DEPARTMENT OF THE ARMY TECHNICAL MANUAL

General Support and Depot Maintenance Manual

TEST SET, RADIO AN/ARM-5A
(NSN 6625-00-926-7768)

This copy is a reprint which includes current pages from Change 1. Title was changed by Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 1971

WARNING

Dangerous voltages exist in this equipment. When servicing the AN/ARM-5A, be extremely careful of high voltages. Dc voltages up to 75 volts appear between the DEMOD output connector and ground. Voltages up to 700 volts are present at vacuum tube terminals within the chassis.

DON'T TAKE CHANCES!

Change 1

TECHNICAL MANUAL
No. 11-6625-828-45

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 18 March 1971

GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL
TEST SET, RADIO AN/ARM-5A
(NSN 6625-00-926-7768)

This manual, together with TM 11252812, 11 September 1970, supersedes TM 1 1.2542.15, 21 July 1967.

CHAPTER 1
FUNCTIONING OF TEST SET, RADIO AN/ARM-5A

1-1. Scope

a. This manual covers general support (GS) and depot maintenance for Test Set, Radio AN/ ARM-5A. It includes instructions appropriate to GS and depot categories for troubleshooting, testing, aligning, and repairing the equipment, replacing maintenance parts, and repairing specified maintenance parts. It also lists tools, materials, and test equipment for GS and depot maintenance. Detailed functions of the equipment are covered in paragraph 1-4.

b. The complete technical manual for this equipment includes TM 11-6625-828-12.

c. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, NJ 07703.

NOTE

For applicable forms and records, refer to paragraph 1-3, TM 11-6625-828-12.

1-2. Indexes of Publications

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

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Block Diagram Analysis

The AN/ARM-5A is a signal generator which provides simulated omni and amplitude localizer signals for testing vhf navigational receiving equipment in the 108- to 132-megacycle (me) frequency range. Signal paths are shown in the block diagram (fig. 4-10) and are discussed in a through m below. For complete circuit details, refer to the overall schematic diagram (fig. 4-11).

a. Tone Generator. Modulation frequencies in the SG-66B/ARM-5 are produced by tone generator MG101. The modulation frequencies are derived from two tone wheels (E101A and E101B) by means of five pickup coils (L10I, L102, L103, L104, and L105).

b. OMNI TRACK Switch. OMNI TRACK switch S101 selects coil signal combinations of L101, L102, L104, and L105. The selected combinations are paired to determine phase results, capable of shifting the track angle through 3600 in increments of 30°.

c. Reference and Variable Amplifiers. Reference amplifier V101A and VIO1B and variable amplifier V103A and V103B increase the input signals from the tone generator to suitable out- put levels for limiting.

d. Limiters. Limiters CR101 and CR102 and CR103 and CR104 function identically within their respective channel circuits. They symmetrically limit the upper and lower peaks of the input signals.

e. Detector Driver. Detector driver V104A functions to amplify the output of limiter CR103, CR104 to drive the ratio detector-discriminator.

f. Ratio Detector-Discriminator. The ratio detector-discriminator consisting of discriminator network Z101 and diodes CR105 -and CR!06, demodulates the 30-cycle voltages for the omni signal circuit, and the 90- and 150-cycle voltages for the amplitude localizer circuit from the signals generated by the tone generator.

g. 90- and 150-Cycle Filter Networks. The 90- and 160-cycle filter networks, Z102 and Z103, are bandpass filters for the amplitude localizer circuit and remove undesirable frequency components.

h. -Cycle Filter Network. The 30-cycle filter

network is a filter for the onmi circuit to eliminate harmonics and high-frequency components.

i. 15° Phase Shift Network. When selected, the 15° phase shift network adds 15° to the phase of the filtered 30-cycle signal.

j. Modulation , Amplifier. Modulation amplifier V104B amplifies its various input signals to a level sufficient to drive modulator V102.

k. 1,000-Cycle Oscillator. The 1,000-cycle oscillator (V107) supplies 1,000-cycle signals to modulation amplifier V104B. Oscillator V107 is keyed by oscillator keyer V106 when IDENTIFIER switch S104 is in the ON position to identify a radiated test signal.

l. Modulator. Modulator V102 amplitude-modulates (am.) the radio frequency (RF) signals generated in RF unit Z104.

m. RF Unit. Rf unit Z104 generates an RF voltage of known amplitude which is controlled by RF attenuator Z105. This output is available at ATTEN jack J104. Also, a 1-volt output is available at I VOLT jack J105. The RF voltage is modulated by the frequency selected at MODULATION switch S102. The RF output is demodulated by cathode follower V116A and is available at DEMOD jack J107.

1-4. Stage Analysis

Test Set, Radio AN/ARM-5A produces crystal- controlled RF signals that are amplitude-modulated by any of three types of internally generated signals. These are omni, localizer, and 1,000-cycle signals. The omni signal consists of an RF signal simultaneously amplitude-modulated with 30 cycles known as the variable 30-cycle component and 9,960-cycle subcarrier component. The subcarrier is frequency-modulated at a 30-cycle rate (known as the reference 30- cycle signal). OMNI TRACK switch S101 determines the phase angle between the variable and reference 30-cycle signals. The localizer signal consists of an RF signal simultaneously amplitude-modulated with 90- and 150-cycle components. On course indicates equality of these components. Off course indicates inequality, with the 150-cycle component predominating for needle left and the 90-cycle component predominating for needle right. The third type of signal is 1,O00-cycle internal modulation or the RF signal may be externally modulated by an audio- frequency or voice signal, The various navigational signal outputs generated by a tone generator are selected by means of MODULATION switch S102, located on the front panel. Switch S102 (fig. 4-11) also has four SET positions to permit the individual setting of the modulation level for the 9,960-, 30-, 90-, and 150-cycle components. The modulation percentage of each of these modulation components is adjusted to the N. proper value by means of separate potentiometers following the limiter circuits. The circuit is designed so that when the 30- and 9,960-cycle components are properly adjusted to 30 percent modulation, the needle of %M meter M102 will align with the green arrow on the dial. When the 90- and 150-cycle components are properly adjusted to 20 percent modulation, the needle of M102 will point to the red dot on the dial. First, adjust the 90-cycle component and then adjust the 150-cycle component.

a. Omni Signal Circuit. (fig. 4-11). The four 30-cycle tone wheel coils (L101, L104, L105, and L102) are connected to OMNI TRACK switch S101. These coils are disposed around tone wheel E1O1A at precise angular spacings of 0°, 30°, 120°, and 180°. Switch S101 selects these coils in pairs, in various combinations, and with MODULATION switch S102 in the OMNI position, connects one to the input of reference amplifier V101 and the other to variable amplifier V103. For zero-degree track, the same coil is connected to both channels. The output of V101 is clipped symmetrically by the twin, crystal diode limiter CR101, CR102, and applied to modulator tube V102 as the reference-phase component of modulation. The output of V103 is clipped by crystal diode limiter CR103, CR104, and amplified by V104A, and then discriminated by net- work Z101 and CR105, CR106. The resulting variable phase 30-cycle signal is fed through a 30-cycle filter for the elimination of harmonics and then through a phase-shifting resistance network to modulation amplifier V104B. The signal, after being amplified by V104B, is applied to modulator V102 as the variable-phase component of modulation,

b. Amplitude Localizer Signal Circuit. (fig. 4-11). With the MODULATION switch set to any of the three AMP LOC positions, the input to the reference phase channel is disconnected from the tone generator and grounded. Amplitude localizer pickup coil L103, associated with tone wheel E101B, is connected to the variable-phase channel. Amplitude localizer tone wheel E101B is cut to provide a 9,960-cycle signal, frequency-

modulated (fm) simultaneously at 90 and 150- cycles. In place of the 30-cycle filter used for omni signals, a 90- to 150- cycle filter is connected, and a ratio network replaces the resistor network. The 90- to 150-cycle filter is used to pass the 90- and 150-cycle voltages produced by the ratio detector-discriminator, and to remove the higher- frequency components. The ratio network, in combination with the 90- to 150-cycle filter, functions to set the relative levels of the 90- and 150-cycle components. The ratio' detector-discriminator (Z101, CR105, CR106) and modulation amplifier V104B function in the same way as in the omni positions of MODULATION switch S102.

c. Output Circuits. The modulation components developed in the omni and localizer signal circuits are amplified by modulator tube V102. This tube, in turn, amplitude-modulates the RF signals generated in RF unit Z104. The resulting RF output is made available at a 1-volt level at 1 VOLT jack J105 or at an attenuated level from ATTEN jack J104. Detection of the modulated RF signals takes place within the RF unit, and the demodulated output is connected through cathode follower V116A to DE- MOD output connector J107. The RF level and modulation percentage are measured by two volt- meter circuits, incorporating V115A and V115B and indicated by meters M101 and M102. External voice modulation may be obtained through a microphone connected to MIC jack J108. Other external modulation is connected to EXT MOD binding posts on the front panel.

d. Power Supply. (fig. 4-11). All necessary high voltages for the operation of Test Set, Radio AN/ARM-5A are from a regulated power supply. The 115-volt alternating current (ac), 60-cycle, primary power is connected at POWER INPUT connector J106 and controlled by POWER STANDBY switch S106. For circuit protection, both sides of the input line are fused by F101 and F102. With S106 at STANDBY, primary power is supplied to the space heaters. Switching S1Q6 to POWER applies primary volt- age to transformers T101 and T102 of the power supply and applies power to motor B101 of tone generator MG101. The regulator circuit is de- signed to compensate for input voltage variations as well as load-voltage variations. The direct current (de) output from rectifier V11, filtered by a single-section choke-input filter, consisting of choke L121 and capacitor C158, is connected in series with series regulator V114. The load current through V114 is dependent on TM 11-6625-4$' 45 the grid bias applied to V114. The grid bias applied to V114 is determined by load resistor R196 and error amplifier Vl13 and voltage reference V112 which are series-connected across the dc output of V111. Voltage reference V112 holds the cathode of V113 at a constant reference potential of approximately 150 volts with respect to ground, while the control grid of V113 is fed from the tap on the voltage divider, consisting of resistors R204, R202, and R198. If the load voltage rises, whether from a decrease in the load current or from an increase in the input voltage, the voltage on the grid of V113 rises, decreasing the bias, while its cathode volt- age remains practically constant. The plate cur- rent of V113 increases thereby causing a larger voltage drop across load resistor R196. This change in voltage will also be applied to the grid of V114, but with inverted form, causing the grid of V114 to become more negative; in effect, increasing the plate resistance of V114. Under these conditions, a larger portion of the available dc voltage will appear across V114 which tends to restore the output voltage. The action of the regulator circuit is reversed if the load voltage tends to fall. The low end of the voltage divider (R204, R202, and R198) is re- turned to ground through R200 and R203. Also, the input voltage to the regulator circuit is bled through R197, R200, and R203, so that any change in input voltage will produce the same effect as a change in output voltage. The ripple current through C158 will produce a voltage drop across R203 which will tend-to oppose any ripple that does appear at the input point of the regulator circuit. Resistor R201 maintains the flow of operating current through V112. Resistor R199 is the screen voltage-dropping resistor for V113. In case of transient load variations, such as motor surges, C159C produces a corrective voltage at-the grid of V113 of a greater magnitude than would the voltage from the divider.

e. Tone Generator (fig. 1-2). Modulation frequencies in the AN/ARM-5A are produced by tone generator MG101. The modulation frequencies are derived from tone wheels ElO1A and E101B, which are mounted on a common shaft and driven by motor B101, a 60-cycle, 1,800-revolution per minute (rpm) synchronous motor. Each tone wheel has teeth so cut as to generate a frequency-modulated signal with a 9,960-cycle center frequency. On one wheel (E101A), the modulation frequency is 30 cycles, that is, 1 cycle per revolution of the wheel. This

wheel is surrounded by pickup coils L101, L102, L104, and L105. Voltages generated in selected pairs of these coils are used in the formation of signals for omni modulation. The other wheel (E101B) is frequency-modulated by equal components of 90 cycles, corresponding to 3 cycles per revolution of the wheel, and 150 cycles, corresponding to 5 cycles per revolution. Coil L103 is used with E101B to generate the localizer modulations. Capacitors C102 through C106 are used to tune the coils to a broad resonance at 9,960 cps. The 9,960-cycle signal frequency-modulated at 30 cycles as generated by E101A, is amplified, limited, and applied to modulator tube V102 as the reference modulation component for omni signal. The 30-cycle modulation, or 90-cycle and 150-cycle modulation for localizer signals, is obtained by discriminating and filtering the frequency-modulated output of the appropriate tone wheel pickup coil.

f. MODULATION Switch (fig. 1-3). MODULATION switch S102 is a rotary switch with ten active positions which, when set to the-proper position, selects the type of emission desired from the AN/ARM-5A. There are three amplitude localizer (AMP LOC) standard positions on this switch corresponding to off course- needle right, off course-needle left, and one course signals. A single switch position OMNI selects a standard omni signal. In addition to the standard AMP LOC and OMNI positions, four SET positions, 30, 90, 150, and 9,960 cycles, are included. The EXT position is used for setting the RF level or for external modulation.

g. OMNI TRACK Switch (fig. 1-4). OMNI TRACK switch S101 selects, from pickup coils L101, L102, L104, and L105, the pair of coils which determines the phase relationship between the 30-cycle. frequency modulation on the reference-phase component of modulation, and the 30-cycle variable-phase component of modulation. By selecting these coils in proper combination, S101 is capable of shifting the track angle through 360° in twelve 30° steps. The angular relationship between various paired coils is shown in figure 3-9(. At intermediate (odd 15°) positions of S101, an additional phase shift is introduced by the connection of a phase- shifting circuit consisting of R142, R143, and C122. This circuit is connected between the 30- cycle filter and modulation amplifier V104B. The OMNI TRACK switch is calibrated in angle to degrees to simulate an omni transmitter. At a zero-degree setting of S101, the emitted signal 1-4 is the same as that which would be received by an aircraft due south of an omni transmitter. A 90° setting provides modulation corresponding to the signal received due west of the omni station, and so forth.

h. Reference and Variable Channel Amplifiers (fig. 1-5 and 1-6). Reference -channel amplifier V1O1A, V1O1B and variable channel amplifier V103A, V103B are similar, each being a triode amplifier designed to increase the respective channel modulations derived from tone generator MG101 to a suitable level.

i. Limiters (fig. 1-7 and 1-8). Reference channel limiter CR101, CR102 circuit and variable channel limiter CR103, CR104 circuit differ slightly in circuit values, but function identically within their respective channel circuits. They limit the upper and lower peaks of the input signals symmetrically, thereby removing amplitude variations, and perform as follows: The limiter in its quiescent state (no signal in- put) may be considered as a resistor network in which the current through R128 divides equally through R127 and R129 (fig. 1-8). Diodes CR-103 and CR104 will prevent current flow from R127 to R128, and similarly, from, R129 to R128. ' - If the voltage at the cathode of CR103 is reduced, due to an applied signal, the voltage at the anode of CR103 will also be reduced, as will the voltage at the anode of CR104. If the potential at the anode of CR104 reaches ground potential or attempts to go lower, no current can flow because of the rectifier action of the anode and cathode of CR104. The negative swing of the input signal is limited. Circuit values are chosen so that the voltage at CR101, CR102 circuit may be reduced to ground potential, but no further. If the voltage at the cathode of CR103 increases, the action is relatively the same, with component values chosen so that the voltage at CR101, CR102 circuit will rise to twice the no-signal voltage and no further, resulting in the limiting of the positive swing. The action of reference channel limiter CR101, CR102 circuit (fig. 1-7) is the same. In the variable channel circuit, the output is applied to the grid of V104A, which serves to amplify the limited signal present at the output of CR101, CR102. Resistor R109 (fig. 1-7) is used to adjust the level of the 9,960-cycle modulation component to its proper value. Resistors R130 and R131 (fig. 1-8) are used to adjust the modulation level of the 30-cycle or 90 plus 150-cycle components.

j. Ratio Detector-Discriminator (fig. 1-9). The ratio detector-discriminator, consisting of the network Z101 and CR105, CR106, produces the 30-cycle voltages used in the omni signal circuit, and the 90- and 150-cycle voltages used in the amplitude localizer signal circuit. The ratio detector-discriminator connections are such that the 30-cycle output voltage is maximum when the frequency of the frequency-modulated input signal is minimum. This corresponds to a 180° phase difference between the reference and variable channel signals. The output voltages of the ratio detector-discriminator are passed through a low-frequency filter circuit as de- scribed in k below. Driver V104A amplifies the level of the output signal from CR103, CR104, the variable channel limiter, before entering the ratio detector-discriminator circuit.

k. Filter and Resistance Networks (fig. 1-10). The output voltages from the ratio detector-discriminator are passed through filters to eliminate harmonics. Both 30-cycle low-pass filter and 90- to 150-cycle bandpass filter networks are incorporated, the 30-cycle filter being connected for omni signals, the 90- to 150-cycle filters for localizer signals. The 30-cycle filter consists of R138, R139, L106, C114A, C114B, and C121A, C121B, and C121C. After passing through the filter, the 30-cycle output is passed through a resistance network. For 30° omni courses, as selected by OMNI TRACK switch S101, the network consists of resistors R140 and R141. In the case of odd 15° omni courses selected by S101, the network consists of R142, R143, and C122. This network causes an additional phase shift. For 30° courses, the output is taken from the low end of R140 with a slight reduction in signal amplitude. For 15° courses, the output is taken from the junction of R143 and C122, reducing the signal amplitude an equal amount.

l. Ratio Network (fig. 1-11). The function of the ratio network is to set the relative levels of the 90- and 150-cycle components derived from the ratio detector-discriminator circuit. When MODULATION switch S102 is in the AMP LOC ((needle center) position, these voltages, taken from the junctions of R145 and R146 and R147 and R148, are equal' and each provides 20 percent modulation of the carrier. Resistors R146 and R148 are selected to produce this result. For the AMP LOC O (needle left) and AMP LOC ®) (needle right) switch positions, the voltages are unbalanced to produce 3-dot deflection on a cross-pointer meter of a standard localizer receiver. This corresponds to an increase of 2 decibels (db) in the 150-cycle component, and a decrease of 2 db in the 90-cycle component for AMP LOC (needle left).

m. 90- and 150-Cycle Amplifier. Amplifier V105 is a duotriode amplifier which increases the 90- and 150-cycle signal level output from the ratio network described in 1 above. The amplified signal is applied through S102H to V104B. Demodulation amplifier V104B raises the level of the variable 30-cycle signal or the 90- and 150-cycle signal as selected by S102H and applies the amplified signal through R161 and C110 to the grid of modulator V102.

n. Modulator (fig. 1-12). The modulation components from V104B are applied to the grid of modulator tube V102 through C110 and R161 and from V101B through limiter CR101, CR102 and C109. Resistors R112 and R115 act to sup- press parasitic oscillations. Capacitor C112 is a plate blocking capacitor with a high value chosen to minimize a 30-cycle phase shift.

o. RF Unit (fig. 1-13). RF unit Z104 contains circuits for generating an amplitude-modulated, crystal-controlled RF signal, and for demodulation of the signal. The RF signal is produced by a Pierce oscillator circuit in which either or two crystals, Y101 or Y102, is selected by MC switch S105A. Two doubler circuits are used for raising the fundamental crystal frequency to the desired output frequency. The final output frequency may be located anywhere between 108 and 132 mc. The crystals normally supplied with the AN/ARM-5A produce output frequencies of 110.9 and 114.9 me. Other crystals (not supplied) may be used for other output frequencies.

p. Oscillator (fig. 1-13). Oscillator tube V108A is connected in a modified Pierce circuit in which one terminal of the crystal is grounded The plate (terminal 6) of V108A is therefore at ac ground potential, and the output load actually is located in the cathode circuit. The output of the oscillator is applied to the grid of first doubler V108B through C141.

q. Doublers (fig. 1-13). First doubler tube V108B is connected in a doubler circuit, the tuned plate circuit of which consists of choke L112, and either C143A or C143B as chosen by the setting of MC switch S105B Tuning of this output circuit is accomplished by front- panel screwdriver adjustments which vary the setting of the capacitors. The output of V108B

is applied through C145 and R185 to V109, a pentode, which serves as the second doubler an modulated output tube. The tank circuit comprising L114, and either C149A or C149B as selected, by S105C, is tuned in the same way as the firs doubler. The setting of R119 determines the value of screen voltage applied to V109. Varying the screen voltage applied to V109 by means of RF LEVEL SET control R119 controls the RF output voltage. This controlled RF output volt age is used as the reference value for zero-setting RF meter M101, before reading the percent modulation on %M meter M102. The RF signal i modulated by a voltage supplied by V102, modulation being effected by impressing the modulation voltage from V102 on the screen grid of V109. The output of V109 is inductively coupled to the RF output connectors through L115. The RP output may be taken at a fixed 1-volt level from 1 VOLT jack J105 or at a continuously adjustable calibrated level, controlled by RF attenuator Z105, between 1 and 10,000 microvolts (iv) from ATTEN jack J104.

r. Demodulator Circuits (fig. 1-13). The de modulator or detector circuit (V110A) is connected across the plate tank circuit of V10(and operates as an infinite impedance detector The output of V110OA is coupled through an RF filter to cathode follower V11OB. The RF filter consists of C151, L117, and C153. The audio output of the demodulator circuit is the same in waveform and phase as the modulation envelope of the RF output of RF unit Z104. Cathode follower V110lOB is used to lower the impedance of the demodulator output, thereby helping to maintain good audiofrequency fidelity of the demodulator circuit.

s. RF Unit Filter Circuit (fig. 1-13). All the circuitry of RF unit Z104, comprising the oscillator, doublers, and detector circuits, is contained within an electrical shield. The demodulator out put and all supply leads are brought out through two-section filters to prevent RF leakage out side of this shield. The demodulated output is brought out through L119, C156, C157, and L120 to terminal 3. The filament circuit connection is made at terminal 4 and filtered through L108 L111, C134, and C136. The modulating voltage circuit which enters at terminal 2, and the plate supply at terminal 1, are filtered by L118 C155, L116, and C154, and C133, L107, C135 and L110, respectively.

t. RF Output Circuit (fig. 1-13). The Rf output of the AN/ARM-5A is controlled by a piston-type attenuator Z105 which is inductively coupled by L115 to the RF output tank coil L114. Attenuator Z105 permits continuous control of the RF output available at J104, between 1 and 10,000 microvolts across a 51-ohm load. To provide continuously adjustable attenuation, the piston of the attenuator is moved along the axis of the attenuator tube by means of a rack and pinion drive. A fixed output level of 1 volt is available at 1 VOLT jack J105. To keep the output impedance of the AN/ARM-5A constant, 51-ohm resistor R191 is placed in series with the internal pickup loop of the attenuator to match the nominal 51-ohm RG-58/U cable generally used for external output connections. The 51-ohm cap P103 containing R192, or its equivalent, must be in place on J105 to make the attenuator reading correct. The attenuator is calibrated to read microvolts across a 51-ohm termination.

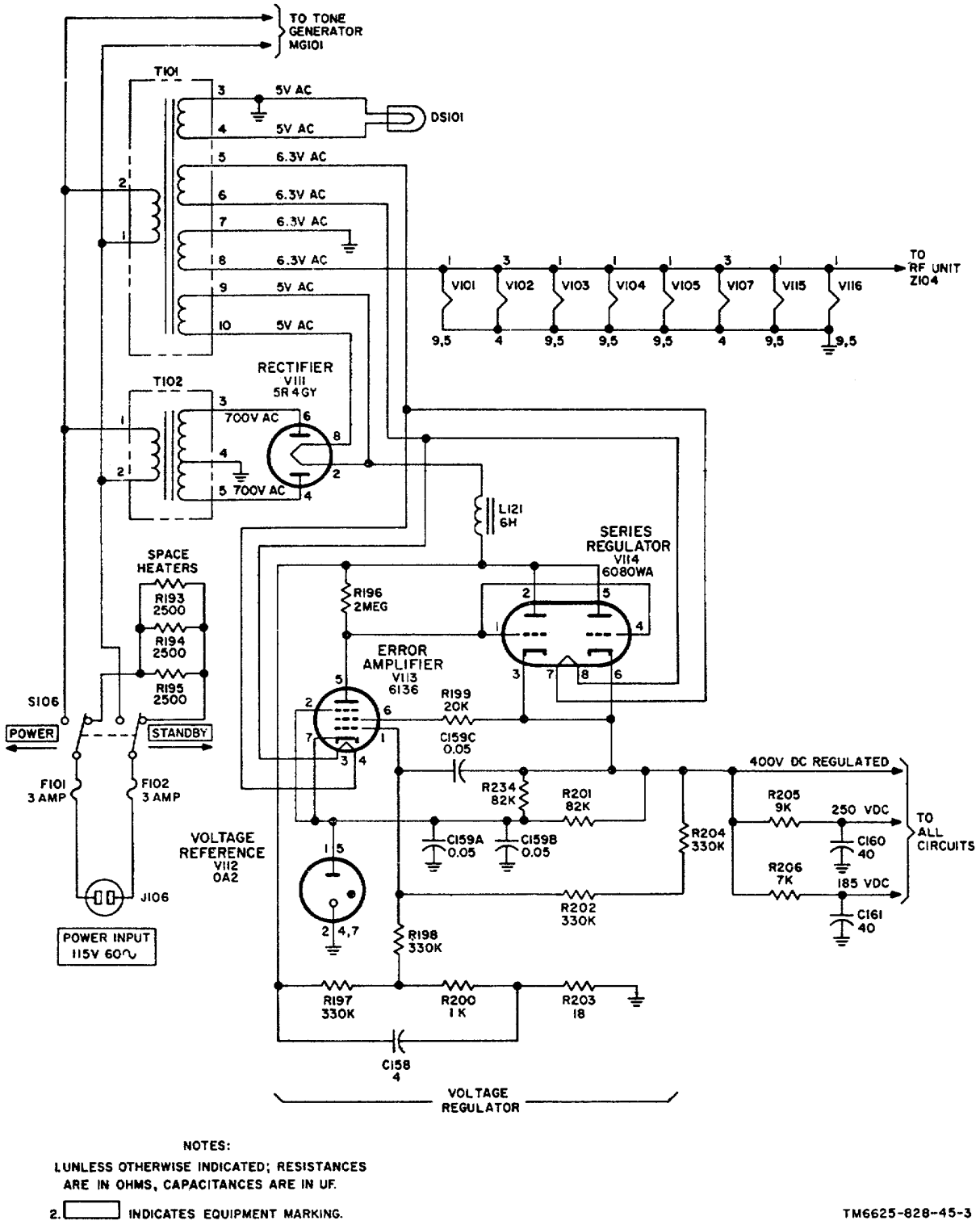
u. RF Meter Circuit (fig. 1-14). RF meter M101 is a microammeter which, with its voltage divider consisting of R207, R208, and R164, measures the de voltage developed by the detector circuit (Vl10) of Z104. This dc voltage consists of a fixed bias of approximately 16 volts plus a voltage which is proportional to the RF voltage appearing across RF coil L114. Since both M101 and %M meter M102 (v below) are connected in the cathode circuits of vacuum tubes, a source of bucking voltage is required to make them read zero when no RF or modulation voltages are present. Such a voltage is developed by monitor bridge arm V115B, and is more suitable than if bled from a dc supply since it is less subject to the same variations with filament and plate voltage as is V11OB. Monitor bridge arm V115B is biased by resistors R216 and R217, to produce a-current flow in the cathode-resistor net- work consisting of R218, R219, R222, R221, and R223. A portion of this voltage is used to cancel the fixed de voltage present in the demodulator output. Exact zero settings of M101 and M102 are accomplished by adjustment of R218 and R219, when the RF output has been reduced to zero; that is, when the related ZERO SET knob is depressed, operating switch S108, and reducing the output from RF unit Z104 to zero. The sensitivity of M101 is such that the redline (LEVEL SET) indication corresponds to a 1-volt output across 51 ohms at J106. At this level, provided J105 is terminated in 61 ohms, the proper input is fed to RF attenuator Z106. Such a 51-ohm termination is provided by cap P108

attached to the front panel, which normally is used to terminate J105.

v. % M Meter Circuit (fig. 1-14). The %M meter M102 circuit is a linear voltmeter circuit designed to measure the audio voltage derived from the modulated RF carrier by cathode follower V11OB in RF unit Z104. The demodulated output from Z104 (terminal 3) is connected through C162 which acts to remove the dc component present. % M meter M102 is connected between the cathode circuits of modulation monitor cathode follower V115A and V115B which detects the audio voltage of second doubler V109. Initial meter current is bucked out as explained previously. Under a condition of no modulation, zero setting of M102 is achieved by adjustment of ZERO SET control R218. When the RF out- put is set at the standard level (the redline indication on RF meter M101), %M meter M102 indicates the percent modulation. The sensitivity of M102 is such that with MODULATION switch S102 in either the 9,960- SET or the 30- SET position, the LEVEL SET (green arrow) indication corresponds to 30 percent modulation.

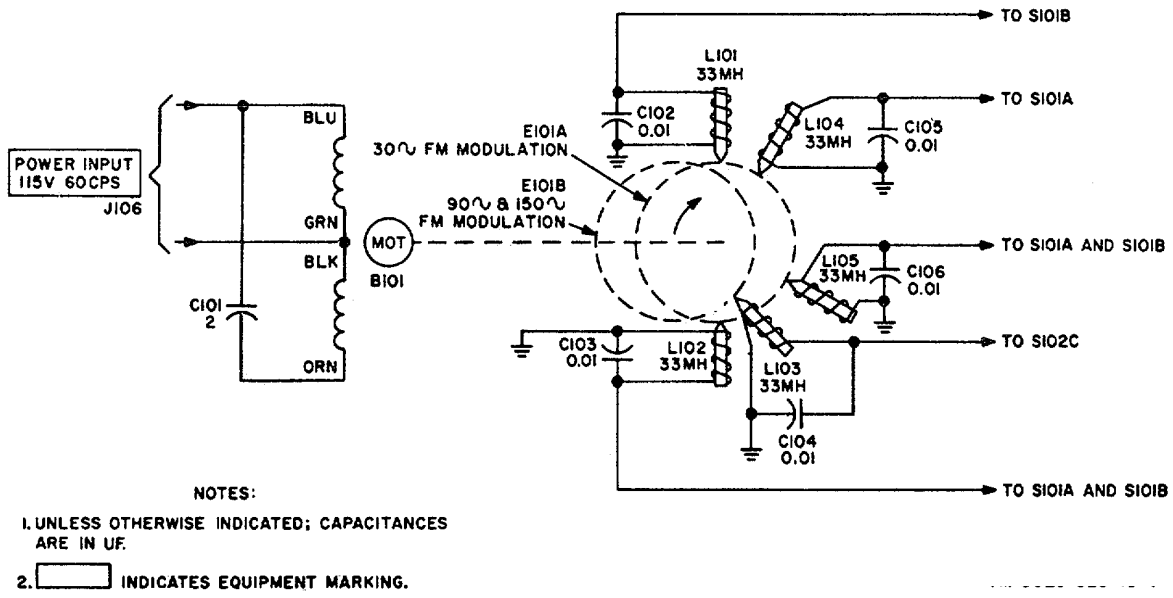
w. Microphone and External Modulation Circuit (fig. 1-15). In all positions of MODULA- TM 11-6625-828-4S TION switch S102, voice modulation may be superimposed on the internal test modulations to permit simultaneous voice and signal transmission. The voice modulation is connected through amplifier stage V116B to modulator V102. Amplifier V116B also functions as the amplifier for any other external modulation source which may be connected to EXT E102 and MOD E103 binding posts, located on the front panel. These binding posts are automatically short- circuited when the push-to-talk button of a microphone plugged into MIC jack J108 is operated.

x. 1,000-Cycle Oscillator (fig. 1-16). The 1,000-cycle oscillator uses V107 as a phase-shift oscillator. Feedback is attained from the plate circuit of V107 back to the common connection of C127 and C128. When IDENTIFIER switch S104 is at ON, it grounds V106. Therefore, V106 in parallel. with the plate circuit of V107 illuminates. When MODULATION switch S102 is in position 11 (1,000 cycles), oscillation is fed from the grid circuit of V107, through the wiper of 1000- MOD control R163 and the switch to the grid of V104B. This signal is then amplified by modulation amplifier by V104B and fed to modulator V102.



TM 6625-828-45-3

Figure 1-1. Power supply, schematic diagram.

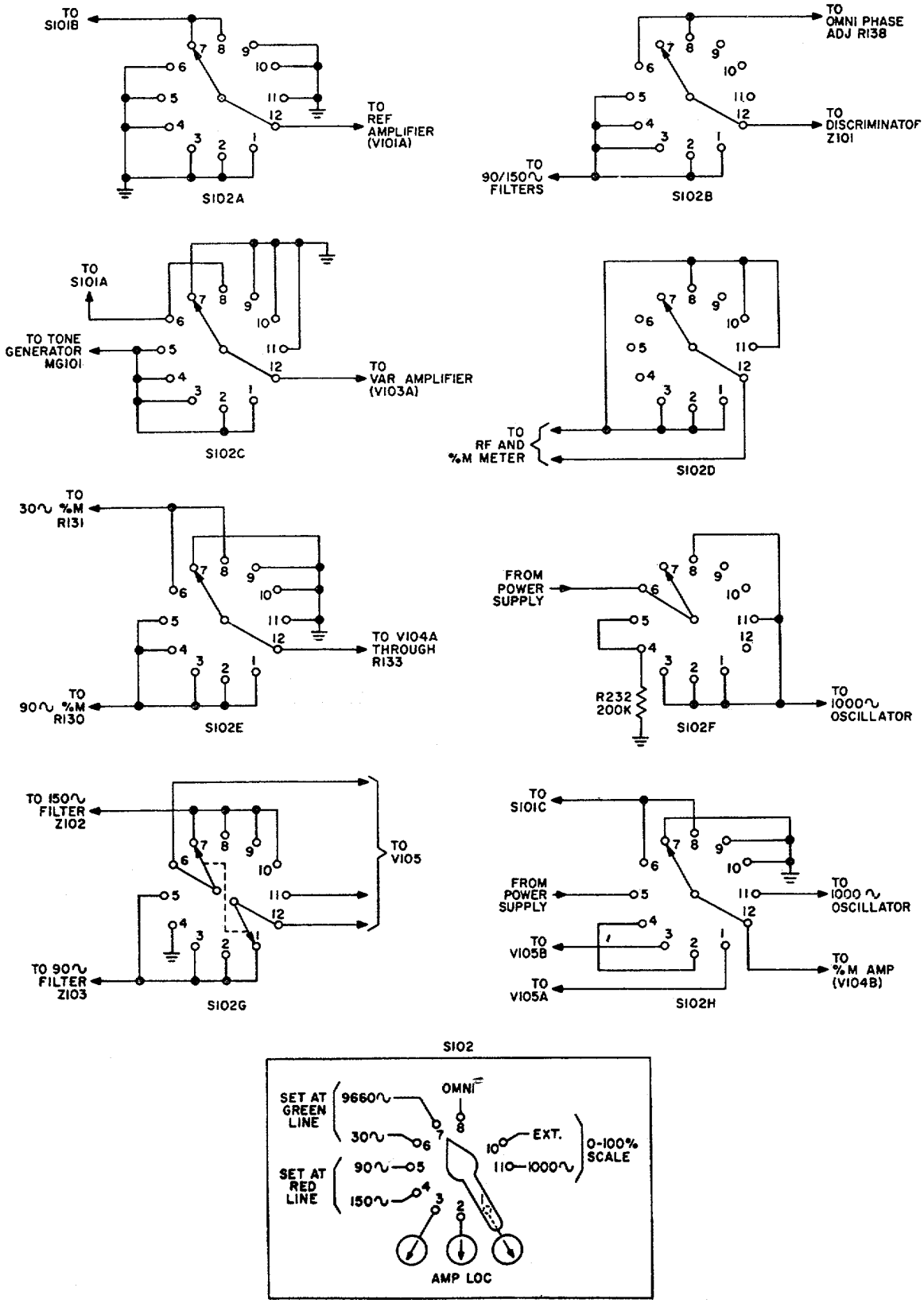


NOTES:

1. UNLESS OTHERWISE INDICATED; CAPACITANCES ARE IN UF.
2. [ ] INDICATES EQUIPMENT MARKING.

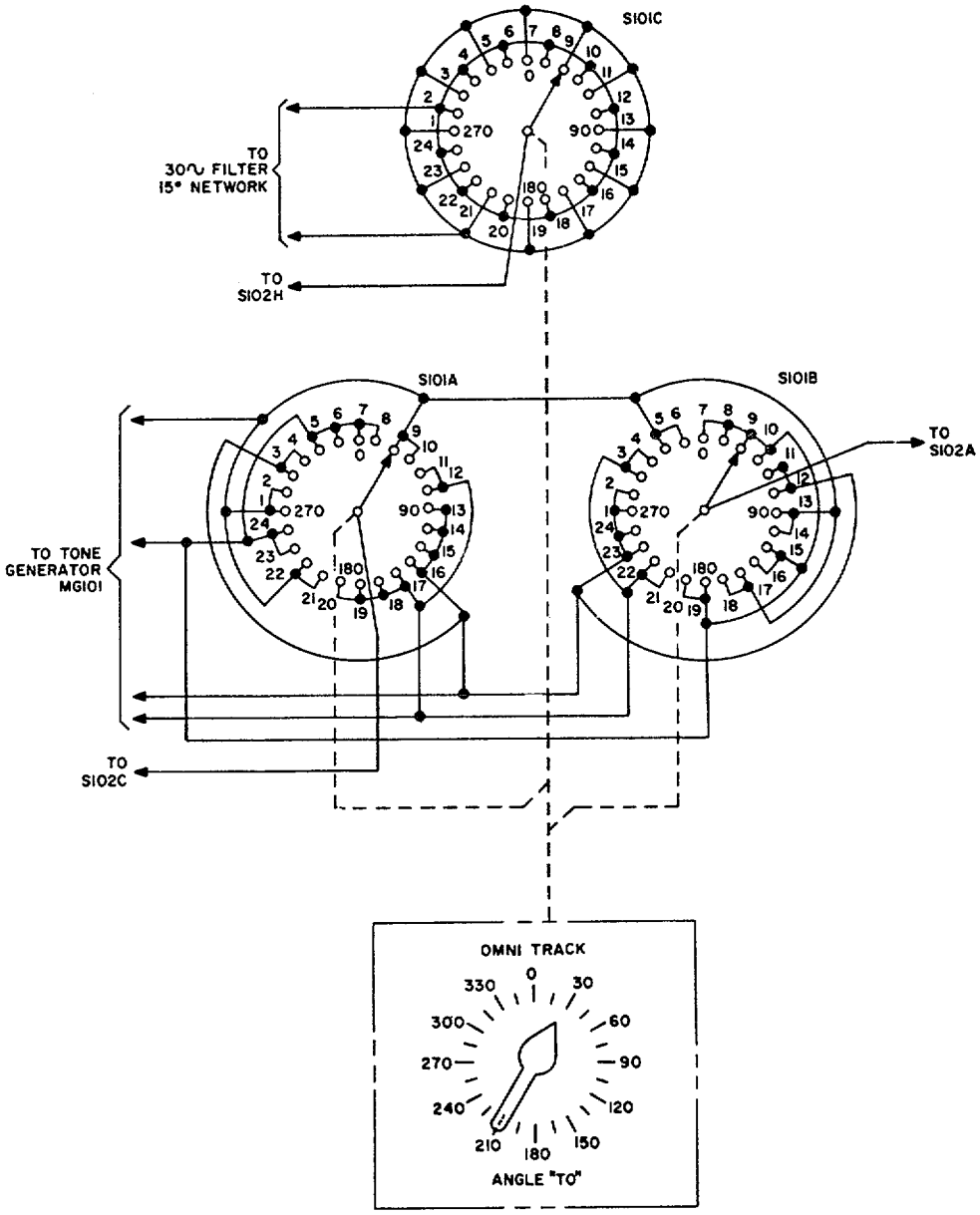
TM 6625-828-45-4

Figure 1-2. Tone generator, schematic diagram.



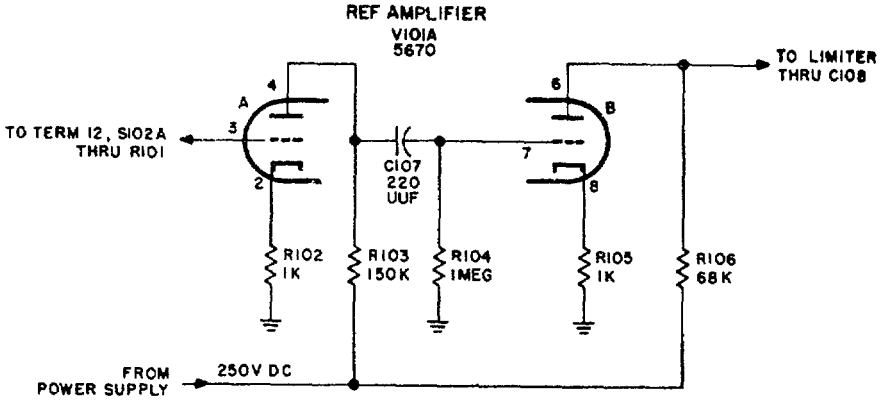
TM 6625-828-45-5

Figure 1-3. MODULATION SWITCH, FUNCTIONAL DIAGRAM.



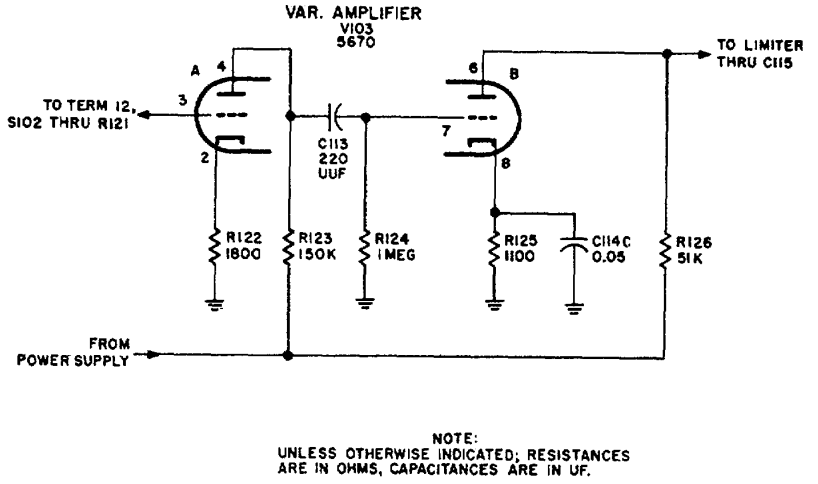
TM 6625-828-45-6

Figure 1-4. OMNI TRACK switch, functional diagram.



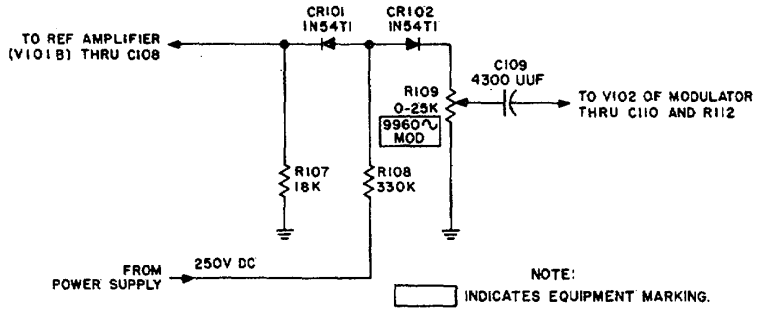
TM 6625-828-45-7

Figure 1-5. Reference channel amplifier, schematic diagram.



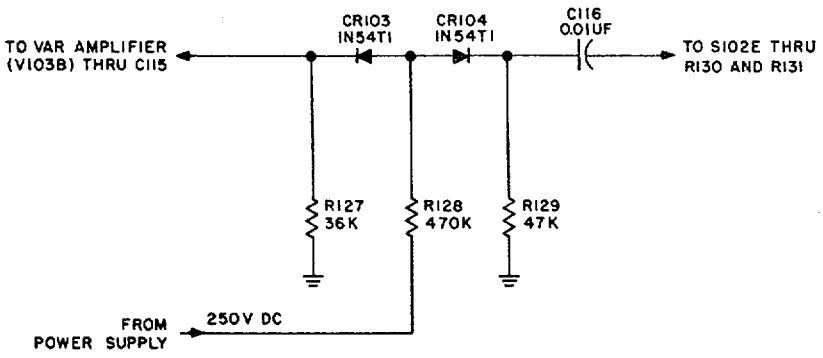
TM 6625-828-45-8

Figure 1-6. Variable channel amplifier, schematic diagram.



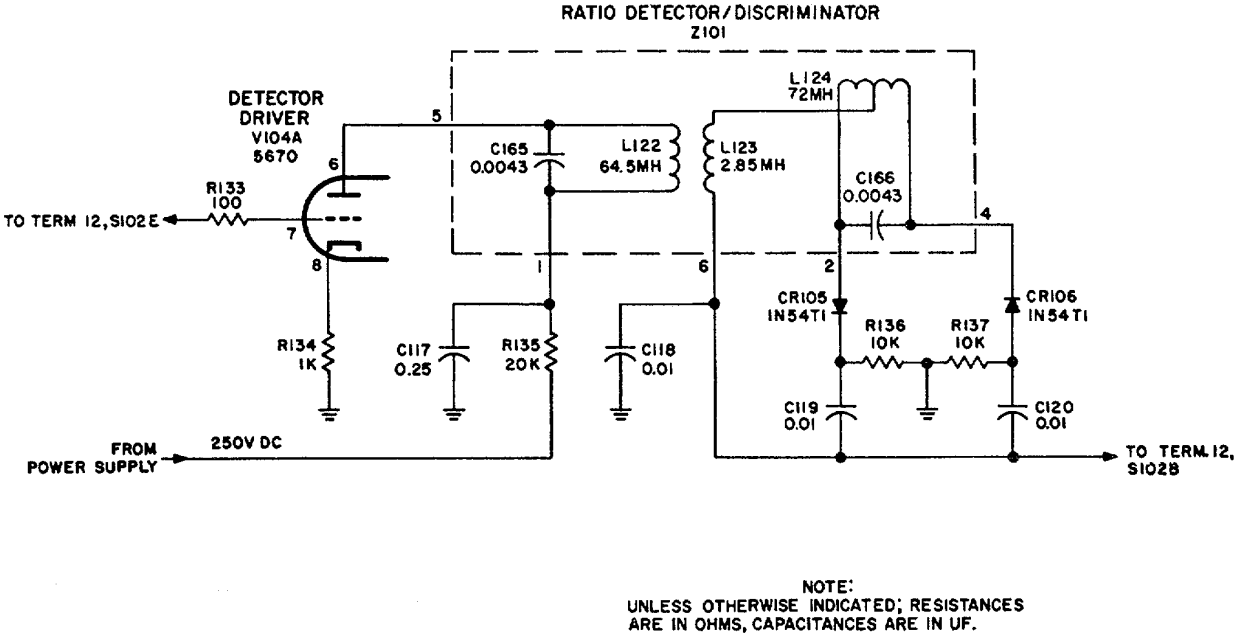
TM 6625-828-45-9

Figure 1-7. Reference channel limiter, schematic diagram.



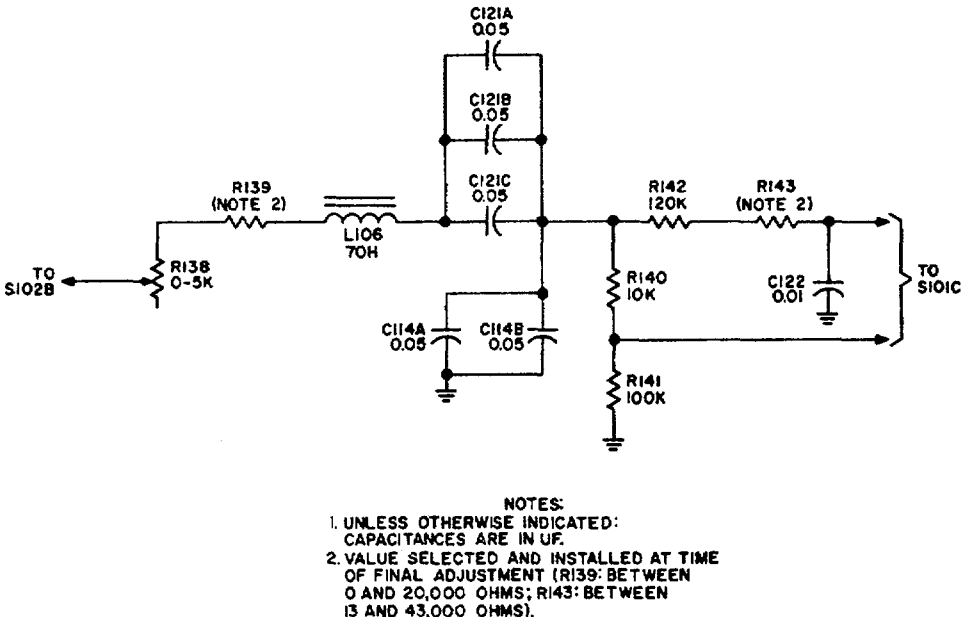
TM 6625-828-45-10

Figure 1-8. Variable channel limiter, schematic diagram.



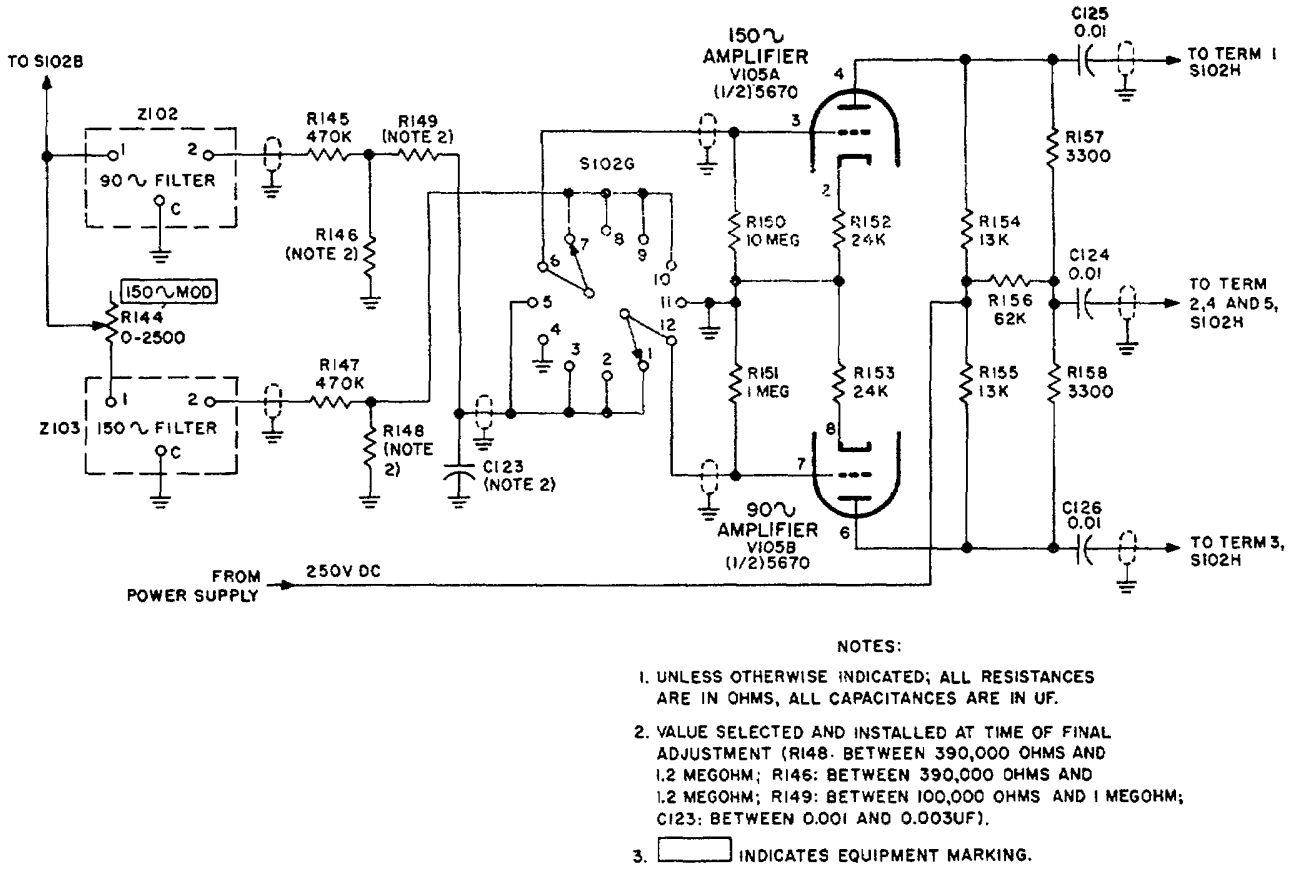
TM 6625-828-45-11

Figure 1-9. Ratio detector-discriminator, schematic diagram.



TM 6625-828-45-12

Figure 1-10. Filter and resistance networks, schematic diagram.

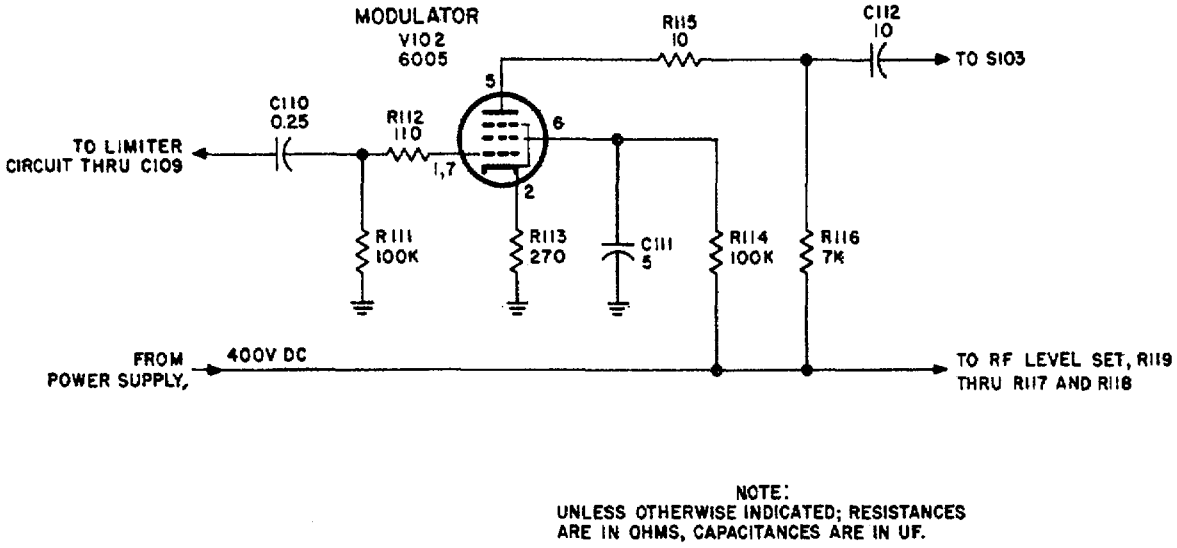


NOTES:

1. UNLESS OTHERWISE INDICATED; ALL RESISTANCES ARE IN OHMS, ALL CAPACITANCES ARE IN UF.
2. VALUE SELECTED AND INSTALLED AT TIME OF FINAL ADJUSTMENT (R148- BETWEEN 390,000 OHMS AND 1.2 MEGOHM; R146: BETWEEN 390,000 OHMS AND 1.2 MEGOHM; R149: BETWEEN 100,000 OHMS AND 1 MEGOHM; C123: BETWEEN 0.001 AND 0.003UF).
3. ☐ INDICATES EQUIPMENT MARKING.

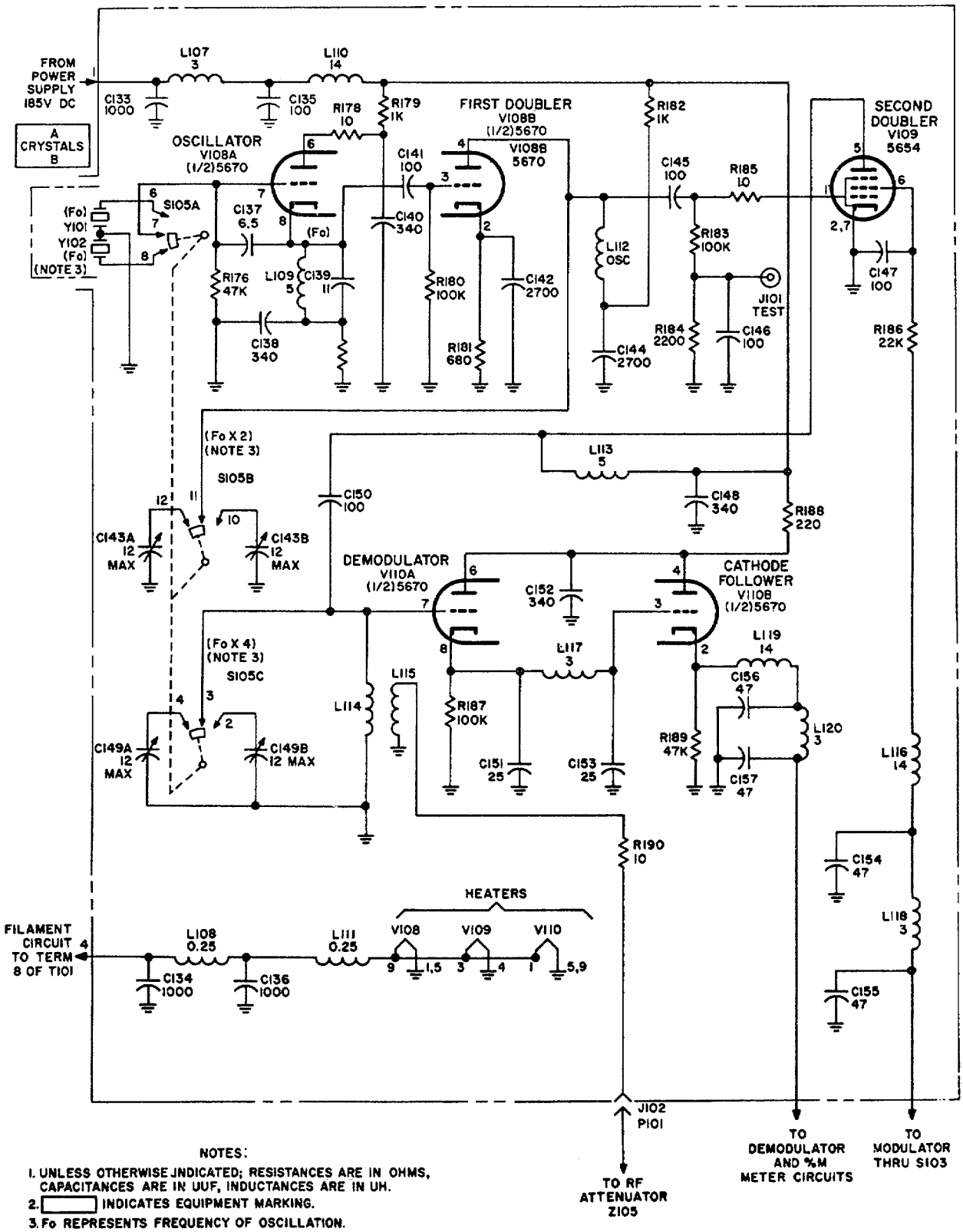
TM 6625-828-45-13

Figure 1-11. Ratio network, schematic diagram.



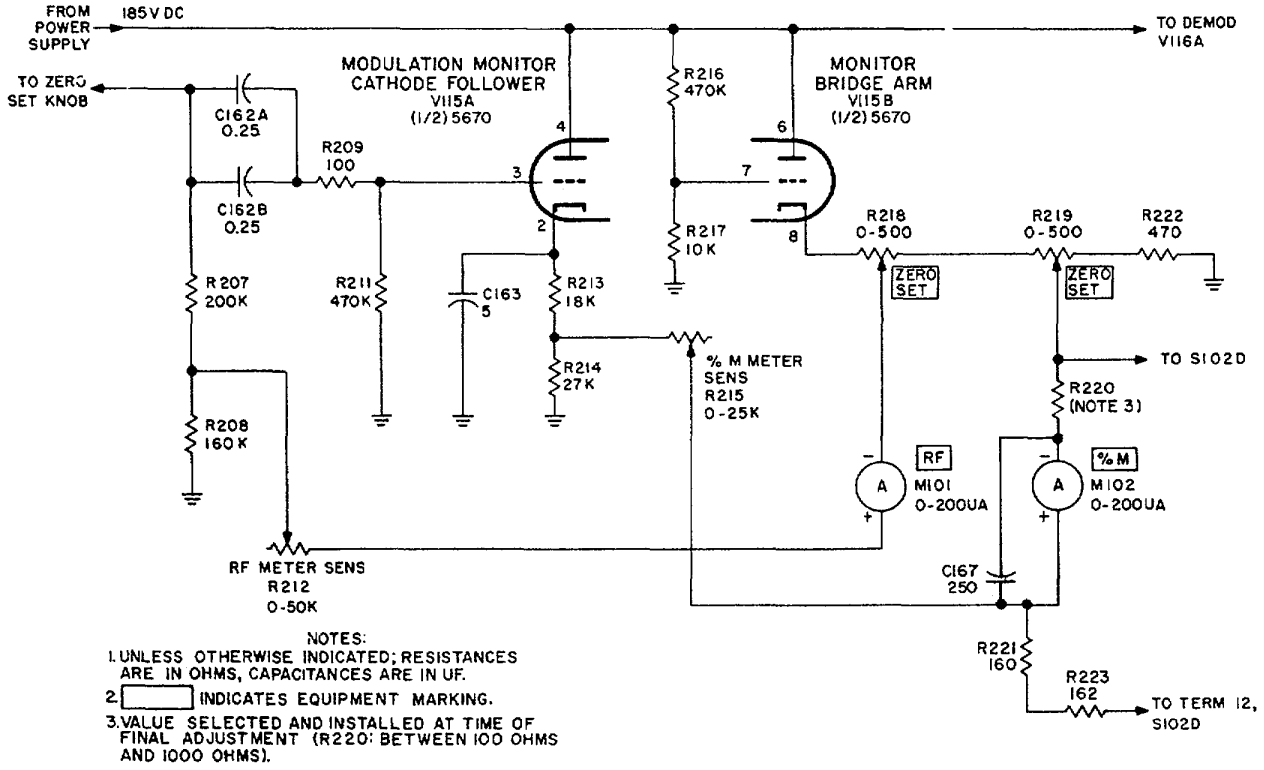
TM 6625-828-45-14

Figure 1-12. Modulator, schematic diagram.



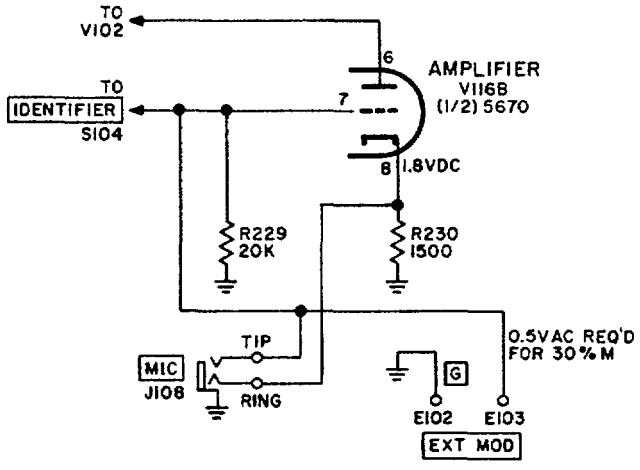
TM 6625-828-45-15

Figure 1-13. RF unit, schematic diagram.



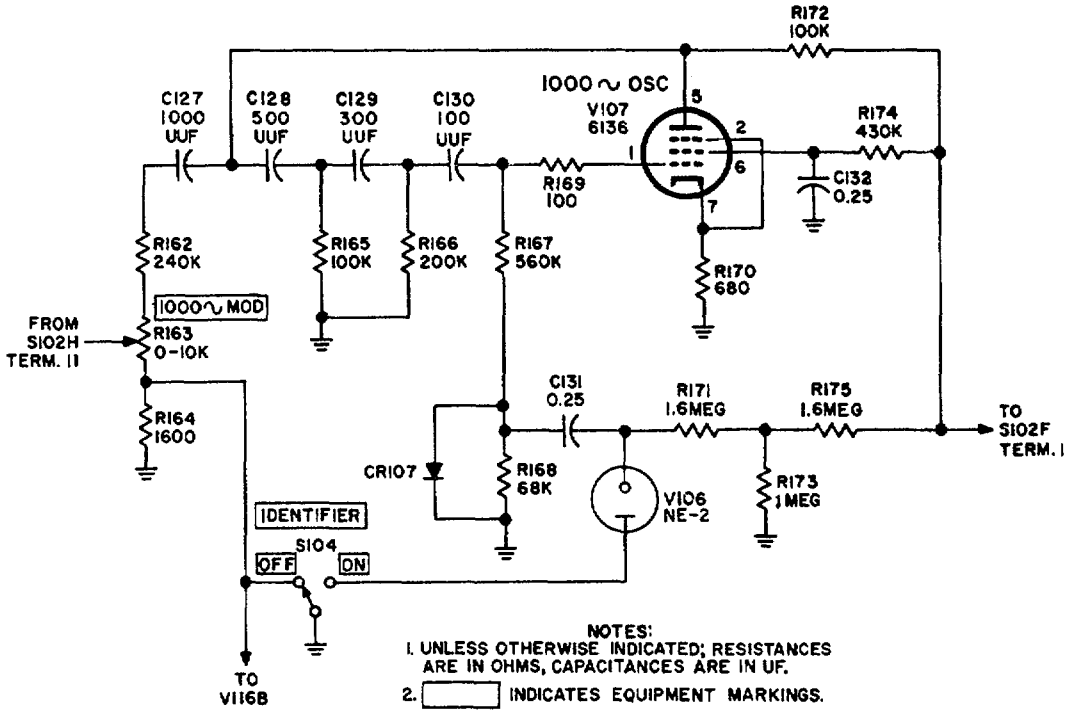
TM 6625-828-45-16

Figure 1-14. RF meter circuit, schematic diagram



TM 6625-828-45-17

Figure 1-15. Microphone and external modulation circuit, schematic diagram.



TM 6625-828-45-18

Figure 1-16. 1,000-cycle oscillator, schematic diagram.

CHAPTER 2
TROUBLESHOOTING

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

WARNING

When servicing the AN/ARM-5A, be extremely careful because of the high voltages. Dc voltages up to 75 volts appear between the DEMOD output connector and ground.

2-1. General Instructions

Troubleshooting at general support and depot maintenance categories includes all the techniques outlined for organizational maintenance and any special or additional techniques required to isolate a defective part. The general support maintenance and depot procedures are not complete in themselves but supplement the procedures de- scribed in TM 11-6625-828-12. The systematic troubleshooting procedure, which begins with the operational and sectionalization checks that can be performed at organizational category, must be completed by means of sectionalizing, localizing, and isolating techniques. Paragraphs 2-5, 2-6, and 2-7 provide localizing and isolating techniques that must be performed at the general support maintenance category.

2-2. Organization of Troubleshooting Procedures

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

b. Sectionalization. Test Set Radio AN/ARM-5A is a single unit that has three major circuits: omni signals, amplitude localizer signals, and modulation signals. The first step in tracing trouble is to locate the circuit or circuits at fault by the following methods:

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

(2) Operational tests. Operational tests frequently indicate the general location of troubles. In many instances, the tests will help in deter- mining the exact nature of the fault. The equipment performance checklist (TM 11-6625-828- 12) is a good operational test.

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.

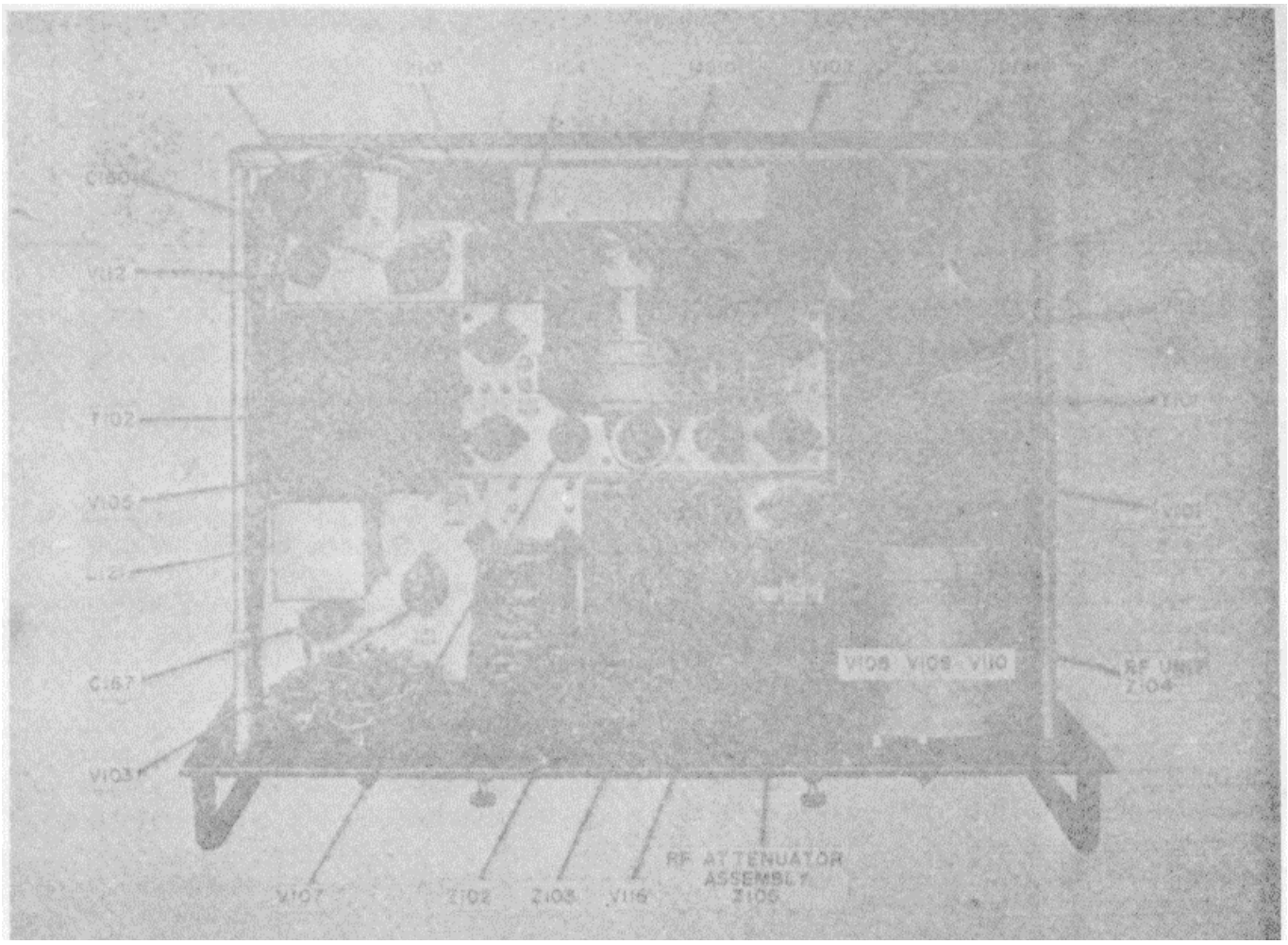
(1) Voltage and resistance measurements. Use the resistor and capacitor color codes (fig. 4-13 and 4-14) to find the value of the components. Use the voltage and resistance diagram (fig. 4-12) to find normal readings, and compare them with the readings taken.

(2) Troubleshooting chart. The trouble symptoms listed in the chart (para 2-5d) will aid in localizing trouble to a component part.

(3) Intermittent troubles. In all these tests, the possibility of intermittent troubles should not be overlooked. If trouble is present, this type of trouble often may be made to appear by tapping or jarring the equipment. Check the wiring and connections to the units of the set.

2-3. Test Equipment Required

The following chart lists test equipment required for troubleshooting Test Set, Radio AN/ ARM-5A, the associated technical manuals, and the assigned common names.



TM 6625-828-45-22

Figure 2-1. Test set chassis, top view.

Test Equipment	*Technical manual*	*Common name*
Multimeter TS-352B/U	TM 11-6625-366-15	Multimeter
Test Set, Electron Tube TV-7/U	TM 11-6625-274-12	Tube tester
Variable Power Transformer CN-16A/U	----------	Variac

Section II. TROUBLESHOOTING TEST SET, RADIO AN/ARM-5A

CAUTION

Do not attempt removal or replacement of parts before reading the instructions given in paragraphs 3-1 through 3-4.

2-4. Test Setup

Bench tests of the test set require connection to a power source and to various test equipment The power source must be connected to the test set for all dynamic-servicing procedures; the test equipment connections vary from test to test Remove the test set from its cabinet (para 3-'2) and make a test setup as outlined below.

a. Power Connections. Connect the test set to a source of 115-volt, 60-cycle power.

b. Test Equipment. Connect the test equipment to the test set as specified for the particular tests (para 2-5d).

2-5. Localizing Troubles

a. General. In the troubleshooting chart (*d*

below), procedures are outlined for sectionalizing troubles to a major circuit and for localizing troubles to a particular stage. Parts locations are indicated in figures 21 through 2--4. Voltage and -resistance measurements are shown in figure 4-12. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When trouble has been localized to a particular stage, 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 11-6625-828-12. If no operational symptoms are known, begin with item 1 TM 11-6625-828-45 of the equipment performance checklist (TM 11- 6625-828-12) and proceed until a symptom of trouble appears.

c. Conditions for Tests. All checks outlined in the chart are to be conducted with the test set connected to a power source as described in paragraph 2-4a, unless otherwise specified.

d. Troubleshooting Chart.

NOTE

Perform the operations in the checklist (TM 11-6625-828-12) before using this chart, unless trouble has already been localized.

Malfunction	*Probable cause*	*Corrective action*
1. Indicator lamp DS101 does not light and tone generator motor B101 does not start when POWER-STAND- BY switch 8106 is pressed to the POWER position.	No ac power is applied to the radio test set.	Check Power Cable Assembly CX-337/U. Check for input voltage. Replace fuse. If fuse blows again, check transformers T101 and T102, and tone generator motor B101.
	Open fuse F101I or F102.	
	Indicator lamp DS101 or indicator lamp socket defective.	Replace indicator lamp DS101 or socket.
	Transformer T101 defective.	Replace transformer T101.
2, Tone generator motor B101 starts but indicator lamp DS101 does not light.	Defective capacitor C101.	Replace C101.
	Tone generator motor B101 defective.	Replace motor.
3. Tone generator motor B101 does not start but indicator. lamp DS101 lights.	Defective electron tube V15.	Replace tube.
	Defective potentiometer R218; R219, or R212.	Replace defective potentiometer.
	Defective resistor R207, R208, or R222.	Replace defective resistor.
	Defective capacitor C162.	Replace capacitor.
	Defective switch 8103.	Replace switch.
4. RF meter M101 needle does not respond to ZERO SET knob move- ment and cannot be aligned with meter LEVEL SET line with MOD- ULATION switch S102 at the OMNI position. No voltage at 51- ohm cap R192.	Defective plate voltage supply to V115.	Check capacitor C161 and resistor R206. Replace defective component.
	Defective power supply circuit.	Check electron tubes V111, V112, V115, and V114; choke 1,121; transformer T102; and capacitors C159A, C159B, C160, C161. Replace defective component.
	Improper output from RF unit Z104.	Check electron tubes V108, V109 and V110. Replace if defective. Check other circuit details of Z104. Re- place defective parts.
5. %M meter M102 needle does not respond to ZERO SET knob move- ment and cannot be aligned with meter ZERO SET line with MOD- ULATION switch S102 at the OMNI position.	Defective meter M101.	Replace meter.
	Defective electron tube V115.	Replace tube.
	Defective potentiometer R218, R129, or R215.	Replace defective potentiometer.
	Defective resistor R220, R222, R218, or R214.	Replace defective resistor.
	Defective capacitor C163 or C162.	Replace defective capacitor.
	Defective switch 5108.	Replace switch.
	Defective plate voltage supply to Vi 15.	Check capacitor C161 and resistor R206. Replace defective component.
	Defective power supply circuit.	Check electron tubes VIII, V112, V118, and Vi14; choke L121; transformer T102; and capacitors C159A, C159B, C1IO, and C161. Replace defective component.

		Probable cause	*Corrective, action*
6.	No maximum readings on RF meter M101 with MODULATION switch S102 set to 30-, .MC switch S105 set to A, and screwdriver adjustments made at PLATE and GRID holes marked A.	Improper output from RF unit Z104.	Check electron tubes V108, V109, and V110.
		Defective meter Ml 02.	Replace defective tube. Check other circuit details of Z104. Replace defective parts.
		Defective electron tubes V108, V109, and VIO0.	Replace meter.
		Defective crystal Y102.	Replace defective tubes.
		Defective capacitor trimmers C143A and C149A.	Replace crystal.
		Defective coils T.112, L,1j4, and L1115.	Replace defective trimmers.
		Defective switch S105.	Replace defective coils.
7.	No Maximum readings on RF meter M101 with MODULATION switch S102 set to 30w, MC switch S105 set to B, and screwdriver adjustments made at PLATE and GRID holes marked B.	Defective electron tube V 08, V109, or V1i11.	Replace switch. Check other circuit details of RF unit Z104. Replace defective parts.
		Defective crystal Y101.	Replace defective tube.
		Defective capacitor trimmers C143B and C149B.	Replace crystal.
		Defective coils I,i12, L114, and 1,115.	Replace defective trimmers.
		Defective switch S10,.	Replace defective coils.
8.	RF meter M101 needle does not respond to movement of RF LEVEL SET control R119 and cannot be aligned with the meter LEVEL SET line.	Defective resistors R117 and R118.	Replace switch. Check other circuit details of RF unit Z104. Replace defective parts.
		Defective potentiometer R119.	Replace defective resistors.
		Defective electron tubes V109 and V110.	Replace potentiometer.
		Defective coils L116, L118, 1,119, and L120.	Replace defective tubes.
		Defective capacitors C150, C154, C155, C156, and C157.	Replace defective coils.
9.	%M meter M102 needle does not respond to movement of 99606 MOD control R109 with MODULA- TION switch S102 at the 9960- position and cannot be aligned with the meter green line.	Defective meter M101.	Replace defective capacitors. Check other circuit details of RF unit Z104. Replace defective parts. Replace meter. Check other details of meter circuit.
		Defective potentiometer R109.	Replace defective parts.
		Defective capacitors C109, C110, or C112.	Replace potentiometer.
		Defective electron tube V102.	Replace defective capacitors.
		Defective resistors R112 and R115.	Replace tube.
		Defective RF unit Z104.	Replace defective resistors.
		Defective meter M102.	Check circuit details of RF unit. Replace defective parts. Replace meter. Check details of meter circuit. Replace defective parts.
		Defective switch S102.	Replace switch.
		Defective potentiometer R131.	Replace potentiometer.
		Defective electron tube V103.	Replace tube.
		Defective diodes CR103 and CR104.	Replace defective diodes. Check details of variable amplifier and limiter circuits. Replace defective parts.
		Defective switch S102.	Replace switch.
		Defective electron tube V104.	Replace tube.
10.	%M meter M102 needle does not respond to movement of 30- MOD control of R131 with MODULA- TION switch S102 at the 30- posi- tion and cannot be aligned with the meter green line.	Defective ratio detector-discriminator Z101.	Check details of Z101 circuit. Replace defective parts.
		Defective potentiometer R138.	Replace potentiometer.
		Defective 30-cycle filter 15’ network circuits.	Check details of 30 filter and 15’ network circuits. Replace defective parts.
		Defective switch S191.	Replace switch.
		Defective resistors R161 and R’31.	Replace defective resistor.

	Malfunction	*Probable cause*	*Corrective acts*
11.	%M meter M102 needle does not respond to movement of 90-MOD control R130 with MODULATION switch S102 at the 90- position and cannot be aligned with the meter redline.	Defective electron tubes V116 and V11S.	Replace defective tubes.
		Defective meter M102.	Replace meter.
		Defective meter circuit.	Check details of meter circuit. Replace defective parts.
		Defective potentiometer R130.	Replace potentiometer.
		Defective electron tubes V103 and V104.	Replace defective tubes.
		Defective diodes CR103 and CR104.	Replace defective diodes. Check details of variable amplifier and limiter circuits. Replace defective parts.
		Defective resistor R133.	Replace resistor.
		Defective ratio detector-discriminator Z101.	Check details of Z101 circuit. Replace defective parts.
		Defective switch S102.	Replace switch.
		Defective 90cycle filter Z102.	Replace filter.
		Defective potentiometer R144.	Replace potentiometer.
		Defective resistors R145, R146, R149, R151, and R153.	Replace defective resistors.
		Defective electron tube V105.	Replace tube. Check details of 90-to 150-cycle filter amplifier circuit.
		Defective Resistors R161 and R231.	Replace defective parts.
		Defective electron tubes V116 and V115.	Replace defective resistors.
		Defective meter M102.	Replace defective tubes.
		Defective meter circuit.	
12.	%M meter M102 needle does not respond to movement of 150-MOD control R144 with MODULATION switch S102 at the 150- position and cannot be aligned with the meter redline.	Defective potentiometer R144.	Replace meter.
		Defective electron tubes V103 and V104.	Check details of meter circuit. Replace defective parts.
		Defective diodes CR103 and CR104.	Replace potentiometer.
		Defective resistor R133.	Replace defective tubes.
		Defective ratio detector-discriminator Z101.	Replace defective diodes. Check details of variable amplifier and limiter circuits. Replace defective parts.
		Defective switch S102.	Replace resistor.
		Defective 150-cycle filter Z103.	Check details of Z101 circuit. Replace defective parts.
		Defective resistors R147, R148, R150, R152, R154, and R157.	Replace switch.
		Defective electron tube V105.	Replace filter.
		Defective resistors R161 and R231.	Replace defective resistors.
		Defective electron tubes V116 and V115.	Replace tube. Check details of 90- to 150-cycle filter amplifier circuit. Replace defective parts.
		Defective meter M102.	Replace defective resistors.
		Defective meter circuit.	Replace defective tubes.
13.	RF meter M101 needle does not align with meter red LEVEL SET line and %M meter M102 needle does not indicate in the broad red area when MODULATION switch S102 is in any of the AMP LOC positions.	Defective pickup coil L103.	Replace meter.
		Defective capacitor C104.	Check details of meter circuit. Replace defective parts.
		Defective switch S102.	Replace pickup coil.
		Defective variable amplifier circuit, limiter circuit, or ratio detector-discriminator Z101 circuit.	Replace capacitor.
			Replace switch.
		Defective 90-cycle filter Z102 or 150-cycle filter Z103.	Check details of variable amplifier, limiter, or ratio detector-discriminator circuits. Replace defective parts.
			Replace defective filter.

Malfunction	Probable cause	Corrective action
	Defective resistors R145 through R148.	Replace defective resistors. Check details of 90- to 150-cycle filter amplifier circuit. Replace defective parts.
	Defective electron tube V116.	Replace tube.
	Defective meter circuits.	Check details of meter circuits. Replace defective parts. Replace defective meters.
	Defective meters MI01 and M102.	Replace potentiometer.
	Defective potentiometer R163.	Replace tube.
14. %,M meter M102 needle does not respond to 1000- MOD control R163 movement with MODULA- TION switch S102 set to the 1000- position.	Defective electron tube V107.	
	Defective capacitors C127 and C128.	Replace defective capacitors. Check details of 1,000-cycle oscillator circuit. Replace defective parts.
	Defective switches S102 and S106.	Replace defective switches.
	Defective electron -tube V104.	Replace tube.
	Defective electron tube V102.	Replace tube. Check details of modulator circuit. Replace defective parts.
	Defective electron tube V116.	Replace tube.
	Defective meter circuits.	Check details of meter circuits. Replace defective parts.
	Defective meter M0I or M102.	Replace defective meter.

2-6. Signal Substitution

a. General. Signal substitution procedures help to localize troubles to a circuit or stage in the test set. An externally generated signal is substituted for the signal normally present in each stage. The test equipment required for the tests below is listed in paragraph 2-3.

b. Space Heater Circuit.

(1) Connect Variable Power Transformer CN-16A/U to a source of power and connect Power Cable Assembly CX-337/U between the CN-16A/U and test set POWER INPUT 115 V 60- receptacle J106.

(2) Adjust the CN-16A/U for a 115-volt input to the test set and set POWER-STANDB7 switch S106 at STANDBY. Check to see that space heater resistors R193, R194, and R195 warm up.

c. Power Supply.

(1) Use the CN-16A/U to apply an input voltage of 115 volts to the AN/ARM-5A from multimeter TS-352B/U. Set POWER-STAND BY switch at POWER.

(2) With Multimeter TS-352B/U, measure the output voltage at pin 3 of high-voltage regulator V114. The voltage should be between 390 and 420 volts de.

(3) Measure the voltage at the orange wire terminal of capacitor C160. The voltage should

(4) Measure the voltage at the yellow with red-trace wire terminal of capacitor C161. Volt- age should be between 185 and 215 volts de.

2-7. Isolating Trouble Within Stage

When trouble has been localized to a stage, either through operational checks or signal substitution (para 2-6), use the following techniques to isolate the defective part:

a. Test the tube involved using Electron Tube, Test Set TV-7/U or by substituting a similar type tube which is known to be operating norm- ally.

b. Take voltage measurements at the tube sockets (fig. 4-12) and other points related to the stage in question.

c. If voltage readings are abnormal, take resistance readings to isolate open and short circuits. Also, refer to the de resistances of transformers and coils in paragraph 2-8.

d. Use the wiring diagrams (fig. 3-3 and 3-5) to trace circuits and to isolate the faulty component.

2-8. Dc Resistances of Transformers and Coils

The dc resistances of the transformer windings and the coils in the test set are listed below:

Transformer or coil	Terminals	Ohms
T101	1–2	3.55
	3–4	Less than 1
	5–6	Less than 1
	7–8	Less than 1
	9–10	Less than 1
T102	1–2	2.58
	3–4	165
	4–5	150
L101	1–2	110
L102	1–2	110
L103	1–2	110
L104	1–2	110
L105	1–2	110
L106	1–2	4500
L107	1–2	Less than 1
L108	1–2	Less than 1
L109	1–2	Less than 1

Transformer or coil	Terminals	Ohms
L110	1–2	5
L111	1–2	Less than 1
L112	1–2	Less than 1
L113	1–2	Less than 1
L114	1–2	Less than 1
L115	1–2	Less than 1
L116	1–2	5
L117	1–2	Less than 1
L118	1–2	Less than 1
L119	1–2	5
L120	1–2	Less than 1
L121	1–2	122
L122	1–5	220
L123	6–2 and 6–4	25
L124	2–4	210

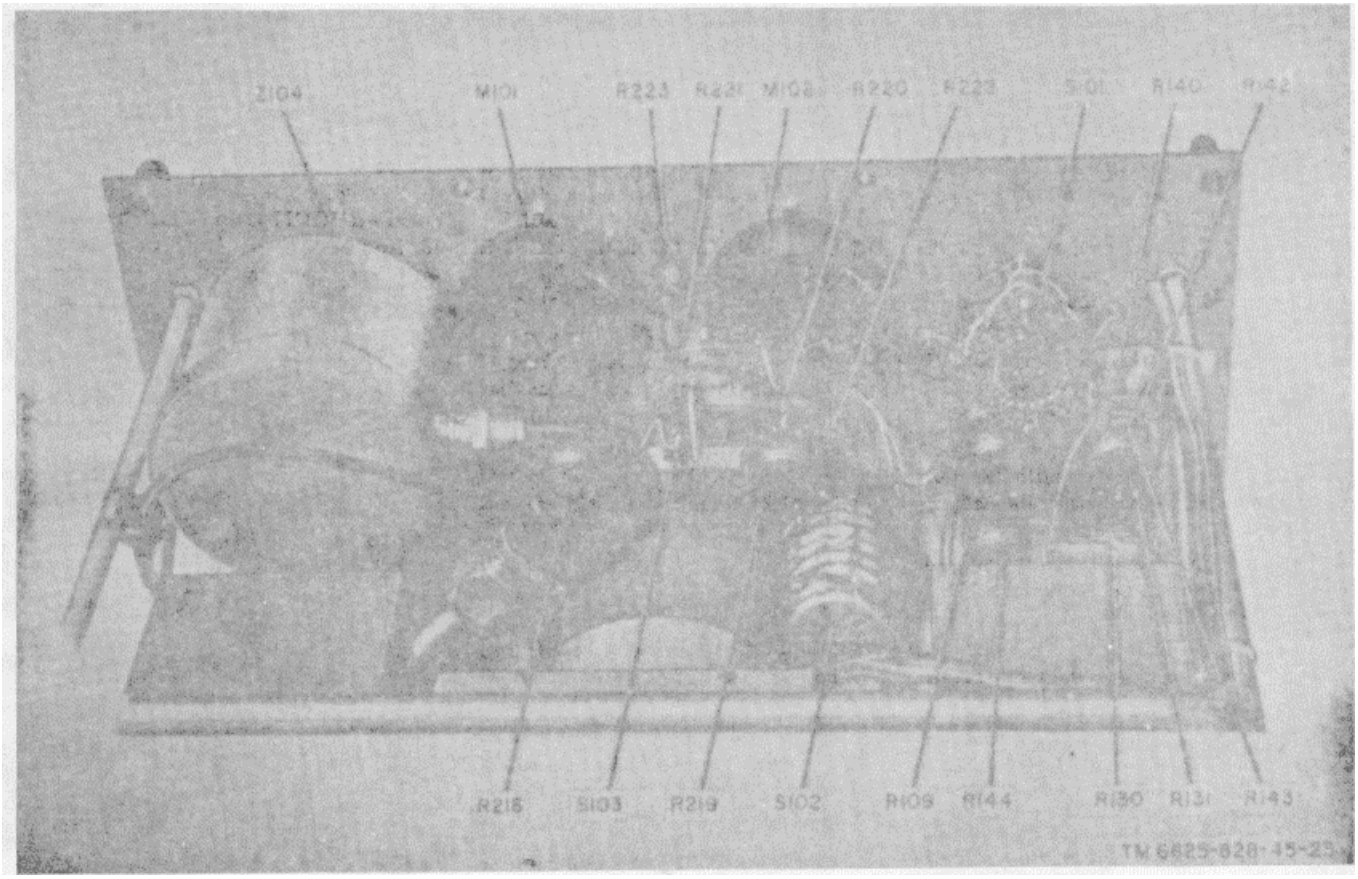


Figure 2-2. Front panel, top rear view.

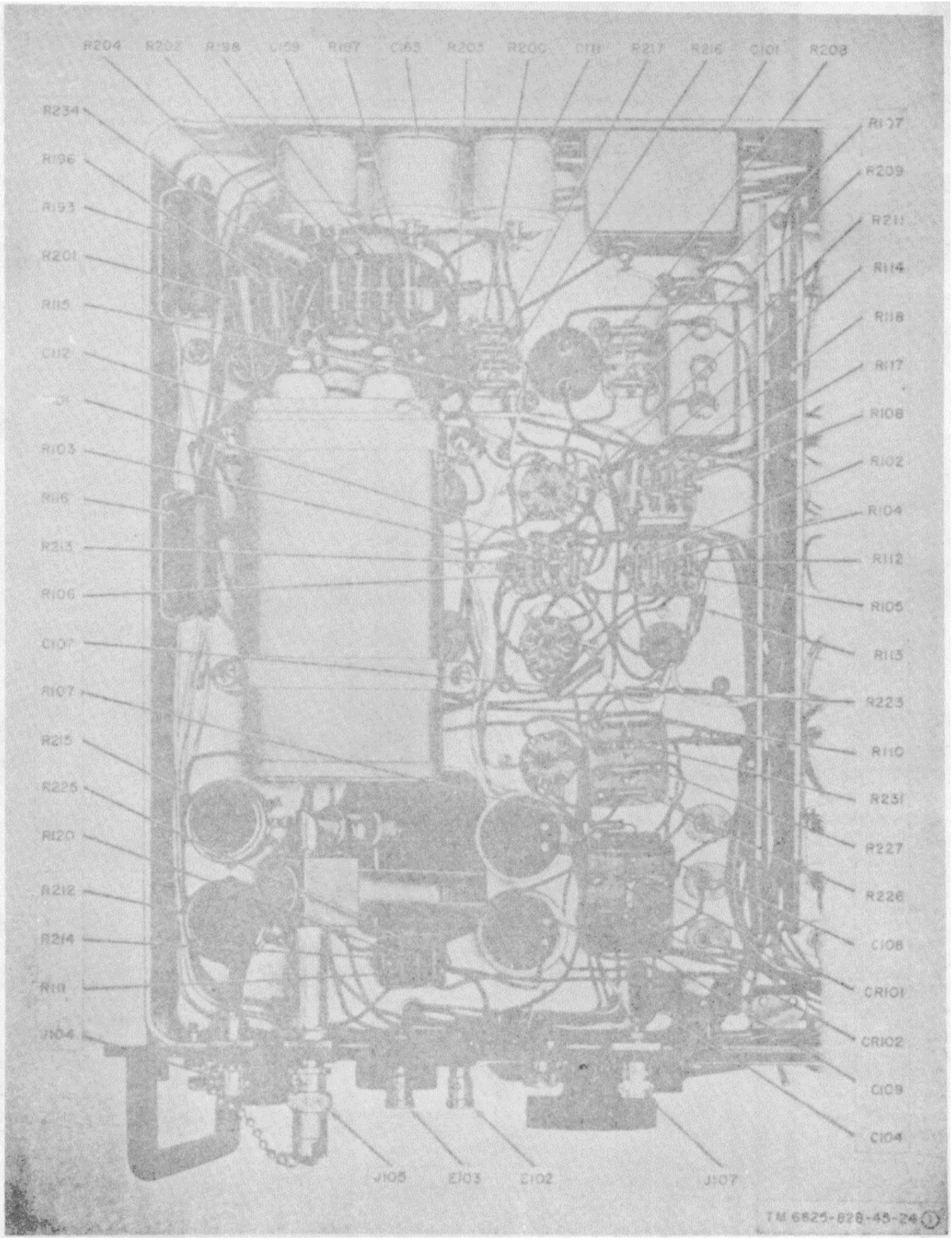


Figure 2-3(1). Test set chassis, bottom view (part 1 of 2)

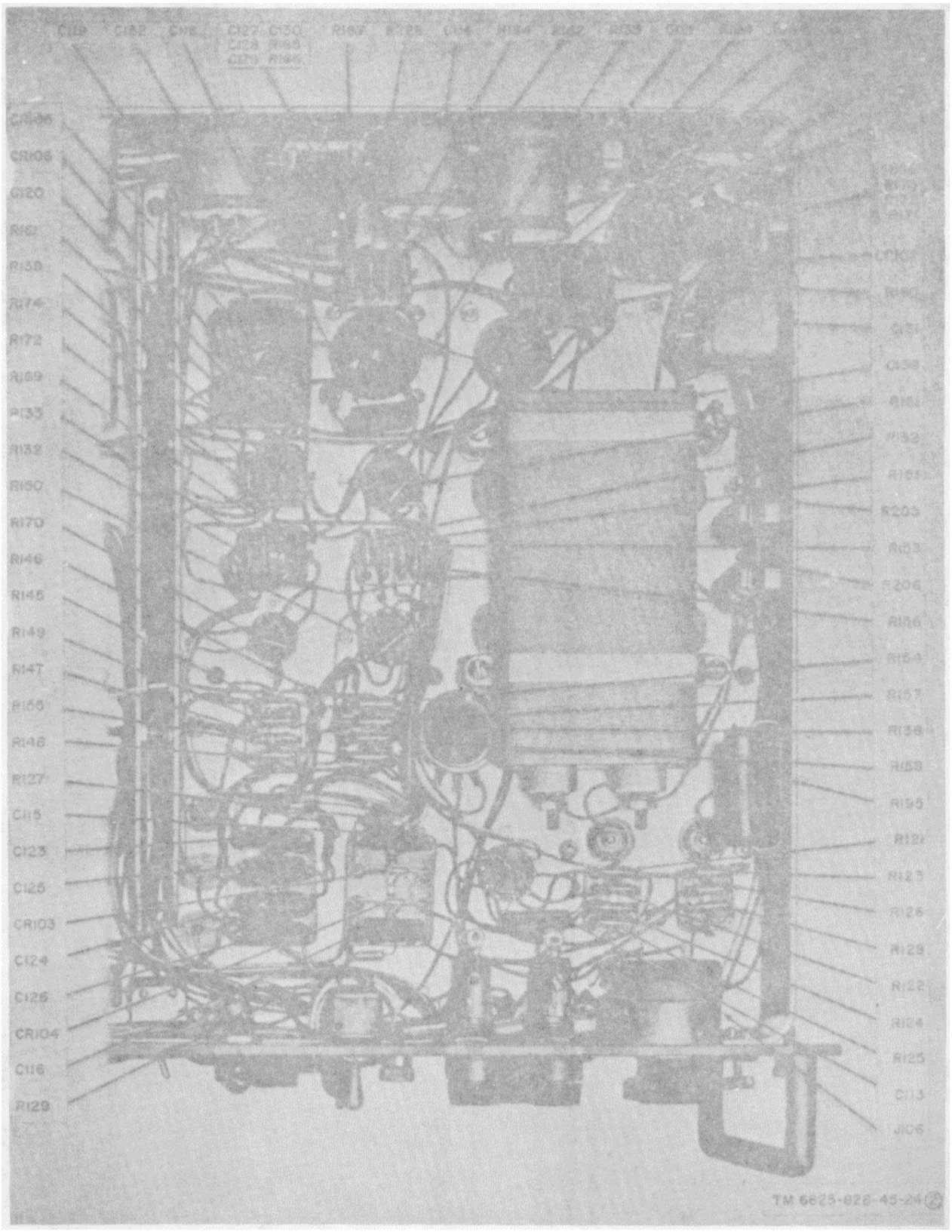


Figure 2-3(2). Test set chassis, bottom view (part 2 of 2)

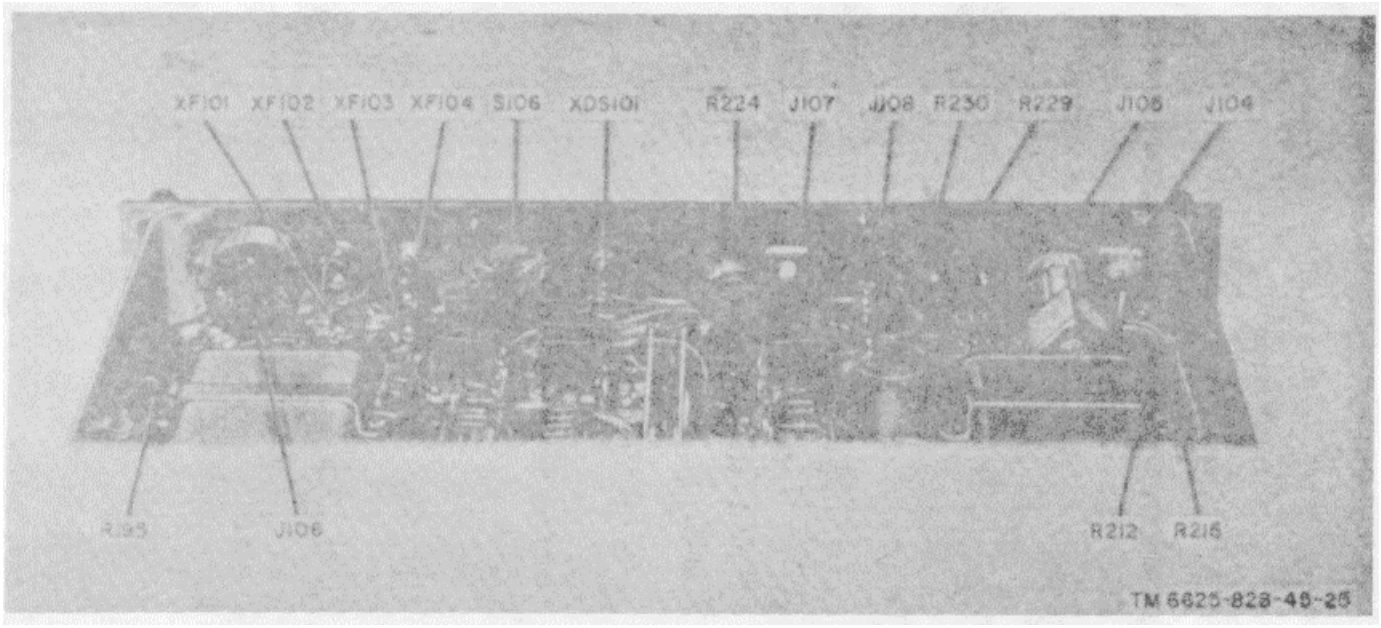


Figure 2-4. Front panel, bottom rear view.

CHAPTER 3
REPAIRS AND ALIGNMENT

Section I. REPAIRS

3-1. General Parts Replacement Techniques

Most of the parts in Test Set, Radio AN/AR! 5A can be reached and replaced easily without special procedures. This section provides remove replacement, disassembly, and reassembly instructions for the RF unit, tone generator, a RF attenuator. The following precaution applies when performing the procedures given in this section.

NOTE

Disconnect Power Cable Assembly CX337/U from the test set for removal and disassembly procedures.

3-2. Removal of Test Set Chassis from Cabinet

a. Remove test set chassis from its cabin as follows:

(1) Loosen the two.captive screws on t rear of the cabinet.

(2) Stand the test set on its back and loose the eight captive screws on the front panel.

(3) Grasp the two handles and pull the chassis out of the cabinet.

b. Replace the test set chassis in its cabin as follows:

(1) Stand the cabinet on its back.

(2) Lift the chassis by the two handles (the front panel and lower the chassis into t cabinet.

(3) Start the captive screws on the from panel; then erect the test set cabinet and stay the two captive screws at the rear of the cabinet.

(4) Tighten all screws, especially the tv rear screws, which provide heat transfer from the chassis to the cabinet.

3-3.Removal and Replacement of Tone Generator

Tone generator MG101 is mounted on the chassis at the rear of the test set (fig.3-1).

CAUTION

Be careful not to damage tone wheels E101A and E101B during removal and replacement procedures.

a.Remove the tone generator from the chassis as follows:

(1) Place the test set (minus cabinet) in an upright position on a workbench.

(2) If necessary, tag and unsolder the wire leads connected to terminal board TB103 (fig. 3-2).

(3) Loosen and remove the three screws and associated hardware from the vibration mounts.

(4) Lift and remove the tone generator from the chassis.

(5) Remove the eight screws that retain the tone wheel cover, and remove the cover.

b. After the tone generator has been removed (a above), the unit can be disassembled as follows:

(1) Use an Allen wrench to loosen three setscrews H158 which secure tone wheels E10O1A and E1O1B to the motor shaft (fig.3-2).

CAUTION

Take care not to damage tone wheel E101A and E101B during removal procedures.

(2) Use the short end of an Allen wrench to loosen two setscrews H166 (fig.3-9).

(3) Loosen and remove hexagonal nut H164 (fig. 3-2).

(4) Loosen and remove knurled nut H165 from coil stud MP161.

(5) Slide out magnet MP162.

(6) Repeat (2) through (5) above for disassembly of the remaining coil assemblies.

c. Reassemble the tone generator as follows:

(1) Slide magnet MP162 back in coil stud MP161.

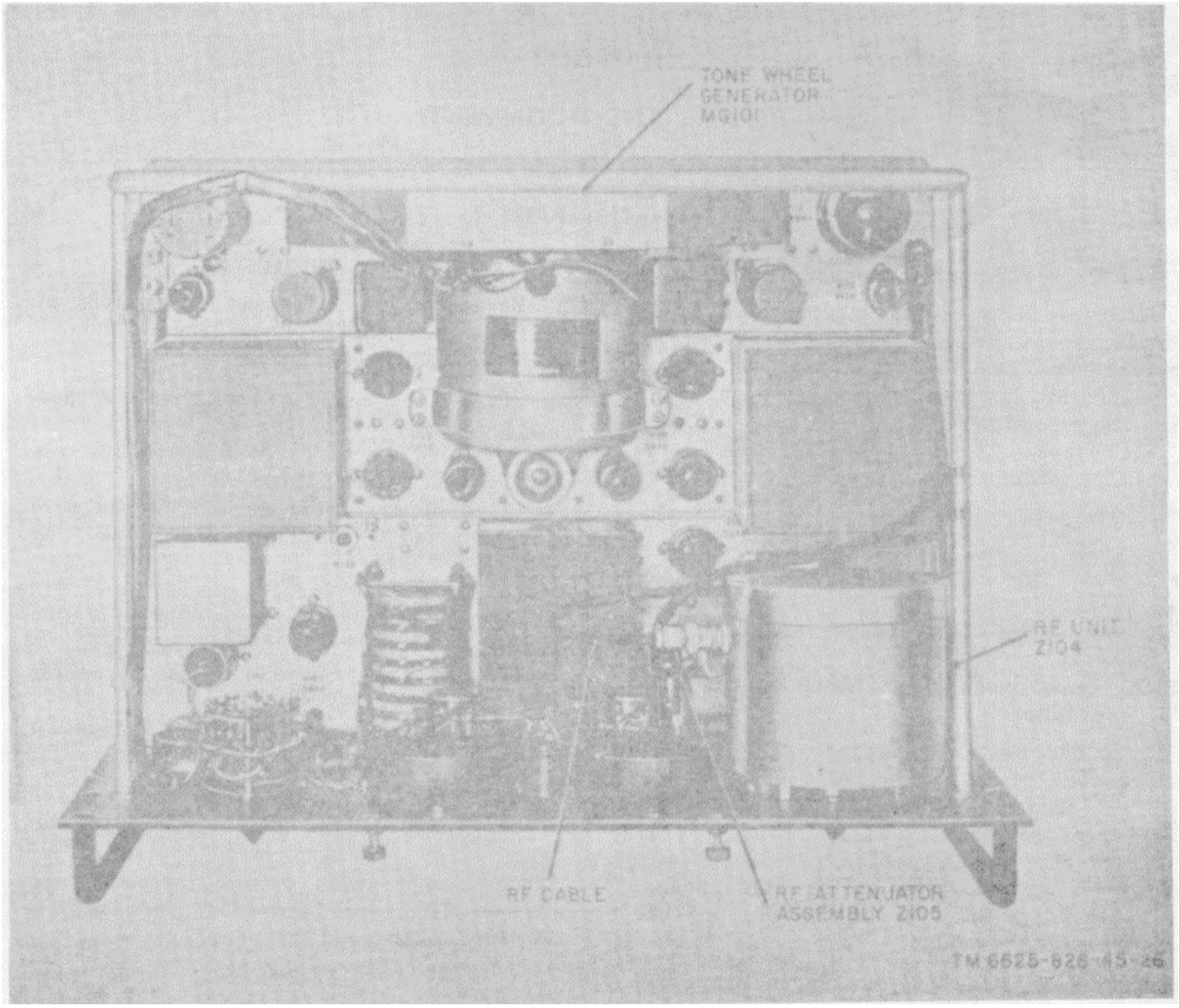


Figure 3-1. Location of major components and associated parts.

(2) Replace and tighten knurled nut H16, on coil stud MP161.

(3) Replace and tighten hexagonal nut H 164.

(4) Use an Allen wrench to tighten two setscrews H166 on support MP164.

(5) Carefully replace tone wheel E1O01 back on the motor shaft, and then replace tone wheel E1O1A back on the motor shaft.

(6) Secure the tone wheels with three setscrews H158.

(7) Perform the alignment procedures outlined in paragraph 3-11.

(8) Replace the tone wheel cover and secure with the eight screws.

d. Replace the tone generator on the chassis as follows:

(1) Lift the tone generator and lower it down to the chassis in its proper position.

(2) Insert the three screws through the vibration mounts and tighten with a screwdriver.

(3) Carefully replace the tone wheel cover back on the tone generator.

(4) Solder the wire leads back on terminal board TB103 (fig. 3-3).

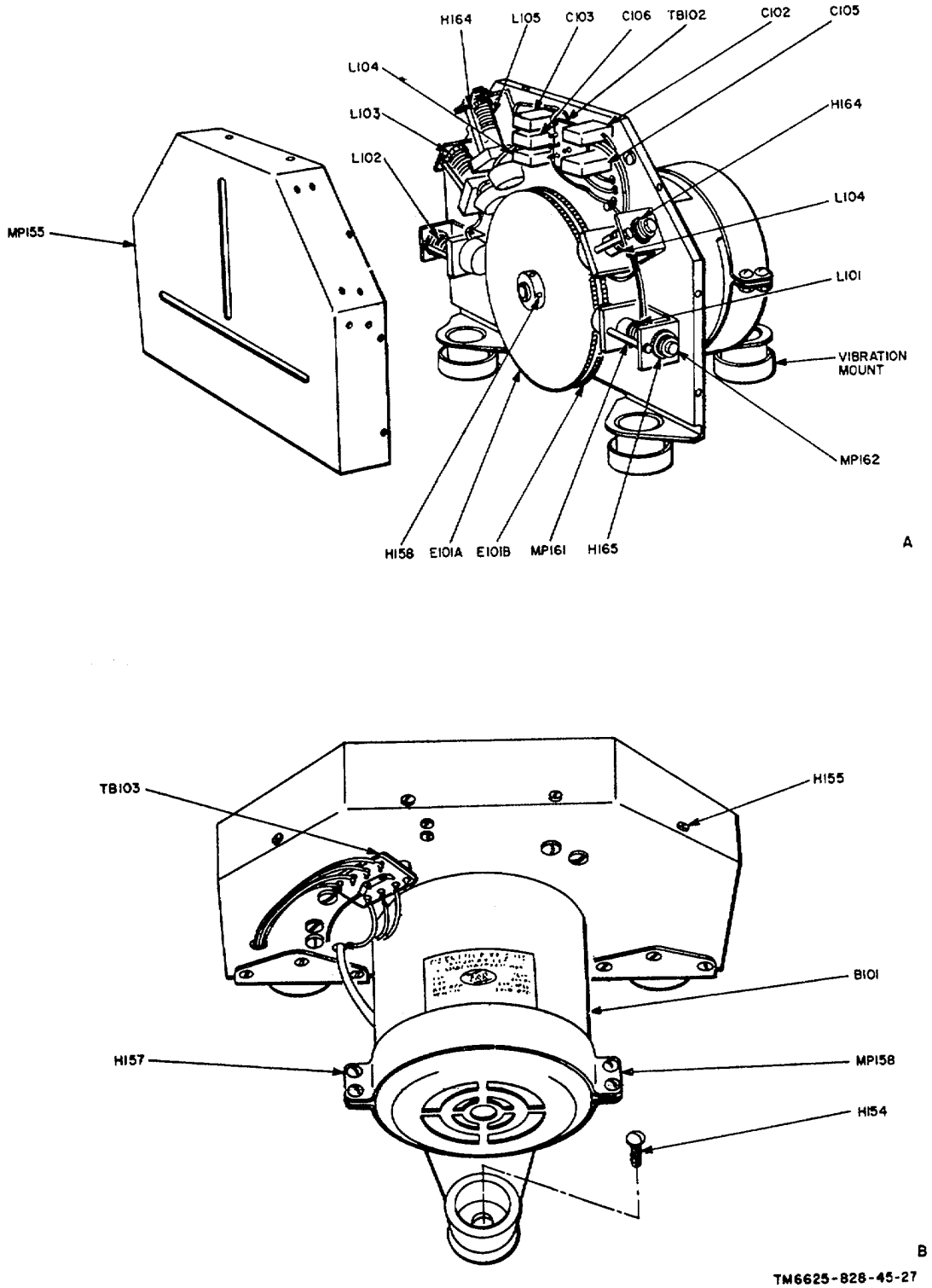


Figure 3-2. Tone generator, exploded view.

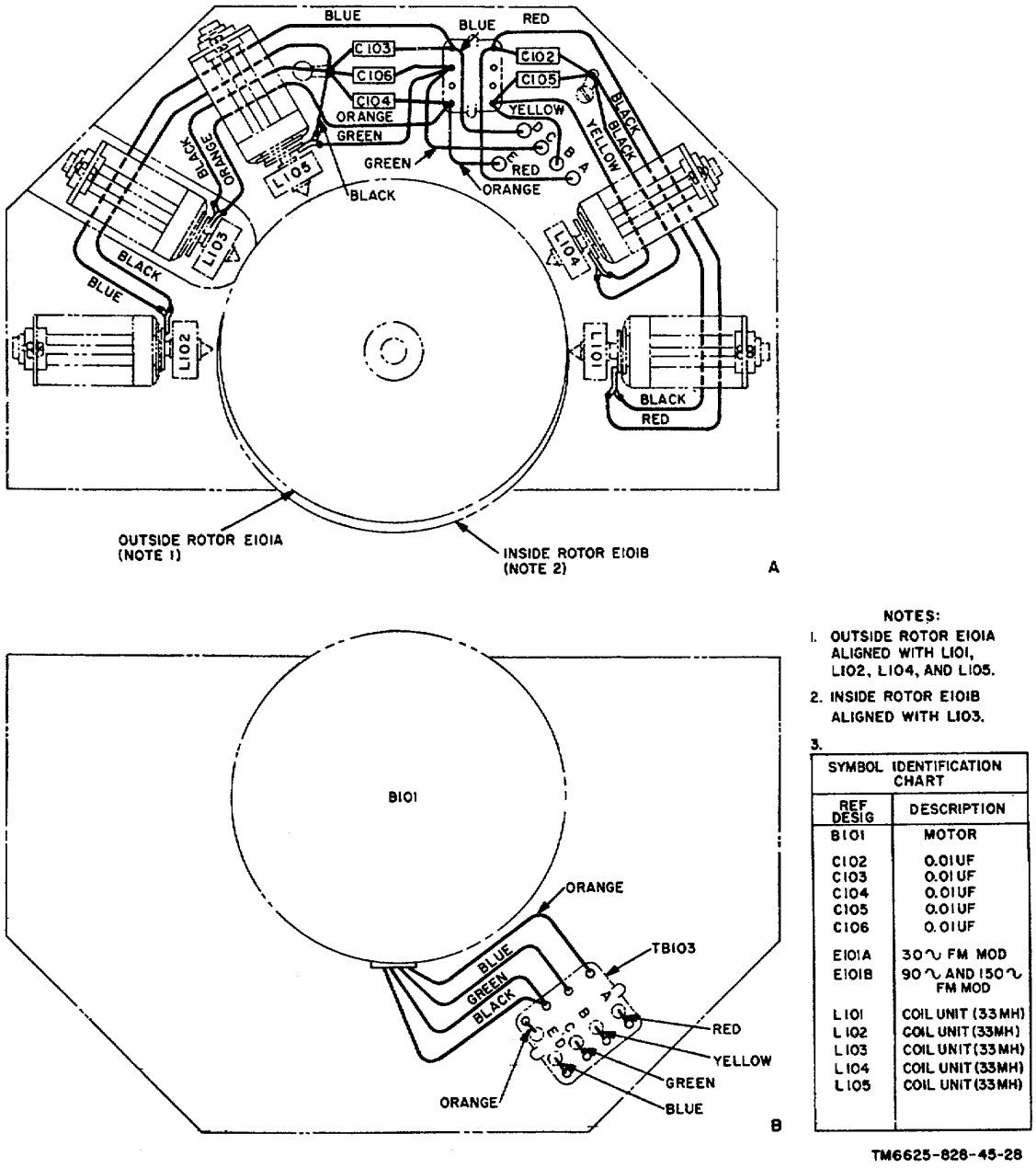


Figure 3-3. Tone generator, wiring diagram.

3-4. Removal and Replacement of RF Unit Z104

The RF unit is mounted on the back of the front panel (fig. 3-1).

a. Remove the RF unit as follows:

(1) Place the test set in an upright position on a workbench.

(2) On the front panel, loosen the setscrew

that secures the MC selector knob to the RI drive shaft.

(3) Unscrew and remove the crystal cove and remove the two crystals from the front pane (4) Disconnect the RF cable at the RI unit.

(5) With a free hand, support the RF unit and then, from the front panel, remove the four knurled nuts, the MC selector switch shaft nut and the nut from the crystal housing.

(6) Tag and unsolder the connections to feedthrough capacitors C134, C157, C155, an C133 located on the side of Z104 (fig. 3-4).

(7) Remove the RF unit from the equipment.

b. After the RF unit has been removed, the unit can be disassembled. Refer to figure 3-4 and proceed as follows:

(1) Remove three screws H135 and lift out rotor assembly A109.

(2) Remove shaft MP144 by removing two setscrews H136 from the side of rotor assemble A109. Two protective disks MP141 may be left in the rotor body.

(3) Lift off washer H137.

(4) From inside the RF unit, at terming board TB101, unsolder the leads of four choke L111, L119, L116, and L110 (fig. 3-5). Carefully straighten the other leads so that they do not interfere with the future removal of the tube deck.

CAUTION

In the following procedures be careful not to bend or distort L115 and L112.

(5) Unsolder the connecting lead of R19 from J102 (fig. 3-4). Loosen and remove the nut, lockwasher H134, coil L115, and resistor R190. Take out connector J102.

(6) Use a 5/i,-inch open-end or hexagon wrench to loosen and remove four hexagonal nuts H138 from RF unit housing MP154. Care fully remove the tube deck.

(7) To remove cover MP137, loosen and remove six screws H143 and lockwashers H142 Lift the cover up and slightly to the side when removing.

(8) The remaining parts of Z104 (fig. 3-4) may be removed by. using standard maintenance procedures. Refer to the RF unit wiring diagram (fig. 3-5).

c. Reassemble the RF unit as follows:

(1) Secure cover MP137 with six screws H143 and lockwashers H142.

(2) Replace connector J102, R190, and L-115, and secure-with lockwasher H134 and nut.
Solder the lead of R190 to connector J102 (fig. 3-5).

(3) Install the tube deck in RF unit housing MP154 and secure with hexagonal nuts H138.

(4) On the inside of RF unit A125, solder the leads of chokes L116, L119, LI11, and L110 to terminal board TB101.

(5) Replace washer H137 on rotor assembly H109.

(6) Replace the two setscrews H136 on the side of rotor assembly H109. Insert shaft MP144.
Tighten setscrews H136.
(7)Insert rotor assembly H109 and secure with three screws H135.

d. Replace the RF unit as follows:

(1) Place the RF unit near its proper position so that the connections to feedthrough capacitors C134, C157, C155, and C133 can be soldered. Solder the connections to C134, C157, C155, and C133.
(2)With a free hand, support the RF unit in its proper position on the back of the front panel. On the front panel, replace the nut in the crystal housing, the nut on the MC selector switch, and the four knurled nuts. Tighten all nuts alternately until the RF unit is secured properly.

(3) Connect the RF cable (fig. 3-1) to the RF unit.

(4) On the front panel, replace the two crystals and the crystal cover.

(5) On the front panel, replace the MC selector knob on the RF drive shaft and insert "the setscrew. Tighten the setscrew.

3-5. Removal and Replacement of RF Attenuator Assembly

RF attenuator assembly Z105 is mounted behind the front panel above and below the main chassis (fig. 3-1).

a. To remove the RF attenuator assembly, proceed with (1) through (8) below.

(1) Place Test Set, Radio AN/ARM-SA (minus cabinet) -on a work bench so that the front panel faces the front edge of the workbench. Rotate the test set 90° from right to left. The above procedure should provide access to RF

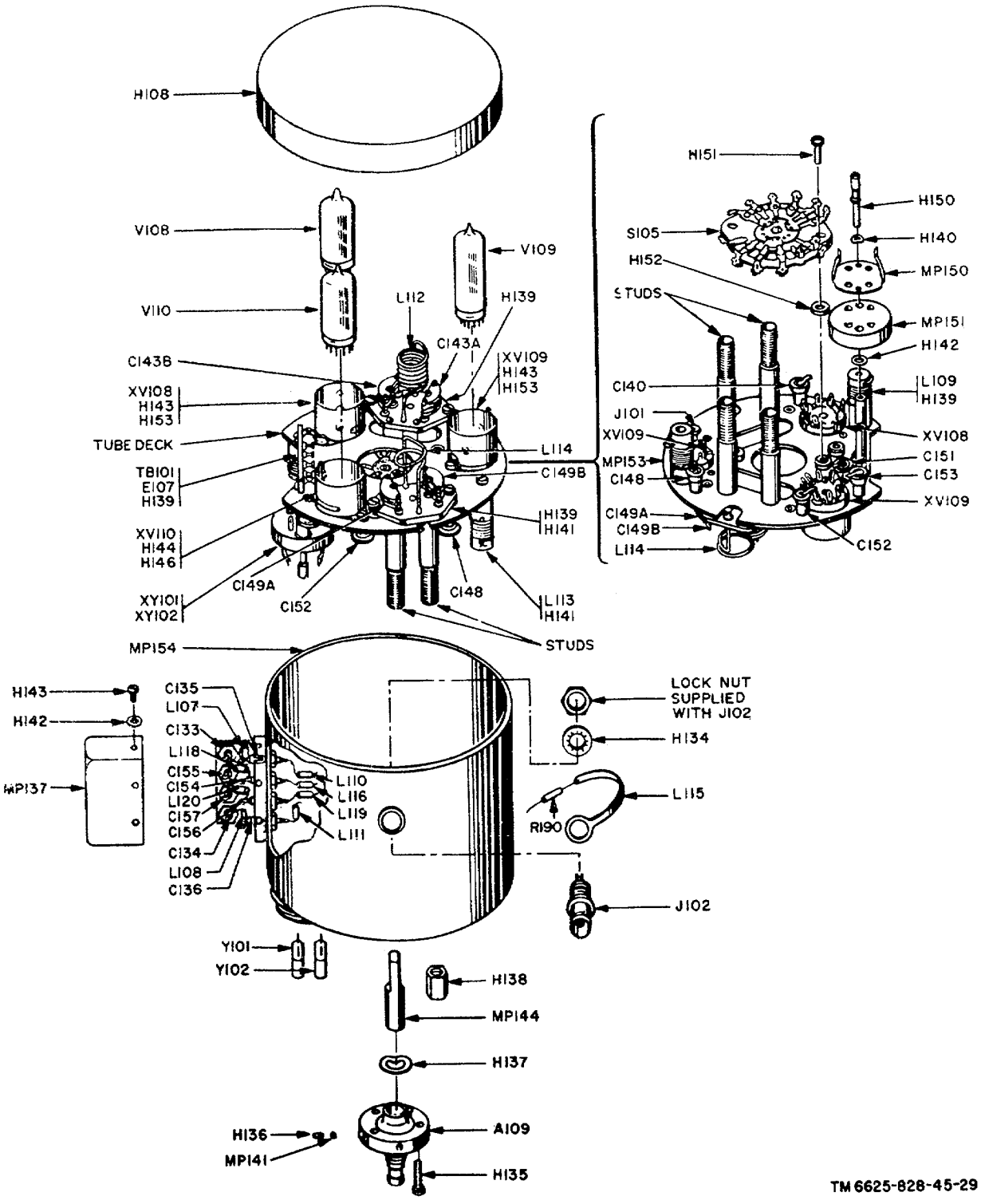


Figure 3-4. RF unit, exploded view

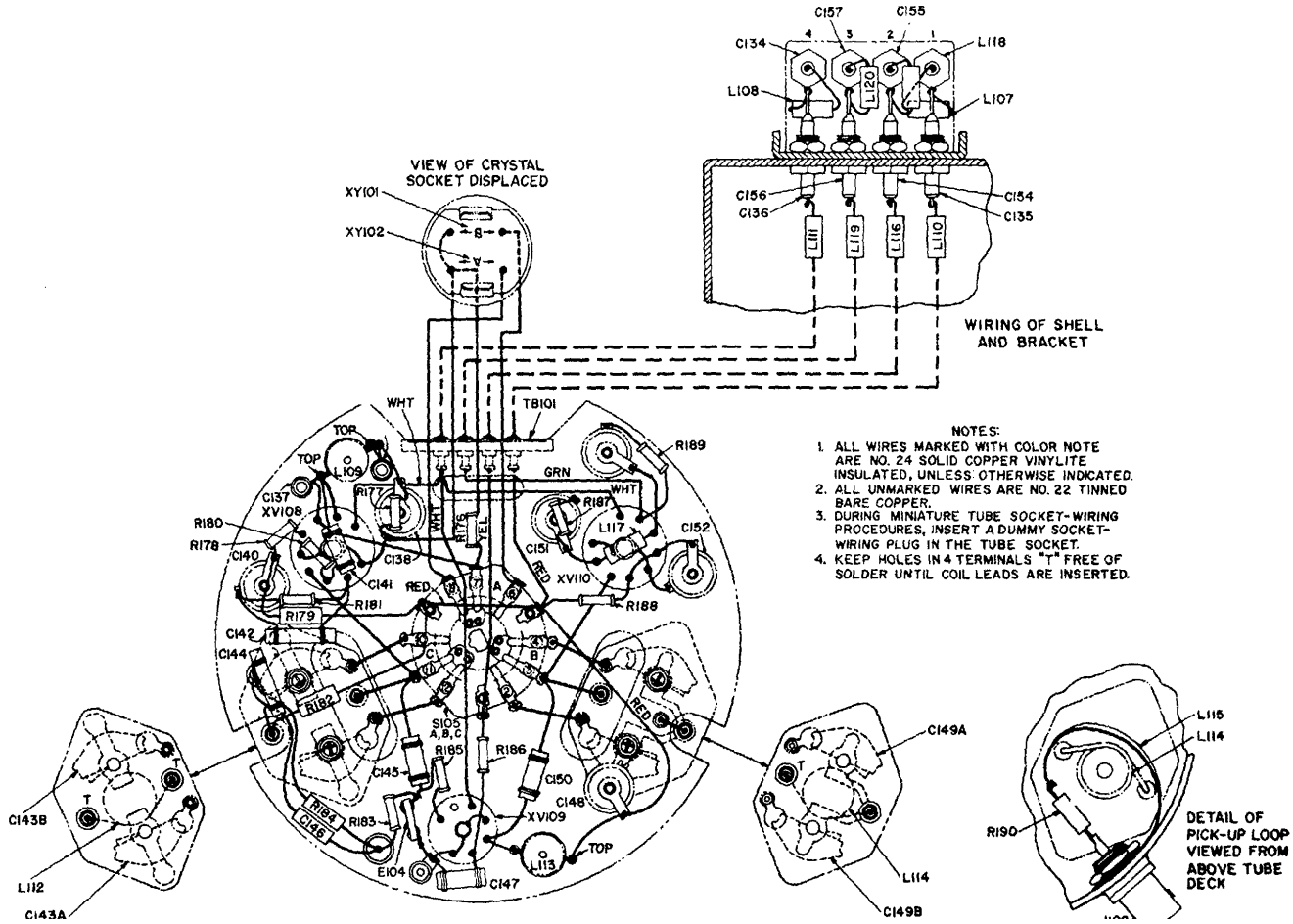


Figure 3-5. RF unit, wiring diagram.

attenuator assembly Z105 (fig. 3-1) from both the top and bottom of the chassis.

(2) On the front panel, loosen the setscrew and remove the ATTENUATOR UV control dial from shaft MP112 (fig. 3-6). Remove the round knurled nut beneath the dial that secure the upper portion of attenuator assembly A1l to the front panel.

(3) On the lower portion of the attenuator assembly, disconnect the RF cable (fig. 3-1) from connector J103 (fig. 3-6).

(4) On the upper portion of the attenuator assembly, loosen two setscrews H119 and r move gear MP111. Remove shaft MP112, wash 1I120, and washer H121.

(5) On the front panel, remove the cc from 1 VOLT connector J105.

NOTE

To prevent dropping the attenuator assembly, support the attenuator assembly with a free hand while performing the following step.

(6) Use a screwdriver to remove the four screws from the front panel that secure t lower portion of the attenuator assembly al connector J105 (fig. 3-6) to the front panel.

(7) Use a screwdriver to remove the four screws and four washers from the front par that secure ATTEN connector J104 to the from panel. Withdraw connector J104 from the panel.

(8) Move the RF attenuator assembly toward the back of the chassis. Withdraw the attenuator assembly upward through the chassis aperture.

b. When the RF attenuator assembly is removed, the rack gear and cable assembly may disassembled. Refer to figure 3-6, and proceed as follows:

(1) Use a 3/8-inch fixed-face spanner wrench to loosen and remove plug MP109.

(2) Unsolder tube MP110 and connection wire from connector J103.

(3) Remove four screws H116 and washer H117 that secure connector J103 to the attenuator assembly.

(4) Remove two screws H118 and washer H117, and remove connector J105 from attenuator assembly A107.

(5) If necessary, unsolder tube MP110 a wire from connector J10.

(6) Loosen two setscrews H119 and remove gear MP111 and washer H120 from shaft MP-112.Remove shaft MP112 and washer H121 from attenuator A107.

(7) Loosen screw H125 that secures rack gear MP114 to attenuator assembly A107.Remove screw H125, washer H124, and rack gear MP114.lf necessary, loosen and remove screw H127 from rack gear MP114.

(8) If necessary, remove adjustment screw H126 and locknut H128 from tube assembly A106.

(9) Remove two screws H122, two washers H123, and one spring MP113.

(10) Withdraw sleeve assembly A105 from attenuator A107.

(11) If necessary, unsolder resistor R191 from loop MP116 and sleeve MP119.

(12) Withdraw plate MP115 and unsolder loop MP116 from the cable.Remove mica washer MP117.

(13) Unscrew and remove tube MP123, together with connector J104, sleeves MP120, spacers MP121, grommet MP122, and cable assembly W102, from tube assembly A106.

(14) If necessary, unsolder sleeve MP119 from tube of tube assembly A106.

(15) Unscrew the clamping nut supplied with connector J104 and slide back on the cable. Unsolder the cable lead to connector J104 and remove the connector.

(16)Remove sleeves MP120 and spacers MP121 from each end of cable assembly W102.

(17) Slide the clamping nut (supplied with J104), grommet MP122, and tube MP123 off cable W102.

(18) If damaged or replacement is required, remove adjustment screw H126 and locknut H128 from tube assembly A106.

c. Reassemble the RF attenuator as follows:

(1) Replace the clamping nut (supplied with J104), grommet MP122, and tube MP123 on cable assembly W102 (fig. 3-6).

(2) Replace sleeves MP120 and spacers MP121 on each end of cable W102.

(3) Solder the cable lead to connector J104.

(4) Slide the clamping nut (supplied with connector J104) down the cable into J104 and tighten.

(5) If removed, solder sleeve MP119 to the tube of tube assembly A106.

(6) Thread tube MP123 together with cable assembly W102, spacer MP121, and sleeve

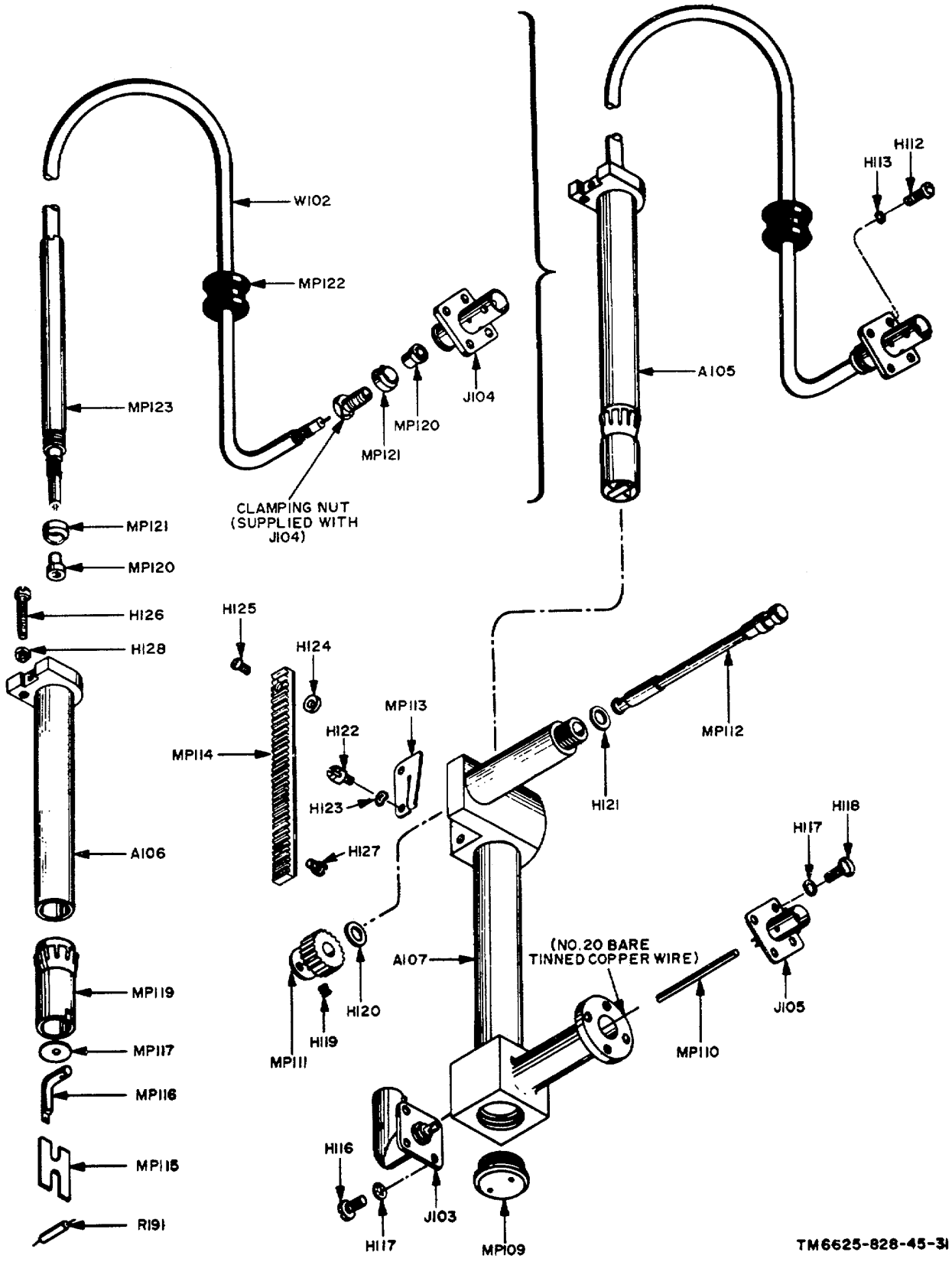


Figure 3-6. RF attenuator assembly, exploded view.

MP120, into tube assembly A106. Tighten tub MP123.

(7) Replace mica washer MP117 and loop MP116. Solder loop MP116 to cable assemble W102. Insert plate MP115.

(8) Replace and solder R191 to loop M] 116 and sleeve MP119.

(9) Insert sleeve assembly A105 in attenuator A107.

(10) Replace spring MP113, washers HI12: and two screws 11122 on attenuator assemble A107. Tighten the two screws.

(11) If removed, replace locknut H128 an adjustment screw H126 on tube assembly A106.

(12) Replace screw H127, washer H124, rack gear MP114, and screw H125 on the attenuator assembly. Tighten screw H125.

(13) Solder tube MP110 and wire to connector J105, and replace J105 on attenuator assembly A107.

(14) Replace two screws 11116 and washer H117 that secure the connector to the attenuate assembly. Tighten the screws.

(15) Replace connector J103 on attenuator assembly A107, and secure in position wit four screws H11116 and washers H117. Solder the other end of tube MP110 and wire to connector J103.

(16) Replace and tighten plug MP109.

(17) Seal plug MP1O9, screw H125, and setscrews H119 by covering the item and the immediate adjoining area with gray enamel.

d. Replace the RF attenuator assembly as follows:

(1) Position the RF attenuator assembly in its proper location on the back panel. Replace four washers H117, and secure the lower portion of the attenuator assembly and 1 VOLT connector J105 (fig. 3--6) to the front panel with four screws H116.

(2) Install shaft MP112 with washers H120 and H121 in attenuator assembly A102. Replace gear MP111. Use an Allen wrench to tighten two setscrews H11119.

(3) Thread the hexagonal nut on the threaded portion of the attenuator protruding through the front panel to secure the upper portion of the attenuator assembly to the panel. Tighten the hexagon nut.

(4) Insert ATTEN connector J104 throughout the front panel and replace the four washers and four screws on the front panel that secure

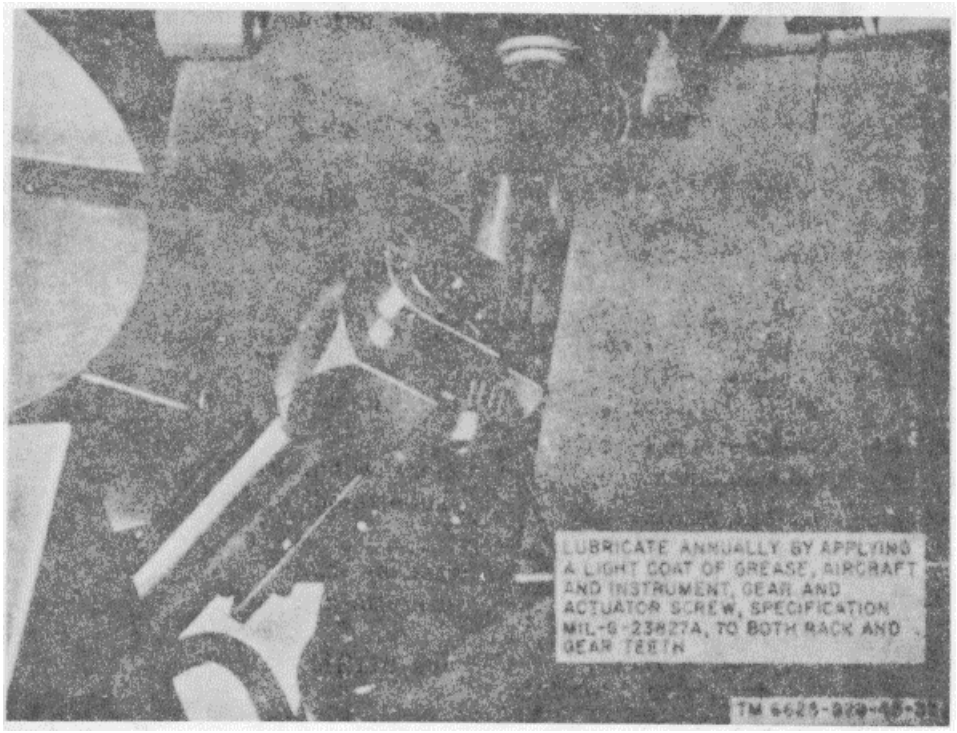


Figure 3-7. Lubrication of RF attenuator rack and spur gear assembly.

the connector to the panel. Tighten the four screws.

(5) On the front panel, replace the ATTENUATOR UV control dial and tighten the setscrews.

(6) Reconnect RF cable (fig. 3-1) connector P102 to connector J103 (fig. 3-6).

(7) On the front panel, replace the 51-ohm cap on 1 VOLT connector J105.

3-6. Lubrication

Lubricate the RF attenuator rack and spur gear assembly as shown in figure 3-7.

SECTION II. ALIGNMENT

3-7. Test Equipment Required for Alignment

The chart below lists test equipment required in aligning Test Set, Radio AN/ARM-5A, the associated technical manuals, and assigned common names.

Test equipment	*Technical manual*	*Common name*
Multimeter TS-352BU	T6625-366-15	Multimeter
Electronic Voltmeter ANIU RM-145	T6625-524-14 and TM 11-6625-524-15-1	Electronic voltmeter
Filter Unit (Aircraft Radio Corp. Model F-12)		Filter unit
Voltmeter Electronic ME30E/U	T6625-320-12	Vacuum tube voltmeter
Resistance Bridge ZM-4U		Decade resistance box
Test Set, Signal Generator AN/GSM-21	T6625-609-14	Course checker Signal generator
Audio Signal Generator (Collins Radio Model 479S-3)		
Oscilloscope AN/USM-281A	T6625-1703-15	Oscilloscope

3-8. Characteristics of Test Equipment Required for Alignment

The type of test equipment required for alignment of the AN/ARM-5A is listed below.

a. Multimeter.

(1) *Ohmmeter function*. A 20,000 ohms-per-volt volt-ohm-meter, capable of measuring dc voltage at 2.5 to 500 volts.

(2) *Voltmeter function*. A dc voltmeter with an input impedance of 1 megaohm is required to measure dc voltages from 5 to 50 volts with an accuracy of 1 percent.

b. *Electronic Voltmeter*. A voltmeter capable of measuring a signal of 30,u V at 100 to 150 me to an accuracy of 5 percent.

c. *Vacuum Tube Voltmeter*. A voltmeter capable of accurately measuring levels from 100 mv to 1 volt in the range from 30 Hz to 20 kHz should be used.

d. Decade Resistance Boxes. Three decade resistance boxes should be available, each with a resistance range of 1 kilohm to 1.2 megohms.

e. *Standard Course Checker*. A standard course checker capable of measuring the demodulated OMNI track angle to an accuracy of 0.1° should be used.

f. *Signal Generator*. A signal generator capable of generating variable phase 39, 90, and 150 cps signals for checking VOR equipment is required.

3-9. %M and RF Meter Zero Alignment

a. *Initial Adjustment*. The test set %M and RF meters are initially adjusted for electrical zero by means of the ZERO SET knobs located immediately below each meter.

b. *Connections and Settings*. Connect the 51-ohm termination cap to the RF OUTPUT-1 VOLT connector, and set the front panel controls and switches as indicated in the chart below.

Control on switch	*Setting*
POWER-STANDBY	POWER
30 - MOD	Fully counterclockwise
90 - MOD	Fully counterclockwise
9960 - MOD	Fully counterclockwise
150 - MOD	Fully counterclockwise
RF LEVEL SET	Fully counterclockwise
1000 - MOD	Fully counterclockwise
MODULATION	30 -
IDENTIFIER	OFF
MC switch	A
ATTENUATOR μ V	Midscale

c. *RF Meter Zero Alignment*. Push in the ZERO SET control and adjust the control to align the meter needle with the ZERO SET line on the meter scale.

d. *%M Meter Zero Alignment*. Push in the

ZERO SET control. The meter needle will hi the lower stop pin for about 2 seconds., Hold the control in until the needle returns to the vicinity of the ZERO SET line on the S%M mete scale. Adjust the control to align the needle c the 7%M meter with the ZERO SET line on the meter scale.

3-10. RF unit Alignment

a. RF Tuning. Capacitors C143A, C149A, an C143B, C149B peak the oscillator output for the A- and B-frequencies, respectively. The capacitors are located on the front panel adjacent t the MC switch and are marked: PLATE A, X (C143A, LB) and GRID A, B (C149A, B). Se the MC switch to A. Adjust the RF LEVEL SET control as required. With a small-screw driver, adjust the PLATE A capacitor and GRI] A grid in turn for maximum RF meter indication. Repeat the adjustment until both capacitor are peaked. Set the MC switch to B and similarly adjust the PLATE B and GRID B capacitor for maximum RF meter indication.

CAUTION

Do not apply undue pressure to the capacitors or damage and false settings may result.

b. RF Output Alignment.

(1) Remove the termination cap from the RF OUTPUT-1 VOLT connector and connect a external 51-ohm termination to the connector.

(2) Connect the ac voltmeter across the external 51-ohm termination.

(3) Adjust the RF LEVEL SET control until 1.0 volt is indicated on the voltmeter.

(4) Adjust RF meter sensitivity variable resistor R212 (fig. 2-3 (1)) until RF mete M101 indicates at the LEVEL SET redline.. If the range of R212 is insufficient, reorientate L-115 in RF unit Z104 (fig. 3-5) and readjust the output level to 1.0 volt.

(5) Remove the external 51-ohm termination and replace the 51-ohm termination car The RF meter needle should return to the SE! LEVEL redline within 1/32 inch.

c. RF attenuator Alignment. Connect the test set RF OUTPUT ATTEN connector to the a voltmeter 50-ohm input connector, and proceed as follows:

(1) Adjust the test set RF LEVEL SE: control until RF meter M101 indicates at the LEVEL SET redline.

(2) Adjust the test set ATTENUATOR uV control until the ac voltmeter indicates 300 microvolts. (3) If required, loosen the ATTENUATOR TV dial on its shaft and rotate the dial until the dial indicates 300 microvolts. Tighten the dial on its shaft.

(4) Using a 1/16-inch Bristol wrench, back off the two setscrews securing the ATTENUATOR uV control dial on its shaft and rotate the ATTENUATOR tV control fully clockwise until the dial indicates 10K. The setscrews are located on the bore of the knob portion of the dial and are 120° apart.

(5) Be careful not to disturb the attenuator control setting, back off locknut H128 (fig. 3-6), and adjust stop screw H126 until the end of the screw contacts the top of attenuator assembly A107. Tighten the locknut.

3-11. Modulation Meter Alignment

Recheck the ZERO SET meter indications as specified in paragraph 3-9 and proceed as follows:

a. Set the test set MODULATION switch to 30- and turn the 30- MOD control fully counterclockwise.

b. Set the MC switch to B.

c. Adjust the RF LEVEL SET control until RF meter M101 indicates at the LEVEL SET redline.

d. Connect the dc voltmeter between terminal 3 (green wire with red trace) of RF unit Z104 (fig. 3-5) and the negative terminal of RF meter M101. Connect the vacuum tube voltmeter across the dc voltmeter.

e. Use a small screwdriver to adjust the PLATE B trimmer capacitor on the front panel of the test set, as required, to obtain the maximum detuning effect (minimum RF meter indication). Record the voltage indicated by the dc ,voltmeter as Eo.

f. Adjust PLATE B trimmer capacitor for maximum RF meter indication, and reset the RF meter to the LEVEL SET redline. Record the voltage indicated by the dc voltmeter as E.

g. Compute EAC from the following formula:

$$E_{AC} = 0.212 (E, + 3 - E_o).$$

h. Adjust the test set 30- MOD control until the vacuum tube voltmeter indicates a reading equal to the computed value of E_{AC}.

i. Loosen the locknuts on c M meter sensitivity control resistor R215 (fig. 2-3(1)) by backing off the two locknuts located beneath the R unit (fig. 3-1), and adjust R215 until %M mete M102 indicates 30 percent (green line). If R2; does not have sufficient range to obtain the met, reading; replace resistor R220 (fig. 2-2) with resistor of different value within the range , 100 ohms to 1,000 ohms and again adjust R2] as required.

j. Lock sensitivity control R215 in its adjusted position.

3-12. 30- Phase Angle Adjustment

a. Preliminary. The procedure given in (1) through (4) below must be performed before proceeding to b below.

(1) Remove resistor R139 (fig. 2-3®) from the test set and connnect a decade resistance box in its place. Temporarily replace resistor R143 with a 20,000-ohm resistor.

(2)Set variable resistor R138 (fig. 2-2) to its midtravel position and set the DEMOD control on the front panel to its midtravel position.

(3) Set the MODULATION switch to OMNI.

(4) Connect the course checker to the test set DEMOD connector.

b. *0° Track Alignment.* Check the alignment of the 0° track as follows:

(1) Set the test set OMNI TRACK switch zero-degree. Set the course checker COURSE switch to the 0.0° position.

(2) Adjust the decade resistance box until the course checker DEGREES meter indicates 0.0°. Note the resistance value reading on the decade resistance box.

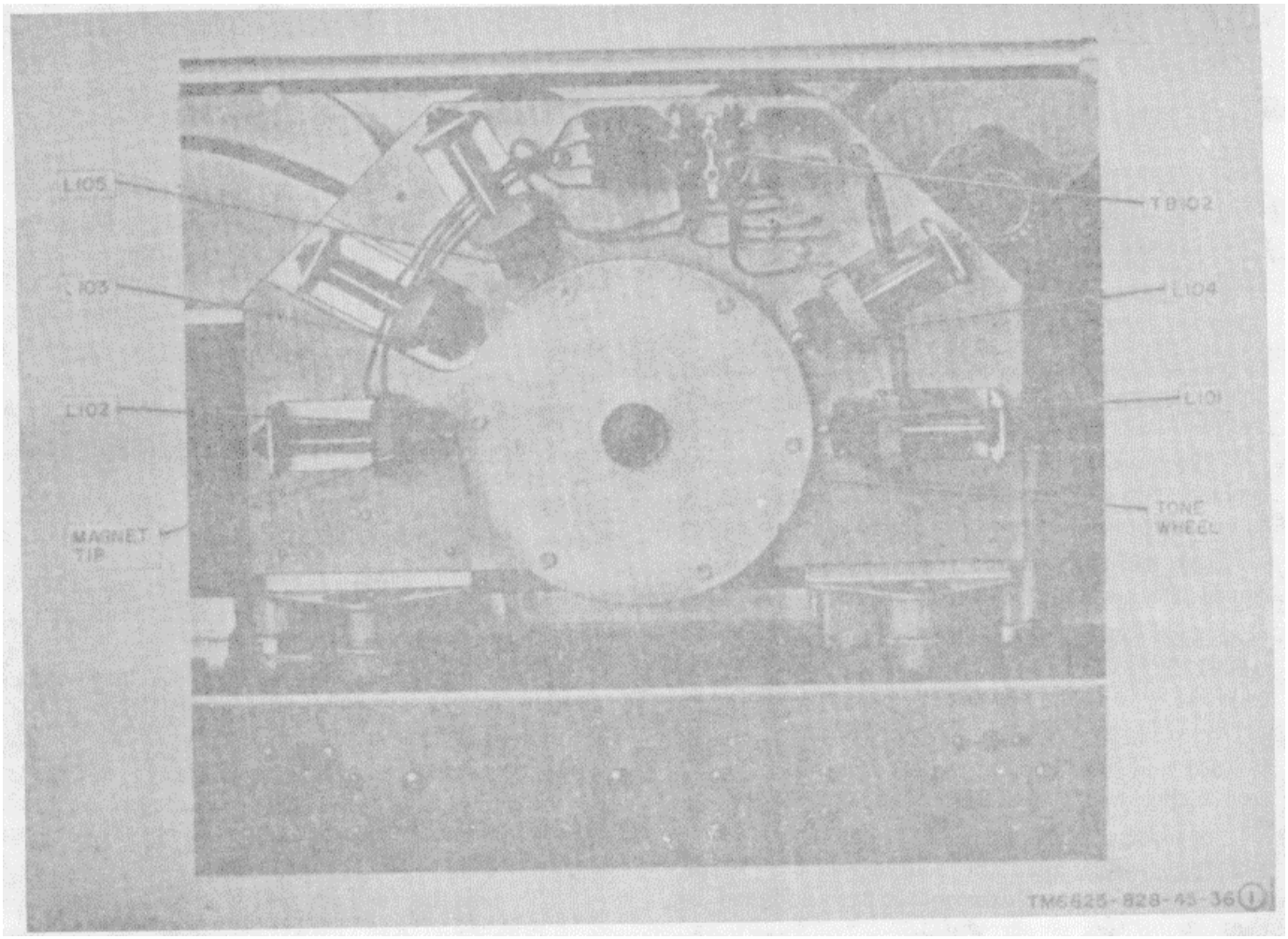


Figure 3-8(1). Location of alignment components, tone wheel generator

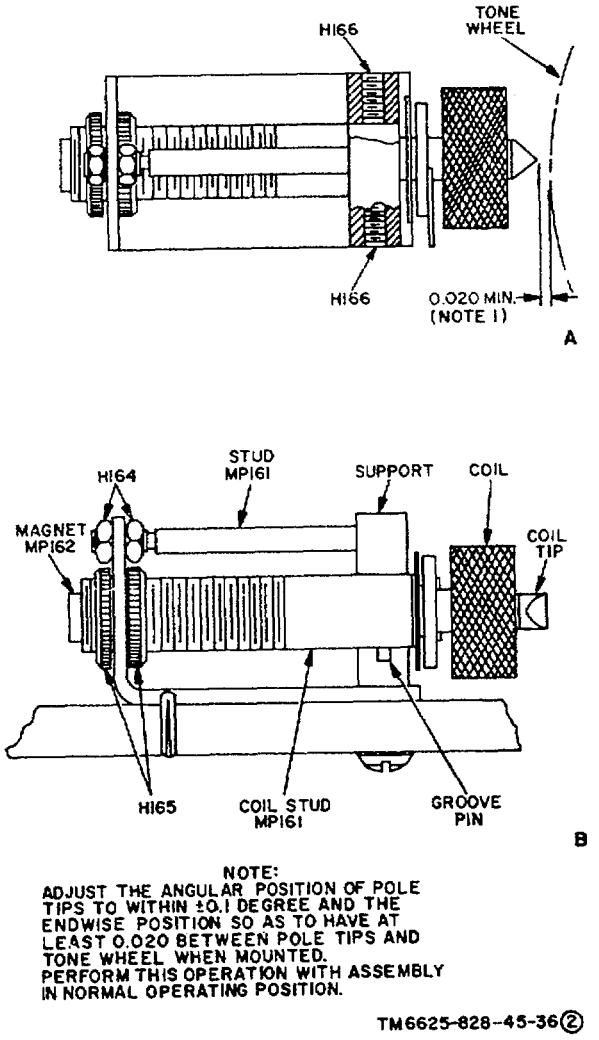


Figure 3-8 (2). Location of alignment components, tone wheel generator.

(3) Remove the decade resistance box replace with a fixed resistor (R139) having same approximate value as noted in (2) above

(4) Adjust variable resistor R138 until course checker again indicates 0.00.

c. 180° Track Alignment. Set the test OMNI TRACK switch to 180 and proceed follows:

(1) Set the course checker COURSE s, to 1800 and read the course error, if any, on course checker DEGREES meter.

(2) Adjust the angular position of coil 102 (fig. 3-80) until the course has 0.00 el Angular position adjustment is accomplished backing off one setscrew H166 (fig. 3-8®) tightening the other setscrew. Loosen the set 3-14 on the side of the support facing the direction in which the coil is to be moved.

(3) Connect the vacuum tube voltmeter test A, leads to the terminals of coil L102 (fig. 3-8()) and adjust the gap between the coil tip and the tone wheel until the vacuum tube voltmeter indicates 14 volts -+0.01. Gap adjustment is accomplished by backing off one knurled nut H165 (fig. 3-8(1))and tightening the other nut. Tighten the nut on the side of the bracket facing the direction in which the tip is to be moved.

NOTE

The gap between the coil tip and the tone wheel must always be greater than 0.007 inch.

(4) Disconnect the vacuum tube voltmeter and recheck the course error. If necessary, readjust the angular position of coil L102 until the indicated error is 0.00.

(5) If coil L102 cannot be moved enough to obtain a course error of 0.0° at 180° track also adjust coil L101 (fig. 3-8()).

(6) If coil L101 was adjusted, coil L101 must be set for a voltage of 14 volts i 0.01, and variable resistor R138 (fig. 22) must be readjusted for a 0.00 course error (b(4) above).

d. 30° Track Alignment. Set the test set OMNI TRACK switch to 30 and check the angular position and voltage output of coil L104 (fig. 3-80) in the same manner as specified for coil L102. Coil L104 voltage must be 14 volts ±+0.01 and the course error, if any, must be corrected to 0.0°.

e. 1200 Track Alignment. Set the test set OMNI TRACK switch to 120 and check the angular position and voltage output of coil L105 (fig. 3-8()) in the same manner as specified for coil L102. Coil L105 voltage must be 14 volts _+0.01 and the course error, if any, must be corrected to 0.0°.

f. 15° Track Alignment. Allow the test set to warm up for a minimum period of 2 hours, and then proceed as follows:

(1) Set the test set OMNI TRACK switch to the 0° and set the course checker SELECTOR switch to 0°.

(2) Note the course error, if any, indicated on the course checker DIkGREES meter. Adjust variable resistor R188 (b(4) above), as necessary, to obtain a 0.00 error.

(3) Set the test set OMNI TRACK switch to 15 and the course checker SEL4ECTOR switch to 15°.

(4) Remove the 20,000 ohm resistor installed in place of resistor R143 (a above) and by the substitution method, determine the resistance value of R143 required to obtain the smallest error as indicated on the course checker Permanently install R143 of the determine value.

(5) Repeat (1) through (4) above to rE check the 0° and 15° track accuracy.

(6) Set the test set OMNI TRACK switch to 0 and set the course checker SELECTOR switch to 0°.

(7) Vary the input line voltage to the test set from 105 volts to 125 volts and see that the DEGREES meter on the course checker does no vary more than a total of 0.20. Set the line volt age to 115 volts.

3-13. 90- to 150-cycle Phase and AMP LOC Alignment

a. Preliminary 90- -to 150-c,ycle Phase Adjustment. Replace each resistor, R146, R148, an R149 (fig. 2-3(2), with a decade resistance box set to reach 0.62 megaohm (mgo). Replace capacitor C123 (fig. 2-30) with a capacitor of 0.00 microfarad (Iff), and proceed as follows: (1) Position the test set 90- MOD control in a 75 percent clockwise rotation. Set the tee set 150- MOD control to the center of its rang

(2) Use the vacuum tube voltmeter wit the test leads connected to the terminals of coil L103 (fig. 3-80) to be sure that the output c L103 is 14 volts -+0.01. Disconnect the vacuum tube voltmeter.

(3) Set the test set MODULATION switch to 90, and adjust the setting of the decade resistance box, substituted for resistor R146, until %M meter M102 indicates at the redline.

(4) Set the test set MODULATION switch to 150- and adjust the setting of the decade resistance box, substituted for resistor R148, until % M meter M102 indicates at the redline.

b. 90- to 150-cycle Phase Adjustment. Without disturbing any of the above adjustments, set the test set MODULATION switch to the AMP LO position and proceed as follows:

(1) Apply a 30-cycle output from the sign< generator to the X (horizontal) amplifier of the oscilloscope and connect the test set DEMO output to the Y (vertical) amplifier of the oscilloscope.

(2) Set the oscilloscope to external inpl and adjust its controls for a full screen display TM 11- 662-245 (3) Adjust the setting of the decade resistance box, substituted for resistor R149, until the display illustrated in A, figure 3-9 is obtained. The display illustrated in B, figure 3-9 is not an acceptable display.

(4)The resistance value of the decade resistance box setting must be between 100,000 ohms and 1 megohm when the acceptable display is obtained. If the setting is not within these limits, replace the 0.002-microfarad capacitor of C123 with a 0.001- or 0.003-microfarad capacitance, and readjust the R149 decade resistance box until the correct oscilloscope display is obtained.

NOTE

The phase of the 30-cycle output from the signal generator must be adjusted properly (para 3-12) to obtain the desired overlapping pattern illustrated in the display on figure 3-9.

(5) Set the test set MODULATION switch to 90- and rotate the 90- MOD control (variable resistor R130) fully clockwise. Check to see that the test set % M meter indicates at least 24 percent.

(6) If the correct meter reading is not observed, readjust the decade resistance box, substituted for resistor R146, until the 24 percent indication is obtained.

(7) Set the test set MODULATION switch to 150- and rotate the 150- MOD control (variable resistor R144) fully clockwise. Check to see that the % M meter indicates at least 24 percent.

(8) If the correct meter reading is not observed, readjust the decade resistance box, substituted for resistor R148, until the 24 percent indication obtained.

(9) Recheck the phase adjustments in (1) through (4) above. Note the values indicated on the decade resistance boxes for resistors R146, R148, and R149. Disconnect the decade resistance boxes. Install resistors R146, R148, and R149, with a resistance value equal to that noted above. Solder capacitor C123 in place.

c. AMP LOC Level Adjustments. Connect the vacuum tube voltmeter to the input connectors of the filter unit and connect the filter unit output connector to the test set DEMOD connector. Place both the test set MODULATION switch and the filter unit switch in the 30-cycle position, and proceed as follows:

(1) Adjust the test set 30- MOD control

(variable resistor R131) until the %oM meter indicates at the green line on the dial scale.

(2) Use a small screwdriver to adjust the test set DEMOD control (variable resistor R224 until the vacuum tube voltmeter indicates exactly 0.03 volt.

(3) Set the test set MODULATION switch to 90, and adjust 90- MOD control R130 t obtain a redline indication on the 7%M meter.

(4) Set the test set MODULATION switch to 150- and adjust 150- MOD control R144 t obtain a redline indication on the % M meter.

(5) Set the test set MODULATION switch to the AMP LOC + position and set the filter unit switch to 90 cycles. Check to see that the vacuum tube voltmeter indicates 0.019 to 0.2 volt.

(6) Set the filter unit switch to 150-cycl and note that the vacuum tube voltmeter indicates 0.019 to 0.021 volt.

(7) Set the filter unit switch to 90-cycl and adjust the test set DEMOD control unit the vacuum tube voltmeter indicates exactly 0.0 volt. Place the test set MODULATION switch in the AMP LOC (O position.

(8) Check to see that the filter unit output is 2.0 db + 0.1 below the 0.02 volt (6 db).

(9) Set the filter unit switch to 150 cycle and check to see that the filter unit output is 2. db ±0.1 above the 0.02 volt (6 db) and is as many db (within ±0.1 db) above 0.02 volt as the 90-cycle output was below 0.02 volt. e.j(10) Set the test set MODULATION switch to AMP LOC O) and set the filter unit switch to 90 cycles. Check to see that the filter unit output is 2.0 db +0.1 above 0.02 volt (6 db).

(11) Set the filter unit switch to 150 cycles and check to see that the filter unit output is 2.0 db +0.1 below 0.02 volt (6 db) and is as many db (within ±0.1 db) below 0.02 volt as the 90-cycle output was above 0.02 volt.

(12) Set the test set POWER-STANDBY switch to STANDBY and disconnect and remove all test equipment. Replace the test set cabinet.

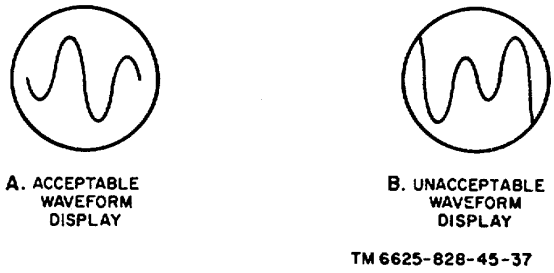


Figure 3-9. Phase adjustment oscilloscope display.

CHAPTER 4

GENERAL SUPPORT TESTING PROCEDURE

4-1. General

a, Testing procedures are prepared for use Electronic Field Maintenance Shops and Service Organizations responsible for general support ((maintenance of electronic equipment to determine t acceptability of repaired electronic equipment. The procedures set forth specific requirements that repaired electronic equipment must meet before it returned to the using organization. These procedure may also be used as a guide for testing equipment that has been repaired at direct support category if the proper tools and test equipments are available. A summary of the performance standards is given in paragraph 4-14.

b. Comply with the instructions preceding each chart before proceeding to the chart. Perform each step in sequence. Do not vary the sequence. For each step, perform all the actions required in the Control settings columns; then perform each specific test procedure and verify it against its performance standard.

4-2. Test Equipment and Other Equipment

The test equipment and other equipment required to perform the testing procedures given in this chapter are listed in a and b below.

a. Test Equipment.

Nomenclature	*National stock No*	*Technical manual*
Audio Signal Generator (Collins Model 479S-3)	6625-00-669-4031	
Filter Unit (Aircraft Radio Model F-12)	6625-00-539-9685	TM 11-6625-508-10
RF Signal Generator AN/USM.44A	6625-00-694-2054	TM 11-6625-609-14
Test Set, Signal Generator ANIGSM-21	6625-00-973-3986	TM 11-6625-524-14
Electronic Voltmeter AN/U RM-145	6625-00-543-1356	TM 11-6625-212-15
Frequency Meter AN/USM-26		TM 11-6625-366-15
Multimeter TS-352B/U*	6625-00-228-2201	TM 11-6625-1703-15
Oscilloscope AN/USM-281A	5950-00-235-2086	
Variable Power Transformer CN-16A/U	6625-00-643-1670	TM 11662520-12
Voltmeter, Electronic ME-30EIU	6625-00-999-7465	TM 11-6625-654-14 E
*or Multimeter AN/USM-223		

b. Other Equipment.

(1) Three-conductor telephone jack.

(2) Capacitor 0.1-microfarad (300 to 500 volts working).

(3) Receiving Set, Radio AN/ARM30E.

4-3. Special Requirements

Signal Generator SG-66B/ARM-5 should be allowed warm up for at least 2 hours before starting the to procedures in this chapter. The chassis should removed from the cabinet to reach the test points indicated.

NOTE

Use the equipment in its normal vertical position when performing the tests.

4-4. Preliminary Inspection

a. Test Equipment and Material.

Variable Power Transformer CN-16A/U Multimeter TS-352/U

b. Test Connections and Conditions.

(1) Connect the equipment as shown in figure 4-1.

(2) Location of components is shown in figure 23.

	Control settings			
Test equipment		*Equipment under test*	*Test procedure*	*Performance standard*
1 CN-16A/U: VOLTAGE CONTROL: 115 volts. TS-352B/U: a. FUNCTION: AC volts b. RANGE SCALE: 250 volts.		a. Set POWER-STANDBY switch STANDBY. b. Set POWER-STANDBY switch to POWER.	a. Adjust VOLTAGE CONTROL on CN-16A/U until output measured on TS352B/U is 115 volts. b. Adjust VOLTAGE CONTROL on CN-16A/U until output measured on TS-352B/U is 115 volts.	Observe that R193 (fig. 2-3(1)) and R194 and R195 (fig. 2-3(2)) warm Up. Note that test set red indicator lamp lights, that tone generator runs clockwise as tone wheel is balanced by noting lack of vibration of panel, and that tone wheel is bal.

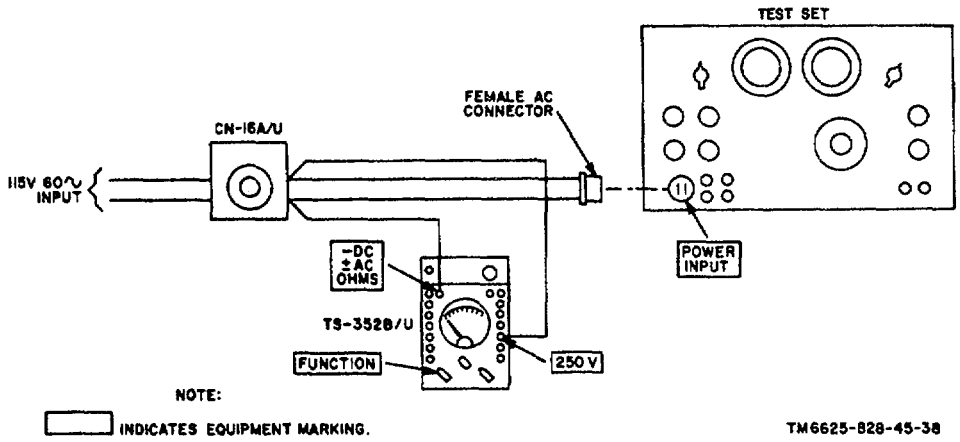


Figure 4-1. Preliminary inspection test setup.

4-5. Meter Zero Test

a. Test Equipment and Material.
None.

b. Test Connections and Conditions.
None.

C. Procedure.

Test equipment	*Control settings* *Equipment under test*	*Test procedure*	*Performance standard*
1 None.	MODULATION switch at 30 -	a. Push in %M meter ZERO SET control and adjust %M meter needle to ZERO SET mark.	Needle adjust to ZERO SET mark.
		b. Push in RF meter ZERO SET control and adjust needle RF meter needle to ZERO SET mark.	Needle adjusts to ZERO SET mark.

4-6. RF Unit Test

a. *Test Equipment and Material*.

Frequency Meter AN/USM-26

b. *Test Connections and Conditions*.

Refer to figure 4-2 for connection of AN/USM-26 to test set.

NOTE

Frequency meter should warm up for 1 hour before performing this test.

	Test equipment	*Control settings* *Equipment under test*	*Test procedure*	*Performance standard*
1	None	a. MC switch to A.	a. Check to see that crystals are plugged into A- and B-crystal-holders and that the tabs above the crystals agree with crystal frequencies. Use a screwdriver to adjust first plate A, then grid A, trimmer capacitors for maximum RF meter indication.	a. Trimmers should tune either side of maximum.
		b. MC switch to B.	b. Repeat a above for plate B and grid B trimmer capacitor.	b. Trimmers should tune either side of maximum.
2	AN/USM-26: FUNCTION SWITCH: FREQUENCY TIME BASE SWITCH: 1 SEC	RF LEVEL SET control midway. MODULATION switch to EXT. IDENTIFIER switch to OFF. a. MC switch to A	a. Use AN/USM-26 to measure frequency of test set A crystal.	a. Frequency should be within 0.005 percent of indicated frequency on tab.
		b. MC switch to B.	b. Use AN/USM-26 to measure frequency of test set B crystal.	b. Frequency should be within 0.005 percent of indicated frequency

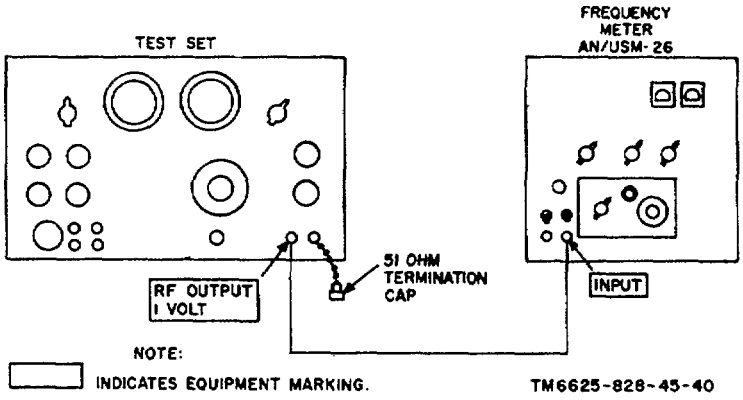


Figure 4-2. RF unit test setup.

4-7. Power Supply Test

a. Test Equipment and Material.

Multimeter TS-352B/U
Variable Power Transformer CN-16A/U
3-Conductor Standard Telephone Jack

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 4-3. Test points referenced in procedure are shown in figure 2-1.

Test equipment	*Control settings* *Equipment under test*	*Test procedure*	*Performance standard*
1 TSO:52B/U: a. FUNCTION: AC volts. RANGE: 250 volts CN-16A/U voltage control to 115 volts. b. FUNCTION: DC volts. RANGE: 500 volts. c. FUNCTION: AC volts CN-16A/U voltage control to 100 volts d. FUNCTION: DC volts RANGE: 250 volts RANGE: 500 volts e. FUNCTION: AC volts CN-16A/U voltage control to 130 volts f. FUNCTION: DC volts RANGE: 250 volts RANGE: 500 volts g. Repeat a above. RANGE: 500 volts A. FUNCTION: DC volts RANGE: 250 volts i FUNCTION: DC volts j. FUNCTION: DC current RANGE: 5 ma	POWER-STANDBY switch: POWER.	a. Measure output of CN-16A/U with TS-352B/U and adjust voltage to 115 volts. b. Measure dc voltage at pin 3 of V114. c. Set output of CN-16A/U to 100 volts. d Measure dc voltage at pin 3 of V114. e. Set output of CN-16A/U to 130 volts. f. Measure dc voltage at pin 3 of V114. g. Repeat a above. h. Measure voltage at positive end of C160 (orange wire). C161 (pink wire). i Measure voltage at positive end of sleeve of standard 3-conductor j. Measure current between ring and jack plug inserted into the test set MIC jack.	a. None b. Between 390 and 420 volts dc. c. None. d. Value obtained in b above +2 volts. e. None. f. Value obtained in b above +2 volts. g. None. h. Between 245 and 273 volts. i Between 185 and 215 volts. j. Between 1.45 and 1.7 ma.

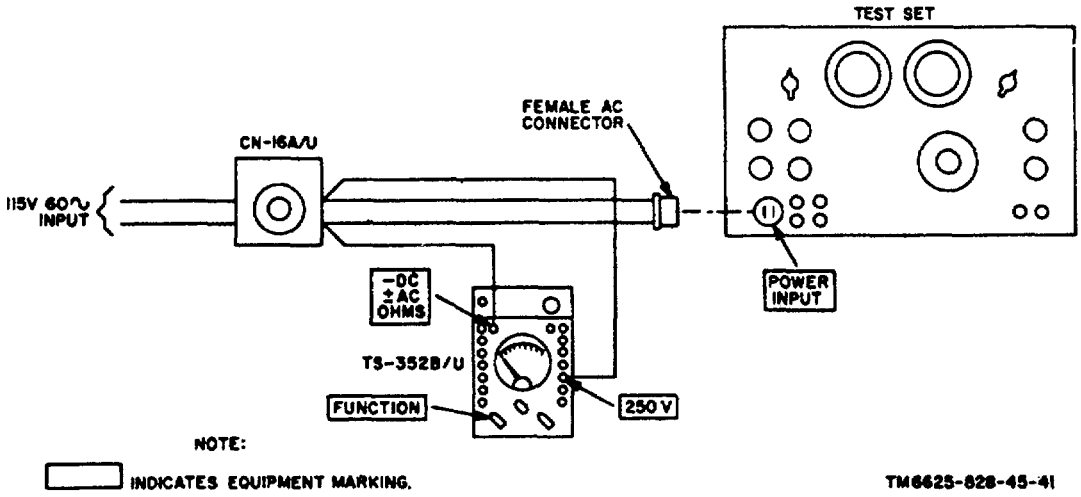


Figure 4-3. Power supply test setup.

Multimeter TS-352B/U.

4-8. RF Meter Adjustment Test

a. Test Equipment and Material.

Electronic Voltmeter AN/URM-145 with 51-ohm termination

b. *Test Connections and Conditions.* Connect the test equipment as shown in figure 44.

c. Procedure.

Test equipment	*Control settings* *Equipment under test*	*Test procedure*	*Performance standard*
1 AN/URM-145: Range to 3 volts	MODULATION switch at 30w.	a. Adjust test set RF LEVEL SET control for LEVEL SET mark indication on RF meter. Measure voltage with AN/URM-14.	a. Between 0.8 and 1.2 volts.
		b. Rotate test set RF LEVEL SET control fully clockwise. Measure voltage with AN/URM-145.	b. Greater than 1.3 volts.
		c. Rotate test set RF LEVEL SET control fully counterclockwise. Measure voltage with AN/URM-145.	c. Less than 0.9 volts.
2 TS452B/U: FUNCTION: OHMS RANGE SWITCH	Adjust RF LEVEL SET control for LEVEL SET mark on test set RF meter.	a. Measure resistance of test set termination cap.	a. 51 ohms + 1.
		b. Remove AN/URM-145 from RF OUTPUT, 1 VOLT CONNECTOR and replace termination cap.	b. RF meter indication should return to LEVEL SET mark within ± 1/32 inch.

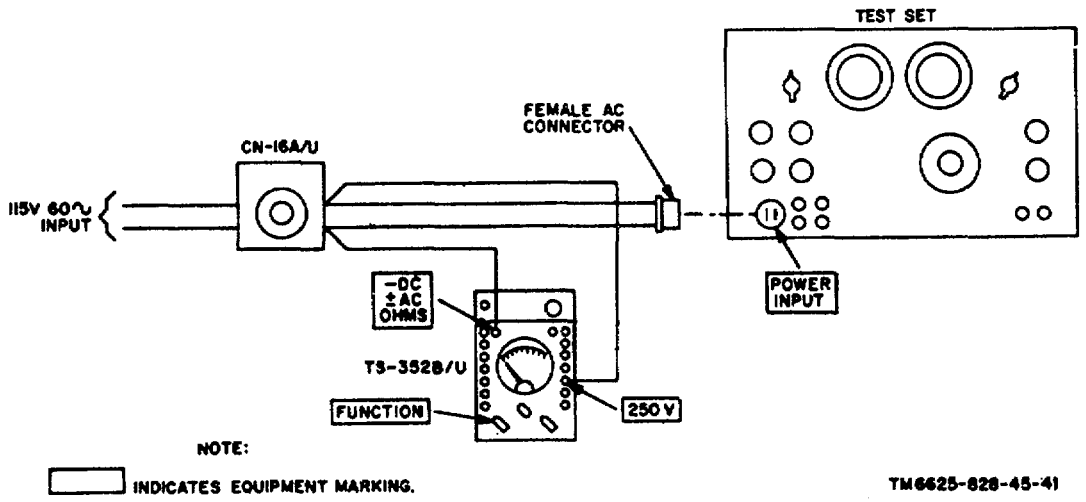


Figure 4-4. Power supply test setup.

4-8. RF Meter Adjustment Test

a. Test Equipment and Material.
Electronic Voltmeter AN/URM-145 with 51- ohm termination Multimeter TS-352B/U.

b. Test Connections and Condition. Connect the test equipment as shown in figure 4-4.

c. Procedure

Step No.	Test Equipment	Control settings Equipment under test	Test procedure	Performance standard
1	AN/URM-145: ***Range to** 3 volts*	MODULATION switch- at 30	*a. Adjust test set RF LEVEL SET control for LEVEL SET mark ure voltage with Ai/URM-14.).* b. *Rotate test set RF LEVEL SET control fully clockwise. Measure voltage with AN/URM-145.* *c. Rotate test set RF LEVEL SET control fully counterclockwise. Measure voltage with AN/URM-145.*	*a. Between 0. and 1.2 volts.* b. *Greater than 1.3 volts.*
2	**TS352B/U:** **FUNCTION: OHMS** **RANGE SWITCH**	*Adjust RF LEVEL SET control for LEVEL SET mark on test set RF meter*	*a. Measure resistance of test set termination cap.* b. Remove AN/URM-145 from RF *OUTPUT, 1 VOLT CONNEC TOR and replace termination cap.*	*a. 51 ohms ± 1.* *b. RF meter indication should return to LEVEL SET mark within ± 1/32 inch.*

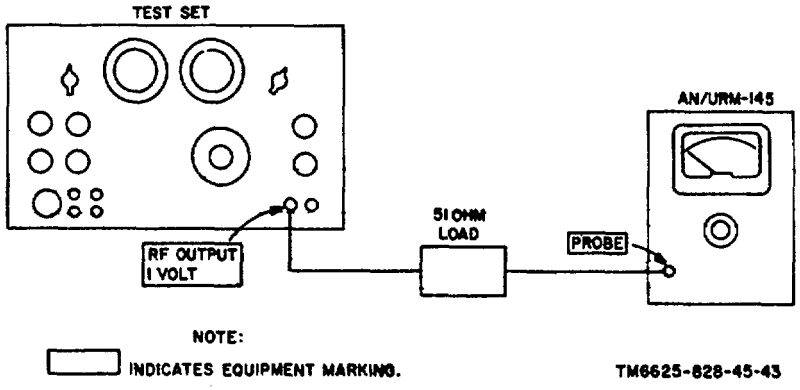


Figure 44 RF meter test setup.

4-9. %M Meter Test

a. Test Equipment and Material.
Voltmeter Electronic ME4OE/U

b. Test Connections and Conditions.. Connect test equipment as shown in figure 4-5 for step No. 1, 2, and 3 in the chart in c below and observe the conditions stated.

c Procedure.

Step No.	Test Equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	ME-30E/U: RANGE: 30 volts	MODULATION switch to 30-. 30 ~ MOD control fully counter-clockwise: MC switch to A.	a. Adjust PLATE A trimmer capacitor for maximum. detuning (minimum indication) on test set RF meter. Note voltage (E,) of meter.	a. None
			b. Return PLATE A capacitor for maximum RF meter indication. Using test set RF LEVEL SET control, set RF meter indication to LEVEL SET mark. Note voltage (E,) of meter.	b. None.
			c. Compute E_{Ac}: EA- - .212 (E, + 3 - E,)	c. None.
			d. Adjust test set 30- MOD control for indication on ME-30E/U of EA.	d. None.
			e. Note test set %M meter indiction.	e. Green line indicates 30 percent +2.
2	ME-30E/U RANGE: 3 volts	MODULATION switch to 1000~. 1000~ MOD control fully counter clockwise.	a. Adjust level of test set 1000~ MOD control for full-scale read Ing of %M meter. Note indication on ME-30E/U.	a. Between 1.25 and 1.7 volts.
			b. Vary level of 1000~ MOD control from 0 to 60 percent modulation as indicated on %M meter. Note Change in indication on test set RF meter.	b. Meter indication must not change more than the width of the pointer.
3	ME-30E/U:	a. MODULATION switch to 30~. Adjust DEMOD control fully clockwise.	a. Adjust test set 9960~ MOD con trol for green line indication on %M meter. Note indication on ME-30E/U.	c. Between 60 and 70 volts.
		d. Adjust DEMOD control fully couterclockwise.	d. Note indication on ME-30E/U.	d. Between 20 and 30 volts.

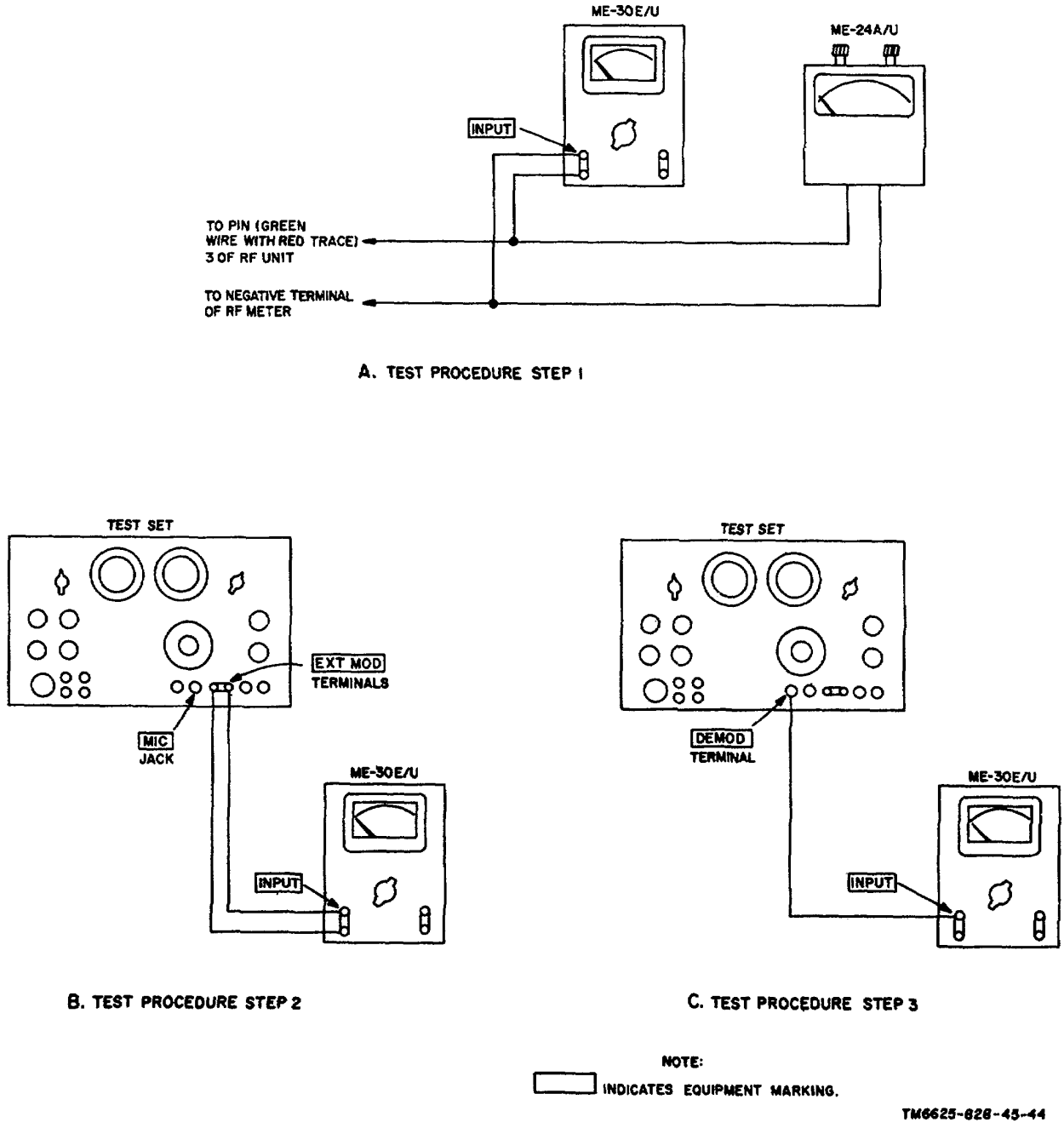


Figure 4-5. . %M meter test setup.

4-10. 30~ Phase Angle Test

a. Test Equipment and Material. Course Checker AN/GSM-21.

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-6.

c. Procedure

Step No.	Test Equipment	Control settings Equipment under test	Test procedure	Performance standard
1	None	a. MODULATION switch to 30~	a. Adjust test set 30~ MOD control for redline indication on %M meter.	a. None
		b. MODULATION switch to OMNI.	b. Adjust test set 9960~ MOS con trol for green line indication on %M meter.	b. None
2	AN/GSM-21: COURSE 0°.	MODULATION switch to OMNI. OMNI TRACK switch to 0.	Measure course error on AN/GSM-21.	Course error must be less than 0.5°.
3.	AN/GSM-21: COURSE 180°.	OMNI TRACK SWITCH TO 180.	Measure course error on AN/GSM-21.	Course error must be less than 0.5°.
4.	AN/GSM-21: COURSE 15°,	OMNI TRACK SWITCH TO 15.	Measure course error on AN/GSM-21.	Course error must be less than 0.2°.

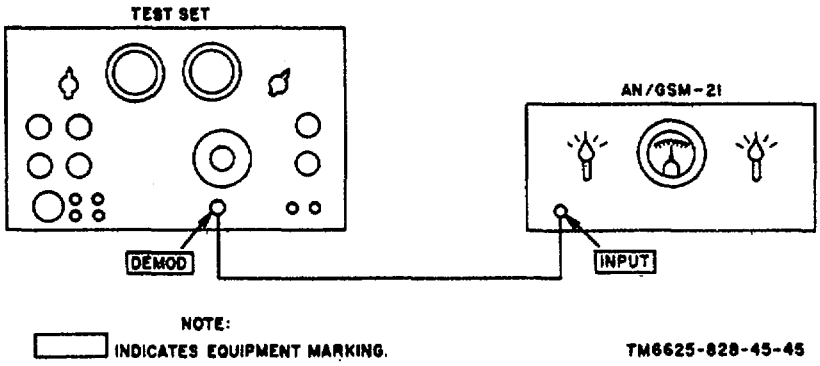


Figure 4-6. 30~ phase angle test setup.

4-11. AMP LOCK Level Test

a. Test Equipment and Material. Voltmeter Electronic ME-30E/U Filter Unit Model F-12

b. Test Connection and Conditions. Connect the equipment as shown in figure 4-7.

c. Procedure.

Step No.	Test Equipment	Control settings / Equipment under test	Test procedure	Performance standard
1	ME-SOE/U: *RANGE: 30 mv.* *F12 FILTER: 30~.*	a. *MODULATION switch to 30-.* *IDENTIFIER switch to OFF.*	*a. Adjust test set 30- MOD control for green line indication on %M meter. Adjust DEMOD output with screwdriver for 0.03 volt indication on ME-30E/U.*	*a None.*
		b. *MODULATION switch to 90O.*	b. *Adjust test set 90- MOD control for redline indication on %M meter.*	*b. None.*
		c. *. MODULATION switch to 150-.*	*c. Adjust test set 1590 MOD control for redline indication on %M meter.*	*c. None.*
2	*F12 FILTER: 90-.*	*MODULATION switch to AMP LOC*	*Measure voltage with ME-30E/U.*	*Between 0.019 and 0.021 volt.*
3	*F12 FILTER: 150-.*		*Measure voltage with ME-30E/U.*	*Between 0.019 and 0.021 volt.*
4	*F12 FILTER: 90-.*		*Adjust test set DEMOD control with screwdriver for 0.020 volt indication on ME40E/U.*	*None.* *None.*
5	*F12 FILTER: 90-.*	*MODULATION switch to AMP LOC*	*Measure voltage on MECOE/U.*	*Between 0. 0149 and 0.0168 volt.*
6	*F12 FILTER: 150--.*		*Measure voltage on ME-30E/U.*	*Between 0.0237 and 0.0267 volt.*
7	*F12 FILTER: 90--*	*MODULATION switch to AMP LOC*	*Measure voltage on ME-30E/U.*	*Between 0.0237 and 0.0267 volt.*
8	*P12 FILTER: 150-.*		*Measure voltage on ME-30E/U.*	*Between 0.0149 and 0.0168 volt.*

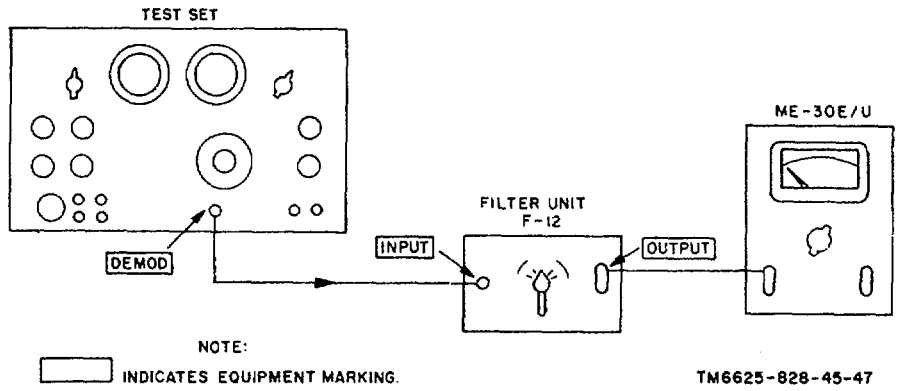


Figure 4-7. AMP LOC level test setup.

4-12. 1000- Oscillator and Identifier Test

a. Test Equipment and Material. Oscilloscope AN/USM-140C

b. Test Connections and Conditions. Connect the equipment as in figure 4-8.

c. Procedure

Step No.	Test Equipment	Control settings Equipment under test	Test procedure	Performance standard
1	AN/USM-140C: Adjust AN/USM-140C controls to display 1,000-cps Waveform.	MODULATION switch to 1000~. IDENTIFIER switch to OFF.	Vary test set 1000~ MOD control Over 20 to 80 percent modulation range as indicated by %M meter. Observe waveform on AN/USM-140C.	Waveform should be without distortion and vary in amplitude as 1000~ MOD control is adjusted.
2	AN/USM-140C: SWEEP; 1 second.	a. MODULATION switch to 1000~. IDENTIFIER switch to OFF.	a. Adjust test set 1000~ MOD control for 30 percent modulation as indicated by %M meter.	a. None.
		b. MODULATION switch to 1000~. IDENTIFIER switch to ON.	b. Observe AN/Usm-140C display.	b. AN/USM-140C displays between 3 and 5 switching actins per
		c. MODULATION switch to OMNI. IDENTIFIER switch to ON.	c. Observe AN/USM-140C display.	c. AN/USM-140C displays switching Action similar to b above.
		d. MODULATION switch to AMP LOC. IDENTIFIER switch to ON.	d. Observe AN/USM-140C display.	d. AN/USM-140C displays switching Action similar to b above.
		e. MODULATION switch to AMP LOC.	f. Observe AN/USM-140C DISPLAY.	f. AN/USM-140C displays switching Action similar to b above.

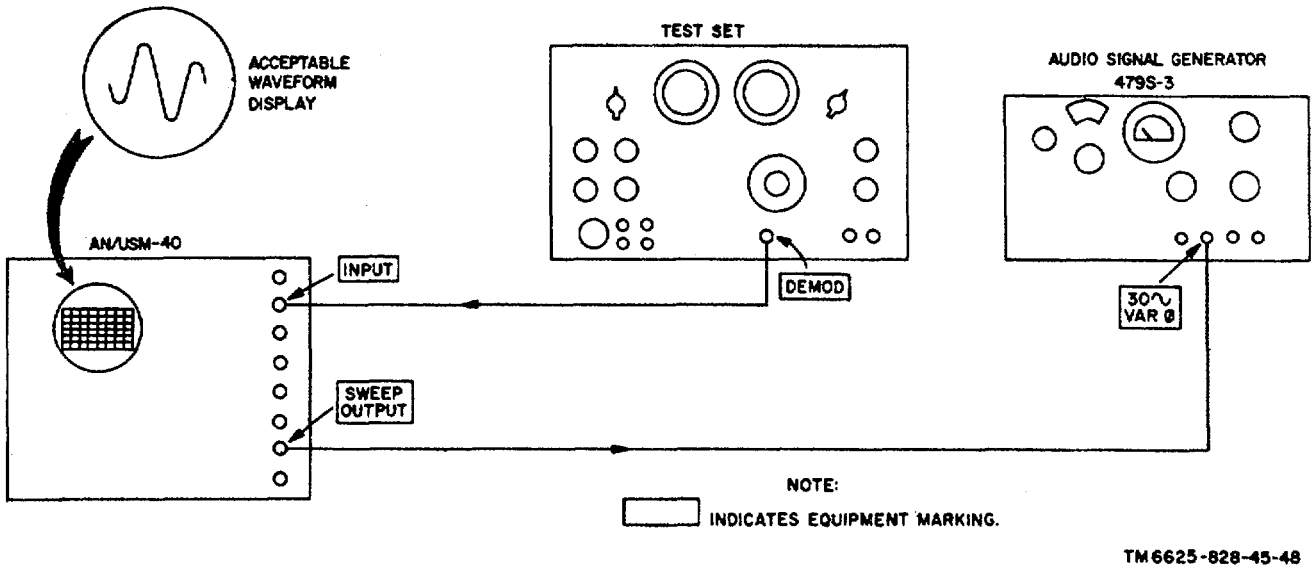


Figure 4-8. 1000~ oscillator and identifier test setup.

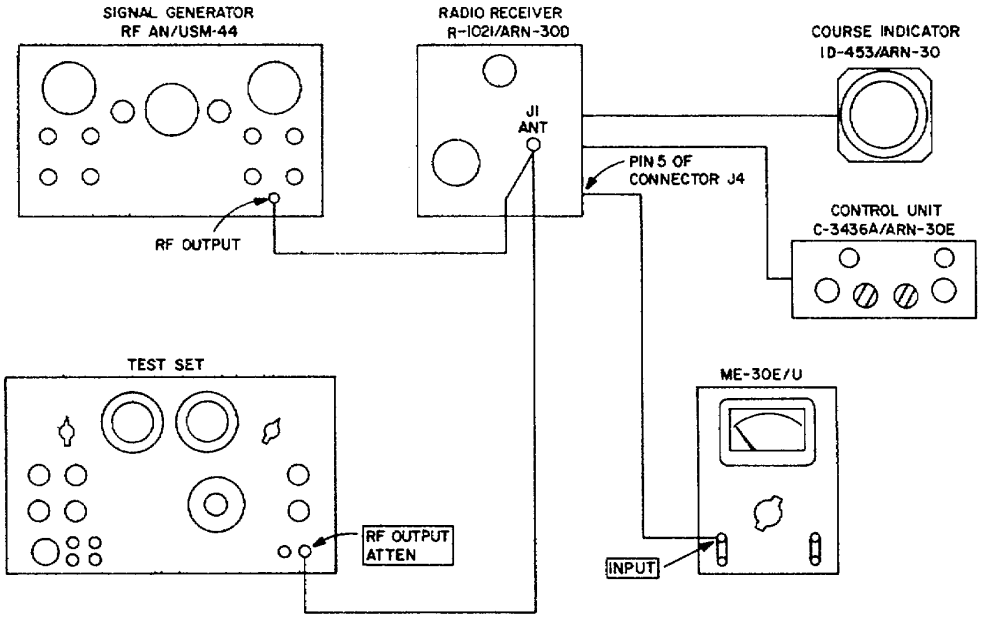
4-13. Overall Performance Test

a. Test Equipment and Material.
Voltmeter, Electronic ME-3OE/U
RF Signal Generator, AN/USM-44
Receiving Set, Radio AN/ARN30E

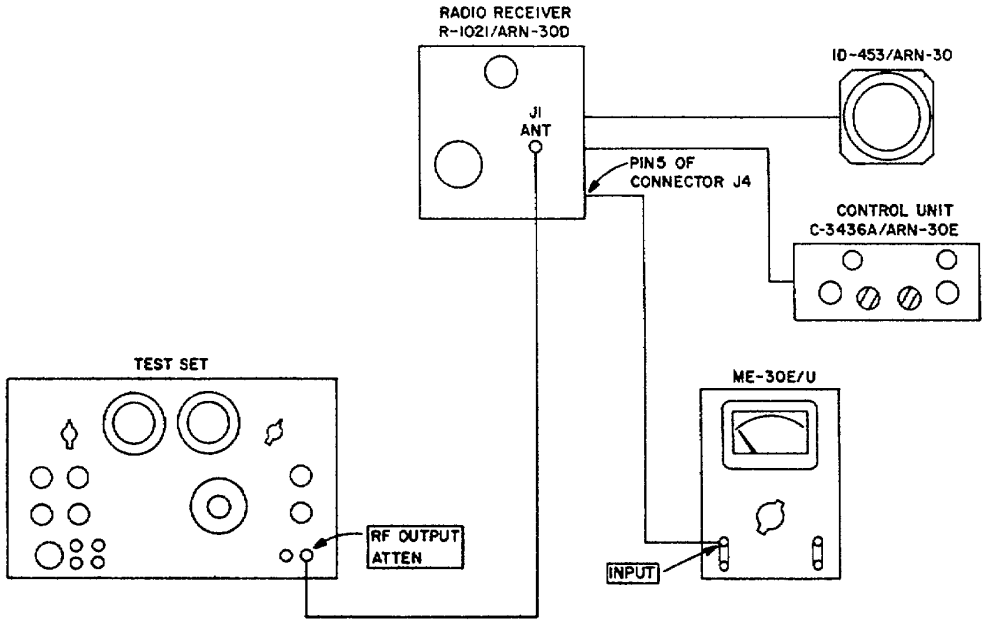
b. Test Connection and Conditions. Connect the equipment as shown in figure 4-9.

Step No.	Test Equipment	Control settings Equipment under test	Test procedure	Performance standard
1	AN/USM-44: FREQUENCY: Exactly as test set A crystal frequency OUTPUT LEVEL: 100 volts MODULATION: OFF C-46A/ARNIOD: FREQUENCY: As test set A crystal MESOE/U:	MC switch to A. ATTENUATOR VOLT control to 100. MODULATION switch to OMNI.	a. Adjust test set RF LEVEL SET control for LEVEL SET indication on RF meter. Note voltage reading on ME30E/U with AN/USM-44 connected to J1 of b. Note voltage reading on ME-30E/U with test set connected to J1 of R-1021/ARN-30D.	a. None. b. Voltage should be within 0.1 volt of reading in step a of Test procedure column.
2	CS4$6A/ARN-OD: FREQUENCY: Same as test set A crystal ID-45s/ARN-o: COURSE: 0	a. MC switch to A ATTENUATOR a VOLT control to 100. MODULATION switch to 9960-. b. MODULATION switch to 30-. c. MODULATION switch to 90-. d. MODULATION switch to 150. e. OMNI TRACK switch to 0 (straight up).	a. Adjust test set RF LEVEL SET control for LEVEL SET on RF meter. Adjust 9960- MOD control for green line indication on %M meter. b. Adjust test set 30- MOD control for green line indication on -, c. Adjust test set 90- MOD control for redline indication on %M meter. d. Adjust test set 150- MOD control for redline indication on % M meter. e. Note indication on ID-453/ARN-30.	a. None. b. None. c. None. d. None. e. 0° :2'. TO-FROM flag should indicate TO.
3	ID-45s/ARN-0; COURSE: 15, 45, 60, up to 360.	OMNI TRACK switch to 15, 45, 60, up to 360.	Note indication on ID-453/ARN-30 for each track: 15, 45, 60, up to 360.	Error at each point not to exceed 2°. TO-FROM flag should indicate TO.
4	ID-452/ARN80O: COURSE: 45.	OMNI TRACK switch to 225. 30.	Note flag indication on ID-453/ARN-	TO-FROM flag should indicate FROM.
5	ID-45s/ARN-So: COURSE: 135,225,315.	OMNI TRACK switch to 315, 45, 225.	At each course, note flag indication on ID-453/ARN-30.	TO-FROM flag should indicate r.OM on each track.
6	None.	a. ATTENUATOR 1 VOLT control to 1000. MODULATION switch to AMP LOC q. b. IDENTIFIER switch to ON. c. MODULATION switch to AMP LOC ®. *IDENTIFIER switch to OFF.*	a. Note position of vertical indicator needle on ID-453/ARN-30. b. Note position of vertical indicator needle of ID-453/ARN-30. c. Note position of vertical indicator needle of ID-453/ARN-30.	a. ID-453/ARN-30 needle should indicate vertically ±1/32inch. b. No appreciable change in position of needle from a above. c. Needle should indicate 3 dots to the left.

		d. IDENTIFIER switch to ON. e. MODULATION switch to AMP LOC. IDENTIFIER switch to OFF. f. IDENTIFIER switch to ON.	D. Note position of vertical indicator e. Note position of vertical indicator needle on ID-453/ARN-30. f. Note position of vertical indicator. needle on ID-453/ARN-30.	d. No appreciable change in needle e. Needle should indicate 3 dots to The right. f. No appreciable change in needle Position form e above.
7	ID-453/ARN-30: COURSE: 0.	a. OMNI TRACK switch to 0. MODULATION switch to OMNI. IDENTIFIER switch to OFF. b. IDENTIFIER switch to ON.	a. Note position of needle on ID-453/ARN-30. b. Note position of needle on ID-453/ARN/30.	a. None. b. Needle should show no appreciable change from position in a above.



A. OVERALL PERFORMANCE TEST, STEP 1



B. OVERALL PERFORMANCE TEST, STEP 2 AND 3

NOTE:
[ ] INDICATES EQUIPMENT MARKING

TM 6625-828-45-49

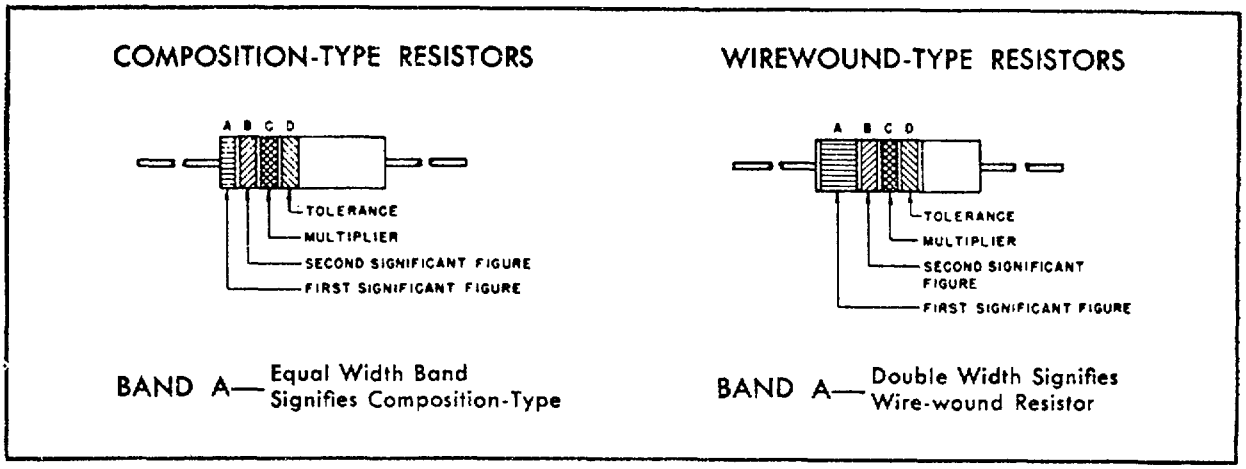
Figure 4-9. Overall performance test setup.

4-14. Test Data Summary

Personnel may find it convenient to arrange the checklist in a manner similar to that shown be- low.

1. Preliminary Inspection	
POWER-STANDBY switch:	STANDBY Resistors R193, R194, R195, warm **up.**
POWER-STANDBY switch:	POWER Indicator lamp lights and tone generator runs.
2. Meter Zero Test	
MODULATION switch to 30-. Press in %M meter ZERO SET control, and then press in RF meter ZERO SET control.	*%M* meter needle at ZERO SET line. RF meter needle to ZERO SET line.
3. RF Unit Test	
MC switch to A, trimming capacitors peaked.	Crystal A frequency within **t** 0.0005 **me** of rating.
MC switch to B, trimming capacitors peaked.	Crystal B frequency within +0,0005 mcof rating.
4. Power Supply Test	
Ac input of 100 volts, 115 volts, and 130 volts.	Voltage at pin 3 of V114-880 to 420 volts Voltage at positive end of C160-245 to 275 volts. Voltage at positive end of **C161-185** to **216** volts. Current at MIC jack-1.45 to 1.? ma.
5. RF Meter Test	
MODULATION switch to 30-.	Output of 0.8 to 1.2 volts.
RF meter needle at LEVEL SET line	
RF LEVEL SET control fully clockwise	Output of more than 1.3 volts.
RF LEVEL SET control fully counterclock- wise	Output of less than 0.9 volts.
6. %M Meter Test	
MODULATION switch to 30-, 30- MOD control fully counterclockwise, MC switch to A	%M meter indicates at green **line-** percent +2.
MODULATION switch to EXT, 9960- MOD control fully counterclockwise	Output of 1.25 to 1.7 volts.
MODULATION switch to 30-, DEMOD con- trol fully clockwise,	Output of 60 to 70 volts.
DEMOD control fully counterclockwise	Output of 20 to 30 volts.
MODULATION switch to 9960-,	Output of 60 to 70 volts.
DEMOD control fully clockwise,	
DEMOD control fully counterclockwise	Output of 20 to 30 volts.
7. 30~Phase Angle Test	
MODULATION switch to OMNI,	Course error less than 0.5°.
OMNI TRACK switch to 0	
OMNI TRACK switch to 180	Course error less than 0.60.
OMNI TRACK switch to 15	Course error less than 0.2°.
8. 90-/150- Phase Test	
MODULATION switch to AMP LOC (i	Check waveform for proper display.
9. Amp LOC Level Test	
MODULATION switch to AMP LOC ®	Output of 0.019 to 0.021 volt.
Filter unit at 90-	Output of 0.019 to 0.021 volt.
Filter unit at 150-	

MODULATION switch to AMP LOC 3	*Output of 0.0158 to 0.0162 volt.*
Filter unit at 90~	*Output of 0.0238 to 0.0242 volt.*
Filter unit at 150~	
MODULATION switch at AMP LOC 6	*Output of 0.0238 to 0.0242 volt.*
Filter unit at 90~	*Output of 0.0158 to 0.0162 volt.*
Filter unit at 150~	
10. 1000- Oscillator and Identifier Test	
MODULATION switch to 1000~	*Check waveform for proper display.*
IDENTIFIER switch to OFF	*Waveform shows between 3 and 5 switching ac-*
IDENTIFIER switch to ON	*tions per sweep.*
11. Overall Performance Test	
MODULATION switch to OMNI, MC switch to A, ATTENUATOR μv control to 100	*NAV output voltage same as test voltage within +0.1 volt.*
OMNI TRACK switch clockwise through range in 15° step-s.	*Error at each step not to exceed 20, TO-FROM flag indicates TO.*
OMNI TRACK switch to 315, 45, and 225 with ID-53/ARN-30 at 135, 225, and 315, respectively.	*TO-FROM flag indicates FROM.*
MODULATION switch to AMP LOC 4O, ATTENUATOR Rev control to 1000, IDENTIFIER switch to OFF. IDENTIFIER switch to ON.	*Indicator needle is vertical within + 1/32 inch. No appreciable change in needle position.*
MODULATION switch to AMP LOC.	*Indicator needle indicates 3 dots to the left.*
MODULATION switch to AMP LOCG.	*Indicator needle indicates 3 dots to the right.*



COLOR CODE TABLE

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

EXAMPLES OF COLOR CODING

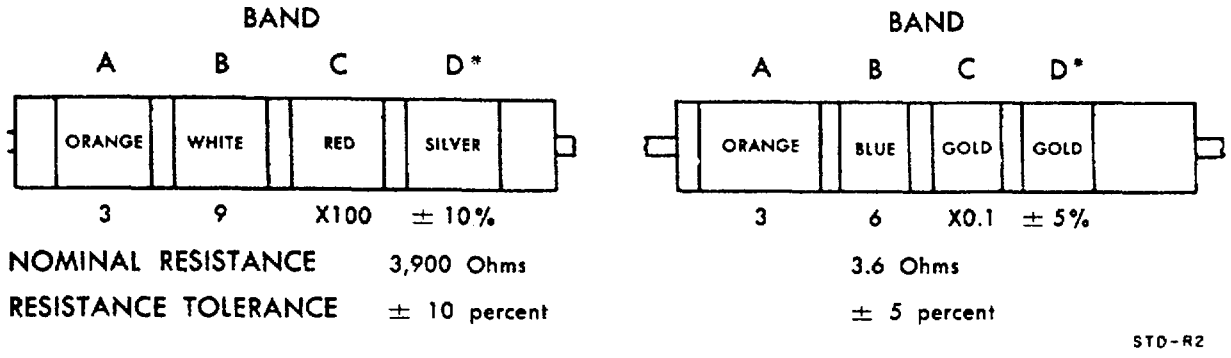


Figure 4-13. Color code marking for MIL-STD resistors.

CHAPTER 5
DEPOT OVERHAUL STANDARDS

5-1. General

The tests outlined herein are designed to measure the performance capability of a repaired equipment. Equipment that meets the minimum standards stated in the tests will furnish satisfactory operation, equivalent to that of new equipment.

5-2. Test Facilities Required

The following equipment and test equipment will be employed in determining compliance with these tests.

a. Equipment.

NOTE

The following equipment must meet established new equipment specifications.

Equipment	*Technical Manual*	*Common name*
Radio Set, Receiving AN/ARN-30E	TM 11-5826-215-12	Radio Set

b. Test Equipment.

Test equipment	*Technical Manual*	*Common Name*
Ac Voltmeter ME-93/U	----------	Ac voltmeter
Audio Signal Generator, (Collins Radio Model 479S-3)	----------	Audio signal generator
Test Set, Signal Generator AN/GSM-21	TM 11-6625-609-14	Course checker
Digital Readout Electronic Counter AN/USM-207	TM 11-6625-700-10	Electronic counter
Voltmeter Electronic ME-30E/U	TM 11-6625-320-12	Vacuum tube voltmeter
Filter Unit, Type F-12 (Aircraft Radio Corp)	----------	Filter unit
Impedance Matching Attenuator CN-947/USM-181	----------	Impedance matching
Multimeter TS-352B/U*	TM 11-6625-366-15	attenuator
Oscilloscope AN/USM-140C or AN/USM-281A	TM 11-6625-535-15-1	Multimeter
Resistance Bridge ZM-4/U*	----------	Oscilloscope
RF Signal Generator AN/USM-44	TM 11-6625-508-10	Decade resistance box
Electronic Voltmeter AN/URM-145	TM 11-6625-524-14 and TM 11-6625-524-15-1	RF signal generator Electronic voltmeter
Variable Power Transformer CN-16A/U	----------	Variac
* Or Multimeter AN/USM-223	TM 11-6625-654-14	Multimeter

c. Preliminary Inspection. Prior to performing inspection procedures, make the following preliminary check with the test set removed from the center section of the case:

(1) Set the test set POWER-STANDBY switch to STANDBY and connect the test set to the variac-controlled 115-volt, 60-cycle power source.

(2) Check that space heater resistors R193, R194, and R195 warm up.

(3) Set the test set POWER STANDBY switch to POWER and check that the red indicator lamp on the front panel lights and that the tone generator runs in clockwise direction as viewed from the front panel and

5-3. Test Procedure

a. Meter Zero Set. With the test set connected to a variac-controlled 115-volt, 60-cycle power source, set the test set MOSULATION switch to 30~ and adjust the %M meter ZERO SET knob until the meter pointer indicates at the zero set line. Set the MODULATION switch to EXT position and adjust the RF meter ZERO SET knob until the meter pointer indicates at the zero set line.

b. RF Unit Test. Check the test **set RF unit** operation **as** follows:

(1) Install a 108-me test crystal in crystal socket "A" and a 182-mc crystal in socket "B."

(2) Use a screwdriver to tune the "A" crystal capacitors (C143A and C149A) and the "B" crystal capacitors (C143B and C149B) to resonance at the crystal frequencies.

(3) Interchange the crystals and repeat (2) above.

(4) Check that the installed crystal frequencies agree with the frequency tabs located on the test set front panel above the MC switch. With the multimeter connected to the test set RF-OUTPUT 1 VOLT connector, tune for maxi- mum output at both frequencies.

c. Power Supply Test (fig. 4-3). Use the vacuum tube voltmeter to make the following test set voltage checks:

(1) Connect the test set to a variac-controlled, 115-volt, 60-cycle power source and measure the output voltage of the high voltage regulator at pin 3 of electron tube V114. The vacuum tube voltmeter indication should be between 390 and 420 volts.

(2) Vary the input voltage from 100 to 130 volts and record the change in regulator volt- age output. The change should not exceed ± 2 volts from the reading in step (1).

(3) Restore the input voltage to 115 volts and measure the high voltage audio supply volt- age at the orange wire connection at capacitor C160. The vacuum tube voltmeter indication should be between 245 and 275 volts.

(4) Measure the high voltage RF supply voltage at the pink wire connection at capacitor C161. The vacuum tube voltmeter indication should be between 185 and 215 volts.

(5) Connect the vacuum tube voltmeter between the ring and the sleeve of a standard-microphone jack and insert the plug in the MIC jack of the test set. The microphone circuit current indication on the vacuum tube voltmeter shall be between 1.62 and 1.98 volts de.

d. RF Output Test. With the test set MC switch set to the "B" crystal position, allow the test set to warm up for at least 30 minutes and then perform the following tests:

(1) Remove the termination cap from the test set RF OUTPUT **1 VOLT** connector J105 and replace it with an external 51-ohm termination.

(2) By means of the test set RF LEVEL SET control, adjust the RF output voltage to 1.0 volt as indicated on the vacuum-tube voltmeter connected across the external 61-ohm termination.

e. RF Meter Test (fig. 4-4). With the test set connected to the vacuum tube voltmeter as specified in *d* above, check the RF meter as follows:

(1) Recheck the RF and 7%M meters zero adjustment. Adjust the test set RF METER SENS control until the needle of the RF meter indicates exactly at the red LEVEL SET line.

(2) Check the range of the test set RF LEVEL SET as indicated on the vacuum tube voltmeter while turning the control from the fully counterclockwise to the fully clockwise positions. Place the test set MC switch in the "A" crystal position and repeat the RF LEVEL SET control range check.

(3) Adjust the RF LEVEL SET control until the RF meter needle indicates exactly at the red LEVEL SET line.

(4) Use the multimeter to check the resistance value of the test set 51-ohm termination cap. Replace the external 51-ohm termination and the voltmeter with the 51-ohm termination cap and check to see that the RF meter needle indicates at the LEVEL SET line within 1/32 inch.

(5) Deleted

f 7%M Meter Test (fig. 4-5). Check the zero set condition of the RF and %M meters as instructed in paragraph 5-3a and proceed as follows:

(1) Connect the multimeter between terminal 3 (green wire with red trace) of the test set RF unit and the negative (-) terminal of the RF meter and connect the vacuum tube volt- meter across the multimeter.

(2) Set the test set MODULATION switch to 30- and rotate the 30- MOD control fully counterclockwise.

(3) Adjust the test set PLATE B trimming capacitor to obtain maximum detuning effect and record the voltage indicated by the multimeter as E_0 (approximately 7.2 volts).

(4) Retune the PLATE B trimming capacitor for the maximum RF meter indication. Use the test set RF LEVEL SET control to reset **the** RF meter needle to the red LEVEL SET-fine and record the voltage indicated by the multimeter as **El** (approximately 37 volts).

(5) Compute EAC from the following formula:

$$\mathbf{E_{AC} = 0.212 (E_1 + 3 - E_0)}$$

(6) Rotate the test set 360 MOD control in a clockwise direction until the vacuum tube voltmeter indicates the computed value of E_{AC}. Check that the 7%M meter needle indicates exactly at the meter green line (30 %).

(7) Set the test set MODULATION switch to EXT and connect the vacuum tube voltmeter to the EXT MOD terminals. Connect the oscilloscope to the test set DEMOD receptacle.

(8) Connect the audio signal generator to the test set MIC jack and adjust the 1,000-cycle tone to produce a full scale reading on the *%M* meter. Rotate the test set 9960- MOD control fully counterclockwise.

(9) Check that the RF meter indications do not change by more than the width of the meter needle with modulation percentages as high as 60 percent..

g. Limiters Test. Connect the oscilloscope to the test set 9960- MOD control capacitor C109 (located on the underside of the chassis adjacent to terminal 1 of Z103) and ground and proceed as follows:

(1) Set the test set MODULATION switch to 9960- and rotate the 9960- MOD control as required to obtain a green line indication on the % M meter.

(2) Observe the limiter output pattern on the oscilloscope. The envelope should show no trace of amplitude modulation with sweep frequencies of 15 or 30 cycles. At high sweep frequency (approximately 2,000 cycles) the wave- form must show equal flattening of the top and bottom peaks.

(3) Set the test set MODULATION control to 30- and adjust the 30- MOD control as required to obtain a green line indication on the % M meter. (4) Connect the oscilloscope to the test set 30- MOD control capacitor C116 (located on the underside of the chassis adjacent to tube socket XV103) and ground. Observe the limiter output pattern. The waveform must appear essentially the same as that described in (2) above.

h. 30- Phase Angle Test-Zero Phase Shift (fig. 4-6).

NOTE

Allow the test set to warm up for at least 2 hours before proceeding with this test.

(1) Connect the course checker to the test set DEMOD connector.

(2) Set the test set MODULATION switch to OMNI and set the OMNI TRACK switch to 0. (3) Set the course checker COURSE "TO" switch to 0° and set the EQUALIZE switch to READ COURSE ERROR. Check that the course checker DEGREES COURSE ERROR meter indicates exactly 0 degrees. If reading is not exactly 0 degrees, proceed as follows:

(a) Set the course checker EQUALIZE switch to SET INPUT (RED LINE). Use a screwdriver to adjust the course checker INPUT control as necessary to obtain a red line indica- tion on course checker DEGREES COURSE ERROR meter.

(b) Set the course checker EQUALIZE switch to NOTE METER position and record the meter reading.

(c) Set the course checker EQUALIZE switch to 9960- and compare the meter reading with the reading recorded in (b) above. If the readings are not identical, use a screwdriver to adjust the course checker 9960- control until the meter readings are identical.

(d) Set the course checker EQUALIZE switch to ADJUST PHASE-BAL and observe the position of the meter needle. Use a screw- driver to adjust the course checker PHASE control to remove one-half of the needle deviation from the 0 position on the meter.

(e Set the course checker COURSE "TO" switch to 180° and observe the position of the meter needle. Use a screwdriver to adjust the course checker BALANCE control to remove one-half of the needle deviation from the 0 position on the meter.

(f) Repeat *(d)* and *(e)* above until the course checker DEGREES COURSE ERROR meter indicates 0 in both the 0° and 180° positions of the course checker COURSE "TO" switch.

(g) Set the course checker EQUALIZE switch to READ COURSE ERROR and observe the position of the meter needle. If the meter does not indicate to 0, use a screwdriver to adjust the test set variable resistor R138- (located on the underside of the chassis adjacent to capacitor C158) until the course checker DEGREES COURSE ERROR meter indicates exactly 0.

(4) Set the test set OMNI TRACK switch to 15 and set the course checker SELECTOR switch to 15° to measure the 15-degree angle of the test set. Check that the course checker DE- GREES COURSE ERROR meter indicates 0 ± 0.2 degree.

(5) Set the test set OMNI TRACK switch to 180 and set the course checker SELECTOR switch to 180° to measure the 180-degree angle of the test set. Check that the course checker DEGREES COURSE ERROR meter indicates 0 ± 0.2 degree.

(6) All other 30-degree phase angles of the test set can be checked only in a system using Radio Set, Receiving AN/ARN-30E. Compare the resulting indicator readings to the track angles of another rf signal generator modulated by the audio signal generator. The system error tolerance should not be greater than + 2.0 degrees.

(7) Set the test set OMNI TRACK switch to 0 and set the test set MODULATION switch to OMNI. Vary the input line voltage between 105 volts to 125 volts to the test set and check that the course indication on the course checker does not change by more than ± 0.2 degree. Reset the line voltage to 115 volts.

i. 90-/150- Phase Test.

NOTE

Allow the test set to warm up for at least 2 hours before proceeding with this test.

(1) Set the test set MODULATION switch to 90- position and adjust the test set 90- MOD control to obtain a red line indication on the test set %M meter.

(2) Set the test set MODULATION switch to 150- and adjust the test set 150- MOD control as require to obtain a red line indication on the test set %M meter.

(3) Connect the audio, signal generator 30- VAR 0 output connector to the ac X amplifier of the oscilloscope and connect the test set DEMOD output connector to the ac Y amplifier of the oscilloscope.

(4) Set the test set MODULATION switch to AMP LOC ®, set the audio signal generator FUNCTION SELECTOR switch to SPECIFIC SIG, set the audio signal generator SPECIFIC SIGNAL SELECTOR switch to 30- VAR 0, and adjust the audio signal generator PHASE ANGLE SELECTOR indicator until the top dial indicates 180°and the lower dial indicates 09.

(5) Adjust the PHASE ANGLE SELECTOR indicator until a equally phased waveform I is obtained (fig. 3- 9).

(6) Rotate the test set 90- MOD and 150- MOD controls fully clockwise and check that the test set '%M. meter indicates at least 24 percent with the test set MODULATION switch set first to 90- and then to 150-.

j. AMP LOC Level Tests (fig. 4-7). Connect the vacuum tube voltmeter to the filter unit, connect the filter unit to the test set DEMOD output connector, and proceed as follows:

(1) Set the test set MODULATION switch and the filter unit switch to 30- and adjust the test set 30- MOD control to obtain a green line indication on the 7%M meter. Use a screwdriver to adjust the test set DEMOD output until the vacuum tube voltmeter indicates exactly 0.03 volt.

(2) Adjust the test set 90- MOD and 150- MOD controls, as required, to obtain a red line indication on the test set *%M* meter. Set the test set MODULATION switch to AMP LOC (), set the filter unit switch to 90-, and check that the vacuum tube voltmeter indicates between 0.019 and 0.021 volt.

(3) Repeat (2) above with the filter unit switch set to 150- and check that the vacuum tube voltmeter indicates between 0.019 and 0.021 volt.

(4) Set the filter unit switch to 90- and adjust the test set DEMOD output until the vacuum tube voltmeter indicates exactly 0.02 volt. Set the test set MODULATION switch to AMP LOC i. Check that the vacuum tube voltmeter indication is as many db (within +0.1 db) below 6 db (0.02 volt) with the filter unit switch at 90- as it is above 6 db with the filter unit switch at 150- . The amount above and below the 6 db value must be 1.9 to 2.1 db.

(5) Set the test set MODULATION switch to AMP LOC). Check that the vacuum tube voltmeter indication is as many db (within + 0.1 db) above 6 db (0.02 volt) with the filter unit switch at 90- as it is below 6 db with the filter unit switch at 150-. The amount above the 6 db value must be 1.9 to 2.1 db.

k. 1000- Oscillator and Identifier Test (fig. 4-8). Connect the oscilloscope to the test set DEMOD output connector, adjust the oscilloscope controls to display a 1000-cycle waveform, and proceed as follows:

(1) Set the test set MODULATION switch to 1000- and vary the 1000- MOD control over the range of 20 to 80 percent modulation as indicated on the test set % M meter.

(2) Check that the oscilloscope waveform is free of distortion and varies in amplitude as the test set 1000- MOD control is adjusted.

(3) Adjust the test set 1000 - MOD control to obtain a 30% indication on the test set % M meter and set the IDENTIFIER OFF/ON switch to ON. Check that the oscilloscope pattern displays between 3 and 5 switching actions per sweep.

(4) With the test set IDENTIFIER OFF/ON switch set to ON, first set the test set MODULATION switch to OMNI and then to the three AMP LOC positions, in turn, and check that the oscilloscope pattern display is similar to that in (3) above for each switch position.

l. . RF Attenuator Test Check that test set 51-ohm termination cap is connected to the 1-volt jack. Connect the AN/URM-145 to the test set RF OUTPUT ATTEN connector, with the 50-ohm adapter MX4528/U sup- plied with the electronic voltmeter, and proceed as follows:

(1) Set the test set MODULATION switch to EXT and the test set ATTENUATOR **g** V control to 1000. Set the electronic voltmeter RANGE-FULL SCALE control to .003 and observe the electronic voltmeter RMS VOLTS meter. The meter should indicate i 1 millivolt.

(2) Disconnect the electronic voltmeter from the test set and replace the test set 51-ohm termination cap. Rotate the test set ATTENUATOR *EV* control to the 10,000 position and check that the control engages the attenuator stop at that point.

m. Operation Test (fig. 4-9).

NOTE

Warm up the test set for at least 2 hours before performing this check.

(1) Remove the test set 51-ohm termination cap and connect the electronic counter to the test set RF OUTPUT 1 VOLT connector. Set the test set MC switch first to A and then to B and check the electronic counter at each position to determine that the A and B crystal frequencies tolerance is within i 0.005 percent.

(2) Disconnect the electronic counter from the test set. Rotate the test set 51-ohm termination cap, and connect the test set RF OUTPUT ATTN connector to the receiver ANT connector of a standard AN/ARN-30E radio receiving set.

(3) Set the test set MODULATION switch to OMNI and set the test set ATTENUATOR A V control to 100. Check that all 24 positions of the test set OMNI TRACK switch are operating and that the course indication is within system tolerance (I2 degrees).

(4) Check that the AN/ARN-30E course indicator, TO-FROM meter indicates TO on all track settings of
the test set OMNI TRACK switch and indicates FROM on the reciprocal tracks.

(5) Connect the RF signal generator to the AN/ARN-30E receiver ANT connector. Set the RF signal generator FREQUENCY control to the exact frequency of the test set B crystal, the OUTPUT LEVEL control to 100, VOLTS, and the MODULATION switch to ON.

NOTE

Make sure that the AN/ARN-30E receiver and converter are properly installed in the system mounting rack.

(6) Remove the rear cover from the AN/ARN430E mounting rack and connect the ac voltmeter to pins 2 and 6 of connector J302 on the rack. Record the ac voltmeter indication.

(7) Disconnect the RF signal generator and connect the test set RF OUTPUT ATTN connector to the ANT connector of the AN/ARN-30E receiver. Set the AN/ARN-30E control unit MC control to the exact frequency of the test set B crystal and observe the voltage indication on the ac voltmeter. The voltage shall be within ±0.1 volt of the reading obtained in (6) above. Disconnect the ac voltmeter and replace the rear cover on the AN/ARN30E mounting rack.

(8) With the test set and the system connected as in (7) above, set the AN/ARN-30E course indicator to 0 degrees and set the test set MODULATION switch to the 9960 --. Adjust the test set 9960 - MOD control to obtain a green line indication on the test set % M meter.

(9) Set the test set MODULATION switch to 30 - and adjust the test set 30 - MOD control to obtain a green line indication on the test set % M meter.

(10) Set the test set MODULATION switch to 90 - and adjust the test set 90 - MOD control to obtain a green line indication on the test set % M meter.

(11) Set the test set MODULATION switch to 150 -and adjust the test set 150 - MOD control to obtain a green line indication on the test set % M meter.

(12) Set the test set OMNI TRACK switch to 0 and set the test set MODULATION switch to OMNI. Check that the AN/ARN-30E course indicator indicates 0 degrees i 2 degrees and that the TO-FROM meter indicates TO.

(13) Set the AN/ARN-30E course indicator and the test set OMNI TRACK switches to each

position from 15 through 345 (i.e. 15, 45, 60, etc.) and note the course indicator indication for each position. To TO-FROM meter should indicate TO and the reading error for each switch position should not exceed +± 2 degrees.

(14) Set the AN/ARN-30E course indicator to 45 degrees and set the test set OMNI TRACK switch to 225. Check that the course indicator TO-FROM meter indicates FROM.

(15) Set the AN/ARN-30E course indicator to 135, 225, and 315, in turn, and set the test set OMNI TRACK switch to 315, 45, and 135 respectively. Check that at each position the TO- FROM meter on the course indicator indicates FROM.

(16) Set the test set ATTENUATOR μV control to 1000, the test set MODULATION switch to the AMP LOC GO, and the test set IDENTIFIER switch to OFF. Check that the needle of the AN/ARN-30E course indicator indicates vertically ± 1/32 inch.

(17) Switch the test set IDENTIFIER switch to ON and check that there is no appreciable change in the course indicator needle position from that in (16) above.

(18) Without disturbing the test set ATTENUATOR RV control, set the test set MODULATION switch to AMP LOC g and switch the test set IDENTIFIER OFF/ON switch to OFF. Set the test set MC switch to A and set the AN/ARN-30E control unit MC control to the exact frequency of the test set A crystal. Check that the AN/ARN-30E course indicator needle indicates 3 dots to the left of vertical.

(19) Switch the test set IDENTIFIER switch to ON and check that there is no appreciable change in the course indicator needle position from that $_{in}$ (18) above.

(20) Without disturbing the test set ATTENUATOR μV control, set the test set MODULATION switch to AMP LOC ® and switch the IDENTIFIER switch to OFF. Check that the AN/ARN-30E course indicator needle indicates 3 dots to the right of vertical.

(21) Switch the test set IDENTIFIER switch to ON and check that there is no appreciable change in the course indicator needle position from that in (20) above.

(22) Disconnect all power from the test set-up, and disconnect and remove all test equipment from the test set.

APPENDIX A
REFERENCES

Following is a list of references available to the GS and depot maintenance technician of the AN/ARM-5A:

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310:7	U.S. Army Equipment Index of Modification Work Orders.
CTA 50-970	Expendable Items (Except: Medical, Class V, Repair Parts and Heraldic Items). I
TB SIG 222	Solder and Soldering.
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 355-2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 3553	Depot Inspection Standard for Moisture and Fungus Resistant Treatment.
TM 11-5826-215-12	Operator's and Organizational Maintenance Manual: Receiving Set, Radio AN/ARN-30D and AN/ARN-30E.
TM 11-6625-212-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Frequency Meters AN/USM-26 and ANIUSM-26A.
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7AIU, TV-7B/U, and TV-7D/U.
TM 11-6625320-12	Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-66-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U.
TM 11-6625508-10	Operator's Manual: Signal Generators ANIfSM-44 and AN/USM-44A.
TM 11-6625-524-14 AN/URM-145.	Operator, Organizational and Field Maintenance Manual: Voltmeter, Electronic
TM 11-6625-524-15-1	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Electronic Voltmeter AN/URM-145.
TM 116625 535-151	Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools List: Oscilloscopes AN/USM-140B, AN/USM-140C, ANIUSM-141A, and AN/USM-141B.
TM 11-6625 609-14	Operator's, Organizational, Direct Support, and General Support Maintenance Manual: Test Set, Signal Generator AN/GSM-21.
TM 11-6625454-14	Operator's, Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tool Lists (Including Depot Maintenance Repair Parts and Special Tools Lists) for Multimeter AN/USM-223.
TM 11-6625 700-10	Operator's Manual: Digital Readout, Electronic Counter ANfUSM-207.
TM 1166252812	Operator's and Organizational Maintenance (Including Repair Parts and Special Tool Lists): Test Set, Radio AN/ARM-5A.
TM 11-6625-1703-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Oscilloscope AN/USM-281A.
TM 38-750	The Army Maintenance Management System (TAMMS).

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-36 (qty rqr block no. 381) Direct and General Support Maintenance requirements for All Fixed and Rotor Wing Aircrafts.

*U.S. GOVERNMENT PRINTING OFFICE : 1991 281-486 (42749)

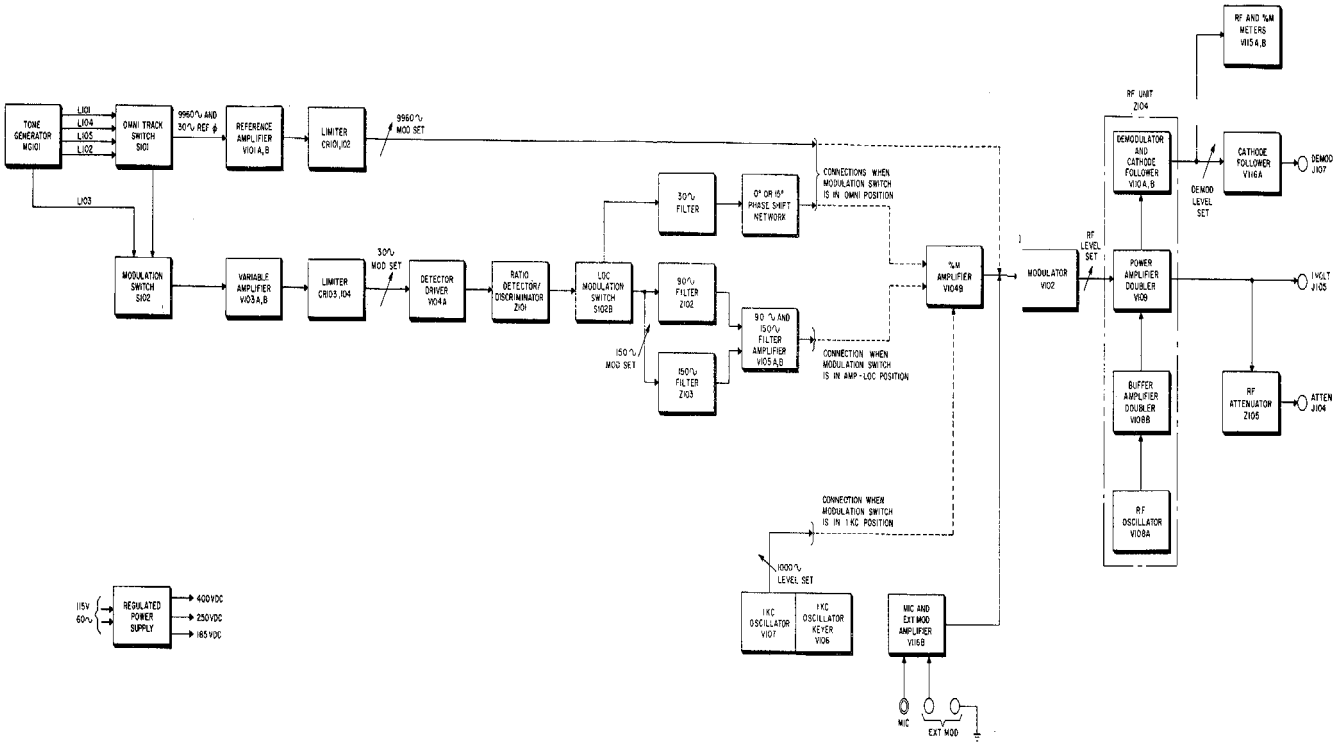


Figure 4-10. Test Set, Radio AN/ARM-5A, block diagram.

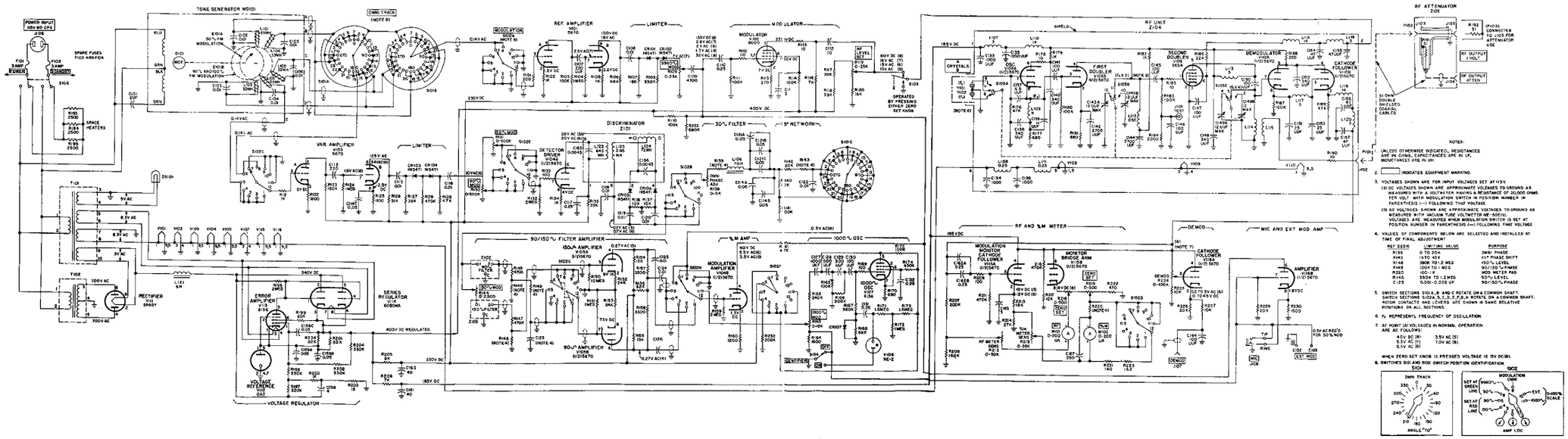
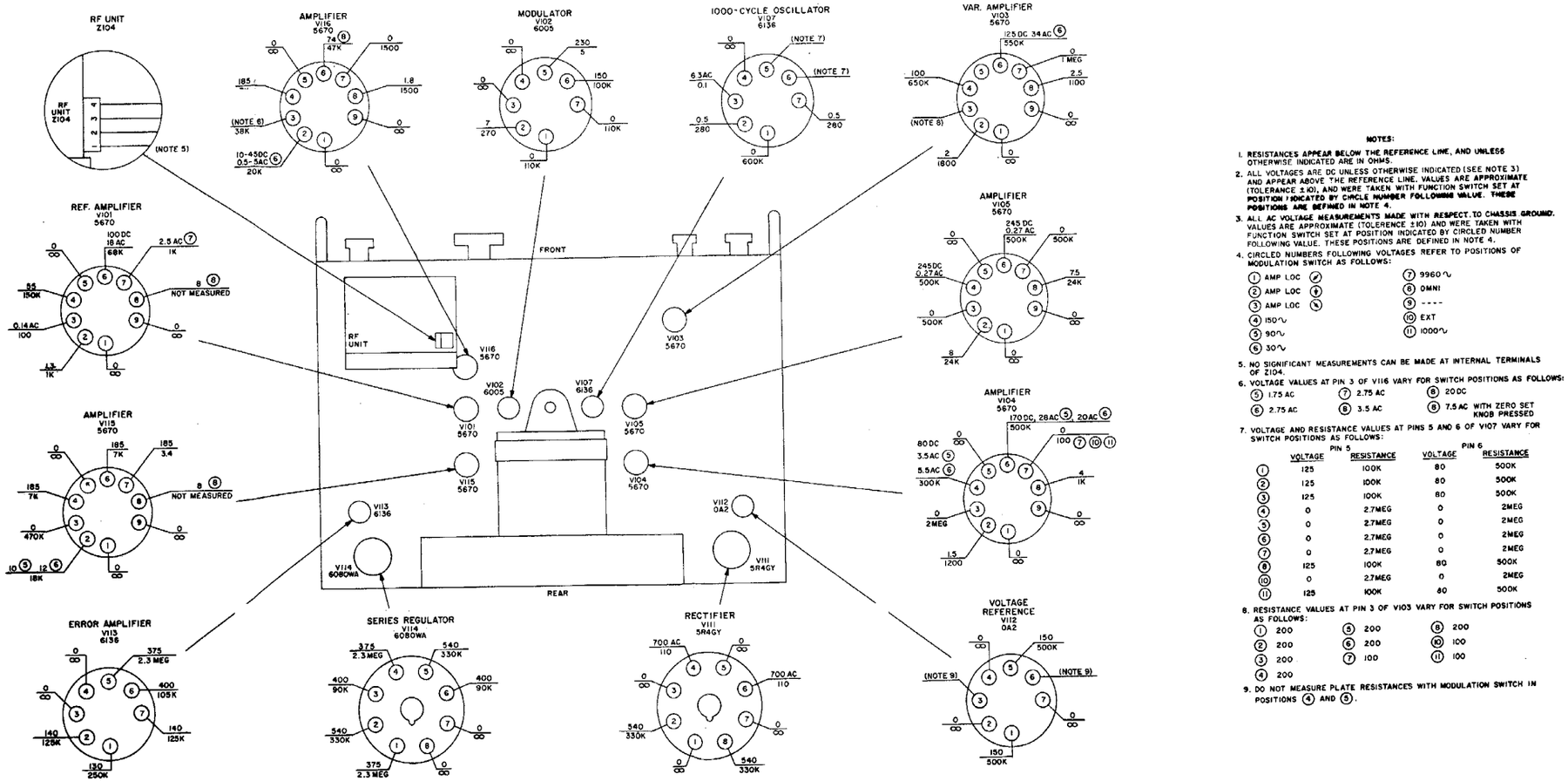


Figure 4-11. Test Set, Radio AN/ARM-5A, schematic diagram.



NOTES:

1. RESISTANCES APPEAR BELOW THE REFERENCE LINE, AND UNLESS OTHERWISE INDICATED ARE IN OHMS.
2. ALL VOLTAGES ARE DC UNLESS OTHERWISE INDICATED (SEE NOTE 3) AND APPEAR ABOVE THE REFERENCE LINE. VALUES ARE APPROXIMATE (TOLERANCE ±10), AND WERE TAKEN WITH FUNCTION SWITCH SET AT POSITION INDICATED BY CIRCLE NUMBER FOLLOWING VALUE. THESE POSITIONS ARE DEFINED IN NOTE 4.
3. ALL AC VOLTAGE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND. VALUES ARE APPROXIMATE (TOLERENCE ±10) AND WERE TAKEN WITH FUNCTION SWITCH SET AT POSITION INDICATED BY CIRCLED NUMBER FOLLOWING VALUE. THESE POSITIONS ARE DEFINED IN NOTE 4.
4. CIRCLED NUMBERS FOLLOWING VOLTAGES REFER TO POSITIONS OF MODULATION SWITCH AS FOLLOWS:

(1) AMP LOC	(7) 9960 ∿
(2) AMP LOC	(8) OMNI
(3) AMP LOC	(9) ----
(4) 150 ∿	(10) EXT
(5) 90 ∿	(11) 1000 ∿
(6) 30 ∿	

5. NO SIGNIFICANT MEASUREMENTS CAN BE MADE AT INTERNAL TERMINALS OF Z104.
6. VOLTAGE VALUES AT PIN 3 OF V116 VARY FOR SWITCH POSITIONS AS FOLLOWS:

(5) 1.75 AC	(7) 2.75 AC	(8) 20 DC
(6) 2.75 AC	(8) 3.5 AC	(9) 7.5 AC WITH ZERO SET KNOB PRESSED

7. VOLTAGE AND RESISTANCE VALUES AT PINS 5 AND 6 OF V107 VARY FOR SWITCH POSITIONS AS FOLLOWS:

	PIN 5		PIN 6	
	VOLTAGE	RESISTANCE	VOLTAGE	RESISTANCE
(1)	125	100K	80	500K
(2)	125	100K	80	500K
(3)	125	100K	80	500K
(4)	0	2.7MEG	0	2MEG
(5)	0	2.7MEG	0	2MEG
(6)	0	2.7MEG	0	2MEG
(7)	0	2.7MEG	0	2MEG
(8)	125	100K	80	500K
(10)	0	2.7MEG	0	2MEG
(11)	125	100K	80	500K

8. RESISTANCE VALUES AT PIN 3 OF V103 VARY FOR SWITCH POSITIONS AS FOLLOWS:

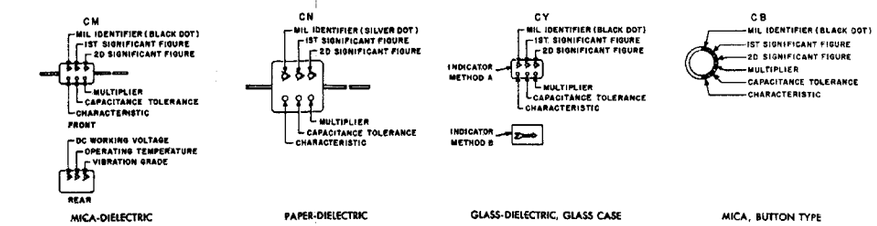
(1) 200	(5) 200	(8) 200
(2) 200	(6) 200	(10) 100
(3) 200	(7) 100	(11) 100
(4) 200		

9. DO NOT MEASURE PLATE RESISTANCES WITH MODULATION SWITCH IN POSITIONS (4) AND (5).

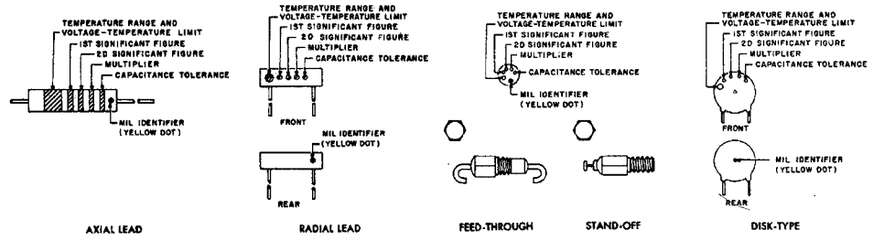
Figure 4-12. Tube socket voltage and resistance diagram.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dielectric (Temperature Compensating) Style CC

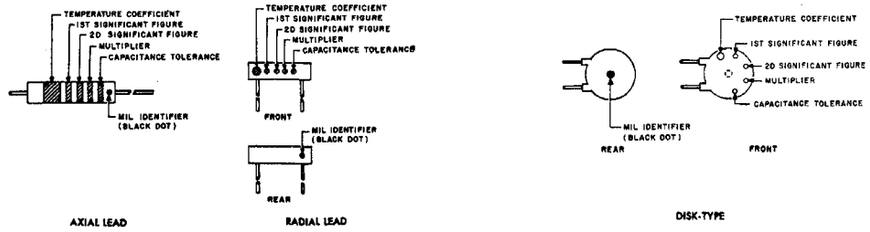


TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE			CHARACTERISTIC[2]				DC WORKING VOLTAGE		OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%		C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are
2. Letters indicate the Characteristics designated in applicable specifications: A
3. Letters indicate the temperature range and voltage-temperature limits desig
4. Temperature coefficient in parts per million per degree centigrade.

plied to obtain the capacitance in uuf.

:–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.

l in MIL–C–11015.

Figure 4-14. Color code marking for MIL-STD capacitors.

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO	TABLE NO.

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ▸ ARE OBSOLETE.

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