TM 11-6625-620-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORGANIZATIONAL MAINTENANCE

MANUAL

TEST SET, TELETYPEWRITER AN/UGM-1

HEADQUARTERS, DEPARTMENT OF THE ARMY

02 MAY 1966

WARNING

Be careful when working on or near the 115-volt or 230-volt ac line connections. Serious injury or DEATH may result from contyact with these terminals.

DON'T TAKE CHANCES!

CHANGE

No. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 February 1990

ORGANIZATIONAL MAINTENANCE MANUAL
TEST SET, TELETYPEWRITER AN/UGM-1
(NSN 6625-00-965-0195)

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Organizational Maintenance Manual
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SHAD (3)	**11-368**	**57**
USA Dep (1)	**11-377**	**57-100**
Sig Sec USA Dep (1)	**11-500 (AA-AC)**	**67**
Sig Dep (1)	**17**	**77-100**
Sig FLDMS (1)		

NG: STATE AG (3)

USAR: None

For explanation of abbreviation used, see AR 810-50.

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No. 3

HEADQUARTERS
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Organizational Maintenance Manual

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WRAMC (1)
USACDCEC (10)
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Instl (2) except:
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Fort Huachuca (10)
Fort Carson (6)
Ft Richardson (ECOM Oft) (2)
WSMR (1)
Army Dep (2) except:
LBAD (14)
SAAD (30)
TOAD (14)
ANAD (4)
ATAD (10)
USA Dep (2)
Sig Sec USA Dep (2)
Sig Dep (2)
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6-615	11-226	29-56
6-616	11-237	29-57
7	11-247	29-75
7-100	11-302	29-79
9-247	11-303	29-85
10-207	11-327	29-86
11-15	11-347	29-102
11-16	11-357	29-105
11-17	11-367	29-109
11-19	11-368	29-134
11-35	11-377	29-136
11-37	11-500 A	29-207
11-38	17	29-245
11-85	17-100	29-247
11-86	29-1	29-427
11-95	29-11	29-500
11-97	29-15	31-105
11-117	29-16	32-78
11-127	29-17	37
11-137	29-21	37-100
11-147	29-25	39-51
11-158	29-35	57
11-205	29-36	57-100
11-206	29-37	67
11-215	29-41	77-100
11-216	29-51	
11-225	29-55	

NG: State AG (3)
USAR: None
For explanation of abbreviations used, see AR 310-50.

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C 2

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No. 2

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USCONARC (5)
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ARADCOM Rgn (2)
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USASTRATCOM (4)
USASTRATCOM-SO (5)
USASTRATCOM-EUR (5)
USATECOM (2)
USAESC (70)
TOPOCOM (1)
USASETAF (5)
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Corps (2)
Instl (2) except
  Ft Carson (25)
  Ft Knox (12)
  Ft Gordon (10)
  Ft Huachuca (10)
Svc Colleges (2)
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USASESS (60)
USAIS (5)
USAES (2)
USAADS (2)
USA FA Sch (2)
USAARMS (2)
USATC Armor (2)
USATC Inf (2)
USASTC (2)
Army Dep (2) except
  SAAD (30)
  LBAD (14)
  TOAD (14)
  ANAD (10)
  ATAD (10)
  LEAD (7)
  NAAD (5)
  SVAD (5)
  CHAD (3)
  SHAD (3)
Gen Dep (2)
Sig Sec. Gen Dep (5)
Sig Dep (12)
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WRAMC (6)
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USAERDAA (2)
USAERDAW (13)
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6-615	17	77-100
6-616	17-100	
7	29-1	
7-100	29-11	
9-247	29-15	
11-5	29-16	
11-6	29-17	
11-7	29-21	
11-56	29-25	
11-57	29-35	
11-85	29-36	
11-86	29-37	
11-95	29-41	
11-97	29-51	
11-99	29-55	
11-117	29-56	
11-127	29-57	
11-137	29-75	
11-147	29-79	
11-155	29-85	
11-156	29-86	
11-157	29-102	
11-158	29-105	
11-205	29-109	
11-206	29-134	
11-215	29-138	
11-216	29-205	
11-225	29-206	
11-226	29-207	
11-237	29-247	
11-247	29-500 (EL, FC)	
11-303	31-105	
11-327	32-78	
11-347	33-56	
11-357	37	
11-377	37-100	
11-500	39-51	
11-587	57	
11-592	57-100	
11-597	67	

ARNG: State AC (3).

USAR: None.

For explanation of abbreviations used, see AR 320-50.

Organizational Maintenance

TEST SET, TELETYPEWRITER AN/UGM-1

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No. 1

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Armies (2)
Corps (2)
USAC (3)
USATC (2)
Svc Colleges (2)
USASCS (20)
USASESCS (40)
USAOC8ZS (4Q)
WRAMC (1)
Army Pic Cen (2)
Instal (2) except
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  Ft Carson (21)
  Fort Knox (12)
WSMR (5)
Gen Dep (2)
Sig See, Gen Dep (5)
Sig Dep (12)
Army Dep (5) except
  LBAD (20)
  SAAD (35)
  TOAD (20)
  LEAD (20)
  ATAD (10)
  TEAD (15)
  ANAD (15)
  PUAD (15)
Sig FLDMS (2)
AMS (1)
USACRREL (2)
USAERDAA (2)
USAREDAW (5)
Frankford Arsenal (10)

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  11-57 (2)
  11-97 (2)
  11-98 (2)
  11-155 (2)
  11-157 (2)
  11-500 (AA-AC) (2)
  11-158 (2)
  11-587 (2)
  11-592 (2)
  29-56 (2)
  29-134 (10)

NG: None.

USAR: None.

For explanation of abbreviations used see AR 320-50.

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TECHNICAL MANUAL
No. 11-6625-620-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *2 May 1966*

ORGANIZATIONAL MAINTENANCE MANUAL
TEST SET, TELETYPEWRITER AN/UGM-1

Current as of August 1977

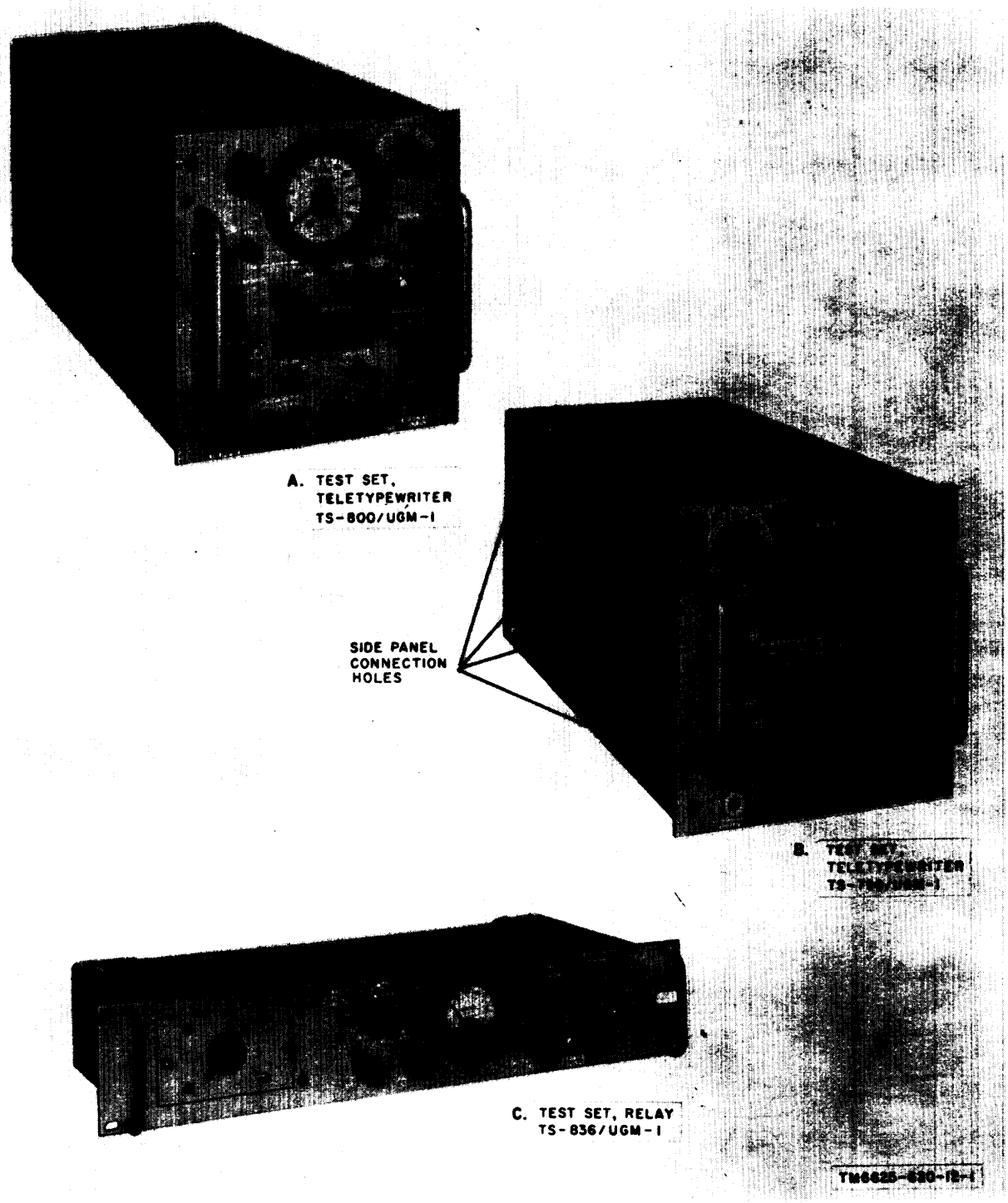

Figure 1–1. Test Set, Teletypewriter AN/UGM–1, less running spares and removed from transit cases.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Test Set, Teletypewriter AN/UGM-l (fig. l-l) and provides instructions for the installation, operation, and operator and organizational maintenance of the equipment. It includes instructions for operation under usual and unusual conditions and cleaning and inspection of the equipment; it includes a maintenance allocation chart, a basic issue items list, and instructions on replacement of parts available to operator and organizational maintenance personnel.

1-2. Consolidated Index Of Army Publications And Blank Forms

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

1-3. Maintenance Forms, 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 DA Pam 738-750, as contained in Maintenance Management Update. Air force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

b. Reporting of Item Packaging Discrepancies. Fill out and forward 6F 364 (Report of Discrepancy (ROD)) a. proscribed in AR 735-11-2/DLAR 4140.55 /SECNAVINST 435S.18/AFR 400-54/MCO 4430.3J.

c. Transportation Discrepancy Report (TDR) (SF 361). Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AH 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-3.1. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, or OA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, New Jersey 07703-5000.

1-3.2. Reporting Equipment Improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-PA-MA-D, Fort Monmouth, New Jersey, 07703-5000. We'll send you a reply.

1-3.3. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PNCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraph 6-2.

1-3.4. Destruction of Army Electronics Materiel

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

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. Test Set, Teletypewriter AN/UGM-l (fig. l-l) is composed of three digital test equipments that provide facilities for comprehensive analysis of telegraph signals and relays to determine the types and magnitudes of signal distortion present.

b. The equipment may be used to provide a continuous indication of system performance for quality-control functions, as well as a test instrument for troubleshooting and testing data for telegraph equipment and systems.

1-5. Technical Characteristics

Technical characteristics of the three units of Test Set, Teletypewriter AN/UGM-l are detailed below.

a. Test Set, Teletypewriter TS-799/UGM-1.

Output signal patterns ..... Test message ("quick brown fox" message); alternate R & Y characters; selected characters; reversal (dot cycle).
Output signal reversal (dot cycle) speeds ..... 100, 75, 37.5, 37, or 23 cps, nominal.
Test message, alternate R and Y characters, selected characters ..... 7-unit code at 45 or 150 baud; 7.5-unit code at 45, 50, 74; or 75 bauds.
Signal distortion available ..... Mark bias, space bias, space end, mark end.
Percent of signal distortion available ..... 0 to 50%
Accuracy of signal distortion output ..... ±2%
Types of output current:
Neutral operation, internal supply ..... 20 milliamperes (ma); 60 ma
Neutral operation, external loop used ..... 60 ma, maximum
Polar operation, external batteries required ..... 30 ma
Power requirements:
Voltage ..... 115- or 230-volts ac ±10%
Frequency ..... 50 to 60 cps
Power consumption ..... 25.5 watts

b. Test Set, Teletypewriter TS-800/UGM-1.

Types of input current:
Neutral operation ..... 20 ma; 60 ma
Polar operation ..... 30 ma, polar
Input rate acceptance ..... 7-unit code at 45 and 150 bauds; 7.5-unit code at 45, 50, 74, and 75 bauds; dot cycles at 23, 37, 37.5, 75, or 100 cps.
Types of distortion indicated ..... Total peak, early peak, late peak, and average for mark-to-space or space-to-mark transitions.
Distortion indicators ..... One 250° front-panel milliammeter, calibrated 0% to 50% (±2%). Sensitivity 1 ma at 53 millivolts. Meter resistance: 53 ohms. One EARLY indicator lamp. One LATE indicator lamp.
Power requirements:
Voltage ..... 115 or 230 volts ac ±10%, single phase.
Frequency ..... 50 to 400 cps
Power consumption ..... 16.5 watts

c. Test Set, Relay TS-836/UGM-1.

Test speeds ..... 23, 37, 75, 100, 125, dot cps (23 and 37 are nominal values. The actual frequencies correspond to 60 wpm and 100 wpm baud-lengths).
Test currents (as selected by TEST CURRENT switch) ..... Bias coil, 4 ma; operate coil, 8 ma; bias coil, 10 ma, operate coil, 20 ma; bias coil, 30 ma; operate coil, 60 ma.
Types of tests ..... Bias distortion
Accuracy ..... Contact efficiency, ±2%
Types of display ..... Milliammeter: Calibrations, 0% to 100%; sensitivity, 11 ma at 5.83 mv; resistance, 0.53 ohm. Provisions for visual display: EXT OUTPUT jack.
Voltage requirements:
Voltage ..... 115 or 230 volts ac ±10%. single phase.
Frequency ..... 50 to 400 cps
Power consumption ..... 27.5 watts

1-6. Items Comprising an Operable Equipment

FSN	Qty	Nomenclature, part No., and mfr code	Fig. No.
6625-965-0195		Test Set, Teletypewriter AN/UGM-1 consisting of:	1-1
5995-941-2359	2	Cable Assembly, Special Purpose, Electrical, C5471079 (90047003); 96238.	1-3 1-7
6625-965-0196	1	Test Set, Teletypewriter TS-799/UGM-1	1-1
6625-965-0197	1	Test Set, Teletypewriter TS-800/UGM-1	1-1
6625-077-2986	1	Test Set, Relay TS-836/UGM-1	1-1

1-6.1. Components of Test Set, Teletypewriter AN/UGM-1

a. Components. Refer to appendix II for the official listing of components of the AN/UGM-l.

b. Dimensions of Major Component. The following chart lists the dimensions and weights of the equipment components.

Item	*Dimensions (in.)*			
	Height	*Depth*	*Width*	*Weight (lb)*
Test Set Teletypewriter TS-799/UGM-1, including-	8 23/32	17 1/8	8 7/16	21

Item	Dimensions (in.)			Weight (lb)
	Height	Depth	Width	
Transit case	9-5/16	20-1/2	9-9/16	10
Power cable (96 inches long) with connections				
Printed circuit board				
Cap, receptacle				
Test Set, Teletypewriter TS-800/UGM-1, including—	8-23/32	17-1/8	8-7/16	17-1/2
Transit case	9-5/16	20-1/2	9-9/16	10
Power cable (96 inches long) with connectors				
Printed circuit board				
Cap, receptacle				
Test Set, Relay TS-836/UGM-1, including—	2-15/32	6-1/8	19	11
Transit case	5-3/4	9-1/2	18-5/8	8

Figure 1-2. Test Set, Teletypewriter AN/UGM-1. running spares.

1-7. Common Names

Common names for Test Set, Teletypewriter AN/UGM-1 are indicated for each nomenclature component below.

Common name	Nomenclature
	Test Set, Teletypewriter AN/UGM-1
Pattern generator	Test Set, Teletypewriter TS-799/UGM-1
Distortion analyzer	Test Set, Teletypewriter TS-800/UGM-1
Relay test set	Test Set, Relay TS-836/UGM-1.
Power cable	Cable Assembly, Special Purpose Electrical.

1-8. Description of Test Set, Teletypewriter AN/UGM-1

The AN/UGM1 (fig. 1-1) consists of three self-contained units. In normal application, the only connections between the units are the front-panel signal connections from the relay test set to the distortion analyzer. The three units are described in *a* through *c* below.

a. Pattern Generator.

(1) The pattern generator, a lightweight transistorized test set, is contained within a transit case (fig. 1-3) and secured to the case at its front panel by four bracket-securing screws.

The pattern generator can be operated in its case or removed from the case and mounted in a rack. A description of the transit case is given in paragraph 1-9a. Two ac power receptacles are provided on the chassis: AC POWER (fig. 3-1) on the front and J2 (fig. 1-4) on the rear. A pro tective cap is provided for the power connector that is not in use.

(2) Pattern generator circuitry is contained within two sideplates, a front panel, and a top and bottom cover. All operating controls are mounted on the front panel (fig. 1-3) together with the alternating current (ac) input power fuses and two spare fuses. Internally, the unit is divided into four sections by board-guide separators (fig. 1-5).

(a) The first section, immediately behind the front panel, houses panel controls.

(b) The second and third sections contain a common harness board (fig. 1-6) into which 19 printed circuit (PC) boards are inserted. The PC boards are installed from the top (fig 14) into groove-slides on the board-guide separators, and plug into connectors on the harness board. A board extender is provided, which fits into all assembly locations, for troubleshooting. Each PC board contains an extractor handle that

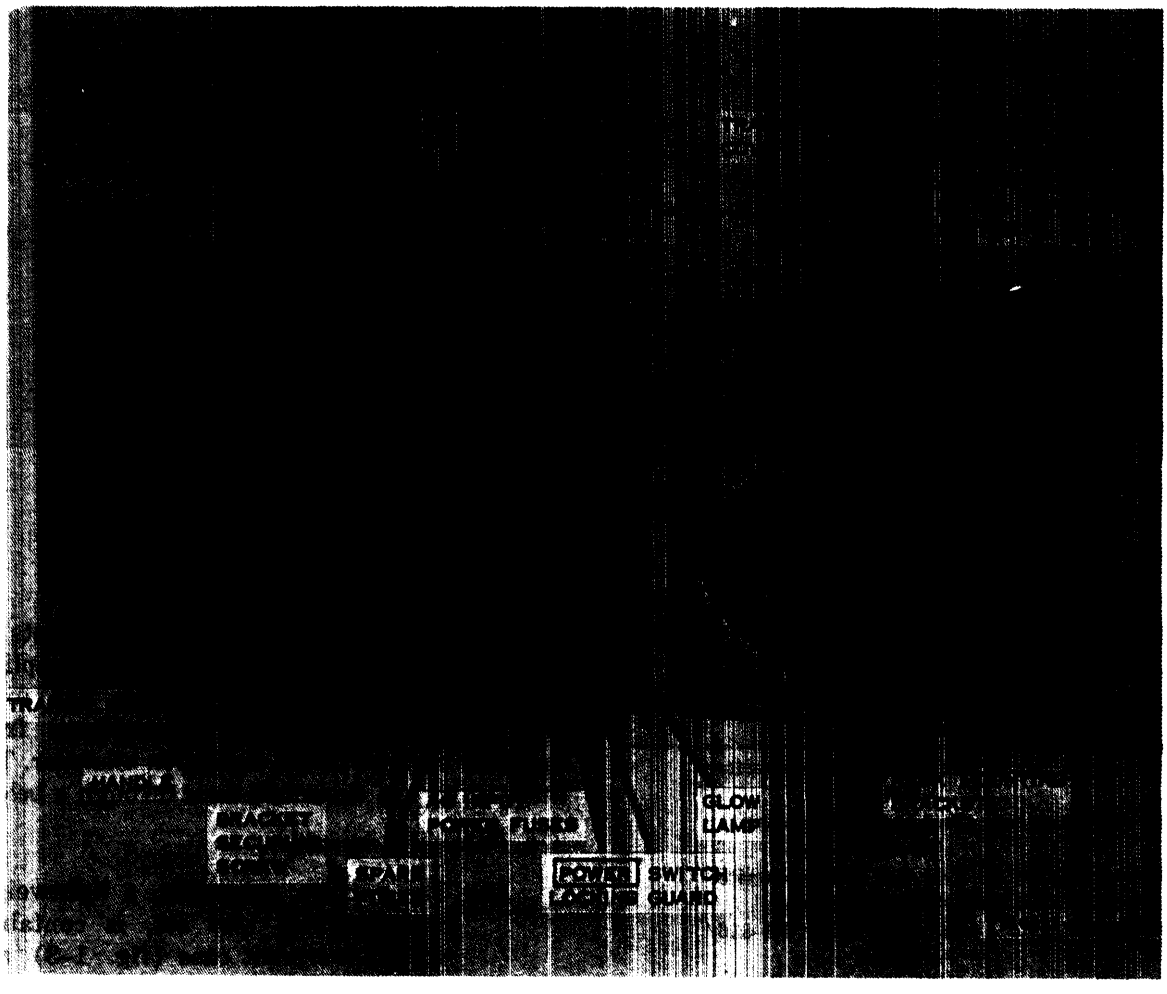

Figure 1-3. Test Set, Teletypewriter TS-799/UGM-1 in transit case.

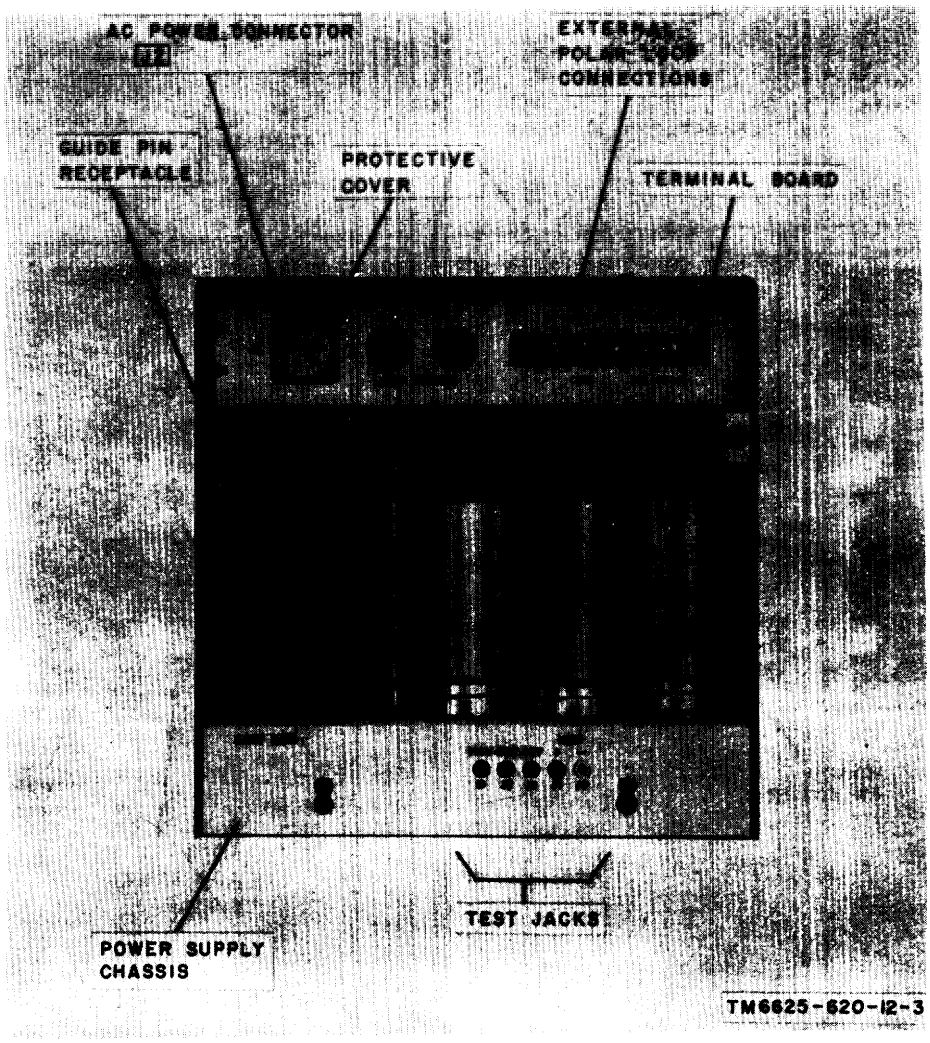

Figure 1-4. Test Set, Teletypewriter TS-799/UGM–1, rear view.

facilitates the board's removal or installation; the extractor tabs are marked with individual board assembly location numbers. Matching assembly numbers are printed on the top of each board-guide separator adjacent to each PC board. Thus, each PC board has an associated location number that identifies the physical location of the board; all PC boards are kept in place by the top of the unit which is secured, with screws, to the sides of the unit.

(c) The fourth (rear) compartment contains the power supply. Battery connections, fuses, chasis ground connections, and color-coded voltage test points and adjustments are accessible at the rear of the unit (fig. 1-4).

b. Distortion Analyzer.

(1) The distortion analyzer, a lightweight transistorized test set, is contained within a transit case (fig. 1–7) and secured to the case at its front panel by four bracket-securing screws. The unit can be operated from its-case or,

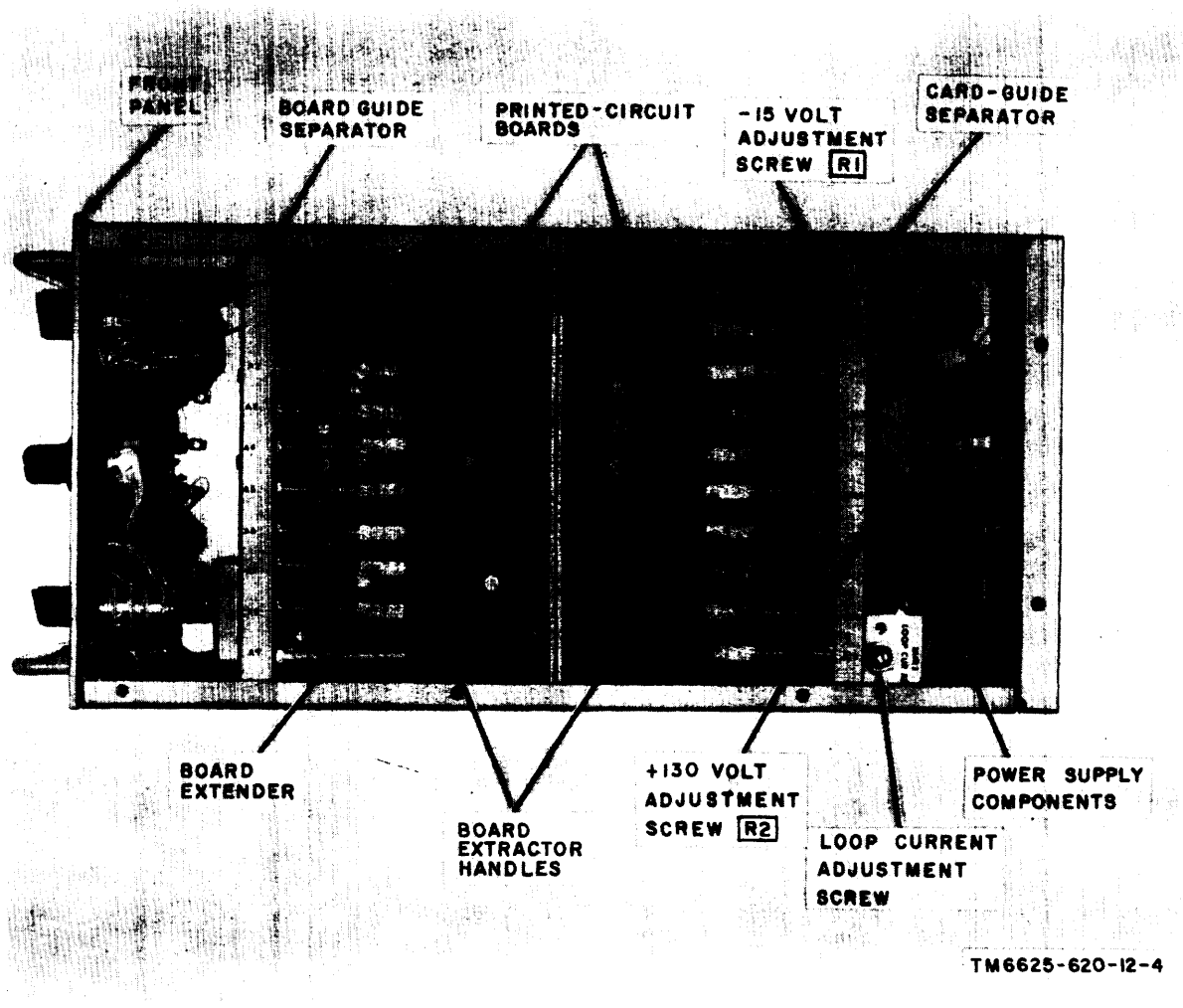

Figure 1-5. Test Set, Teletypewriter TS-799/UGM-1, top view.

if required, it can be removed from the case and operated while mounted in a rack. A description of the transit case is given in paragraph 1-9a. Two ac power receptacles are provided on the chassis: AC POWER on the front and J4 on the rear (fig. l–8). A protective cover (same as shown in fig. 1-4) is provided for the power connector that is not in use.

(2) All operating controls are mounted on the front panel (fig. 1–7) together with the ac input power fuses and two spare fuses. Internally, the unit is divided into four sections by board-guide separators (fig. 1-9).

(a) The first section, immediately behind the front-panel, houses front-panel controls.

(b) The second and third sections contain a harness board (fig. 1-10) into which 15 PC boards are inserted. The boards are installed from the top (fig. 1-9) into groove-slides on the board–guide separators, and plug into connectors on the harness board. A card extender is provided which fits into all assembly locations for troubleshooting. Each PC board contains an extractor handle that facilitates its removal and installation; extractor

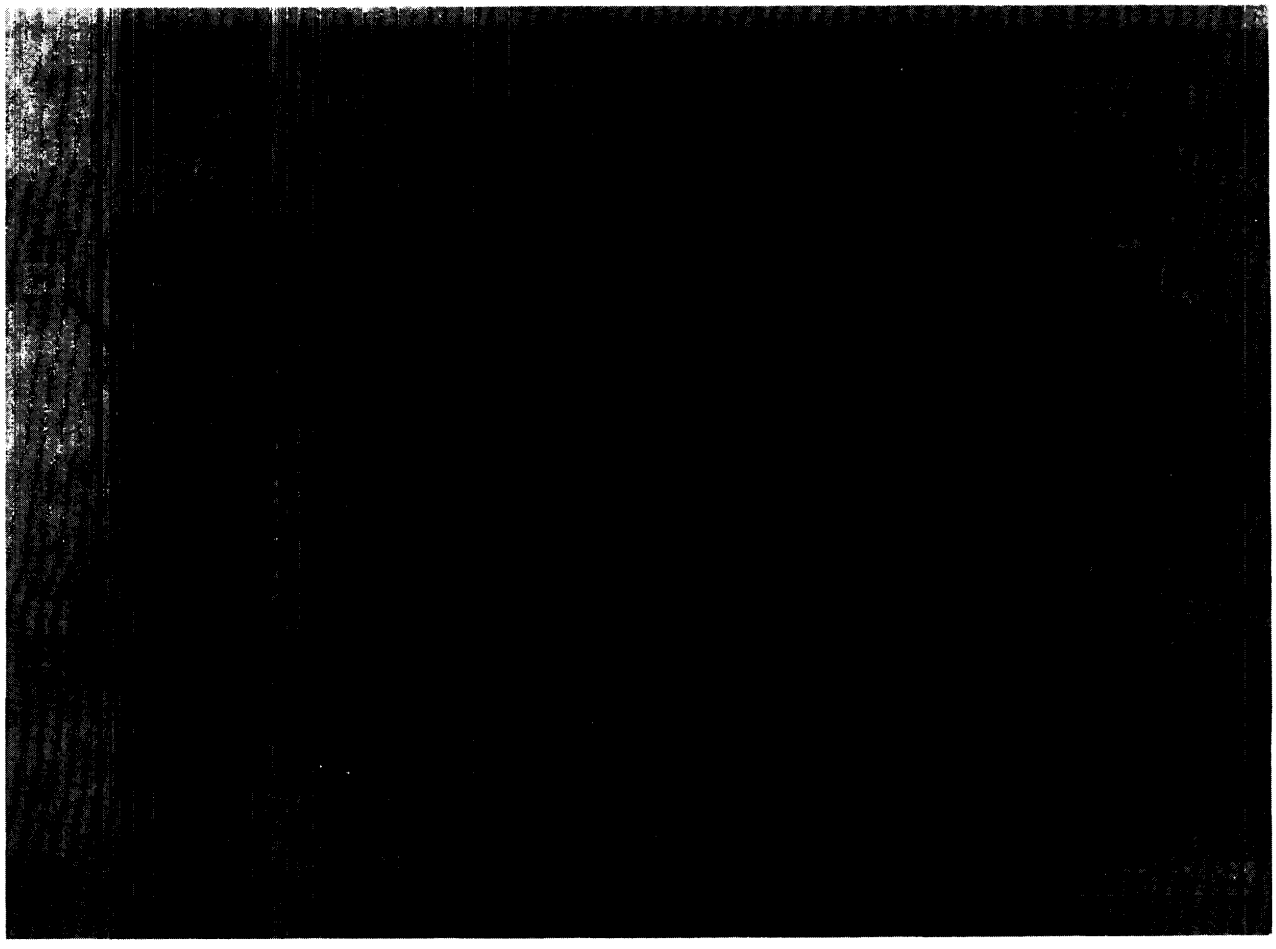

Figure 1-6. Test Set, Teletypewriter TS-799/UGM-1, bottom view.

tabs are marked with individual board-assembly location numbers. Matching assembly numbers are printed on the top of each board-guide separator adjacent to each PC board. Each PC board has an associated location number that identifies the board's physical location. All PC boards are kept in place by the top of the unit which is secured by screws to the sides of the unit.

(c) The fourth (rear) compartment contains the power supply. Battery connections, a chassis ground connection, a sync connection, external meter connections, as well as color-coded voltage test jacks are accessible at the rear of the unit (fig. 1-8).

c. Relay Test Set.

(1) The lightweight, transistorized relay test set is mounted in a transit case (fig. 1–11) and secured to the case at its front panel. All operating controls are mounted on the front panel together with the ac input power fuses. Two spare fuses are mounted in clips next to the test socket adapter. The relay test set can be operated from its case or while mounted in a rack. A description of the transit case is given in paragraph l-9b. An ac power cable is permanently wired to the power supply at the rear of the unit (fig. 1–12). This cable is also accessible from the front of the relay test set at a cable slot while the unit is in its transit case.

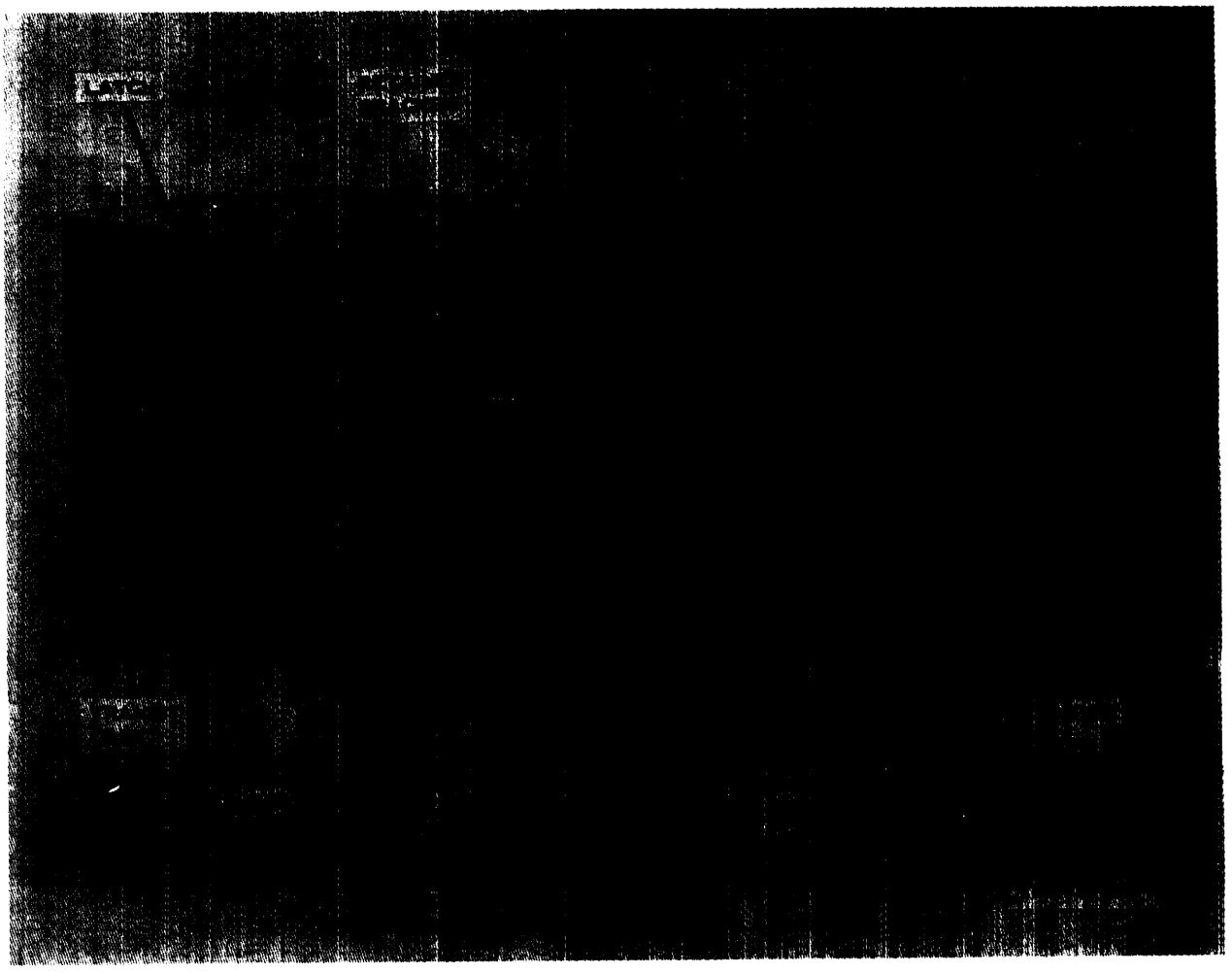

Figure 1-7. Test Set Teletypewriter TS-800/UGM-1 in transit case.

(2) The relay test set is divided into two major sections.

(a) One is the housing for the relay test socket adapter (fig. 1-13), which the operator can remove from the fromt panel (after loosening two retaining screws) and place in the desired position within approximately 1 foot of the relay test set.

(b) The other section (right side) contains PC boards that are permanently wired to a harness board (fig. 1-13). and a power supply. The rear panel contains jacks, test points, and variable resistors for checking and adjusting internal voltages and currents of the relay test set (fig. 1-12).

1-9. Description of Minor Components

The AN/UGM-l includes a transit case for each unit, plus associated power cables, a rack-mounting bracket, and a protective power receptacle cap that is placed over the power receptacle that is not in use. Pattern generator and distortion analyzer transit causes, which are identical. are described in *a* below. The transit case for the relay test set is described in *b* below.

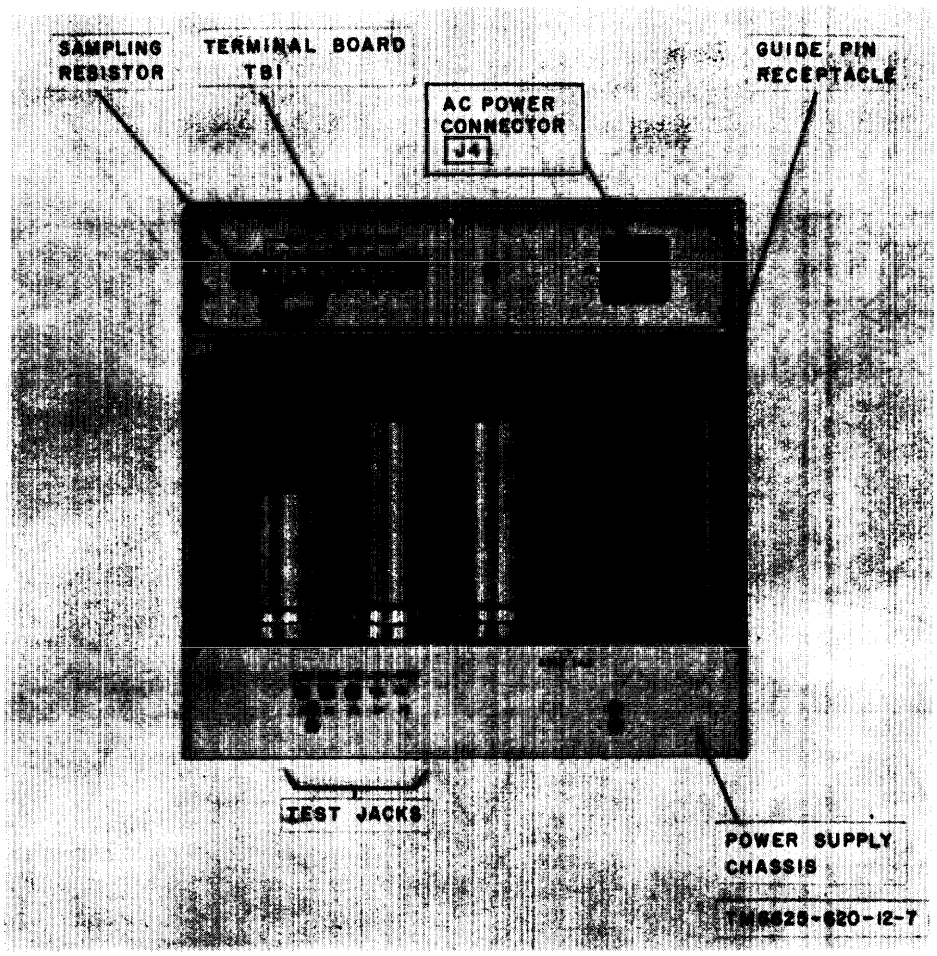

Figure 1-8. Test Set, Teletypewriter TS–800/UGM-1 rear view.

a. The transit case for the pattern generator and for the distortion analyzer (fig. 1–3 and 1–7), is a wraparound–type structure containing a carrying handle (not shown) at the rear. Inside the case, on the. bottom, a guide rail guides two receptacles on the rear of the unit (fig. 1-4 and 1-8) into two locating pins on the rear panel of the case. These locating pins stabilize the unit and minimize shock and vibration during transit. At the front of the transit case (figs. 1–3 and 1–7), two hinged retainer brackets are screw-fastened to the top and bottom of the unit. The transit-case cover is attached to the transit case by four latches, one on each side. The power cable for the unit and the rack-mounting bracket for securing the unit to a relay rack are stored inside the transit-case cover in retaining brackets.

b. The relay test set transit case (fig. 1–11.) has two handles. Inside the bottom of the case is a guide rail which guides two relay test receptacles into two locating pins on the rear panel of the case. These locating pins stabilize the unit and minimize shock and vibration during transit. Two brackets, one on each side of the transit case, secure the relay test set to the transit case. The transit-case cover is attached to the transit case by six latches, two at the top and bottom and one on each side. A power cable, permanently wired to the rear of the relay test set (fig. 1–12), is brought from the rear along the right side and out through an external cable slot (fig. 1–11) at the front panel of the relay test set. During transit, excess cable is wrapped around retainer brackets in the relay test set transit-case cover.

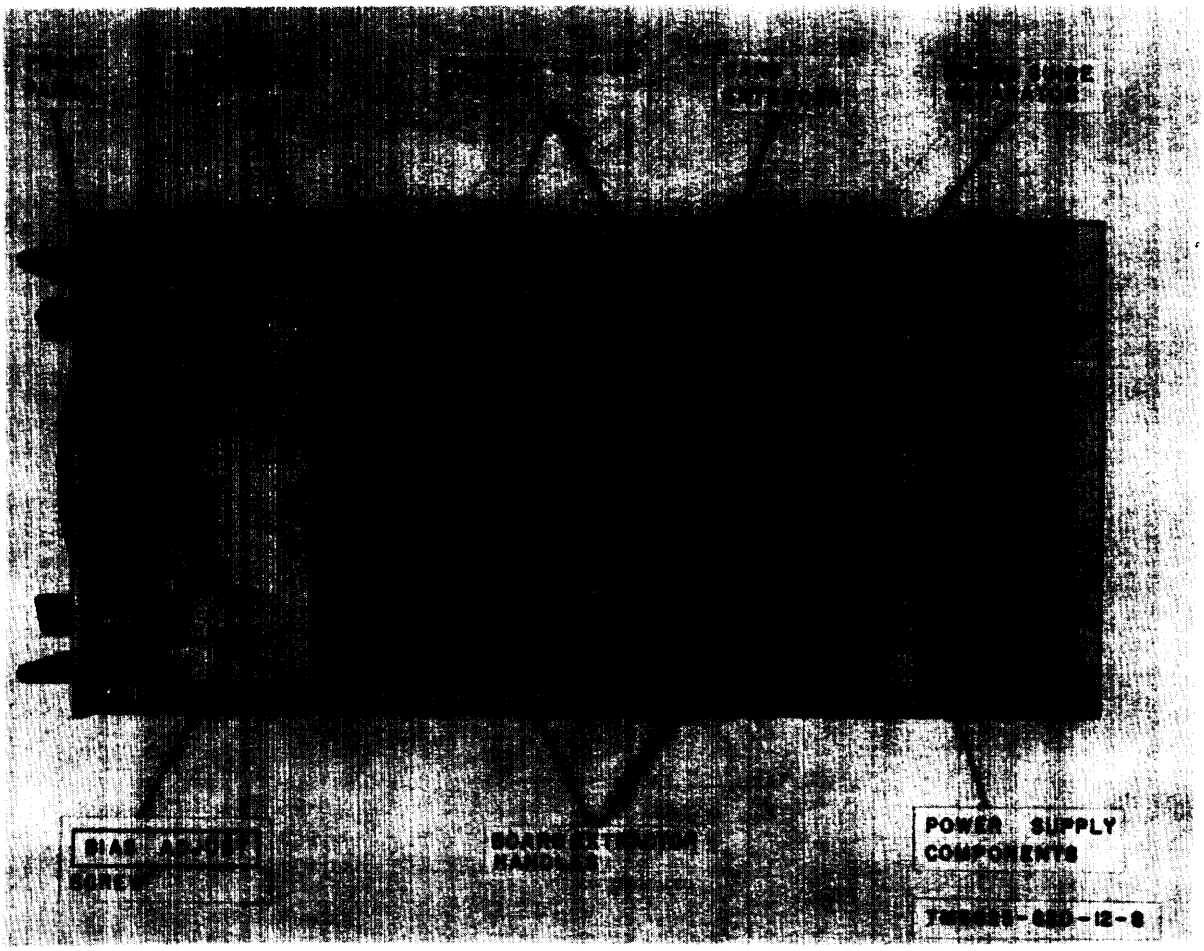

Figure 1-9. Test Set, Teletypewriter TS-800/UGM-1, top view.

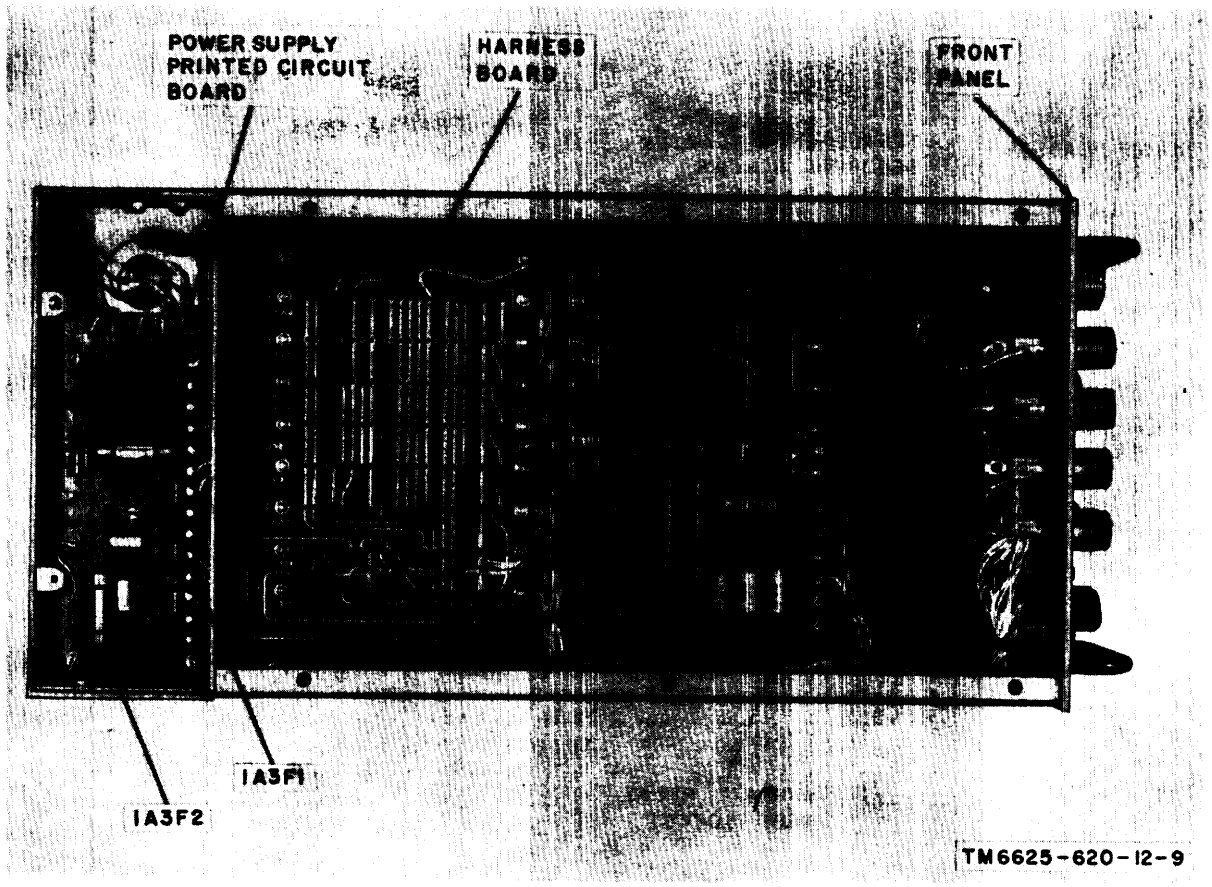

Figure 1-10. Test Set, Teletypewriter TS-800/UGM-1, bottom view.

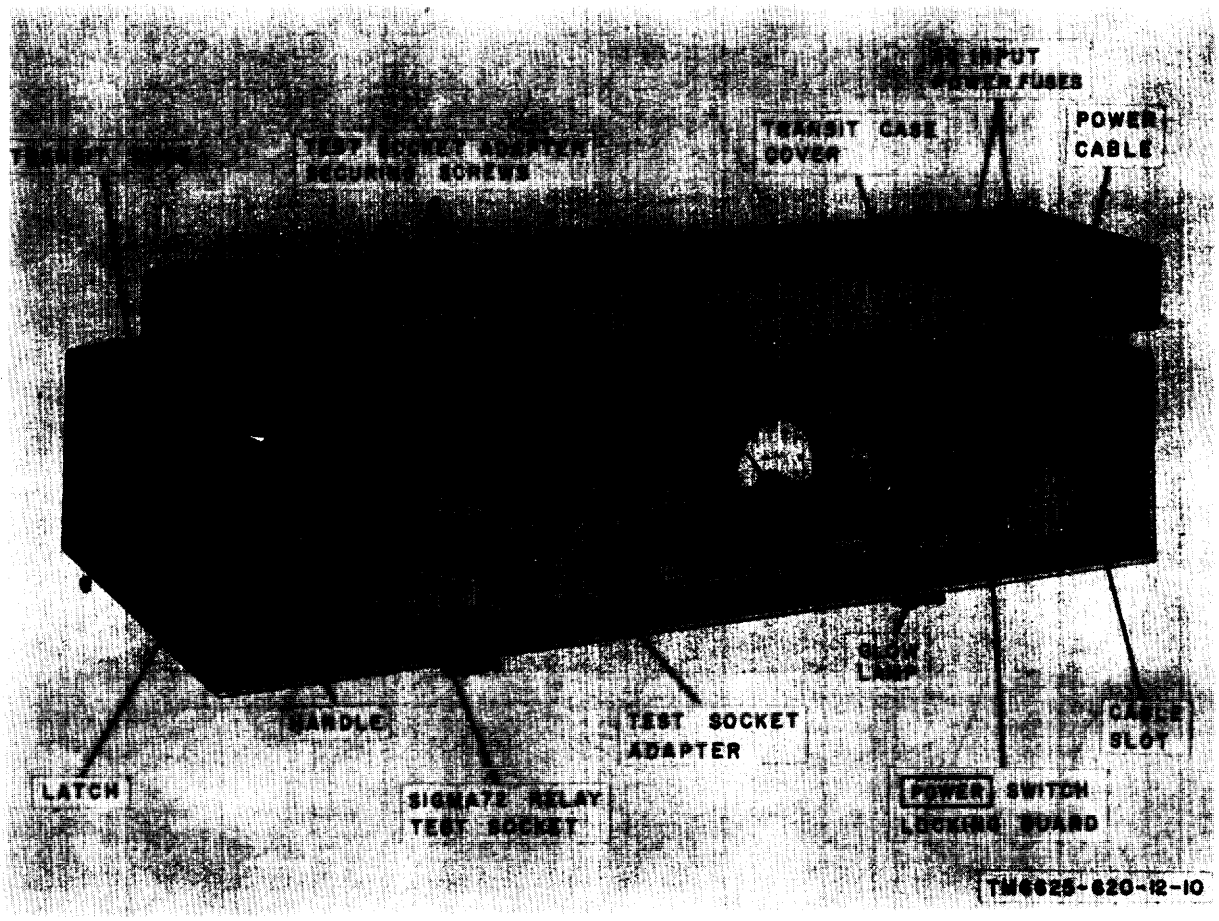

Figure 1-11. Test Set, Relay TS-886/UGM-1, in transit case.

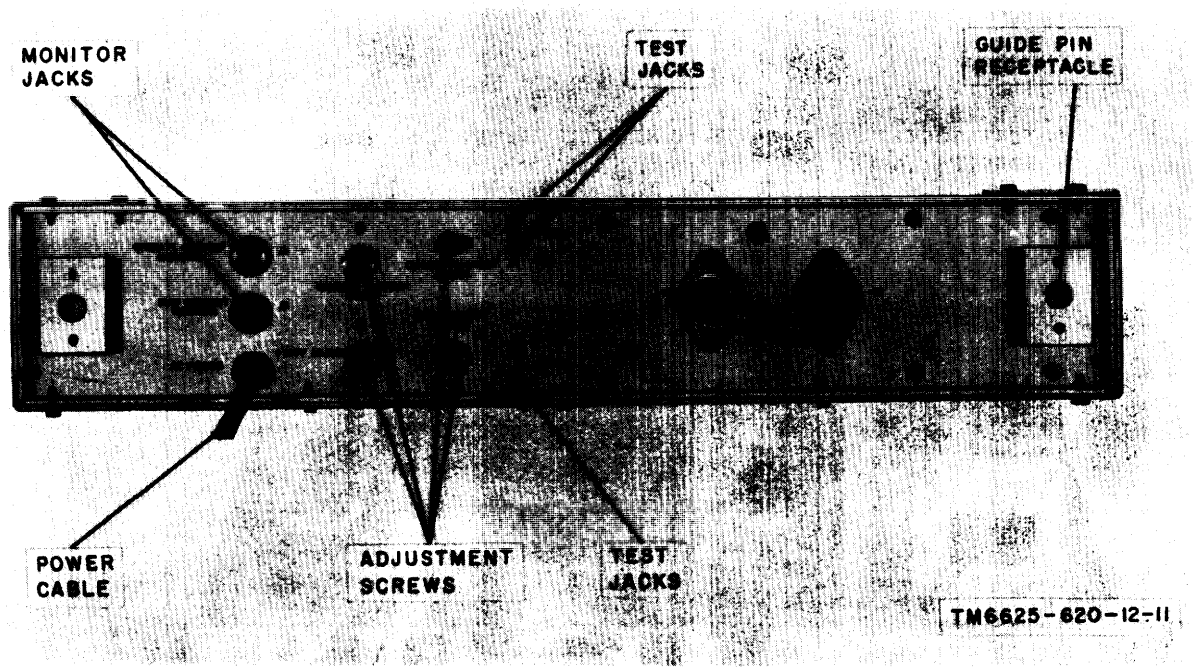

Figure 1-12. Test Set Relay TS-836/UGM-1, rear view.

Figure 1-13. Test Set, Relay TS-836/UGM-1, top view.

CHAPTER 2
INSTALLATION

2-1. Unpacking

a. Packaging Data. When packaged for shipment, each unit of the AN/UGM–l (in its transit case) is placed in a cardboard carton. Each individual cardboard carton is then packed in an outer waterproof cardboard carton, together with the technical manuals and running spares. A typical shipping carton and its contents are shown in figure 2-1. The shipping carton is ll inches wide by 27 inches long by 21½ inches high. The total weight of the shipping carton and its contents is 86 pounds.

b. Removing Contents.

(1) Open the waterproof corrugated cardboard outer carton, and remove the waterproof barrier bags and the three waterproof corrugated cardboard inner cartons.

(2) Open the barrier bags, and remove the spares and technical manuals.

(3) Open each waterproof corrugated cardboard inner carton, and remove the individual unit.

2-2. Checking Unpacked Equipment

After the units have been removed from their corrugated cardboard carton, perform the following checks:

a. Remove the pattern generator and the distortion analyzer from their transit cases as follows:

(1) Unsnap the four snap latches (one at each side), and remove the transit cover (figs. l-3 and l–7).

(2) Unscrew the four outer screws on the transit-case hinged retainer brackets.

(3) Pull back the retainer brackets; grasp the unit by its front handles, and pull the unit forward, Place the unit in a convenient inspection area.

(4) Replace the four screws in the retainer brackets.

b. Remove the relay test from the transit case as follows:

(1) Unsnap the six snap latches, and carefully remove the cover and unwind the power cord from the retainer brackets inside the cover (fig. 1-11).

(2) Unscrew the four screws that hold the front panel to the transit case.

(3) Grasp the relay test set by its front handles and pull the unit forward. Place the unit in a convenient inspection area.

(4) Replace the four screws in the transit case.

c. Carefully inspect all equipment for possible damage. If the equipment has been damaged, refer to paragraph 1-3.

d. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against paragraph 1–6. Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

e. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, see that any operational instruction changes resulting from the modification have been entered in the equipment manual.

NOTE

Current MWO'S applicable to the equipment are listed in DA Pam 310-7.

* U.S. GOVERNMENT PRINTING OFFICE: 1973 O—540-855/3339A

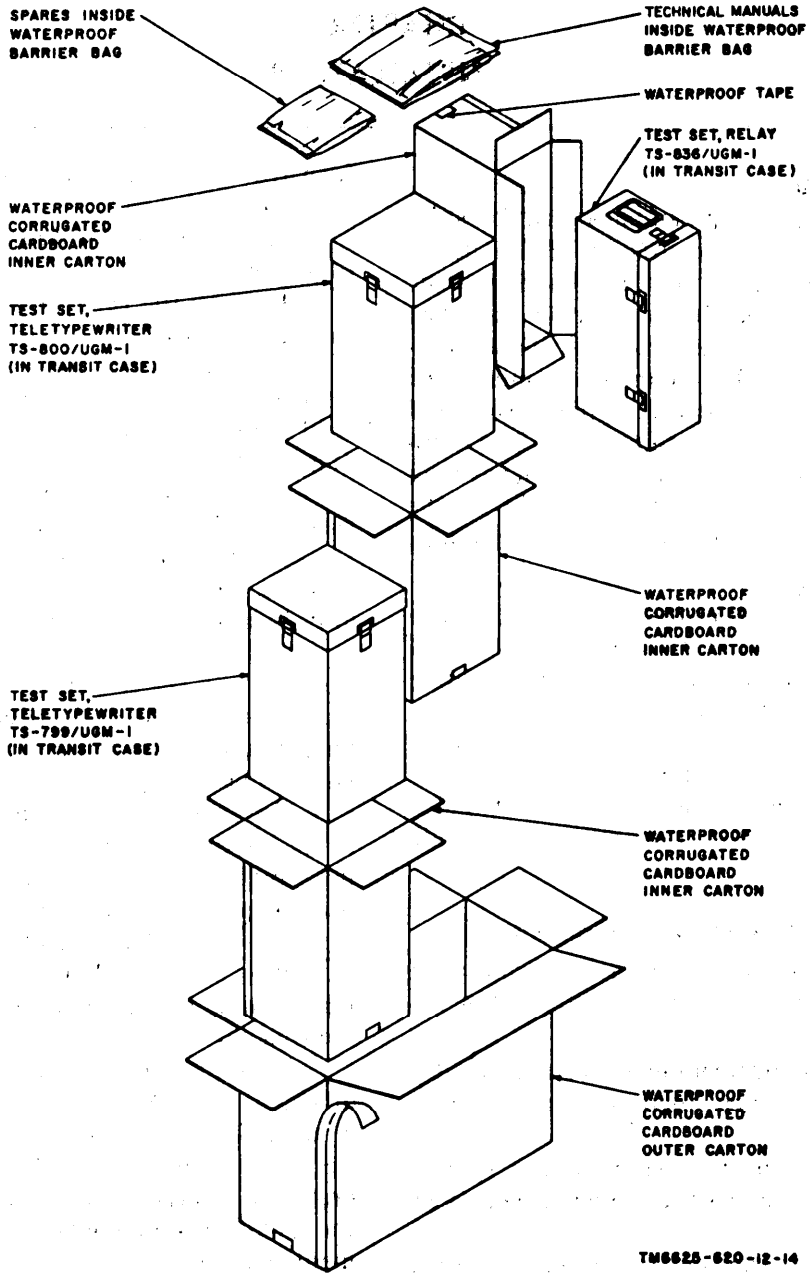

Figure 2-1. Typical packing diagram for the AN/UGM-1.

2-3. Tools, Test Equipment, and Materials Required for installation

Pattern generator	Distortion analyzer	Relay test set
1 Multimeter TS–352/U or equivalent (TM 11–5527).	1 Multimeter TS–352/U or equivalent (TM 11–5527).	1 Multimeter TS–352/U or equivalent (TM 11–5527).
1 screwdriver, 1/4 inch	1 screwdriver, 1/4 inch	1 screwdriver, 1/4 inch.
1 wrench, adjustable	1 wrench, adjustable	1 screwdriver, 1/8 inch.
		1 Allen wrench, 1/16 inch.
		1 wrench, adjustable.

2-4. Installation Procedures

The three units of the AN/UGM-l can be installed in a local rack mount or bench-type arrangement, or at separate remote bench or rack-mount locations. For local rack-mount installation the distortion analyzer should be mounted to the left of the pattern generator and above the relay test set, in a standard 19 inch relay rack. In local or remote installations, the units may be left in their respective transit cases and mounted on a bench or table, or each may be mounted in a rack at separate remote locations. Rack or cabinet installation procedures are described in *a* below; bench installation is described in *b* below and procedures for installing telegraph relays in the relay test set are outlined in c below.

a. Installation in Rack or Cabinet. The pattern generator and the distortion analyzer each maintains a rack adapter (within its respective transit case cover), which permits the units to be mounted adjacent to one another in a standard 19-inch rack. The relay test set, which fits in a standard 19-inch rack without a rack adapter, should be mounted *below* the pattern generator and distortion analyzer.

Note. The pattern generator and distortion analyzer require eight 10-32 panhead screws for securing the equipment to the rack. Standard rackmount frames contain tapered holes which accept the 10-32 flathead screws that bond the rack-mount adapters (figs. 1-3 and 1-7) (with units attached) to the standard rack enclosure. The left-side panel of the pattern generator and the right-side of the distortion analyzer must be bound together with four 10-32 flathead screws, four No. 10 lockwashers, and four No. 10-32 hexagonal nuts.

Note. The four 10-32 panhead screws that secure the relay test set to its transit case can be used to secure the unit in a rackmount installation. The relay test set should be mounted at a location and a height which permits the relay test socket adapter (fig. 1-11), when removed, to be placed on a flat area for relay testing (approximately 14 inches from the front panel).

CAUTION: Do not install the three units of the AN/UGM- 1 directly above any equipment that generates excessive heat. Excessive heat will cause faulty operation of the AN/UGM-1 and may damage the transistors.

(1) Distortion analyzer and pattern generator rack installation.

(a) Remove the contents from the packing case in accordance with instructions in paragraph 2-lb.

(b) Remove the units from their respective transit cases in accordance with instructions in paragraph 2-2.

(c) Remove the power cable and rack-mounting bracket from both transit-case covers (figs. 1-3 and 1-7).

(d) Connect the pattern generator mounting bracket to the two bracket-securing mounting holes (fig. 1-3) on the right side of the unit with 10-32 panhead screws.

(e) Connect the distortion analyzer mounting bracket to the two bracket-securing mounting holes (fig. 1-7) on the left side of the unit 10-32 panhead screws.

(f) On each unit remove the six 8-32 panhead screws (figs. 1-5 and 1-9) that secure the top cover, and remove the top covers. Secure the pattern generator mounting bracket to the rack with two 10-32 panhead screws.

(g) Place the distortion analyzer in the rack to the left of the pattern generator, and attach its mounting bracket to the rack with two 10-32 panhead screws.

(h) Secure the pattern generator to the distortion analyzer at the four connection holes, (fig. l-l) located on the right side of the distortion analyzer, and the left side of the pattern generator with four 10-32 screws, four No. 10 split lockwashers, and four 10-32 hexagonal nuts.

(i) Connect the pattern generator power cable to the rear panel ac power connector J2 (fig. 1-4).

(j) Place (and tighten) the pattern generator POWER switch locking guard (fig. 1-3) to the position that specifies the input voltage to which the power cable will be connected.

(k) Connect the power receptacle cap to the AC POWER connector (fig. 3-1).

(l) Replace the top covers of the pattern generator and distortion analyzer. See *f* above.

Caution: **Make certain that the power cable is never connected to 230 volts ac with the POWER switch locking guard permitting the POWER toggle switch to be set to the 115-volt position. When this condition occurs, one of the ac input power fuses (fig. 1-3) will blow.**

(m) Connect the other end of the power cable to the voltage specified by the POWER switch locking guard.

(n) Connect the distortion analyzer power cable to the unit's rear panel ac power connector J4 (fig. 1-8).

(o) Place (and tighten) the distortion analyzer POWER switch locking guard (fig. 3-2) to the position that specifies the input voltage to which the power cable will be connected.

(p) Connect the power receptacle cap to the AC POWER jack (fig. 3-2).

Caution: **Make certain that the power cable is never connected to 230 volts ac with the POWER switch locking guard permitting the POWER toggle switch to be set to the 115-volt position. When this condition occurs, one of the ac input power fuses (fig. 1-7) will blow.**

(q) Connect the other end of the power cable to the voltage specified by the POWER switch locking guard.

(2) *Relay test set rack installation.*

(a) Remove the contents from the packing case in accordance with paragraph 2-1b.

(b) Remove the unit from the transit in accordance with paragraph 2-2.

(c) Position the permanently wired power cable (fig. 1-11) at the rear of the unit.

(d) Place the relay test set in the rack below the pattern generator distortion analyzer, and attach the relay test set to the rack with four 10-32 panhead screws at the bracket-mounting holes (fig.1-11).

(e) Place (and tighten) the relay test set POWER switch locking guard to the position that specifies the input voltage to which the power cable will be connected.

Caution: **Make certain that the power cable is never connected to 230 volts ac with the POWER switch locking guard permitting the POWER toggle switch to be set to the ll5-volt position. When this condition occurs, one of the ac input power fuses will blow.**

(f) Connect the power cable (fig. 1-12) to the voltage specified by the POWER switch locking guard.

b. Bench Installation.

(1) For bench installation, the three units OF THE AN/UGM-l should be placed so that (when facing the bench) the relay test set is to the left of the distortion analyzer and the pattern generator is to the right of the distortion analyzer.

(2) If an external battery connection is required for the pattern generator (fig. 1-4) or if an external meter connection is required for the distortion analyzer (fig. 1-8), these units must be removed from their transit cases, since the required connections are made at their rear (para 2–2). Otherwise, the three units of the AN/UGM–l can be placed on a bench in their transit cases.

(3) The power cables for the pattern generator and the distortion analyzer should be connected to the AC POWER connecter on the front panel of these units (figs. 3-1 and 3-2). The relay test set power cable should be brought from the rear along the

right side of the transit case (inside) and out through an external cable slot at the front panel (fig. 1-11).

c. Installation of Telegraph Relay. The relay test set is capable of testing most types of mechanical and electronic relays.

Caution: **Do not insert or check more than one relay at a time in the test socket adapter. Possible damage to the relay or equipment may result.**

(1) *Mechanical relay.* Plug the mechanical relay to be tested directly into the test socket adapter or into one of the two available sockets (figs. 1-11 and 1-13), depending on the type of relay to be tested.

Note. To install the WECO-type 255A relay into the test wcket (fig, 1-13), the test socket adapter must be removed by loosening the securing screws (fig. 1-11).

(2) *Electronic relay.* Although most electronic relays can be plugged into the octal test socket at the f rent of the relay test set, some electronic relays have their outputs polarized in opposition to the wiring of the octal test socket. Before plugging an electronic relay into the relay test set for testing, check the relay plug wiring against the wiring diagram of the test socket (fig. 2-2).

(a) If the wiring of the relay plug corresponds to the wiring of the test socket, the relay to be tested may be plugged directly into the test socket.

(b) If the relay plug wiring does not correspond to the test socket wiring, an adapter socket (such as the Vector Electronic Co. Type TX-8-0-5) may be used to cross-wire the relay plug so that it corresponds to to test socket wiring.

Note. When checking a mercury-wetted type relay, the test socket adapter (fig. 1-11) should be removed and placed on end, so that the mercury-wetted relay may be tested in its *upright* position.

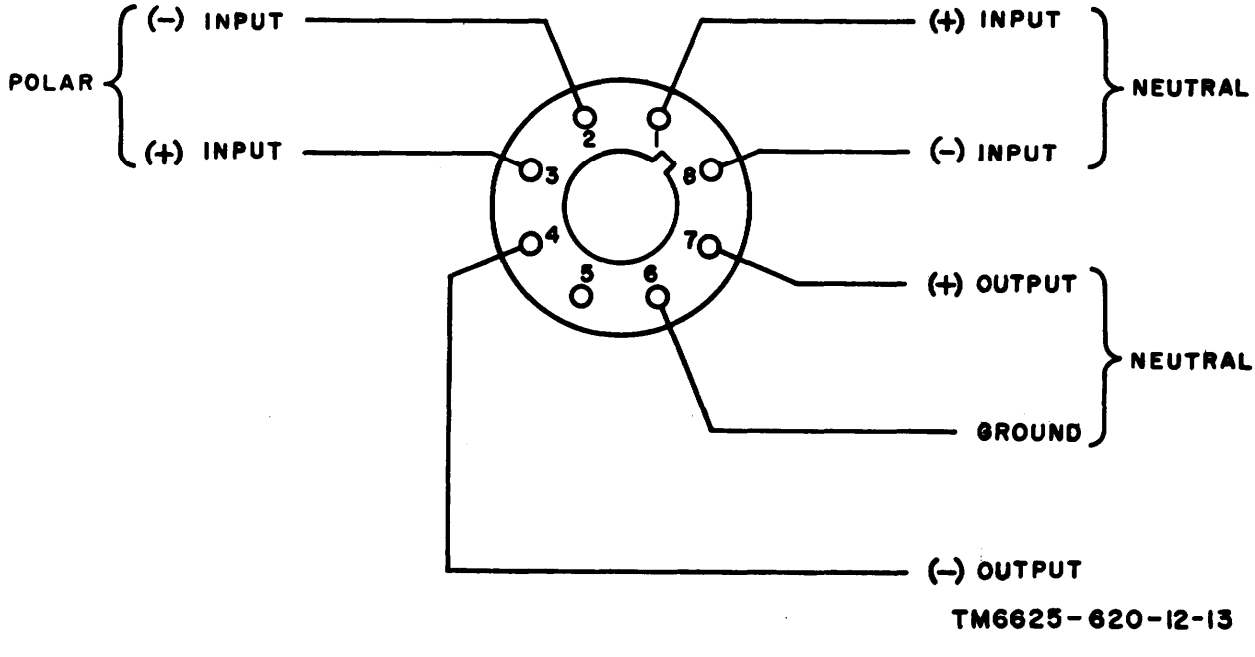

Figure 2-2. Octal test socket wiring diagram, front view.

2-5. Test Set, Teletypewriter TS-799/ UGM-1 Message Programing

A test message is factory-programed on PC boards in the pattern generator. When installed, these PC boards contain resistors which produce the following message: "the quick brown fox jumped over a lazy dog FIG 'LET s back FIG 1234567890 LET testing LET LET LET LET CR CR LF LET'." (The last eight characters may be used as call letters, if desired.) To change the message or insert call letters, higher level maintenance is required.

2-6. Input Power Connections

Each of the three AN/UGM–l units is shipped with a power cable. The power cable for the relay test set is permanently wired into the rear of the unit (fig. 1-12).

a. To use the unit on a table or bench, connect the pattern generator and distortion analyzer ac power cable to the AC POWER input connector (figs. 1-3 and 1-7). Bring the relay test set power cable from the rear along the right side and out through an external cable slot on the front panel.

b. If the units are to be mounted in a rack, connect the ac power cable to ac power connector jack J2 of the pattern generator (fig. 1-4) and to ac power connector jack J4 on the distortion analyzer (fig. 1-8).

2-7. Test Set Teletypewriter TS-799/ UGM-1 Loop Power Connection

a. General. The pattern generator provides loop power for a 20-milliameter (ma) or 60–ma neutral output signal. If a 20–ma or 60-ma neutral output signal is desired, proceed as described in *b* below. If a polar output signal is desired, connect to external loop battery as described in *c* below. If the output signal is to be connected into a loop that already contains loop power, proceed as described in *d* below. After the loop connections have been completed, adjust the loop current as described in *e* below.

b. Neutral Output.

(1) Connect the loop wires to a two-conductor phone plug (such as PJ–055B) and insert the plug into the front-panel SIGNAL OUTPUT jack (fig. 3-1).

(2) Set the front-panel CURRENT SELECT switch to the 20 or 60 position, as required.

c. Polar Output.

(1) Connect the positive (+) terminal of the loop pattern (60 volts maximum) to the + EXT BAT terminal of terminal board TB1 (fig. 1–4).

(2) Connect the negative (–) terminal of the loop battery (60 volts maximum) to the -EXT BAT terminal of terminal board TB1.

(3) Connect the loop battery common terminal (connected to station ground), through a loop-current rheostat, to the EXT BAT COM terminal of terminal board TB1.

(4) Connect the loop wires to a two-conductor phone plug, and insert the plug into the front-panel SIGNAL OUTPUT jack (fig. 3-1).

(5) Set the CURRENT SELECT switch to the 30 POLAR position.

d. Connections Into Existing Power Loop.

(1) Connect the loop wires to a two-conductor phone plug, (such as PJ-055B) and insert the plug into the front-panel SIGNAL OUTPUT jack (fig. 3-1).

(2) Set the CURRENT SELECT switch to the EXT PWR position.

Caution: **If the CURRENT SELECT switch is not placed in the EXT PWR position, possible damage may be incurred in the pattern generat or in the externally connected equipment.**

Warning: **When the ac power cable is connected to the rear of the pattern generator, place the protective cover over the AC POWER connector on the front of the unit (fig. 3-1).**

e. Loop Current Adjustment. Before operating the pattern generator, adjust the output loop current for the proper value. Adjust the pattern generator output loop current as follows:

* U. S. GOVERNMENT PRINTING OFFICE: 1969 390-933/194.

(1) Connect the TS-352/U and set it to measure 100 ma in series with the signal output loop, with the positive multimeter lead connected to the ring of the SIGNAL OUTPUT jack (fig. 3-1) on the front panel.
(2) Operate the CURRENT SELECT switch to the desired position and the MESSAGE TRANSMIT switch to OFF (steady mark).
(3) Operate the POWER switch to the 115V ON or ON 230V position.
(4) Adjust the LOOP CUR ADJ control (fig. 1-5) until the TS-352/U indicates the required loop current.

Note. When the EXT PWR position of the CURRENT SELECT switch is used (para 2-7d), loop current is controlled by the externally powered loop. The LOOP CUR ADJ control (fig. 1-5) may be used as a *touch up* for the loop current.

2-8. Test Set, Teletypewriter TS-800/ UGM-1 Connections

a. General. In addition to the signal input connections *(b* below), the distortion analyzer has provisions for connection of a remote pen recorder, a remote milliammeter, or voltmeter. Such an external device can be connected to the EXT M connections (terminals 1 and 3) of terminal board TB1 (fig. 1-8). When any of these external units is connected, it must be calibrated in terms of percentage of distortion as shown on the front-panel meter (fig. 1–7) of the distortion analyzer. The method of connecting a pen recorder or meter depends on whether the device is a high-impedance, voltare-operated device *(c* below) or a low-impedance, current-operated device *(d* below).

b. Signal Input Connection. All input connections are made through the front-panel SIGNAL INPUT jack (fig. 3-2).

(1) Connect the loop wires to a two-conductor phone plug (such as PJ-055B) and insert it into the signal input jack.
(2) Set the CURRENT SELECT switch to the position that corresponds to the type of loop (20 ma, 60 ma neutral, or 30 ma polar) to be analyzed.

c. Connection of High-Impedance Device. The high–impedance device used must be one with an input voltage across it that is directly proportional to the distortion indicated by the distortion analyzer. Connect the external device as described below.

Note. For this operation, the input resistance of the external device must be at least 10,000 ohms. Otherwise, the calibration of the distortion analyzer will be disturbed.

(1) Connect the two leads of the high-impedance device to terminals 1 and 3 of terminal board TB1 on the distortion analyzer (fig. 1–8).
(2) Calibrate the external device so that the device measures, in percentage, exactly the same as the front-panel meter of the distortion analyzer.

d. Connection of Low-Impedunce Device. The low-impedance device used must be one with an input *current* that is directly proportional to the distortion indicated by the distortion analyzer. Connect the external device as follows:

(1) Determine the resistance value of the sampling resistor (usually 150 ohms) (fig. 1-8) on the rear panel of the distortion analyzer.
(2) Determine the impedance of the external device being connected to the distortion analyzer (usually less than 150 ohms).
(3) Replace the sampling resistor with a resistance that, when combined in series with the impedance of the low-impedance device being connected, equals the value of the original sampling resistor.
(4) Connect the low-impedance device to terminals 1 and 3 of terminal board TB1 on the rear panel of the distortion analyzer.
(5) Calibrate the external device so that it measures, in percentage, exactly the same value indicated on the fronti panel meter of the distortion analyzer.

Warning: **When the power cable is connected to the rear of the distortion analyzer, place the protective cap over the AC POWER connector o n the front of the unit (fig. 1-7).**

2-9. Test Set, Relay TS-836/UGM-1 Connections

The relay test set provides a loop current output at the front-panel EXTERNAL 0UT PUT jack (fig. 1-11). Signal output from this jack, which depends on the type of relay inserted in the test socket and the type of test being performed, may be applied to the distortion analyzer. To obtain the output, connect loop wires to a two-conductor phone plug (such as PJ-055B), and insert the plug into the EXTERNAL OUTPUT jack.

2-10. Initial Adjustments

Initial adjustment procedures are performed by organizational maintenance personnel as described in paragraph 5-7. These adjustments *must* be performed prior to initial operation of the equipment.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. OPERATOR'S CONTROLS, INDICATORS, AND JACKS

3-1. Test Set, Teletypewriter TS-799/UGM-1 Controls and Indicators

a. Front Panel (fig. 3-1).

Control, indicator, or jack	Function
RATE (12-position rotary) switch	When set to BAUDS, selects code and rate output of message selected.
	BAUDS pos / **Function** 7.00/45.5 — Allows 7-unit code, test-message output signal at 45.5 bauds. 7.5/45.5 — Allows 7.5-unit code, test-message output signal at 45.5 bauds. 7.5/50 — Allows 7.5-unit code, test-message output signal at 50 bauds. 7.5/74.2 — Allows 7.5-unit code, test-message output signal at 74.2 bauds. 7.5/75 — Allows 7.5-unit code, test-message output signal at 75 bauds. 7.00/150 — Allows 7.0-unit code, test-message output signal at 150 bauds.
	When set to DOT CYCLES, provides alternate mark and space output at 23, 37, 37.5 75, or 100 cps.
DISTORT SELECT (5-position rotary) switch	Establishes type of distortion introduced into signal.
	Switch pos / **Function** MARK BIAS — Output signal space-to-mark transitions are early. SPACE BIAS — Output signal space-to-mark transitions are late. OFF — Unit produces undistorted output signal. SPACE END — Output signal mark-to-space transitions are early. MARK END — Output signal mark-to-space transitions are late.
% DISTORT control	Controls magnitude of output signal distortion.
MESSAGE SELECT (four-position rotary switch	Selects type of output signal.
	Switch pos / **Function** DOT CY — Set up equipment to produce an output pattern of alternate marks and spaces.

Control, indicator, or jack	Function
	Switch pos — **Function** TEST MESSAGE — Sets up equipment to produce the following test output signal: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 1234567890 TESTING, followed by four consecutive carriage returns (CR) a line feed (LF), and a, final letters shift (LTRS). ALT R&Y — Sets up equipment to produce an output of alternate R- and Y-characters. SELECTED PULSES — Sets up equipment to produce a continuous selected character as determined by the positions of the SPACE-MARK toggle switches.
SPACE-MARK SELECTED PULSES toggle switches	Establishes bit-pattern of output character: **Switch pos** — **Function** SPACE — Produces space output level for corresponding bit in output signal. MARK — Produces mark output level for corresponding bit in output signal.
MESSAGE TRANSMIT (two-position toggle) switch.	Controls output of pattern generator: **Switch pos** — **Function** ON — Permits normal transmission of output signal, as determined by MESSAGE SELECT switch. OFF — Holds output in mark condition.
CURRENT SELECT (four-position rotary) switch	Establishes output mode. **Switch pos** — **Function** 20 — Produces neutral electronic keying with internal 20-ma loop supply. 60 — Produces neutral electronic keying with internal 60-ma loop supply. 30 POLAR — Produces polar electronic keying output with 30-ma supply connected to rear of unit. *Note*. The negative polar battery may be used for 30-ma neutral keying. **Switch pos** — **Function** EXT PWR — Produces neutral dry contact electronic keying (closures) with external powered loop connected at SIGNAL OUTPUT jack.
POWER (neon) indicator	Lights to indicates that ac power is applied to the unit.
POWER (three-position toggle, with locking guard) switch.	Permits pattern generator to operate from 115- or 230-volt ac source. OFF position removes ac power from the pattern generator.

Control, indicator, or jack	Function
SIGNAL OUTPUT (two-conductor) jack	Provides telephone plug connection for output signal.
AC POWER connector	Provides connection for 115-volt or 230-volt ac input power.

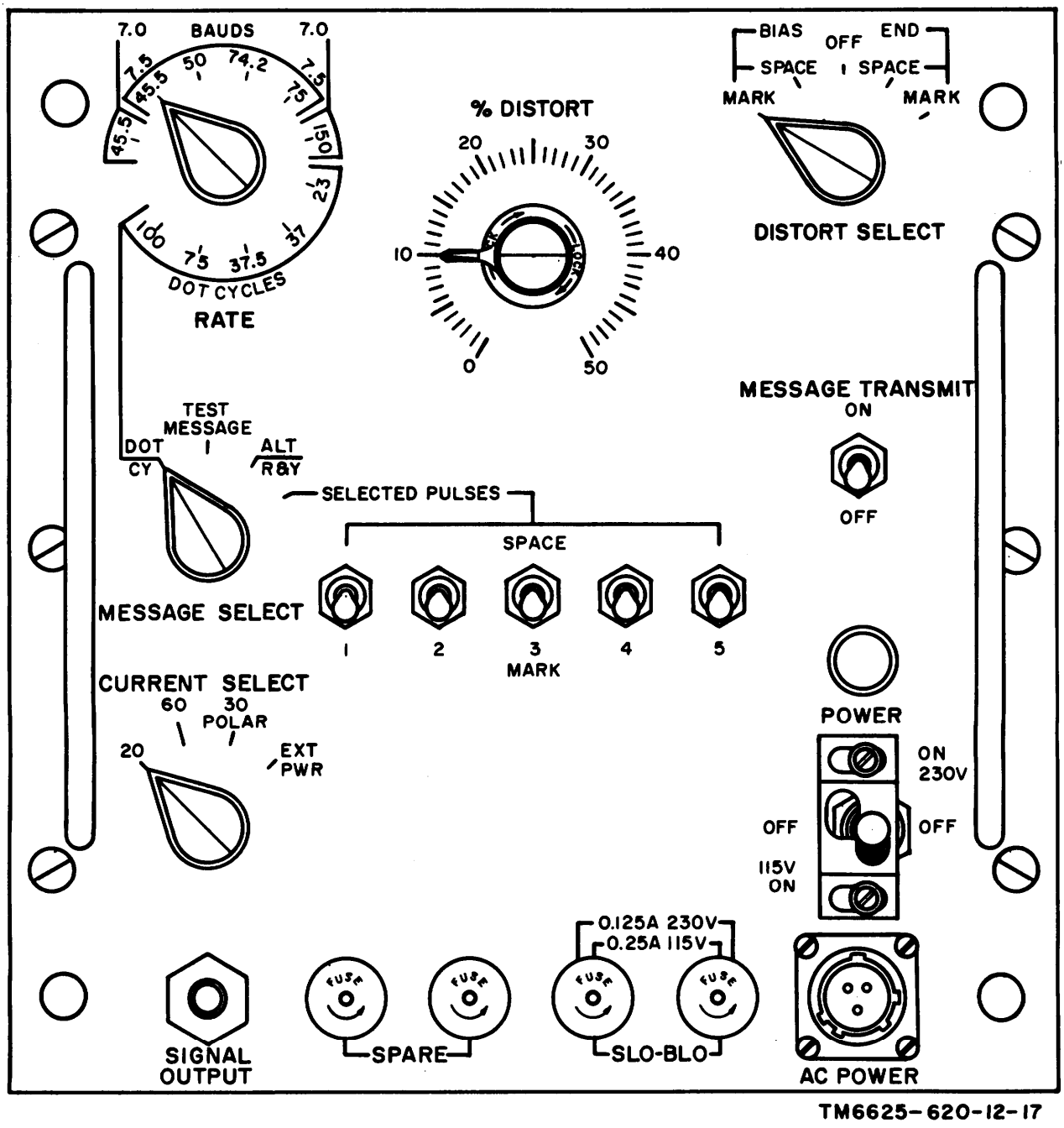

Figure 3-1. Test Set, Teletypewriter TS-799/UGM-1, front panel.

b. Rear Panel (fig. 1-4).

Control, indicator, or jack	Function
J2 connector	Provides rear-panel connection for ll5-volt or 230-volt ac input power.
+15V jack J1	Permits test equipment connection for measuring +15-volt output
GRD jack J2	Permits test equipment ground connection.
-15V jack J3	Permits test equipment connection for measuring -15-volt output.
130V jacks J4 and J5	Permits test equipment connection for measuring 130-volt output.

3-2. Test Set Teletypewriter TS-800/UGM-1 Controls and Indicators

a. Front Panel (fig. 3-2).

Control, indicator, or jack	Function
TRANSITION SELECT (seven-position rotary) switch	Permits selection of individual transition, or all transitions, to be analyzed.
PERCENT DISTORTION meter	Indicates in percent, the magnitude of the input signal distortion.
RATE (five-position rotary switch	Each position sets up equipment to operate with input signals of a particular code and a particular modulation rate.
EARLY (neon) indicator	Indicates that monitored transitions are occuring early. operates only when left-hand DISTORTION SELECT switch is in AVERAGE position.
LATE (neon) indicator	Indicates that monitored transitions are occurring late. Operates only when left-hand DISTORTION SELECT switch is in AVERAGE position.
DISTORTION SELECT switches, left-hand, (four-position rotary).	**Switch pos** — **Function** AVERAGE — Unit indicates average distortion (early and late) existing in selected transitions. TOTAL PEAK — Unit indicates peak (early *or* late) distortion existing in selected transitions. EARLY PEAK — Unit indicates early peak distortion existing in selected transitions. LATE PEAK — Unit in indicates late peak distortion existing in selected transitions.
Right-hand, two-position rotary	Selects type of transitions to be monitored (mark-space or space-mark) for distortion
SIGNAL indicator	Lights when input signal is at a mark.
RESET pushbutton	Reset PERCENT DISTORTION meter to 0.
POWER (neon) lamp	Lights to indicate that ac power is applied to the unit.
POWER (three-position toggle, with locking guard) switch.	Permits unit to operate from 116-volt or 230-volt ac source. OFF position removes power.
FILTER (toggle) switch	Connects filter into or disconnects filter from input signal Circuit
POLARITY (toggle) switch	Reverses polarity of the input signal connection.
CURRENT SELECT (three-position rotary) switch	When set to- **Switch pos** — **Function** 20 — Input circuits accept 20-ma neutral input signals. 60 — Input circuits accept 60-ma neutral input signals. 30 POLAR — Input curcuits accept 30-ma polar input signals.

Control, Indicator, or jack	Function
AC POWER connection	Provides connection to 115-volt or 230-volt AC input power.
CHARACTER SYNC jack	Provides output pulse which indicates the start of each character.
SIGNAL INPUT (two-conductor jack)	Provides telephone plug connection for input signal.

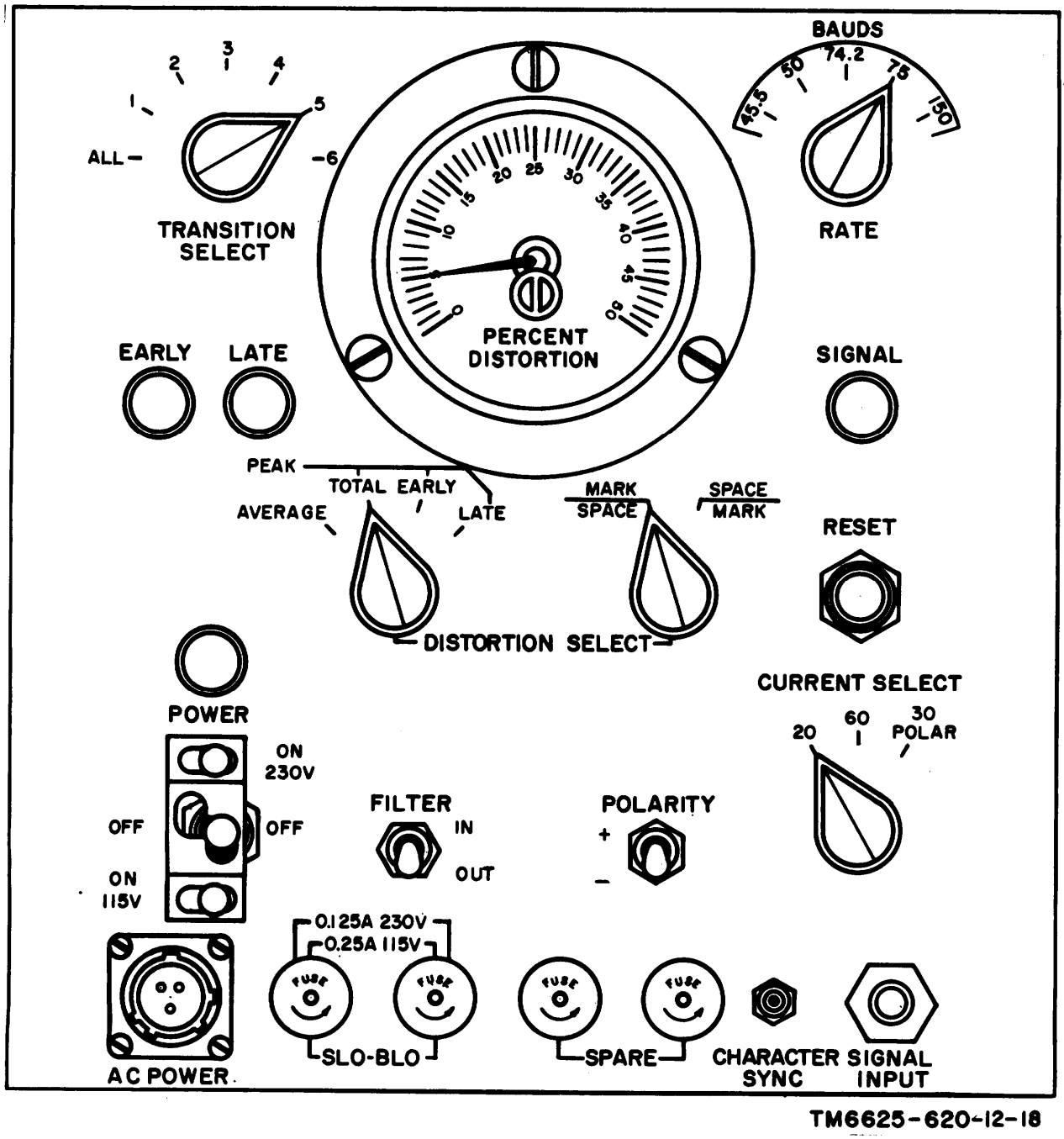

Figure 3-2. Test Set, Teletypewriter TS-800/UGM-1, front panel.

b. Rear Panel (fig. 1-8).

Control, indicator, or jack	Function
J4 jack	Provides rear-panel connection for 115-volt or 230-volt ac input power.
+15V jack J1	Permits test equipment connection for measuring +15-volt output.
GRD jack J2	Permits test equipment ground connection.
-15V jack J3	Permits test equipment connection for measuring -15-volt output.
-1OV jack J4	Permits test equipment connection for measuring -10-Volt output.
-120V jack J5	Permits test-equipment connection for measuring -120-Volt output.

3-3. Test Set, Relay TS-836/UG-1 Controls and Indicators

a. Front Panel (fig. 3-3)

Control, indicator, or jack	Function
Relay test socket (octal)	Provides connection for sigmatype 72 relay as well as electronic relays.
Relay test socket (block) (fig. 1-13)	Provides connection for WECO type 225A relays.
TEST SELECT (five-position rotary) switch	When set to-
	PS BAL, — Allows meter to indicate balance between the -100-volt and +100-volt-power supplies (meter indicates 0 when supplies are balanced).
	MARK — Permits meter indication of mark relay contact closure efficiency (meter indicates 100 percent for complete contact closure).
	SPACE — Permits meter indication of space relay contact closure efficiency (meter indicates 100 percent for complete contact closure) l
	CONT EFF — Permits meter indication of transient time between relay contact closures (meter indicates 100 percent for zero time between mark closure and space closure) .
	BIAS — Permits meter indication of relay bias distortion. Mark bias distortion causes the meter needle to deflect to the right of O. Space bias distortion causes the meter needle to deflect to the left of 0. (Meter indicates 0 when no bias distortion is present.)
BALANCE ADJUST control	BaIances the -100- and + 100-dc volt power supplies.
TEST CURRENT switch	When set to- (1) 4-8, arranges equipment to produce 4-ma bias current and 8-ma operate current. (2) 10-20, arranges equipment to produce 10-ma bias current and 20 ma operate current.

Control, Indicator, or jack	Function
	(3) 30-60, arranges equipment to produce 30-ma bias current and 60 ma operate current.
METER ADJUST control	Adjusts meter for full-scale deflection.
BAL TEST test points	Provides external-meter connections for performing a power-supply balance adjustment with the BALANCE ADJUST control.
MESSAGE SPEED (5-position rotary) switch	Provides dot-cycle input rates (23 37, 75, 100, 125 dot cps) to the solenoid of the relay under test.
OUTPUT CURRENT SELECT (3-position rotary) switch.	Provides for selection of 20- 30-, or 60-ma output signals at the EXTERNAL OUTPUT jack. Switch position depends on type of relay under test.
EXTERNAL OUTPUT jack	Provides for connection of external output through the relay under test, to analyzing equipment or oscilloscope.
POWER indicator	Lights when ac power is applied to the relay test set.
POWER switch	Applies 115- or 230-volt ac to the relay test set, depending on the position of the locking-guard.

b. Rear Panel (fig. 1–12)

Control, indicator, or jack	Function
OPERATE CURRENT MONITOR jack J4	Permits test-equipment connection for monitoring relay operate coil current.
BIAS CURRENT MONITOR jack J5	Permits test-equipment connection for monitoring relay bias coil current
OPERATE CURRENT ADJUST control	Adjusts operate coil current to be used when testing a relay.
CONTACT CURRENT ADJUST control	Adjusts relay loop current when relay under test is in a steady mark condition.
BIAS CURRENT ADJUST control.	Adjusts bias coil current to be used when testing a relay.
+100V jack J8	Permits test-equipment connection for measuring +100-Volt output.
GRD jack J7	Permits test-equipment ground connection.
-l00V jack J6	Permits test-equipment connection for measuring –l00-Volt output.
+15V jack J9	Permits test-equipment connection for measuring +15-Volt output.
+lOOV ADJUST	Permits adjustment of +100 volts at test jack J8.

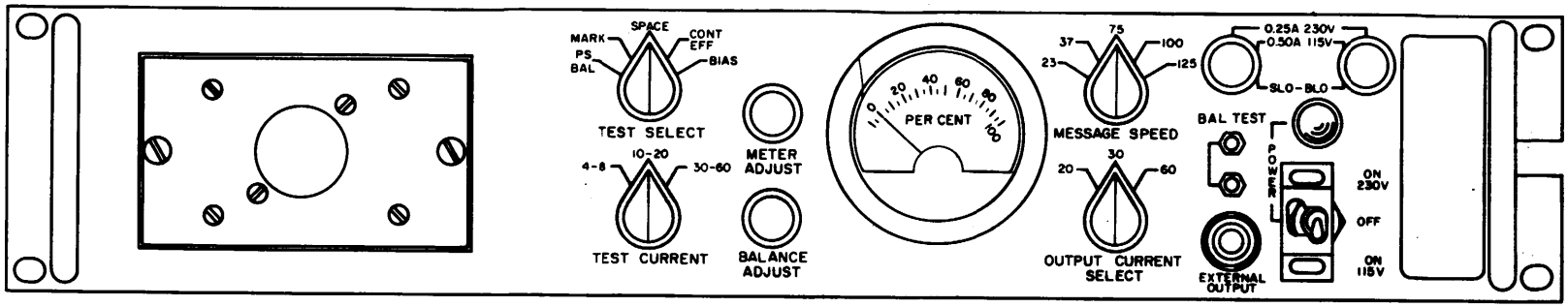

Figure 3-3. Test Set, Relay TS-836/UGM-1, front panel

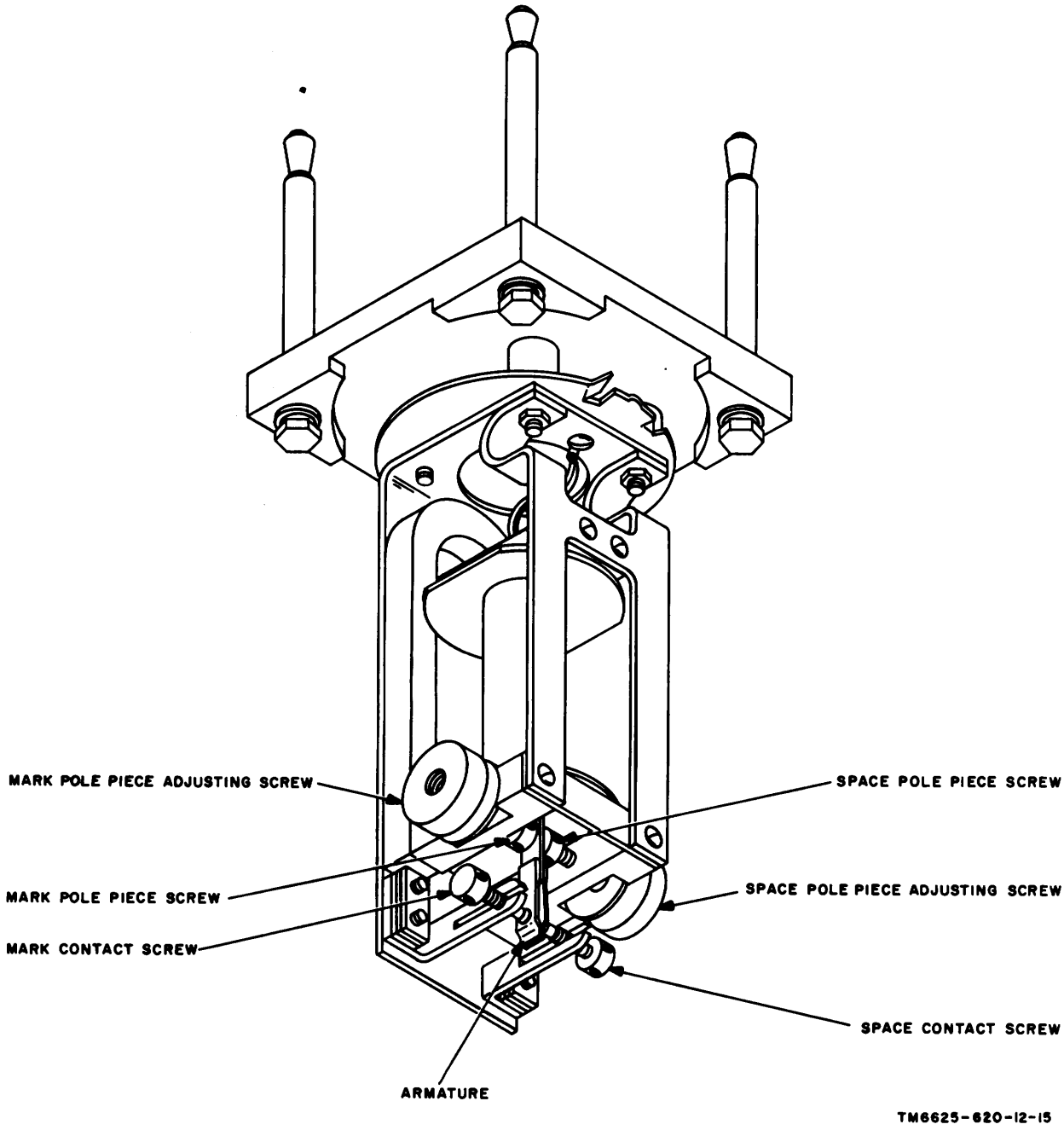

Figure 3-4. WECO-type 255A relay, cover removed.

Section II. OPERATION UNDER USUAL CONDITIONS

3-4. General

a. The three units of the test set can be operated independently or in conjunction with each other at the same location or at three separate locations. Front-panel signal connections permit the out put from the pattern generator and the relay test set to be monitored locally on the PERCENT DISTORTION meter of the distortion analyzer. Also, pattern generator messages or relay test set outputs can be sent from the pattern generator of relay test set through a telegraph network and then observed for distortion on the distortion analyzer at another location.

b. Preliminary operating procedures for the three units of the test set (paras. 3-5a, 3-6a, and 3-7a) should be performed whenever the power source or loop current is changed.

3-5. Test Set, Teletypewriter TS-799/ UGM-1 Operating Instructions

(fig. 3-1)

a. Preliminary Procedures.

(1) Set the CURRENT SELECT switch to the position that indicates the' required type of current signal output.

(2) Set the MESSAGE TRANSMIT switch to OFF.

(3) The POWER indicator lamp lights.

(4) Set the POWER switch to 115V or 230V, whichever is permitted by the POWER switch locking guard.

b. Operating Procedure (fig. 3-1).

(1) Set the MESSAGE SELECT switch to the position indicating the desired test-pattern output. When the MESSAGE SELECT switch is set to SELECTED PULSES, set SELECTED PULSES switches 1 through 5 to MARK or SPACE, as indicated in the chart below, to obtain the desired output.

SELECTOR PULSES Switch Setting

Selected character	SELECTED PULSES switch positions				
	1	2	3	4	5
A	MARK	MARK	SPACE	SPACE	SPACE
B	MARK	SPACE	SPACE	MARK	MARK
C	SPACE	MARK	MARK	MARK	SPACE

SELECTED PULSES Switch Setting—Continued

Selected character	SELECTED PULSES switch positions				
	1	2	3	4	5
D	MARK	SPACE	SPACE	MARK	SPACE
E	MARK	SPACE	SPACE	SPACE	SPACE
F	MARK	SPACE	MARK	MARK	SPACE
G	SPACE	MARK	SPACE	MARK	MARK
H	SPACE	SPACE	MARK	SPACE	MARK
I	SPACE	MARK	MARK	SPACE	SPACE
J	MARK	MARK	SPACE	MARK	SPACE
K	MARK	MARK	MARK	MARK	SPACE
L	SPACE	MARK	SPACE	SPACE	MARK
M	SPACE	SPACE	MARK	MARK	MARK
N	SPACE	SPACE	MARK	MARK	SPACE
O	SPACE	SPACE	SPACE	MARK	MARK
P	SPACE	MARK	MARK	SPACE	MARK
Q	MARK	MARK	MARK	SPACE	MARK
R	SPACE	MARK	SPACE	MARK	SPACE
S	MARK	SPACE	MARK	SPACE	SPACE
T	SPACE	SPACE	SPACE	SPACE	MARK
U	MARK	MARK	MARK	SPACE	SPACE
V	SPACE	MARK	MARK	MARK	MARK
W	MARK	MARK	SPACE	SPACE	MARK
X	MARK	SPACE	MARK	MARK	MARK
Y	MARK	SPACE	MARK	SPACE	MARK
Z	MARK	SPACE	SPACE	SPACE	MARK
SPACE	SPACE	SPACE	MARK	SPACE	SPACE
CAR. RET.	SPACE	SPACE	SPACE	MARK	SPACE
LINE FEED	SPACE	MARK	SPACE	SPACE	SPACE
FIGS. SHIFT	MARK	MARK	SPACE	MARK	MARK
LETS. SHIFT	MARK	MARK	MARK	MARK	MARK
BLANK	SPACE	SPACE	SPACE	SPACE	SPACE

(2) Set the RATE switch to the position that indicates the desired output keying rate. If the dot cycles pattern is to be used, set the RATE switch to the DOT CYCLES position that indicates the desired output in cycles per second.

Note. Since the dot cycle output does not have a stop-mark-to-start-space pulse, the distortion analyzer will indicate bias distortion, even if no distortion is generated by the pattern generator.

(3) Set the DISTORT SELECT switch to the position that indicates the desired type of distortion. If no distor- is required, set the switch to OFF.

(4) Loosen the lock screw, and set the % DISTORT control to the desired value. Tighten the lock screw to secure the knob at the desired setting.

(5) Set the MESSAGE TRANSMIT switch to ON.

Note. To change the output message or selected character, set the MESSAGE TRANSMIT switch to OFF, select the new output and then set the MESSAGE TRANSMIT switch to ON. Settings of the DISTORT SELECT switch and % DISTORT control ((3) and (4) above) may be changed at any time during operation.

c. Stopping Procedure.

(1) To stop the pattern generator from producing an output pattern (steady mark), set the MESSAGE TRANSMIT switch to OFF.

(2) To turn off the pattern generator completely, set the MESSAGE TRANSMIT switch and the POWER switch to OFF.

3-6. Test Set, Teletypewriter TS-800/UGM-1, Operating Instructions

(fig. 3-2)

a. Preliminary Procedures.

(1) Set the POWER switch to the 115V or 230V position allowed by the lock ing guard.

(2) Set the RATE switch to the position corresponding to the code and speed of the signal to be analyzed.

(3) Connect the input signal to the distortion analyzer as described in paragraph 2–8b.

(4) Apply power. If the input signal is in a mark condition or is being keyed, the SIGNAL indicator lamp will light. If the lamp does not light, reverse the position of the FILTER switch.

(5) If the transients and noise in the input signal are to be eliminated before analysis, operate the FILTER switch to IN; if they are to be present during analysis, operate the FILTER switch to OUT.

b. Operating Procedure.

Note. In each of the measurements described below, depress the RESET button before reading meter indications, to insure a correct indication.

(1) *Average mark to space distortion measurement.*

(a) Set the left- and DISTORTION SELECT switch to AVERAGE.

(b) Set the right-hand DISTORTION SELECT switch to MARK-SPACE.

(c) Set the TRANSITION SELECT switch to ALL; the meter indicates the average distortion of all mark–to-space transitions of the input signal.

(d) If the EARLY lamp is on, spacing end distortion is indicated.

(e) If the LATE lamp is on, marking end distortion is indicated.

(2) *Average space to murk distortion measurement.*

(a) Set the left-hand DISTORTION SELECT switch to AVERAGE.

(b) Set the right-hand DISTORTION SELECT switch to SPACE-MARK.

(c) Set the TRANSITION SELECT switch to ALL; the meter indicates the average distortion of all space-to-mark transitions to the input signal.

(d) If the EARLY lamp is on, marking bias distortion is indicated.

(e) If the LATE lamp is on, spacing bias distortion is indicated.

(3) *Total peak distortion measurement.*

(a) Set the left-hand DISTORTION SELECT switch to TOTAL PEAK.

(b) Set the TRANSITION SELECT switch to ALL; the meter indicates the maximum distortion present in any input signal transition.

(4) *Peak bias distortion measurements.*

(a) Set the right-hand DISTORTION SELECT switch to SPACE-MARK.

(b) Set the TRANSITION SELECT switch to ALL.

(c) Set the left-hand DISTORTION SELECT switch to LATE PEAK; the meter indicates maximum marking bias distortion.

(d) Set the left-hand DISTORTION SELECT switch to EARLY PEAK; the meter indicates maximum spacing end distortion.

(5) *Peak end distortion measurements.*

(a) Set right-hand DISTORTION SELECT switch to MARK-SPACE.

(b) Set the TRANSITION SELECT switch to ALL.

(c) Set the left-hand DISTORTION SELECT switch to LATE PEAK; the meter indicates maximum marking end distortion.

(d) Set the left-hand DISTORTION SELECT switch to EARL PEAK; the meter indicates maximum spacing end distortion.

(6) *Distortion measurement of single transitions* To perform any of the tests decribed above on an individual transition rather than the composite signal, set the TRANSITION SELECT switch to the position indicating the transition to be tested. Be sure that the signal input provides transitions of the type being monitored, in the position being monitored. Only the space-to-mark transitions can be obtained in positions 1 and 6 (the end of the start-space and the beginning of the stop-mark, respectively).

(7) Dot cycle distortion measurement.

Note. Since the dot cycle input does not have a stop-mark-to-start-space pulse, the distortion of this input signal is measured by the distortion analyzer as bias distortion; thus, dot cycle distortion should be read with right-side DISTORTION SELECT switch set to SPACE-MARK.

(a) Set the left-hand DISTORTION SELECT switch to AVERAGE.

(b) Set the right-hand DISTORTION SELECT switch to SPACE-MARK.

(c) Set the TRANSITION SELECT switch to ALL.

(d) Set the RATE switch to the position that corresponds to the dot cycle rate input; the meter indicates the average space-to-mark transition distortion of the input signal. If the EARLY indicator is on, marking bias distortion is indicated; if the LATE indicator is on, spacing bias distortion is indicated.

3-7. Test Set, Relay TS-836/UGM-1, Operating Instructions

a. General. Operating procedures for the relay test set include those for relay testing and for the necessary relay adjustments (where applicable). For the most part, electronic relays are not adjustable. Procedures for checking relays for bias distortion and for contract efficiency are given in *b* through *d* below. Also included are instructions for adjusting Sigma–series 72-type mechanical relays and the WECO–type 255A mechanical relays. Because bias adjustments and contact efficiency adjustments are interrelated, the adjustment procedures *(d* below) must be performed in the order given.

Note. For neutral relays, the relay test set provides an indication of relay contact closure only. This contact closure is indicated by a 50-percent reading on the relay test set meter. Bias distortion measurements, contact efficiency measurements, and mechanical adjustment procedures for mechanical types of polar relays are possible.

b. Bias Distortion Test.

(1) Set the POWER switch (fig. 3-3) to the 115V or 230V position whichever is permitted by the POWER switch locking-guard.

(2) Set the TEST CURRENT switch to 4-8.

(3) Insert the relay to be tested into the appropriate relay test socket. (See fig. 1-11 for the Sigma-series 72 relay test socket; see fig. 1–13 for WECO-type 255A test socket.)

(4) Set the MESSAGE SPEED switch (fig. 3-3) to the appropriate test frequency position (as determined by the relay under test).

(5) Set the TEST SELECT selector switch to MARK.

(6) Adjust the METER ADJUST control for a 100-percent indication on the meter.

(7) Set the TEST SELECT switch to BIAS.

(8) Observe the bias indication on the meter; a positive (up-scale) deflection of the meter needle indicates marking bias distortion; a negative (down-scale) deflection of the meter needle indicates spacing bias distortion.

(9) Set the POWER switch to OFF.

c. Contact Efficiency Test (Fig. 3-3).

(1) Set POWER switch to the position permitted by the POWER switch locking-guard.

(2) Set the TEST SELECT switch to MARK.

(3) Adjust the METER ADJUST control until the relay test set meter indicates full-scale deflection.

(4) Set the TEST SELECT switch to the CONT EFF position.

(5) On the meter, observe the contact efficiency of the relay under test.

Note. Contact efficiency indications will vary according to the settings of the TEST CURRENT switch and the MESSAGE SPEED switch. Refer to the chart below for normal contact efficiency indications for various settings of both of these switches.

Contact Efficiency Versus Relay Coil Current and Operating Speed

TEST CURRENT switch setting		MESSAGE SPEED switch setting	Contact efficiency (percent)
Bias	Operate		
4	8	23	96
4	8	37	94
4	8	75	86
4	8	100	81
4	8	125	77
10	20	23	98
10	20	37	97
10	20	75	92
10	20	100	90
10	20	125	87
30	60	23	99
30	60	37	98
30	60	75	95
30	60	100	93
30	60	125	90

(6) Set POWER switch to OFF.

d. Adjustment Procedures. The following adjustment procedures are presented for WECO–type 255A ((1) below) and Sigma-series 72 ((2) below) relays. Insert the relay to be tested into the proper test socket. The test socket (XK1) for the WECO-type 255A relay is shown in figure 1-13; the relay test connection for the Sigma-series 72 is shown in figure 1–11. To adjust a relay, remove the relay cover.

(1) *WECO-type* 255A *adjustment procedure with power applied.*

(a) Set the TEST SELECT switch (fig. 3-3) to CONT EFF.

(b) Set the TEST CURRENT switch to 4-3.

(c) Set the MESSAGE SPEED switch to the frequency desired.

(d) Turn the space-polepiece adjusting screw (fig. 3-4) and the mark–polepiece adjusting screw fully counterclockwise.

(e) Turn the space-polepiece screw and the mark–polepiece screw counterclockwise until the armature of the relay is free to assume a position where no force is applied from either the mark or the space-polepiece screw.

(f) Set the TEST SELECT switch (fig. (fig. 3-3) to SPACE.

(g) Turn the space-contact screw (fig. 3-4) clockwise, until the relay test set meter indicates full-scale deflection.

(h) Turn the space-polepiece screw counterclockwise one-eighth of a turn.

(i) Set the TEST SELECT switch (fig. 3-3) to MARK.

(j) Adjust the mark-contact screw (fig. 3-4) clockwise, until the relay test. set meter indicates full-scale deflection.

(k) Turn the mark-polepiece screw counterclockwise one-eighth of a turn.

(l) With the armature touching the mark-contact screw, insure that a gap of 0.003 to 0.005 inch exists between the armature and the space contact. Make this measurement

with the 0.004-inch shim stock paper supplied with the relay. Turn the mark-polepiece adjusting screw clockwise until the mark-polepiece screw pushes the armature away from the mark-contact screw and the relay test set meter indicate's 0.

(m) Turn the mark-polepiece screw counterclockwise one-quarter turn.

(n) Turn the space-polepiece adjusting screw and the space-polepiece screw clockwise until the space-polepiece screw pushes the armature away from the space-contact screw and the relay test set meter indicates 9.

(o) Turn the space-polepiece screw counterclockwise and one-quarter turn.

(p) Set the TEST SELECT switch (fig. 3-3) to BIAS.

(q) Set the MESSAGE SPEED switch to 23.

(r) Set the TEST CURRENT switch 4-8.

(s) Adjust both the space-polepiece screw (fig. 3-4 and the mark-polepiece screw for a zero indication on the relay test set meter.

(t) Set the TEST SELECT switch (fig. 3-3) to the CONTF EFF position.

(u) Adjust the space-contact screw (fig. 3-4) and the mark-contact screw for a relay test set meter indication of 96 percent.

(v) Repeat the procedures given in *(a)* through *(f)* above until the bias indication on the relay test set meter is zero and the contact efficiency indication is 96 percent.

(w) Set the TEST CURRENT switch (fig. 3-3) and MESSAGE SPEED switch through each position presented in the chart in c(5) above. The bias indication for all switch settings should be zero. The contact efficiency for each switch setting should be as indicated in the chart in c(5) above.

Note. During adjustment of a relay, an oscilloscope may be connected to the EXTERNAL OUTPUT jack on the relay test set front panel to observe contact bounce. Relay adjustments may then be made while the relay test set meter as well as the visual presentation of contact action displayed on the external oscilloscope is observed.

(2) Sigma-series 72 telegraph relay adjustment.

(a) Perform the bias distortion test *(b* above) and the contact efficiency test *(c* above) for the Sigma-series 1 72 relay.

(b) Turn the mark-contact screw (fig. 3-5) and the space-contact screw counterclockwise, until the relay armature is free to touch either of the polepieces (mark or space).

(c) Center the armature between the mark polepiece and the space polepiece, and, from the rear of the relay, insert a 0.004-inch paper shim between the armature and the mark polepiece.

(d) Set the TEST SELECT switch (fig. 3-3) to SPACE.

(e) Set the MESSAGE SPEED switch to 23.

(f) Set the TEST CURRENT switch to 4-8.

(g) Adjust the space-contact screw relay test set meter indicates full-scale deflection. Turn the space-contact screw counterclockwise one-sixth of a turn.

(h) Remove the paper shim from between the armature and the mark polepiece; insert the paper shim between the armature and the space polepiece.

(i) Set the TEST SELECT switch (fig. 3-3) to MARK.

(j) Adjust the mark-contact screw (fig. 3-5) on the relay until the relay test set meter indicates full-scale deflection. Turn the mark-contact screw counterclockwise one. sixth of a turn.

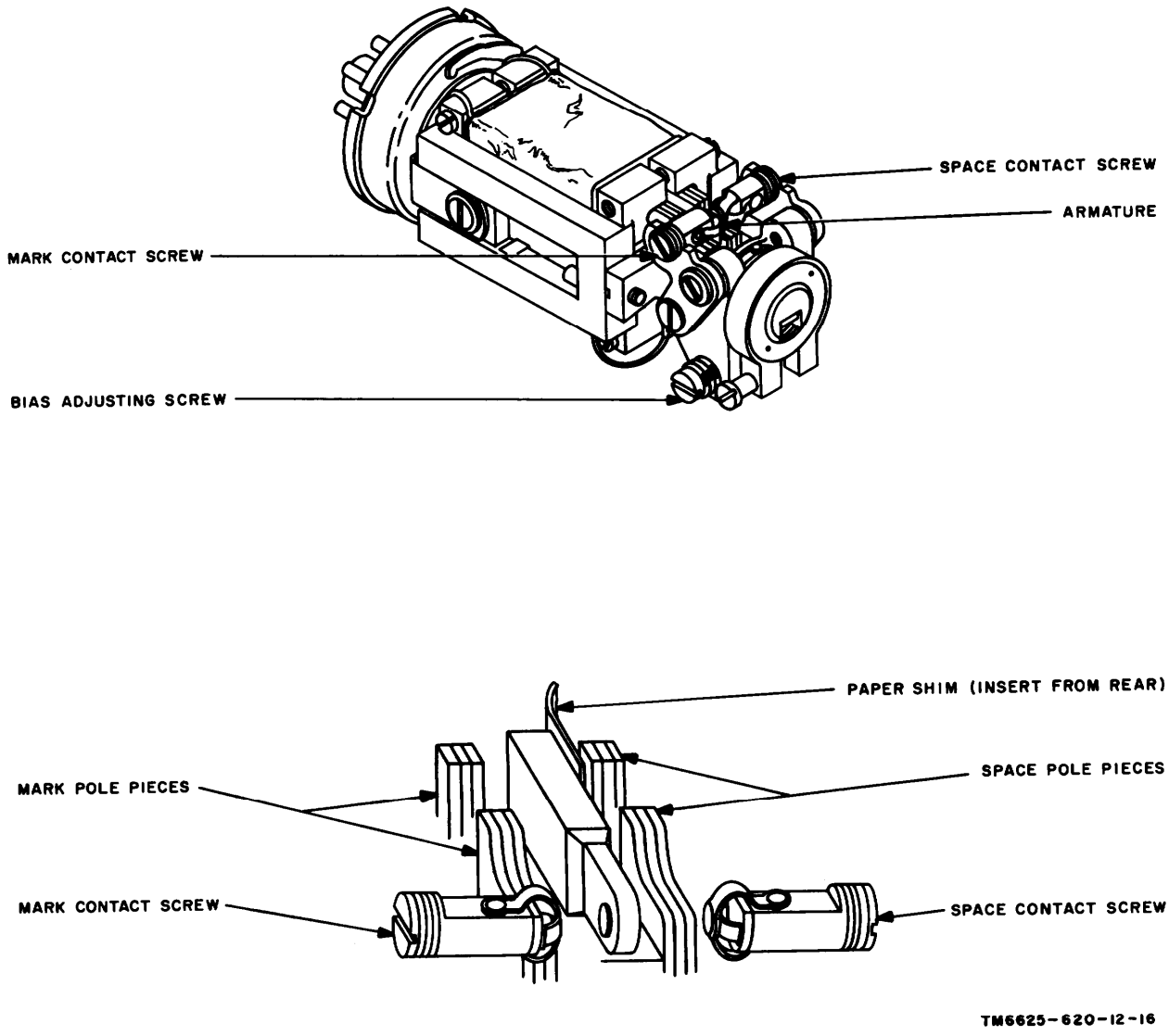

Figure 3–5. Sigma-series 72 relay, adjustment location.

(k) Remove the paper shim from between the armature and the space–polepiece.

(l) Set the TEST SELECT switch (fig. (fig. 3-3) to BIAS.

(m) Adjust the bias-adjusting screw (fig. 3-5) on the relay until the relay test set meter indication is zero.

(n) Set the TEST SELECT switch (fig. 3-3) to CONT EFF. The relay contact efficiency should be identical with those presented in the chart in *c(5)* above for all positions of TEST CURRENT switch and MESSAGE SPEED switch.

(o) If the contact efficiency indication is not correct, adjust the space-contact screw, in conjunction with the mark-contact screw, to obtain the correct efficiency indication on the relay test set meter.

(p) Repeat the procedures given in *(a)* through *(m)* above until the bias indication on the meter is zero and the contact efficiency indication for each position of the TEST CURRENT and MESSAGE SPEED switches are as shown in the chart in *c(5)* above.

Note. During adjustment of the relay, an oscilloscope may be connected to the EXTERNAL OUTPUT jack on the front panel of the relay test set to observe contact bounce. Relay adjustments can then be made while the relay test set meter as well as a visual presentation of contact action display on the external oscilloscope is observed.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-8. General

Difficulty may be encountered in the test set operation where extreme cold, heat, humidity, excessive moisture, sand, or dust conditions prevail. Although the components of the test set maintain their technical characteristics over a wide range, adverse climatic conditions may affect proper operation. Paragraphs 3-9 through 3-11 describe procedures that will minimize these effects.

3-9. Operation in Arctic Climates

a. Keep the test set components warm and dry.

b. Keep the power on continuously if possible.

c. When equipment that has been exposed to the cold is brought into a warm room, moisture will gather on it and may cause a change in operating characteristics. Apply the power and, after the test set reaches room temperature, dry the components thoroughly.

3-10. Operation in Tropical Climates

When the test set is operated in tropical climates, the high relative humidity causes condensation on the equipment whenever the temperature of the equipment becomes lower than that of the surrounding air. To minimize this condition, provide as much ventilation as possible. Dry the units thoroughly before operating.

3-11. Operation in Desert Climates

a. The main problem that arises with operation of the test set in desert areas is the large amount of sand, dust, and dirt that enters the chassis.

b. Keep the equipment as free from dust as possible. Make frequent preventive maintenance checks. The units do not require lubrication and should be kept free from oil and grease.

CHAPTER 4

OPERATOR'S MAINTENANCE INSTRUCTIONS

4-1. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the test set are listed below together with preference to the paragraphs covering the specific maintenance function. These duties do not require special tools or test equipment.

a. Operator's daily preventive maintenance checks and services (para 4-3).

b. Cleaning and touchup painting (para 4-4).

c. Repairs and adjustments.

(1) Replacement of fuses (para 4-5a).

(2) Replacement of indicator lamps (para 4-5b.).

(3) Loop current adjustments (para 4-5).

4-2. Operator's Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to insure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 4-3 and 4-4 cover routing systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Operator's Preventive Maintenance Checks and Services. The operator's daily preventive maintenance checks and services chart (para 4-3) outlines specific functions to be performed by the operator on a daily basis. These checks and services are to maintain Army electronic equipment in a combat–serviceable condition; that is, in good physical condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and what the normal conditions are; the *References* column lists the illustrations of paragraphs that contain additional information relative to repair or adjustment procedures. If the defect cannot be remedied by the corrective measure indicated, higher level maintenance or repair is required. Records and reports of these checks and services must be made in accordance with requirements set forth in TM 38-750.

4-3. Operator's Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	Reference
1	Exterior surface----------	Clean dirt and moisture from exposed surfaces, control panels, meter windows.	Para 4-4a.
2	Connecting hardware----------	Inspect to see that switches, jacks, knobs, connectors, etc, are not loose.	
3	Meter movements----------	Check for sticking pointer movement in meters of distortion analyzer and relay test set.	
4	Lamps and fuses ----------	Inspect for. burned-out indicator lamps and power fuses.	
5	Handles----------	Hand-check for looseness of handles, latches, hinges.	

Sequence No.	Item to be inspected	Procedure	Reference
6	Cables	Inspect power cables for cuts, cracks, strain, fraying, and deterioration.	
7	Controls and indicators	While making operating checks for pattern generator and distortion analyzer (item 8 through 58) and relay test set (items 59 through 68), observe that mechanical action of each knob, dial, and switch is smooth and free of external or internal binding and no looseness is apparent.	
8	Connections	Use a patch cord and connect pattern generator SIGNAL OUTPUT jack to a teleprinter, through a multimeter.	Para 2–7.
9	Preliminary settings	Set pattern generator controls as follows: *a.* MESSAGE SELECT — TEST MESSAGE. *b.* RATE — as determined by teleprinter. *c.* CURRENT SELECT — as determined vy teleprinter. *d.* DISTORT SELECT — OFF. *e.* % DISTORT — 0. *f.* MESSAGE TRANSMIT — OFF. *g.* POWER — OFF.	Para 3–5.
10	POWER switch	Set to ON. Note that:— *a.* POWER indicator lamp lights *b.* Teleprinter runs with closed loop	Para 3–5*a*, 5–6. Para 4–5, fig. 3–1 (F1, F2, POWER lamp).
11	LOOP CUR ADJ control	Adjust LOOP CUR ADJ control as required.	Para 2–7*c*.
12	MESSAGE TRANSMIT switch	Set to ON. Note that teleprinter prints out "fox" message.	Para 3–1*a*, 4–6*a*, fig. 1–6 (F1, F2).
13	MESSAGE SELECT switch	*a.* Set to ALT R&Y. Note that teleprinter prints out alternate R and Y characters. *b.* Set to DOT CY. Note that teleprinter prints out a distorted R and Y pattern. *c.* Set to SELECTED PULSES.	Para 3–5*b*. Para 3–5*b*(2).
14	SELECTED PULSES switches	Set to various combinations of marks and spaces and note that teleprinter prints out correct character.	Para 3–5*b*(1).
15	Connections	Disconnect teleprinter from pattern generator. Connect pattern generator SIGNAL OUTPUT jack to distortion analyzer SIGNAL INPUT jack with a 2-conductor patch cord and a multimeter in series.	Para 2–7, 2–8.
16	Pattern generator control settings.	Set pattern generator controls as follows: *a.* CURRENT SELECT — 60.	

Sequence No.	Item to be inspected	Procedure	Reference
		b. MESSAGE SELECT..... ALT R&Y. *c.* RATE ..... 7.5/75. *d.* DISTORT SELECT..... OFF. *e.* % DISTORT... 25. *f.* MESSAGE TRANSMIT.... ON *g.* POWER..... ON..... h. MESSAGE TRANSMIT..... OFF	Para 3-5a
17	Distortion analyzer control settings.	Set distortion analyzer controls as follows: *a.* POWER..... OFF. *b.* CURRENT SELECT..... 60. *c.* FILTER..... OUT. *d.* RATE..... 75. *e.* Left-hand DISTORTION SELECT..... TOTAL-PEAK. *f.* Right-hand DISTORTION SELECT..... SPACE-MARK. *g.* TRANSITION SELECT..... All.	
18	LOOP CUR ADJ control (pattern generator).	Adjust LOOP CUR ADJ control for a 60-milliampere indication on multimeter.	Para 2-7.
19	POWER switch (distortion analyzer).	Set to ON. Note that:.....	Para 3-6a.
		a. POWER indicator lamp lights.....	Para 4-5a, *b*; fig. 3-2 (F1, F2; POWER lamp).
		b. SIGNAL indicator lamp lights steadily with INPUT POLARITY switch in one of its two positions.	Para 4-5*b*, fig. 3-2 (SIGNAL lamp).
20	Pattern generator MESSAGE TRANSMIT switch.	Set to ON. Note that distortion analyzer SIGNAL indicator lamp blinks on and off.	Para 4-5*b*, fig. 1-10 (F1, F2).
21	Pattern generator DISTORT SELECT switch.	Set to BIAS-SPACE.	
22	Distortion analyzer left-hand DISTORTION SELECT switch.	Set to AVERAGE. Note that:..... *a.* LATE indicator lamp lights. *b.* PERCENT DISTORTION meter indicates presence of distortion (approximately 25%).	Para 4-5*b*, fig. 3-2.
23	Pattern generator % DISTORT control.	*a.* Set to 40 and then to 10. Note that distortion analyzer PERCENT DISTORTION meter indicates first an increase in distortion and then a decrease in distortion, respectively. *b.* Set to 25	
24	Pattern generator DISTORT SELECT switch.	Set to BIAS-MARK. Note that on distortion analyzer: *a.* LATE lamp goes out and EARLY lamp lights..... *b.* PERCENT DISTORTION meter indicates as in item 23.	Fig. 3-2.

Sequence No.	Item to be inspected	Procedure	Reference
25	Distortion analyzer right-hand DISTORTION SELECT switch.	Set to MARK-SPACE. Note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
26	Pattern generator DISTORT SELECT switch.	*a.* Set to END-SPACE. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to END-MARK. Note that distortion analyzer EARLY lamp goes out and LATE lamp lights.	
27	Distortion analyzer left-hand DISTORTION SELECT switch.	Set to TOTAL PEAK. Note that both EARLY and LATE lamps on the distortion analyzer go out.	
28	Pattern generator % DISTORT control.	Set control to 40 and then back to 25. Note that distortion analyzer PERCENT DISTORTION meter indication increases and remains there.	
29	Distortion analyzer RESET button.	Press and note that distortion analyzer PERCENT DISTORTION meter indicates approximately 25%.	
30	Distortion analyzer left-hand DISTORTION SELECT switch.	Set to EARLY PEAK.	
31	Distortion analyzer RESET button.	Depress and note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
32	Pattern generator DISTORT SELECT switch.	Set to END-SPACE. Note that distortion analyzer PERCENT DISTORTION meter indicates approximately 25%.	
33	Distortion analyzer left-hand DISTORTION SELECT switch.	Set to LATE PEAK.	
34	Distortion analyzer RESET button.	Depress and note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
35	Pattern generator DISTORT SELECT switch.	Set to END-MARK. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates approximately 25%.	
36	Distortion analyzer left-hand DISTORTION switch.	Set to AVERAGE. Note that distortion analyzer PERCENT DISTORTION meter indicates as in sequence No. 23.	
37	Pattern generator SELECTED PULSES switches.	Set all switches to SPACE.	
38	Pattern generator MESSAGE SELECT switch.	Set to SELECTED PULSES. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
39	Pattern generator SELECTED PULSES switch.	Set all switches to MARK. Note that distortion analyzer PERCENT DISTORTION meter indicates approximately 25%.	
40	Distortion analyzer TRANSISTION SELECT switch.	Set to 1.	
41	Pattern generator SELECTED PULSES switch 1.	Set to SPACE. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
42	Distortion analyzer TRANSITION SELECT switch.	Set to positions 2 through 6. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each switch position.	
43	Pattern generator SELECTED PULSES switches 1 and 2.	Set switch 1 to MARK and switch 2 to SPACE.	
44	Distortion analyzer TRANSITION SELECT switch.	*a.* Set to 2. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to positions 1, and 3 through 6. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each of the switch positions.	

Sequence No.	Item to be inspected	Procedure	Reference
45	Pattern generator SELECTED PULSES switch 2 and 3.	Set switch 2 to MARK and switch 3 to SPACE.	
46	Distortion analyzer TRANSITION SELECT switch.	*a.* Set to 3. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to positions 1,2 and 4 through 6. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each of the switch positions.	
47	Pattern generator SELECTED PULSES switches 3 and 4.	Set switch 3 to MARK and switch 4 to SPACE.	
48	Distortion analyzer TRANSITION SELECT switch.	*a.* Set to 4. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to positions 1 through 3, 5 and 6. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each of the switch positions.	
49	Pattern generator SELECTED PULSES switches 4 and 5.	Set switch 4 to MARK and switch 5 to space.	
50	Distortion analyzer TRANSITION SELECT switch.	*a.* Set to 5. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to positions 1 through 4, and 6. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each of the switch positions. c. Set to 5.	
51	Pattern generator DISTORT SELECT switch.	Set to BIAS/SPACE.	
52	Pattern generator SELECTED PULSES switches.	Set all switches to SPACE.	
53	Distortion analyzer right-hand DISTORTION SELECT switch.	Set to SPACE-MARK. Note that distortion analyzer PERCENT DISTORTION meter indicates 0.	
54	Distortion analyzer TRANSITION SELECT switch.	*a.* Set to 6. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23. *b.* Set to position 1 through 5. Depress the RESET button. Note that distortion analyzer PERCENT DISTORTION meter indicates 0 for each of the switch positions.	
55	Pattern generator MESSAGE SELECT switch.	Set to ALT R&Y.	
56	Pattern generator RATE switch.	Set to 7.5/50.	
57	Distortion analyzer RATE switch.	Set to 50. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23.	

Sequence No.	Item to be inspected	Procedure	Reference
58	Distortion analyzer RATE switch and pattern generator RATE switch.	Set the two switches to the same position, correspondingly. Note that distortion analyzer PERCENT DISTORTION meter indicates as in item 23 for each rate.	
59	Relay test set controls	Set relay test set controls as follows: *a.* TEST SELECT BIAS. *b.* TEST CURRENT 30–60. *c.* POWER OFF.	
60	POWER switch	Set to ON. Note that POWER indicator lamp lights.	Fig. 3–3 (F1, F2, POWER lamp).
61	BIAS CURRENT MONITOR jack.	Insert a two-conductor telephone patch cord (plug on one end only) into BIAS CURRENT MONITOR jack.	Fig. 1–12.
62	Multimeter connection	Connect other end of patch cord to a multimeter set to measure 100 milliamperes (ma). Note that multimeter indicates 30 ma.	Para 4–5a, fig. 1–13 (F1, F2).
63	TEST CURRENT switch	*a.* Set to 10-20. Note that multimeter indicates 10 ma. *b.* Set to 4-8. Note that multimeter indicates 4 ma.	
64	TEST CURRENT switch	Set to 30-60. Note that multimeter indicates 30 ma.	
65	OPERATE CURRENT MONITOR jack.	Remove plug from BIAS CURRENT MONITOR jack and insert into OPERATE CURRENT MONITOR jack. Note that multimeter indicates 60 ma.	
66	TEST CURRENT switch	*a.* Set to 10-20. Note that multimeter indicates 20 ma. *b.* Set to 4-8. Note that multimeter indicates 8 ma.	
67	TEST SELECT switch	*a.* Remove patch cord from OPERATE CURRENT MONITOR jack. *b.* Set switch to MARK. Note that front-panel meter indicates full-scale deflection *c.* Set switch to CONT EFF. Note that front-panel meter deflects to the right from 0 toward 100%.	
68	POWER switch	Operate all POWER switches to OFF. Note that all indicating lamps go out.	

4-4. Cleaning and Touchup Painting

a. Cleaning. Inspect the exterior surfaces of each unit of the test set. The exterior surfaces should be free from dust, dirt, grease, and fungus.

(1) Remove dust and loose dirt with a clean, soft cloth.

Warning: **Prolonged breathing of cleaning compound is dangerous; be sure adequate ventilation is provided. Cleaning compound is flammable; do not use near a flame Avoid contact with the skin; wash off any that spills on your hands**

(2) Remove grease fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with Cleaning Compound (NSN 7930-395-9542).

(3) Remove dust and dirt from plugs and jacks, with a brush.

(4) Clean the front panels, indicator lenses, and control knobs; use a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water. Use mild soap if necessary.

b. Touchup Painting Instructions. Remove rust and corrosion from metal surfaces by light ly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB SIG 364.

4-5. Repairs and Adjustments

Repairs and adjustments on the part of the operator are limited to replacement of fuses *(a* below) and indicator lamps *(b,* below), and adjustments of the pattern generator loop current (para 2–7).

a. Replacement of Fuses.

(1) *Front–panel or rear–panel fuses. De*press the fuse cap and, at the same time, rotate it counterclockwise one-quarter of a turn. Remove the fuse in the fuse cap and replace it with a new one; make sure that the replacement is of the correct rating. Replace the fuse cap.

(2) *Printed circuit board fuses* (fig.1–6, 1–10). The printed-circuit board fuses are located on the power supply printed-circuit board at the bottom of the pattern generator (fig. 1–6) and the bottom of the distortion analyzer fig. 1–10). Remove the fuse from its snap-type holder, and replace it with a new one; make sure that the replacement is of the correct rating.

Note. If a fuse blows after replacement, do not replace a second time. Refer the the trouble to higher level maintenance personnel.

b. Replacement of Indicator Lamps.

(1) Unscrew the indicator lens from the front panel.

(2) Pull the indicator lamp from the lens, and replace it with a new one; make sure it is of the correct type. Screw the lens back into the front panel.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

5-1. Scope of Organizational Maintenance

Paragraphs 5–2 through 5–5 cover organizational maintenance of the test set. In addition to performance of the daily preventive mainte nance checks and services (para 4-3), organizational maintenance duties include the following:

a. Organizational monthly preventive maintenance checks and services (para 5-4).

b. Troubleshooting (paras 5-5 and 5-6).

c. Internal voltage checks and adjustments (para 5-7).

5-2. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all categories of maintenance concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate probably would fail before the next periodic service. Preventive mainte nance checks and services of the test set at the organizational maintenance level are made at monthly intervals unless otherwise directed by the commanding officer.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

5-3. Organizational Monthly Preventive Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 54) once each month. A month is defined as approximately 30 calenday days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance intervals must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance services performed on it. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

5-4. Organizational Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	Reference
1	Pluckout items	Inspect seating of readily accessible items of a pluckout nature: crystals, fuses, connectors, plug-in units, lamps, etc. Do not remove, rock, or twist to inspect. Only a direct pressure is required to insure that item is fully seated.	
2	Relays	Inspect relays for dirt, corrosion, worn or burned contacts.	
3	Resistors and capacitors	Inspect resistors and capacitors for cracks, blistering, or other detrimental defects.	

Sequence No.	Item to be inspected	Procedure	Reference
4	Bushings and gaskets	Inspect bushing, gaskets, insulators, sleeves, etc., for cracks, chipping, and other excessive wear.	
5	Cleaning	Clean interior of chassis	Para 4–4.

5-5. General Troubleshooting Information

a. Troubleshooting this equipment is based upon the operational check contained in the operator's daily preventive maintenance checks and services chart. To troubleshoot the equipment, perform all functions starting with item number 8 in the operator's daily preventive maintenance checks and services chart (par 4-3) and proceed through the items until an abnormal condition or result is observed. When an abnormal condition or result is observed, refer to the troubleshooting chart (para 5-6). Perform the checks and corrective actions indicated in the troubleshooting chart. If the corrective measures indicated do not result in correction of the trouble, higher level maintenance is required. Paragraph 5-7 (referenced in the chart) contains additional information and step-by-step instructions for performing equipment test and adjustments to be used during the troubleshooting procedures.

b. When using the pattern generator or distortion analyzer portion of the chart, connect the SIGNAL OUTPUT jack of the pattern generator to the SIGNAL INPUT jack of the distortion analyzer. When searching for a trouble in the relay test set, connect the EXTERNAL OUTPUT jack on the relay test set to the SIGNAL INPUT jack on the distortion analyzer. If the defect cannot be remedied by the corrective measure listed, higher level maintenance or repair is required. Records and reports of these checks and services must be made in accordance with requirements set forth in TM 38-750.

c. Tool kit TK-87/U and Multimeter TS-382/U are assigned to the organizational repairman.

5-6. Troubleshooting Chart

Item	Symptom	Probable trouble	Checks and corrective measures
1	When operating from a 115-volt ac source, POWER indicator lamp does not light.	Defective fuseholder for F1 or F2 (fig. 3–1).	Check fuseholder; replace if defective.
		Defective POWER switch	Check for continuity at pins of AC POWER jack when POWER switch is set to position permitted by locking-guard. Check for continuity at POWER switch; replace switch if defective.
		Power cable	Check for voltage at pattern generator side of power cable; replace cable if defective.
		Defective POWER lampholder	Check lampholder; replace if defective.
2	With pattern generator MESSAGE TRANSMIT switch set to ON, teleprinter does not print any test message.	POLARITY switch on distortion analyzer set to incorrect position.	Reverse position of distortion analyzer POLARITY switch.
		Defective wiring in pattern generator power supply.	Check wire to F1, and fuseholders fuse F2 (fig, 1–6) ; replace fuseholder or wire, as required.
		Improper voltage levels in power supply.	Perform the voltage adjustments (para 5–7*a*).

Item	Symptom	Probable trouble	Checks and corrective measures
3	*a.* When operating from 115-volt ac source, distortion analyzer POWER indicator lamp does not light.	*a.* Defective fuseholder for F1 and F2 (fig. 3–2).	*a.* Check fuseholders; replace if defective.
		Defective POWER lampholder____	Check lampholder; replace if defective.
		Defective POWER switch _____	Check for continuity at pins of AC POWER jack when POWER switch is set to position permitted by locking-guard. Check for continuity at POWER switch with POWER switch set to position permitted by locking-guard; replace switch if defective.
	b. With distortion analyzer POWER switch set to position permitted by locking-guard, and pattern generator MESSAGE TRANSMIT switch set to on, distortion analyzer POWER indicator lamp lights but distortion analyzer SIGNAL indicator lamp does not light.	*b.* Defective SIGNAL lampholder.	*b.* Check lampholder; replace if defective.
		Defective fuseholder for F1 or F2 (fig. 1–10).	Check fuseholder and wiring; replace if defective.
		Improper voltage level in power supply.	Perform voltage checks on power supply (para 5–7*b*).
4	*a.* With pattern generator DISTORT SELECT switch set to BIAS-SPACE, distortion analyzer LATE indicator lamp does not light.	*a.* Defective LATE lampholder.	*a.* Check lampholder; replace if defective.
	b. Distortion analyzer does not indicate distortion to which the pattern generator % DISTORT control is set.		*b.* Check and correct switch positions on pattern generator and distortion analyzer.
		Incorrect voltage levels in pattern generator power supply.	Adjust the –15-volt dc and +130-volt dc supply of pattern generator (par 5–7*a*).
5	With pattern generator DISTORT SELECT switch set to BIAS-MARK, distortion analyzer EARLY indicator lamp does not light.	Defective EARLY lampholder.	Check lampholder; replace if defective.
6	When operating from 115-volt ac source, POWER indicator lamp does not light.	Defective fuseholder for F1 or F2 (fig. 3–3).	Check fuseholders and wiring; replace as necessary.
		Defective POWER lampholder____	Check lampholder; replace if defective.

Item	Symptom	Probable trouble	Checks and corrective measures
		Defective POWER switch	Check for continuity at pins of input power plug, with POWER switch set to ON. Check for continuity at POWER switch terminals; replace switch if defective.
7	Correct current reading cannot be obtained from BIAS CURRENT MONITOR jack (fig. 1–12).	Defective fuseholder for F1 or F2	Check fuseholder and wiring; replace as nescessary.
		Improper adjustment	Perform bias current adjustments (para 5–7c(3)).
8	Correct current reading cannot be obtained from OPERATE CURRENT MONITOR jack (fig. 1–12).	Improper adjustment	Perform the operate current adjustments (para 5–7c(1) and (4)).
9	A correct reading cannot be obtained on relay test set meter.	Incorrect voltage levels in relay test set power supply.	Perform +100-volt dc power supply adjustment (para 5–7c(1) and (2)).

5-7. Checks and Adjustments

Perform the checks and adjustments listed below when the equipment is first installed and periodically thereafter, to insure satisfactory performance. Where no voltage exists at the specified test-point in these procedures, refer to the troubleshooting instructions (para 5-5). Where checks do not meet the stated requirements and cannot be adjusted for the required results, higher level maintenance is required.

a. Adjustment Procedures for Pattern Generator.

Caution: **Before proceeding to the voltage adjustments given in (2) through (5) below, perform the following preliminary adjustments to prevent excessive voltage from being applied to the equipment.**

(1) *Preliminary adjustments.*

(a) Remove the pattern generator from its transit case (para 2-1b).

(b) Set the POWER switch (fig. 3-1) to OFF.

(c) Loosen the locknuts on potentiometers RI and R2 (fig. 1-5).

(d) Set potentiometers R1 and R2 fully counterclockwise.

(2) *-15-volt supply adjustment.*

(a) Set the multimeter controls for a -15-volt dc measurement.

(b) Connect the positive lead of the multimeter to test point J3 (–15V) (fig. 1-4; connect the negative lead of the multimeter to test point J2 GRD.

(c) Set the POWER switch (fig. 1–3) to the position permitted by the locking-guard.

(d) Adjust potentiometer R1 (-15 VDC ADJ, fig. 1-5) for a multimeter indication of -15 volts dc.

(e) Tighten the locknut on potentiometer R1. Make sure that the multimeter indication remains at –15 volts after the locknut is tightened.

(f) Set the POWER switch (fig. 1-3) to OFF; disconnect the multimeter from the pattern generator.

(3) +130-volt supply adjustment.

(a) Set the multimeter controls for a +130-volt dc measurement.

(b) Connect the positive lead of the multimeter to test point J4 (+130V) (fig. 1-4).

(c) Connect the negative lead of the multimeter to test point J5 (-130V).

(d) Set the POWER switch (fig. 1-3) to the position permitted by the locking-guard.

(e) Adjust potentiometer R2 (+130) VDC ADJ, (fig. 1–5) for a multimeter indication of +130-volts dc.

(f) Tighten the locknut on potentiometer R2. Make sure that the multimeter indication remains at +130 volts after the locknut has been tightened.

(g) Set the POWER switch to OFF; disconnect the multimeter from the pattern generator.

(4) *Electronic keying output adjustment.*

(a) Set the CURRENT SELECT switch (fig. 3-1) to 20.

(b) Set the MESSAGE TRANSMIT switch to OFF.

(c) Insert a two-conductor plug into the SIGNAL OUTPUT jack.

(d) Set the multimeter controls for a 100-milliampere measurement.

(e) Connect the positive lead of the multimeter to the ring of the SIGNAL OUTPUT jack (fig. 3-1). Connect the negative lead of the multimeter to the sleeve of the SIGNAL OUTPUT jack.

(f) Set the POWER switch to the position permitted by the locking guard.

(g) Adjust the LOOP CUR ADJ screw (fig. 1–5) for a multimeter indication of 20 milliamperes (ma).

(h) Alternately set the CURRENT SELECT switch (fig. 3-1) to 20 and 60 while adjusting the LOOP CUR ADJ screw for an indication of 20 ma and 60 ma, respectively.

(i) Set the POWER switch to OFF; disconnect the multimeter from the pattern generator.

(5) *+15 volt supply check.*

(a) Set the multimeter controls for a +15-volt dc measurement.

(b) Connect the positive lead of the multimeter to test point J1 (+15V, fig. 1-4); connect the negative lead of the multimeter to jack J2 (GRD).

(c) Set the POWER switch (fig. 3-1) to the position permitted by the locking-guard. The multimeter should indicate +15 volts dc.

b. Voltage Checks for Distortion Analyzer. If the indications for the following voltage checks are not correct, higher category maintenance is required.

(1) Remove the unit from its transit case (para 2-2a).

(2) Set the POWER switch (fig. 3-2) to the position permitted by the locking–guard.

(3) Set the multimeter for a +15-volt dc measurement.

(4) Connect the negative lead of the multimeter to jack J2 (GRD, fig. 1–8).

(5) Connect the positive lead of the multimeter to jack J1 (+15V). The multimeter should indicate +15 volts.

(6) Disconnect the multimeter, and set it for a 120-volt dc measurement.

(7) Connect the positive lead of the multimeter to jack J2 (GRD).

(8) Connect the negative lead of the multimeter to jack J5 (–120V). The multimeter should indicate –120 volts.

(9) Connect the negative lead of the multimeter to jack J3 (–15V). The multimeter should indicate –15 volts.

(10) Connect the negative lead of the multimeter to jack J4 (–10V). The multimeter should indicate –10 volts.

(11) Set the POWER switch to OFF, and disconnect the multimeter from the distortion analyzer.

c. Adjustment Procedures for relay Test Set

(1) Preliminary adjustments. Before performing the bias current and operate current adjustments, perform the following voltage adjustments.

(a) Remove the unit from its transit case (para 2-2a).

(b) Loosen the locknuts on the four adjustment screws (fig. 1–12)

(c) Turn the adjustment screws fully counterclockwise.

(d) Turn the METER ADJUST and BALANCE ADJUST controls (fig. 3-3) fully counterclockwise.

Note. After performing any of the adjustments described in (2) through (4) below, set the POWER switch to OFF, and disconnect the multimeter.

(2) Voltage adjustment.

(a) Set the POWER switch (fig. 3-3) to the position permitted by the locking-guard.

(b) Set the multimeter controls for a +100-volt dc measurement.

(c) Connect the negative lead of the multimeter to jack J7 (GRD, fig. 1–12); connect the positive lead to jack J8 (+100V).

(d) Adjust the +100V ADJUST screw for a multimeter indication of +100 volts.

(e) Connect the positive lead of the multimeter to jack J9 (+15V). The The multimeter should indicate +15 volts.

(f) Set the TEST SELECT switch (fig. 3-3) to PS BAL. Adjust the BALANCE ADJUST control for a zero indication on the relay test set meter.

(3) *Bias current adjustment.*

(a) Set the multimeter controls for a 100-ma measurement. Connect the test leads to a telephone plug (such as PJ-055B) so that the tip of the plug is connected to the positive test lead.

(b) Insert the telephone plug into the BIAS CURRENT MONITOR jack (fig. 1-12).

(c) Set the TEST SELECT switch (fig. 3-3) to SPACE.

(d) Set the TEST CURRENT switch to 30-60.

(e) Insert a relay to be tested into the appropriate relay socket on the test socket adapter (fig. 1-11 or 1-13).

(f) Adjust the BIAS CURRENT ADJUST screw (fig. 1–12) for a 30-ma indication on the multimeter.

(g) Set the TEST CURRENT switch (fig. 3-3) to 10-20; the multimeter should indicate 10 ma.

(h) Set the TEST CURRENT switch to 4-8; the multimeter should indicate 4 ma.

(4) *Operate current adjustment.*

(a) Arrange the multimeter for a 100-ma measurement. Connect the test leads to a telephone plug so that the tip of the plug is connected to the positive test lead.

(b) Insert the telephone plug into the OPERATE CURRENT MONITOR jack (fig. 1-12).

(c) Set the TEST SELECT switch (fig. 3-3) to MARK.

(d) Set the test CURRENT switch to 30-60.

(e) the appropriate relay socket on the test socket adapter (fig. 1–11 or 1-13).

(f) Adjust OPERATE CURRENT ADJUST screw R2 (fig. 1–12) for a 60-ma indication on the multimeter.

(g) Set the TEST CURRENT switch (fig. 3-3) to 10-20; the multimeter should indicate 20 ma.

(h) Set the TEST CURRENT switch to 4-8; the multimeter should indicate 8 ma.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE

AND

DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

6-1. Disassembly of Test Set, Teletypewriter AN/UGM-1

a. Disassembly of Pattern Generator.

(1) Set the POWER switch to OFF.

(2) Disconnect the power cable from the pattern generator and from the ac power source. Store the power cable inside the transit case cover (fig. 1–3).

(3) Remove all external battery input connections.

(4) Remove any patch cord from SIGNAL OUTPUT jack.

(5) If rack-mounted, remove the screws and nuts that fasten the pattern generator to the distortion analyzer. Remove the screws that secure the rack-mounting bracket to the rack, and those that secure the mounting bracket to the unit. Store the mounting bracket in the pattern generator transit-case cover.

(6) Remove the four bracket-securing screws from the transit-case retainer brackets.

(7) Pull back the retainer brackets on the transit case; place the pattern generator in the transit case, close the retainer brackets, and secure the pattern generator with the bracket-retaining screws.

(8) Secure the transit-case cover to the transit case with the four latches on the cover.

b. Diassembly of Distortion Analyzer.

(1) Set the POWER switch to OFF.

(2) Disconnect the power cable from the distortion analyzer and from the power source. Store the power cable inside the transit case cover (fig. 1–7).

(3) Remove any patch cord from the SIGNAL INPUT jack.

(4) If rack-mounted, remove the screws and nuts fastening the distortion analyzer to the pattern generator. Remove the screws that secure the rack-mounting bracket to the rack, and those that secure the mounting bracket to the unit. Store the mounting bracket inside the distortion analyzer case cover.

(5) Remove the four bracket-securing screws from the transit-case retainer brackets.

(6) Pull back the retainer brackets on the transit case; place the distortion analyzer in the transit case; close the retainer brackets, and secure the distortion analyzer with the bracket-securing screws.

(7) Secure the transit case cover to the transit case with the four latches on the cover.

c. Disassembly of Relay Test Set.

(1) Set the POWER switch to OFF.

(2) Disconnect the power cable from the power source. Pass the power cable

along the right side of the unit (inside) and out through the external-cable slot (fig. 1-11) on the front panel.

(3) Remove any patch cord from the EXTERNAL OUTPUT jack.

(4) If rack–mounted, remove the four screws that secure the unit to the frame. Remove the retainer screw from each corner of the transit case.

(5) Place the unit in the transit case, and secure the unit to the transit case, with the four screws, one in each corner.

(6) Place the transit case cover a few inches away from the transit case, and wrap the excess power cable around the retainer bracket inside the transit case cover.

(7) Secure the transit case cover to the transit case, with the six latches on the cover.

6-2. Repackaging for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Adapt the procedures outlined below whenever circumstances permit. Information concerning original packaging is provided in paragraph 2-1.

a. Material Requirements. The three units of the test set are packaged in individual waterproof comugated cardboard cartons. The three cartons are then placed in an outer waterproof corrugated card board carton. The dimensions of the carton and other material requirements are given in the chart below.

Carton	Length (in.)	Width (in.)	Depth in.)
Outer	27	11	21–1/2
TS–799/UGM–1	10–1/2	10–1/2	20–3/4
TS–800/UGM–1	10–1/2	10–1/2	20–3/4
TS–836/UGM–1	21–1/4	5–1/2	10
Tape, waterproof	240	3	

b. Packaging.

(1) Place the individual equipment in their respective cartons.

(2) Close each carton, and seal with waterproof tape; allow about 4 inches of overlap at the side of the carton. Be sure to seal all open sides at the tip of each carton.

(3) Place the three sealed cartons in the outer carton illustrated in figure 2-1.

(4) Close the outer carton, and seal with waterproof tape; allow about 4 inches of overlap at the side of the carton. Be sure to seal all open sides at the top of the carton.

Section II. DEMOLITION TO PREVENT ENEMY USE

6-3. Authority for Demolition

The demolition procedures given in paragraph 6-4 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon the order of the commander.

6-4. Methods of Destruction

Use any of the following methods to destroy the test set.

a. Smash Smash the three chassis, three transit cases, all printed-circuit cards, controls. and interior parts; use sledges, axes, handaxes, crowbars.

b. Cut. Cut all three power cables and internal wiring; use axes, matches, or handaxes.

Warning: **Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.**

c. Burn. Burn the instruction manuals and other combustible items; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. Explode. If explosives are necessary, use firearms, grenades, or TNT.

e. Dispose. Bury or scatter the destroyed parts in slit trenches or foxholes, or throw them into streams.

APPENDIX 1
REFERENCES

The following is a list of applicable references that are available to the operator and organizational repairman of Test Set, Teletypewriter AN/UGM-l.

DA Pam 25-30	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 11-5527	Mulimeters TS-352/U, TS-352A/U, and TS-352B/U.
TM 750-244-2	procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command).

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APPENDIX II

BASIC ISSUE ITEMS LIST

A2-1. General

This appendix lists items supplied for initial operation and for running spares. The lists includes tools, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

A2-2. Columns

a. Federal Stock Number. This column lists the 11-digit Federal stock number .

b. Designation by Model. Not used.

c. Description. Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity Authorized. Under "Items Comprising an Operable Equipment", the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running "Spare Items", the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.

g. Illustration. The "Item No." column lists the reference designations that appear on the part in the equipment. These same designations are also used on any illustrations of the equipment. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

SECTION II, FUNCTIONAL PARTS LIST

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QTY AUTH	ILLUSTRATION	
						FIGURE NO.	ITEM NO.
6625-965-0195		TEST SET, TELTTYPEWRITER AN/UGM-1: Alignment of telegraph circuits and equipment analysist of telegraph signals, bias distortion, contact efficiency.		NX		1-1	
		ITEMS COMPRISING AN OPERABLE EQUIPMENT					
ORD THRU AGC		TECHNICAL MANUAL TM 11-6625-620-12			1		
		NOTE: For technical manuals the quantity indicates the maximum number of copies authorized for packing (or issue) with the equipment. Where a number of these equipments are concentrated in a small area, the quantity on hand may be reduced to practical levels. Excess publications must be returned to publication supply centers through AG channels.					
5995-941-2359		CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: Stelma p/n C5471079(90047003)			2	1-3, 1-7	
6625-975-0196		TEST SET, TELETYPEWRITER TS-799/UGM-1		NX	1	1-1	
6625-965-0197		TEST SET, TELETYPEWRITER TS-800/UGM-1		NX	1	1-1	
6625-077-2986		TEST SET, RELAY TS-836/UGM-1		NX	1	1-1	
		RUNNING SPARE ITEMS					
5920-284-9455		FUSE, CARTRIDGE: 0.125 amp, 250 v, slo-blo; MIL type F02B250V1/8A			10	1-6 1-10 1-13	F2, F1, F1,F2
5920-284-9493		FUSE, CARTRIDGE: 0.125 amp, 250 v; MIL type F02GR125A			5	1-6	F3,F4
5920-043-2641		FUSE, CARTRIDGE: 0.250 amp, 250 v; MIL type F02GR250A			10	1-6 1-10 1-7 1-13	F1 F1,F2 F1,F2 F1,F2
5920-655-0976		FUSE, CARTRIDGE: 0.500 amp, 250 v; Littelfuse p/n 313.500			10	1-3 1-11	F1,F2 F1,F2
6240-683-0580		LAMP, GLOW: MIL type NE-2D			2	1-2 1-3 1-7 1-11	DS1 DS1 DS1,2,3,4 DS1

APPENDIX III

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

A3-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for the AN/UGM–l. It authorizes levels 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.

A3-2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Group numbers correspend to the reference designation prefix assigned in accordance with ASA Y32.16, Electrical and Electronics Reference Designations. They indicate the relation of listed items to the next higher assembly.

b. Component Assembly Nomenclature. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance level at which performance of the specific maintenance function is authorized. Authorization to perform a function at any level also includes authorization to perform that function at higher levels. The numbers used represent the various maintenance levels as follows:

Number	Maintenance Category (or level)
1	Operator's
2	Organizational
3	Direct support
4	General support
5	Depot

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section III.

e. Remarks. Self explanatory.

A3-3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements chart are as follows:

a. Tools and Equipment. 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 for the maintenance function.

b. Maintenance Category. The numbers in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance function.

d. Federal Stock Number. This column lists the Federal stock number.

e. Tool Number. Not used.

SECTION II. MAINTENANCE ALLOCATION CHART

MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	TEST SET TELETYPEWRITER AN/UGM-1	1												Exterior
		2		2									6	Exterior and interior
			2										2	Voltage and continuity
			4										1,2,3,4,7,8,9, 10,11,12	See TM 11-6625-620-45
					1									Operational
					4								1,2,3,5,8	
									1					External fuses, lamps, lens
									4				5	Removable P.C. Boards internal fuses
										4			5	All repairs see TM 11-6625-620-45
											4		5	
1A	TEST SET, TELETYPEWRITER TS-799/UGM-1	1												Exterior
		2		2									6	Interior and exterior
			2										2	Voltage and continuity
			4										1,2,3,4,9,10, 11	All testing
					1									Operational
					4								1,2,5	
									1					External fuses, lamps, lens.
									4				5	Removeable P.C. Boards internal fuses
										4			5	All repairs
											4		5	
1B	TEST SET, TELETYPEWRITER TS-800/UGM-1	1												Exterior
		2		2									6	Interior and exterior
			2										2	Voltage and continuity
			4										1,2,3,8,10,11	All testing
					1									Operational
					4								3,5,8	
									1					External fuses, lamps, lens
									4				5	Removable P.C. Boards internal fuses
										4			5	All repairs
											4		5	

MAINTENANCE ALLOCATION CHART

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	AN/UGM-1 (continued)													
1C	TEST SET, RELAY TS-836/UGM-1	1											6	Exterior
		2		2										Interior and exterior
			2										2	Voltage and continuity
			4										1,2,3,7,11,12	
					1									Operational
					4								1,5	
									1					External fuses, lamps, lens
										4			5	All repairs
											4		5	

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
		AN/UGM-1 (continued)		
1	4,5	FREQUENCY, METER AN/USM-26	6625-543-1356	
2	2,4,5	MULTIMETER, TS-352/U	6625-242-5023	
3	4,5	OSCILLOSCOPE OS-8/G	6625-643-1740	
4	4,5	TEST SET, TELETYPEWRITER TS-1060/GG	6625-542-6106	
5	4,5	TOOL KIT, TK-87/U	5180-690-4552	
6	1 thru 5	TOOLS AND TEST EQUIPMENT NORMALLY AVAILABLE TO THE REPAIRMAN BECAUSE OF HIS ASSIGNED MISSION		
7	4,5	POLAR RELAY WECO TYPE #255A OR EQUAL	5945-188-5631	
8	4,5	TEST SET, TELETYPEWRITER TS-799/UGM-1	6625-965-0196	
9	4,5	TEST SET, TELETYPEWRITER TS-800/UGM-1	6625-965-0197	
10	4,5	RECTIFIER RA-87	5815-230-7257	
11	4,5	TEST SET, TRANSISTOR TS-1836/U	6625-893-2628	
12	4,5	SOLID STATE RELAY Radiation Inc. Type 9218 or equal	FSN Pending from Air Force communication systems, Belville, Ill.	

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USASA (2)
CNGB (1)
CC-E (7)
Dir of Trans (1)
Cof Engrs (1)
TSG (1)
CofSptS (1)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA
Ft Huachuca (1)
USACDOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (6)
USCONARC (5)
ARADCOM (6)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (2)
USAMICOM (4)
USASMC (2)
USASCC (4)
USAECOM (80)
USASPTCP (11)
MDW (1)
Armies (2)
Corps (2)
USAC (8)
11th Air Aslt Div (8)
507th USASA Gp (5)
508th USASA Gp (5)
318th USASA Bn (5)
319th USASA Bn (5)
320th USASA Bn (5)
102nd USASA Det (5)
177th USASA Co (5)
182nd USASA Co (5)
183rd USASA Co (5)
184th USASA Co (5)
lst USASA Fld Sta (5)
2nd USASA Fld Sta (5)
3rd USASA Fld Sta (5)
4th USASA Fld Sta (5)
5th USASA Fld Sta (5)
9th USASA Fld Sta (5)
12th USASA Fld Sta (5)
13th USASA Fld Sta (5)
14th USASA Fld Sta (5)
16th USASA Fld Sta (5)
Svc Colleges (2)
Br Svc Sch (2)
USATC AD (2)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)
USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Instl (2) execpt
Ft Monmouth (70)
Ft Gordon (10)
Ft Huachuca (10)
WSMR (6)
Ft Carson (21)
Ft Knox (12)
Ft Devens (5)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
FTWOAD (10)
LEAD (7)
SHAD (3)
NAAD (5)
SVAD (5)
CHAD (9)
ATAD (10)
GENDEP (OS) (2)
Sig Sec, GENDEP (OS) (5)
Sig Dep (OS) (12)
Sig Fld Maint Shops (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
MAAG, Pakistan (5)
USACRREL (2)
Units org under fol TOE:
11-67 (2)
11-97 (2)
11-98 (2)
11-117 (2)
11-12'? (2)
11-166 (2)
11-167 (2)
11-168 (2)
11-500
(AA-AC) (NC)
11-587 (2)
11-597 (2)

NG and USAR: None
For explanation of abbreviations used see AR 320-60.

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THE METRIC SYSTEM AND EQUIVALENTS

NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

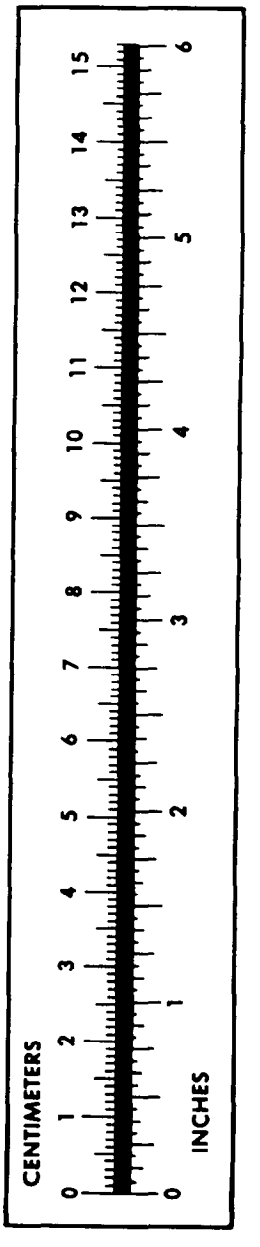
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 020933-005