

TM 9-9505-2-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

ORDNANCE MAINTENANCE

MEGACYCLE METER

8898466



*HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1959*

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the use of personnel responsible for field and depot maintenance of megacycle meter 8898466, hereinafter referred to as the grid dip meter (fig. 1). This manual does not contain information which is intended primarily for the using organization, since such information is available to ordnance maintenance personnel in the pertinent operator technical manual.

b. This manual contains description and theory of operation of the grid dip meter. It also describes troubleshooting procedures, disassembly, repair, and assembly instructions for the grid dip meter. The instructions in this manual are intended for maintenance specialists who have been trained in electronics maintenance practices and have had previous experience in performance testing and alignment and adjustment procedures on similar types of equipment.

c. The appendix contains a list of current references, including supply manuals, technical manuals, and other available publications applicable to the grid dip meter.

d. Operation, lubrication, and all maintenance operations allocated to using organizations in performing maintenance work within their scope for the grid dip meter are contained in the pertinent operation manuals for the system with which the grid dip meter is used. Refer to the appendix.

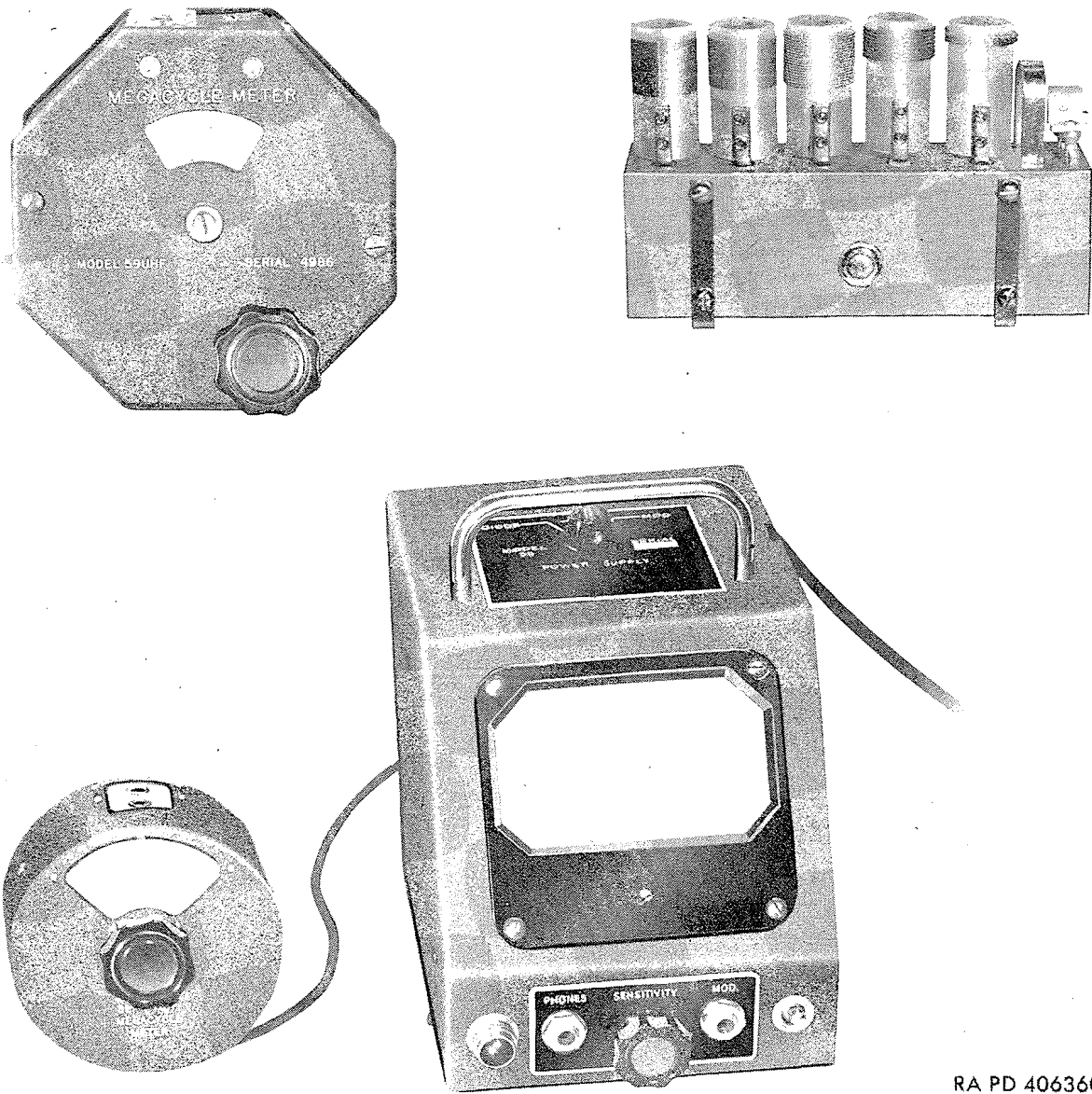
e. Errors or omissions in this manual will be brought to the attention of the Commander, U. S. Army Ordnance Missile Command, Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala., ATTN: ORDXR-FMPT, using DA Form 468 (Unsatisfactory Equipment Report).

2. Field and Depot Maintenance Allocation

The repair and rebuild instructions for the grid dip meter have been divided into separate field maintenance and depot maintenance chapters. In general, field maintenance responsibilities prescribed in this manual are directed by the allocation of maintenance parts listed in the applicable section of Department of the Army Supply Manual ORD 8 SNL J-739 and tools listed in Type 4 SNL J-29. Depot maintenance prescribed in chapter 8 covers rebuild and rewiring of the grid dip meter. Instructions for depot maintenance are to be used by maintenance companies in the field only when the tactical situation makes the repair function imperative. Provisions of parts listed in the depot stock guide column of the applicable section of ORD 8 SNL J-739 will be made to field maintenance personnel only when the emergency nature of the maintenance to be performed has been certified by a responsible officer of the requisitioning organization.

3. Forms, Records, and Reports

a. *General.* Responsibility for the proper execution of forms, records, and reports rests upon the commanding officers of all units maintaining this equipment. However, the value of accurate records must be fully appreciated by all persons responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity, and condition of materiel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of using personnel and for delivery of materiel requiring further repair to ordnance shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the prog-



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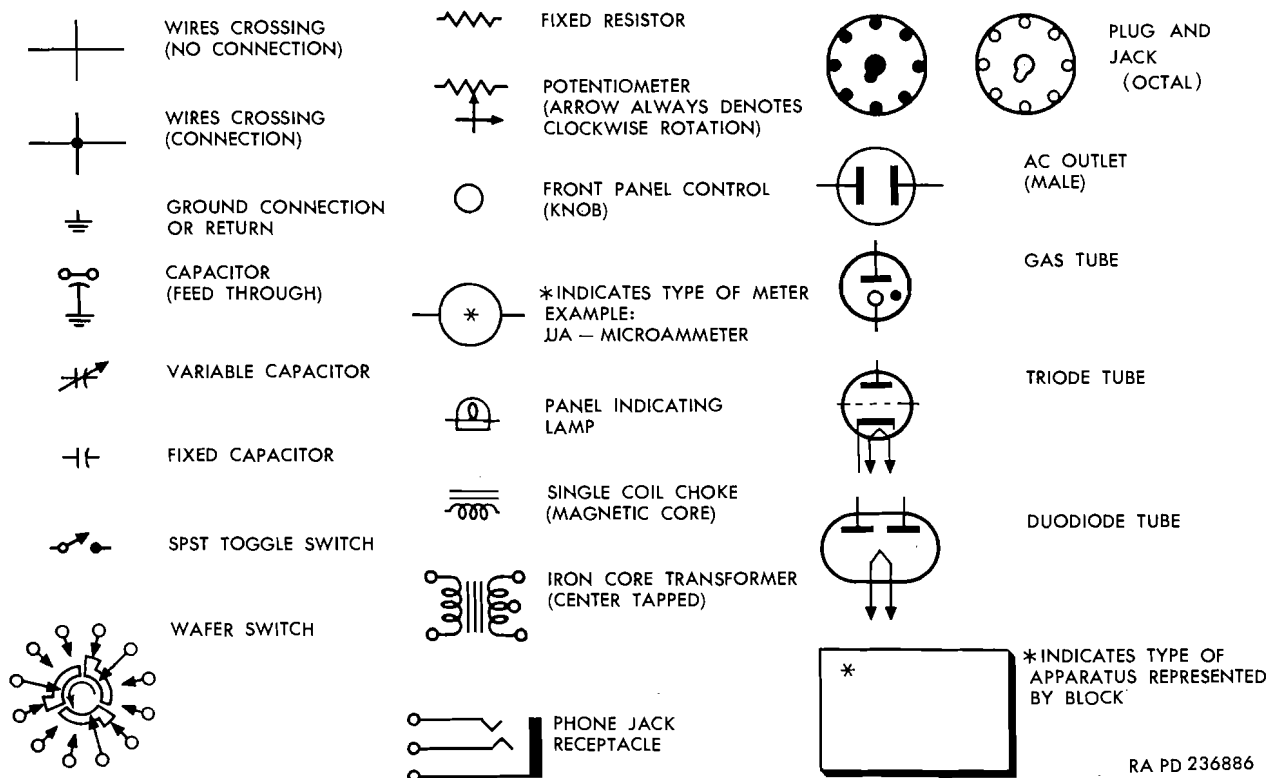
Figure 1. Megacycle meter (grip dip meter) 8898466.

ress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units maintaining this materiel are listed in the appendix. For a current and complete listing of all forms, refer to DA Pam 310-2. For instructions on the use of these forms, refer to FM 9-10. Additional forms applicable to the using personnel are listed in the operator's manual.

c. Field Report of Accidents. The reports necessary to comply with the requirements of the Army safety program are prescribed in detail in AR 385-40. These reports are required whenever accidents involving injury to personnel or damage to materiel occur.

d. Report of Unsatisfactory Equipment or Materials. Any deficiencies detected in the equipment covered in this manual, which occur under the circumstances indicated in AR 700-38, should be immediately reported in accord-



RA PD 236886

Figure 2. Schematic symbols.

ance with the instructions in the cited regulation.

4. Symbols and Reference Designations

A knowledge of schematic symbols, test point symbols, functional symbols, and reference designations is essential for the full utilization of diagrams and illustrations in this manual.

a. Schematic Symbols. So far as is practicable, standard electrical and electronic symbols are used to represent electrical and electronic elements as designated on a schematic diagram. Figure 2 shows the symbols used in the schematic diagrams contained in this manual.

Note. The standard practice of using the Greek letter μ to indicate micro (one-millionth) is followed in this manual.

b. Reference Designations. Reference designations are not to be confused with schematic or test point symbols. A system of reference designations is used for identifying electrical or electronic parts for assemblies or subassemblies. Reference designations are combinations of letters and numbers and are used in the drawings, diagrams, parts lists, and text of this manual. The reference letters indicate the type of part, such as resistor, amplifier, electron tube, etc. The reference number identifies the particular part. If, for example, five resistors, either identical or different, are used in an instrument, each is given a different number. The reference designation thus identifies and locates the part.

Section II. GENERAL DESCRIPTION OF GRID DIP METER

5. Description

a. The grid dip meter is a general purpose high-frequency measuring device. It consists of two units, an oscillator unit and a power

supply unit. The oscillator unit may be either a high frequency (2.2 to 400 megacycles) unit or an ultra high frequency (430 to 940 megacycles) unit. Either oscillator unit may be used with the power supply unit.

b. The HF oscillator unit consists of a variable frequency oscillator which can also be operated as a diode detector and is housed in a round metal case. One of seven plug-in coils is attached to the HF oscillator unit during operation to provide the desired frequency range. The oscillator coils are stored in the rear of the power supply unit when not in use (fig. 1). The uhf oscillator unit (fig. 1) is housed in an octagonal metal case and uses only one oscillator coil permanently affixed to the unit. The oscillator and power supply units are interconnected by a short, flexible cable. The power supply unit contains a regulated power supply, ammeter circuit, and a source of modulation for the oscillator.

c. By following special operating procedures set forth in TM 9-9505-1-30 and TM 9-9505-1-45, the grid dip meter can be used with appropriate charts to calculate capacitance, inductance, mutual inductance, and Q factor.

d. The grid dip meter is supplied as an independent item of test equipment, and is also

supplied as a part of the following Type 4 electronic shop sets:

Truck-Mounted Electronic Shop AN/MPM-38

Truck-Mounted Guided Missile Test Station AN/MSM-12 (with uhf oscillator unit)

Semitrailer-Mounted Electronic Shops AN/MSM-21 and AN/MSM-26

Semitrailer-Mounted Electronic Shops AN/MSM-23 and AN/MSM-24

6. Differences Between Models

Two models of the grid dip meter are being procured, one with the HF oscillator unit and one with the uhf oscillator unit. The description and instructions in this manual apply to both models. Future modifications, if any, will be covered by DA MWO's. Refer to the current DA Pam 310-4 for any applicable DA MWO's published subsequent to the printing of this manual.

Section III. DATA

7. Physical Data

The grid dip meter is manufactured by Measurements Corporation of Boonton, N. J., and is identified by the manufacturer as model 59 or model 59UHF. The pertinent physical data is contained in table I (par. 8).

8. Electronic Data

The electronic data is contained in table II. The tube complement is contained in table III.

Table I. Physical Data

Characteristics	Uncrated		Crated
	Oscillator section	Power supply section	Both sections
Height	-----	6½ inches	9 inches
Width	-----	5½ inches	8 inches
Length	2 inches	7½ inches	13 inches
Diameter	3¾ inches	-----	-----
Weight	1 lb.	6½ lbs.	11 lbs.
Volume	89 cubic inches.	234 cubic inches.	936 cubic inches.

Table II. Electronic Data

Frequency range	2.2 mc to 400 mc
Frequency stability	±2% from 2.2 to 400 mc (940 mc with uhf oscillator unit).
Frequency ranges (in steps)	2.2 to 5 mc 5 to 10 mc 10 to 22 mc 22 to 45 mc 45 to 100 mc 100 to 250 mc 200 to 400 mc 430 to 940 mc (uhf oscillator unit).
Supply voltage	117 volts ac, 50/60 cycles
Power consumption	20 watts
Modulation:	
Internal	120 cps
External	20-volt rms for 30% modulation.

Table III. Tube Complement

Tube	Type	Function
V1	5Y3WGT	Rectifier
V2	OD3/VR150	Shunt regulator
V3	955	High frequency oscillator

CHAPTER 2

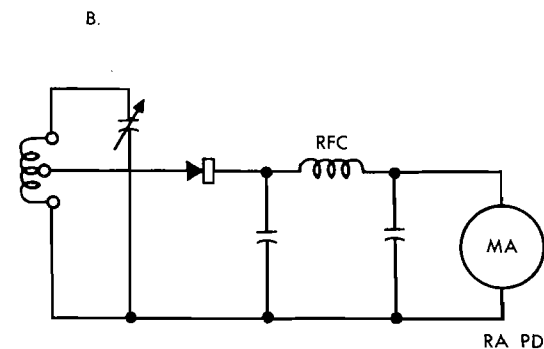
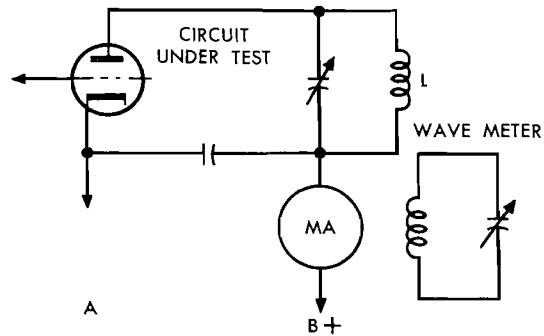
THEORY OF OPERATION

9. Measurement Problem

a. Electronic equipment using resonance circuits requires a means of measuring frequency. The simplest frequency measuring device is the absorption frequency meter (absorption wavemeter). A, figure 3, illustrates a typical absorption wavemeter coupled to a tank circuit. The milliammeter in the plate circuit of the unit under test serves as the indicating device. With the absorption frequency meter loosely coupled to inductor L, the plate current of the type in the unit under test increases slightly as the absorption wavemeter is tuned through the frequency of the circuit under test.

b. The elementary absorption wavemeter requires close coupling to the oscillating circuit to produce a plate current change sufficient to give visual indication on the milliammeter. A more sensitive absorption wavemeter is obtained by adding a rectifier and a dc meter to the elementary circuit as shown in B, figure 3.

c. In both of the absorption wavemeters described, the circuit under test must be operating with normal power applied. However, if the wavemeter is connected as a self-powered oscillator, measurements can be made with no power being applied to the circuit under test. In fact, only those components which make up the tuned portion of the circuit are required to obtain a resonant measurement. When a wavemeter is connected as a self-powered oscillator, it is commonly referred to as a grid dip meter. A grid dip meter is a simple vacuum tube oscillator to which a low-range milliammeter or microammeter is added to measure the oscillator grid current. The grid dip meter is so called because the grid current will decrease or "dip" as the oscillator is tuned through the frequency of the unknown circuit. The "dip" in grid current is observed because the circuit under test absorbs energy from the oscillator when both are tuned to the same fre-



RA PD238614

Figure 3. Absorption frequency meter.

quency. The loss of energy from the oscillator causes the feedback to decrease, and this in turn produces a decrease in grid current.

10. Functional Description of Major Components

a. The block diagram (fig. 4) illustrates the simplicity of the grid dip meter. The grid dip meter consists of a power supply unit and an oscillator unit. The meter used to indicate grid current is mounted on the power supply unit case.

b. The power supply (fig. 20) consists of a power transformer, a full-wave rectifier, a pi-type filter, and a gas-tube voltage regulator. The high-voltage output of the power transformer is rectified by tube V1. The output of tube V1 is filtered by a pi-type filter, consisting

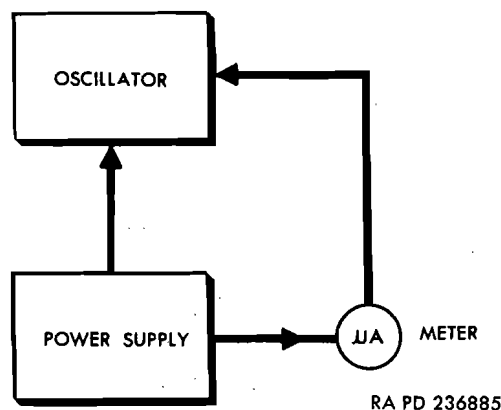


Figure 4. Grid dip meter, block diagram.

of reactor L1 and capacitors C1A and C1B, and applied to the voltage regulator. Switch S2 controls the mode of operation of the oscillator. Meter M1 indicates the grid current of oscillator tube V3.

c. The oscillator circuit is a modified Colpitts oscillator. Variable capacitors C5 and C6 provide a variable frequency output within the ranges of the seven plug-in coils used with the unit. Capacitors C3, C4, C5, C6, and one of the plug-in coils complete the tank circuit of the oscillator unit. A low-range microammeter is connected in series with the grid circuit to provide a visual indication of grid current. Variable resistor R6 on the power supply affects the grid bias of the oscillator tube, and controls the bucking current to the meter bridge circuit.

d. The null or zero beat of the grid dip meter can be determined by two means: a grid dip meter indication, or an audible click in a headset. When using a headset, the meter is disconnected by insertion of the headset plug in PHONES jack J2. The headset gives an audible click, not a continuous tone, as the grid dip meter is tuned through zero beat.

11. Detailed Circuit Operation

a. When the oscillator grid return circuit is connected through a milliammeter to ground (using PHONES jack J2), the swing of grid current is from 1.7 milliamperes with no load on the oscillator to 0.92 milliamperes with the oscillator at resonance with an external circuit. A meter capable of handling this range of current is not sensitive enough for practical application. Through the use of a bucking voltage,

a low-range meter (200 microamps) is used, thus realizing the full use of available grid current swing. This bucking voltage is provided by a meter bridge circuit. The meter bridge circuit is shown in simplified form in figure 5. When the grid dip meter is operated normally, with variable resistor R6 at full cw position, and a coil inserted in the oscillator section, but not tuned to resonance with an external circuit, point A of figure 5 is at -1.8 volts dc. This voltage is a direct result of oscillator grid current through point C to two parallel paths, resistor R7 and meter M1 in series, and variable resistor R6 to ground. Opposing this current is a positive voltage at point B.

b. Point B (fig. 5) is connected to $+150$ volts dc through a 270K resistor (R3) and to ground through variable resistor R6 in parallel with series-connected resistor R5 and meter M1. When R6 is at full ccw position, the voltage at point B is $+4.4$ volts dc. Variable resistor R6 can be adjusted to balance the two voltages at point C. When these voltages are exactly equal, they cancel and the meter reads zero. When R6 is adjusted to cause the meter to indicate full scale, the negative voltage is the higher voltage (greater grid current). Tuning the grid dip meter (coupled to an external circuit) to a "grid dip" will lower the value of grid current, thus lowering the grid voltages. The positive voltage is derived from a voltage regulated source, so that with R6 at a given point, the voltage at point B is stable. If the voltage at point A varies, the current through the A to C arm of the bridge will vary, and the meter will follow this current change. In this case as grid current decreases, the meter reading decreases. The voltages at point C always approach an equal but opposite value as the meter approaches a zero reading. When the grid dip meter is loosely coupled to the circuit under test, the change in grid current is slight. The use of a low-range microammeter allows indication of small grid current changes. The meter circuit remains the same in all three modes of operation in which the grid dip meter is used.

c. When the grid dip meter is operated in the DIODE position, the grid and plate of tube V3 are connected together. Figure 6 shows the

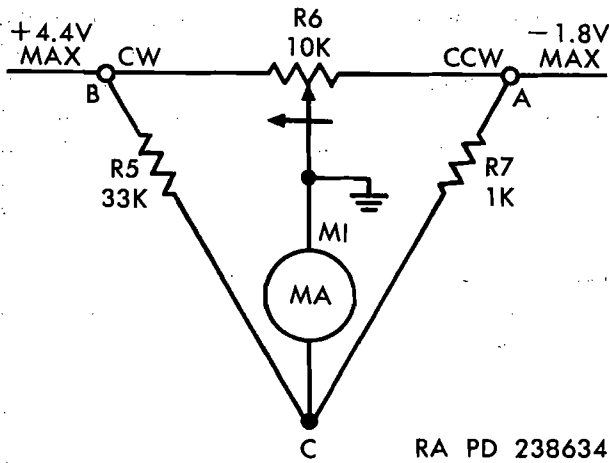
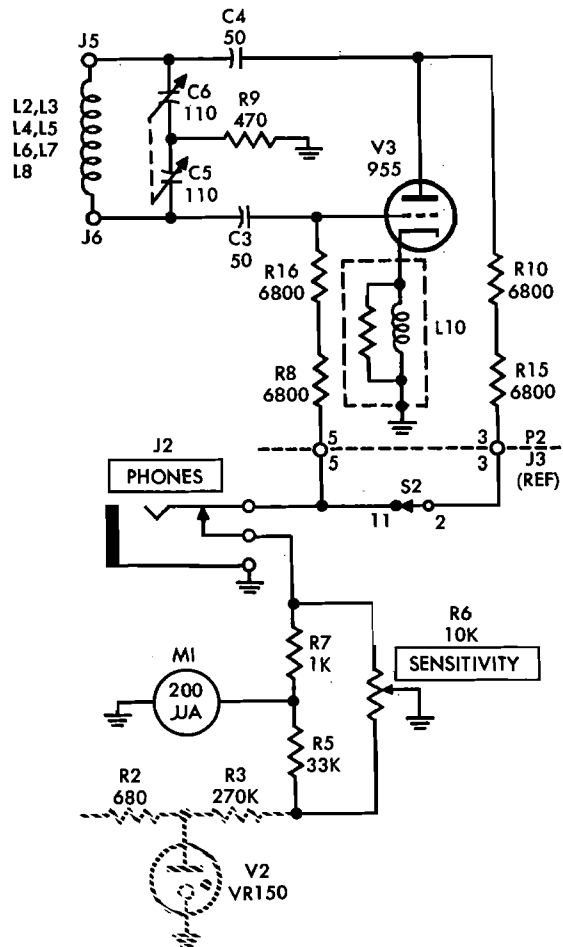


Figure 5. Meter bridge circuit, partial schematic.

simplified schematic with switch S2 in the DIODE position. The circuit in this condition is that of an absorption wavemeter with diode detector and meter indicator as described in paragraph 9b. The external circuit under test must have power applied.

d. In the CW position (fig. 7) selector switch S2 connects the plate circuit of tube V3 to the B+ supply. Tube V3 now functions as an rf oscillator, tunable over the ranges selected by the plug-in coils. The resonant circuit to which the grid dip meter is coupled now acts somewhat like an absorption-type wavemeter in that it absorbs power from the grid dip meter tank circuit. As power is absorbed from the grid dip meter, the plate-to-grid feedback is reduced, and in turn the grid current is decreased. When the grid dip meter and the external circuit are tuned to the same frequency, maximum power transfer occurs, and minimum grid current is drawn by tube V3 as indicated on meter M1.

e. Circuit operation of the grid dip meter in the MOD position (fig. 8) is identical with operation in the CW position, except that the oscillator is modulated by the 120 cps ripple voltage of rectifier tube V1. The ripple voltage is applied through capacitor C7, MOD jack



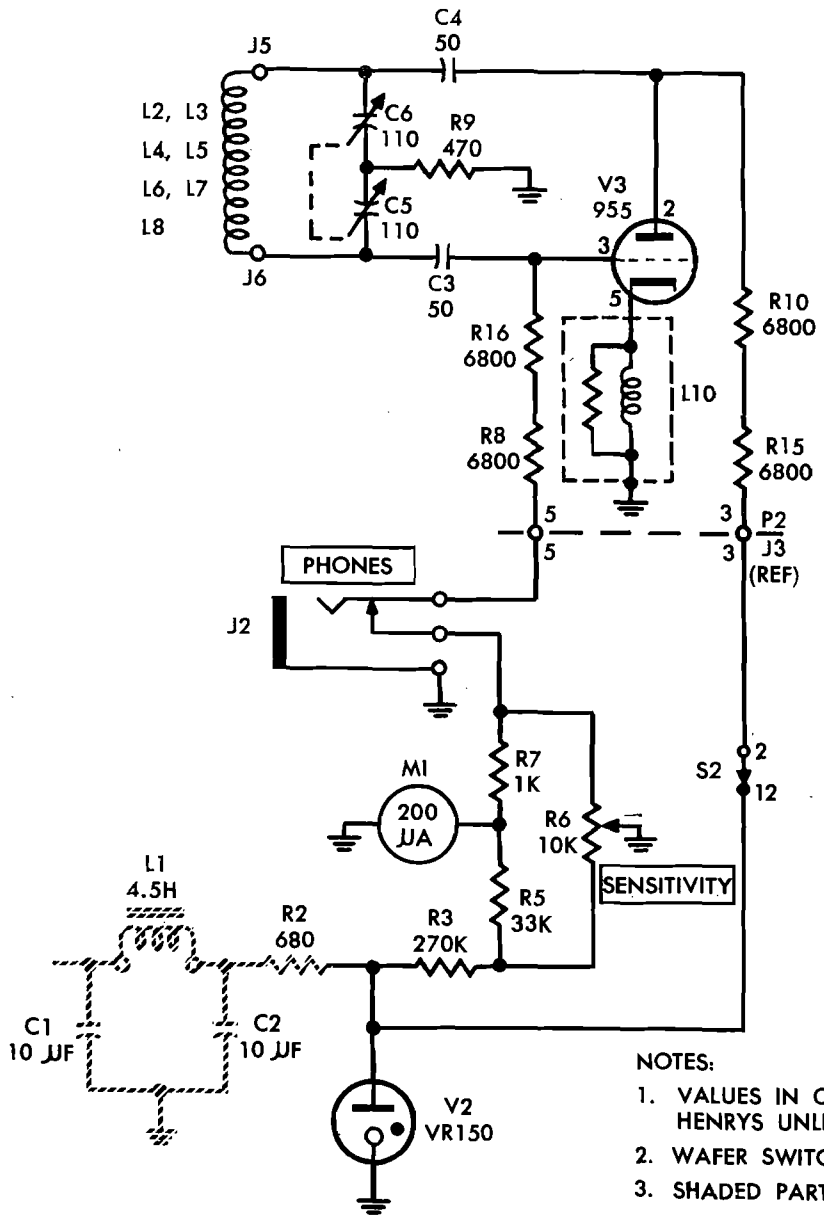
NOTES:

1. SHADED PARTS SHOWN FOR REFERENCE ONLY
2. VALUES IN OHMS, MICROMICROFARADS, AND HENRYS UNLESS OTHERWISE NOTED
3. WAFER SWITCH SHOWN IN POSITION USED ONLY

RA PD 238554

Figure 6. Diode position, simplified schematic.

J1, selector switch S2, and capacitor C8. An external audio signal can be applied to MOD jack J1 to modulate the grid dip meter. The internal modulating source is disconnected by the insertion of a plug into closed-circuit MOD jack J1.



- NOTES:
1. VALUES IN OHMS, MICROMICROFARADS, AND HENRYS UNLESS OTHERWISE NOTED
 2. WAFER SWITCH SHOWN IN POSITION USED ONLY
 3. SHADED PARTS SHOWN FOR REFERENCE ONLY

Figure 7. CW position, simplified schematic.

RA PD 238600

CHAPTER 3

PARTS, SPECIAL TOOLS, AND EQUIPMENT FOR FIELD AND DEPOT MAINTENANCE

12. General

Tools, equipment, and maintenance parts are supplied to ordnance direct support maintenance units and depots for maintaining and repairing the materiel covered in this manual.

13. Parts

Direct support maintenance parts and depot maintenance parts are listed in appropriate columns of the applicable section of Supply Manual ORD 8 SNL J-739, which is the authority for requesting replacements. Chassis-mounted electronic parts, and electronic parts for which the disassembly procedure is obvious, are identified in this manual on photographic illustrations. These parts are identified on the illustrations by reference designations only. For full descriptions, values, and part numbers for these parts, refer to the legend to the schematic diagrams (figs. 20 and 21). In each case where an ordnance part number is not available, the manufacturer's part number is used (par. 31c).

14. Common Tools and Equipment

Standard and commonly used tools and equipment having general application to this materiel are listed in Type 4 SNL J-29, section 3, and are authorized for issue by TA and TOE.

15. Special Equipment

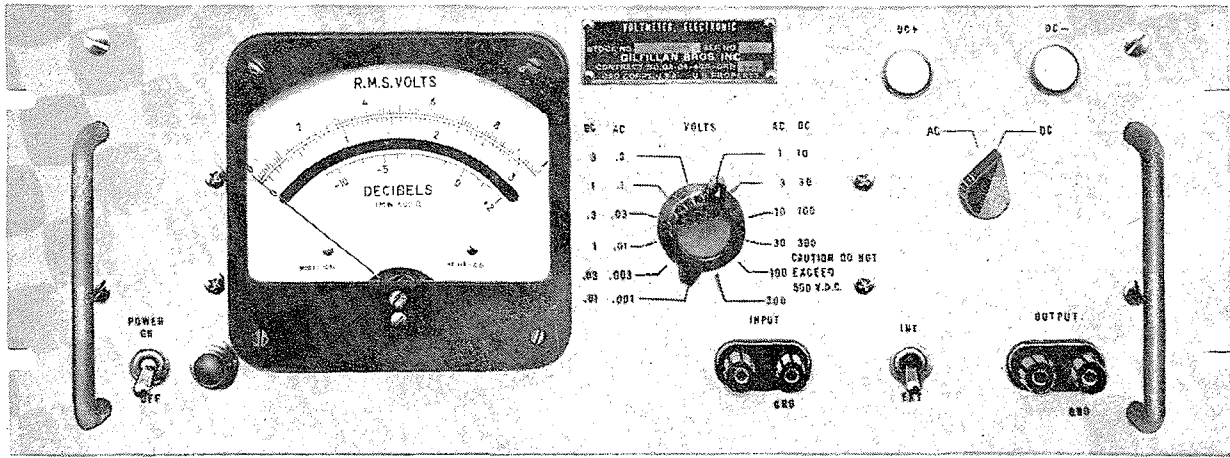
a. The special equipment tabulated in table IV is listed in Type 4 SNL J-29, section 3. This tabulation contains only the special equipment necessary to perform the operations described in this manual. It is included for information only, and is not to be used as a basis for requisitions.

Note. Type 4 SNL J-29, section 3, in addition to special equipment, also contains standard and commonly used tools and equipment specifically applicable to this materiel.

b. A description together with theory and maintenance for the special equipment tabulated in table IV is contained in the following technical manuals: electronic voltmeter ME-119/MPM-38 (8501933), TM 9-9508-4-35; frequency meter 8026531, TM 9-9504-6; and meter calibrator 8027828, TM 9-9504-41.

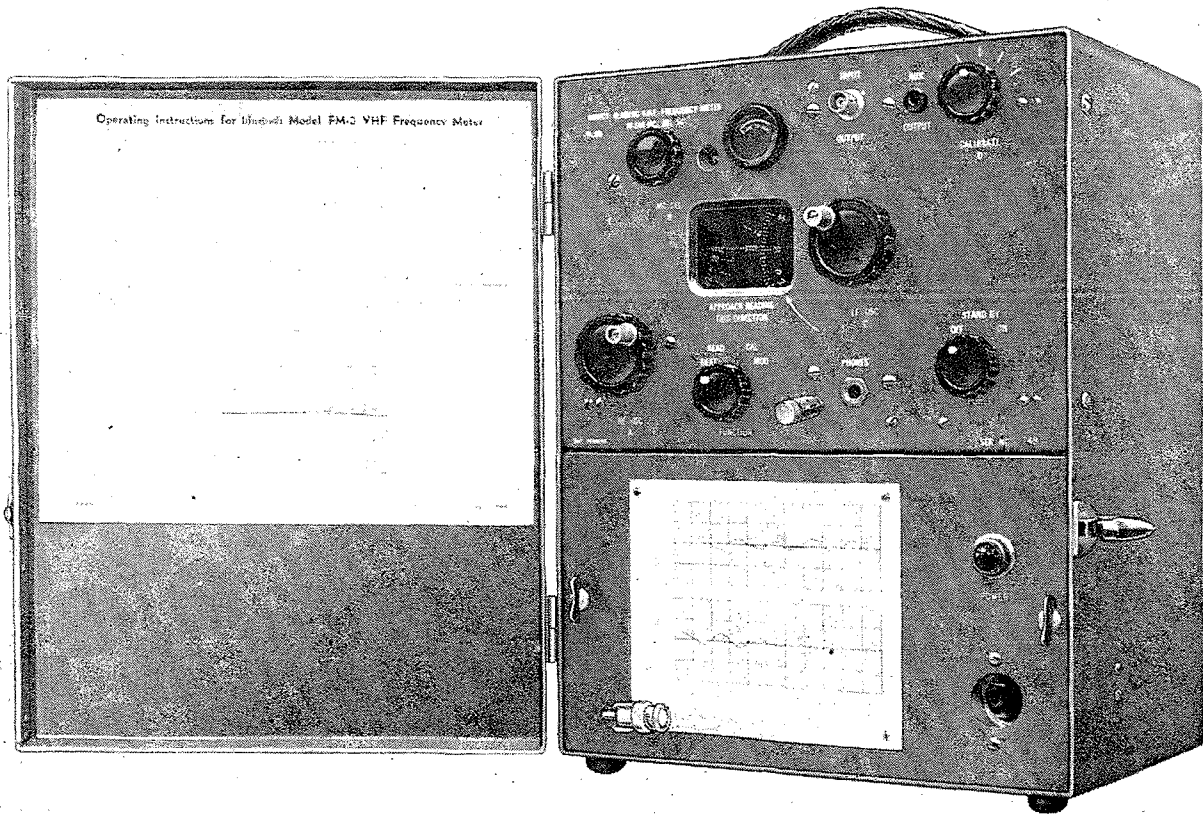
Table IV. Special Equipment

Item	Part No.	Fig.	Par.	Use
Electronic voltmeter ME-119/MPM-38 (VTVM)	8501933	9	15b	AC voltage measurement DC voltage measurement
Frequency meter (Gertsch Model FM-3)-----	8026531	10	15b	Frequency measurement
Meter calibrator (Kay Lab Model M30B1Z)-----	8027828	11	15b	Variable dc voltage



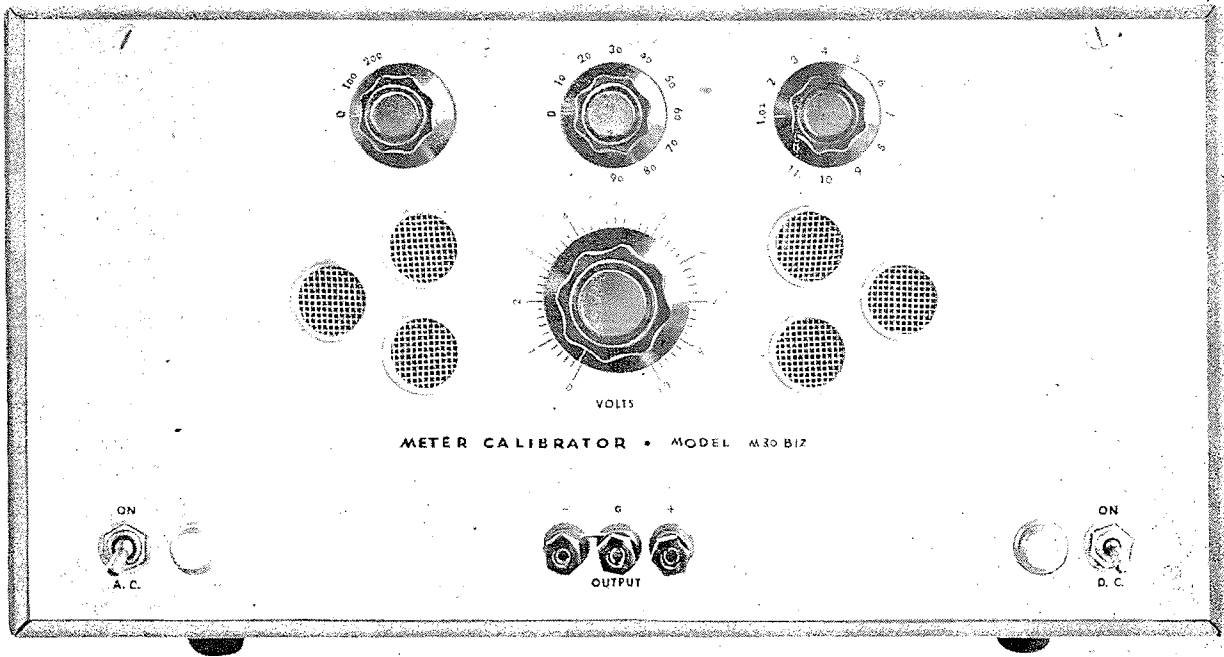
RA PD 236892

Figure 9. Electronic voltmeter ME-119/MPM (VTVM).



RA PD 236891

Figure 10. Frequency meter 8026531.



RA PD 236894

Figure 11. Meter calibrator 8027828.

CHAPTER 4 INSPECTION

Section I. GENERAL

16. Scope

This chapter provides specific instructions for the technical inspection of the grid dip meter by ordnance maintenance personnel. This chapter also defines the in-process inspection of materiel during repair or rebuild and the final inspection after repair and rebuild has been completed. Section II provides specific instructions for the technical inspection of the grid dip meter. Troubleshooting information is incorporated in chapter 5 and is a normal phase of inspection.

17. Purposes of Inspection

Inspection is primarily for the purpose of determining the condition of an item, for example, serviceable or unserviceable; recognizing conditions which would cause failure; assuring proper application of maintenance policies at prescribed levels; and determining the ability of a unit to accomplish its maintenance and supply mission.

18. Categories of Technical Inspection

In general, there are five categories of inspection performed by ordnance maintenance personnel.

a. Overall Inspection. This is an overall inspection performed periodically on all materiel. It is also performed on materiel received for repair in the field or depot maintenance shops. Upon completion of an inspection for serviceability, materiel will be declared either serviceable or unserviceable.

b. Preembarkation Inspection. This inspection is performed on materiel in the hands of maintenance personnel alerted for oversea duty to insure that such materiel will not become unserviceable or worn out in a relatively short time. It prescribes a higher percentage of

remaining usable life in serviceable materiel to meet a specific need beyond minimum serviceability.

c. In-process Inspection. This inspection is performed by the repair technician and/or floor inspector in the process of repairing or rebuilding the materiel and its components. It insures that all parts conform to prescribed standards, that the workmanship is in accordance with approved methods and procedures, and that deficiencies not disclosed by the technical inspection are found and corrected. Detailed instructions are contained in chapter 6.

d. Final Inspection. This is an acceptance inspection performed by a final inspector, after repair or rebuild has been completed, to insure that the materiel is acceptable according to established standards. Detailed instructions are contained in chapter 9.

e. Spot-Check Inspection. This is an overall inspection performed periodically on only a percentage of the materiel in each unit to determine the adequacy and effectiveness of preventive maintenance.

19. Classification of Materiel

All ordnance materiel, after inspection, is classified as follows:

a. Serviceable. Serviceable property consists of all new or used supplies which are in condition for issue for the purpose intended and all supplies which can be placed in such condition through preissue tests or inspections, in storage deprocessing, installation of accessories, correction of minor deficiencies which have developed since the item was last classified as serviceable, application of modification work orders for which parts are available, or assembly of available components.

b. Unserviceable. Unserviceable property

consists of all supplies which are not serviceable (i. e., does not satisfy the definition in *a* above). The definition of unserviceable property is further broken down into the following

subclassifications: Property which is unserviceable but economically repairable, and property which is unserviceable and not economically repairable.

Section II. INSPECTION OF GRID DIP METER

20. Inspection of the Mechanical Components of the Grid Dip Meter

a. The grid dip meter must be clean and dry inside and out.

b. The painted cases must be in a good state of preservation.

c. The selector control, sensitivity control, and tuning control must be intact, and function normally without binding.

d. The meter scale, frequency indication scale, and all other essential markings must be clearly defined and easily read.

e. The meter needle must not stick at any point.

f. The meter and tuning control windows must not be cracked, scored, or discolored.

21. Inspection of Electrical Components of the Grid Dip Meter

a. Check resistors for cracks, swelling, or discoloration.

b. Check to see that the dual electrolytic capacitor is not leaking.

c. Check power transformer and choke for indications of overheating, such as blistered paint, smoke, or leaking sealing compound; listen for hum which might indicate loose core laminations.

d. Check the tubes to see that they are not loose in their sockets, and that none of the keys are broken.

e. Check to see that the variable tuning capacitor supports are not broken.

CHAPTER 5

TROUBLESHOOTING

22. Purpose

Troubleshooting is a systematic isolation and remedy of malfunctions and defective components by means of symptoms and tests. Close adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the equipment to normal operation.

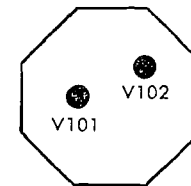
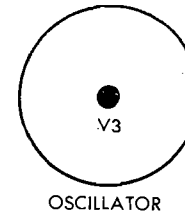
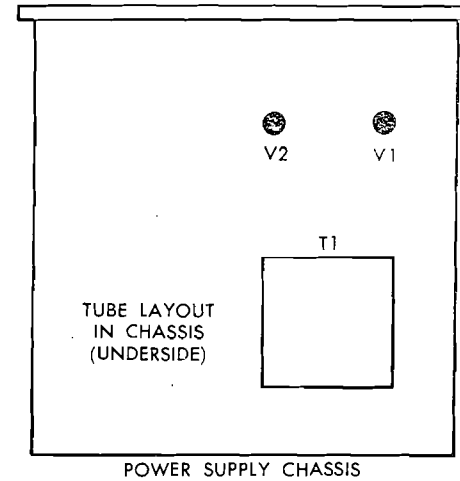
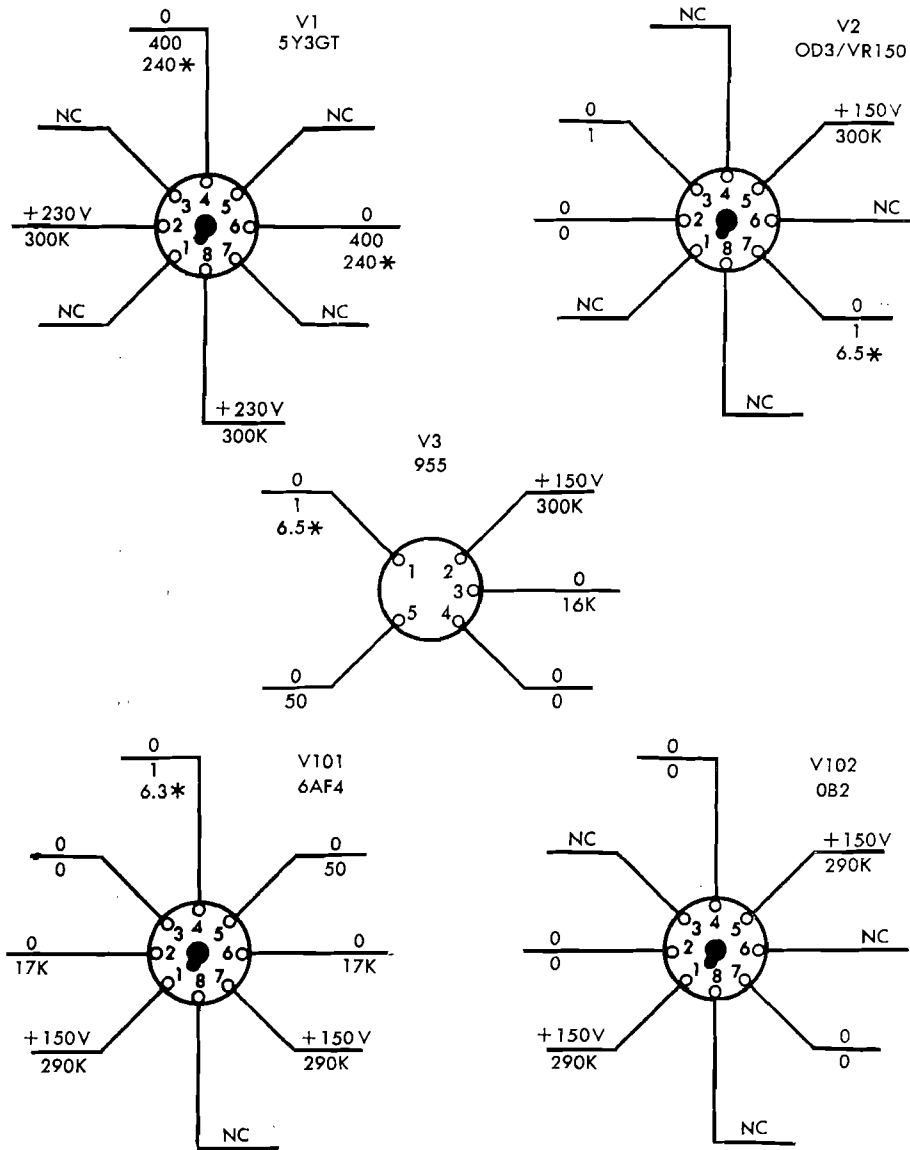
23. Scope

The tests and remedies provided herein are governed by the scope of level of ordnance maintenance. The operational check and troubleshooting table (table V, par. 24) indicates the step-by-step procedure for locating defective components of the grid dip meter. In this table, normal indications are given with

the probable cause of malfunction. Methods for correcting the trouble are given, except when the method of correction can be expected to be obvious to the trained technician. A voltage and resistance chart is shown in figure 12 and is used as an aid in troubleshooting procedures.

24. Operational Check and Troubleshooting of Grid Dip Meter

The operational check and troubleshooting test chart provides a step-by-step procedure of operation necessary to determine what component of the grid dip meter is at fault. The operational check and troubleshooting chart of the power supply is contained in table V, test 1. The operational check and troubleshooting frequency test are shown in table V, tests 2 and 3.

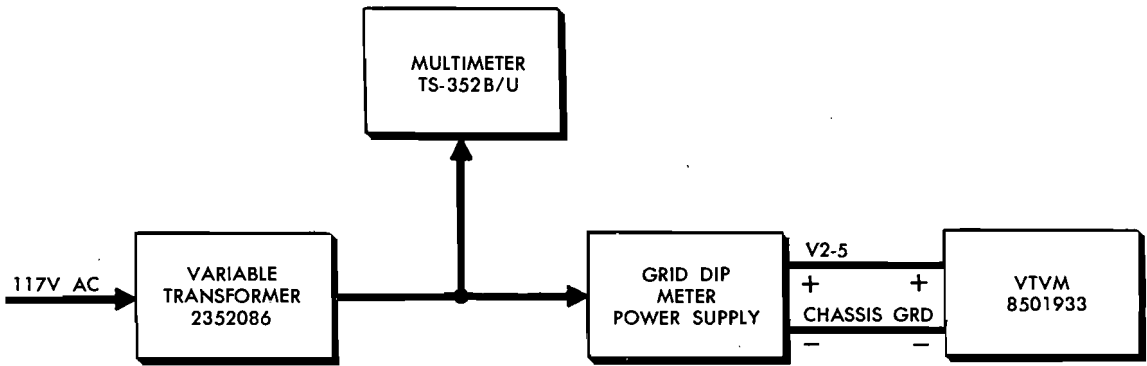


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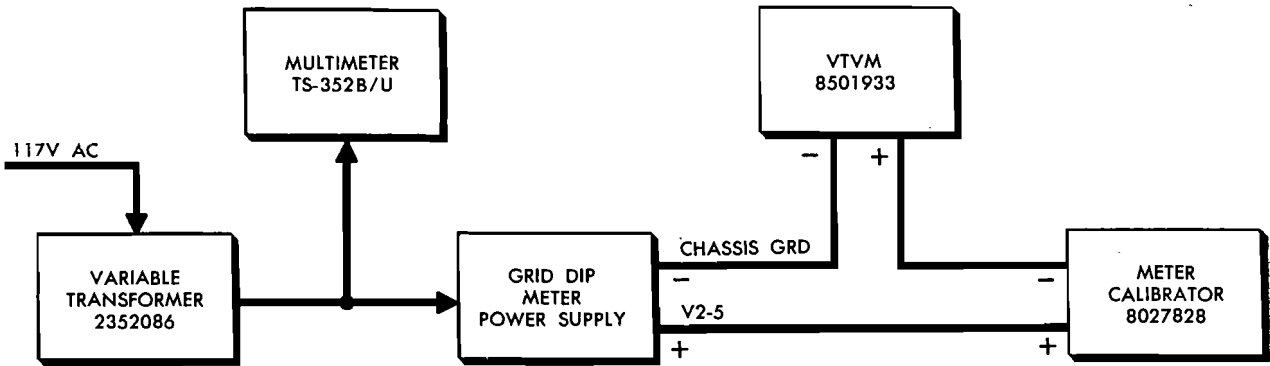
1. TUBE SOCKET POSITIONS ARE AS VIEWED FROM UNDERSIDE OF CHASSIS. DC VOLTAGES ARE PRECEDED WITH A "+" OR "-" SIGN AND APPEAR ABOVE THE LINE. RESISTANCES ARE SHOWN BELOW THE LINE. WHEN FOLLOWED BY K, THE VALUE IS IN THOUSANDS OF OHMS. WHEN FOLLOWED BY MEG, THE VALUE IS IN MILLIONS OF OHMS, WHEN NOTHING FOLLOWS, THE VALUE IS IN OHMS. AC VOLTAGES ARE SHOWN BELOW RESISTANCE MEASUREMENTS AND ARE DESIGNATED BY AN ASTERISK (*).
2. DC VOLTAGE MEASUREMENTS TAKEN WITH ELECTRONIC VOLTMETER.
3. AC VOLTAGE MEASUREMENTS TAKEN WITH ELECTRONIC VOLTMETER.
4. ALL VOLTAGE AND RESISTANCE MEASUREMENTS ARE SUBJECT TO VARIATIONS DUE TO: ACCURACY OF METERS USED TO ESTABLISH CHART DATA, ACCURACY OF METER USED IN TROUBLE SHOOTING, AND TOLERANCE OF CIRCUIT COMPONENTS.
5. ALL MEASUREMENTS TO BE TAKEN WITH SELECTOR SWITCH IN CW POSITION.

RA PD 236980

Figure 12. VR chart.



B



C

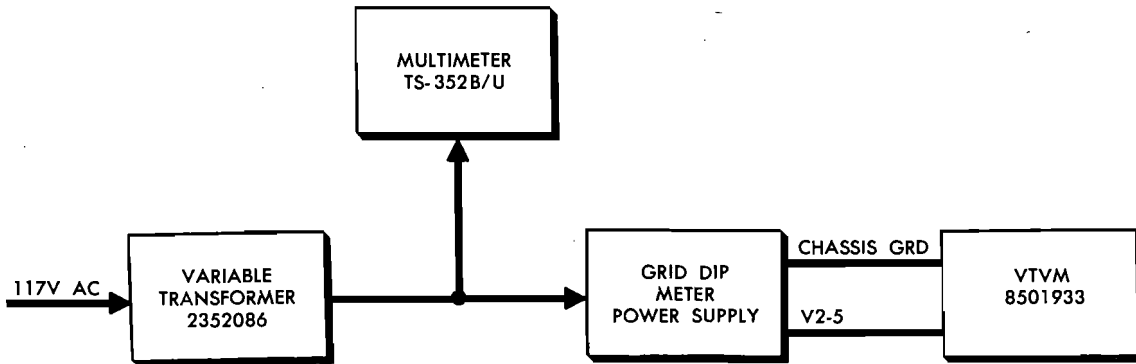


Figure 13. Power supply test equipment connections.

RA PD 236890

Table V. Operational Check and Troubleshooting of Grid Dip Meter

Test No. 1. Power Supply

PRELIMINARY INSTRUCTIONS: Connect variable transformer 2352086 and grip dip meter power supply as shown in A, figure 13. Plug variable transformer into 117v ac outlet. Set variable transformer at 117 volts. Allow a 15 minute warm up period before continuing each test.

Step	Control settings and operation of test equipment	Control settings and operation of unit	Normal indication	Possible cause of abnormal indication
1A	Connect power supply test circuit as shown in figure 13A. Set VTVM to 300 volt dc range.	Place selector switch S2 to CW--- Place off-on switch S1 to on.	150 volts dc ± 7 volts-----	Power transformer T1 or tube V1 defective.
1B	Connect power supply regulation test circuit as shown in figure 13B. Set meter calibrator at 5 volts less than the reading obtained under normal indication column of step 1A, being sure to observe polarities as shown in figure 13B. Set VTVM to 10 volt dc range. Vary the variable transformer from 105 to 129 volts.		VTVM reading varies a maximum of ± 5 volts.	Resistor R2 or R13, reactor L1, or tube V2 defective.
1C	Connect power supply ripple test circuit as shown in figure 13C. Set VTVM to 1 volt ac range.		Maximum of 15 millivolts-----	Capacitor C1, C2, or tube V2 defective.
1D		Place selector switch S2 to MOD--- Connect phones to PHONES connector J2.	120 cps tones heard in phones-----	Capacitor C7 or C8, connector J1 or J2, switch S2, tube V1, or power transformer T1 defective.

Test No. 2. Frequency Test (H-F Oscillator Unit)

PRELIMINARY INSTRUCTIONS: Connect the grid dip meter and the frequency meter to 117 volts ac. Allow a 15-minute warm up period. Couple the coil used in the grid dip meter to the antenna of the frequency meter. The proper coupling can be obtained by placing the oscillator section of the grid dip meter on top of the frequency meter with the coil about four inches from the antenna. The coupling should not be any closer than needed to prevent possible errors in readings.
Note. The frequency meter measures fundamental frequencies from 20 to 40 mc. All frequencies checked outside this range must bear a harmonic relationship to the fundamental frequency used.

Table V. Operational Check and Troubleshooting of Grid Dip Meter—Continued

Test No. 2 Frequency Test (H-F Oscillator Unit)—Continued

Step.	Control settings and operation of test equipment	Control settings and operation of unit	Normal indication	Possible cause of abnormal indication
2A	Set frequency meter to 20 mc-----	Insert 2.2—5 mc coil into the grid dip meter. Set selector switch S2 to CW. Set grid dip meter to 2.5 mc.	Zero beat at 2.5 mc $\pm 2\%$ indicated on grid dip meter dial.	Oscillator stage V3 defective. Calibration out of adjustment (par. 26), 2.2—5 mc coil defective.
2B	Refer to step 2A-----	Set grid dip meter to 4.0 mc-----	4.0 mc $\pm 2\%$ -----	Refer to step 2A.
2C	Refer to step 2A-----	Set grid dip meter to 5.0 mc-----	5.0 mc $\pm 2\%$ -----	Refer to step 2A.
2D	Set frequency meter to 30 mc-----	Insert 5.0—10 mc coil into the grid dip meter. Set grid dip meter to 5.0 mc.	5.0 mc $\pm 2\%$ -----	5.0—10 mc coil defective.
2E	Refer to step 2D-----	Set grid dip meter to 7.5 mc-----	7.5 mc $\pm 2\%$ -----	Refer to step 2D.
2F	Refer to step 2D-----	Set grid dip meter to 10 mc-----	10 mc $\pm 2\%$ -----	Refer to step 2D.
2G	Refer to step 2D-----	Insert 10—22 mc coil in to the grid dip meter. Set grid dip meter to 10 mc.	10 mc $\pm 2\%$ -----	10—22 mc coil defective.
2H	Refer to step 2D-----	Set grid dip meter to 15 mc-----	15 mc $\pm 2\%$ -----	Refer to step 2G.
2J	Set frequency meter to 40 mc-----	Set grid dip meter to 20 mc-----	20 mc $\pm 2\%$ -----	Refer to step 2G.
2K	Set frequency meter to 20 mc-----	Insert 22—45 mc coil in to the grid dip meter. Set grid dip meter to 20 mc.	20 mc $\pm 2\%$ -----	22—45 mc coil defective.
2L	Set frequency meter to 30 mc-----	Set grid dip meter to 30 mc-----	30 mc $\pm 2\%$ -----	Refer to step 2K.
2M	Set frequency meter to 40 mc-----	Set grid dip meter to 40 mc-----	40 mc $\pm 2\%$ -----	Refer to step 2K.
2N	Set frequency meter to 25 mc-----	Insert 45—100 mc coil in to the grid dip meter. Set grid dip meter to 50 mc.	50 mc $\pm 2\%$ -----	45—100 mc coil defective.
2P	Refer to step 2N-----	Set grid dip meter to 75 mc-----	75 mc $\pm 2\%$ -----	Refer to step 2N.
2Q	Refer to step 2N-----	Set grid dip meter to 100 mc-----	100 mc $\pm 2\%$ -----	Refer to step 2N.
2R	Refer to step 2N-----	Insert 100—250 mc coil in to the grid dip meter. Set grid dip meter to 100 mc.	100 mc $\pm 2\%$ -----	100—250 mc coil defective.
2S	Refer to step 2N-----	Set grid dip meter to 150 mc-----	150 mc $\pm 2\%$ -----	Refer to step 2R.
2T	Refer to step 2N-----	Set grid dip meter to 250 mc-----	250 mc $\pm 2\%$ -----	Refer to step 2R.
2U	Set the frequency meter to 40 mc-----	Insert 200—400 mc coil in to the grid dip meter. Set grid dip meter to 200 mc.	200 mc $\pm 2\%$ -----	200—400 mc coil defective.
2V	Refer to step 2U-----	Set grid dip meter to 280 mc-----	280 mc $\pm 2\%$ -----	Refer to step 2U.
2W	Refer to step 2U-----	Set grid dip meter to 400 mc-----	400 mc $\pm 2\%$ -----	Refer to step 2U.

Test No. 3. Frequency Test (UHF Oscillator Unit)

PRELIMINARY INSTRUCTIONS: Connect the grid dip meter and the frequency meter to 117 volts ac. Allow a 15-minute warm up period. Couple the coil used in the grid dip meter to the antenna of the frequency meter. The proper coupling can be obtained by placed the oscillator section of the grid dip meter on top of the frequency meter with the coil about four inches from the antenna. The coupling should not be any closer than needed to prevent possible errors in readings.

Note. The frequency meter measures fundamental frequencies from 20 to 40 mc. All frequencies checked outside this range must bear a harmonic relationship to the fundamental frequency used.

Step	Control settings and operation of test equipment	Control settings and operation of unit	Normal indication	Possible cause of abnormal indication
3A	Set frequency meter to 40 mc.....	Set selector switch S2 to CW..... Set grid dip meter to 440 mc.....	Zero beat at 440 mc $\pm 2\%$ indicated on grid dip meter dial.	Oscillator stage V101 defective. Calibration out of adjustment (par. 26), R-F coupling coil defective.
3B	Refer to step 3A.....	Set grid dip meter to 680 mc.....	680 mc $\pm 2\%$	Refer to step 3A.
3C	Refer to step 3A.....	Set grid dip meter to 920 mc.....	920 mc $\pm 2\%$	Refer to step 3A.

25. Alinement and Calibration of the Grid Dip Meter

a. HF Oscillator Unit. Whenever the oscillator tube (V3) becomes weak or defective and is replaced, recalibration of the grid dip meter is necessary because of the difference in tube interelectrode capacitance. When replacing the dial cover leave the three cover retaining screws slightly loose so that it will be possible to rotate the cover. Rotate the tuning control knob as far as it will go clockwise. Loosen the three dial cover retaining screws and turn the dial cover so that the hairline is alined with the long end mark on the frequency dial. Tighten one of the three cover retaining screws firmly. Place the 22 to 45 mc coil into the grid dip meter. Set control knob of grid dip meter at 30 mc. Set frequency meter 8026531 (Table IV, par. 15) at 30 mc. Couple grid dip meter to the antenna of the frequency meter.

Note. Refer to preliminary instructions of operational check, Table V, (par. 24) Test 2. Rotate tuning control knob of grid dip meter until a null indication is heard. Loosen the retaining screw on the dial cover of the oscillator section and rotate the cover until the hairline is alined with the 30 mc graduation. Tighten the three retaining screws firmly. If unable to calibrate because the cover will not rotate far enough, loosen the three screws retaining the dial, and rotate the dial to compensate.

b. UHF Oscillator Unit. When the oscillator tube (V101) in the oscillator unit requires replacement, a slight adjustment may be necessary. First, try several replacement tubes (type 6AF4) and select a tube to match the original dial calibration as nearly as possible. Remove the tuning knob and the cover of the oscillator unit as follows: remove the screw in the cup washer at the center of the cover and remove the screws on the right and left edges of the top cover. (Do not disturb the screws above the name "MEGACYCLE METER".) Lift the cover off. Also remove the side cover by removing the four screws holding the side in place. Replace the defective tube.

Note. Refer to preliminary instructions of operational check, Table V, (par. 24) Test 3. Set the frequency control shaft (knob has been removed) at 600 mc. Set frequency meter used in performing the alinement at 600 mc. Couple grid dip meter to the antenna of the frequency meter. Rotate the tuning control of the grid dip meter until a null indication is heard. If selection of the tube does not provide an exact match, loosen the two screws on the cover above the name "MEGACYCLE METER" holding the hairline fiducial in position and move the fiducial slightly. Retighten the screws, and replace the side and the cover of the oscillator unit.

CHAPTER 6

GENERAL MAINTENANCE

26. General

General maintenance of the grid dip meter consists of all standard shop practices and procedures required to repair and maintain the equipment in serviceable condition, plus certain special procedures designed to accomplish adequate maintenance where unusual conditions prevail within the equipment. General maintenance procedures are not intended to include operational checks, tests, troubleshooting, or performance measurements, and do not require the use of special test instruments, as these practices are covered in chapter 5. General maintenance does require, however, the use of common and special tools and bulk supplies such as abrasives, solvents, sealing compounds, paints, and lubricants.

27. Scope

This general maintenance chapter provides adequate references to appropriate Department of the Army Technical Manuals, Technical Bulletins, or other Army publications for procedures where shop methods and practice have already been established. Specific maintenance procedures peculiar to the grid dip meter are contained in the repair and rebuild chapters.

28. Use

The repair and rebuild portions of this manual are divided into separate field (chapter 7) and depot (chapter 8) maintenance instructions. In general, the field maintenance responsibilities prescribed are directed by the allocation of maintenance parts listed in the applicable section of Department of the Army Supply Manual ORD 8 SNL J-739 and tools listed in Type 4 SNL J-29, section 3. The general

maintenance shop practices and procedures pertain to either or both field and depot maintenance, as required. Repair and rebuild information in both the field and depot maintenance chapters are based upon the assumption that personnel are familiar with the pertinent general maintenance procedures covered in this chapter. That is, specific references are not made to individual general maintenance procedures, except where danger to equipment or personnel is involved. These references are omitted because they would be too numerous. In view of this, it is especially important that personnel using this manual be familiar with the content of this chapter.

29. Shop Methods and Practices

Established procedures for shop methods and practices will be found in Department of the Army Technical Manuals, Technical Bulletins, and other Army publications. General procedures applicable for the repair and maintenance of the grid dip meter will be found in the following list.

Chassis rewiring.....	TB 5-283-2
Cold weather maintenance.....	TB ORD 193
Desert maintenance.....	TB SIG 75
Lubrication.....	TM 9-2835
Moisture and fungus-proofing.....	TB ORD 350
Painting.....	TM 9-2851
Repair of meters, switches, and connectors.....	TB SIG 24
Soldering.....	TB SIG 222
Tropicalization.....	TB SIG 72
Troubleshooting and repair of radio equipment.....	TM 11-4000

These references are not to be construed as authority for the performance by field maintenance units of those functions which are restricted to depots and arsenals. Refer to paragraph 28.

CHAPTER 7

FIELD MAINTENANCE

Section I. GENERAL

30. Scope

This chapter contains maintenance information covering the grid dip meter that is within the scope of field maintenance personnel. The scope of field maintenance is determined by the listing of field maintenance parts in the applicable section of ORD 8 SNL J-739 and the listing of special tools authorized to field maintenance personnel in Type 4 SNL J-29, section 3.

31. References

a. General maintenance procedures are furnished in chapter 6. Individual references to general maintenance are not made within this chapter. It is, therefore, especially important that personnel become familiar with the content of chapter 6.

b. Operation and organizational maintenance of the grid dip meter, as it is used in electronic shop AN/MPM-38, is covered in TM 9-9505-1-30.

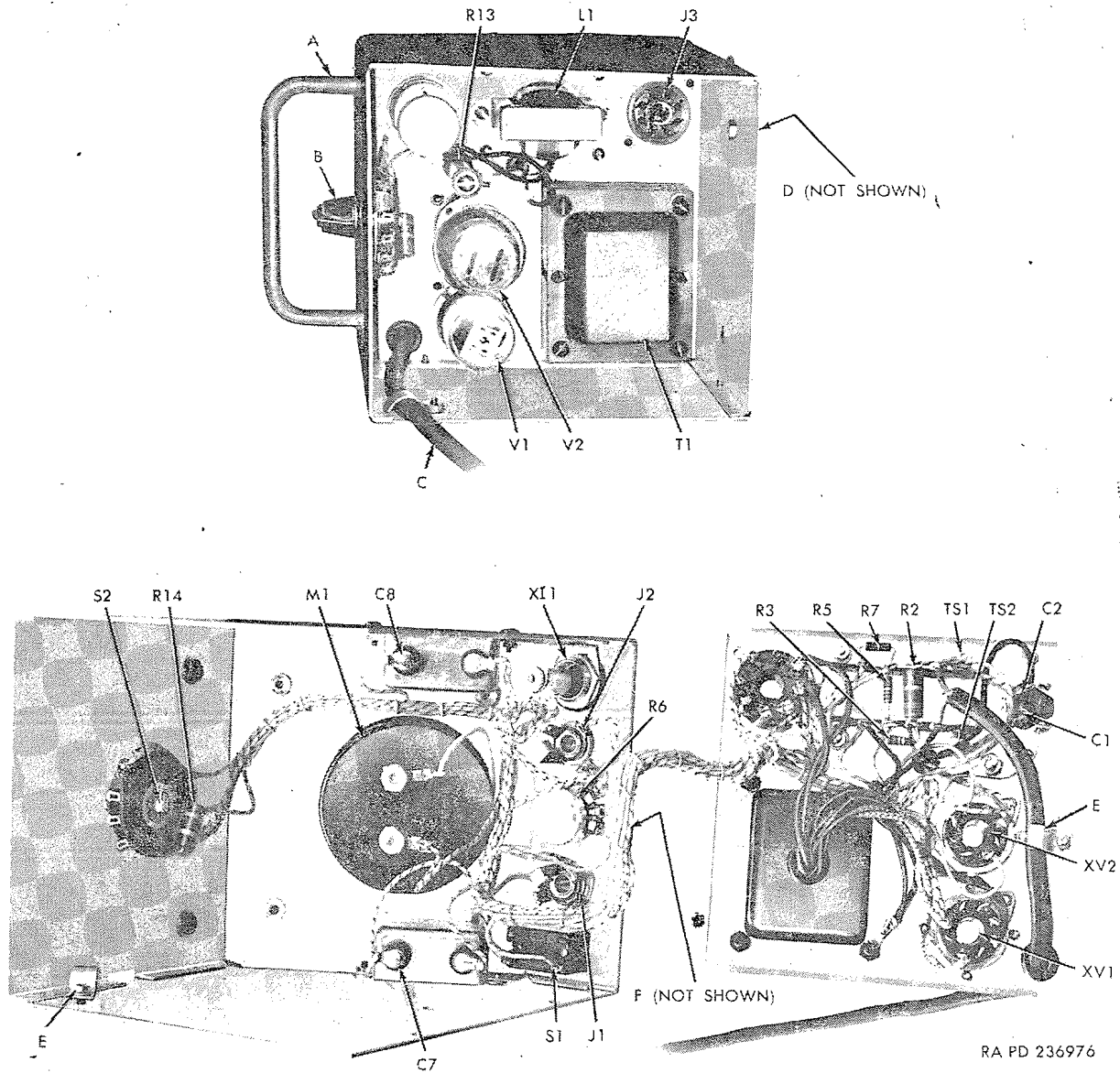
c. Operational check and troubleshooting information is contained in chapter 5. Schematic diagrams are included at the end of chapter 8. The legends for the schematic diagrams list all replaceable electronic parts. The legends for figures 14, 16, and 18 list the balance of the replaceable parts. At the time of printing of this manual, manufacturer's part numbers were used, as ordnance part numbers were not available for all parts. The H numbers in the legends are reference drawing numbers of the Measurements Corporation. The manufacturer's code for parts listed in the legend for the schematic diagram are:

<i>Mfr's code</i>	<i>Manufacturer</i>
H.....	Measurements Corporation
DYR.....	Cornell Dubilier
C.....	Chicago Transformer Company
Q.....	International Resistance Company
PR.....	Wirt Company
MC.....	Industrial Transformer Company

32. Repair and Maintenance

a. Precautions. Before attempting to replace parts or to repair assemblies, be sure to follow the troubleshooting procedures (chapter 5) in order to isolate the source of trouble correctly. Incorrect replacement of parts and inadequate repair practices can complicate existing trouble. Use the proper tools (pars. 12-15) for each replacement and repair procedure. Following the completion of repair or replacement, it sometimes is necessary to clean or retropicalize parts or subassemblies. Refer to paragraph 29 for reference to general instructions on such procedure.

b. Replacement Policies. Most electronic components are not economically repairable and generally, when defective, are to be replaced rather than repaired. Capacitors, resistors, and, in general, all sealed or potted components, such as transformers and coils, are to be replaced when defective. Defective unsealed switches are repairable when the defect consists of dirty or corroded contacts; otherwise, they must be replaced. If possible, replace a defective part with an exact duplicate. When a duplicate is unavailable, substitute a part with similar electrical characteristics and equivalent tolerance. Be particularly careful in selecting the replacements for resistors, capacitors, and tubes. In signal circuits, substitute parts with the same physical sizes to avoid altering circuit inductance and capacitance and affecting high frequency response. It is permissible to use a replacement with a voltage rating greater, but never less, than that for the part to be replaced. See the parts identity illustrations (figs. 14-18) when replacing parts in order to locate the part position and terminal connections. Refer to paragraph 33 of this chapter for standards applying to handling of disassembled compon-



A—Handle, H-2024
 B—Bar knob: 1¼ inches, H-4133
 C—AC cord: molded plug, H-704

D—Mounting foot: felt cushion, H-4204-1
 E—Cable clamp
 F—Round knob: fluted (no marking) H-2791

Figure 14. Power supply unit, parts identification.

ents and to paragraph 29 for references to soldering and dressing wire.

Note. Parts identity illustrations (figs. 14-18) identify electronic parts by reference designation only. Refer to the legends to the schematic diagrams (figs. 20 and 21) for full description, values, and part numbers for the parts.

c. Replacement Practices. Before unsoldering any connection prior to removing components to be replaced, be sure to remove tropicali-

zation varnish on the connection. Observe polarity markings on such parts as capacitors. Mount electronic components on terminals so that the color code reads from top to bottom or from left to right. Wrap leads clockwise around the bottom terminals. Avoid obscuring any identification markings on the terminal board and chassis. In any case, try to mount a replacement in the position formerly occupied by the part being replaced. If any wires

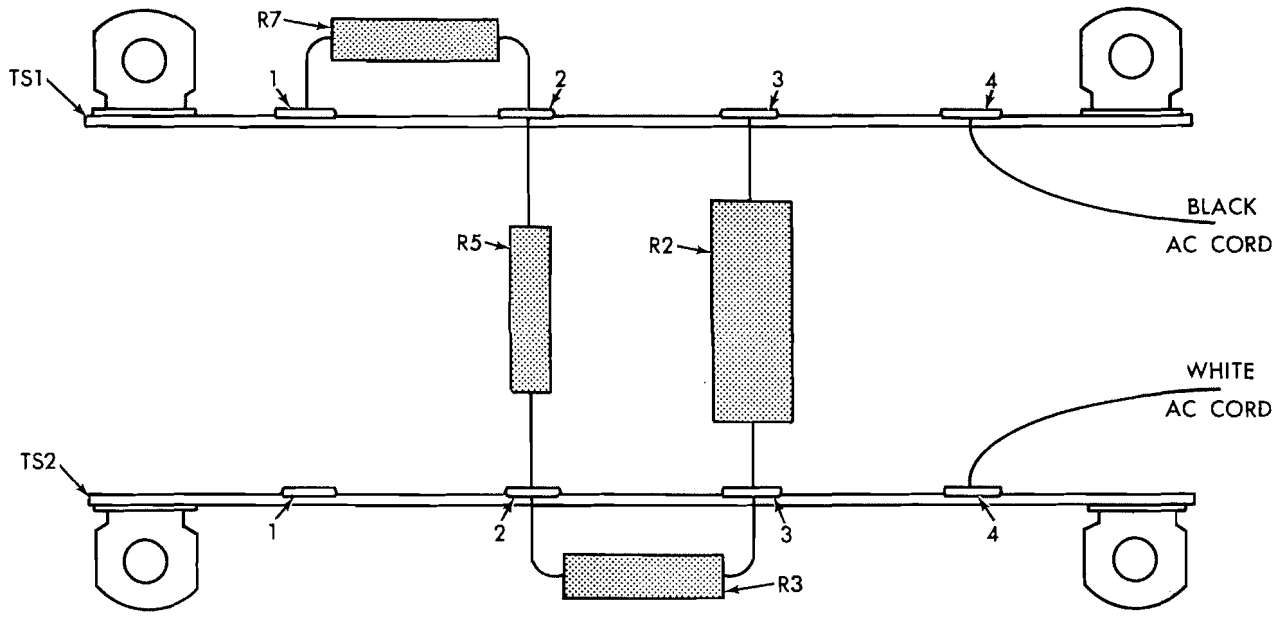


Figure 15. Terminal strip identification.

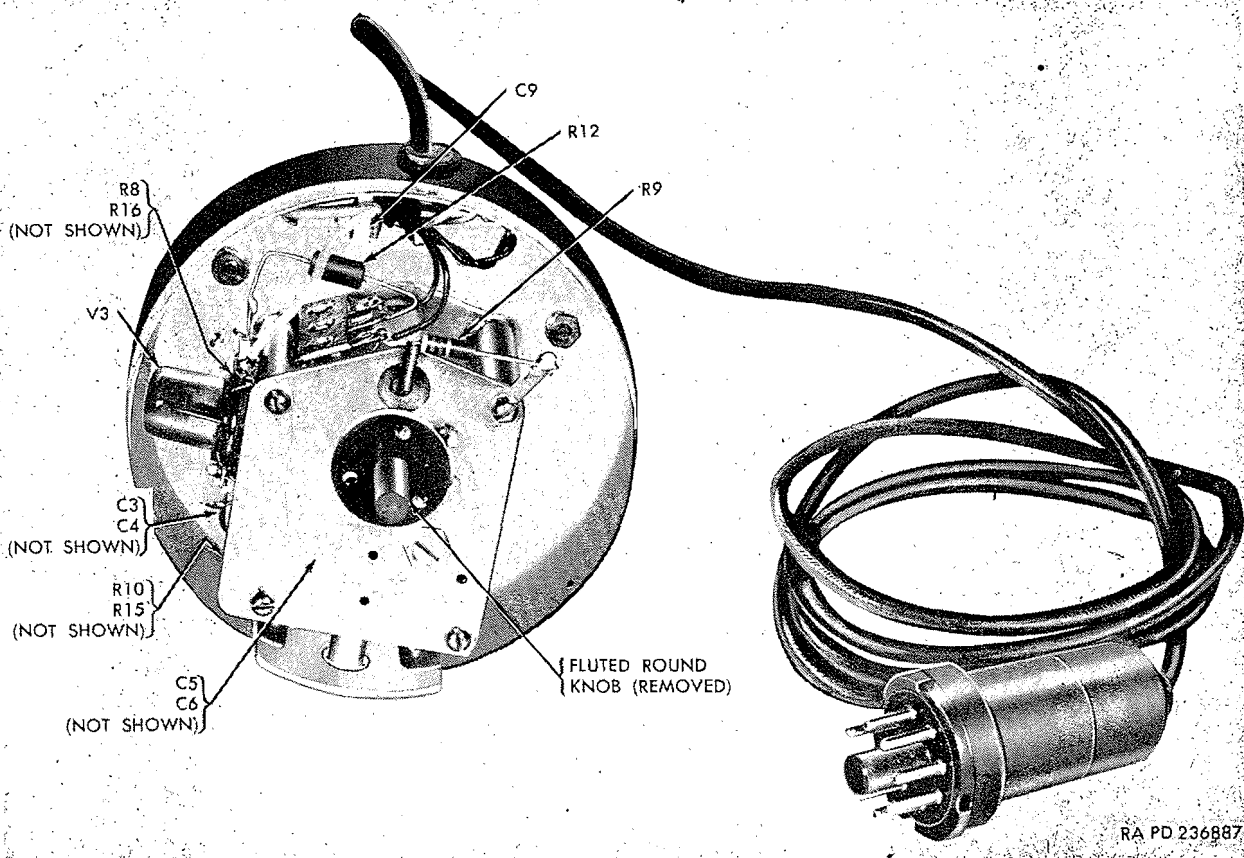


Figure 16. HF oscillator unit, parts identification.

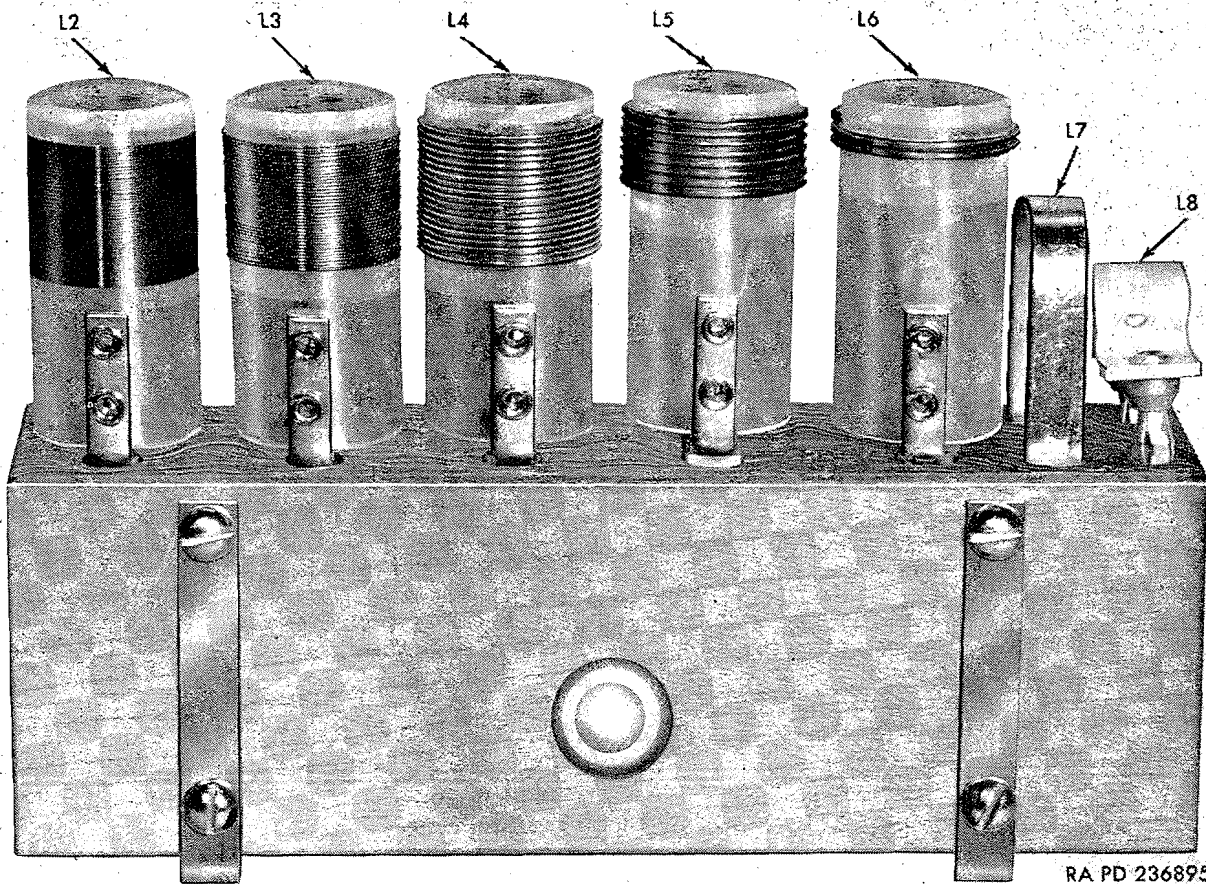


Figure 17. Grid dip meter, plug-in coils identification.

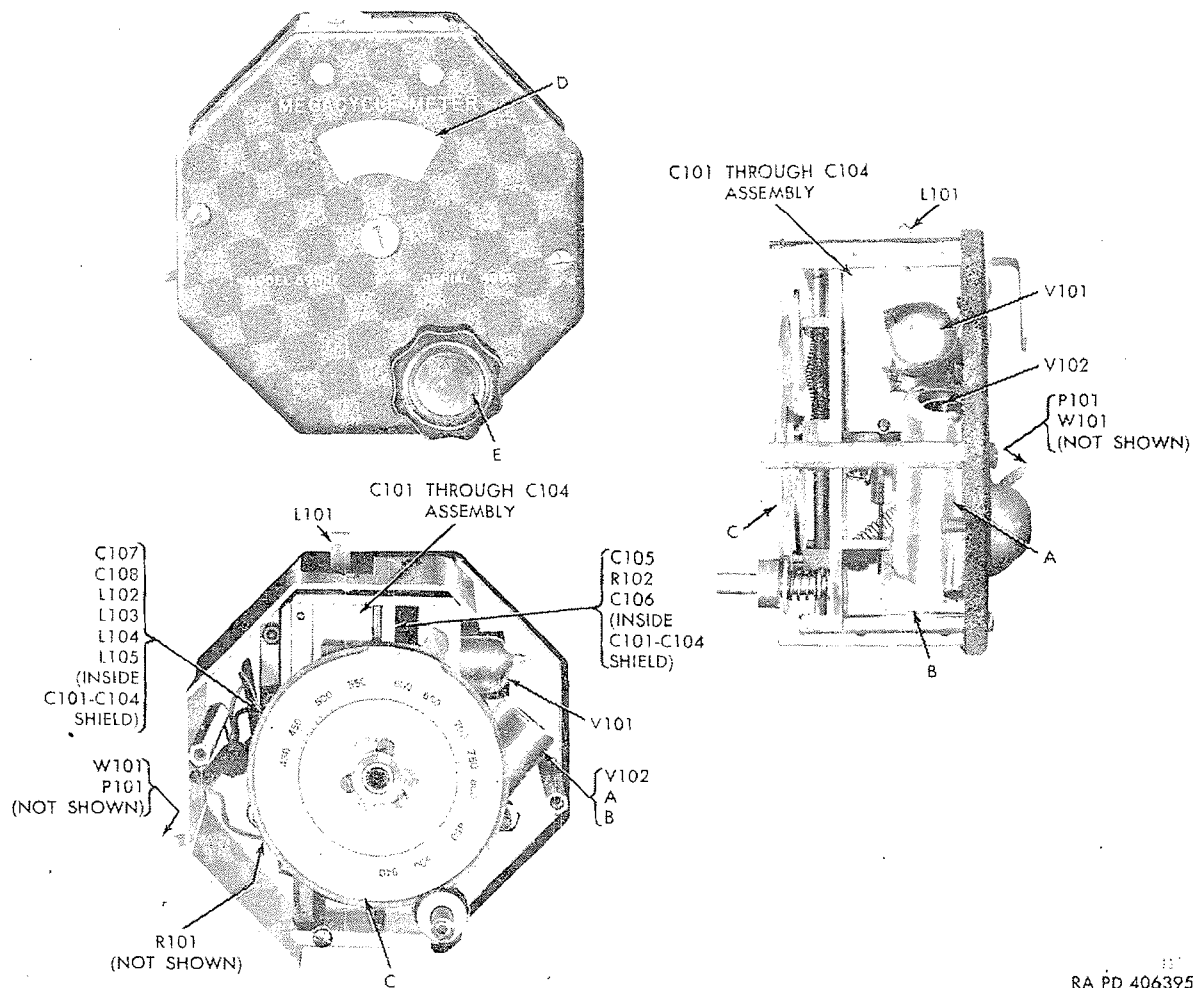
are moved during the process of part replacement, restore them to their original positions when replacement is complete. When replacing mechanical parts such as structural members that attach with screws or bolts, place the lockwashers next to the nut or screw which turns. When necessary, place a flat washer between the lockwasher and the stationary surface.

d. Replacement Definitions. Repair of electronic materiel can be accomplished in one of five ways. The first is replacement of a defective part and is preferred when possible. The second is repair of a portion of a part, such as the reconstruction of a broken socket terminal. The third is rebuild of an entire part, such as the cutting of a form and the winding of a coil to make a reactor. The fourth is substitution of an equivalent part, such as replacement of a 500-ohm 2-watt resistor by two 1000-ohm 1-watt resistors connected in parallel.

The last is an emergency fix which can be considered temporary only. Parts must be repaired only when replacement is impossible, and rebuilt or improvised only when repair is impossible. An emergency fix only partially restores defective materiel and must be used only when repair is impossible or when the urgency of a tactical situation in the field makes any other method of placing materiel into operation impossible. Emergency measures will be taken only when the maintenance to be performed has been authorized by a responsible officer.

33. Handling of Disassembled Parts

Always assume that materiel disassembled by one person will be assembled by another. Therefore, unless the method of assembly is obvious make a suitable sketch showing the orientation of the components before disassembly. Note the position of components and wir-



RA PD 406395

- A—Tube shield, TS102U03
- B—Tube socket, H-5374
- C—Dial scale, H-2788-A
- D—Fiducial, H-2788-B
- E—Knob, H-2788

Figure 18. UHF oscillator unit, parts identification.

ing, and if several leads are involved, tag each so that it can be connected correctly. As each metal component is removed, establish its exact position in relation to other components by suitably scribed reference marks. However, never scribe marks on contact surfaces such as threads and slide rails. Note polarity markings on capacitors and other components so marked. Use a parts tray or other suitable receptacle so that components, as removed, can

be placed in the positions they are to occupy in relation to the complete assembly. Always keep each component in its relative position until it is to be installed. When in doubt as to what position a component or wire is to occupy, refer to the component identity illustrations (figs. 14-18) and to the schematic diagrams (figs. 20 and 21). Keep hardware in a sack attached to the disassembled component if installation is not to be made immediately.

Section II. FIELD MAINTENANCE PROCEDURES

34. Disassembly of Power Supply

The bottom plate and power supply chassis must be removed from the power supply case before any components of the front panel of the case can be removed. The bottom plate is removed by removing four self-tapping screws which are located at the base of the sides of the power supply case. The power supply chassis is removed by removing four self-tapping screws which are located vertically along the sides of the power supply case. Pull the power supply chassis down and out of the power supply case to facilitate further disassembly procedures. Tag all wires leading to components that are to be removed, and record the orientation of each component before it is removed to facilitate reassembly.

35. Repair of Power Supply

No special procedures are required to repair the power supply unit of the grid dip meter other than standard shop procedures as described in chapter 6. All direct support field replaceable parts for the power supply unit are illustrated and identified in figures 14 and 15. All parts are schematically identified in figure 20.

36. Assembly of Power Supply

After defective components have been replaced and all wiring completed, the power supply chassis is installed first. Place the power supply chassis into the power supply case and align the four mounting holes, then insert the mounting screws and tighten. Place the bottom plate into the power supply case and align the mounting holes, then insert the mounting screws and tighten.

37. Disassembly of HF Oscillator and Oscillator Case

The dial cover and calibrated dial must be removed before any part of the oscillator is made accessible. Loosen the two set screws on the tuning control knob and remove the knob. Before removing the dial cover from the case, mark its position with reference to bottom portion of case. Remove the three round head screws from the side of the case, then lift off

the dial cover. Before removing the calibrated dial, turn the tuning control shaft in a full clockwise direction, and locate some point on the dial in relation to some point on the case. Remove the three screws on the top of the dial, and remove the dial and three fiber washers.

Caution: The dial should be kept face up and covered during the time it is out of the case. Care should be taken not to smear or mar the calibrated dial. The components of the oscillator are fragile and easily bent or damaged; therefore, care should be exercised during disassembly procedure.

All components of the oscillator assembly are accessible, and normal repair procedures can be used to repair or replace components of the oscillator assembly. Care must be exercised to keep the placement of parts and the lead length the same as originally installed.

38. Repair of HF Oscillator

No special procedures are required to repair the HF oscillator unit of the grid dip meter other than standard shop procedures as described in chapter 6. All direct support field replaceable parts for the oscillator are illustrated and identified in figures 16 and 17. Electronic components are schematically identified in figure 20.

39. Assembly of HF Oscillator and Oscillator Case

After components have been installed, the calibrated dial should be installed as follows. Turn the tuning control shaft in a full clockwise position. Place the thin fiber washer on the calibrated dial mounting plate and align the holes. Place the calibrated dial on the mounting plate, and orient the dial with the point on the case in the position described in paragraph 37. Place the heavy fiber washer into the calibrated dial and align the insert with the holes in the mounting plate. Place the remaining fiber washer on top of the dial and align the holes. Then insert and tighten the three screws. Place the cover on the oscillator case and align the cover to alignment mark as recorded in paragraph 37. Insert and tighten the three round head screws.

Note. The grid dip meter must be calibrated whenever the top cover is removed. Refer to the alinement and calibration instructions (par. 25).

40. Disassembly of UHF Oscillator Unit

The tuning knob must be removed first. Then, remove the screw in the sealed cup washer at the center of the hexagon top cover. Remove the screws located on the right and left edges of the cover.

Caution: Do not disturb the screws above the name "MEGACYCLE METER" on the cover. Lift off the cover. Remove the four screws in the side of the case, and remove the side. This makes all replaceable or reparable components of the oscillator unit accessible, and normal repair procedure can be used to repair or replace components of the oscillator unit. Extreme care must be exercised to keep the placement of parts and the lead length the same as originally installed. Disassembly beyond this point is not recommended, as critical adjustments may be disturbed.

41. Repair of UHF Oscillator Unit

No special procedures are specified for the

repair of the uhf oscillator unit other than standard shop procedures described in chapter 6. All direct support field replaceable parts are illustrated and identified in figure 18. Electronic components are schematically identified in figure 21. Mechanical parts within the UHF oscillator unit require precision assembly and are not separately replaceable, except for common hardware.

42. Assembly of UHF Oscillator Unit

Assembly of the uhf oscillator unit is the reverse of the disassembly procedures described in paragraph 40.

Note. The calibration of the grid dip meter must be checked as outlined in paragraph 25, after reassembly of the uhf oscillator unit.

43. Lubrication

The lubrication points and lubrication time intervals for the grid dip meter oscillator unit are shown in figure 19. Aircraft oil, specification MIL-O-6085, should be used sparingly at indicated oil points. A light grease such as aircraft and instrument grease, specification MIL-G-3278, should be used at indicated grease points.

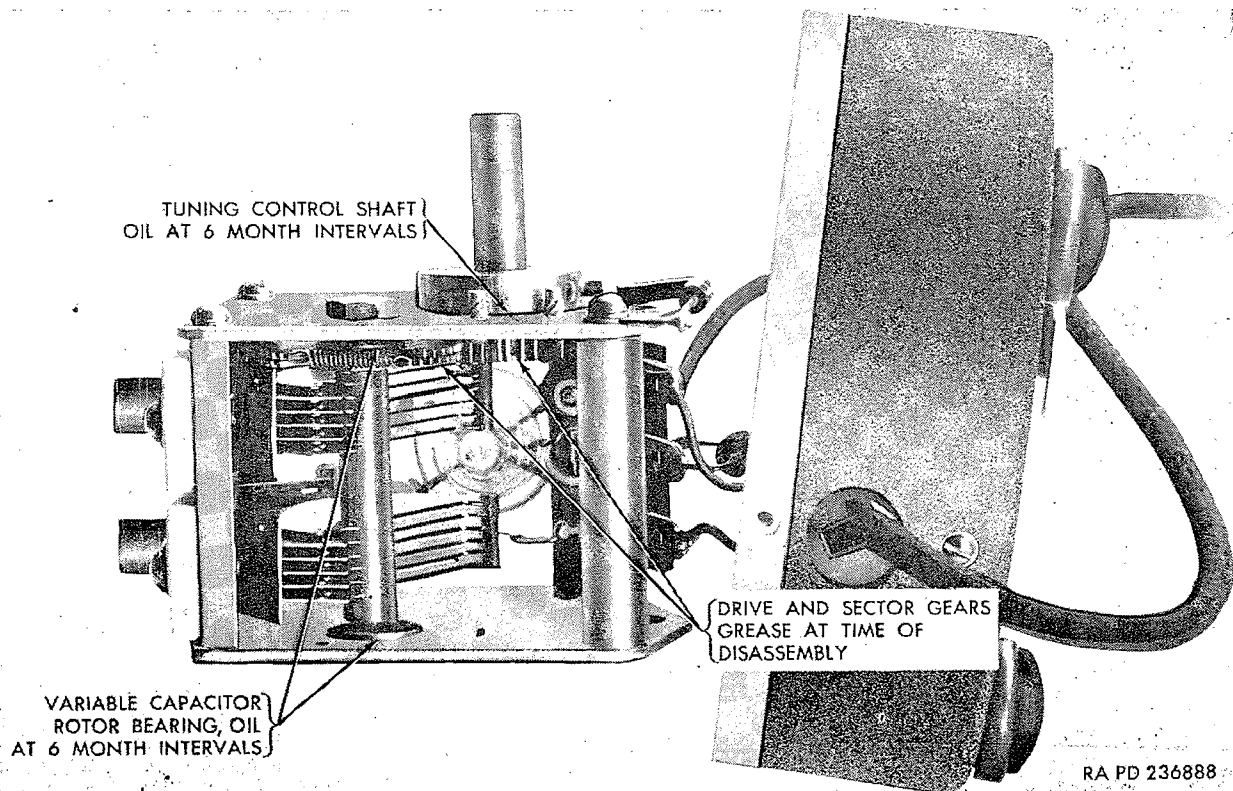


Figure 19. Grid dip meter HF oscillator unit, lubrication points.

CHAPTER 8

DEPOT MAINTENANCE

Section I. GENERAL

44. Scope

This chapter contains maintenance information covering the rebuild and rewiring of the grid dip meter.

45. References

a. General maintenance procedures and shop practices are discussed in chapter 6. Individual references to general maintenance are not made within this chapter. It is, therefore, especially important that personnel become familiar with the content of chapter 6.

b. Operation and organizational maintenance

of the grid dip meter as it is used in electronic shop AN/MPM-38, is contained in TM 9-9505-1-30.

c. Theory of operation is contained in chapter 2. Operational check and troubleshooting information is contained in chapter 5. A schematic diagram is contained at the end of chapter 9.

46. Handling Disassembled Parts

The procedures for handling disassembled parts and the procedures for disassembly are covered in chapter 7.

Section II. REBUILD AND REWIRING

47. General

This section contains maintenance instructions for the rebuild and rewiring of the grid dip meter. Rewiring instructions, along with the field maintenance procedures in chapter 7, are sufficient to enable experienced technicians to rebuild the grid dip meter.

48. Wire List

a. The wire list (table VI) contains information that enables the technician to replace a single wire, reconnect a wire, trace wiring connections, or perform a complete rewiring. The list is in order by electronic part reference designation, and gives a description of the wire connected to each terminal of each part, as well as the destination or opposite termination of each wire. Each wire and each termination appears twice in the list; once in the *To* column and once in the *From* column.

b. To trace a wire or to install a single wire,

locate the reference symbol and terminal number at either wire end, in the *To* column. The *From* column will indicate the correct termination of the opposite end. Figure references showing the physical location of each termination are given.

c. To reattach loose wires after replacing a component part, locate the reference symbol of the replaced part on the list. Each terminal on this part is identified with its correct connection or termination point. Connect the wires accordingly.

d. To rewire the power supply chassis, refer to the parts identification illustrations (figs. 14 and 15) to determine which component part should be wired first. Then refer to the wire list for the proper wire to use and for the correct terminations. Third, refer to the parts identification illustration for the general position and dress of the wire. Place the new wire in the general position of the original wire. Repeat these steps for each wire installed.

Table VI. Wiring List for Grid Dip Meter

Power Supply Unit

From			To			Color	Length (inches)	Gage	Remarks
Ref. desig.	Term.	Fig. ref.	Ref. desig.	Term.	Fig. ref.				
C1A	-----	14	R13	Top	14	WHT-RED	6	20	
C1B	-----	14	TS1	3	14	WHT-RED	2	20	
C1B	-----	14	L1	-----	14	BLK	4	20	(1)
C7	1	14	XV1	2	14	WHT-RED	18	20	
C7	2	14	J1	3	14	WHT-ORN	5	20	
C8	1	14	S2	6	14	WHT-ORN	11	20	
C8	2	14	S2	1	14	WHT-ORN	9	20	
J1	1	14	J3	1	14	WHT-BLK	12	20	
J1	2	14	S2	5	14	WHT	14	20	
J1	3	14	C7	2	14	WHT-ORN	5	20	
J2	1	14	M1	1	14	WHT-BLK	6	20	
J2	2	14	S2	11	14	WHT-GRN	11	20	
J2	2	14	J3	5	14	WHT-GRN	15	20	
J2	3	14	R6	3	14	WHT-GRN	2	20	
J3	1	14	J1	1	14	WHT-BLK	12	18	
J3	1	14	Grd lug	-----	14	Bare	3/4	20	
J3	2	14	XV2	7	14	WHT	7	20	
J3	3	14	S2	2	14	WHT-BLU	18	20	
J3	5	14	J2	2	14	WHT-GRN	15	20	
J3	7	14	T1	-----	14	GRN	4	20	(1)
J3	7	14	XI1	1	14	WHT-BRN	12	18	
J3	7	14	Grd lug	-----	14	Bare	3/4	18	
J3	8	14	T1	-----	14	GRN	4	18	(1)
J3	8	14	XV2	3	14	WHT	6	20	
J3	8	14	XI1	2	14	WHT-BRN	12	20	
L1	-----	14	C1B	-----	14	BLK	4	20	(1)
L1	-----	14	R13	Top	14	BLK	4	20	(1)
M1	1	14	J2	1	14	WHT-BLK	6	20	
M1	2	14	TS1	2	14	WHT	17	20	
R2	1	14	TS1	3	14	-----	-----	-----	(2)
R2	2	14	TS2	3	14	-----	-----	-----	(2)
R3	1	14	TS2	2	14	-----	-----	-----	(2)
R3	2	14	TS2	3	14	-----	-----	-----	(2)
R5	1	14	TS1	2	14	-----	-----	-----	(2)
R5	2	14	TS2	2	14	-----	-----	-----	(2)
R6	1	14	TS1	1	14	WHT-GRN	14	20	
R6	1	14	J2	3	14	WHT-GRN	2	20	
R6	2	14	Grounded through the mounting.						
R6	3	14	TS2	2	14	WHT-YEL	14	20	
R7	1	14	TS1	1	14	-----	-----	-----	(2)
R7	2	14	TS1	2	14	-----	-----	-----	(2)
R13	Top	14	L1	-----	14	BLK	4	20	(1)
R13	Top	14	C1A	-----	14	WHT-RED	6	20	
R13	Bottom	14	XV1	2	14	WHT-RED	6	20	
R14	1	14	S2	1	14	-----	-----	-----	(2)
R14	2	14	S2	12	14	-----	-----	-----	(2)
S1	1	14	TS1	4	14	WHT-PR	12	20	
S1	2	14	TS2	1	14	WHT-PR	12	20	
S2	1	14	C8	2	14	WHT-ORN	9	20	
S2	2	14	J3	3	14	WHT-BLU	18	20	
S2	5	14	J1	2	14	WHT	14	20	
S2	6	14	C8	1	14	WHT-ORN	11	20	

See footnotes at end of table.

Table VI. Wiring List for Grid Dip Meter—Continued

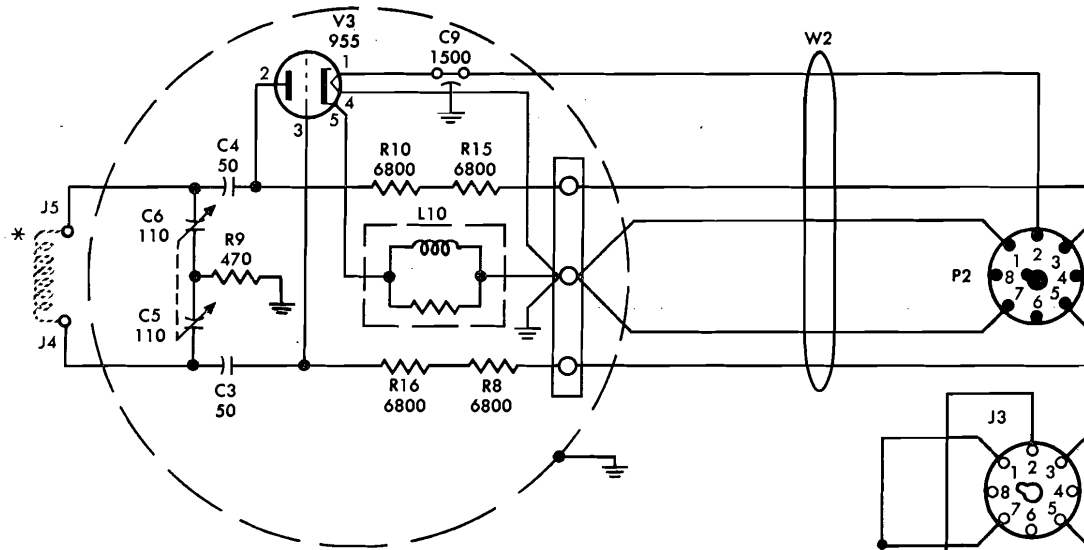
Power Supply Unit—Continued

From			To			Color	Length (inches)	Gage	Remarks
Ref. desig.	Term.	Fig. ref.	Ref. desig.	Term.	Fig. ref.				
S2	11	14	J2	2	14	WHT-GRN	11	20	
S2	12	14	XV2	5	14	WHT-RED	18	20	
T1	-----	14	TS2	1	14	BLK	5	20	(1)
T1	-----	14	TS2	4	14	BLK-RED	5	20	(1)
T1	-----	14	J3	7	14	GRN	4	20	(1)
T1	-----	14	J3	8	14	GRN	4	20	(1)
T1	-----	14	XV1	2	14	YEL-ORN	4	20	
T1	-----	14	XV1	8	14	YEL-ORN	4	20	(1)
T1	-----	14	XV1	4	14	RED	4	20	(1)
T1	-----	14	XV1	6	14	RED	4	20	(1)
T1	-----	14	Grd lug	-----	14	BLK-YEL	3	20	(1)
T1	14	14	Grd lug	-----	14	RED-YEL	3	20	(1)
TS1	1	14	R7	1	14	-----	-----	-----	(2)
TS1	1	14	R6	1	14	WHT-GRN	14	20	
TS1	2	14	R7	1	14	-----	-----	-----	(2)
TS1	2	14	M1	2	14	WHT	17	20	
TS1	3	14	R2	1	14	-----	-----	-----	(2)
TS1	3	14	C1B	-----	14	WHT-RED	2	20	(2)
TS1	4	14	S1	1	14	WHT-PR	12	20	
TS1	4	14	W1	-----	14	BLK	6 ft.	18	
TS2	1	14	S1	2	14	WHT-PR	12	20	
TS2	1	14	T1	-----	14	BLK	5	20	(1)
TS2	2	14	R3	1	14	-----	-----	-----	(2)
TS2	2	14	R5	2	14	-----	-----	-----	(2)
TS2	2	14	R6	3	14	WHT-YEL	14	20	
TS2	3	14	R3	2	14	-----	-----	-----	(2)
TS2	3	14	XV2	5	14	WHT-RED	3	20	
TS2	4	14	T1	-----	14	BLK-RED	5	20	
TS2	-----	14	W1	-----	14	WHT	6 ft.	18	
W1	-----	14	TS1	4	14	BLK	6 ft.	18	
W1	-----	14	TS2	4	14	WHT	6 ft.	18	
XI1	1	14	J3	7	14	WHT-BRN	12	20	
XI1	2	14	J3	8	14	WHT-BRN	12	20	
XV1	2	14	C7	1	14	WHT-RED	18	20	
XV1	2	14	R13	Bottom	14	WHT-RED	6	20	
XV1	2	14	T1	-----	14	YEL-ORN	4	20	(1)
XV1	4	14	T1	-----	14	RED	4	20	(1)
XV1	6	14	T1	-----	14	RED	4	20	(1)
XV1	8	14	T1	-----	14	YEL-ORN	4	20	(1)
XV2	2	14	Grd lug	-----	14	Bare	1	20	
XV2	3	14	J3	8	14	WHT	6	20	
XV2	5	14	S2	12	14	WHT-RED	18	20	
XV2	5	14	TS2	3	14	WHT-RED	3	20	
XV2	7	14	J3	2	14	WHT	7	20	

¹ Transformer T1 and reactor L1 are furnished with flexible leads extending from the unit.

² These resistors are mounted with their own axial leads.

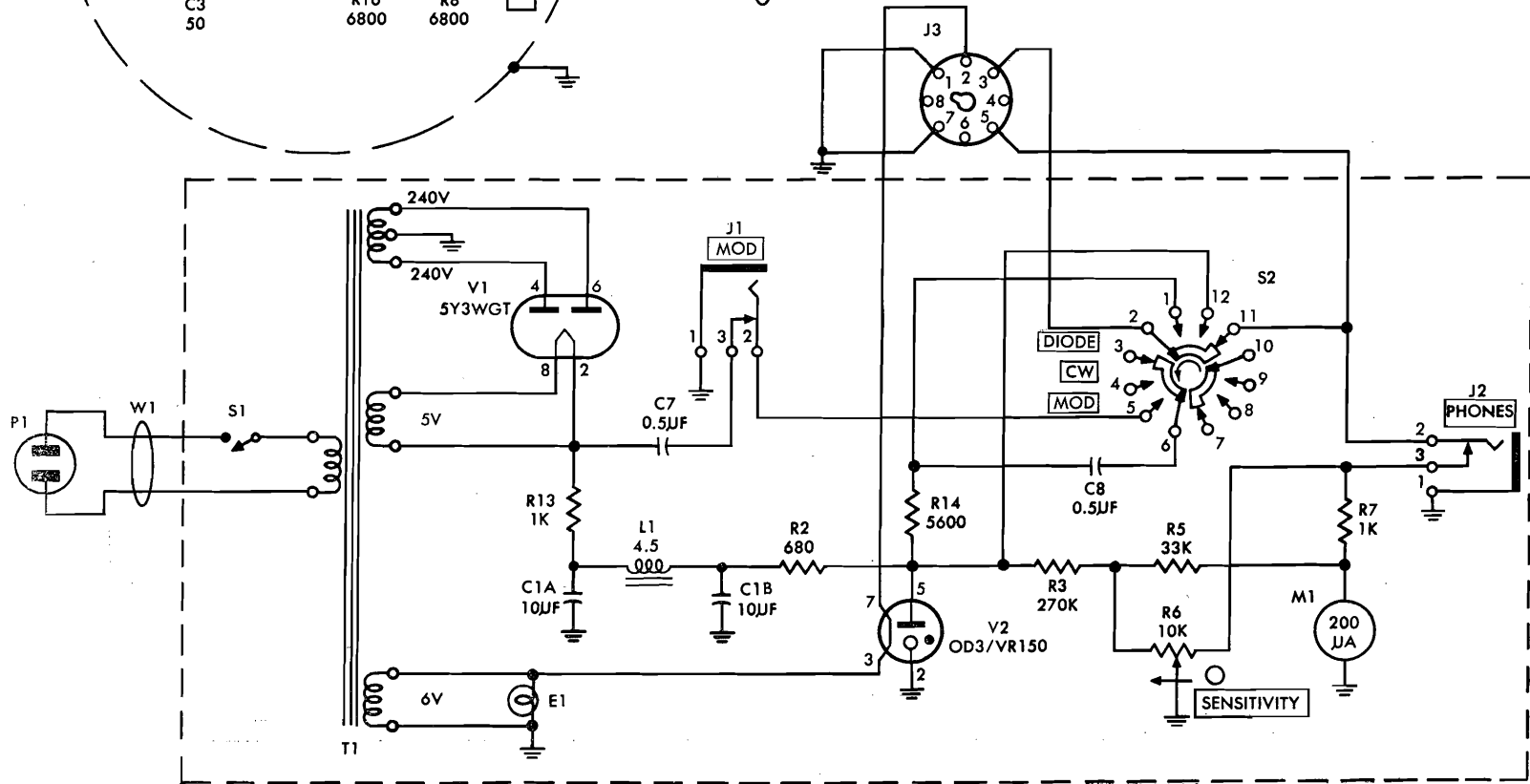
Note. For oscillator section wiring refer to paragraph 48e.



* REF NO. VALUE

L2	2.2-5MC
L3	5-10MC
L4	10-20MC
L5	22-45MC
L6	45-100MC
L7	100-250MC
L8	200-400MC

NOTES:
 1. VALUES IN OHMS, MICROMICROFARADS, AND HENRYS UNLESS OTHERWISE NOTED
 2. ALL WAFER SWITCHES VIEWED FROM REAR



RA PD 411409

Figure 20. Grid dip meter, schematic diagram.

C1A, C1B	ELECTROLYTIC FIXED CAPACITOR: 10-10 μ f, 450v, \pm 20% FP231
C2	Not used
C3, C4, C5, C6, and XV3	CAPACITOR ASSEMBLY: consisting of two fixed mica capacitors 50 μ f each a two section variable capacitor, —10 to 110 μ f each, and one tube socket for acorn tube V3, HM403.
	<i>Note.</i> Capacitors C3, C4, C5, and C6, and tube socket XV3 comprise a mechanical assembly. Individual parts are not separately replaceable.
C7, C8	PAPER FIXED CAPACITOR: 0.5 μ f, 600v dcw \pm 20%, DYR 6050
C9	CERAMIC FIXED CAPACITOR: 1500 μ f, 500v dcw +50%—20%, H-5011
I1	INCANDESCENT LAMP: #44, 6-8v, 0.25 amp, 187189
J1, J2	TELEPHONE JACK: (Carter type J2 or equiv.), H-5312
J3	OCTAL SOCKET 8243107
L1	REACTOR: 4.5H \pm 10% @50 ma dc, C-1706
L2	RF COIL: 2.2 to 5 mc, H-3190-1
L3	RF COIL: 5 to 10 mc, H-3190-2
L4	RF COIL: 10 to 22 mc, H-3190-3
L5	RF COIL: 22 to 45 mc, H-3190-4
L6	RF COIL: 45 to 100 mc, H-3190-5
L7	RF COIL: 100 to 250 mc, H-1973
L8	RF COIL: 200 to 400 mc, H-1974
L9	Not used
K10	RF CHOKER: (coil wound on resistor), H-1980
M1	METER: 200 μ amp, 400 ohms dc resistance, H-740
P2	CONNECTOR PLUG: 8 prong octal, H-5314
R1	Not used
R2	FIXED RESISTOR: 680 ohm, 2w, \pm 5%, RC42GF681J
R4	Not used
R5	FIXED RESISTOR: 35K, $\frac{1}{2}$ w, \pm 5%, RC20GF333J
R6	VARIABLE RESISTOR: 10K, $\frac{1}{4}$ w, \pm 20%, Q13-16
R7	FIXED RESISTOR: 1K, $\frac{1}{2}$ w, \pm 5%, RC20GF102J
R8, R10, R15, and R16	FIXED RESISTOR: 6,800 ohms $\frac{1}{5}$ w, \pm 10%, H-5248-6
R9	FIXED RESISTOR: 470 ohm $\frac{1}{2}$ w, \pm 5%, RC20GF471J
R11, R12	Not used
R13	FIXED RESISTOR: 1K, 10w, \pm 10%, wire wound PR3
R14	FIXED RESISTOR: 5,600 ohms, 2w, \pm 5%, RC42GF562J
S1	TOGGLE SWITCH: spst, H-383-1
S2	ROTARY SWITCH: 3p3t, H-2140
T1	POWER TRANSFORMER: 117V, 50/60 cps, SEC #1—240-0-240 VAC @.020 amp, SEC #2—5.0VAC @2.0A SEC #3 VAC @0.3A, MC-B2572-F.
V1	ELECTRON TUBE: 5Y3WGT 8298921
V2	ELECTRON TUBE: OD3/VR150, 8298910
V3	ELECTRON TUBE: 955
W1	POWER CABLE: 2 conductor, #18AWG, 300v, 6 ft., H-704
W2	SPECIAL PURPOSE CABLE: 5 conductor, H-2786
XV1, XV2	TUBE SOCKET: OCTAL 8243107
XV3	See capacitor C3

Figure 20—Continued.

e. To rewire HF oscillator unit, refer to the parts identification illustration (fig. 16) to determine general location of part or wire to be replaced. Cable W2 must be replaced as a whole cable. Refer to the schematic diagram (fig. 20) for identification of the wires in the cable. Resistors R8 and R16 are soldered in series with $\frac{1}{2}$ inch spacing between the resistors, and are directly supported between the grid terminal (3) of V3 and the tie strip ter-

minal nearest the front panel. Resistors R10 and R13 are connected in a like manner between the plate terminal (2) of V3, and the tie strip terminal nearest the rear of the case. The RF choke, L10, is connected between the cathode terminal (5) of V3 and the center terminal of the tie strip. One side of the filament terminal (4) is grounded directly in the mounting. A 2-inch piece of 20-gage wire is connected from the other filament lead, terminal

(1) of V3 and the filament bypass capacitor. Resistor R9 mounts from the terminal near the tuning shaft and the ground lug as shown in figure 16.

Caution: All parts replaced in the oscillator section must be installed in the same relative positions occupied by the original parts.

f. Rewiring instructions are not applicable to the uhf oscillator unit because all replaceable electronic parts are connected directly to tube socket terminals, ground terminals, or to other parts. Capacitors C101 through C104 are replaceable only as a single assembly, and this assembly is connected directly to pins 6 and 7 of tube socket V101. Cable W101 from the power supply section has five leads; the black and brown leads are connected directly to pin 7 of tube V102 and the red lead is connected to pin 1 of tube V102; the green and white leads are connected directly to feed-through capacitors C106 and C107, respectively. Refer to figures 17 and 21 for cable leads and parts location and identification information.

49. Parts Location and Identification Illustrations

a. Parts identification illustrations (figs. 14-

18) provide physical location and identification information for all electronic parts. Descriptions of electronic parts, by reference designations, are contained in the parts legends for the schematic diagrams (figs. 20 and 21). Mechanical parts and hardware other than common hardware are also located on parts identification illustrations by means of key letters. These key letters are listed in legends accompanying the parts identification illustrations and provide short descriptions and part numbers for these mechanical parts.

b. Where necessary, electronic parts in the parts identification illustrations have been assigned arbitrary terminal numbers in order to identify the exact terminals to be used for connections in accordance with the wire lists.

50. Final Inspection of Rewiring

When rebuild of the grid dip meter is completed, make a thorough examination of all wiring connections, cross-checking between the equipment, the wiring table (table VI, par. 48), and the schematic diagram (fig. 20). Detection of a wiring error before power is applied may prevent serious damage and unnecessary

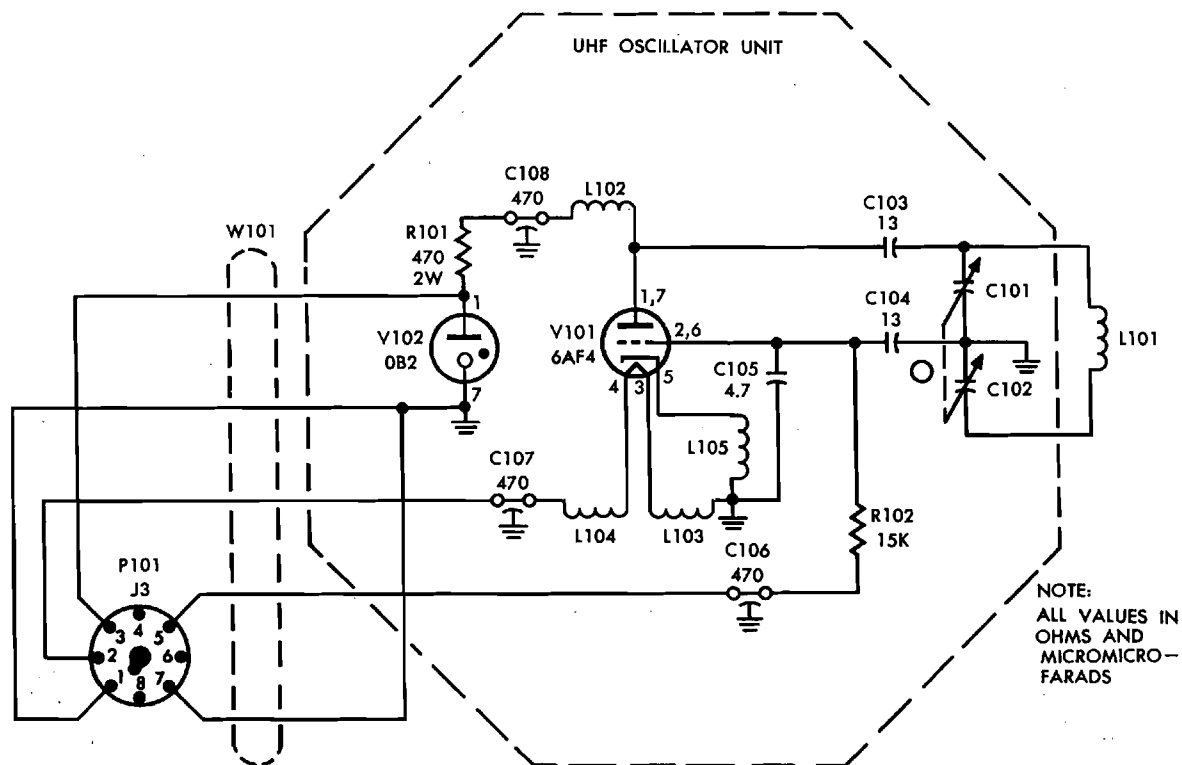


Figure 21. UHF oscillator unit, schematic diagram.

C101, C102, C103,
C104, XV101

C105
C106, C107, C108
L101
L102
L103, L104
L105
P101
R101
R102
V101
V102
W101

CAPACITOR ASSEMBLY: consisting of two fixed mica capacitors 13 μf each, a two section variable capacitor, and one tube socket for V101 (6AF4) H-4614.

Note. Capacitors C101, C102, C103, and C104, and tube socket XV101 comprise a mechanical assembly. Individual parts are not separately replaceable.

CERAMIC FIXED CAPACITOR: 4.7 μf , 500v dcw, $\pm 10\%$, H-5372
CERAMIC FIXED CAPACITOR: 470 μf , 500v dcw, $\pm 20\%$, H-5373
RF COIL: H-4635
RF COIL: H-4639
RF COIL: H-4636
RF COIL: H-4638
CONNECTOR PLUG: 8 prong octal, H-5314
FIXED RESISTOR: 470 ohm, 2w, $\pm 10\%$, RC42GF471K
FIXED RESISTOR: 470 ohm, $\frac{1}{2}$ w, $\pm 10\%$, RC20GF471K
ELECTRON TUBE: 6AF4
ELECTRON TUBE: OB2, 7599321
SPECIAL PURPOSE CABLE: H-886

Figure 21—Continued.

rework. When all wiring has been double-checked and proven to be satisfactory, install the tubes in their sockets except for the rectifier tube. Measure the resistance from the cathode pin of the rectifier socket to chassis ground. The resistance should be approximately 280K. A deviation of more than ± 20 percent indicates a defect in the B+ circuit that must be corrected before power is applied.

Apply power with the rectifier tube removed from socket and observe that filaments of other tubes glow. If no malfunctions are apparent, install the rectifier tube and examine all parts of the grid dip meter for evidence of short circuits. When this inspection is completed, proceed with the final inspection (chapter 9).

CHAPTER 9

FINAL INSPECTION AND REPAIR STANDARDS

51. General

Final inspection is an acceptance inspection performed after repair and rebuild operations have been completed to insure that the materiel is acceptable according to established standards. Final inspection of the grid dip meter consists of a visual inspection and an operational check.

52. Visual Inspection

Visually inspect the grid dip meter for completeness of parts. Use the illustrations in figures 14, 15, 16, and 17 for this purpose. Inspect power supply unit and oscillator unit for physical defects or damage.

53. Soldering

Most electrical connections must be soldered to insure that a good electrical bond is made. The oxidation or corrosion that takes place in an unsoldered or poorly soldered joint will re-

sult in intermittent or faulty operation of the grid dip meter. Connections must be mechanically secure and contact surfaces clean and bright before solder is applied.

a. When a joint has been soldered, chip or scrape any excess deposit of flux from the joint.

b. Inspect the connection for evidence of cold soldering. See that an excessive amount of solder has not been used and that the solder is not touching an adjacent terminal or conducting surface of some other part.

c. If the joints have been previously tropicalized, apply tropicalization varnish according to instructions given in TB ORD 350.

54. Operational Check

Conduct a complete operational check (table V, par. 24) after the visual inspection to be certain the grid dip meter meets all electronic specifications.

APPENDIX REFERENCES

1. Publication Indexes

DA pamphlets of the 310 series and DA Pam 108-1 should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this technical manual.

2. Supply Manuals

The following manuals of the Department of the Army Supply Manual pertain to this materiel.

a. Destruction to Prevent Enemy Use.

Explosives, Bulk Propellants, Explosive Devices SM 9-5-1375

b. General.

Index of Supply Manuals, Ordnance Corps DA Pam 310-29

Introduction ORD 1

c. Repair and Rebuild.

Field and Depot Maintenance Allowances for Heavy Maintenance Test Equip- ORD 8 SNL J-739
ment Set (CORPORAL Type II Ground Guidance Equipment)—Applicable
section of.

Special Tool Sets for CORPORAL Type II Guided Missile Material Type 4 SNL J-29, Sec. 3

Standard Electrical Components ORD 5 SNL H-4

Standard Hardware ORD 5 SNL H-1

3. Forms

The following forms pertain to this materiel:

DA Form 5-31, Shop Job Order Register.

DA Form 9-1, Materiel Inspection Tag.

DA Form 9-79, Parts Requisition.

DA Form 9-80, Job Order File.

DA Form 9-81, Exchange Part or Unit Identification Tag.

DA Form 421, Stock Record Card.

DA Form 460, Preventive Maintenance Roster.

DA Form 468, Unsatisfactory Equipment Report.

DA Form 478, Organizational Equipment Report.

DA Form 81, Work Request and Job Order.

DD Form 6, Report of Damaged or Improper Shipment.

4. Other Publications

The following publications contain information pertinent to this materiel and associated equipment:

a. Destruction to Prevent Enemy Use.

Explosives and Demolitions FM 5-25

Regulations for Firing Ammunition for Training Target Practice, and Combat AR 385-63

b. General.

Carbon-Tetrachloride; Technical-Grade Fed Spec O-C-141

Demolition Materials	TM 9-1946
Inspection of Ordnance Materiel in Hands of Troops.....	TM 9-1100
Unsatisfactory Equipment Report.....	AR 700-38
Precautions in Handling Gasoline.....	AR 850-20
Ordnance Maintenance and General Supply in the Field.....	FM 9-10
Ordnance Service in the Field.....	FM 9-5
Accounting for Lost, Damaged, or Destroyed Property.....	AR 735-11
Accident Reporting and Records.....	AR 385-40
<i>c. Preservation, Packaging, and Packing.</i>	
Army Shipping Document.....	TM 38-705
Instruction Guide: Ordnance Preservation, Packaging, Packing, Storage, and Shipping.	TM 9-1005
Report of Damaged or Improper Shipment.....	AR 700-58
Ordnance Operational List of Specifications and Instructions for Packaging and Processing General Supplies.	SB 9-156
Preservation, Packaging, and Packing Materials, Supplies and Equipment Used in the Army.	SB 38-100
Preservation, Packaging, and Packing of Military Supplies and Equipment.....	TM 38-230
Protection of Ordnance General Supplies in Open Storage.....	TB ORD 379
Standards for Oversea Shipments and Domestic Issue of Ordnance Materiel Other than Ammunition and Army Aircraft.	TB ORD 385
Preparation for Shipment.....	AR 740-20
<i>d. Repair and Rebuild.</i>	
Abrasive, Cleaning, Preserving, Sealing, Adhesive, and Related Materials for Ordnance Materiel.	TM 9-850
Basic Arctic Manual.....	FM 31-70
Desert Maintenance of Ground Signal Equipment.....	TB SIG 75
Cold-Weather Lubrication; Operation and Maintenance of Artillery and Sighting and Fire Control Materiel	TB ORD 193
Inspection Procedure for Repaired Electrical Indicating Instruments.....	TB SIG 24
Instruction Guide: Operation and Maintenance of Ordnance Materiel in Extreme Cold (0° to -65° F.).	TM 9-2855
Instruction Guide: Welding Theory and Application.....	TM 9-2852
Lubrication	TM 9-2835
Moisture and Fungus-Proofing Treatment of Antiaircraft Artillery "On-Carriage" Fire Control Equipment and Associated Cable Systems.	TB ORD 350
Operation of Signal Equipment at Low Temperatures.....	TB SIG 219
Operations in the Arctic.....	FM 31-71
Soldering.....	TB SIG 222
Painting Instructions for Field Use.....	TM 9-2851
Tropical Maintenance of Ground Signal Equipment.....	TB SIG 72
Troubleshooting and Repair of Radio Equipment.....	TM 11-4000
Varnish, Moisture- and Fungus-Resistant, for the Treatment of Communications Electronic, and Associated Electrical Equipment.	MIL-V-173A
<i>e. Related Use.</i>	
Operation: Truck-Mounted Electronic Shop AN/MPM-38.....	TM 9-9505-1-30
Operation: Heavy Maintenance Test Equipment 8501900.....	TM 9-9509-1-45
<i>f. Special Equipment.</i>	
Operation, Organizational Maintenance, and Field and Depot Maintenance: Frequency Meter 8026531.	TM 9-9504-6
Operation and Maintenance: Meter Calibrator 8027828.....	TM 9-9504-41
Ordnance Maintenance: Electronic Voltmeter ME-119/MPM-38.....	TM 9-9508-4-35

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[413.6 (19 Jan 59)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
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Chief of Staff.

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R. V. LEE,
Major General, United States Army,
The Adjutant General.

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USAR: None.

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

USAAMC (2)
USA AD Cen (2)
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Ord Sec, Gen Dep (10)
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MAAG (West Germany) (2)
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Units org under fol TOE:
9-227 (5)
9-500 (5)
9-510 (3)

TM 9-9505-2-35 MEGACYCLE METER, 8898466—1959