TM 11-6625-353-35

DEPARTMENTOFTHEARMYTECHNICALMANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

AMPLIFIER RADIO FREQUENCY AM-1881/U

HEADQUARTERS, DEPARTMENT OF THE ARMY
17 FEBRUAY 1961

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 115-volt (or 230-volt if used) ac line connections and on the 390-volt plate and power supply circuits. Serious injury or death may result from contact with these points.

DON'T TAKE CHANCES !

This equipment contains a selenium rectifier. When selenium rectifiers fail because of burnout or arc-over, poisonous fumes and compounds are released. The fumes have a strong odor and should not be inhaled. *Provide adequate ventilation immediately and do not handle the rectifier until it has cooled.*

TECHNICAL MANUAL
NO. 11-6625-353-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington 25, D. C. *17 February 1961*

AMPLIFIER, RADIO FREQUENCY AM-188/U

CHAPTER 1
THEORY

1. Scope

a. This manual covers field and depot maintenance for Amplifier, Radio Frequency AM-1881/U. It includes instructions appropriate to fourth and fifth echelons for troubleshooting, testing, adjusting, and repairing the equipment, and replacing maintenance parts. It also lists tools, materials, and test equipment for fourth and fifth echelon maintenance. Detailed functions of the equipment are covered in the theory section.

Note. There are no maintenance functions assigned to third echelon.

b. The complete technical manual for this equipment includes three other publications:

TM 11-6625-353-12, TM 11-6625 -353-20P, and TM 11-6625-353-35P.

c. Forward comments concerning this manual to the Commanding Officer, U. S. Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N. J.

Note. For applicable forms and records, see paragraph 2, TM 11-6625-353-12.

2. Block Diagram

The AM-1881/U is a general-purpose wide frequency range (5 cycles per second (cps) to 2 megacycles (mc)) amplifier. The signal path is shown in the block diagram (fig. 1) and is discussed in a through c below. For complete circuit details, refer to the overall schematic diagram, figure 12.

a. First and Second Amplifiers and Cathode Follower. The AM-1881/U amplifier section consists of two stages of voltage amplification (V1 and V2) connected in cascade, a cathode follower output stage (V3), and a negative feedback network. Pentode tubes are used in all three stages. Amplifiers V1 and V2 provide high gain and wide-frequency bandwidth with low-noise level. Negative feedback to V1 is used to stabilize gain, increase bandwidth, and reduce noise and distortion. The negative feedback is adjustable to control gain and frequency response. The input signal. is applied to the grid of first rf amplifier V1 where it is amplified and coupled to the grid of V2. The signal is further amplified by V2 and coupled to the grid of V3. Cathode follower V3 presents a relatively low impedance to external loads.

b. Negative Feedback Network. Negative feedback from the output of V3 is fed to the cathode of V1 through a resistor voltage divider network. The gain of the amplifier is controlled by a two-position GAIN switch (20 DB or 40 DB) that controls the amount of feedback to V1. Frequency response of the amplifier is also controlled by the negative feedback network.

c. Power Supply. The power supply is electronically regulated to stabilize operation during changes in line voltage and load conditions. It consists of power transformer T1, power rectifier V4, series regulator V5, regulator control V6, and voltage reference stage V7. The series regulator stage output is taken from the cathode and supplies the regulated output direct-current (de) voltage. The gaseous OA2 voltage reference tube supplies a stable reference voltage to V6 against which a sample of the output voltage is compared. The regulator control tube amplifies any change in the difference between the sample output voltage and the reference voltage, and applies it to the series regulator control grid. This action holds the output voltage constant at +210 volts dc.

3. Stage Analysis

a. First Amplifier (fig.2). The first amplifier, V1, is a type-5654 pentode voltage amplifier tube. The input signal is applied to the control grid and the negative feedback signal is applied to the cathode. Capacitor C1 blocks any dc component

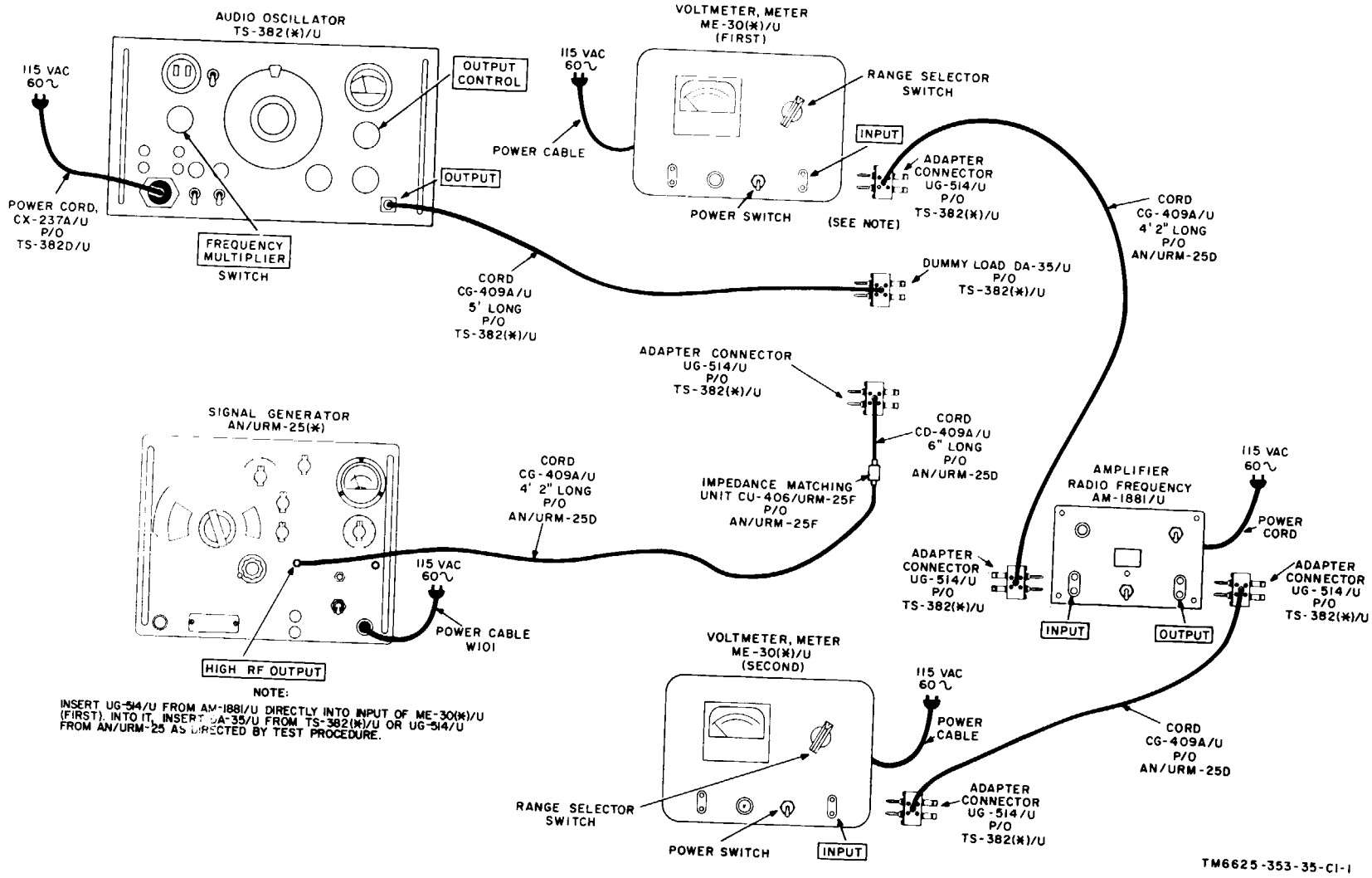

Figure 8.1 Gain and Frequency response test setup.

15.6 Gain and Frequency Response Test

a. Test Equipment and Materials.
Audio Oscillator TS–382(*)/U
Signal Generator AN/URM–25(*)
Voltmeter, Meter ME–30A/U, 2 each
Adapter Connector UG–514/U, 3 each (p/o TS–382A/U)
Cord CG–409A/U, 2 each (p/o AN/URM–25D)

b. Test Connections and Conditions. Connect equipment as shown in figure 8.1.

Note. Signal Generator AN/URM–25(*) is not connected during steps 1 and 2.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*TS–382(*)/U* OUTPUT CONTROL: Fully counterclockwise OSC switch: ON FREQUENCY MULTIPLIER (RANGE) switch: X1 Tuning dial: 100 OUTPUT MULTIPLIER (ATTENUATOR) switch: X1 *ME–30(*)/U (first)* Power switch: ON Range selector switch: .3 *ME–30(*)/U (second)* Power switch: ON Range selector switch: 30	Power switch: ON GAIN switch: 40 db	*a.* Adjust TS–382(*)/U OUTPUT CONTROL for an AM–1881/U input level of 0.1 volt as indicated on the ME–30(*)/U (first). *b.* Change AM–1881/U GAIN switch to 20 db. If necessary, repeat step *a* above. Change ME–30(*)/U (second) range selector switch to 3.	*a.* AM–1881/U output should be between 9 and 11 volts as indicated on ME–30(*)/U (second). *b.* AM–1881/U output should be between .9 and 1.1 volts as indicated on ME–30(*)/U (second).
2	Same as above.	GAIN: 40 db	*a.* Repeat step 1*a*. *b.* Change TS–382(*)/U FREQUENCY MULTIPLIER (RANGE) switch to X10. Repeat step 1*a*, if necessary. *c.* Change TS–382(*)/U FREQUENCY MULTIPLIER (RANGE) switch to X100. Repeat step 1*a*, if necessary. *d.* Change TS–382(*)/U FREQUENCY MULTIPLIER (RANGE) switch to X1000. Repeat step 1*a* if necessary.	*a.* AM–1881/U output should be between 9 and 11 volts as indicated on ME–30(*)/U (second). *b.* Same as *a* above. *c.* Same as *a* above. *d.* Same as *a* above.
3	*AN/URM–25(*)* SET RF OUTPUT: Fully counterclockwise FUNCTION SWITCH: CW POWER: ON BAND SWITCH: 220–600 KC TUNING: 500 KC MICROVOLTS: Fully clockwise *ME–30(*)/U (first)* Range selector switch: 3 *ME–30(*)/U (second)* Range selector switch: 30	Same as above.	*a.* Disconnect Dummy Load DA–35/U and Cord CG–409A/U of TS–382(*)/U from Adapter Connector UG–514/U on INPUT OF ME–30(*)/U (first). Connect Adapter Connector UG–514/U and Cord CG–409A/U from AN/URM–25(*) into Adapter Connector UG–514/U on INPUT of ME–30(*)/U (first), as shown in figure 8.1. *b.* Adjust AN/URM–25(*) SET RF OUTPUT control for a meter deflection to the red arc or 10 on the upper microvolts scale. *c.* Turn the AN/URM–25(*) MICROVOLTS control fully counterclockwise. Change ME–30(*)/U (first) range selector switch to the .3 position. *d.* Adjust AN/URM–25(*) MICROVOLTS control for an AM–1881/U input level of 0.1 volt as indicated on ME–30(*)/U (first) (1 on center 0–3 volts scale). *e.* Change ME–30(*)/U (first) range selector switch to 3. Change AN/URM–25(*) BAND SWITCH to 0.6–1.5 mc, TUNING control to 1 mc, and MICROVOLTS control fully clockwise. *f.* Repeat step *b* above. *g.* Repeat step *c* above. *h.* Repeat step *d* above. *i.* Change ME–30(*)/U (first) range selector switch to 3. Change AN/URM–25(*) TUNING control to 1.5 mc, and MICROVOLTS control fully clockwise. *j.* Repeat step *b* above. *k.* Repeat step *c* above. *l.* Repeat step *d* above. *m.* Change ME–30(*)/U (first) range selector switch to 3. Change AN/URM–25(*) BAND SWITCH to 1.5–3.8 mc, TUNING control to 2.0 mc, and MICROVOLTS control fully clockwise. *n.* Repeat step *b* above. *o.* Repeat step *c* above. *p.* Repeat step *d* above.	*a.* None. *b.* None. *c.* None. *d.* AM–1881/U output should be between 9 and 11 volts as indicated on ME–30(*)/U (second). *e.* None. *f.* None. *g.* None. *d.* Same as *d* above. *i.* None. *j.* None. *k.* None. *l.* Same as *d* above. *m.* None. *n.* None. *o.* None. *p.* Same as *d* above.
4	*TS–382(*)/U* OUTPUT CONTROL: Fully counterclockwise FREQUENCY MULTIPLIER (RANGE) switch: X1 Tuning dial: 100 OUTPUT MULTIPLIER (ATTENUATOR) switch: X1 *ME–30(*)/U (first)* Range selector switch: 3 *ME–30(*)/U (second)* Range selector switch: 30	GAIN: 20 db	*a.* Disconnect Adapter Connector UG–514/U and Cord CG–409A/U from AN/URM–25(*) from the Adapter Connector UG–514/U on the INPUT of ME–30(*)/U (first) connect Dummy Load DA–35/U and Cord CG–409A/U from TS–382(*)/U to Adapter Connector UG–514/U on the INPUT of ME–30(*)/U (first). *b.* Adjust TS–382(*)/U OUTPUT CONTROL for an AM–1881/U input level of 1.0 volts as indicated on ME–30(*)/U (first) (1 on center 0–3 volt scale). *c.* Repeat step 2*b*. *d.* Repeat step 2*c*. *e.* Repeat step 2*d*.	*a.* None. *b.* AM–1881/U output should be between 9 and 11 volts as indicated on ME–30(*)/U (second). *c.* Same as *b* above. *d.* Same as *b* above. *e.* Same as *b* above.
5	Same as step 3.	GAIN: 20 db.	*a.* Repeat step 3*a*. *b.* Repeat step 3*b*. *c.* Adjust AN/URM–25(*) MICROVOLTS control for an AM–1881/U input level of 1.0 volts as indicated on ME–30(*)/U (first). (1 on center 0–3 volts scale). *d.* Change AN/URM–25(*) BAND SWITCH to 0.6–1.5 mc, tuning control to 1 mc, and MICROVOLTS CONTROL fully clockwise. *e.* Repeat step 3*b*. *f.* Repeat step *c* above.	*a.* None. *b.* None. *c.* AM–1881/U output should be between 9 and 11 volts as indicated on ME–30(*)/U (second). *d.* None. *e.* None. *f.* Same as *c* above.

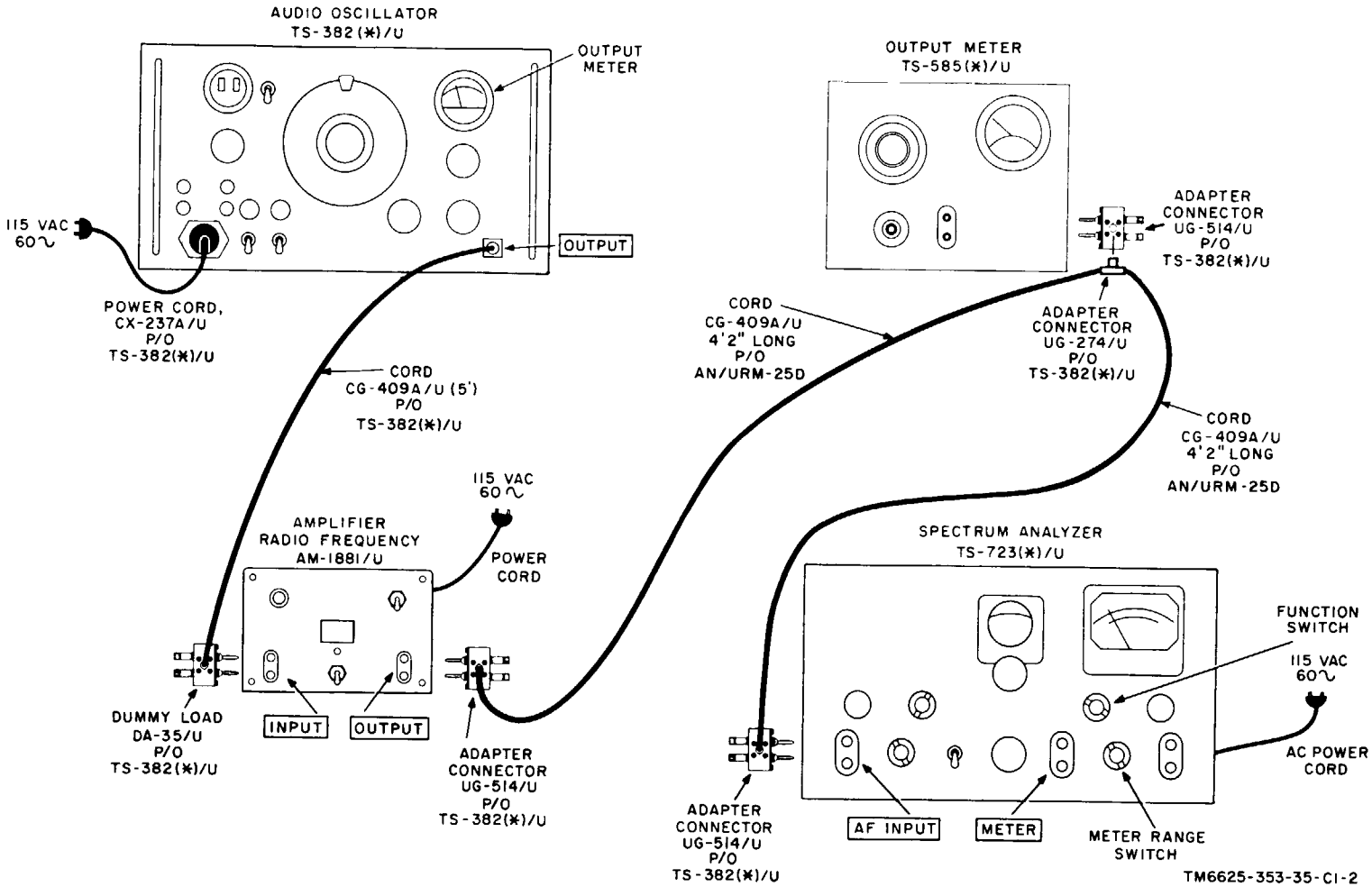

Figure 8-2. Distortion and noise level test setup.

15.7 Distortion and Noise Level Test

a. Test Equipment and Materials.
Audio Oscillator TS–382(*)/U
Output Meter TS–585(*)/U
Spectrum Analyzer TS–723(*)/U
Adapter Connector UG–514/U, 2 each (p/o TS–382(*)/U
Cord CG–409A/U, 2 each (p/o AN/URM–25D)

b. Test Connections and Conditions. Connect the equipment as shown in figure 8.2.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	*TS–382(*)/U* OUTPUT CONTROL: Fully counterclockwise OSC switch: ON (Allow 5 minute warmup) FREQUENCY MULTIPLIER (RANGE) switch: X1000 Tuning dial: 20 OUTPUT MULTIPLIER (ATTENUATOR) switch: X1 *TS–585(*)/U:* Impedance Control: 30 in X100 quadrant MULTIPLY BY: +20 *TS–723(*)/U:* INPUT: MIN AF-RF: AF RANGE: X100 FREQUENCY: 200 Function sw: SET LEVEL Meter range sw: 100% ON-OFF: ON (allow 5 minute warmup)	POWER: ON GAIN: 40 db	*a.* Turn TS–382(*)/U OUTPUT CONTROL clockwise until 0.1 volt is indicated on output meter. *b.* Turn signal INPUT control on TS–723(*)/U clockwise until meter pointer indicates full-scale deflection of 1.0. *c.* Plate function switch on TS–723(*)/U to DISTORTION. *d.* Adjust TS–723(*)/U coarse FREQUENCY tuning control until the meter pointer dips sharply. As adjustment progresses, decrease the setting of meter range switch to maintain a midscale meter deflection. *e.* Adjust TS–723(*)/U fine FREQUENCY tuning control for a maximum dip of the meter pointer. *f.* Adjust TS–723(*)/U BALANCE control for a minimum meter reading. *g.* Repeat steps *d*, *e*, and *f* above until no further reduction in meter reading can be obtained. Note and record the indication on the TS–723(*)/U meter in conjunction with meter range switch (percent of distortion).	*a.* None. *b.* None. *c.* None. *d.* None. *e.* None. *f.* None.
2	Same as test procedure in step 1 except: *TS–723(*)/U* Function sw: METER Meter range switch: 3%	Same as above.	*a.* Disconnect TS–382(*)/U from AM–1881/U and connect DA–35/U to TS–723(*)/U AF INPUT. Remove UG–514/U from TS–723(*)/U AF INPUT and connect it to TS–723(*)/U METER. *b.* Adjust TS–382(*)/U output CONTROL until an indication of 0.1 volt is obtained on the TS–723(*)/U meter. *c.* Remove input from METER terminals on TS–723(*)/U and place input at AF INPUT terminals. *d.* Place function switch on TS–723(*)/U to DISTORTION and record the indication on TS–723(*)/U meter in conjunction with meter range switch (percent of distortion). *e.* Calculate the difference in values obtained in steps 1*g* and 2*d*.	*a.* None. *b.* None. *c.* None. *d.* None. *e.* Calculated value should be less than 1%.
3	Same as test procedure in steps 1 and 2 except: *TS–723(*)/U:* Function sw: SET LEVEL INPUT: MAX Meter range sw: −30/.03	Same as above.	*a.* Disconnect TS–382(*)/U from INPUT terminals of AM–1881/U, and short INPUT terminals on AM–1881/U with a jumper wire. Observe TS–723(*)/U voltmeter. *b.* Place AM–1881/U GAIN switch to 20 db. Observe TS–723(*)/U voltmeter.	*a.* TS–723(*)/U voltmeter should not indicate more than 0.003 volt. *b.* TS–723(*)/U voltmeter should not indicate more than 0.0025 volt.

15.8 Summary of Performance Standards

Function	Performance standard
1. Frequency response	
GAIN at 40 db with .1 v ac input	10 v ac ±1 from 5 cps to 2 mc.
GAIN at 20 db with 1 v ac input	10 v ac ±1 from 2 cps 1.0 mc.
2. Gain at 1 kc with .1 v ac input	
GAIN at 20 db	1 v ac ± 0.1
GAIN at 40 db	10 v ac ± 1.
3.Output	10 volts rms into 3.000 Ohms or higher resistive load.
4.Input noise level	
GAIN at 20db	2.5 millivolts.
GAIN at 40 db	3 millvolts
5. Distortion	Less than 1 percent from 2 cps to100 kc.

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

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TECHNICAL MANUAL

Field and Depot Maintenance

AMPLIFIER, RADIO FREQUENCY AM-1881/U

TM 11-6625-353-35
CHANGES No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 22 October 1962

TM 11-6625-353-35, 17 February 1961, is changed as follows:

Page 16.

Section III.1 (Added) FOURTH

15.1 General

a. Testing procedures are prepared for use by Signal field maintenance shops and Signal service organizations responsible for fourth echelon maintenance to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment must meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment repaired at third echelon if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 15.8.

b. Each test depends on the preceding one for certain operating procedures and, where applicable, for test equipment calibrations. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the Test equipment control setting and Equipment under test control setting columns; then perform each specific test procedure and verify it against its performance standard.

15.2 Test Equipment and Other Equipment Required

All test equipment and other equipment required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA 11–17, Signal Field Maintenance Shops; and TA 11-100 (11-17); Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United States, or TOE 11-158D, Signal Depot Company; and TA 11-101 (11-158), Allowances of Signal Corps Expendable Supplies for Signal Depot Company.

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Audio Oscillator TS-382(*)/U[a].	6625-192-5094	TM 11-6625-261-12
Voltmeter, Meter ME-30A/U and Voltmeter, Electronic ME-30B/U and ME-30C/u.	6625-669-0742	TM 11-6625-320-12
Signal Generator AN/URM-25(*)[b].	6625-570-5719(F) 6625-309-5381(D)	TM 11-5551E TM 11-5551D
Spectrum Analyzer TS-723(*)/U[c].	6625-668-9418	TM 11-5097
Output Meter TS-585(*) /U[d].	6625-224+501	TM 11-5017

[a] Indicated TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U and TS-382F/U.
[b] Indicates AN/URM-25D and AN/URM-25F.
[c] Indicates TS-723A/U, TS-723B/U and TS-728C/U.
[d] Indicates TS-685A/U, TS-686B/U and TS-685C/U.

b. Other Equipment.

Nomenclature	Federal stock No.
Adapter Connector UG-514/U (3 ea) p/o TS-382A/U.	5935-351-4620
Adapter Connector UG-274/U----------	5935-201-2411
Cord CG-409A/U, 4 ft 2 in. long p/a AN/URM-25D (3 ea).	

15.3 Special Requirements

a. The panel markings of certain controls on Audio Oscillator TS-382A/U differ from those used on other models. References to controls in the charts apply to the TS-082B/U, TS-382D/U, TS-382E/U, and TS-382F/U. If the TS-382A/U is used to perform these tests, use the control that corresponds to that given in the charts.

b. The AF-RF switch on Spectrum Analyzer TS-723A/U does not exist on the TS-723B/U or the TS-723C/U. The use of the TS-723B/U or the TS–723C/U for these tests is not affected by the omission of the AF-RF switch.

15.4 Modification Work Orders

There were no modification work orders in effect for this equipment as of the date of this Change. Any MWO'S pertaining to this equipment that may be published since the date of this Change will be listed in DA Pam 310-4. MWO'S other than those classed URGENT should not be reason for rejection.

15.5 Physical Tests and Inspection

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. Make no connections to the AM–1881/U during these tests.

c. Test Procedure.

Step No.	Test equipment control settings	Equipment under test control settings	Test procedure	Performance standard
1	None.	Controls may be in any position.	Check POWER and GAIN switches for proper operation.	All switches should operate freely without binding.
2	None.	Same as above.	a. Inspect all connectors, indicator lamp, fuse, terminal boards, cords, and cover plates for damage, missing parts, or incorrect ratings.	a. Connectors, indicator lamp, fuse terminal boards, cords, and cover Plates should not be damaged to the extent of affecting proper operation or have missing parts or wrong fuse value. Fuse should be 0.8 amp for 115V AC and 0.4 amp for 230V AC operation.
			b. Inspect entire amplifier for physical damage, such as dents, punctures, and bent areas.	*b*, There should be no dents punctures, or bent areas of a nature that would affect proper operation.
			c. Inspect amplifier for condition of finish and panel markings.	c. Surfaces originally painted should not show bare metal. Panel markings should be legible.
3	None.	Same as above.	a. Check seating of all tubes and tube shields in their sockets.	a. All tubes should be vertical, and snugly seated. Shields should be in place, and in electrical contact with the chassis.
			b. Check selenium rectifiers for burns, blistering, or other evidence of excessive heating.	*b.* Selenium rectifiers should not show signs of overheating.
			c. Check all capacitors for evidence of leakage	c. Capacitors should not show evidence of leakage.

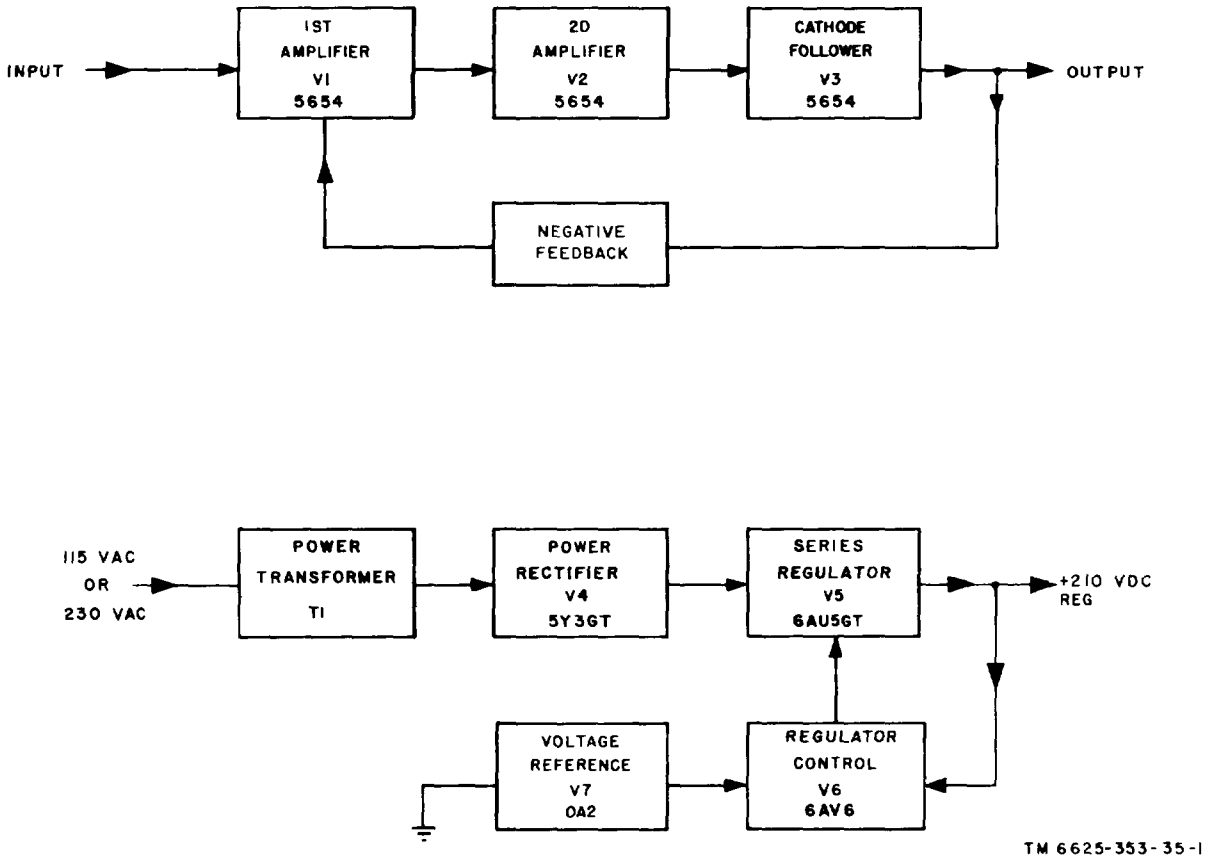


Figure 1. Amplifier, Radio Frequency AM–1881/U, block diagram.

present in the signal applied to the INPUT terminal. Resistor R1 provides the grid with a ground return path, while R2 is a parasitic suppressor. Resistor R3A with R3B and R3C is a tapped, wire-wound resistor that forms a voltage divider network (together with R6) for the feedback signal. Resistor R3Bprovides cathode bias for V1 and the required level of degneration for a total overall rf amplifier gain of 40 decibels (db) when GAIN switch S1 is set to 40 DB. Resistor R3A provides the degeneration required for a total gain of 20 db when the GAIN switch is set to 20 DB. Resistor R6 permits adjustment of the negative feedback over a small range to calibrate the rf amplifier gain. Capacitor Cll adjusts the amount of feedback and is used to adjust the rf amplifier frequency response between 1 and 2 mc. Capacitor C12 reduces degeneration at high frequency (hf) and is selected to give a flat hf response. Resistor R8 reduces the voltage applied to the V1 screen; C2A bypasses the screen to ground. Resistor R9 is the plate load resistor; R10, with C2B and C2C, decouples V1 from V2 and V3. Capacitor C3 couples the amplified signal to the grid of V2.

b. Second Amplifier. The second amplifier, V2, functions the same as V1 except that no feedback signal is introduced into V2.

c. Cathode Follower. Cathode follower V3 is a type-5654 pentode connected as a triode cathode follower. Resistor R29 provides cathode bias for V3 as well as negative feedback for Vl; R18 is the cathode load resistor. Capacitor C6 couples the amplified signal to the OUTPUT terminal and blocks the dc component. Resistor R19 provides a ground return path for the negative side of C6 and the OUTPUT terminal.

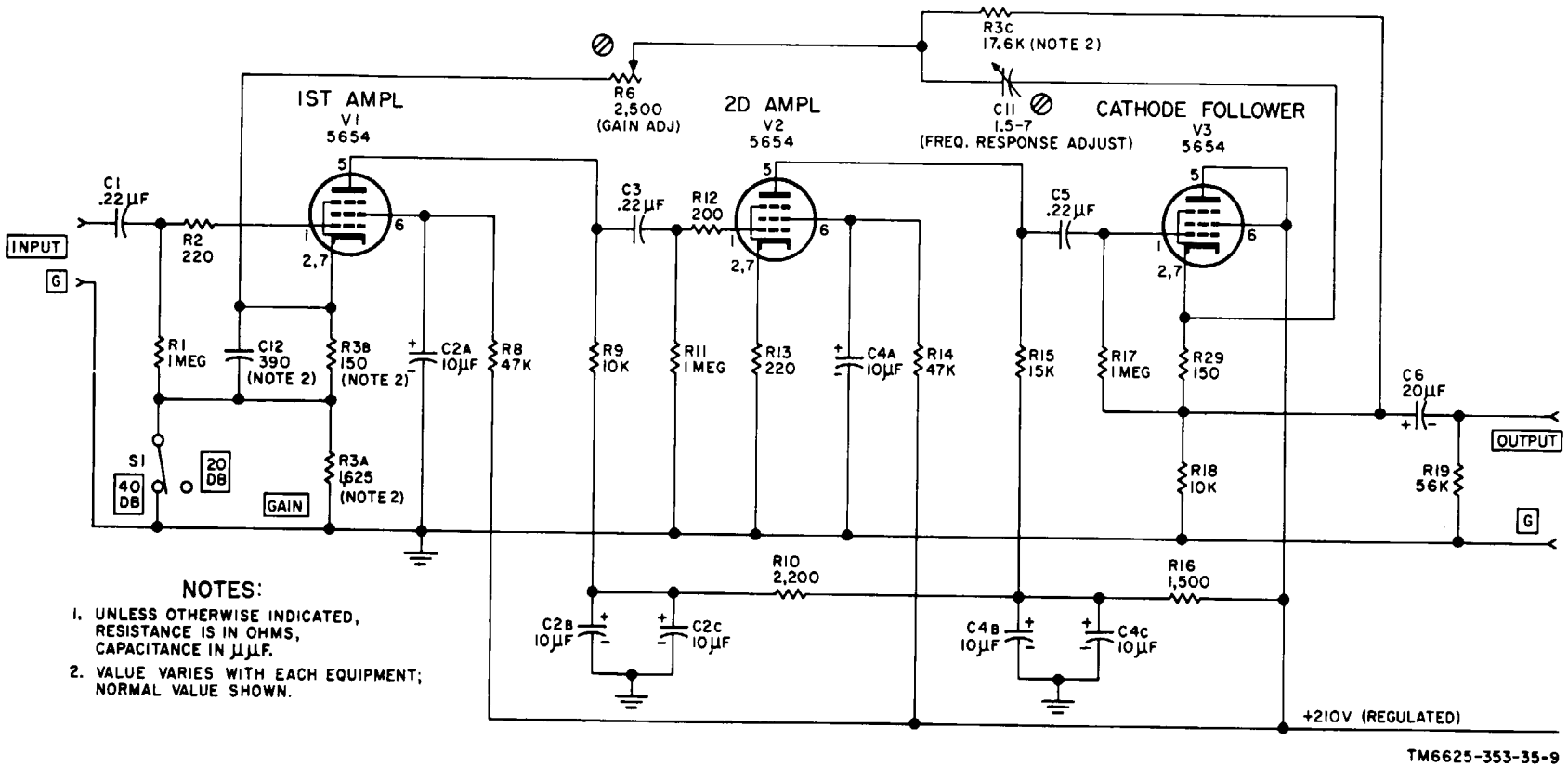


Figure 2. First and second amplifiers and cathode follower, schematic diagram.

d. Power Transformer and Power Rectifier (fig. 3). Power transformer T1 contains two primary windings, three secondary filament windings, and a center-tapped high-voltage (hv) winding. Two primary windings are provided so that they can be connected in parallel for operation from 115-volt alternating current (ac) lines or in series for operation from 230-volt ac lines (para 9, TM 11-6625-353-12). One filament winding is used for regulator tubes V5 and V6. A second filament winding provides 5 volts to the filament of V4. The third filament winding provides 9 volts with a tap at 6.3 volts for lamp DS1 and V3. The 9-volt portion is connected to full-wave bridge rectifier CR1 to obtain dc filament voltage for V1 and V2. The dc filament voltage prevents line-frequency modulation of the amplified signal. Resistor R27 provides adjustment of the dc level to compensate for any change in resistance of CR1 as it ages. Capacitor C7A with C7B filters the output of CR1. The hv winding of T1 is connected to the plates of full-wave power rectifier V4. The rectified dc output is filtered by C8A, C8B, and R21.

e. Series Regulator, Regulator Control, and Voltage Reference. The electronic voltage regulator consists of series regulator tube V5, regulator control tube V6, and voltage reference tube V7 (fig. 4).

(1) The cathode voltage of V5 (+210) is held constant due to the action of regulator control tube V6 and voltage reference tube V7. A change in output voltage due to a change either in input (line) voltage or in the load current is corrected by automatic adjustment of the series regulator grid bias.

(2) A sample of the output voltage is obtained from R25 and R26 in parallel and applied to the grid of V6. Regulator control V6 amplifies any variation of the output voltage by means of the voltage drop across R22, and applies it directly to the control grid of V5. The value of R25 is factory selected to adjust the output voltage at +210 volts ±5; it acts as a B+ voltage-adjusting resistor.

(3) Voltage reference tube V7 provides a stable fixed voltage of +150

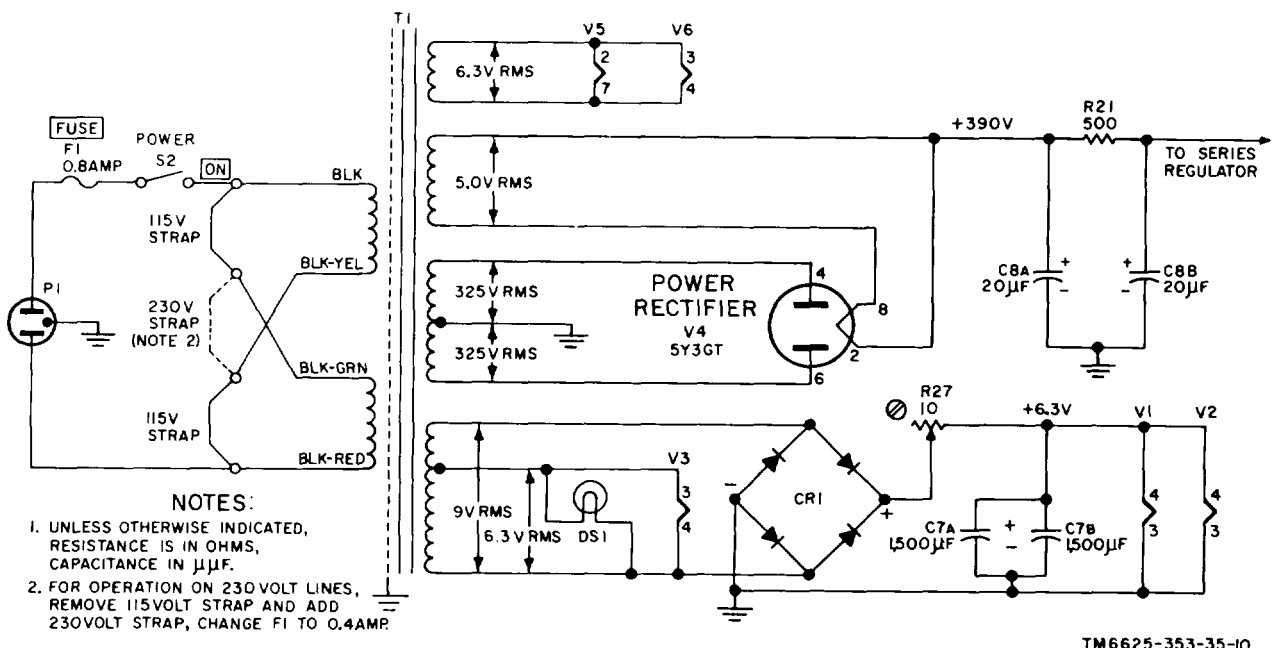


Figure 3. Power transformer and power rectifier, schematic diagram.

volts for cathode of V6. Capacitors C8C and C8D are the output filter capacitors. Resistor R28 is a screen grid current limiting resistor for V5; R24, R25 and R26 form an output voltage divider. Resistor R22 is the plate load for V6 and R23 establishes the correct voltage for the plate of V7.

(4) Any tendency of the output voltage of the power supply to decrease reduces the voltage developed across R26 and R25. This causes the control grid of V6 to become negative (less positive) and decreases the current through V6. The decreased current through R22 causes the plate voltage of V6 to rise, which results in less bias for V5. A decrease in bias on V5 permits more current to flow from ground to V5 through R25, R26, and R24. The increased current through these resistors increases the output voltage, thereby compensating for the original decrease.

(5) When the output voltage tends to increase, the bias on V6 becomes less negative (or positive). This increases the current through plate load resistor R22, which decreases the plate voltage of V6 and, in turn, increases the bias on V5. An increase in bias on V5 permits less current to flow through the output voltage divider and thereby returns the output voltage to its normal regulated level of +210 volts.

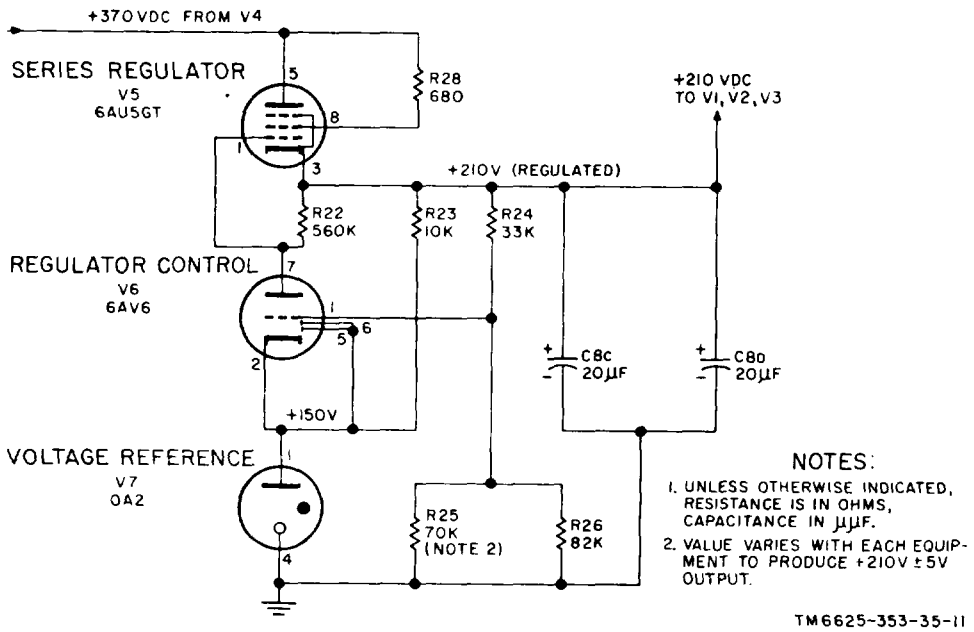


Figure 4. Series regulator, regulator control, and voltage reference, schematic diagram.

CHAPTER 2
TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

Warning:

1. When servicing the rf amplifier, be careful of high voltages. Potentials in excess of 300 volts are exposed at various places below the chassis.

2. The rf amplifier contains a selenium rectifier mounted on the top of the chassis. When selenium rectifiers fail because of burnout or arc-over, poisonous fumes and compounds are released. The fumes have a strong odor and should not be inhaled. *Provide adequate ventilation immediately and do not handle the rectifier until it has cooled.*

4. General Instructions

Troubleshooting at field and depot maintenance level includes all the techniques outlined for organizational maintenance included in TM 11-6625-353-12 and the more comprehensive techniques for localizing trouble symptoms described in this manual. Together, the two manuals give a complete systematic troubleshooting procedure, beginning with simple visual inspection and ending with tube socket voltage, resistance, and stage gain measurements. Troubleshooting instructions in this manual include resistance and voltage measurements, stage gain measurements, and possible circuit malfunctions for various incorrect voltage and resistance readings.

5. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective rf amplifier is to sectionalize the fault. Sectionalization means tracing the fault to a major component. The second step is to localize the fault. Localization means tracing the fault to a defective part responsible for the abnormal condition. Some faults, such as burned-out resistors, arcing, and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be localized by checking the voltages and resistance.

b. Sectionalization. The rf amplifier consists of two major sections: an electronically regulated power supply and a three-stage amplifier section. The first step in tracing trouble is to locate the circuit at fault by the following methods:

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring the circuits. All visual signs should be observed and an attempt made to sectionalize the fault to a particular circuit. A good visual inspection method is outlined in paragraph 20, TM 11-6625-353-12.

(2) Operational tests. Operational tests frequently indicate the general location of trouble. In many instances, the tests will help to determine the exact nature of the fault.

c *Localization.* The tests listed below will aid in isolating the trouble. First, localize the trouble to a single stage or circuit, and then isolate the trouble within that circuit by voltage, resistance, and continuity measurements.

(1) *Stage-gain measurements. Stage*-gain measurements (para 10) will help to isolate a trouble to a specific circuit at fault.

(2) *Voltage and resistance measurements.* These measurements will help locate the individual faulty parts. Use resistor and capacitor color codes (fig. 10 and 11) to find the value of the components. Use the voltage and resistance diagram (fig. 5) to find normal readings, and compare them with the readings taken.

3) *Troubleshooting chart.* The trouble symptoms listed in the chart (para 9) will aid in localizing trouble to a component part.

(4) *Intermittent troubles.* In all these 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 the trouble. Check the wiring for loose connections; move the wires and the components gently with an insulated tool. This may show where a faulty connection or component is located.

6. Test Equipment Required

The following chart lists the test equipment required for troubleshooting the rf amplifier. The chart also lists the associated technical manuals and the common names.

Test equipment	Technical manual	Common name
Audio Oscillator TS-382A/U	TM 11-2684A	Audio oscillator
Multimeter AN/URM-105	TM 11-6625-203-12,-35	Multimeter
Voltmeter, Meter ME–30A/U	TM 11-6625-320-12	Vtvm
Test Set, Electron Tube TV-2/U	TM 11-2661	Tube tester
Test Set, Electron Tube TV-7/U	TM 11-6625-274-12,-35	Tube tester
Tool Equipment T E- 113		

Section II. TROUBLESHOOTING AMPLIFIER, RADIO FREQUENCY AM-1881/11

7. Checking Filament and B Circuits for Shorts

a. When to Check. Check the rf amplifier for shorts whenever application of line power causes the fuse to burn out or causes the transformer or other parts to overheat.

b. What to Check. If fuse F1 blows, remove V5 and again attempt operation. If the fuse no longer blows, the trouble is located in the circuits that follow the regulated power supply. If a replacement fuse blows with V5 removed, the trouble is located in the circuits of the power transformer and the power rectifier. Replace V5 and remove V4. If a replacement fuse still blows, the trouble is in power transformer T1, DS1, CR1 or the filament circuits. If the fuse does not blow, the trouble is in V5, C8A, or C8B. Short circuits are more likely to occur in electron tubes and electrolytic filter capacitors than in other parts; check these parts first. If a tube, a resistor, or a transformer overheats without blowing the fuse, check the tubes in the tube tester for shorts.

c. Conditions for Tests. Prepare for the short-circuit tests as follows:

(1) Remove the top panel on the rf amplifier.

(2) Remove all tubes and indicator lamp DS1. Mark V1, V2, and V3 so that they can be returned to their original tube sockets.

d. Measurements. Make the resistance measurements indicated in the following chart. If abnormal results are obtained, make the additional isolating checks outlined. When the faulty part is found, repair the trouble before applying power to the unit.

	Short-circuit tests	
Point of measurement	Normal indication (ohms)	Isolating produre
Between pins 2 and 7 of tube socket XV5.	Less than 1	Zero resistance indicates a short circuit in the filament winding.
Between pins 3 and 4 of tube socket XV3.	Less than 1	Check continuity of each wire to locate the short. High or infinite resistance indicates an open transformer filament winding or defective wiring between the tube socket and the transformer.
Between pins 2 and 8 of tube socket XV4.	Less than 1	
Between pin 2 of tube socket V5 and chassis ground.	Infinite resistance	A low resistance indicates a short circuit in the filament wiring.
From pin 5 of tube socket XV5 to ground.	Infinite resistance	If resistance is low, check for shorted capacitor C8A or C8B.
Note. Connect ohmmeter negative lead to chassis wrong polarity on electrolytic capacitors will give a false low reading.		
From pin 3 of tube socket XV5 to ground.	100,000	If resistance is low, check capacitors C8C and C8D.
From pin 6 of tube sockets XV1 and XV2 to ground.	150,000	If resistance is low, check for defective screen bypass capacitors C2A, C4A, or filter capacitors C8C and C8D. If resistance is higher than normal, check for an open resistor in the voltage regulator circuits.

8. Test Setup

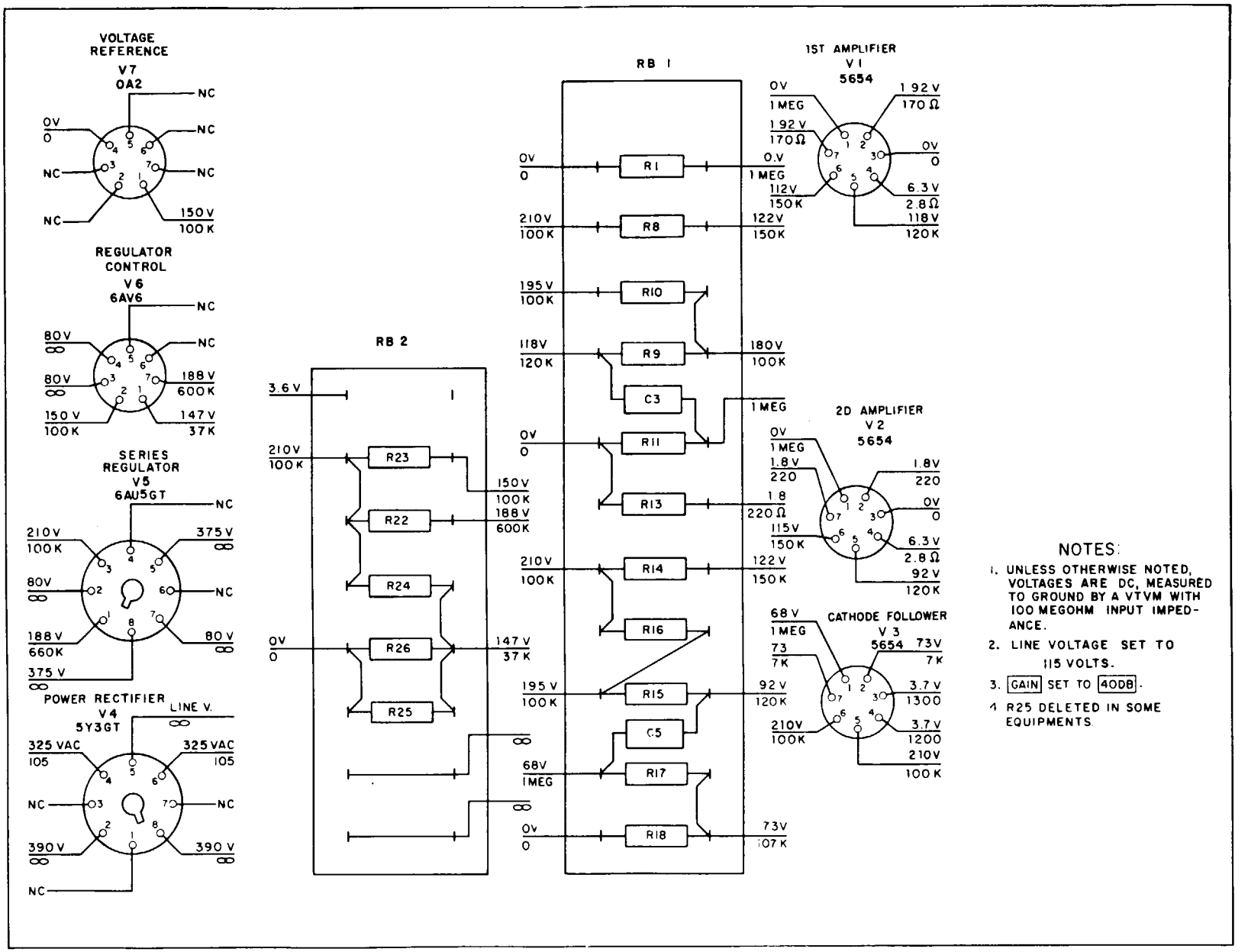
Bench tests of the rf amplifier require connection to a power source and to various test equipments. The power source must be connected to the rf amplifier for all dynamic-servicing procedures; the test equipment connections vary from test to test. Remove the top cover from the rf amplifier and make a test setup as follows:

a. Connect the output terminals of Audio Oscillator TS-382/U (or equivalent) to the INPUT terminals of the rf amplifier so that the ground lead on the audio oscillator connects to the ground lead of the rf amplifier.

b. Connect the OUTPUT terminals of the rf amplifier as specified for the particular tests or adjustments (para 14 and 15). A 3,000-ohm, l-watt resistor is connected across the OUTPUT terminals for all distortion measurements (para 19).

9. Localizing Troubles

a. General In the troubleshooting chart *(d* below), procedures are outlined for localizing troubles to a particular stage within the rf amplifier. Parts locations are shown in figures 6 and 7. A schematic diagram of the rf amplifier is shown in figure 12. Voltage and resistance measurements are shown in figure 5. Depending on the nature of the operational symptoms, one or more of the localizing procedures may be necessary. When trouble has been localized to a particular stage,



TM6625-353-35-5

Figure 5. Tube socket and terminal board voltage and resistance diagram.

use voltage and resistance measurements to isolate the trouble to a particular part.

b. Use of Chart. The troubleshooting chart is designed to supplement the operational checks detailed in TM 11-6625-353-12. If previous operational checks have resulted in reference to a particular item of this chart, go directly to the referenced item. If no operational symptoms are known, begin with item 1 of the troubleshooting chart and proceed until a symptom of trouble appears.

Caution: If operational symptoms are not known or if they indicate the possibility of short circuits within the rf amplifier, make the short-circuit tests described in paragraph 7 before applying power to the rf amplifier.

c. Conditions to Tests. All checks outlined in the chart are to be conducted with the rf amplifier connected to a power source as described in TM 11-6625-353-12.

10. Stage-Gain Measurements

Use the techniques outlined below when the output of the rf amplifiers abnormally low or distorted (item 4 or 5 of the troubleshooting chart).

a. Connections. Connect the rf amplifier to a suitable power source and set the GAIN control to 40 DB. Connect the output terminals of Audio Oscillator TS-382A/U (or equivalent, such as Audio Oscillator TS-421A/U) to the rf amplifier as indicated in below. Connect the OUTPUT terminals of the rf amplifier to the INPUT terminals on Voltmeter, Meter ME-30A/U.

b. Procedure. Apply a 1,000-cycle signal from the audio oscillator to the points indicated in the following table; at each point, adjust the audio oscillator output at each step to obtain a reading of 1 volt on the ME-30A/U. Compare the audio oscillator output and the computed stage gains (found by dividing the audio oscillator voltage applied to the plate, by the audio

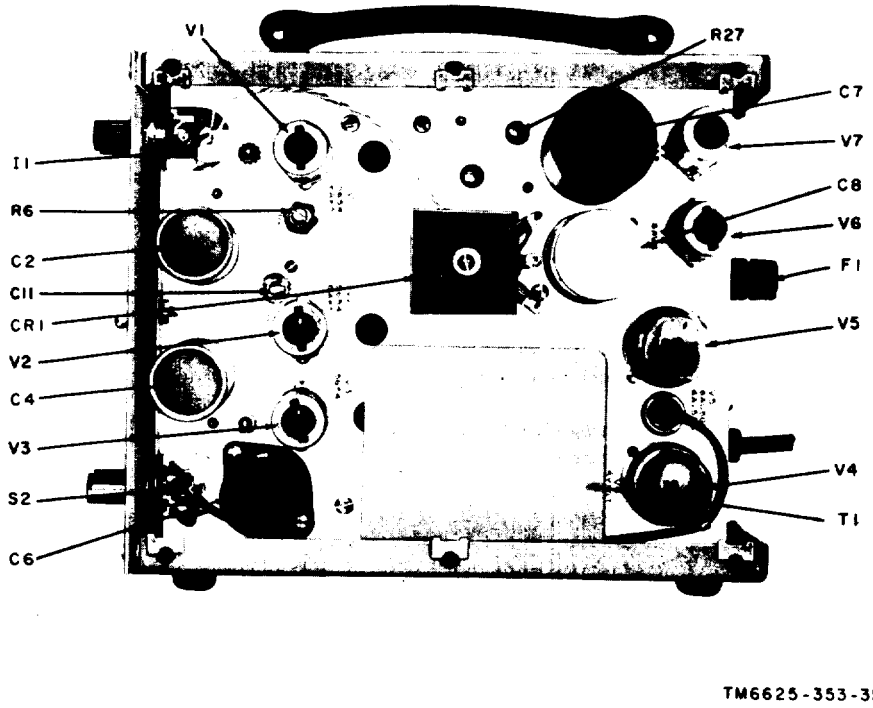


Figure 6. Rf amplifier chassis, top view.

d. Troubleshooting Chart.

	Probable trouble	Correction
1. Line power indicator lamp does not light when power cord is connected to power source and power switch is set to ON.	No sc power applied to rf amplifier.	Check for proper input line voltage.
	Open fuse F1 in power supply.	Replace fuse F1. If the replaced fuse blows, refer to paragraph 7.
	Defective indicator lamp DS1.	Replace indicator lamp.
	Defective wiring to DS1 lamp.	Check continuity of wiring to lamp.
	Defective power switch S2.	Check with ohmmeter for proper operation; replace if defective,
	Defective transformer T1.	Check resistance of T1 (para 11); replace if defective.
2. Line power indicator lamp lights; filaments of V1 and V2 do not.	Defective rectifier CR 1.	Replace CR1.
	Open resistor R27.	Replace R27.
	Defective V1 or V2.	Replace V1 or V2.
3. Line power indicator lamp lights, but filament of V4 does not light.	Defective V4.	Replace V4.
	Open 5-volt filament winding.	Replace T 1.
4. Filament of one or both tubes V5 and V6 does not light.	Defective V5 or V6.	Replace V5 or V6.
	Open 6.3-volt filament winding.	Replace T1.
5. Output is distorted.	Defective voltage regulator.	Check output of voltage regulator (para 13).
	Defective V1, V2, or V3.	Replace V1, V2, or V3.
	Capacitor C 11 improperly adjusted.	Readjust C11 (para 15).
6. Rf amplifier does not produce a 20-db gain when GAIN switch is set to 20 DB, or does not produce a 40-db gain when GAIN switch is set to 40 DB.	Defective V1, V2, or V3.	Replace V1, V2, or V3:
	Defective switch S1.	Check switch S1 and replace if defective.
	Resistor R6 improperly adjusted.	Readjust R6 (para 14).

oscillator voltage applied to the grid of the stage) with those listed in the table. Agreement within 10 percent indicates normal operation.

Test connections	Input voltage (volts)	Stage gain
Pin 1 (grid) and pin 5 (plate) of V1.	.01	4.3
Pin 1 (grid) and pin 5 (plate) of V2.	.043	25.6
Pin 1 (grid) and pin 5 (plate) of V3.	1.1	0.91

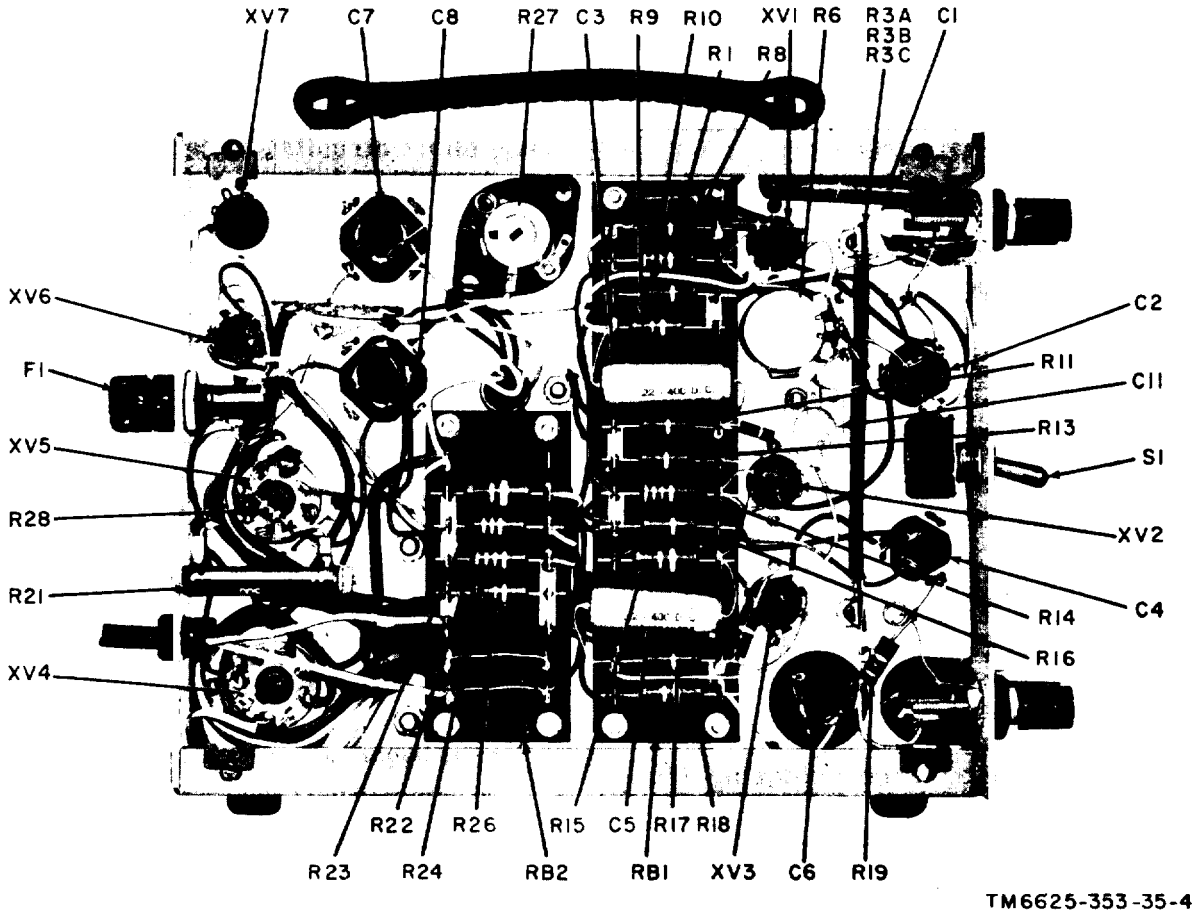


Figure 7. Rf amplifier chassis, bottom view.

11. Dc Resistance of Transformer T1

The dc resistances of the windings of transformer T1 are listed below.

Winding	Winding color code.	Ohms
Primary No. 1	Black, black-yellow	8
Primary No. 2	Black-green, black-red	8
6.3-volt filament	Brown, brown	less than 1
5-volt filament	Yellow, yellow	less than 1
Hv and center tap	Red, red-yellow	105
Hv (end to end)	Red, red	210
9-volt filament	Green, white	0.18
6.3-volt filament tap	Green, red	0.12

Section III. REPAIRS AND ADJUSTMENTS

12. General Parts Replacement Techniques

Most of the parts of the rf amplifier can be reached and replaced easily Without special procedures. The following precautions apply specifically to the rf amplifier:

a. When servicing the chasms assembly, do not disturb the settings of variable resistor R6 (gain adjust), variable capacitor C11 (which controls frequency response), or variable resistor R27 (which adjusts the dc voltage for the filaments of V1 and V2).

b. Before a part is unsoldered, note the position of the leads. If the part, such as the power transformer, has a large number of connections, tag each lead.

c. Do not damage the leads by pushing or pulling them out of the way.

d. Do not use a large soldering iron when soldering small parts. Irons of less than 50 watts are recommended for soldering this equipment. Overheating of small parts may damage or change the value of the component.

e. Do not allow drops of solder to fall into the pats on the chassis; they may cause short circuits.

f. A carelessly soldered connection may create new faults. Make well-soldered joints; a poorly soldered joint is one of the most difficult faults to find.

g. Replace all parts in exactly the same position occupied by the original part. Use exact replacement parts if possible; a part that has the same electrical value but different physical size may cause trouble.

h. Give particular attention to proper grounding when replacing a part; use the same ground as in the original wiring. Failure to observe the precautions may result in undesirable voltages being produced when the rf amplifier is operated with other test equipment.

13. Power Supply Adjustments

a. Regulated Output Voltage. Whenever electron tube V5, V6, or V7 is replaced, check the regulated output voltage as follows:

(1) Connect the rf amplifier to a suitable power source (115 or 230

volts ±10 percent, 50-1,000 cycles) depending on whether power transformer T1 is connected for 115- or 230-volt operation.

(2) Connect the multimeter between pin 3 of V5 and chassis ground, and apply power to the rf amplifier.

(3) The regulated output voltage should measure between +205 and +215 volts dc.

(4) If the regulated output voltage is not between +205 and +215 volts, remove resistor R25 and substitute another resistor with the proper value necessary to produce the correct regulated output voltage. This new resistor is still referred to as R25.

b. Filament Voltage. Whenever selenium rectifier CR1 or electron tubes V1 and V2 are replaced, check the +6.3 filament voltage as follows:

(1) Connect the rf amplifier to a suitable power source (e(1) above).

(2) Connect the multimeter between pin 4 of V1 and V2 and chassis ground.

(3) Apply power to the rf amplifier.

(4) The filament voltage should measure +6.3 volts.

Note. Make this measurement with V1 and V2 both in their sockets for a proper reading.

(5) If the filament voltage is not +6.3 vols, adjust variable resistor R27 to produce the correct filament voltage.

14. RF Amplifier Gain Adjustment

a. General. The rf amplifier amplifies an input signal by either 20 db or 40 db. depending on the setting of GAIN switch S1 and the setting of gain adjust resistor R6. The GAIN switch requires no adjustment. Resistor R6, however, controls the amount of feedback to V1 and must be properly set in conjunction with the GAIN switch to produce a fixed gain of 20 db or 40 db.

b. Gain Adjustment Procedure. To adjust the gain of the rf amplifier, proceed as follows:

(1) Connect the output terminals of the test oscillator to the INPUT terminals of the rf amplifier (fig. 8). Check to see that the ground terminal on the test oscillator connects to the G terminal on the rf amplifier.

(2) Connect the OUTPUT terminals of the rf amplifier to the INPUT terminals of the vtvm.

(3) Set the test oscillator controls to produce a 1,000-cycle signal at a level of 0.1-volt root mean square (rms).

(4) Set the GAIN switch to 40 DB and apply power to the rf amplifier.

(5) Adjust R6 to produce exactly a 10-volt rms (40-db gain) indication on the vtvm.

(6) Set the GAIN switch to 20 DB. The vtvm should indicate 1-volt rms (20-db gain).

(7) If the indication is slightly above or below 1-volt rms, adjust R6 to bring the vtvm meter needle halfway back to the 1-volt mark.

(8) The gain of the rf amplifier in now set to produce either a gain of 40 db ±0.13 or 20 db ±0.13.

(9) If adjustment of R6 cannot bring the gain within the above tolerances, check resistor R3A and replace, if defective. Repeat the gain adjustment procedure.

Note. Reduction of the value of R3A will increase the gain of the rf amplifier when the GAIN sw itch is set for 20 DB operation.

15. Frequency Response Adjustment

a. General. The frequency response of the rf amplifier is adjusted by variable capacitor C11 which is located on the top of the chassis (fig. 6). The frequency response of the rf amplifier when set for a 40 DB gain must be flat within ±0.5 db between 10 cycles per second (cps) and 1 mc, and within +1 db between 5 cps and 2 mc. The frequency response of the rf amplifier when set for a 20 DB gain must be

flat within ±0.5 db between 5 cps to 1 mc, and within ±1 db from 5 cps to 1.2 mc.

b. Adjustment Procedure.

(1) Check the gain adjustment of the rf amplifier as described in paragraph 14.
(2) Connect the output terminals of the test oscillator to the INPUT terminals of the rf amplifier (fig. 8).

Note. Use test leads less than 1 foot in length.

(3) Set the test oscillator output frequency to 2 mc.
(4) Use the vtvm to measure the input level to the rf amplifier.
(5) Adjust the output level of the signal generator to .09 volt rms.
(6) Set the GAIN switch to 40 DB and vtvm should indicate 9 volts.
(7) If the vtvm does not indicate 9 volts, adjust C11 to produce a 9 volt indication.
(8) Set the signal generator frequency to 1 mc and the output level to 0.9 volt rms.
(9) Set the GAIN switch to 20 DB. The vtvm should indicate 9 volts.
(l0) If the vtvm does not indicate 9 volts, readjust C11 for the best compromise between the 20-DB and the 40-DB positions.
(11) If a satisfactory compromise cannot be reached, change the value of C12 in the cathode circuit of V1. An increase in the value of C12 will increase the gain at high frequencies does not require any adjustments.
(12) If C12 is changed, repeat the adjustment procedure until the proper response is obtained.

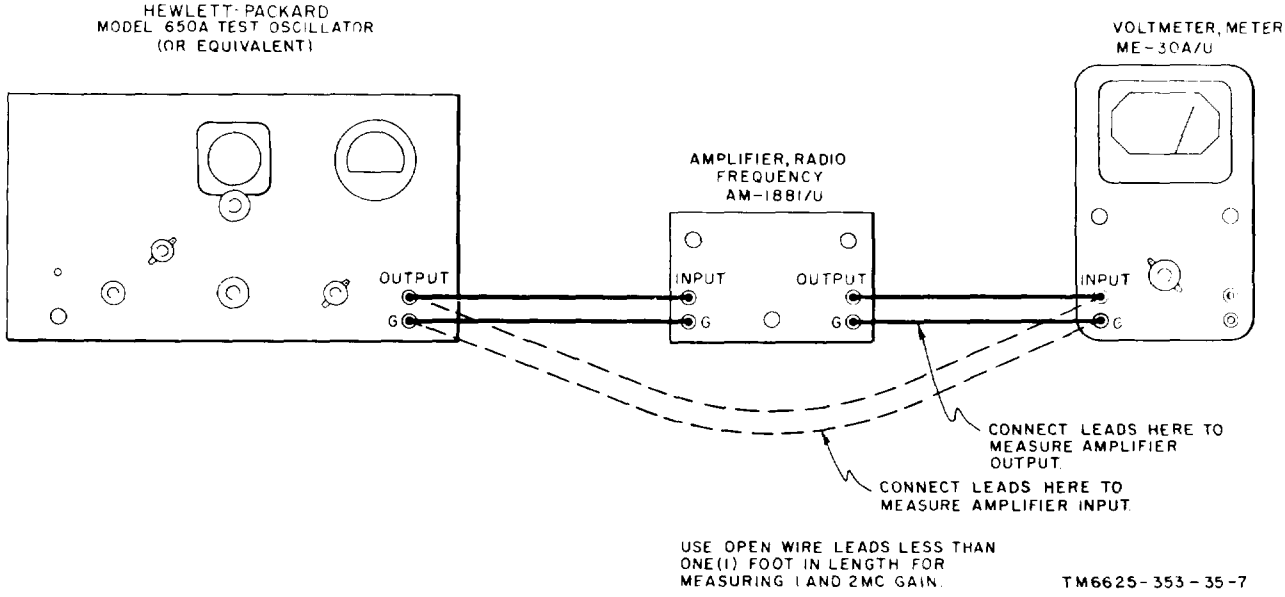


Figure 8. Gain frequency response adjustment test setup.

CHAPTER 3

FINAL TESTING

16. Purpose of Final Testing

The tests outlined in this section together with the adjustments in paragraphs 13 through 15, are designed to measure the performance capability of a repaired equipment.

17. Test Equipment Required for Final Testing

In addition to the test equipment listed in paragraph 6, Spectrum Analyzer TS-723A/U is also required for final testing and is referred to as the spectrum analyzer. The spectrum analyzer is an electronic ac voltmeter preceded by a frequency-rejection filter which is adjustable from 20 cps to 20,000 cps. The fundamental frequency of the input signal to the spectrum analyzer is rejected by the filter section while the total level of all remaining signals (harmonics, noise, and distortion) is measured by the ac voltmeter.

18. Test Setup

a. The test will be performed under the conditions listed below and illustrated in figure 9. Testing will be simplified if connections and panel-control settings are made initially and modifications are made as required.

b. Using the audio oscillator, the rf amplifier, and the spectrum analyzer, connect the equipment as shown in figure 9.

c. Set the front-panel controls on the rf amplifier as follows:

Control	Position
Power switch	Off
GAIN switch	40 DB

d. Set the front-panel controls on the audio oscillator as follows:

Control	Position
FREQUENCY dial	20
FREQUENCY range	X1
OUTPUT ATTENUATOR (upper)	30
OUTPUT ATTENUATOR (lower)	5
AMPLITUDE	0
IMPEDANCE	600
POWER	OFF
LOAD	OFF

e. Set the front-panel controls on the spectrum analyzer as follows:

Control	Position
Signal INPUT control	MIN
Frequency RANGE switch	X1
FREQUENCY tuning dial	20
Function switch	METER
Meter Range switch.	.10 volt
AF-R F selector switch	AF
Power switch	OFF

f. Always allow at least 20 minutes for all equipment to reach stabilized temperatures before beginning any of the testing procedures.

19. Noise and Distortion Test

Noise and distortion in the rf amplifier are measured by applying an undistorted signal into the amplifier and measuring any noise or distortion present in the output after rejecting the input frequency with the spectrum analyzer. When the input frequency is rejected, the total level of all remaining signals is measured by the spectrum analyzer. This residual level will consist of random noise, line frequency ripple, and harmonics of the test signal. To test for noise and distortion, connect the equipment as shown in figure 9 and proceed as follows:

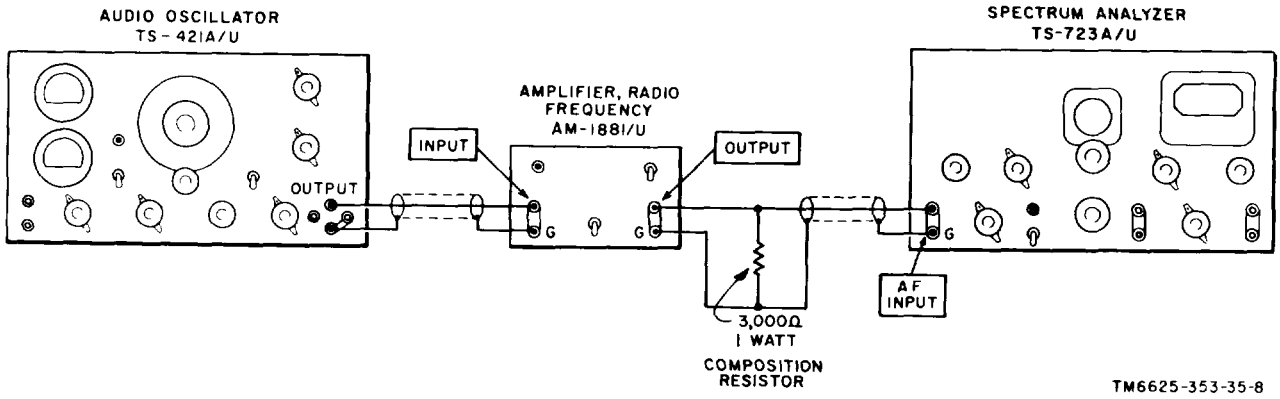


Figure 9. Connections for final testing.

a. Adjust the AMPLITUDE control on the audio oscillator to obtain a reading of .1 volt on the spectrum analyzer voltmeter.

b. Set the spectrum analyzer function switch to SET LEVEL and the meter range switch to 100% (10 volts). Adjust the spectrum analyzer signal INPUT control to obtain a full-scale reading on the 0-1 scale of the spectrum analyzer voltmeter.

c. Set the spectrum analyzer function switch to DISTORTION and tune the FREQUENCY dial for a dip on the voltmeter. Reduce the setting of the meter range switch as necessary and tune the spectrum analyzer FREQUENCY and BALANCE controls for a minimum meter reading. The distortion indicated by the meter must be less than 1 percent. If it is higher, measure the distortion in the audio oscillator output alone which should be less than 0.5 percent.

cf. Set the audio oscillator frequency to 20,000 cps and repeat the above procedure for distortion measurement at this frequency. Distortion should measure below 1 percent. If distortion is below 1 percent within the frequency range of the spectrum analyzer (20 cps -20 kc), presume that is is low at higher frequencies.

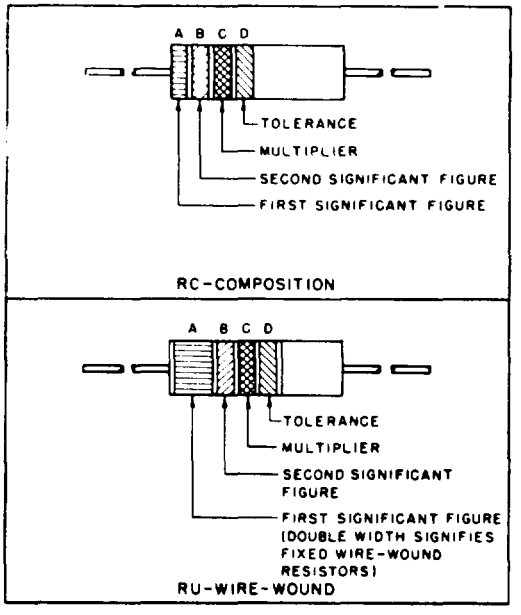
e. Disconnect the audio oscillator from the rf amplifier INPUT terminals, and short the INPUT terminals on the rf amplifier together with a wire jumper.

f. Set the spectrum analyzer function switch to SET LEVEL and set the signal INPUT control to MAX; set the meter range switch to the .03 R.M.S. VOLTS range. The actual voltage input is now only 0.1 (one-tenth) of that indicated on the meter. The measured noise voltage should not exceed 3 millivolts.

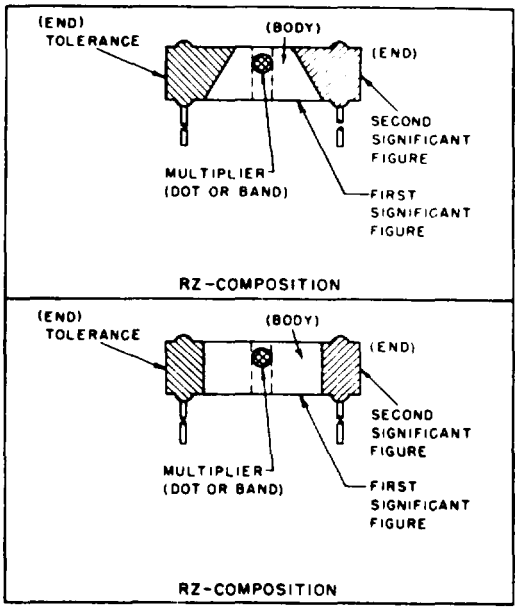
g. Set the amplifier GAIN switch to 20 db. The spectrum analyzer meter should indicate less than 2.5 millivolts.

RESISTOR COLOR CODE MARKING
(MIL-STD RESISTORS)

AXIAL-LEAD RESISTORS
(INSULATED)



RADIAL-LEAD RESISTORS
(UNINSULATED)



RESISTOR COLOR CODE

BAND A OR BODY*		BAND B OR END*		BAND C OR DOT OR BAND*		BAND D OR END*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1	BODY	± 20
BROWN	1	BROWN	1	BROWN	10	SILVER	± 10
RED	2	RED	2	RED	100	GOLD	± 5
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000		
GREEN	5	GREEN	5	GREEN	100,000		
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	GOLD	0.1		
WHITE	9	WHITE	9	SILVER	0.01		

*FOR WIRE-WOUND-TYPE RESISTORS, BAND A SHALL BE DOUBLE-WIDTH. WHEN BODY COLOR IS THE SAME AS THE DOT (OR BAND) OR END COLOR, THE COLORS ARE DIFFERENTIATED BY SHADE, GLOSS, OR OTHER MEANS.

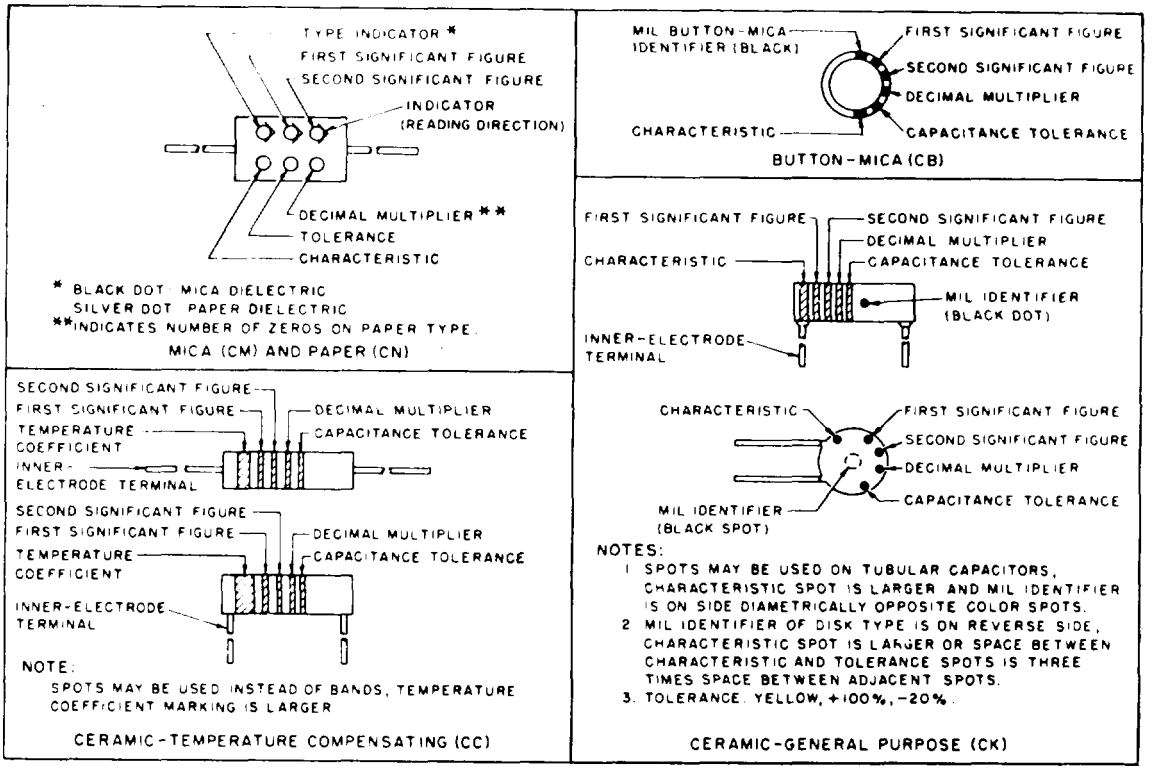
EXAMPLES (BAND MARKING):
10 OHMS ±20 PERCENT: BROWN BAND A; BLACK BAND B, BLACK BAND C; NO BAND D.
4.7 OHMS ±5 PERCENT YELLOW BAND A, PURPLE BAND B; GOLD BAND C; GOLD BAND D.

EXAMPLES (BODY MARKING):
10 OHMS ±20 PERCENT: BROWN BODY, BLACK END; BLACK DOT OR BAND, BODY COLOR ON TOLERANCE END.
3,000 OHMS ±10 PERCENT: ORANGE BODY, BLACK END, RED DOT OR BAND; SILVER END.

STO-R1

Figure 10. MIL-STD resistor color-code marking.

CAPACITOR COLOR CODE MARKING
(MIL-STD CAPACITORS)



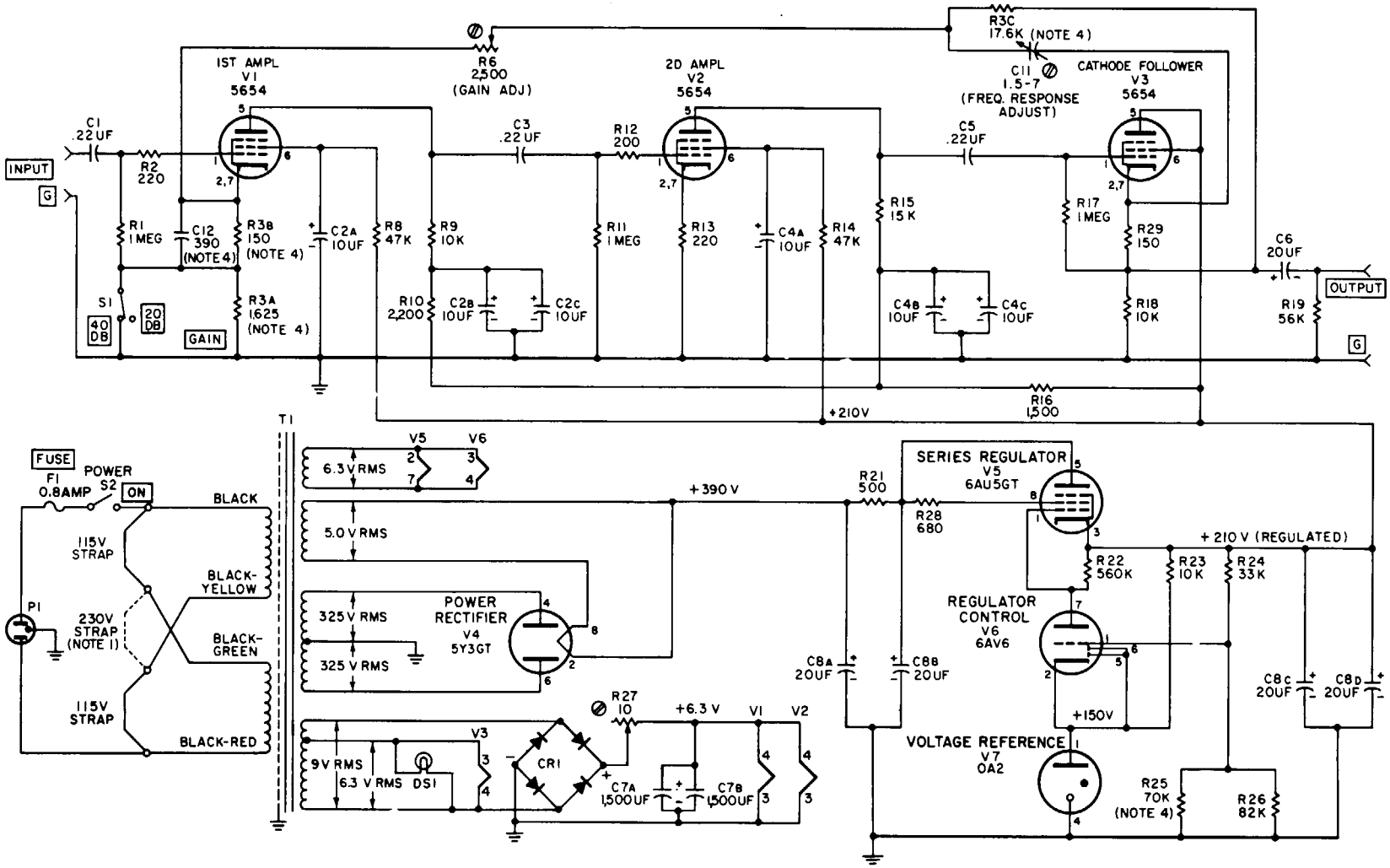
CAPACITOR COLOR CODE

COLOR	SIG FIG.	MULTIPLIER		CHARACTERISTIC[1]				TOLERANCE [2]					TEMPERATURE COEFFICIENT (UUF/UF/°C)
		DECIMAL	NUMBER OF ZEROS	CM	CN	CB	CK	CM	CN	CB	CC		
											OVER 10UUF	10UUF OR LESS	CC
BLACK	0	1	NONE		A			20	20	20	20	2	ZERO
BROWN	1	10	1	B	E	B	W				1		-30
RED	2	100	2	C	H		X	2		2	2	*	-80
ORANGE	3	1,000	3	D	J	D			30				-150
YELLOW	4	10,000	4	E	P								-220
GREEN	5		5	F	R						5	0.5	-330
BLUE	6		6		S								-470
PURPLE (VIOLET)	7		7		T	W							-750
GRAY	8		8			X						0.25	+30
WHITE	9		9								10	1	-330(±500) [3]
GOLD		0.1						5		5			+100
SILVER		0.01						10	10	10			

1. LETTERS ARE IN TYPE DESIGNATIONS GIVEN IN MIL-C SPECIFICATIONS.
2. IN PERCENT, EXCEPT IN UUF FOR CC-TYPE CAPACITORS OF 10 UUF OR LESS.
3. INTENDED FOR USE IN CIRCUITS NOT REQUIRING COMPENSATION.

STD-CI

Figure 11. MIL-STD capacitor color-code marking.



NOTES:

1. FOR OPERATION ON 230 VOLT LINES, REMOVE 115 VOLT STRAPS AND ADD 230 VOLT STRAP; CHANGE F1 TO 0.4 AMP.
2. UNLESS OTHERWISE INDICATED, RESISTANCE IS IN OHMS, CAPACITANCE IN UUF.
3. ⌀ INDICATES SCREW DRIVER ADJUSTMENT.
4. VALUE VARIES WITH EACH EQUIPMENT; NORMAL VALUE SHOWN.

TM6625-353-35-6

Figure 12. Amplifier, Radio Frequency AM–1881/U, schematic diagram.

APPENDIX I

REFERENCES

The following applicable publications are available to the field and depot maintenance repairmen of Amplifier, Radio Frequency AM-1881/U.

TM 11-2661	Electron Tube Tests Sets TV-2/U, TV-2A/U, and TV-2B/U.
TM 11-2684A	Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, and TS-382E/U.
TM 11-5097	spectrum Analyzers TS-723A/U and TS-723B/U.
TM 11-6625-203-12	Operation and Organizational Maintenance: Multimeter AN/URM-105, including Multimeter ME-77/U.
TM 11-6625-203-35	Field and Depot Maintenance: Multimeter AN/URM-105, including Multimeter ME-77/U.
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 11-6625-274-35	Field and Depot Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 11-6625-320-12	Operator's and Organizational Maintenance Manual, Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30 B/U and ME-30C/U.
TM 11-6625-353-12	Operator's and Organizational Maintenance Manual, Amplifier, Radio Frequency AM-1881/U.
TM 11-6625-355-12	Operator's and Organizational Maintenance Manual, Audio Oscillator TS-421A/U.

By Order of the Secretary of the Army:

G. H. DECKER
General, United States Army,
Chief of Staff.

Official:

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

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USARADCOM (2)
USARADCOM Rgn (2)
MDW
Seventh US Army (2)
EUSA (2)
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11-6 (2)
11-7 (2)
11-16 (2)
11-55(2)
11-56 (2)
11-57 (2)
11-98 (2)
11-117 (2)
11-155 (2)
11-500 (AA-AE,RA-RT) (4)
11-557 (2)
11-587 (2)
11-592 (2)
11-597 (2)

NG: State AC (3); Units same as Active Army except allowance is any copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

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The Metric System and Equivalents

Linear Measure

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

Weights

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

Liquid Measure

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

Square Measure

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

Cubic Measure

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

Approximate Conversion Factors

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

Temperature (Exact)

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

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