356007	. FUSE BLOCK (75915)	1	
-12	RCR07G132JM	. RESISTOR (R1-R13)	13	
-13	161222-1	. PLATE, Mounting	1	
-14	SE12XC04	. TERMINAL	34	
-15	B1530C3-8-11	. STANDOFF (88245)	4	

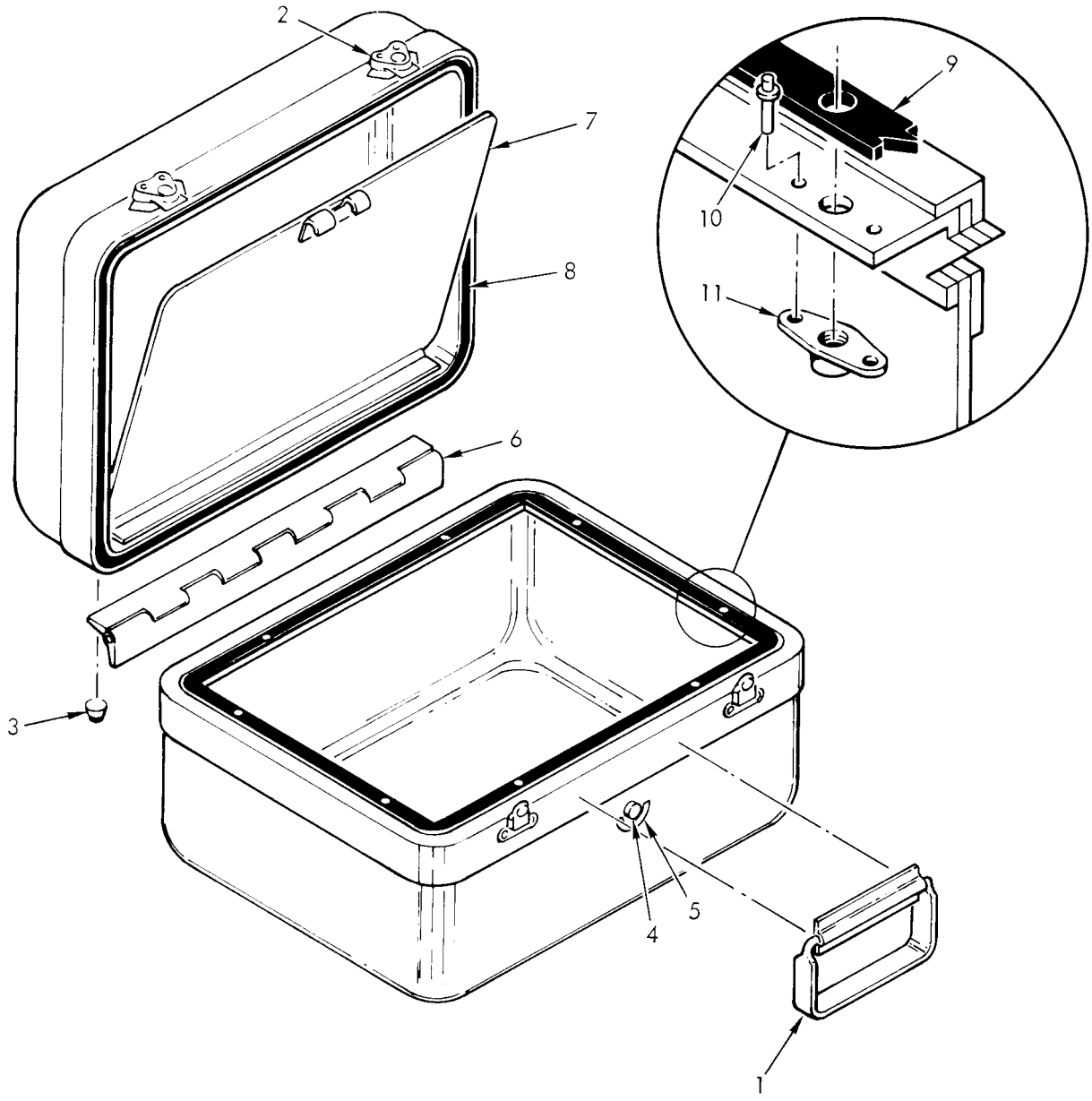


Figure 5-4. Instrument Case

FIGURE & INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DE SCRIPTION	UNITS PER ASSY	USABLE ON CODE
5-4	161221-1	CASE, Instrument (See figure 5-1, index 26)	REF	
-1	TA50A08G2	. HANDLE ASSEMBLY (53031)	1	
-2	XTC01P29	. LATCH ASSEMBLY (53031)	2	
-3	TC61B10N1	. BUMPER ASSEMBLY (53031)	4	
-4	TC78V01-1	. VALVE ASSEMBLY (53031)	1	
-5	TA50A06-04	. LABEL, VALVE (53031)	1	
-6	TA50A05-011	. HINGE ASSEMBLY (53031)	1	
-7	TC76T25-05	. TRAY ASSEMBLY (53031)	1	
-8	No Number	. SEAL (make from TC20R04 (53031)	1	
-9	TC10G05N4	. GASKET (53031)	1	
-10	MS20605AD3C4	. RIVET	20	
-11	TC10M07	. NUTPLATE (53031)	10	

APPENDIX A

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

A-1. Maintenance Allocation Chart.

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

AVUM which corresponds to the O code in the Repair Parts and Special Tools List (RPSTL).

AVIM which corresponds to the F code in the Repair Parts and Special Tools List (RPSTL).

DEPOT which corresponds to the D code in the Repair Parts and Special Tools List (RPSTL).

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

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

(a) Company Size Aviation Units. Perform those tasks which consist primarily of preventive maintenance and maintenance repair and replacement functions associated with sustaining a high level of equipment operational readiness. Perform maintenance inspections and servicing to include daily, intermediate, periodic and special inspections as authorized by the MAC or higher headquarters. Identify the cause of equipment system malfunctions using applicable technical manual troubleshooting instructions. Built-In-Test Equipment (BITE), installed instruments, or easy to use Test Measurement and Diagnostic Equipment (TMDE). Replace worn or damaged modules/components which do not require complex adjustments or system alignments and which can be removed/installed with available skills, tools and equipment. Perform operational and continuity checks and make minor repairs. Perform servicing, functional adjustments, and minor repair/replacement. Evacuate unserviceable modules/components and end items beyond the repair capability of AVUM to the supporting AVIM.

(b) Less than Company Size Aviation Units. Aviation elements organic to brigade, group, battalion headquarters and detachment size units are normally small and

have less than ten aircraft assigned. Maintenance tasks performed by the aircraft crew chief or assigned aircraft repairman will normally be limited to preventive maintenance, inspections, servicing, spot painting, stop drilling, minor adjustments module/component fault diagnosis and replacement of selected modules/components. Repair functions will normally be accomplished by the supporting AVIM unit.

2. Aviation Intermediate Maintenance (AVIM). AVIM provides mobile, responsive "One Stop" maintenance support (Maintenance functions which are not conducive to sustaining air mobility will be assigned to depot maintenance). Performs all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can be accomplished efficiently with available skills, tools, and equipment. Establishes the Direct Exchange (DX) program for AVUM units by repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level. Inspects, troubleshoots, tests, diagnoses, repairs, adjusts, calibrates, and aligns system modules/components. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and the replacement of seals, fittings and items of common hardware. Unserviceable reparable modules/components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance. This level will perform special inspections which exceed AVUM capability. Provides quick response maintenance support, on-the-job training, and technical assistance through the use of mobile maintenance contact teams. Maintains authorized operational readiness float. Provides collections and classification services for serviceable/unserviceable material. Operates a cannibalization activity in accordance with AR 750-50. (The aircraft maintenance company within the maintenance battalion of a division will perform AVIM functions consistent with air mobility requirements and conservation of personnel and equipment resources. Additional intermediate maintenance support will be provided by the supporting non-divisional AVIM unit).

A-2. Use of the Maintenance Allocation Chart.

a. The MAC assigns maintenance functions to the lowest level of maintenance based on past experience and the-following consideration:

1. Skills available.

2. Time required.

3. Tools and test equipment required and/or available.

b. Only the lowest level of maintenance authorized to perform a maintenance function is indicated. If the lowest level of maintenance cannot perform all tasks of any single maintenance function (e.g., test, repair), then the higher maintenance level(s) that can accomplish additional tasks will also be indicated.

c. A maintenance function assigned to a maintenance level will automatically be authorized to be performed at any higher maintenance level.

d. A maintenance function that cannot be performed at the assigned level of maintenance for any reason may be evacuated to the next higher maintenance organization. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required or directed by the appropriate commander.

e. The assignment of a maintenance function will not be construed as authorization to carry the associated repair parts in stock. Authority to requisition, stock or otherwise secure necessary repair parts will be as specified in the repair parts and special tools list appendix.

f. Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, maintenance functions assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be specifically authorized by the maintenance officer of the level of maintenance to which the function is assigned. The special tools, equipment, etc. required by the lower level of maintenance to perform this function will be furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility of the function. The higher level of maintenance will provide technical supervision and inspection of the function being performed at the lower level.

g. Organizational through depot maintenance of the U.S. Army Electronics Command equipment will be performed by designated U. S. Army Electronics Command personnel.

h. Changes to the MAC will be based on continuing evaluation and analysis by responsible technical personnel and on reports received from field activities.

A-3. Definitions.

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

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

c. Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents and air.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Aline. To adjust specified variable elements of an item to bring to optimum performance.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison 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 or test equipment being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an emplacement, site or vehicle.

h. Replace. To replace unserviceable items with serviceable assemblies, subassemblies or parts.

i. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This includes, but is not limited to, inspection,

cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

j. Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards prepared and published for the specific item to be overhauled.

k. Rebuild. To restore an item to a standard as nearly as possible to the original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

A-4. Functional Groups. Standard functional groupings are not considered feasible for aviation ground support equipment due to variation and complexity. Therefore variations to functional groupings may occur.

A-5. Maintenance Categories and Work Times. The maintenance categories (levels) AVUM, AVIM, and DEPOT are listed on the Maintenance Allocation Chart with individual columns that indicate the work times for maintenance functions at each maintenance level. Work time presentation such as 0.1 indicate the average time it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation shall indicate "--". Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

A-6. Tools and Test Equipment (Section III). Common tool sets (not individual tools), special tools, test and support equipment required to perform maintenance functions are listed alphabetically with a reference number to permit cross-referencing to column 5 in the MAC. In addition, the maintenance category authorized to use the device is listed along with the item National Stock Number (NSN) and, if applicable, the tool number to aid in identifying the tool/device.

A-7. Remarks (Section IV). Remarks contained in column 6, with an alphabetical code, are listed to provide a ready reference to the definition of the remarks.

Section II

MAINTENANCE ALLOCATION CHART
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS

APU TESTER (ZELDA)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
00	APU TESTER						
01	CASE INSTRUMENT						
0101	SEALS	Inspect	.3				
		Replace		.8		103	
0102	LATCHES	Inspect	.3				
		Repair		.5		103	
		Replace		.8		103	
02	PANEL ASSY						
0201	METERS, TEMP & SPEED	Inspect	.3				
		Test	.3			102	A
		Service	.3				B
		Replace		1.0		105	
0202	POST BINDING	Inspect	.3				
		Replace		.8		105	
0203	CONNECTORS	Inspect		.8			
		Replace			1.5		
0204	SWITCHES	Inspect	.3				C
		Test		.5		106	D
		Replace		.8		106	
0205	LAMPS, LED INDICATORS	Inspect	.3				
		Test		.3			E
		Replace		.8		106	
0206	LAMPS, METERS	Inspect	.2				
		Replace	.3				
0207	HOLDER, LAMP	Inspect		.3			
		Replace		.8		106	
		Test		.5		106	D
03	MOUNTING PLATE ASSY						
0301	FUSES	Inspect		.3			
		Test		.3		106	D
		Replace		.5		106	

MAINTENANCE ALLOCATION CHART
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS

APU TESTER (ZELDA)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
0302	RESISTORS	Replace		.8		106	
0303	RELAY	Inspect		.3			
		Test		.5		106	
		Replace		.8		106	
04	CONTROL ASSY						
0401	CONVERTER, ANALOG	Inspect		.5			
		Replace		.8		106	
05	ELECTRIC HARNESSES	Inspect		.3			
		Test		.8		106	D
		Repair		1.0		106	F
		Replace		.5		106	

Section III

TOOL AND TEST EQUIPMENT REQUIREMENTS
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS: APU TESTER (ZELDA)

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
100	O	Tool Set, AVUM, Set No. 1	4920-00-159-8727	SC492099CLA90
101	O	Tool Set, AVUM, Set No. 2	4920-00-567-0476	SC492099CLA92
102	O	Tool Kit, Acft Mech Gen	5180-00-323-4692	SC518099CLA01
103	O	Tool Kit, Arfrm Rpmn	5180-00-323-4876	SC518099CLA02
104	O	Tool Kit, Hyd Rpmn	5180-00-323-4891	SC518099CLA03
105	O	Tool Kit, Instr Rpmn	5180-00-323-4913	SC518099CLA05
106	O	Tool Kit, Elec Rpmn	5180-00-323-4915	SC518099CLA06
107	O	Tool Kit, Eng Rpmn	5180-00-323-4944	SC518099CLA07
108	O	Tool Kit, Pwr Trn	5180-00-003-5267	SC518099CLA13
109	F	Shop Set, AVIM, Elec-Instr	4920-00-165-1453	SC492099CLA91ELAM
110	F	Shop Set, AVIM, Hyd	4920-00-165-1454	SC492099CLA91HYAM
111	F	Shop Set, AVIM, Machine Shop	4920-00-405-9279	SC492099CLA91MAAM
112	F	Shop Set, AVIM, Pwr Trn	4920-00-001-4132	SC492099CLA91PTAM
113	AVIM	Shop Set, AVIM Rtr Shop	4920-00-405-9270	SC492099CLA91ROAM
114	AVIM	Shop Set, AVIM, Sheet Metal	4920-00-166-5505	SC492099CLA91SMAM
115	AVIM	Shop Set, AVIM, Tool Crib	4920-00-472-4183	SC492099CLA91TCAM
116	AVIM	Shop Set, AVIM, Turbine Eng	4920-00-224-3684	492099CLA91ENTAM
117	AVIM	Shop Set, AVIM, Welding	4920-00-163-5093	492099CLA91WEAM

Section IV. REMARKS

REFERENCE CODE	REMARKS/NOTES
A	Zero adjust only.
B	Clean lens and surrounding area.
C	Check outside mountings for security.
D	Test for proper operation and continuity.
E	Check for illumination.

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. MAINTENANCE ALLOCATION CHART.

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

AVUM which corresponds to the O code in the Repair Parts and Special Tools List (RPSTL).

AVIM which corresponds to the F code in the Repair Parts and Special Tools List (RPSTL).

DEPOT which corresponds to the D code in the Repair Parts and Special Tools List (RPSTL).

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

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

(a) *Company Size Aviation Units.* Perform those tasks which consist primarily of preventive maintenance and maintenance repair and replacement functions associated with sustaining a high level of equipment operational readiness. Perform maintenance inspections and servicing to include daily, intermediate, periodic and special inspections as authorized by the MAC or higher headquarters. Identify the cause of equipment system malfunctions using applicable technical manual troubleshooting instructions. Built-In-Test Equipment (BITE), installed instruments, or easy to use Test Measurement and Diagnostic Equipment (TMDE). Replace worn or damaged modules/components which do not require complex adjustments or system alignments and which can be removed/installed with available skills, tools and equipment. Perform operational and continuity checks and make minor repairs. Perform servicing, functional adjustments, and minor repair/replacement. Evacuate unserviceable modules/components and end items beyond the repair capability of AVUM to the supporting AVIM.

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

(2) *Aviation Intermediate Maintenance (AVIM).* AVIM provides mobile, responsive "One-Stop" maintenance support (Maintenance functions which are not conducive to sustaining air mobility will be assigned to depot maintenance). Performs all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can) be accomplished efficiently with available skills, tools, and equipment. Establishes the Direct Exchange (DX) program for AVUM units by repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level. Inspects, troubleshoots, tests, diagnoses, repairs, adjusts, calibrates, and aligns system modules/components. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and the replacement of seals, fittings and items of common hardware. Unserviceable reparable modules/components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance. This level will perform special inspections which exceed AVUM capability. Provides quick response maintenance support, on-the-job training, and technical assistance through the use of mobile maintenance contact teams. Maintains authorized operational readiness float. Provides collections and classification services for serviceable/unserviceable material. Operates a cannibalization activity in accordance with AR 750-50. (The aircraft maintenance company within the maintenance battalion of a division will perform AVIM functions consistent with air mobility requirements and conservation of personnel and equipment resources. Additional intermediate maintenance support will be provided by the supporting non-divisional AVIM unit).

B-2. **USE OF THE MAINTENANCE ALLOCATION CHART.**

a. The MAC assigns maintenance functions to the lowest level of maintenance based on past experience and the following consideration:

(1) Skills available.

(2) Time required

(3) Tools and test equipment required and/or available.

b. Only the lowest level of maintenance authorized to perform a maintenance function is indicated. If the lowest level of maintenance cannot perform all tasks of any single maintenance function (e.g., test, repair), then the higher maintenance level(s) that can accomplish additional tasks will also be indicated.

c. A maintenance function assigned to a maintenance level will automatically be authorized to be performed at any higher maintenance level.

d. A maintenance function that cannot be performed at the assigned level of maintenance for any reason may be evacuated to the next higher maintenance organization. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required or directed by the appropriate commander.

e. The assignment of a maintenance function will not be construed as authorization to carry the associated repair parts in stock. Authority to requisition, stock or otherwise secure necessary repair parts will be as specified in the repair parts and special tools list appendix.

f. Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, maintenance functions assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be specifically authorized by the maintenance officer of the level of maintenance to which the function is assigned. The special tools, equipment, etc. required by the lower level of maintenance to perform this function will be furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility of the function. The higher level of maintenance will provide technical supervision and inspection of the function being performed at the lower level.

g. Organizational through depot maintenance of the U.S. Army Electronics Command equipment will be performed by designated U.S. Army Electronics Command personnel.

h. Changes to the MAC till be based on continuing evaluation and analysis by responsible technical personnel and on reports received from field activities.

B-3. **DEFINITIONS.**

a. *Inspect.* To detemine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

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

c. *Service.* To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents and air.

d. *Adjust.* To rectify to the extent necessary to bring into proper operating range.

e. *Aline.* To adjust specified variable elements of an item to bring to optimum performance.

f. *Calibrate.* To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison 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 or test equipment being compared with the certified standard.

g. *Install.* To set up for use in an operational environment such as an emplacement, site or vehicle.

h. *Replace.* To replace unserviceable items with serviceable assemblies, subassemblies or parts.

i. *Repair.* To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

j. *Overhaul.* To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards prepared and published for the specific item to be overhauled.

k. *Rebuild.* To restore an item to a standard as nearly as possible to the original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

B-4. **FUNCTIONAL GROUPS.** Standard functional groupings are not considered feasible for aviation ground support equipment due to variation and complexity. Therefore variations to functional groupings may occur.

B-5. **MAINTENANCE CATEGORIES AND WORK TIMES.** The maintenance categories (levels) AVUM, AVIM, AND DEPOT are listed on the Maintenance Allocation Chart with individual columns that indicate the work times for maintenance functions at each maintenance level. Work time presentation such as 0.1 indicate the average time it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation shall indicate "-". Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

B-6. **TOOLS AND TEST EQUIPMENT** (Section III). Common tool sets (not individual tools), special tools, test and support equipment required to perform maintenance functions are listed alphabetically with a reference number to permit cross-referencing to column 5 in the MAC. In addition, the maintenance category authorized to use the device is listed along with the item National Stock Number (NSN) and, if applicable, the tool number to aid in identifying the tool/device.

B-7. **REMARKS** (Section IV). Remarks contained in column 6, with an alphabetical code, are listed to provide a ready reference to the definition of the remarks.

Section II

MAINTENANCE ALLOCATION CHART
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS

APU TESTER (ZELDA)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
00	APU TESTER						
01	CASE INSTRUMENT						
0101	SEALS	Inspect	.3				
		Replace		.8		103	
0102	LATCHES	Inspect	.3				
		Repair		.5		103	
		Replace		.8		103	
02	PANEL ASSY						
0201	METERS, TEMP & SPEED	Inspect	.3				
		Test	.3			102	A
		Service	.3				B
		Replace		1.0		105	
0202	POST BINDING	Inspect	.3				
		Replace		.8		105	
0203	CONNECTORS	Inspect		.8			
		Replace			1.5		
0204	SWITCHES	Inspect	.3				C
		Test		.5		106	D
		Replace		.8		106	
0205	LAMPS, LED INDICATORS	Inspect	.3				
		Test		.3			E
		Replace		.8		106	
0206	LAMPS, METERS	Inspect	.2				
		Replace	.3				
0207	HOLDER, LAMP	Inspect		.3			
		Replace		.8		106	
		Test		.5		106	D
03	MOUNTING PLATE ASSY						
0301	FUSES	Inspect		.3			
		Test		.3		106	D
		Replace		.5		106	

MAINTENANCE ALLOCATION CHART
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS

APU TESTER (ZELDA)

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
0302	RESISTORS	Replace		.8		106	
0303	RELAY	Inspect		.3			
		Test		.5		106	
		Replace		.8		106	
04	CONTROL ASSY						
0401	CONVERTER, ANALOG	Inspect		.5			
		Replace		.8		106	
05	ELECTRIC HARNESSES	Inspect		.3			
		Test		.8		106	D
		Repair		1.0		106	F
		Replace		.5		106	

Section III

TOOL AND TEST EQUIPMENT REQUIREMENTS
(AVSCOM Reg 310-10)

NOMENCLATURE OF END ITEMS

APU TESTER (ZELDA)

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
100	O	Tool Set, AVUM, Set No. 1	4920-00-159-8727	SC492099CLA90
101	O	Tool Set, AVUM, Set No. 2	4920-00-567-0476	SC492099CLA92
102	O	Tool Kit, Acft Mech Gen	5180-00-323-4692	SC518099CLA01
103	O	Tool Kit, Arfrm Rpmn	5180-00-323-4876	SC518099CLA02
104	O	Tool Kit, Hyd Rpmn	5180-00-323-4891	SC518099CLA03
105	O	Tool Kit, Instr Rpmn	5180-00-323-4913	SC518099CLA05
106	O	Tool Kit, Elec Rpmn	5180-00-323-4915	SC518099CLA06
107	O	Tool Kit, Eng Rpmn	5180-00-323-4944	SC518099CLA07
108	O	Tool Kit, Pwr Trn	5180-00-003-5267	SC518099CLA13
109	F	Shop Set, AVIM Elec-Instr	4920-00-165-1453	SC492099CLA91ELAM
110	F	Shop Set, AVIM, Hyd	4920-00-165-1454	SC492099CLA91HYAM
111	F	Shop Set, AVIM, Machine Shop	4920-00-405-9279	SC492099CLA91MAAM
112	F	Shop Set, AVIM, Pwr Trn	4920-00-001-4132	SC492099CLA91PTAM
113	AVIM	Shop Set, AVIM, Rtr Shop	4920-00-405-9270	SC492099CLA91ROAM
114	AVIM	Shop Set, AVIM, Sheet Metal	4920-00-166-5505	SC492099CLA91SMAM
115	AVIM	Shop Set, AVIM, Tool Crib	4920-00-472-4183	SC492099CLA91TCAM
116	AVIM	Shop Set, AVIM, Turbine Eng	4920-00-224-3684	492099CLA91ENTAM
117	AVIM	Shop Set, AVIM, Welding	4920-00-163-5093	492099 CLA91 WE AM

Section IV. REMARKS

REFERENCE CODE	REMARKS/NOTES
A	Zero adjust only.
B	Clean lens and surrounding area.
C	Check outside mountings for security.
D	Test for proper operation and continuity.
E	Check for illumination.

ALPHABETICAL INDEX

ALPHABETICAL INDEX (CONTINUED)

 GOVERNMENT PRINTING OFFICE: 1985 - 564-030/20110

ALPHABETICAL INDEX (CONTINUED)

ALPHABETICAL INDEX (CONTINUED)

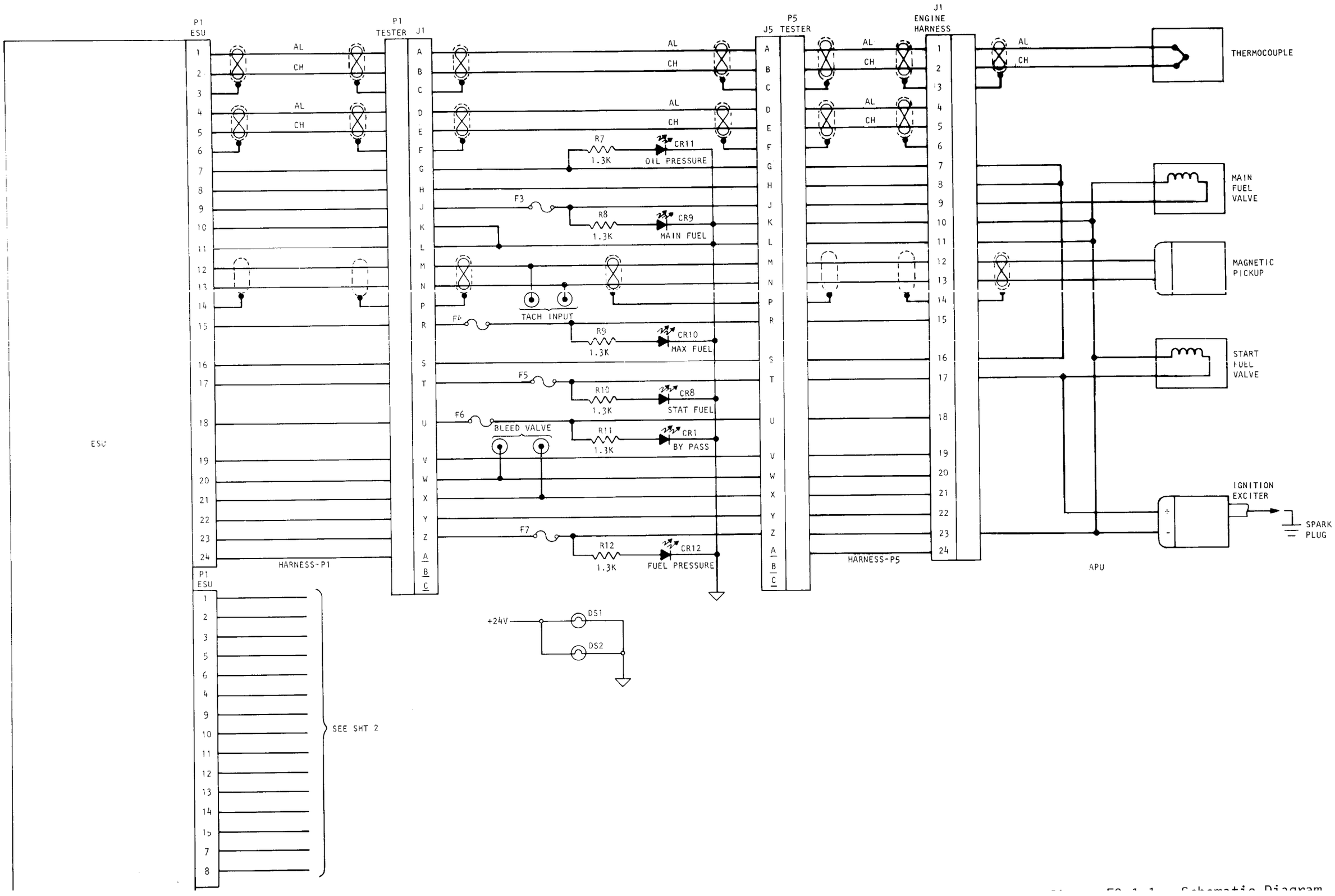


Figure FO-1.1. Schematic Diagram (Sheet 1 of 2)

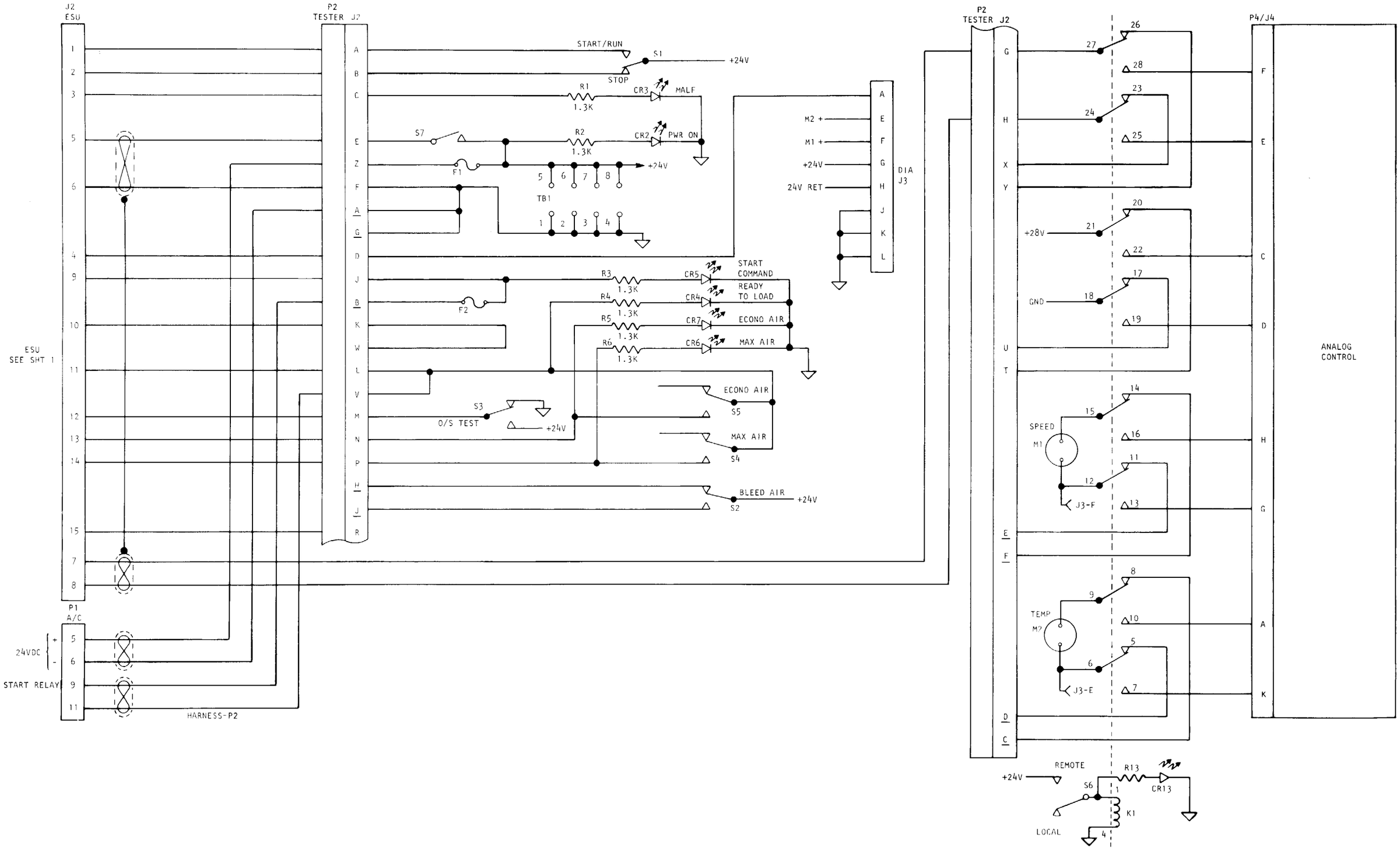
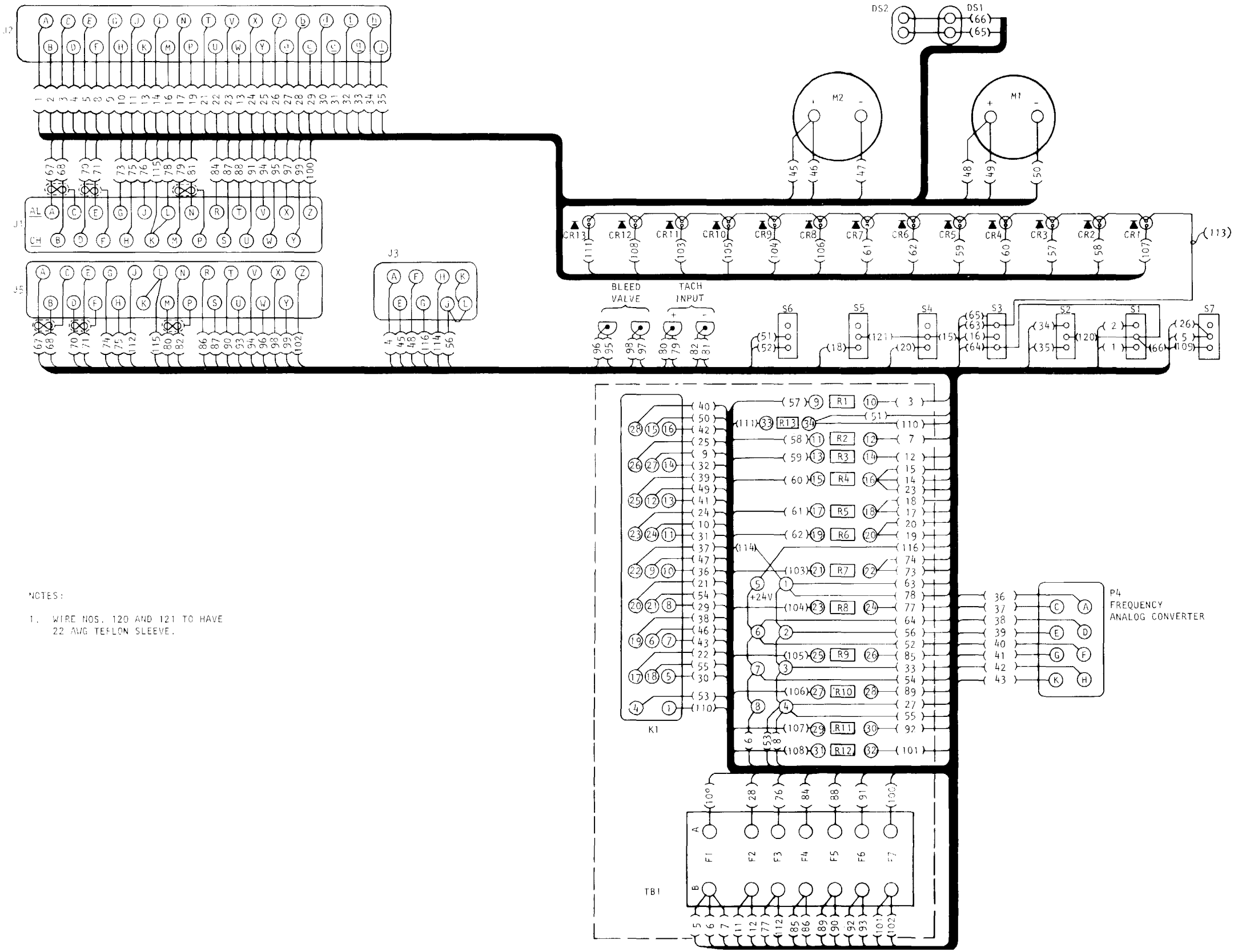


Figure FO-1.2. Schematic Diagram (Sheet 2 of 2)



NOTES:

1. WIRE NOS. 120 AND 121 TO HAVE 22 AWG TEFLON SLEEVE.

Fiure FO-2. Wiring Diagram

By Order of the Secretary of the Army:

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

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 55-4920-431-13	31 Mar 83	Auxiliary Power Unit NSN 4920-01-121-0605

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

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

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Clenge the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please Correct one or the Other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket bit it doesn't fit. Supply says I got what I ordered, so the NSN is Wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2 PREVIOUS EDITIONS ARE OBSOLETE.
DRSTS-M Overprint 1, 1 Nov 80

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

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

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4300 GOODFELLOW BOULEVARD
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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 053010-001