TM 11-6625-2745-14

TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL

(NSN 6625-00-420-9354)

VOLTMETER, ELECTRONIC ME-30F/U

AND

VOLTMETER, ELECTRONIC AN/USM-265A

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY
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TECHNICAL MANUAL
No. 11-6625-2745-14

HEADQUARTERS
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OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL
VOLTMETER, ELECTRONIC ME-30F/U
(NSN 6625-00-420-9345)
AND
VOLTMETER, ELECTRONIC AN/USM-265A

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 (Test) located in the back of the manual. Simply tear out the self addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

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In either case a reply will be furnished direct to you.

LIST OF ILLUSTRATIONS

LIST OF TABLES

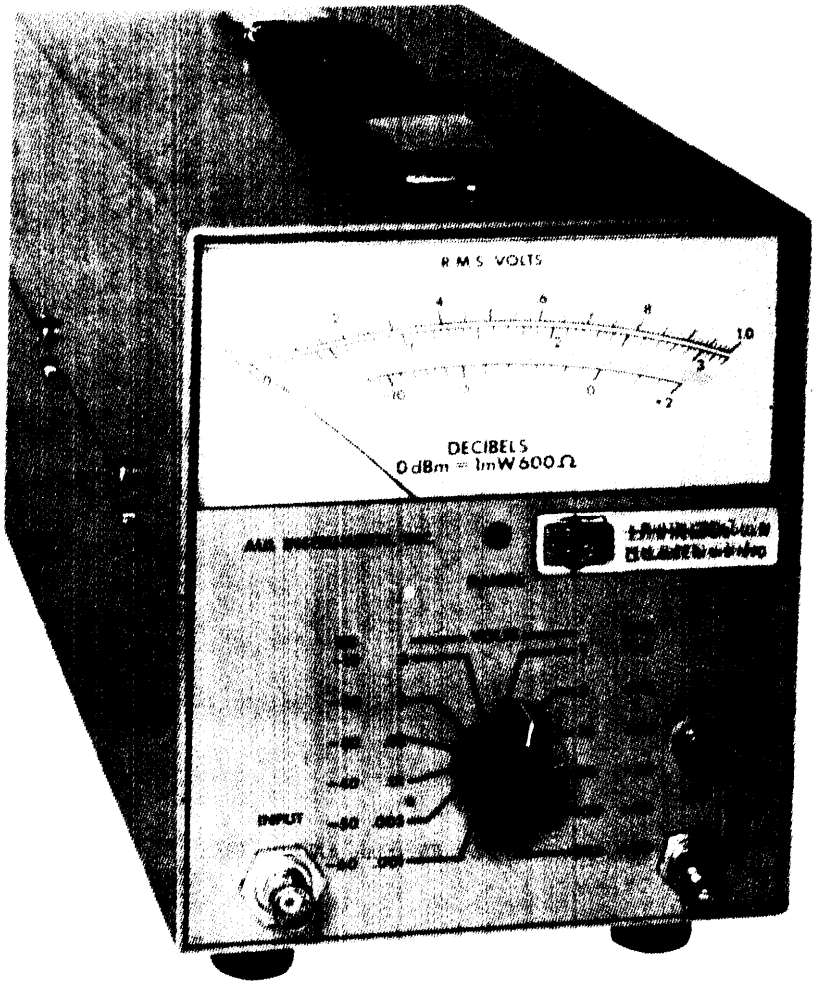


Figure 1-1. Voltmeter, Electronic ME-30F/U.

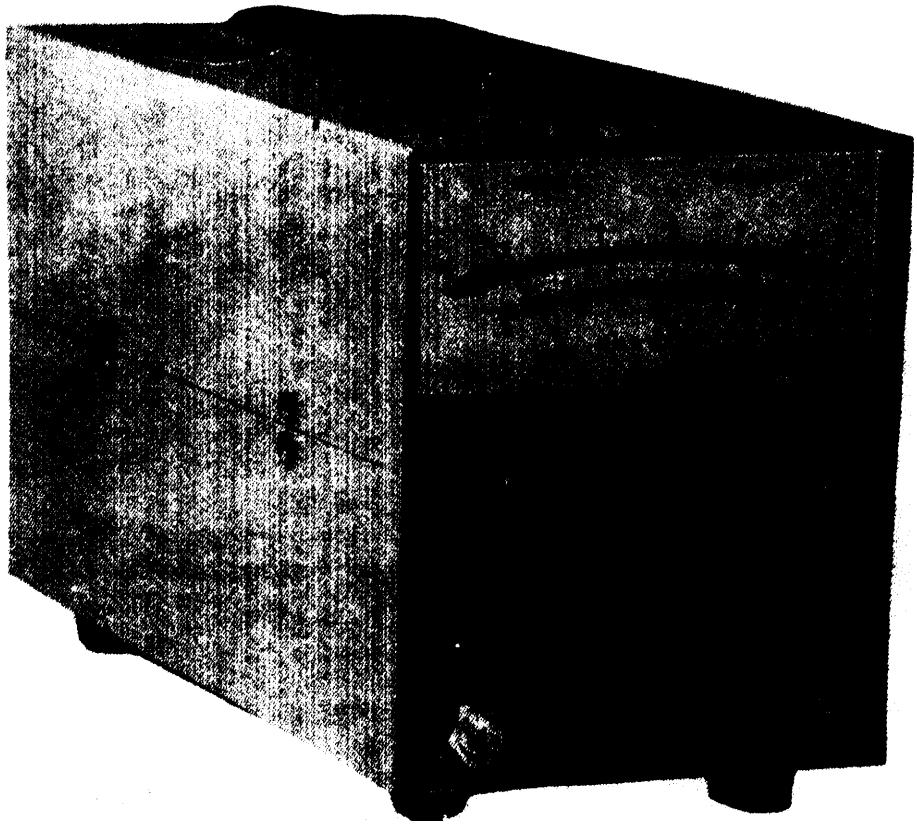


Figure 1-2. Voltmeter, Electronic AN/USM-265A .

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Voltmeters, Electronic, ME-30F/U and AN/USM-265A (herein after referred to as voltmeter) and covers their installation, operation, and operator, organizational, and general support maintenance. No direct support maintenance is authorized.

NOTE

All references in this manual to ME-30F/U also apply to the AN/USM-265A unless otherwise indicated.

1-2. Index of Publications

a. *DA Pam 310-4.* Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to this equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWOs) pertaining to this equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/ARF 71-13/MCO P4030.29A, and DLAR 4145.8.

c. *Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 /NAVSUPINST 46 10.33 B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-4. Administrative Storage

For procedures, forms, and records, and inspections required during administrative storage of this equipment, refer to TM 740-90-1.

1-5. Destruction of Army Material

Demolition and destruction of electronic equipment will be under the direction of the commander and in accordance with TM 750-244-2.

Section II. DESCRIPTION AND DATA

1-6. Purpose and Use

The voltmeter is used for measuring a.c. voltage, gain, audio frequency (a, f.) and radio frequency (r. f.) levels and hum and noise levels. The scales of the meter permit measurements to be expressed either in decibels per milliwatt (dBm) or in decibels (dB). The voltmeter may also be used as a high gain, broadband amplifier to provide greater sensitivity to other equipment such as oscilloscopes and bridges.

1-7. Description

The voltmeter is a solid state type. The voltage scale is calibrated in terms of root-mean-square (rpms) voltage of a sine wave. Each is capable of measuring alternating current (at) voltages from .001 volts full scale to 300 volts full scale through a frequency range of 10 hertz to 10 megahertz.

1-8. Differences between Models

The ME-30F/U and the AN/USM-265A are identical with the following exceptions. The AN/USM-265A panel meter scale is linear in decibels, contains a special meter board, and incorporates an adjustable REL REF control on the front panel. The ME-30F/U is complete with line cord whereas the AN/USM-265A consists of a Voltmeter, Electronic ME-340A/U and a detached line cord, AUL Instruments part no. 344250.

Table 1-1. Technical Characteristics

Voltage Range	1 mv to 300 *v* full scale in 12 ranges; dB scale -10 to +2 dB; 10 dB between ranges.
Accuracy and Frequency Response	*a.* 1 mini-volt Range 10 Hz to 40 Hz: ± 5% 40 Hz to 500 kHz: ± 1% 500 kHz to 4 MHz: ± 5% *b.* .003 through 300 Volt Range 10 Hz to 40 Hz: ± 5% 40 Hz to 2 MHz: ± 1% 2 MHz to 4 MHz ± 3% 4 MHz to 10 MHz ± 5%
Input Impedance	10 megohms shunted by 25 pf maximum
Amplifier Output	150 millivolt minimum for full scale indicator on .003 -300 volt ranges. 100 millivolts minimum on .001 volt range,

Table 1-1. Technical Characteristics—Continued

Amplifier Output Impedance	50 Ohms
AC-DC Converter Output	1 volt dc for full scale meter deflection
Meter Tracking	±1% at 1 kHz
Response Time	1 second maximum
Noise	2 percent of full scale maximum
A.C. Power	115 or 220 volts, 50—400 Hz, 5 watts maximum
External Battery Operation	35—55 Volt dual (+ and -) battery 40 ma terminals provided on rear panel
Dimensions	5.25” wide, 6.5” high, 11“ deep
Weight	5 lbs.

CHAPTER 2

SERVICE UPON RECEIPT AND INSTALLATION

2-1. Siting

The ME-30F/U is intended for indoor shop use. As normally supplied, it is a bench-top portable instrument. Rack-mounting adaptors are available to convert from one to three ME-30F/U instruments to standard EIA 19" rack mounting, with a modular height of seven inches.

2-2. Shelter Requirements.

The ME-30F/U should be operated only at ambient temperatures greater than 32° F (0°C) and less than 132°. (55°C.). Although the unit is housed in a protective case, prolonged exposure to salt spray, sand, or dust should be avoided.

2-3. Unpacking

The ME-30F/U should be unpacked carefully to avoid damage to the equipment. Figure 2-1 shows the packaging and packing technique used by the factory for shipment. Avoid damaging the packing material if re-shipment is desired. Do not thrust sharp tools through the walls of the containers.

2-4. Checking Unpacked Equipment

a. Inspect the equipment for damage during shipment. If the equipment has been damaged, report the damage on DD Form 6.

b. Check the equipment against the component listing in the operator's manual and the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750. The equipment should be placed in service even though a minor assembly or part that does not affect proper functioning is missing.

c. Check to see whether the equipment has been modified. Equipment which has been modified will have the MWO number on the front panel, near the nomenclature plate. Check also to see whether all currently applicable MWO have been applied. (Current MWO applicable to the equipment are listed in DA Pam 310-7).

2-5. Tools, Test Equipment, and Materials required for Installation

No special tools are needed for normal installation of the equipment (see below for optional rackmounting instructions).

2-6. Assembly of Equipment

As normally supplied by the factory, the unit need only be placed on a horizontal flat surface in an upright position for use. If rackmounting is necessary, optional rackmounting kit (Aul Instruments P/N 100752) is available. Figure 2-2 illustrates the assembly of this kit. Note that for installation of less than three units in the module, blank filler panels are used in the unoccupied spaces. The assembly procedure for assembly of the rackmounting kit is as follows:

a. Remove the rackmounting kit from its shipping container, being sure to retain all supplied hardware.

b. Remove carrying handle from unit(s) which are to be mounted by prying off protective covers to the front and rear of handle strap and then unscrewing the four screws which will be exposed. (Retain all hardware for future use.)

c. Remove front feet and tilt bail by unscrewing four screws from the bottom of each unit.

d. Turn each unit upside down on bench. Attach the bottom horizontal bracket (P/N 201596) to the bottom of each unit using the screws removed from the front feet in step (c).

e. Turn the partially assembled module right side up on bench. Attach the top bracket (P/N 201598) to the top of each unit using two of the screws removed from the handle in step (b). Place the remaining screws in the vacant holes in the top cover.

f. Install filler panels (P/N 201599) as necessary using hardware provided (P/N 363757) and 363602).

g. Install the vertical brackets (P/N 201597) on each side of the assembly using the hardware provided (P/N 363648).

h. Install the completed module in standard 19" relay rack, 7" height.

2-7. Interconnections

The ME-30F/U is designed to be operated from a single phase power source having the following characteristics:

a. Voltage of 115 or 230 volt nominal, ± 10% (see caution note).

b. Frequency of 50-400 Hz.

c. Power capability of 6 watts.

CAUTION

The line voltage switch located on the rear panel of the instrument *must* be set to the proper line voltage (115 or 230 volts). Verify that the proper switch setting has been made *before* connecting equipment to power source. Use of the remaining front and rear panel connectors is explained in Chapter 3, "operating Instructions. " No other-installation or pre-alignment procedures are necessary for operation.

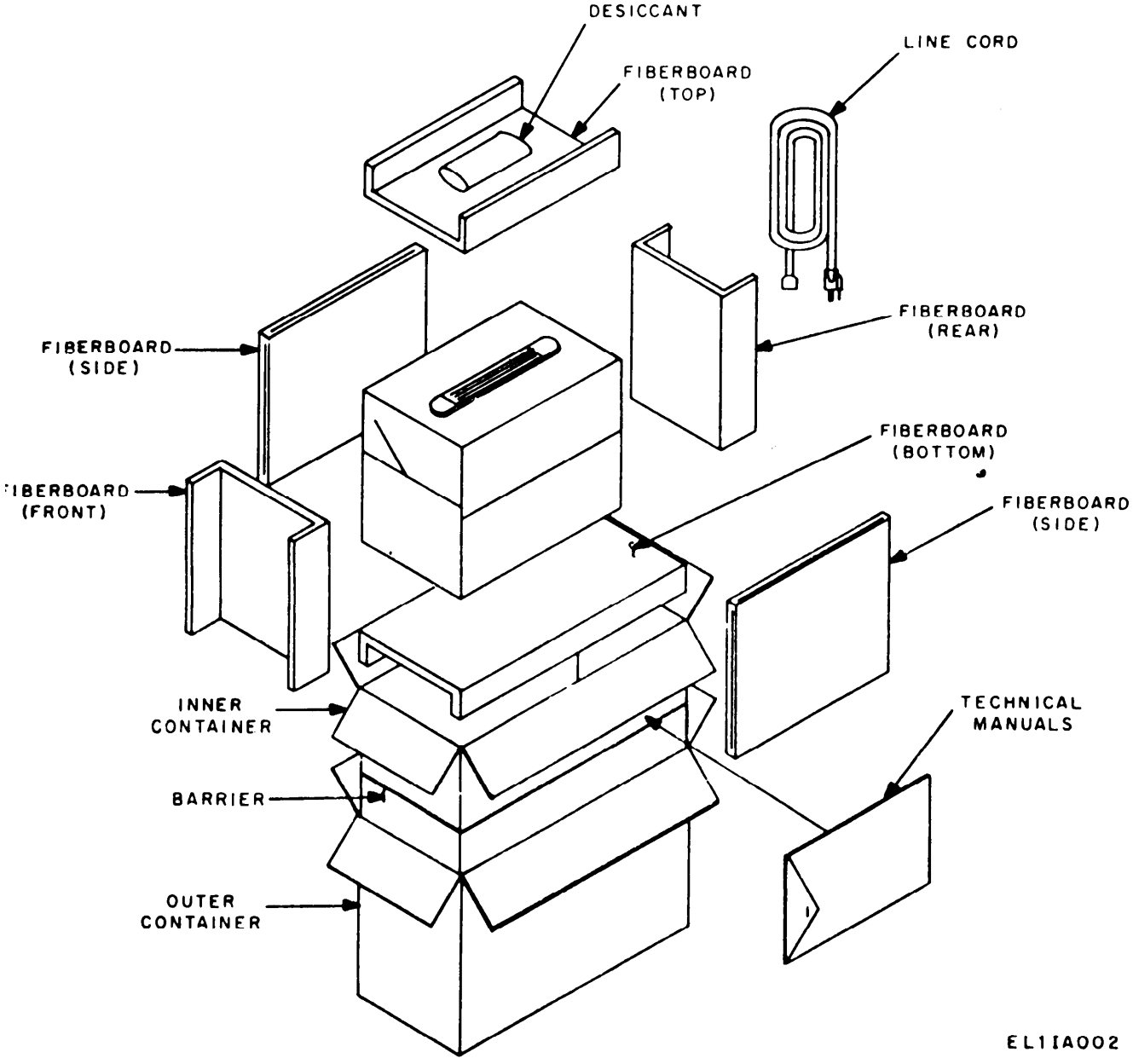


Figure 2-1. Equipment packing and packaging

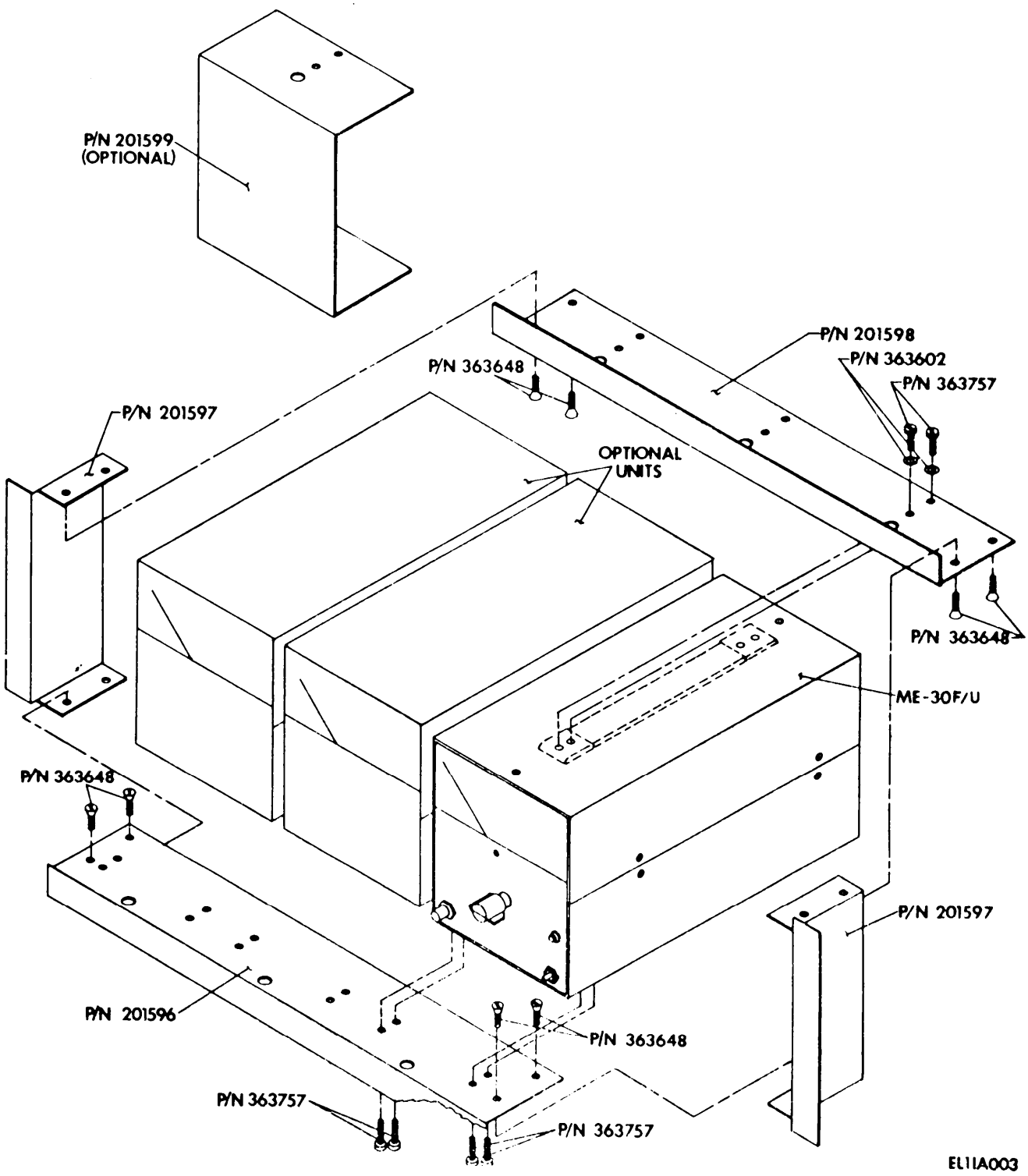


Figure 2-2. Rackmounting assembly.

CHAPTER 3
OPERATING INSTRUCTION

Section I. CONTROLS AND INSTRUMENTS

3-1. General

The voltmeter is primarily an ac voltmeter and a dB meter, which may also be used as an ac to dc converter or as a wide band amplifier. The following paragraphs explains the function of each control and indicator and outlines operating procedures for each mode of operation.

3-2. Operator's Controls

Table 3-1 lists the operator's controls and connectors. Figure 3-1 illustrates these controls and connectors.

CAUTION

The following precautions should be observed when applying voltages to the voltmeter for measurement purposes.

1. The instrument will withstand up to 350 volts applied to any range without permanent damage. However, application of voltages grossly in excess of the full scale value of each range may blow the internal protective fuse, necessitating disassembly and replacement. Therefe~, it is advisable to avoid overloading the instrument by applying voltages in excess of the full scale value of each range. When measuring an unknown voltage, always set the RANGE switch to the highest (300 volt) range.

2. The rear connector and terminal posts are instrument *outputs. Do* not connect external voltage sources to these connectors, as permanent damage could result. Connect these outputs only to measurement equipment as described in the operating procedure.

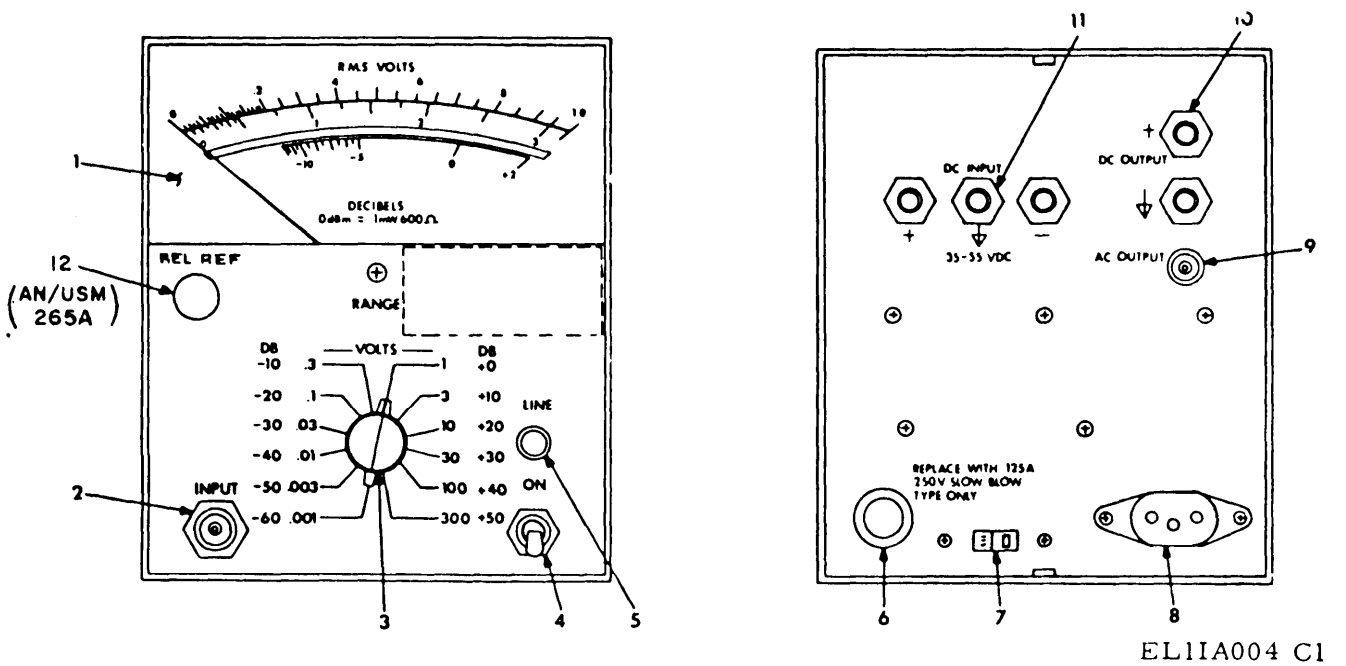


Figure 3-1. Voltmeter, Electronic ME-30F/U and AN/USM-266A, controls and indicators.

Table 3.1. Voltmeter, Electronic ME-30F/U and AN/USM-265A, Controls and Indicators.

Item No.	*Control, indicator or* connector	Function
1	R.M.S, Volts--DECIBEL	R.M.S. Volts. Scale: Indicates magnitude of applied signal in volts and db. 0dBm lmW in 600 ohms,
2	AC INPUT jack	BNC input jack connects signal to be measured
3	RANGE selector switch	Selects full scale reading of meter. The dB reading on scale adds algebraically to dB setting of RANGE selector.
4	ON toggle switch	Applies primary power.
5	LINE indicator	Indicates application of primary power,
6	Fuse	1/8 or .125 amp 250V slow blow fuse protects instrument against current overload.

Table 3-1. Voltmeter, Electronic ME-30F/U an AN/USM-266A, Controls and Indicators-Continued

Item No.	Control, indicator or connector	Function
7	115/230 volt slide switch	Selects 115 or 230 volts ac mode of line operation.
8	Primary power connector	Line voltage is applied through this connector.
9	AC OUTPUT connector	AC amplifier output.
10	DC OUTPUT terminals	AC to DC converter output. DC voltage is proportional to percentage of meter deflection. Output impedance is 1000 ohms.
11	DC INPUT terminals	The voltmeter may be powered by connecting two 35 to 55 volt batteries to these terminals,
12	REL REF (AN/USM-256A only)	Adjusts meter indication for 0dB reference,

Section II. OPERATION UNDER USUAL CONDITIONS

NOTE

(ME-30F/U only)

After the voltmeter is turned on, there may be a meter indication of as much as two scale division. This effect is normal and does not affect the accuracy of the instrument.

3-4. Effect From Stray Voltages

a. When the voltmeter is used on any one of the three lowest ranges, the meter pointer may deflect full scale or beyond before voltage is applied to the input circuit. This condition is normal and is caused by pickup from stray voltages in the vicinity of the instrument. The accuracy of the meter indication is not affected unless the voltage under measurement is from a high impedance source. For maximum accuracy on the .001 VOLTS range, the voltage under measurement should be applied to the voltmeter through a coaxial type cable.

b. When the voltage under measurement is from a high impedance source, hum pickup may affect the meter indication because of the high impedance of both the source and the voltmeter. Shielded test leads will reduce such pickup but will cause an increase in the capacity shunted across the source, with the possibility y of excessive circuit loading.

3-5. Effect From Harmonics

Inaccurate measurements may result when the voltage under measurement contains harmonics. This is due to the current through the meter being proportional to the average value of the measured ac voltage and also due to the meter being calibrated in terms of rms voltage of a sine wave. Table 3-2 illustrates the deviation of the meter indication from the true rms value when the input voltages contain harmonics.

Table 3-2. Harmonic Effects

Input voltage characteristic (voltage and harmonic content)	True rms value (volts)	Meter Indication (Volts)
Fundamental (100 volts)	100	100
Fundamental +10 percent 2d harmonic.	100.5	100
Fundamental +20 percent 2d harmonic.	102	100 to 102
Fundamental +50 percent 2d harmonic.	112	l00 to 110
Fundamental +10 percent 3d harmonic.	100.5	96 to 104
Fundamental +20 percent 3d harmonic.	102	94 to 108
Fundamental +50 percent 3d harmonic,	112	90 to 116

NOTE

This chart is universal in application since these are inherent in all average-reading type voltage-measuring instruments.

3-6. Application of Power

a. Ac Operation. Insure that 115-230 Vac slide switch on the rear panel matches line voltage used, and connect power to the instrument. Mechanically zero the instrument using the procedure outlined in paragraph 3-2.

CAUTION

Insure that the 115-230 Vac slide switch is in the proper position for the voltage to be use. Failure to do so will damage the voltmeter.

b. Dc operation. To operate the voltmeter with battery power, connect two 35 to 55 volt batteries as shown in figure 3-1. Since the front panel power ON switch has no effect during battery operation, the switch in figure 3-1 can be used as a convenient method of disconnecting the batteries when the instrument is not in use. Two 35 volt batteries will deliver approximately 75 ma and two 55 volt batteries will deliver approximately 50 ma.

3-7. Voltage Measurements

The two upper meter scales (R.M.S. Volts) are provided for voltage measurements. When the range selector switch is set at the .001, .01, .1, 1, 10 or 100 volts position, read the indication on the O to 1.0 scale, When the range selector switch is set at the .003, .03, .3,3, 30 or 300 volts position, read the indication on the 0 to 3 scale.

a. Check to see that the meter pointer indicates exactly O on the voltage scales (para 3-3),

b. Connect the voltmeter to the ac or dc power source (para 3-6).

c. Operate the power ON switch to the ON position, observe lighted LINE lamp, and allow a warmup period of approximately 5 minutes. If on dc power (battery operation) power ON switch has no effect; use external switch is so wired, (fig. 3-2).

CAUTION

Do not apply more than 500 volts ac to input. Do not overload the .001 through 1 volt ranges. Consult figure 3-3 for overload limits. If any of these overloads are exceeded, the instrument may be damaged.

e. Connect the voltage to be measured to INPUT connector.

j Note the meter indication on the applicable R.M.S. VOLTS scale.

g. To obtain the value of the voltage being measured, multiply the meter reading by a factor which corresponds to the range being used. The meter reading will be a value between O and 1 or a value between 0 and 3. The correct multiplying factor may be located in table 3-3.

Table 3-3. Scale Multiplying Facts

Range selector switch setting (VOLTS)	Read on scale between	Multiply reading by
.001	0 to 1.0	0.001
.003	0 to 3	0.001
.01	0 to 1.0	0.01
.03	0 to 3	0.01
.1	0 to 1.0	0 1
.3	0 and 3	().1
1	0 and 1.0	1
3	0 and 3	1
10	0 and 1.0	10
30	0 and 3	10
100	0 and 1.0	100
300	0 and 3	100

3-8. Decibel Measurement

The R. M. S. VOLS—DECIIIELS meter scale is calibrated in dBm. 0dBm is equivalent to 1 milliwatt disipated by a 600 ohm load. Consequently, any dBm measurements must be made across a total impedance of 600 ohms. Measurements across other impedances will be in DB.

a. Perform power application as described in paragraph 3-6.

b. Connect lead from INPUT jack across load to be measured.

c. If the load is 600 ohms the scale reading will be in dBm. Add the scale reading to RANGE setting to

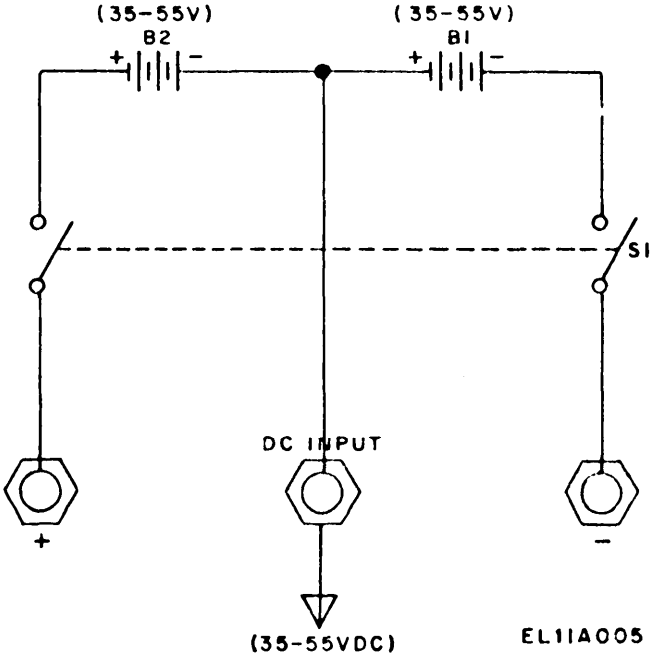


Figure 3-2. External battery connection.

obtain dBm measurement. *For example:* If the scale reading is +1.5 and the RANGE switch is -20 dB, the final measurement is -18.5 dBm. This is the algebraic sum of the meter reading plus the RANGE setting.

d. If the load is other than 600 ohms the scale reading will be in dB. Add the scale reading to RANGE setting to obtain dB measurement. *For example:* If the scale reading is -10 and the RANGE setting is +20 dB, the final measurement is +10 dB. To convert the dB measurement to dBm perform the following computation.

e. To convert a dB reading to dBm, use the impedance correction chart, figure 3-4. *For example:* To convert +30 dB reading made across 50 ohms to dBm, locate the load impedance on bottom of the graph. Follow the impedance line until it bisects the heavy line and read the meter correction at that point. The correction for 50 ohms is +10.5 dBm, and therefore the corrected reading is (+30) + (+10.5) = +40.5 dBm.

3-9. Wide Band Amplifier Operation

a. The amplifier section of the voltmeter may be used to amplify signals in the frequency range of 10 Hz to 10 MHz for other applications. With full-scale meter deflection, the open-circuit output of the amplifier is approximately 0.15-volt rms on all ranges, except the .001 volt range. The impedance looking into the AC OUTPUT binding posts is approximately 50 ohms.

CAUTION

When using the voltmeter as an amplifier do not apply more than twice the value indicated by the range selector switch. Equipment damage may result.

b. When the voltmeter is used as an amplifier, it will safely accommodate an input voltage of approximately twice the value indicated by the range selector switch. *For example,* with the range selector switch. *For example*, with the range selector switch in the .001 position, an input voltage of up to 0.002 volt may be applied.

c. Maximum gain from the amplifier is obtained on the .001 volts range. This is due to the 10-dB loss per step inserted by the range selector switch as it is operated in a clockwise direction. Amplification may also be obtained on the .003, .01, .03, and.1 volts ranges. For gain characteristics of the voltmeter -refer to table 3-4.

d. To use voltmeter as an ac amplifier- follow the procedures in (1) through (5) below:

(1) Connect the voltmeter to the ac or dc source (para 3-6).

(2) Operate the LINE switch on the ON position, and allow a warmup period of approximately 5 minutes.

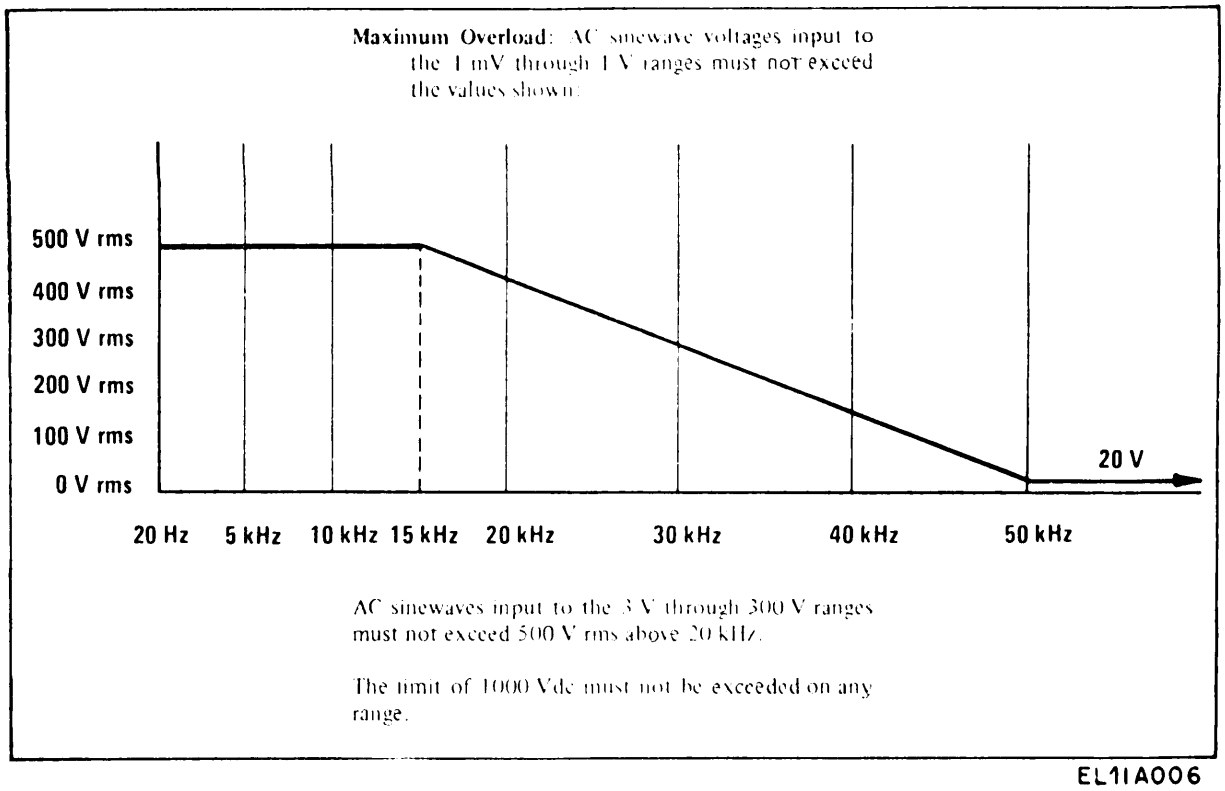


Figure 3-3. Overload characteristics.

NOTE

When using the ac power source, prevent ground loops by using a NEMA adapter on the oscilloscope, counter or other instrument used with ME-30F/U. Keep leads as short as possible and shield the input of the ac voltmeter to minimize Pick-up. If the DC OUTPUT Terminals are not used when using AC OUTPUT terminals, place a 1 kilohm shielded load across the DC OUTPUT terminals. This is especially necessary on low ranges.

(3) Operate the RANGE selector switch to the desired position.

(4) Connect the equipment which is to receive the amplified signal to the AC OUTPUT connector.

(5) Connect the signal to be amplified to the INPUT connector.

Table 3-4. AC Amplifier Gain

Range	Gain	Range	Gain
0.0001	+40dB	1	-16dB
0.003	+34dI	3	-26dB
0.01	+24dB	10	-36dB
0.03	+14dB	30	-46dB
0.1	+ 4dB	100	-56dB
0.3	- 6dB	300	-66dB

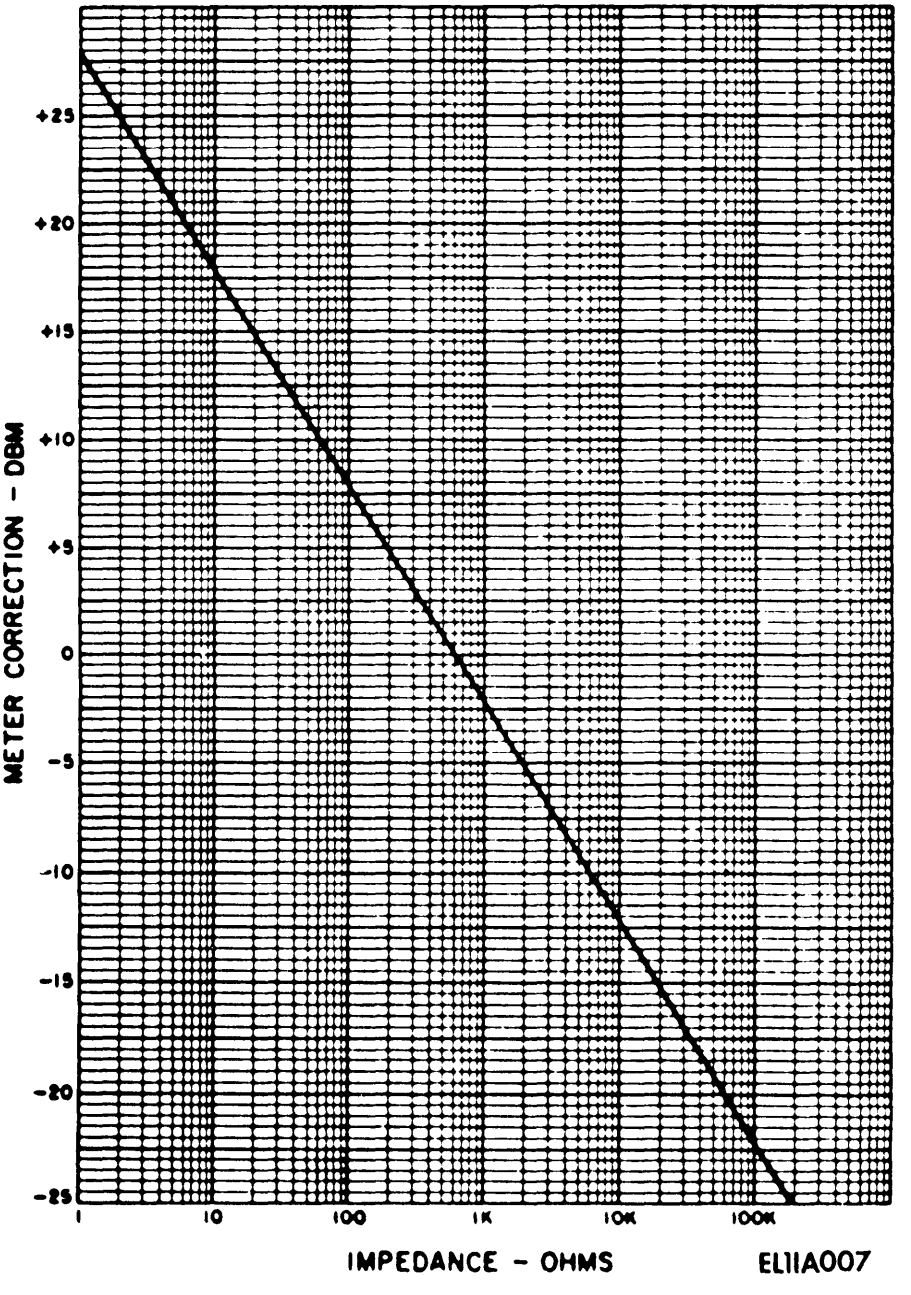


Figure 3-4. Impedance correction graph.

CHAPTER 4

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL TOOLS AND EQUIPMENT

4-1. Tools and Test Equipment

Table 4-1 lists the tools and test equipment which should be used by the operator or organizational maintenance personnel for maintenance purposes.

4-2. Special Tools and Test Equipment

No special tools or test equipment is required for operator/organizational maintenance.

4-3. Lubrication Instructions

No lubrication should be necessary for maintenance of the ME-30F/U.

Section II. OPERATOR AND ORGANIZATIONAL PREVENTATIVE MAINTENANCE CHECKS AND SERVICES

4-4. General

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable. The necessary preventive maintenance checks and services to be performed are listed and described in tables 4-1,4-2, and 4-3. Item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Operation shall be stopped immediately if a deficiency is noted which would damage the equipment. Record all deficiencies together with corrective action taken as prescribed in TM 38-750.

4-5. Scope of Operator/Crew Maintenance

The maintenance duties assigned to the operator/crew for the test set are listed below.

a. Daily preventive maintenance checks and services (table 4-2).

b. Weekly preventive maintenance checks and services (table *4-2).*

c. Cleaning (para 4-8).

Item	N S N and/or	Reference No	Fig. No(s)	Reference Para. No (s)	Use
Multimeter: Tool and Test Equipment available to the repairman user because of his assigned mission	6625-00-581-2036	AN/URM-105		Table 4-3	Continuity

4-6. Systematic Care

The procedures given in tables 4-2 and 4-3, along with paragraphs 4-8 and 4-9, cover routine systematic care and cleaning essential to proper upkeep of this equipment when it is used separately. When this equipment is used as part of a set or system, follow the procedures established in the set or system manual.

4-7. Preventive Maintenance Checks and Services Periods.

Preventive maintenance checks and services of the test set are required daily, weekly, monthly, and quarterly.

a. Table 4-2 specified checks and services that must be accomplished daily and under the special conditions listed below:

(1) At least once each week if the equipment is maintained in standby condition.

(2) When the equipment is initially installed.

(3) When the equipment is reinstalled after removal for any reason.

b. Tables 4-2 and 4-3 specify additional checks and services that must be performed on a weekly, monthly, and quarterly basis, respectively.

c. To assist in maintaining combat serviceability, the tables indicate what to check, how to check, and what normal conditions are. References included are to illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by performing the corrective actions indicated, higher maintenance category repair is required.

W—Weekly
Time Required:

D—Daily
Time Required: 0.2

lnterval and sequence No D	W	Item to be inspected procedure	Work time M/H
1		EXPOSED ITEMS: Clean exposed surfaces of case and and control panel (para 4-8).	0.1
		CONTROLS: Check that mechanical action of each knob, switch, and control is smooth and free of binding and no excessive looseness is apparent.	0.1

D–Daily
Time Required 0

W–Weekly
Time Required: 0.45

lnterval sequence No. D	W	Item to be Inspected procedure	
	1	POWER C0RD: Inspect cord for chafed, cracked, or frayed insulation. Replace cord that is stripped or worn excessively.	
	2	HARDWARE: ,Inspect all exterior hardware for looseness and damage. All screws must be tight and not damaged.	0.05
	3	METAL SURFACES: Inspect exposed metal surfaces for rust and corrosion. Clean arm touch up paint as required (para 4-10).	0.05
	4	OPERATION: Perform operating procedures given in paragraph 3-6 through 3-9.	0.2
	5	CONNECTIORS: Inspect connectors for snug fit and good contact,	0.1

Table 4-3. Organizational Preventive Maintenance
Checks and Services

Q-Quarterly
Total Man-Hours Required: 1.8

Sequence Number	Item to be lnspected Procedure	Worktime M/H
1	Controls: Rotate all controls through their positions.	.1
2	Bulb: (’heck that bulb light when set is energized.	.1
3	Power Cord: Check that insulation is intact and not frayed or broken,	1
4	Grounding Using Multimeter AN/URM-105 check for 1 ohm or less of resistance from the center pin to ground: and open circuit from the remaining pins to ground.	.1
5	Connectors: Visually inspect the input and rear connectors for damage.	.1
6	Wiring: Remove covers and check for broken wires.	.5
7	Meter Movement: Shake unit from side to side and verify the meter needle pivots freely. Adjust mechanical zero.	.3
8	PUBLICATIONS: .See that all publications are complete, serviceable, and current (DA Pam 310-4).	.05
9	MODIFICAT1ONS: Check DA Pam 310-7 to determine if new Applicable MWOs have been published. All urgent M W Os must be applied immediately. All normal MWOs must be scheduled (TM 38-750 and DA Pam 310-7).	
1 0	SPARE PARTS: Check all spare parts (operator/ crew and organizational) for generall condition and method of storage. No overstock should be evident and all shortage must be on valid requisitions.	

4-8. Cleaning

inspect the exterior surfaces of the signal generator; exterior surfaces should be clean, free of dust, grease and fungus.

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

WARNING

The fumes of trichloroethane are toxic. Provide ventilation whenever used. DO NOT USE NEAR AN OPEN FLAME. Trichlorethane is not flammable, but exposure of the fumes to an open flame or hot metal forms highly toxic phosgene gas.

CAUTION

Trichlorethane will attack the metal face and terminals on rear panel. Care should be taken not to allow these parts to come in contact with Trichloroethane. Use damp cloth with a mild soap for cleaning these surfaces.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with trichloroethane (NSN 6810-00-292-9625).

c. Remove dust or dirt from connectors with a brush.

d. Clean the front panel and control knobs; use a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water; use mild soap if necessary.

4-9. Touchup Painting

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable cleaning and refinishing practices specified in TB 43-0118.

Section III. TROUBLESHOOTING

4-10. Visual Inspection

If malfunction is suspected, a thorough visual inspection should be performed to locate possible mechanical faults or problems.

WARNING

Disconnect the power cord of the instrument before performing visual inspection.

a. Power Cord—Check visually for parting of wires, etc.

b. Underside of Chassis—Check for broken or loose wires (Refer to chap 7, General Support Maintenance Instructions for wiring list).

c. Upper side of chassis—Check for broken or loose wires. If obvious component damage exists or circuit boards or subassemblies, refer to higher maintenance levels.

4-11. Troubleshooting and Organizational Maintenance of ME-30F/U

organizational maintenance is limited to the correction of faults located during performance of Preventative Maintenance Checks and Services. If the equipment is still inoperative following these checks, refer to a higher level of maintenance.

CHAPTER 5
FUNCTIONING OF EQUIPMENT

5-1. General

The voltmeter is a solid state analog voltmeter capable of measuring 2 micro-volts to 300 volts at frequencies from 10 Hz to 10 MHz.

5-2. Block Diagram Description

(fig. 5-1)

a *Input Attenuator.* The input attenuator provides an attenuation factor of 310 (50 dB) for RANGE switch positions 3 through 300 VOLTS and zero attenuation on the lower scales (.001 through 1 volt). The attenuator is relay controlled by the RANGE switch.

b. Impedance Converter and Meter Attenuator. The impedance converter provides a high input impedance to the incoming signal and the low impedance of the meter attenuator. The meter attenuator attenuates the output of the impedance converter by 10dB for each step of the RANGE switch.

c. *Meter Amplifier and Meter.* The meter amplifier amplifies the input signal at a fixed gain on all ranges except the .001 volt range. This circuit also contains a bridge circuit which rectifies the amplifier output of the meter amplifier and provides the dc current to drive the meter. The meter circuit provides a display in volts rms or dB. In addition the meter circuit provides the DC OUTPUT which is a 0-1 volt level that is proportional to meter deflection.

d. AC Output Amplifier. The ac output amplifier isolates the meter bridge and amplifier from the ac output load.

e. Power Supplies. The power supplies produce regulated +26 volts, and -26 volts.

5-3. Functional Description

(figures FO-2 and FO-4)

a. Input Attenuator. The input attenuator A4 has a nominal input resistance of 10 Megohms. When relay K1 is energized and relay K2 is deenergized, the attenuator does not attenuate the input voltage, but connects directly to the input amplifier. This mode is selected in the .001 through the 1 volt ranges. In the 3 through 300 volt ranges, the input attenuator attenuates the signal by a factor of 310 (50 dB). Capacitor C2 is used to adjust the frequency response of the attenuator at 500 kHz. The signal is routed through K2 or K1 as determined by the RANGE SWITCH position.

b. Impedance Converter. The impedance converter located on the main voltmeter board, matches the high impedance of the input attenuator to the relatively low impedance of the meter attenuator. Breakdown diodes CR17 and CR18 bias diodes CR9 and CR10 at +5 and -5 volts respectively. CR9 and CR10 limit the input to 10 volts peak-to-peak, providing overload protection. Diodes CR20 and CR21 stabilize the bias voltages on Q5. Fuse F1 protects the instrument against deastructive overloads. A field-effect transistor (Q5) is used in the input stage of the impedance converter because of its characteristically high input impedance and good frequency response. R17 adjusts the dc bias of the impedance converter. The output is taken from the emitter circuit of Q7 and applied to the meter attenuator and then applied to the meter amplifier.

c. Meter Attenuator. The meter attenuator consisting of resistors R1 through R13 (assembly A3). The attenuator is a 600 ohm ladder type which has the attenuations listed in table 5-1. The meter attenuator, combined with the input attenuator, provides a constant 3 millivolt signal to the meter amplifier on all ranges except the 1 millivolt range, where 1 millivolt is provided.

d. Meter Amplifier. The meter amplifier amplifies its input signal by a fixed gain on all ranges except the .001 volt range. The amplifier itself is a four-stage, dc coupled amplifier with a cascade-coupled final stage (Q12 and Q13). DC feedback is coupled from the emitter of Q12 back to the base of A2Q9. Diodes CR12, CR13 and CR14 establish fixed dc bias levels in the amplifier. The output from the collector of Q13 is coupled through the meter bridge and fed back to the emitter of Q9. C28 (3 MHz ADJ) in the feedback circuit adjusts the amount of the feedback at the high end of the frequency range, and R38 (IV CAL) adjusts the feedback at the low end. This calibrates the amplifier gain at both ends of the frequency range, R44, R45 and R72 are switched into the feedback circuit on the 0.001 volt range, boosting the gain on that range. R44 (lmV ADJ) adjusts the gain on the lmV range with a 400 Hz input. R31 (+8V ADJ) adjusts the dc bias level of the amplifier.

Table 5-1. Attenuation of Meter Attenuator

Range	Attenuation (dB)
.00lV	0
.003V	0
.01V, 3V	-10
.03V, 10V	-20
.lV, 30V	-30
.3V, 100V	-40
lV, 300V	-50

e. *Meter Bridge.*

(1) The meter bridge rectifies the ac amplifier output and supplies the dc current to drive the meter. In order to use part of the meter bridge output as the rear terminal dc output, the meter has to be referenced to ground, Transistor Q14 references the meter to ground.

(2) During the positive half cycle, CR15 conducts. Part of the current goes through C34 into the feedback

path, and part of the current goes through R53 and the meter to ground. The current through R53 turns on Q14, and Q14 draws current from the positive supply. The current from Q14 goes through C36 into the feedback path. The current through Q14 and C36 is equal to the current drawn through the meter, so the current out of the bridge is equal to the current into the bridge.

(3) During the negative half cycle, CR16 conducts and draws current from the feedback path. Part of the current goes through C36 and CR16 into the amplifier, and part goes through R53 and the meter to ground. The current through R53 turns on Q14, and the current from Q14 goes through R54 and CR16 to the amplifier. Again the current through the meter equals the current through R54, and the current into the bridge equals the current out.

(4) Transistor Q14 replaces current drawn by the meter, so the meter bridge is kept floating while the meter is referenced to ground. The de output, taken across R65 and R2, is also referenced to ground.

f. Meter Amplifier (AN/USM-265A only). The meter amplifier provides an offset capability which, when used with the panel meter gives a response linear in dB. A5-AR1 provides a buffered dc output on the rear panel, based on the voltage drop across A5R5 and R2. The offset is provided by A5CR1 and R6. Controls for linearity adjustment at the top end of the scale are R9 and R10.

g. *AC Output Circuit* The ac output circuit isolates the meter bridge and amplifier from the ac output load. It consists of two emitter followers (Q15 and Q16) connected in cascade. R59 (OV ADJ) in the base circuit of Q15 zeroes the output dc level at the ac output.

h Power Supply.

(1) The power supply produces regulated +26 volts and -26 volts. Breakdown diode CR7 establishes a reference voltage of 6.98 volts. Part of the power supply output is applied to the base of Q2, and Q2 senses the difference between the supply output and the reference. If the output voltage changes, the emitter to base voltage of Q2 will change; and the output of Q2 will change the current through Ql, the regulator.

(2) The negative regulator, Q3 and Q4, uses the +26 volt output as a reference. Consequently, the negative supply is dependent upon the positive supply.

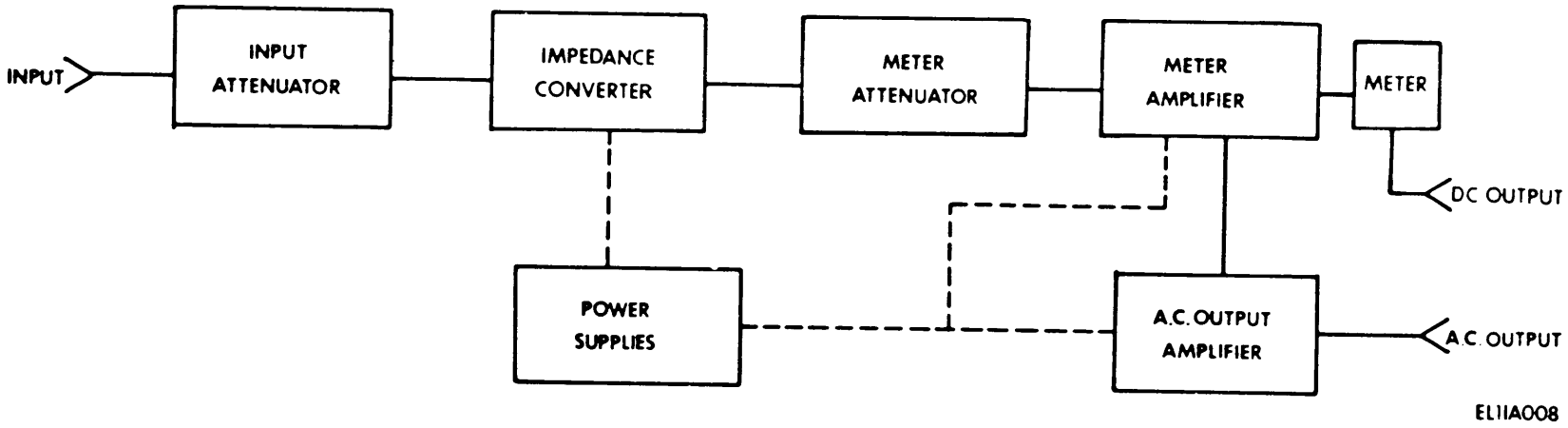


Figure 5-1. Functional block diagram.

CHAPTER 6
DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

NOT APPLICABLE

CHAPTER 7
GENERAL SUPPORT MAINTENANCE

Section I. GENERAL

7-1. Scope
The procedures for troubleshooting and general support maintenance of the voltmeter are outlined in subsequent sections of this chapter. Where applicable, the procedures include instructions for making voltage and resistance measurements and instructions for replacing components when the procedure is not obvious.

7-2. Voltage and Resistance Measurements
Make all voltage and resistance measurements using Multimeter TS-352/U, or equivalement at the points specified in the troubleshooting table. To make measurements that are not specified in figure 7-1 and tables 7-3 and 7-4, refer to the appropriate schematics diagram to determine the test point desired.

Section II. GENERAL SUPPORT TOOLS AND TEST EQUIPMENT

7-3. Tools and Test Equipment
Tools and test equipment required for troubleshooting the signal generator are listed in table 7-1 below.

7-4. Special Tools and Equipment
No special tools or equipment are required.

Table 7-1. List of General Support Test Equipment

Item	NSN and/or	Reference No.	Use
Multimeter	6625-00-553-0142	TS-352B/U	In circuit transistor tests.
Generator, Signal	6625-00-788-9625	AN/USM-205	Source of AC Signals 1mv-3V
Voltmeter, Electronic	6625-00-050-8686	ME-202/U	Standard for AC accuracy
Oscilloscope	6625-00-106-9622	AN/USM-281C	General Troubleshooting
Test Set, Transistor	6625-00-168-0954	TS-1836B/U	General Troubleshooting
Transformer, Variable, Power	5950-00-235-2086	CN-16/U	a) Means of Varying Line Voltage b) Source of AC voltage 10v-150v
Tool Kit, Electronic Equipment	5180-00-605-0079	TK-100/G	General

Section III. TROUBLESHOOTING

7-5. Organization of Troubleshooting Procedures
a. General. The first step in servicing a defective equipment is to sectionalize the fault. Sectionalization means tracing the fault to one of the major circuits responsible for the abnormal operation. The second step is to localize the fault. Localization means tracing the fault to a particular stage or network within one of the major circuits. The third step is to isolate the fault.. Isolation means tracing the fault to the defective part responsible for the abnormal condition. Some faults, such as

burned-out resistors, arcing, and shorted transformers often can relocated by sight, smell, and hearing. The majority of faults, however, must be isolated by checking voltages and resistances.

b. Component Sectionalization, Localization, and Isolation. Listed below is a group of tests arranged to simplify and to reduce unnecessary work and to aid in tracing a trouble to a specific component. Follow the procedure in the sequence given. A serviceman must be careful not to cause further damage to the equipment while it is being serviced.

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. All visual signs should be observed and an attempt made to sectionalize the fault to a particular function.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help in determining the exact nature of the fault. The daily maintenance service and inspection table contains a good operational test.

(3) *Troubleshooting table.* The troubleshooting table (7-2) lists symptoms of common troubles and gives (or references) corrective measures. Such a table obviously cannot include all trouble symptoms that may occur. The repairman should use this chart as a guide in analyzing symptoms that may not be listed.

(4) *Voltage and resistance measurements.* Take voltage measurements related to the stage or board in question (fig. 7-l). Where abnormal voltage reading is obtained, take resistance measurements. (Readings may vary up to± 20% from unit to unit.)

(5) *intermittent troubles.* In all the tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. It is possible that some external connections may cause trouble. Test wiring for loose connections; move wires and components with an insulated tool, such as a pencil or fiber rod. This may show where a faulty connection or component is located. Minute cracks in printed circuit boards can cause intermittent operation. A magnifying glass is often helpful in locating defects in printed boards. Make continuity measurements of printed conductors.

c. *Visual Inspection.* Failure of the equipment to operate properly can often be traced to one or more of the following faults:

(1) Improperly connected power cable, or no voltage at the outlet into which the power cable is connected.

(2) Burned-out fuse.

(3) Broken wires.

(4) Improperly connected output or input cables.

(5) Worn, broken, or disconnected cords or connectors,

7-6. Troubleshooting

The troubleshooting instructions contained in this manual are presented in tabular form. Table 7-2 lists some common defects and corrective action for them.

NOTE

The subassemblies are interconnected using snap connectors. To disconnect these connectors, grasp the connector with long-nose pliers and pull the connector and wire off of the pin. Make sure that the connector is not distorted before re-inserting. The connector may be re-compressed before re-inserting using the long-nose pliers.

NOTE

Voltages and resistances on Figure 7-1 may vary up to ± 20% between units.

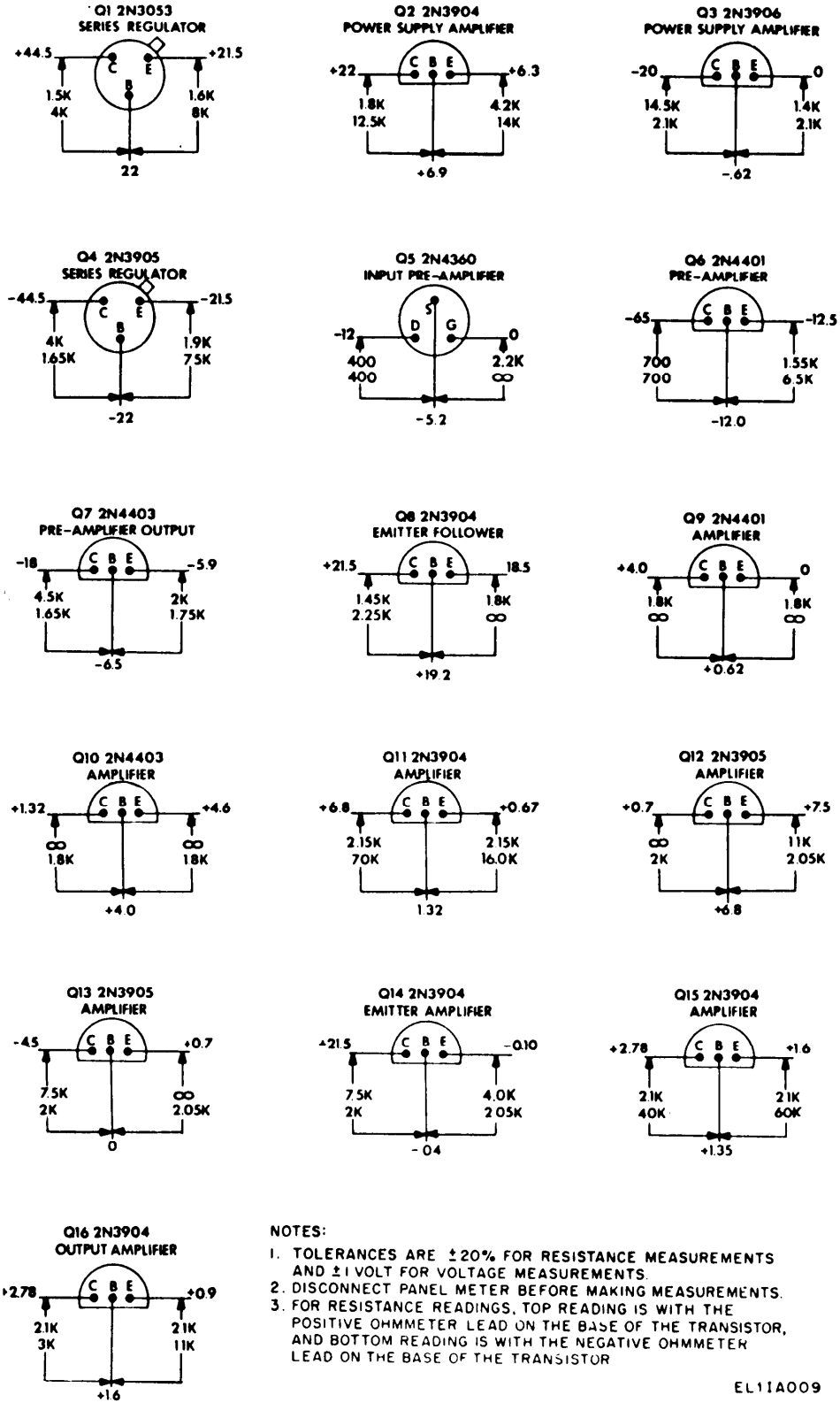


Figure 7-1. Voltage and resistance measurements

Table 7-2. Troubleshooting

Symptom	Possible Cause	Corrective Actions
Instrument does not operate on any range. Pilot light does not light.	Blown Line Fuse	Check with ohmmeter and replace if necessary.
Instrument does not operate on any range. Pilot light lights.	Blown input fuse	Check with ohmmeter and replace if necessary.
	Defective power supplies	Perform power supply tests of table 7-4. Take corrective action as necessary.
	Defective input relay(s)	Perform ohmmeter test across each relay contacts with input assembly removed and grounded to the main chassis and instrument energized.
	Defective input amplifier	Measure the DC voltage at A2TP3 with the multi meter. Voltage should be -6vdc. If faulty, use the transistor voltage or resistance charts (fig. 7-1) to locate the faulty components.
	Defective meter attenuator	Inject a 1 volt signal from the AN/USM 20.5A at 1 kHz. Usc the set-up of figure 7-2. Set the ME30F/U to the 1 volt range. Measure the voltage at the output of the Range Switch subassembly A3 between the white wire' and ground with the white wire disconnected from the A3 board. Use the ME-202/U. The voltage should be between and 3.09 millivolts. If faulty, use the resistance chart (table 7-3).
	Defective meter amplifier	Measure the voltage at A2TP5 using the setup of figure 7-2 and a 1 volt signal. If faulty, use the transistor voltage or resistance chart (fig. 7-1) to locate the Faulty component.
	Defective meter assembly	Disconnect wires leading to Meter Assembly (Al). Place the TS-35211/U in the circuit in place of the meter assembly on the 2.5 ma. range. If the TS-35213/U reads correctly (1 ma.) but the Meter Assembly does not, then the meter assembly is defective. Check the continuity of the wires on the meter assembly before assuming that the meter movenment is defective.
Instrument's readings are grossly in error on 3 volt range and up.	Defective input	Check with ohmmeter (fig. 5-2).
Power ranges are correct.	Defective input range resistors	Check A4A1 resistors using ohmmeter.
Instrument's readings are grossly in error on same ranges, but others are correct.	Range switch	Perform tests of table 7-3.
Instrument's readings are slightly in error.	Instrument requires adjustment	Perform adjustments of table 7-6.
No D.C. output.	A2R65 shorted	Repair or replace as necessary.
No. A.C. output.	A2Q15 or A2Q16 defective	Test with ohmmeter using figure 7-1. Replace as necessary.

Table 7-3. Range Switch Resistance Readings

Range	Ohms Input To Ground	output 10 Ground	Input To Ground
300.1	600	150	600
100,.3	600	150	600
30, .1	600	150	600
10, ,03	600	150	550
3, .01	600	150	370
003	300	150	120
011	300	150	120

* All resistance reading are ±5%.

Table 7-4. Power Supply Voltage Tests

Multimeter Black (Neg) Lead	Red (Pos) Lead	*Voltage*	*Notes*
Chassis	+22 volt Test Point	22 Volta ±5%	If voltage is obtained, power supplies are O.K. If not obtained, proceed with following tests.
+22 volt Test Point (TP2)	Chassis	22 volts! ±5%	Same as above.
Chassis	+end of Cl	+46 volts ±10%	Unregulated Positive Power Supply. *If* obtained, proceed with following test. If not obtained, rectifier circuit is defective.
-end of Cl	Chassis	-46 Volts ±10%	Negative Power Supply. Same as above,
Chassis	+22 'Jolt Test Point (TP1)	+22 Volts	Unsolder and remove Jumper J1. See figure 7-6 and Fo-2. Do this only if readings are incorrect in above test. Removing the jumper isolates the power supply circuit from the rest of the instrument. The power supply voltage should be present on the rear jumper connection after the jumper is removed. If the supply is normal with the jumper removed, then the rest of the circuitry is shorting out the power supply. If the power supply voltage remains abnormal, then the problem is in the power supply circuitry.
-22 volt Test Point (TP2)	Chassis	-22 Volts	(See above). Remove Jumper J2

Table 7-5. Aasembly Prefixes

Assembly	Prefix
Meter and Bracket Assembly	A1
Circuit Board Assembly	A2
Range Switch Assembly	A3
Input Attenuator Assembly	A4
Input Attenuator Circuit Board	A4A1
Meter Board (AN/USM-265A only)	A5

Section IV. MAINTENANCE OF VOLTMETER

7-7. General Parts Replacement Techniques

Most of the voltmeter parts can be reached without special procedures. The following precautions apply:

a. Precision-type resistors are contained on the RANGE switch assembly, input attenuator, and circuit board. When soldering these resistors, keep the tip of a long-nosed pliers between the end of the resistor and the point being soldered. This procedure will prevent excessive heat from entering the resistor and changing its value.

b. When removing a switch or control, make a note of the connections before unsoldering them.

7-8. Alignment Procedures

Paragraphs 7-9 through 7-14 describe the alignment procedures for the voltmeter. Alignment is performed with the covers removed. Cover removal is self-evident.

7-9. +22 Volt Adjustment

a. Connect the ME-202/U to ME-30F/U test point TPI.

b. Adjust +22V ADJ (R77) for a +22 ±1 vdc reading on the ME-202/U.

c. Connect the ME-202/U to test point TP2 and read -22 ± 1 vdc.

7-10. -6 Volt Adjustment

a. Connect the ME-202/U to ME-30F/U test point TP3.

b. Adjust -6 V ADJ (R17) for a -6 vdc reading on the ME-202/U.

7-11. +8 Volt Adjustment

a. Connect the ME-202/U to ME-30F/U test point TP4.

b. Adjust +8V ADJ (R31) for a +8 vdc reading on ME-202/U.

NOTE

The alignment procedures described in paragraphs 7-12 and 7-13 shall be performed in sequence.

7-12. 1 Volt Calibrate Adjustment

a. Set up equipment as shown in figure 7-2.

b. Set the ME-202/U controls as follows:

RANGE . . . . . l volt
NULL . . . . . 0l volt
MODE . . . . . AC volts
DECADE 1.0000

C. Set the AN/USM-205A controls as follows:

RANGE . . . .XlK
OUTPUT ATTENUATOR . . . . . 1 VOLTS
EXPAND-NORMAL switch . . . . . .EXPAND
FREQUENCY dials.. 1

d. Set the ME-30F/U to 1 volt range.

e. Adjust the output of AN/USM-205A for 1 volt reading on the ME-202/U.

f. Adjust SET REFERENCE control on AN/USM-205A for O (center) indication on output level meter on AN/USM-205A.

g. Disconnect the ME-202/U.

h Adjust lV CAL (R38) so that ME-30F/U indicates exactly full scale deflection (1 volt).

i. Simultaneously rotate the OUTPUT ATTENUATOR of the AN/USM-205A and the RANGE switch of ME-30F/U under test clockwise, one position at a time. All indications on the ME-30 F/U should remain at full scale deflection ± 1%.

j. If, on the 1 mv (.001) range, the& 1% accuracy is not achieved, adjust 1MV ADJ (R44) for exactly full scale deflection.

k. Return the AN/USM-205A and ME-30F/U to 1 volt range and proceed to paragraph 7-13.

7-13. Frequency Response Adjustment

a. Set voltmeter RANGE switch to .01 VOLTS.

b. Adjust the AN/USM-205A to 400Hz and output amplitude for a full-scale indication on the voltmeter.

c. While maintaining the AN/USM-205A output amplitude constant, adjust its frequency to 10MHz.

d. Adjust 10 MHZ ADJ A2R67 for a full scale indication on the voltmeter, ± 5%.

e. Set voltmeter RANGE switch to .003 VOLTS.

f. Adjust the AN/USM-205A frequency to 400Hz and output amplitude for a full scale indication on the voltmeter.

g. While maintaining the AN/USM-205A output amplitude constant, adjust it frequency to 8MHz.

h Adjust A3C3 for a full scale indication on the voltmeter, ±5%.

i. Set voltmeter RANGE switch to 1 VOLTS.

j. Adjust the AN/USM-205A frequency to 400Hz and output amplitude for a full scale indication on the voltmeter.

k. While maintaining the AN/USM-205A output constant, adjust its frequency to 3 MHz.

l. Adjust 3MHZ ADJ A2C28 for a full scale indication on the voltmeter, ±3%.

m, Repeat steps *i* through *l* above except adjust the AN/USM-205A to 8HMz.

n. Adjust A3C4 for a full scale indication of the voltmeter, ± 5%.

o. Set voltmeter RANGE switch to 3 VOLTS.

p. Adjust the AN/USM-205A frequency to 400Hz and output amplitude for a full scale indication on the voltmeter.

q. While maintaining the AN/USM-205A output constant, adjust its frequency to 500kHz.

r. Adjust 500 KHZ ADJ A4C2 for a full scale indication on the voltmeter, ± 1%.

s. Repeat the entire adjustment procedure as necessary to achieve readings within tolerances as specified.

7-14. 0 Volt Adjustment

a. Connect the ME-202/U to the AC OUTPUT jack on the rear of the ME-30F/U.

b. Adjust OV ADJ (R59) control for ±.01 vdc.

7-15. Repair Procedures

a. Repair of Mechanical Assemblies. When replac. ing parts of disassembling mechanical portions of the ME-30F/U, refer to the TM 11-6625-2697-24P for the correct re-assembly sequence for lockwashers, flatwashers, etc. Use the proper wrenches, screwdriver, etc. so as not to scratch or damage the hardware or adjacent components.

b. Removal of Circuit Boards. When removing circuit boards, the wire-to-board connectors must be disconnected. This is accomplished by pulling on the insulated body of the connector in a direction perpendicular to the circuit board. To replace the connector, grasp it with the pliers in a similar manner and push in onto the pin. After the wires have been removed, the board may be removed from the unit by unscrewing the mounting screws, being sure to retain all of the mounting hardware.

c. Replacing Components on Circuit Boards. When replacing components on circuit boards, it is recommended that a soldering iron of 40 watts or less be used. After removing the component, clear the solder out of the holes in the circuit board before re-inserting.

Section V. GENERAL SUPPORT TESTING PROCEDURES

7-16. General

This section contains test procedure for use by general support maintenance personnel to determine whether the performance of the repaired equipment is satisfactory for return to users. The test procedures should be followed in the order given. Unless specified otherwise all tests should be performed under the following conditions.

a. Atmospheric Conditions. The tests are to be performed at prevailing factory or laboratory atmospheric conditions.

b. Input Power. The input power should be 115 ± 4V, 60 ± 2 Hz.

c. Meter Mechanically Zeroed. The meter pointer must be exactly over zero when the meter has been off for at least one minute.

d. Test Equipment Table 7-1 is a list of the equipment to be used in performing the test procedures.

7-17. Test Procedures

Tables 7-6 through 7-11 list the information required to make the performance tests. Included in the tables are step numbers, control settings of the test equipment and equipment under test, test procedure and performance standard.

7-18. Modification Work Orders

Assure all applicable MWO's have been applied. A listing of current modification work orders will be found in DA Pam 310-7.

7-19. Physical Tests and Inspections

a. Test Equipment and Materials. No test equipment or materials are required.

b. Test Connections and Conditions.

(1) No connections necessary.

(2) Remove voltmeter chassis from its case.

c. Procedure. Refer to table 7-6 for correct procedures.

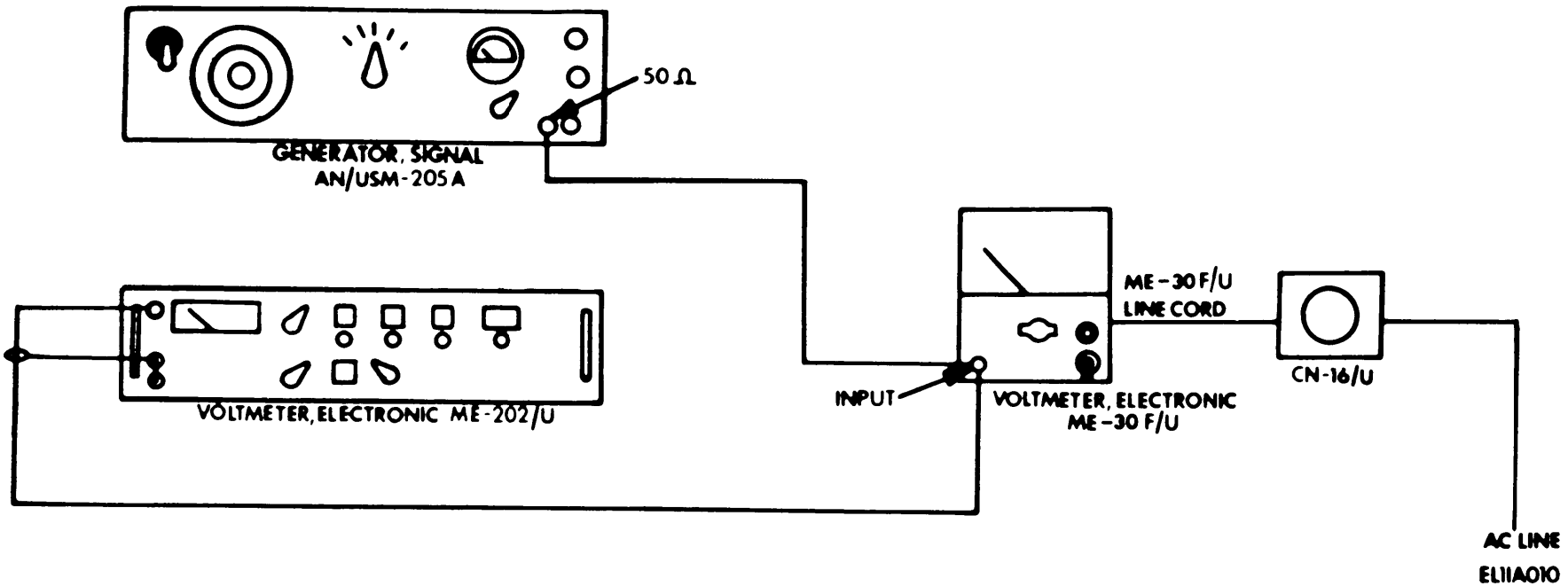


Figure 7-2. Power supply, accuracy, frequency response, and meter tracking test setup.

Table 7-6. Physical Tests and Inspections

step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performance standard
1	None	Controls may be in any position.	a. Inspect case and chassis for damage, missing parts, and condition of paint.	a. No damage evident or parts missing. External surfaces intended to be painted must not show bare metal. Panel lettering must be legible.
			NOTE Touch-up painting is recommended instead of refinishing whenever practical; screw heads, binding post, receptacles, and other plated parts should not be painted or polished with abrasives.	
			b. Inspect all controls mechanical assemblies for loose or missing screws, bolts, and nuts.	b. Screws, bolts, and nuts must be tight. None missing.
			c. Inspect all connectors, sockets, and receptacles, fuseholders, and dials for looseness, damage, or missing parts.	c. No loose parts or damage, No missing parts.
2	None.....	Controls may be in any position.	a. Rotate all panel controls throughout their limits of travel.	a. Controls must rotate freely without binding or excessive looseness.
			b. Inspect dial stops for damage or bending and for proper operations.	b. Stops operate properly without evidence of damage.
			c. Operate all switches.	c. Switches must operate properly.

7-20. Power Supply Test

a *Test Equipment and Materials.*

(1) Generator, Frequency AN/USM-205A.

(2) Voltmeter, Electronic ME-202/U.

(3) Transformer, Variable Power CN-16/U.

b. Test Connections. Interconnect equipment as shown in figure 7-2.

c. *Procedure.* Perform procedures in table 7-7.

Tbble 7-7. Power Supply Test

step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performance standard
N/A	a. AN/USM-205A: FREQUENCY: 1 RANGE X1K OUTPUT ATTENUATOR: 1 volts b. ME-202/U: MODE: AC RANGE: 1000	RANGE: 1 volt	a. Using CN-16/U set the source line voltage to 115 volts 60Hz and energize equipment under test. b. Apply a 1 KHz, .5 volt signal to the signal input terminals of the instrument and note meter reading. c. Lower the line voltage to 103.5 and record meter reading. d. Raise the line voltage to 126.5 and again record meter reading.	The instrument's meter deflection shall not change more than ±2 percent from the initial reading.

7-21. Accuracy and Frequency Response Test

a Test Equipment and Materials.

(1) Generator, Frequency AN/USM-205A,

(2) Voltmeter, Electronic ME-202/U.

(3) Transformer, Variable Power AN-16/U.

b. Test Connections. Interconnect equipment as shown in figure 7-2.

c. Procedure. Perform procedures in table 7-8.

Table 7-8. Accuracy and Frequency Response Test

step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performance standard
1	a. AN/U SM-205A: FRE- QUENCY: 1 RANGE X1K OUTPUT ATTENUA- OR. lmV	RANGE .001 volt	a. Apply a 1 KHz, lmV signal to the input terminals of ME-30F/U. The output amplitude of AN/USM-2O5A is accurately monitored with ME-202/U.	The reading on ME-202/U should be within * 1% of reading (full scale) on ME30F/U from 40 Hz to 500 Hz and ±5% from 10 Hz to 40 Hz, and 500 KHz to 40 MHz.
	b. ME-202/U: MODE: AC RANGE: 1		b. Adjust the output of AN/USM-205A until the meter on ME-30F/U under test reads exactly full scale. Record the actual amplitude of AN/USM-205A as read on the external ME-202/U.	
2	Same as 1 above	RANGE: .003 through 3 volts	Repeat steps a, b, and c except ME-30F/U RANGE switch to .003, .01, .03, .1, .3, and 3 VOLTS positions respectively, adjusting the output level of AN/USM-205A accordingly to give full scale ME-30F/U meter indication while adjusting frequency output from 10Hz to 10 MHz. Record readings.	Same as step 1 above except ± 3% from 2 MHz to 4 MHz.
3	a. AN/U SM-205A: FRE- QUENCY: 30 RANGE Xl OUTPUT ATTENUATOR: 1 volts	RANGE 1 volt	a. Apply a 30 Hz, 1 volt signal to the input terminals of ME-30F/U and adjust AN/USM-205A output until the meter on ME-30F/U under test reads full scale. Record the actual amplitude of AN/USM-2O5A as read on ME-202/U.	The reading on ME-202/U should be within ±5% of reading (full scale) on ME-30F/U for all frequencies
	b. ME-202/U: MODE: AC RANGE: 1		b. Repeat step a at AN/USM-205A frequencies of 500 kHz. 4 MHz, 8 MHz, and 10 MHz.	
4	a. ME-202/U: MODE: AC RANGE, 10	RANGE 10 volts	a. Remove AN/USM-205A and CN-16/U from ME-30F/U under test.	The readings on ME-202/U should be within ±1% of reading (full scale) on ME-30F/U.
	b. CN-16/U: 10 bolts		b. Connect CN-16/U and ME-202/U to INPUT jack of ME-30F/U.	

Table 7-8.. Accuracy and Frequency Response Test-Continued

Step no.	Control Test equipment	Setting Equipments under test	Tat procedure	Performance standard
			c. Energize the CN-16/U with 60Hz and adjust the transformer output so that ME-30F/U under test reads exactly full scale. Record the actual amplitude as read on the ME-202/U.	
			d. Repeat *c* with RANGE switches on ME-30F/U and ME-202/U set to 30 and 100 VOLTS respectively.	

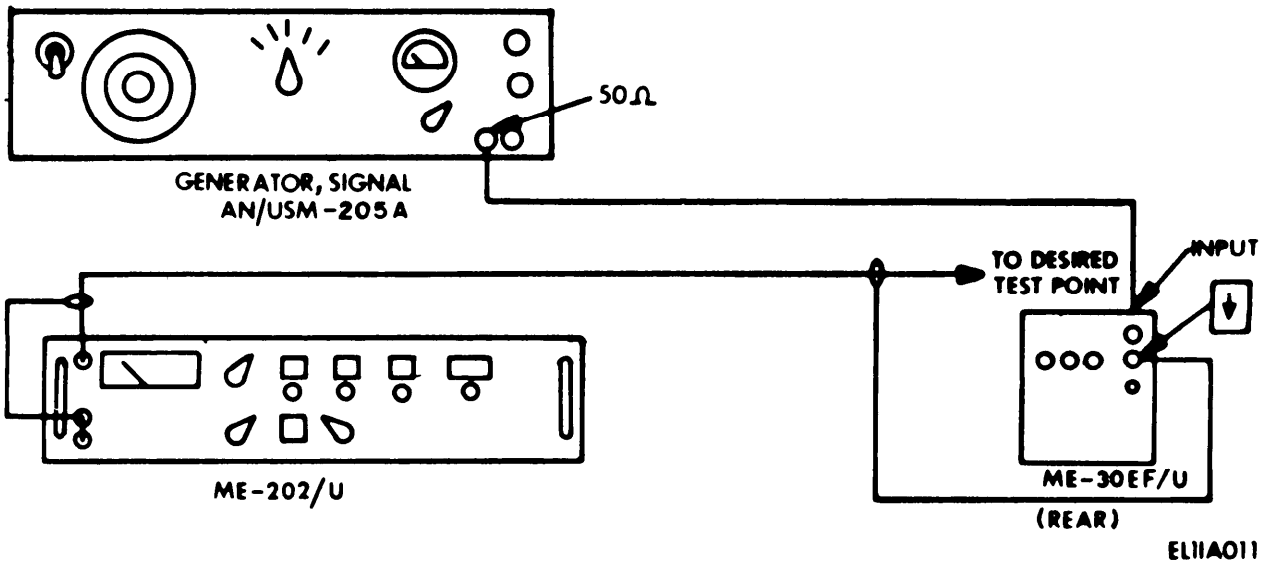


Figure 7-9. AC amplifier and DC output test setup.

7-22. AC Amplifier Output Test

a. Test Equipment and Materials.

(1) Generator, Frequency AN/USM-205A.
(2) Voltmeter, Electronic ME-202/U.

b. Test Connctions. Interconnect equipment as shown in figure 7-3.

c. Procedure. Perform procedures in table 7-9.

Table 7-9. AC Amplifier Output Test

step no.	Control Test equipment	Setting Equipments	Test procedure	Performance standard
1	AN/USM-205A: FREQUENCY: 1 RANGE: X1K OUTPUT ATTENUATOR: 1 volts ME-202/U: MODE: AC RANGE: 1	RANGE: l volt	a Apply the 1 volt, 1 KHz signal to INPUT jack of MKE-30F/U. b Adjust output of AN/USM-205A for full scale deflection on ME-30F/U. c. Measure voltage at AC OUTPUT terminal on rear of ME-30 F/U with ME-202/U.	ME-202/U should indicate with full scale deflection ME-30F/U, 150 mv ±10%.
2	Same as 1 above, except OUTPUT ATTENUATOR .03 through .1 volts.	RANGE: .03 through 3 volts	Measure voltage at AC output terminal on rear of ME-30F/U with ME-202/U for each position of the RANGE switches.	Same as 1 above

7-23. DC Output Test

a. Test Equipment and Materials.

(1) Generator, Frequency AN/USM-205A.
(2) Voltmeter, Electronic ME-202/U.

b. Test Connection. Interconnect equipment as shown in figure 7-3.

c. Procedure. Perform procedures in table 7-10.

Table 7-10. DC output Test

Step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performance standard
N/A	AN/USM-205A: Frequency: 1 Range: X1K Output Attenuator 1 volt	Range: 1 volt	a. Apply a 1 volt, 1 KHz signal to INPUT terminal on front panel of ME-30F/U as determined by reading on ME-202/U. b. Measure voltage at DC OUTPUT + terminal on rear of ME-30F/U with ME-202/U.	Voltage reading on ME-202/U with full scale deflection on ME-30F/U shall be 1 ±0.05 volts

7-24. Meter Tracking Test (ME-30F/U only)

a Test Equipment and Materials.

(1) Generator, Frequency AN/USM-205A.

(2) Voltmeter, Electronic ME-202/U.

b. Test Connection Interconnect equipment as shown in figure 7-2.

c. Procedures. Perform procedures in table 7-11.

Table 7-11. Meter Tracking Test (ME-30F/U only)

step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performance standard
1	AN/USM-205A: FREQUENCY: 1 RANGE: X1K OUTPUT ATTENUATOR: 1 Volts	RANGE: 1 volt.	Apply a 1 volt, 1 khz signal to INPUT terminal on front panel of ME-30F/U as determined by reading on ME-202/U.	Meter reading on ME-30F/U shall be full scale deflection.
2	Same as above	same as above	Decrease the voltage level of the input signal in 0.1 volt steps from 1 to 0.1 volts and record ME-30 F/U reading.	The meter reading on ME-30F/U shall track with the input voltage within ±1%.

7-25. Meter Tracking Test (AN/USM-265A only)

a *Test Equipment and Materials.*

(1) Generator, Frequency AN/USM-205A.

(2) Voltmeter, Electronic ME-202/U.

b. Test Connections. Interconnect equipment as shown in figure 7-2.

c. Procedures. Perform procedures in table 7-12.

Table 7-12. Meter Tracking Test (AN/USM-265A/U only)

step no.	Control Test equipment	Settings Equipments under test	Test procedure	Performances standard
1	AN/USM-205A: FREQUENCY: 1 RANGE: X1K OUTPUT ATTENUATOR: 1 Volts	RANGE: 1 volt	Apply a signal to cause a +2dB deflection on the AN/USM-265A.	ME202/U indicates between and .985 volts,
2	Same as above	Same as above	Apply signal to cause: 0dB deflection -2dB deflection -4dB deflection -6dB deflection -8dB deflection -l0dB deflection	.764 to .795 volts .605 to .625 volts .478 to .499 volts .378 to .408 volts .298 to .318 volts .235 to .255 volts

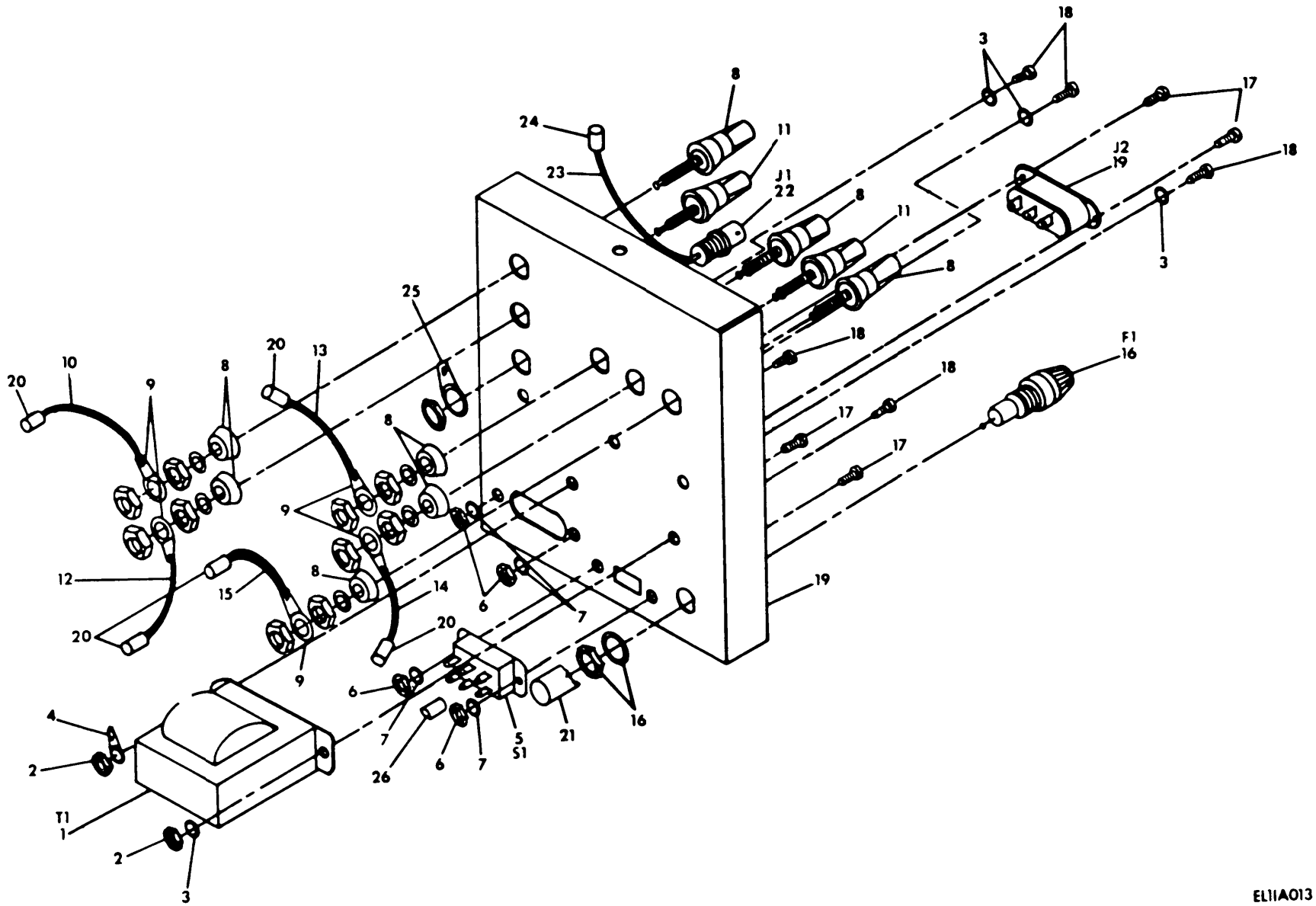


Figure 7-4. Chassis assembly, parts location diagram.

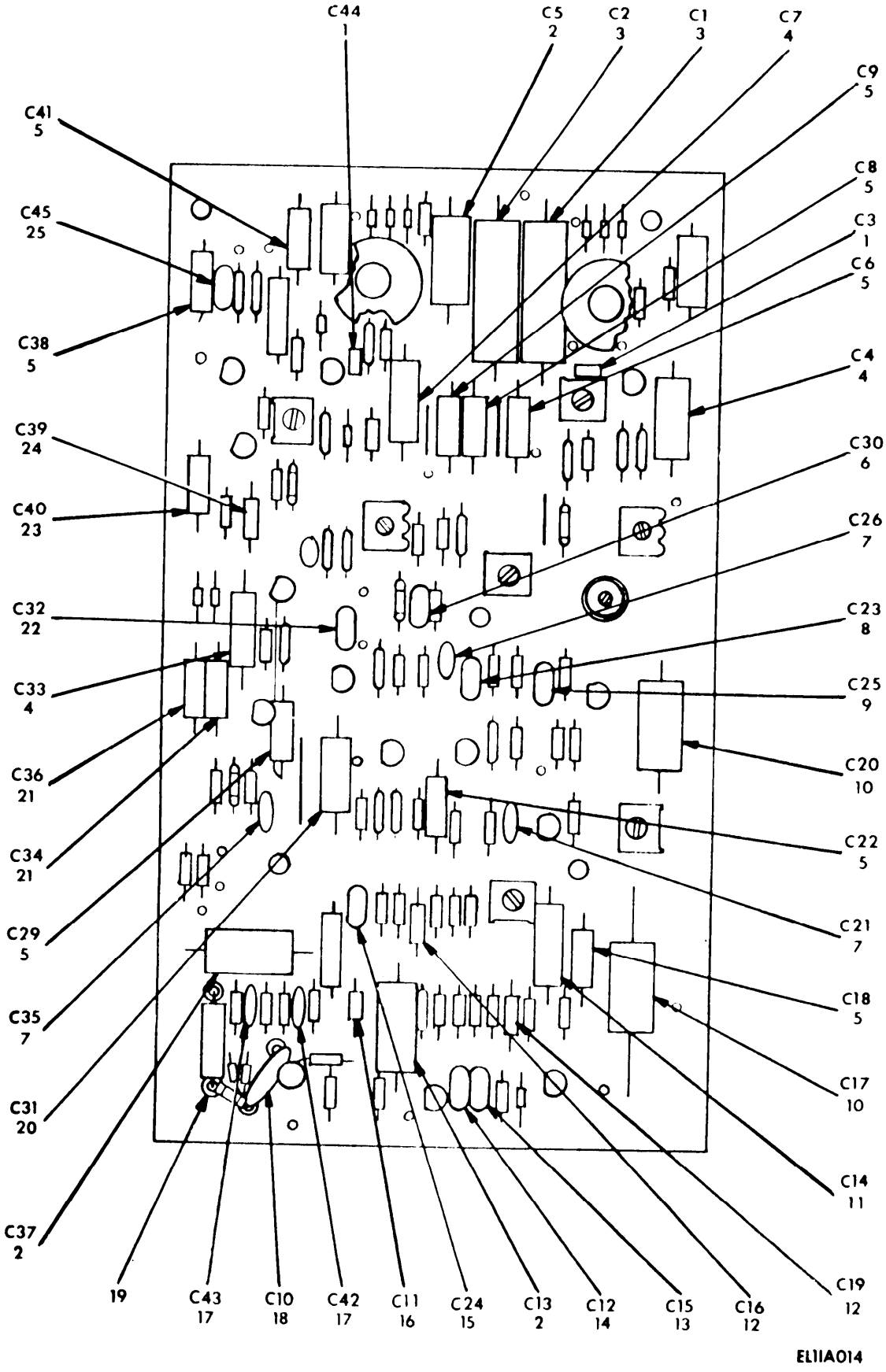


Figure 7-5. Circuit board assembly A2, capacitor location diagram.

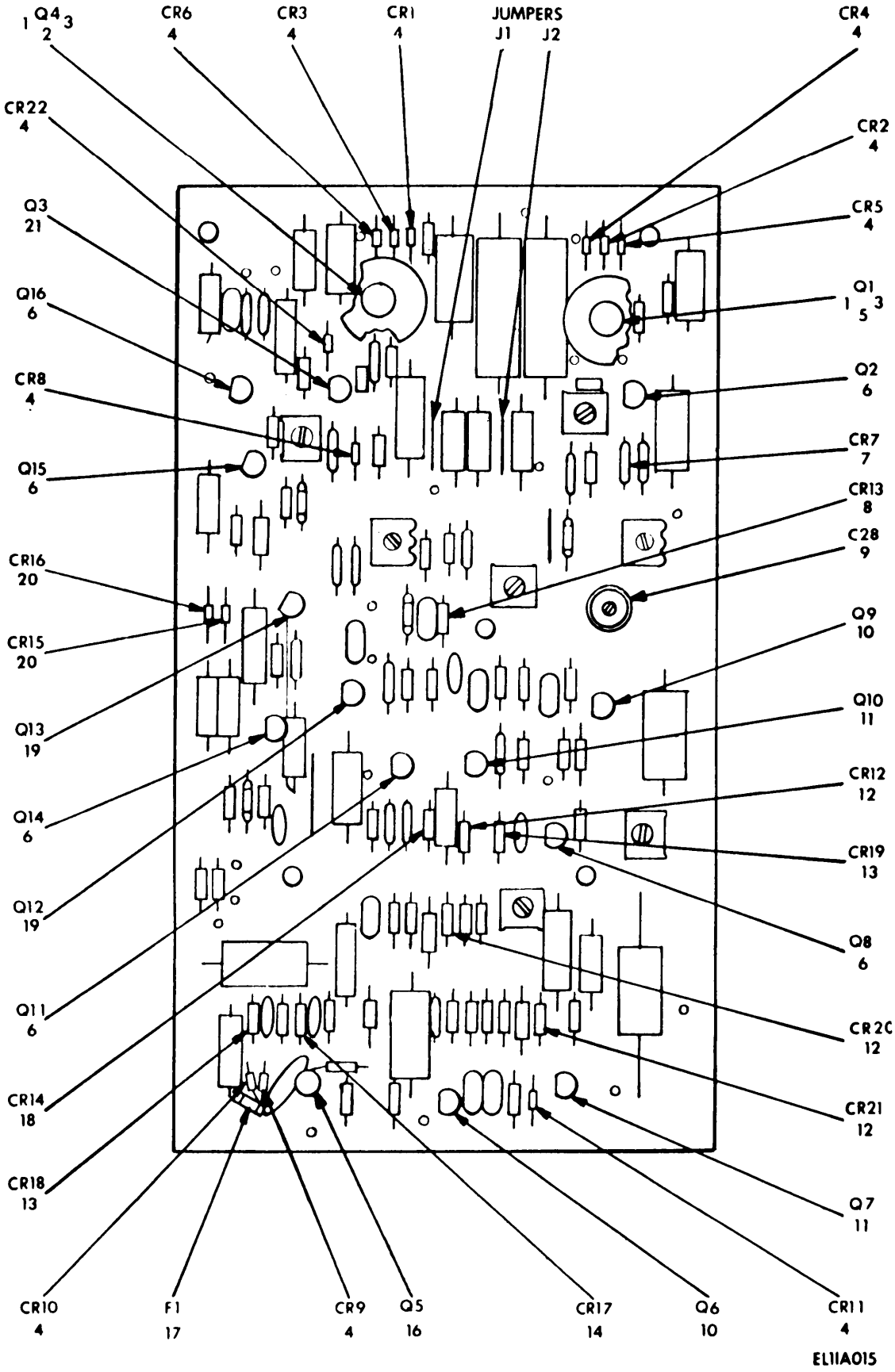


Figure 7-6. Circuit board assembly A2, transistor and diode location diagram.

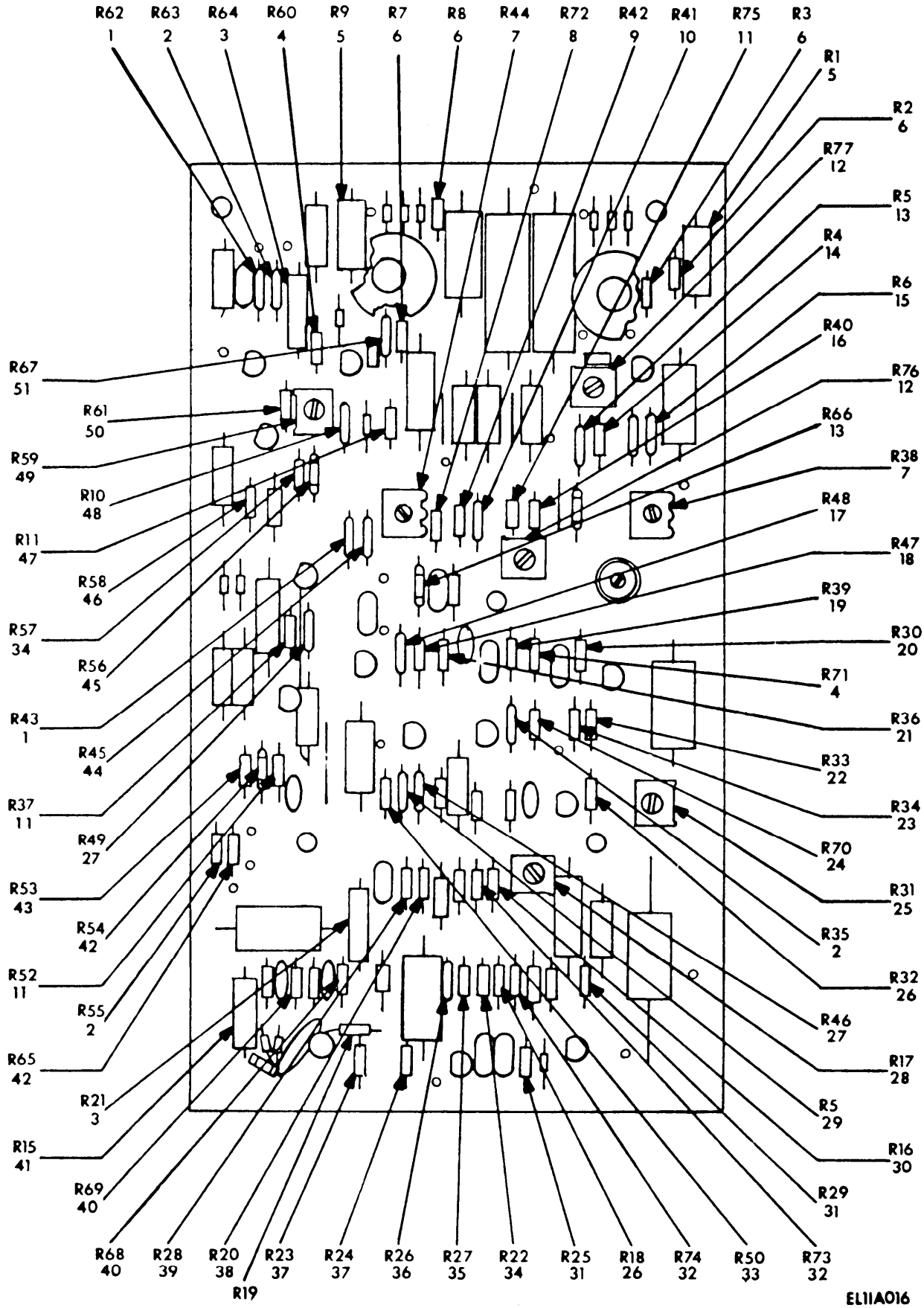


Figure 7-7. Circuit board assembly A2,. resistor location diagram.

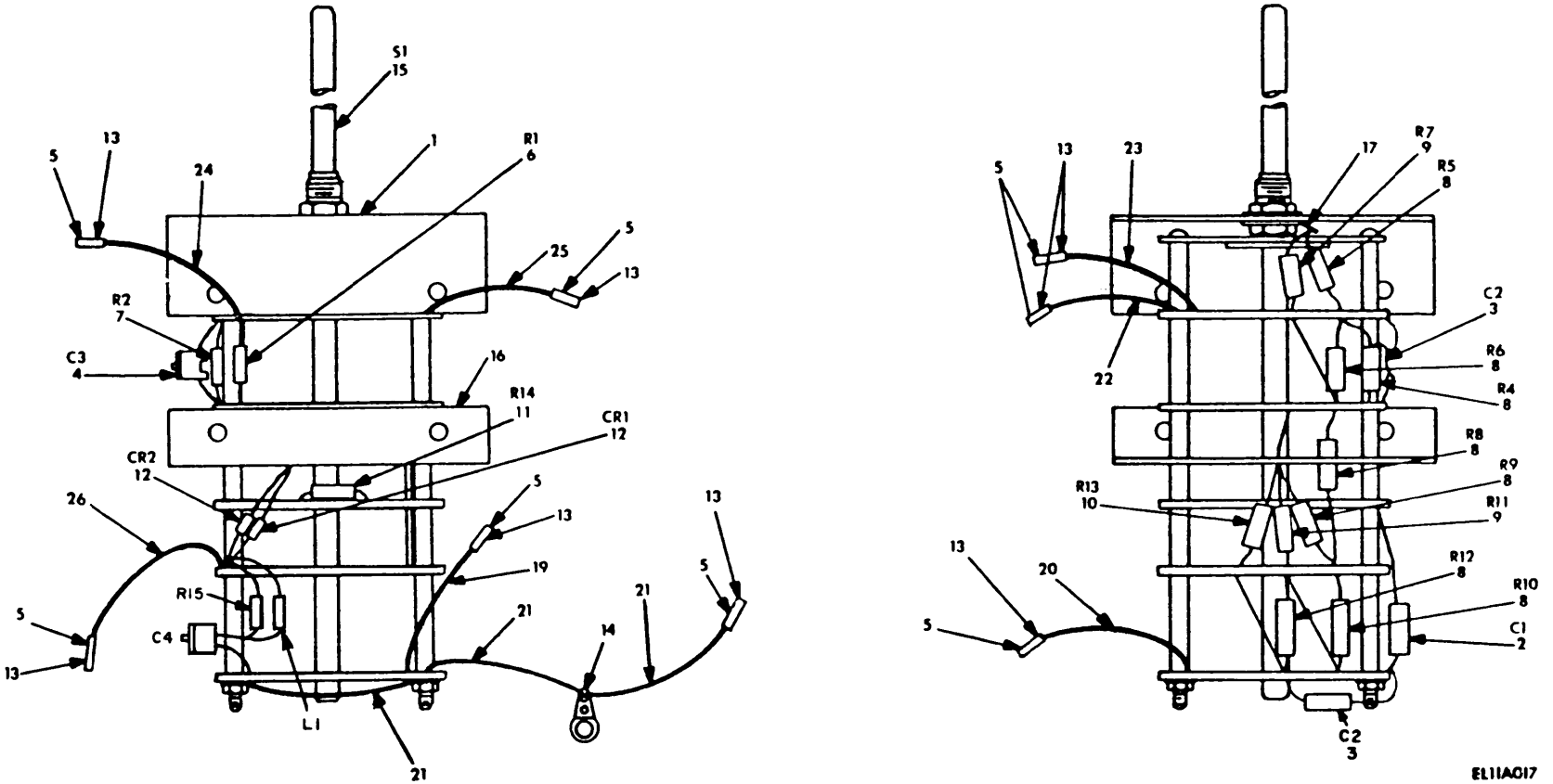


Figure 7-8. Range switch assembly A3, parts location diagram.

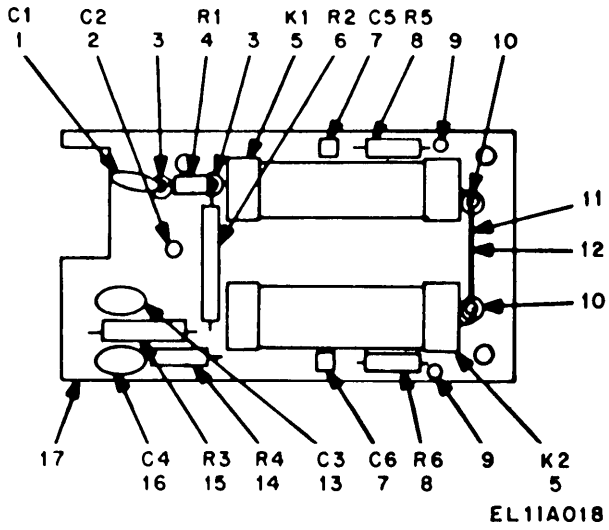


Figure 7-9. Input attenuator circuit board parts location diagram

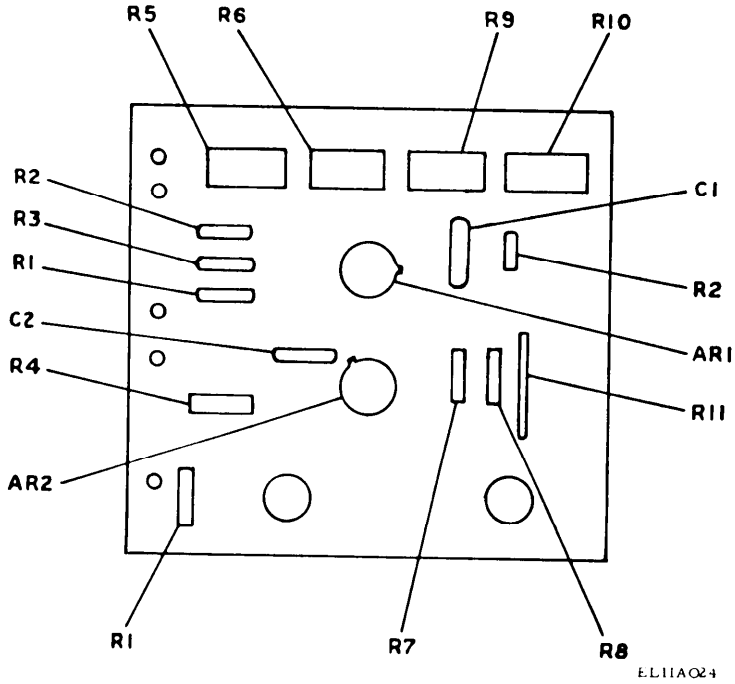


Figure 7-10. Meter board AS, parts locution diagram. (AN/USM-265A only

APPENDIX A
REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	US Army Equipment Index of Modification Work orders.
SB 38-100	Preservation, Packaging, Packing, and Marking Materials, Supplies and Equipment Used by the Army.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters.
TM 11-6625-366-15	Operator's Organizational, DS, GS, and Depot Maintenance Mannual. Multimeter TS-35B/U.
TM 11-6625-537-15	Operator, Organizational, Field, and Depot Maintenace Manual: Voltmeter, Electronic ME-202/U.
TM 1l-6625-539-15-1	Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools List: Test Set, Transistor TS-1836A/U.
TM 11-6625-1703-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool List: Oscilloscope AN/USM-281A.
TM 38-750	The Army Maintenance Management Systems (TAMMS).

APPENDIX C
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations for the ME-30F/U. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

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

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

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

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

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

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

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

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

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system. This function does not include the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

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

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

C-3. Column Entries

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

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

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

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity or' the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime": figure will be shown for each category. The number of man-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. If an intermediate facility (L) is not available, this category of maintenance will be accomplished at depot. If an intermediate facility (L) has been designated, the maintenance information required to perform this category of maintenance will be provided in the DMWR. Subcolumns of column 4 are as follows:

C ..... Operator/crew
O. . . . . Organizational
F ..... Direct support
H ..... General support
D ..... Depot

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

C-4. Tool and Test Equipment Requirements (Table 1)

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

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

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

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

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

SECTION II MAINTENANCE ALLOCATION CHART
FOR
VOLTMETER ELECTRONIC, ME-30F/U AND AN/USM-265A

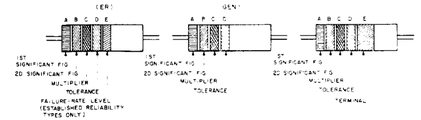
(1) GROUP NUMBER	(2) COMPONENT\ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
01	VOLTMETER ELECTRONIC ME-30F/U	Inspect		0.5				visual	
		Test		1.0				only	
		Service		0.5				1, 9	
		Replace		0.5				9	
		Test				1.0		9	
		Repair				2.0		2 thru 8	
		Rebuild					2.0	2 thru 8	
								2 thru 8	

TABLE 1 TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

VOLTMETER, ELECTRONIC, ME-30F/U AND AN/USM-265A

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	0	MULTIMETER AN/URM-105	6625-00-999-6282	
2	H,D	MULTIMETER TS-352B/U	6625-00-553-0142	
3	K,D	GENERATOR, SIGNAL AN/USM-205	662%00-788-9672	
4	H,D	VOLTMETER, ELECTRONIC ME-202/U	6625-00-050-8686	
5	H,D	0SCILLOSCOPE AN/USN-281C	6625-00-106-9622	
6	H,D	TEST SET , TRANSISTOR TS-1836B/U	6625-00-168-09511	
7	H,D	TRANSFORMER, VARIABIE , POWER CN-16/U	5950-00-235-2086	
8	H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
9	0	TOOL AND TEST EQUIPMENT AVAILABLE TO THE REPAIRMENT USER BECAUSE OF HIS ASSIGNED MISSION .		

INDEX



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS

TABLE 1
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP TYPE ONLY)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8							
WHITE	9	WHITE	9	SILVER	0.01					
				GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, TWO BAND WIDTHS (APPROXIMATELY 1½ TIMES THE WIDTH OF OTHER BANDS) AND INDICATES TYPE OF TERMINAL.

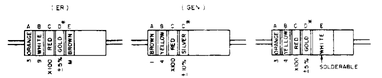
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODES.)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE

2R7 = 2.7 OHMS 10RO = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS, COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 400 OHMS
RESISTANCE TOLERANCE ±10%

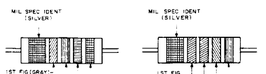
NOMINAL RESISTANCE 3400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



(A) 8.2UH ± 10%

(B) 330 UH ± 5%

COLOR CODING FOR TUBULAR ENCAPSULATED R.F CHOKES. AT A, AN EXAMPLE OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330UH INDUCTOR ARE ILLUSTRATED

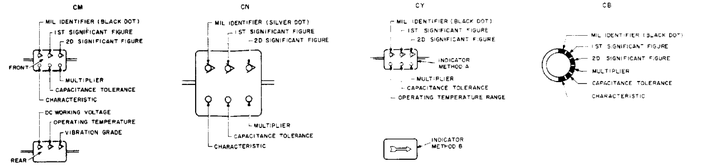
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F CHOKES.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB



MICA-DIELECTRIC

PAPER-DIELECTRIC

GLASS-DIELECTRIC, GLASS CASE

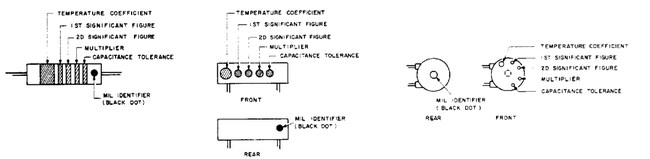
MICA, BUTTON TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE				CHARACTERISTIC				DC WORKING VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CY	CM	CK, CM	CM
BLACK	CM, CY, CB	0	0	1			±20%	±20%	A					−55°C to +70°C	10-55Hz
BROWN		1	1	10					B	E	B				
RED		2	2	100	±2%		±2%	±2%	C					−55°C to +85°C	
ORANGE		3	3	1,000	±30%								500		
YELLOW		4	4	10,000					E					−55°C to +25°C	10-2,000CPS
GREEN		5	5		±5%								500		
BLUE		6	6											−55°C to +150°C	
PURPLE (VIOLET)		7	7												
GRAY		8	8												
WHITE		9	9												
GOLD				0.1			±5%	±5%							
SILVER	CN			0.01	±10%		±10%	±10%							

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFF CIENT [4]	1ST SIG FIG	2D SIG FIG	MULTIPLIER [1]	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±0.02 UUF	CC
BROWN	−30	1	1	10	±1%		
RED	−80	2	2	100	±2%	±0.25 UUF	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		±5%	±0.5 UUF	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

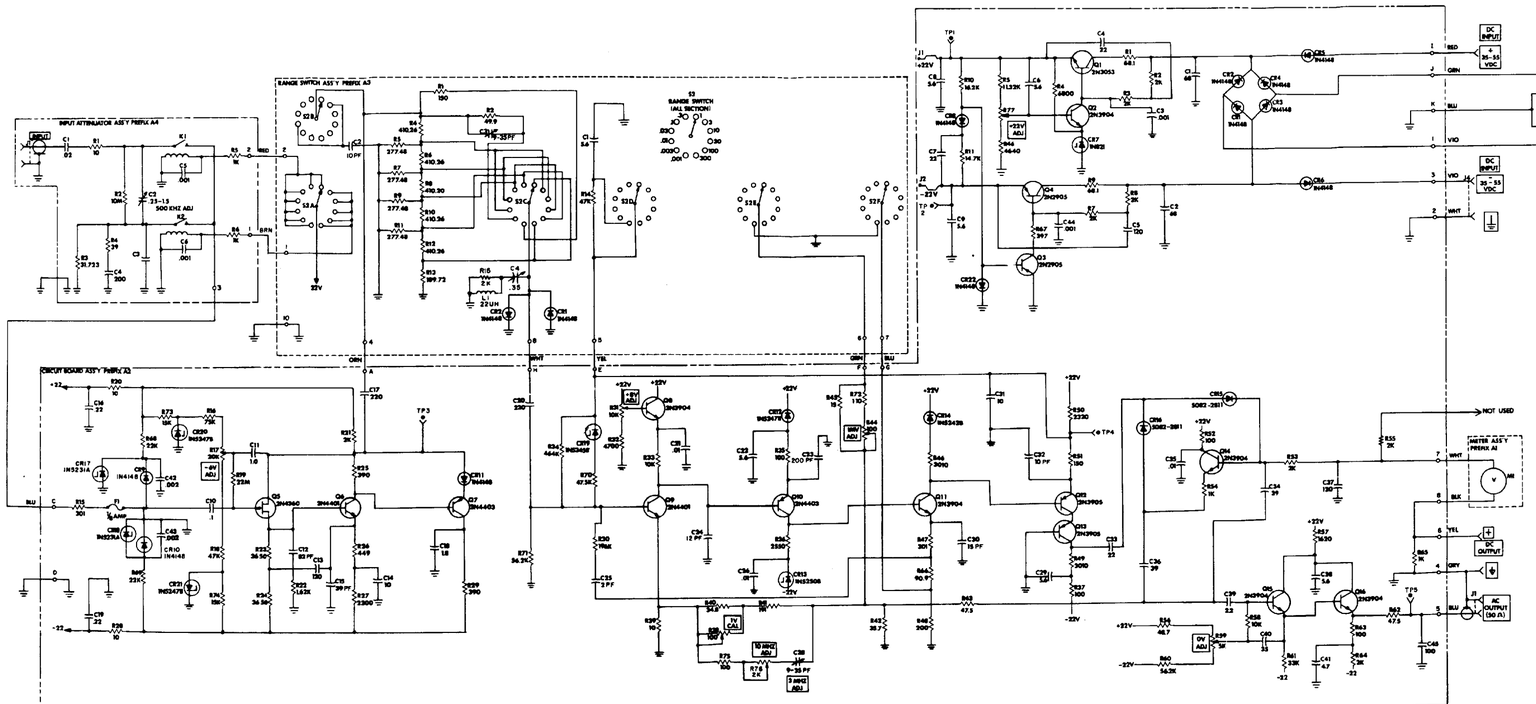


1. THE MULTIPLIER IS THE NUMBER BY WHICH THE TWO SIGNIFICANT (SIG) FIGURES ARE MULTIPLIED TO OBTAIN THE CAPACITANCE IN UUF.
2. LETTERS INDICATE THE CHARACTERISTICS DESIGNATED IN APPLICABLE SPECIFICATIONS MIL-C-3, MIL-C-250, MIL-CHR12728, AND MIL-C-11015OC RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.
* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

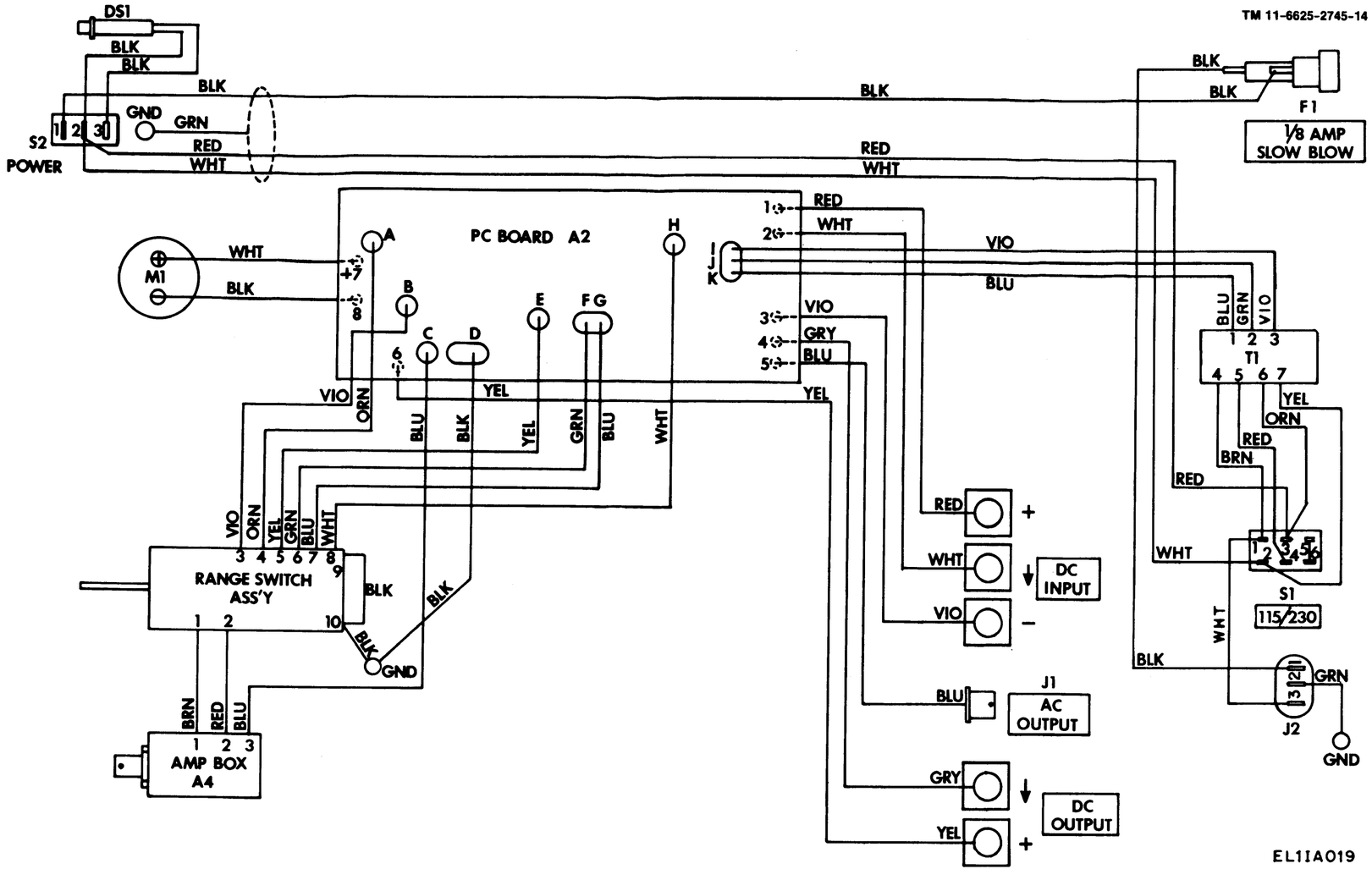
C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

ESC-FM 913.73

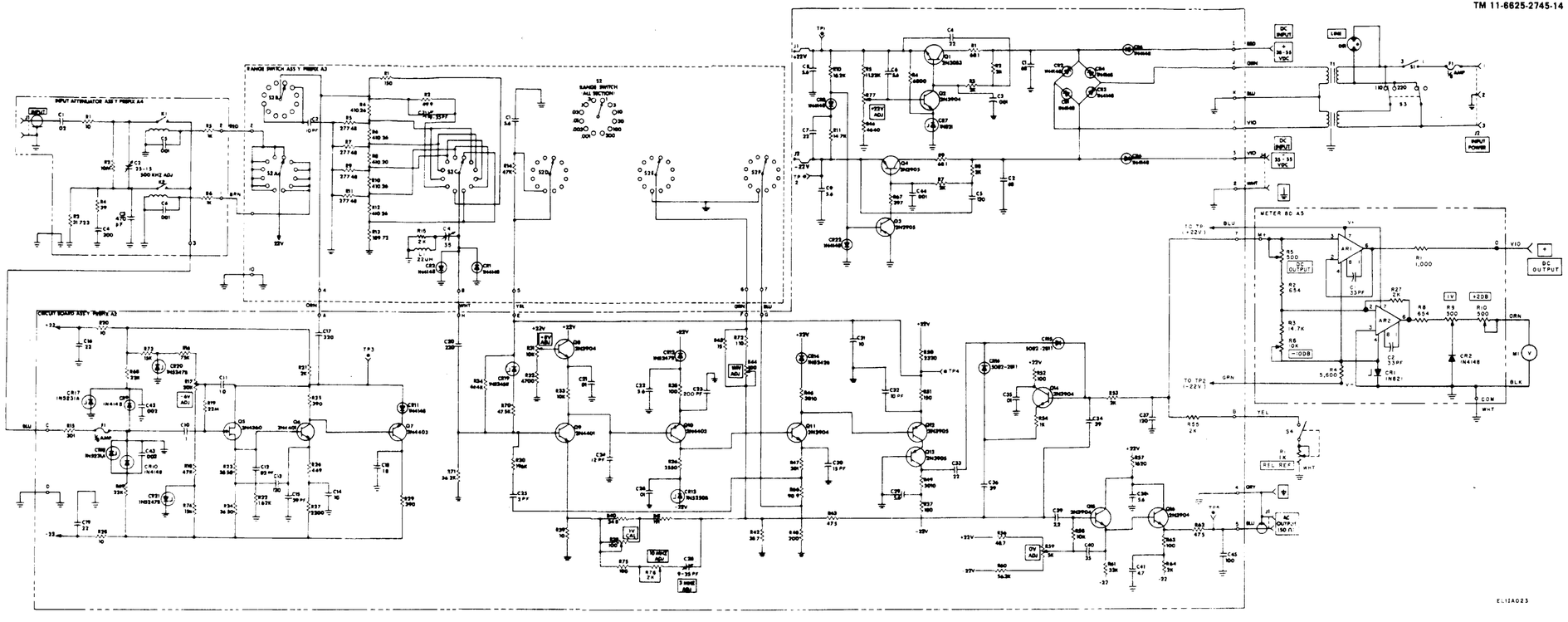
FO-1. Color code markings for MIL-STD resistors, inductors, and capacitors.



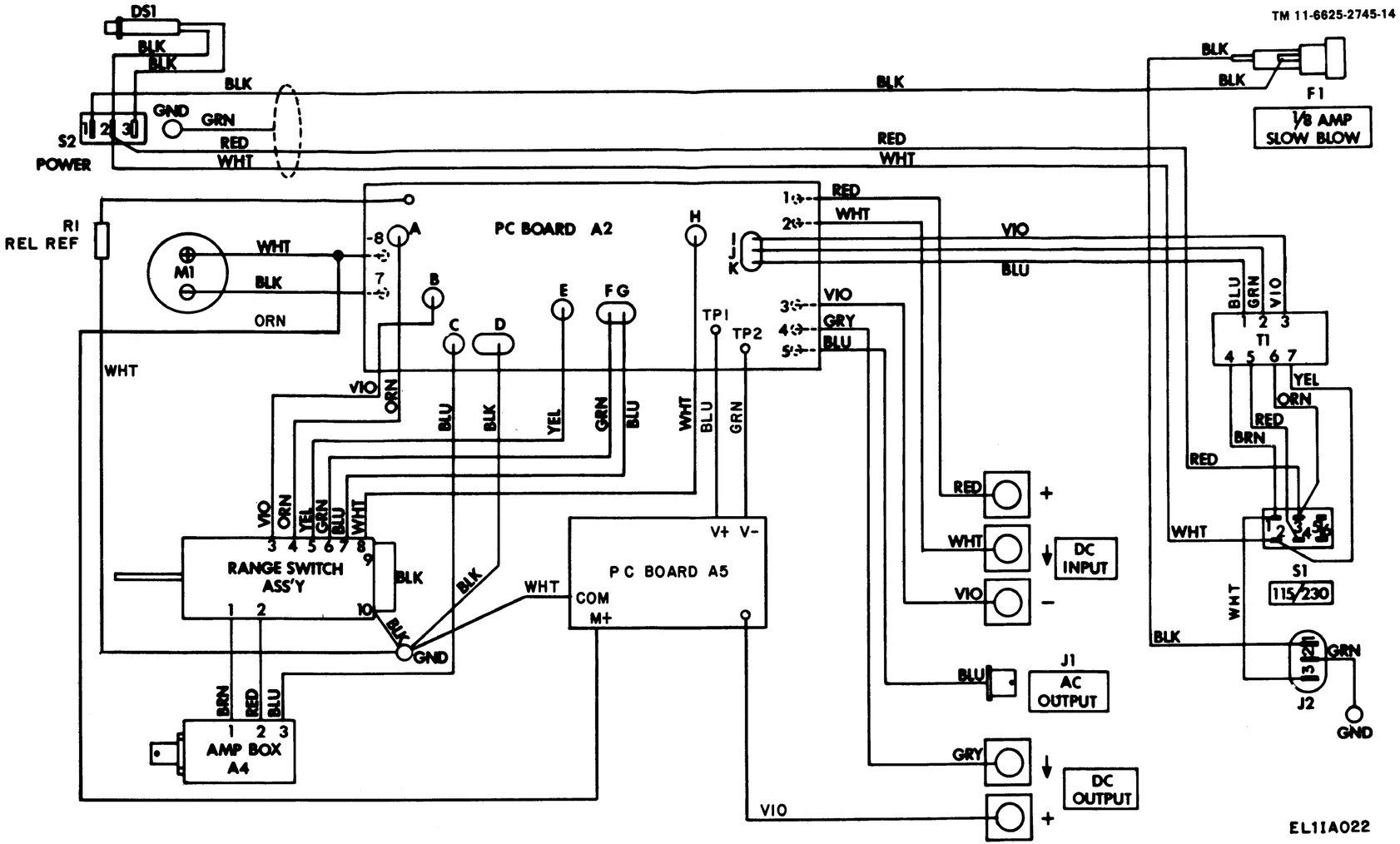
FO-2. Voltmeter, Electronic ME-30F(U), schematic diagram.



FO-3. Voltmeter, Electronic ME-30F/U, wiring diagram.



FO-4. Voltmeter, Electronic AN/USM-265A, schematic diagram.



FO-5. Voltmeter, Electronic AN/USM-265A, wiring diagram.

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:
PAUL T. SMITH
Major General, United States Army
The Adjutant General

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USAERDAW (1)

NG: None

USAR: None

For explanation of abbreviations used see, AR 310-50

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