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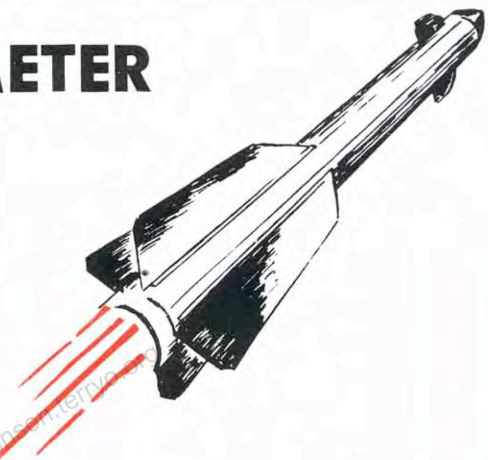
INSTRUCTION BOOK

FOR

TYPE 107-A RF TEST SET

AND

FIELD INTENSITY METER



NEMS CLARKE CO.

919 JESUP BLAIR DRIVE • SILVER SPRING, MARYLAND

A DIVISION OF Vitro CORPORATION OF AMERICA

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FIELD INTENSITY METER

NEMS-CLARKE COMPANY
919 Jesup Blair Drive
Silver Spring, Maryland

A Division of Vitro Corporation of America

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A. Receiver	
Frequency range	54 to 240 megacycles
Sensitivity at input terminals as a voltmeter	1.0 microvolt
Maximum signal input	
Direct to receiver	0.1 volt
Through the 40 db pad supplied	10 volts
Field intensity measurement range	
At 54 megacycles	1.6 uv/m to 16 v/m
At 240 megacycles	6.5 uv/m to 65 v/m
Receiver input impedance	51 ohms
Intermediate frequency	21.4 megacycles
IF bandwidth	approx. 300 kilocycles
Output indicator	panel meter with an approximately logarithmic scale
Auxiliary outputs	a. audio for headphones b. DC output to operate a 1-ma chart recorder
B. Signal Generator	
Frequency range	54 to 240 megacycles
RF output	continuously variable, 1.0 microvolt to 0.1 volt
Output impedance	51 ohms
C. Power Supply	
Power requirements	
AC	115 volts, 50 to 400 cycles, 60 watts
DC	6 volts, 8 amperes

Table 1-2. MECHANICAL CHARACTERISTICS

A. Complete Instrument	
Size	20 inches wide, 11-3/4 inches deep, 15-1/4 inches high
Weight	56 pounds
B. Antenna Case	
Size	28 inches wide, 7 inches deep, 6-1/2 inches high
Weight -- complete with all equipment	16 pounds
C. Antenna	
Maximum supported height	9-1/2 feet
Minimum supported height	4-1/2 feet
High-frequency elements adjustable from	11 to 26 inches
Low-frequency elements adjustable from	25 to 67 inches

Figure 1-1. Model 107-A RF Test Set

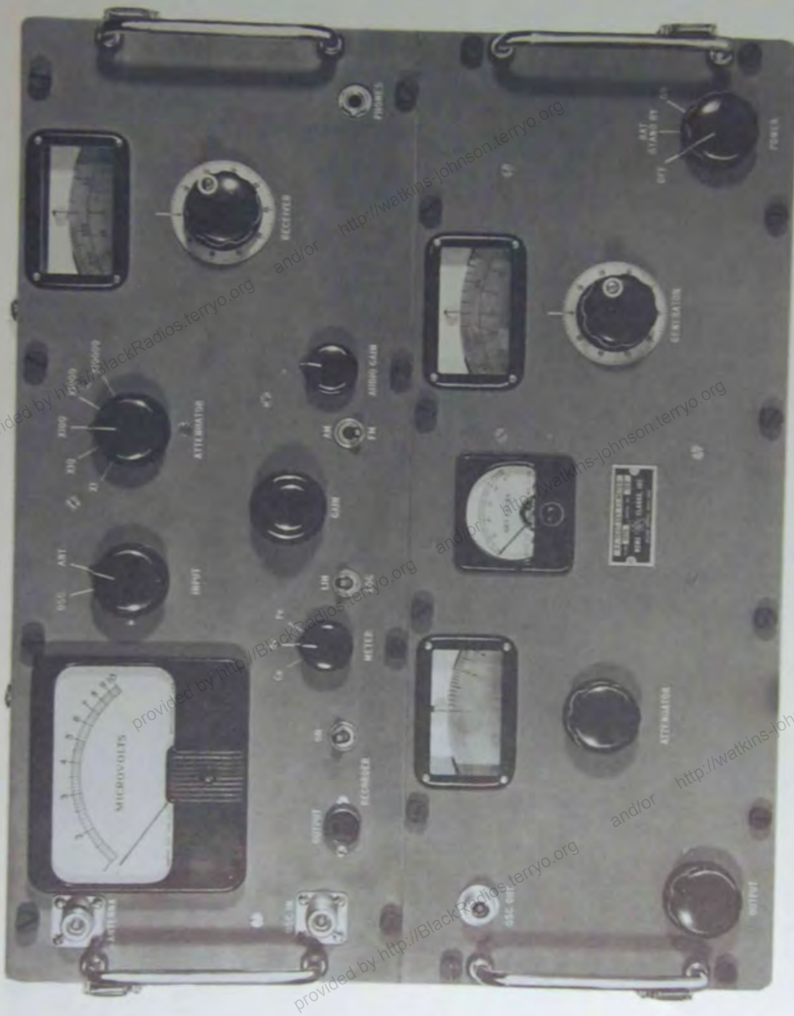


Figure 1-2. Receiver-Oscillator Unit

SECTION 1

GENERAL

1. OPERATION

The model 107-A RF Test Set combines in one portable unit a radio receiver of laboratory quality and an accurately calibrated signal generator. These instruments function over a frequency range of 54 to 240 megacycles without band changing. When used with the associated antenna assembly, they form a highly accurate field intensity meter. Extreme sensitivity and high selectivity make the assembly suitable for the measurement of practically all types of radio-frequency emission even in congested bands.

Field intensity measurements are made with high accuracy by substituting a known RF voltage from the signal generator for the received signal voltage. Field intensity in microvolts per meter is obtained by applying a correction factor involving the effective height of the antenna and the antenna coupling balun and cable. This factor is plotted in chart form as a function of frequency.

The receiver operates in effect as a linear voltmeter having a 100 db range in 20 db steps. The output meter has a logarithmic (approx.) scale calibrated between 1 and 10. A receiver (IF) gain control and the 20 db step attenuator allow the microvolt meter to be set to any desired full-scale voltage from 10 microvolts to 0.1 volt. The range can be extended to 10 volts full scale using the 40 db coaxial pad supplied with the equipment.

Audio frequency circuits in the receiver permit aural monitoring of both AM and FM transmissions while measurements are being made. A recorder output for connection to an Esterline-Angus 1-ma recorder has provisions for making either linear or compressed scale (log) recordings of signal input.

Special circuitry is included to measure the peak-of-sync signal from a television picture transmitter, allowing measurements to be taken on the visual signal that are independent of picture content.

The signal generator functions as a CW signal source of 50 ohms source impedance with continuously adjustable output from 1.0 microvolt to 0.1 volt. The output attenuator is a mutual-inductance type. The output level set meter monitors the input to this attenuator.

The built-in power supply may be energized from either a 6-volt DC source or a 115-volt 50- to 400-cycle AC power line. Circuit changeover for either input is made by selection of the proper power cable for the power source available. This one power supply operates both receiver and signal generator.

2. DESCRIPTION

The model 107-A RF Test Set is built into two separate metal cases, both grey crackle finish. The larger of the two units contains the receiver, oscillator, and power supply, with storage space for the AC

Table 1-3. TUBE COMPLEMENT

1. Receiver

Symbol	Type	Function
V-101	OA2	Voltage Regulator
V-102	6SN7	Recorder Amplifier
V-103	12AU7	Peak Voltmeter
V-104	12AU7	Audio Amplifier
V-201	6J4	RF Amplifier
V-202	6AK5	Mixer
V-203	6AB4	Oscillator
V-301	6AU6	IF Amplifier, first stage
V-302	6AU6	IF Amplifier, second stage
V-303	6AU6	IF Amplifier, third stage
V-304	6AU6	IF Amplifier, fourth stage
V-305	6AU6	Limiter
V-306	6AL5	Discriminator

2. Calibrator Oscillator

V-401	6J6	

and DC power cables. A cover is provided that locks over the front panels of the instruments, while the top is vented and hinged for access to the receiver chassis. The power supply and cord storage compartment is separate, and access is through another hinged panel on the back of the cabinet. Carrying handles are fitted to either end of the unit. The smaller case is compartmented to hold the antenna assembly. This consists of the folding tripod, two mast sections, two sets of dipole rods, antenna cable, and connector for signal generator to receiver. In addition, an extra mast section and coupler are included for vertically polarized signals, as well as an attenuator for antenna coupling. The case is fitted with a leather carrying handle attached to the cover.

SECTION 2

THEORY OF OPERATION

The 107-A is shown in block diagram form by Figure 2-1 and is shown schematically by Figure 5-11.

1. ANTENNA

The receiving antenna has a voltage induced in it by an electromagnetic field. This voltage is applied to the balun, a balance-to-unbalance converter whose action is similar to a transformer with a 2-to-1 turns ratio. The output from the balun is applied to the receiver. The receiver has been designed to present an impedance of approximately 51 ohms at the input frequency.

The antenna is normally adjusted to be a physical half wave long at the operating frequency. Two sets of dipole elements are supplied. The shorter pair are used between 111 and 240 mc, and the longer pair are used between 54 and 118 mc. There is a frequency scale engraved on the two antenna mast sections, and the dipole elements can be swung down along the mast for length adjustment. The antenna assembly can be oriented for either horizontally or vertically polarized signals by makinguse of a tee adapter and extra mast section for vertical polarization.

The balun consists of two coiled transmission lines of approximately 100 ohms characteristic impedance connected in series at the antenna end and in parallel at the receiver end. This produces an input impedance of twice the line impedance and an output impedance of one half the line impedance. The antenna then works into an impedance of four times the receiver input impedance, or approximately 204 ohms.

2. INPUT SELECTION

Input selector switch S-101 allows the signal at either the antenna input or the oscillator input to be selected. C-101 and C-102 provide compensation necessary to maintain a low VSWR for the switch. The coupling across the switch (crosstalk) is a minimum of about 35 db down. The isolation is a function of frequency and has a value of about 50 db at the low end of the band. Under some conditions of use it may be necessary to provide additional isolation between signals by disconnecting or attenuating the unwanted input, but for normal usage the switch attenuation is adequate.

3. RF AMPLIFIER

The RF amplifier V-201 is a grounded grid stage using a 6J4 low noise triode. The input impedance of this amplifier in parallel with R-201 provides the 51 ohm input resistance. The input circuit is tuned by L-201A, one section of a Mallory Inductuner. The plate circuit of the RF amplifier is connected to the mixer grid through a double-tuned capacitively coupled network. Tuning is effected by L-201B and L-201C. C-208 adjusts the coupling to control the interstage bandwidth. L-204 resonates with the

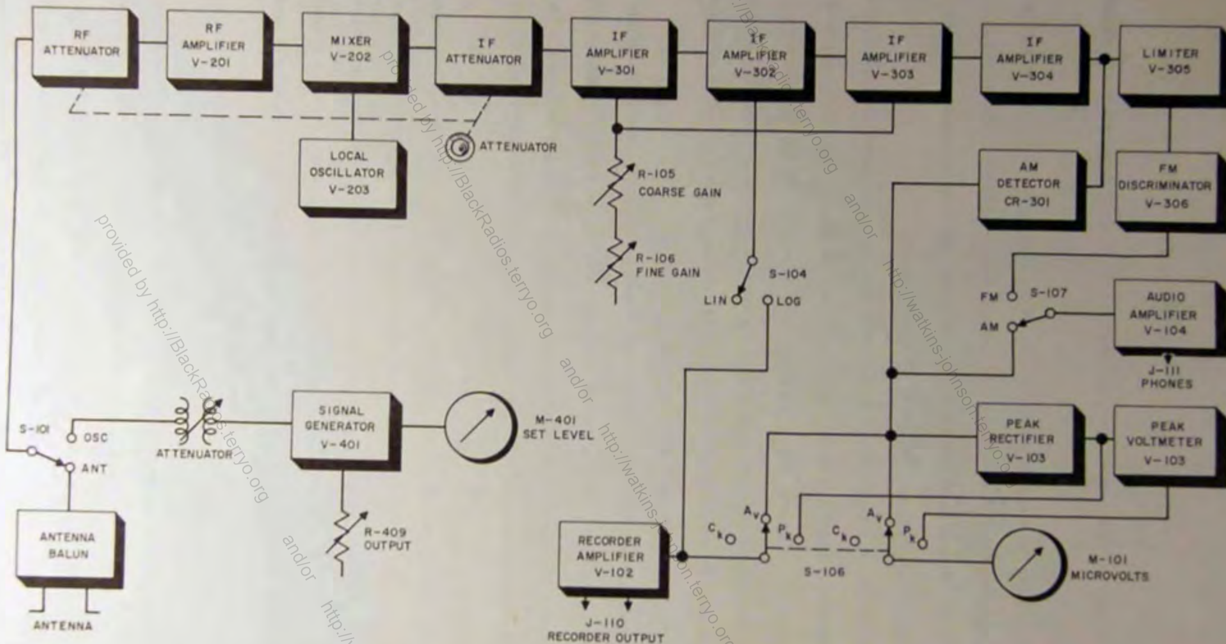


Figure 2-1. 107-A RF Test Set Block Diagram

capacity of the coupling network at a frequency somewhat below 54 mc for the purpose of increasing the coupling at the lower RF frequencies, providing a more uniform coupling over the tuning range.

4. OSCILLATOR

The local oscillator V-203 operates as a high beat oscillator in a modified Colpitts circuit. Tuning is effected by L-201D. C-211 couples the oscillator signal to the mixer grid.

5. MIXER

Mixer V-202 is a pentode-connected 6AK5. TP-201 is provided as a test point for checking oscillator injection voltage or to observe the response of the RF circuits during visual alignment. The plate circuit of the mixer is tuned to the IF frequency of 21.4 mc by the double-tuned circuit of T-201 and T-202. This network is capacitively coupled by C-221 and C-222 in series. Coupling is slightly under transitional.

6. IF ATTENUATOR

The IF attenuator is a conventional capacity divider type. In the X1 position the output arm of the attenuator connects T-202 directly (through C-105) to the grid of V-301 in the IF amplifier. When the attenuator is switched to the X10 position, or beyond, this arm capacity is removed from across T-202, and C-112 is substituted in its place. C-112 is adjusted to preserve exactly the tuning of T-202. The RF attenuator is mechanically ganged with the IF attenuator. In the X10, X100, and X1000 positions IF attenuation only is used. In the X10,000 position 20 db of RF attenuation is inserted between the input terminals and the RF amplifier to prevent overloading of the RF circuits. The RF attenuator is a 50-ohm resistive pad.

7. IF AMPLIFIER

The first three IF amplifier stages, V-301, V-302, and V-303, are identical. The double-tuned network in the plate circuit of each stage uses capacitive coupling. Coupling is slightly under transitional. Amplifier gain is adjusted by R-105 and R-106 connected in the cathode circuit of V-301 and V-303. R-312 functions to bleed some current through the gain control potentiometers to provide a more favorable gain vs. gain control rotation characteristic. Total gain control range is about 100 to 1. The value of the unbypassed portion of the cathode resistance for each stage is chosen to compensate for the variation of tube input capacity with transconductance in order to keep the IF amplifier response shape from changing appreciably with gain control adjustment. The plate decoupling and screen bypass configuration provides screen grid neutralization with the value of screen bypass capacitor employed.

V-304 operates with fixed gain. Both primary and secondary of T-307 resonate with stray circuit capacities. Coupling and loading are such that the 3 db bandwidth of this stage is about 1.75 mc with an essentially flat top response. The secondary circuit connects to the AM detector CR-301 and to the grid of limiter V-305.

8. LIMITER

Limiter V-305 functions to remove amplitude variations from the signal applied to T-308. T-308 and V-306 form a conventional Foster-Seeley discriminator circuit. The audio output, taken from pin 1 of V-306, connects to the AM-FM switch S-107 and is used only for aural monitoring of an FM signal.

9. DETECTOR

Diode detector CR-301 produces an output dc voltage proportional to the average value of the applied RF signal. The diode load consists of R-326 in parallel with R-123. When the meter function switch S-106 is in the Av position, M-101 is connected in series with R-123, and the meter indicates the average dc current through R-123. Full scale meter reading occurs with approximately 10 volts dc across the diode load. Audio or video voltage developed across the diode load resistor is fed to the AM-FM switch through isolating resistor R-139 to be used for aural monitoring. The meter movement itself (M-101) has a specially shaped pole piece to make the normal range of the meter 10 to 1 with an approximately logarithmic scale distribution. Due to variation of the crystal resistance (both forward and backward) with signal level, there is some voltmeter nonlinearity at the lower end of the meter scale. The linearity is corrected to a first approximation by the simple expedient of setting the meter's adjustment screw for a 10-to-1 meter indication with a 10-to-1 range of receiver input signal. The linearity correction required at a meter reading of 1 is on the order of 10%.

10. RECTIFIER

The peak rectifier CR-103 and peak voltmeter V-103 are used primarily when making measurements on TV stations by actually measuring the peak-of-sync level, which is constant regardless of picture content. The composite video signal appearing across diode load resistor R-123 is badly deteriorated by the narrow band IF amplifier, although the sync pulses are pretty well preserved. When S-106 is in the Pk position, CR-103 charges C-117 to approximately the peak voltage across R-123. Because there is a finite (though high) ratio of source to load impedance in the peak rectifier circuit, C-117 cannot be charged exactly to the peak of sync. In addition, the forward resistance of CR-103 increases at low levels, causing some voltmeter nonlinearity. There is also a slight difference in the meter indication between the limiting conditions of a black picture and a white picture. Figure 2-2 compares the indication of the peak voltmeter due to a CW signal with the indication from a black picture and from a white picture, both having the same peak level as the CW signal. The (dc) voltage across C-117 is applied to the grid of V-103A through

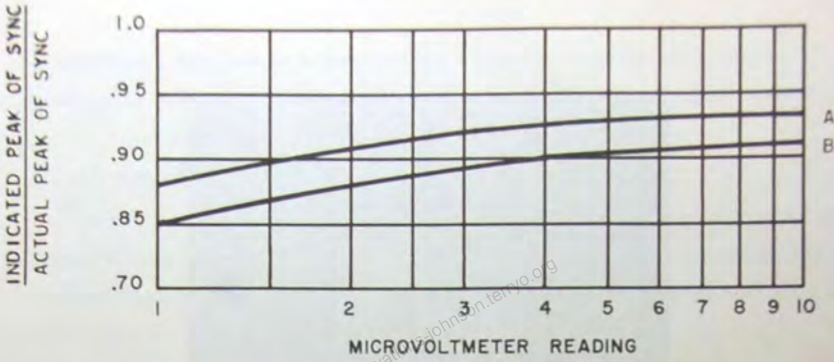


Figure 2-2. Typical curves showing accuracy of the peak voltmeter for the case of a black picture (A) and for a white picture (B) as a function of microvolt meter reading

voltage divider R-125 and R-127. S-106 also connects the microvolt meter (in series with R-124 and R-126) from plate to plate of V-103. R-132 and R-124 are the balance and calibrate controls for the peak voltmeter. CR-103 is a silicon junction diode having extremely high back resistance, making the discharge time constant of the peak voltmeter essentially that of C-117 and the circuit resistance of about 4.5 megohms, allowing the capacitor to hold its charge between horizontal sync pulses without requiring an undue amount of time to discharge after a noise burst.

11. RECORDER AMPLIFIER

Recorder amplifier V-102 is a dc amplifier to operate a one-milliampere chart recorder. The amplifier output impedance is approximately 17,000 ohms. R-109 and R-116 are the balance and calibrate controls for the recorder amplifier. When meter function switch S-106 is in the Av position, the amplifier input is connected (through isolating resistor R-122) to the dc voltage across diode load resistor R-123. When S-106 is in the Pk position, the amplifier input is connected to the dc voltage output of peak rectifier CR-103 as developed across C-117. To conserve battery life when the recorder amplifier is not in use, S-105 allows the filament voltage to be removed from V-102.

12. LOG-LIN SWITCH

With the LOG-LIN switch S-104 set to LIN the receiver is linear; i.e., the microvolt meter reading is directly proportional to receiver input. When S-104 is set to LOG, the microvolt meter indication is compressed. LOG. ADJ. R-107 is normally set so that a 100-to-1 signal input to the receiver produces a 10-to-1 indication on the microvolt meter. In this case, the meter indication is an approximately logarithmic function of the input signal. The log characteristic is produced by feeding a dc voltage derived from the IF amplifier output through a suitable voltage divider to the grid of V-302 to control its gain. When

Figure 2-3. Receiver, Front View

the meter function switch is in the Av position, this dc voltage comes from diode load resistor R-123. When the meter function switch is in the Pk position, this dc voltage comes from the output of peak rectifier CR-103 as developed across C-117.

13. AM-FM SELECTION

The input signal to the audio amplifier V-104 is selected by S-107. With this switch in the AM position audio or video signal output from the AM detector is amplified. In the FM position the audio output from discriminator V-306 is amplified. Audio gain control R-134 adjusts the output level available at the phone jack J-111.

14. SIGNAL GENERATOR

The signal generator portion of the equipment consists of an oscillator tuning the complete frequency range and a continuously adjustable mutual inductance attenuator to control the generator output. The oscillator is a modified Colpitts type tuned by L-401. Oscillator tank current flows through end inductor L-402, located at the mouth of the attenuator. The attenuator consists of a pickup loop mounted on a movable plunger that can be positioned within a circular tube of accurately known and controlled diameter. Current flowing in the end inductor couples to the pickup loop, and for a fixed excitation voltage across the end inductor the signal output from the attenuator depends only upon the distance between the pickup loop and the end inductor. As the distance between the loops is increased, the attenuation increases at the rate of 16.0 db per radius of the tube.

Signal voltage across the end inductor is monitored by crystal voltmeter CR-401, and the oscillator output is adjusted to the set level indication by R-409, which sets the plate voltage of the oscillator. R-408 is the output level calibrate adjustment. This is a factory adjustment and is made by setting the output from the signal generator to a known value and then adjusting R-408 for a "set level" meter indication. The entire oscillator assembly is double shielded, and all leads are adequately filtered to prevent any spurious signal from existing external to the oscillator assembly. The attenuator plunger is driven by a rack and pinion, and since the generator output is a logarithmic function of loop separation the attenuator dial divisions have true logarithmic spacing.

15. POWER SUPPLY

The power supply operates from either 117-volt 50- to 400-cycle AC or 6 volts DC. Two power cables are supplied, and jumper leads in the associated plugs make the circuit connections necessary for operation from the corresponding power source. The B plus voltage comes from a full-wave bridge circuit using selenium rectifiers. Filtering is provided by a two-section electrolytic capacitor C-502 and a

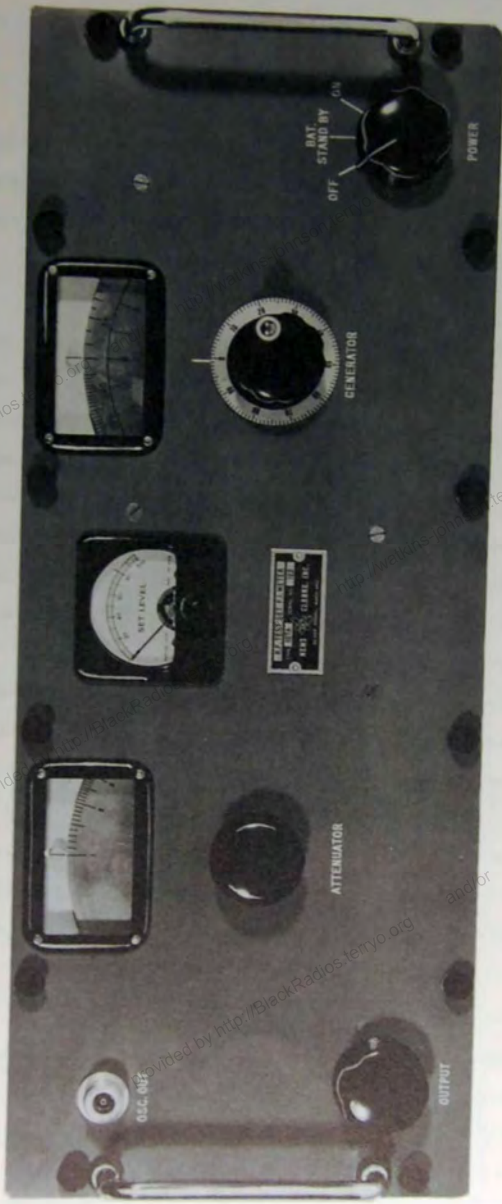


Figure 2-4. Oscillator, Front View

filter choke L-502. For DC operation a vibrator and its associated circuitry is employed, and tube heater power comes directly from the DC input. For AC operation the AC input is connected to a transformer winding, and tube heater power comes from a filament winding. Power switch S-501 is a three-position switch providing a battery stand-by position in which the tube heaters are on and the vibrator is off.

The Ck position of meter switch S-106 is provided for test purposes. In this position the meter operates as a voltmeter of 10 volts full scale. When the unit is operating on AC, the meter reads the voltage across the filament winding of the power transformer to give an indication of AC line voltage. When the unit is operating on DC, the meter reads the DC voltage at the power input connector J-501. A special voltmeter using crystal rectifiers CR-101 and CR-102 is employed in this metering circuit. For DC operation only the input voltage is also indicated when the 107-A is switched off allowing battery voltage drop under load to be observed.

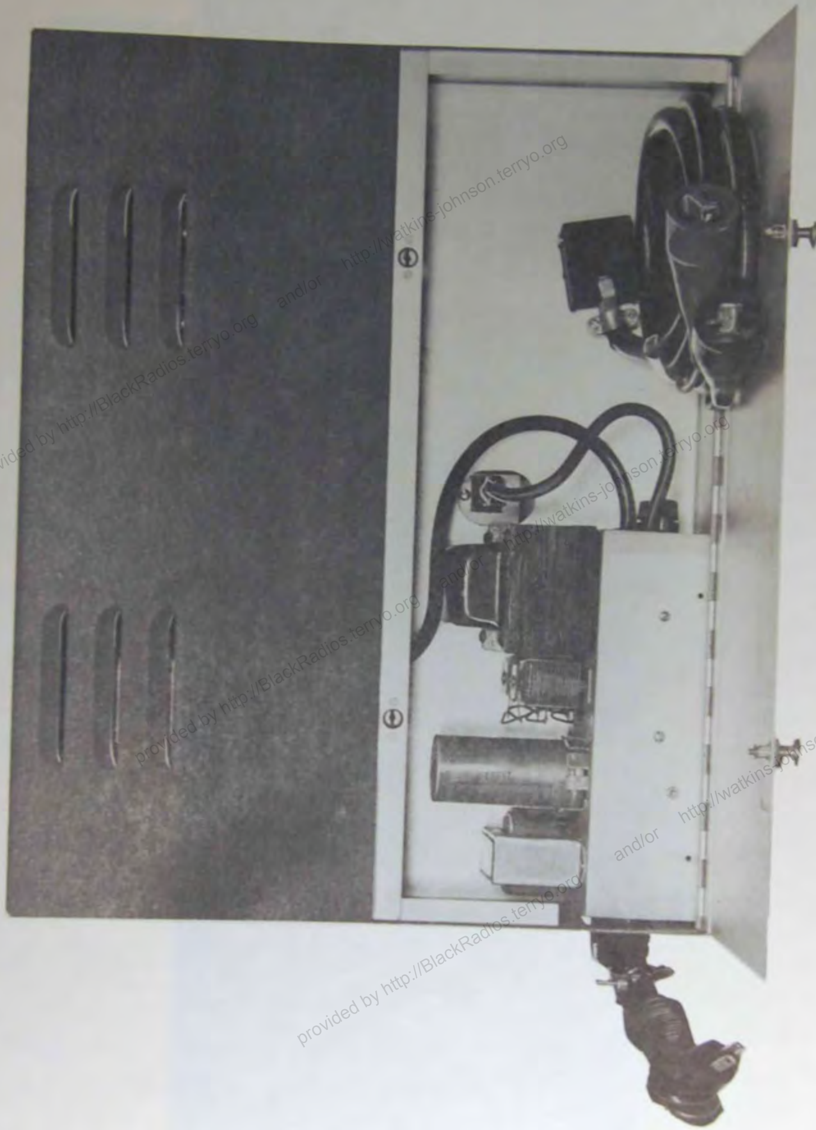


Figure 2-5. Power Supply

SECTION 3

OPERATION

1. GENERAL INSTALLATION AND ADJUSTMENT

When using the 107-A to do a particular job, the greatest measurement accuracy can be obtained by making the applicable circuit adjustments just prior to making measurements.

The following adjustments can be performed whenever it is desired to do so without the use of auxiliary equipment.

a. Microvolt Meter. This adjustment provides a 10-to-1 meter indication for a 10-to-1 input signal to the receiver when the meter switch is in the Av position. The procedure is as follows:

(1) Connect the signal generator output to the receiver. Tune the signal generator to 55 mc and set the output level. Set the attenuator to 1000 microvolts.

(2) Set the LOG-LIN switch to LIN, the METER switch to Av, and the IF ATTENUATOR to X100. Tune in the signal generator signal and adjust the IF GAIN control for a meter indication of exactly 10.

(3) Set the signal generator attenuator to 100 microvolts. Set the meter adjusting screw for a meter reading of exactly 1.0.

(4) Repeat steps (2) and (3) until the meter reads correctly at 10 and at 1.0.

Note: After the offset has been adjusted, meter linearity can be quickly checked using the attenuator on the signal generator as a standard. Set the signal generator attenuator to 1000 microvolts, adjust the receiver gain for a meter reading of 10, and then set the attenuator to 900 microvolts, 800 microvolts, etc., and read the meter. An appropriate correction factor for scale linearity can be applied when the instrument is being used as a linear voltmeter and the maximum accuracy is desired.

b. Peak Voltmeter. This adjustment provides a 10-to-1 meter indication for a 10-to-1 variation of a CW input signal when the meter function switch is in the Pk position. The procedure is as follows:

(1) Connect the signal generator output to the receiver. Tune the signal generator to a convenient frequency and set the output level. Set the attenuator to 1000 microvolts.

(2) Set the METER switch to Av, the IF ATTENUATOR to X100, and the LOG-LIN switch to LIN.

(3) Tune in the signal generator signal and adjust the IF GAIN until the meter reads exactly 10. Set the METER switch to Pk and adjust the peak voltmeter calibrate control for a meter reading of 10.

(4) Set the signal generator attenuator for a meter reading of 1.0 with the METER switch in the Av position. Set the switch to Pk and adjust the peak voltmeter balance control for a meter reading of 1.0.

(5) Repeat steps (3) and (4) until the meter reads the same on Pk and Av at 10 and 1.0.

Note: When using the receiver as a linear voltmeter reading peak of sync of a TV signal, the nonlinearity of the peak rectifier (as shown by figure 2-2) can be essentially compensated by setting the meter to read 10 to 1.05 on Pk for a 10-to-1 reading on Av using a CW signal.

c. Log Adjustment. This adjustment provides a 10-to-1 meter indication for a 100-to-1 variation of receiver input signal when the LOG-LIN switch is in the LOG position. This adjustment is normally made just before readings are taken and with the METER switch in the position that it will be used. The setup procedure is as follows:

(1) Connect the signal generator output to the receiver. Tune the signal generator to a convenient frequency and set the output level. Set the attenuator to 100 microvolts.

(2) Set the LOG-LIN switch to LIN, the IF ATTENUATOR to X100, and the METER switch to Av or Pk, depending upon the characteristic desired. Tune in the signal generator signal and adjust the IF GAIN control for a meter indication of exactly 1.0.

(3) Set the LOG-LIN switch to LOG. Set the generator output to 10,000 microvolts and set the log adjust pot (R-107) for a meter reading of exactly 10.

(4) Repeat steps (2) and (3) until the meter reads correctly at 1.0 and 10. Changing the IF ATTENUATOR step will change the input range in decade steps.

d. Recorder Amplifier. The recorder can be utilized to record either linear or log response from either the average or the peak signal, depending upon the settings of the LOG-LIN and METER switches. The recorder amplifier setup should be performed with the LOG-LIN and METER switches in the positions to be used for recording. The setup procedure is as follows:

(1) Connect a 1-ma recorder (using the plug supplied) to the recorder output jack J-110. The positive lead of the recorder goes to terminal 1 (the wide blade). Set the recorder switch S-105 to ON and allow a few minutes for warm up.

(2) Connect the signal generator output to the receiver. Tune the signal generator to a convenient frequency and set the output level. Set the attenuator to 100 microvolts.

(3) Set the LOG-LIN and METER switches for the desired characteristics. Set the IF ATTENUATOR to X100. Tune in the signal generator and adjust the IF GAIN control for a

microvolt meter indication of exactly 1.0. Adjust the recorder balance control R109 for a recorder indication of 0.1 ma.

(4) Increase the signal generator output until the microvolt meter reads exactly 10. Adjust the recorder calibrate control R-116 for a recorder indication of 1.0 ma.

(5) Repeat steps (3) and (4) until the microvolt meter and recorder read the same at 1.0 and 10. Changing the IF ATTENUATOR range will change the recording range in decade steps.

Note: The signal generator can be used to determine the recording characteristic or law for a CW signal by plotting recorder current as a function of signal input.

e. IF Attenuator Adjustment. The IF Attenuator can be adjusted at any time it is convenient to do so provided the setting of C-112 (the substitution capacitor) is not disturbed. The adjustment procedure is as follows:

(1) Connect the signal generator output to the receiver. Tune the signal generator to 55 mc and set the output level. Set the attenuator to 10 microvolts.

(2) Set the LOG-LIN switch to LIN, the METER function switch to Av, and the IF ATTENUATOR to X1. Tune in the signal generator signal and adjust the IF gain until the meter reads exactly 10.

(3) Switch the IF ATTENUATOR to X10. Set the signal generator attenuator to 100 microvolts. Adjust C-113 for a meter reading of 10.

(4) Switch the IF ATTENUATOR to X100. Set the signal generator attenuator to 1000 microvolts. Adjust C-114 for a meter reading of 10.

(5) Switch the IF ATTENUATOR to X1000. Set the signal generator attenuator to 10,000 microvolts. Adjust C-115 for a meter reading of 10.

(6) Recheck all adjustments.

f. Antenna. To assemble the antenna, swing the spring clips securing the tripod and mast sections out of the way. Attach the dipoles to be used (long, 54 to 118 mc; short, 111 to 240 mc). If the signal to be measured is horizontally polarized, the mast may be assembled directly on the tripod. For vertically polarized signals include the tee section and extra mast segment. The telescoping dipoles may be adjusted by swinging them down along the mast and lengthening them to the scribed wavelength.

Attach the longer cable to the antenna and couple it to the receiver, using the attenuator if required (see Section 3-2). The shorter cable connects the oscillator to the receiver.

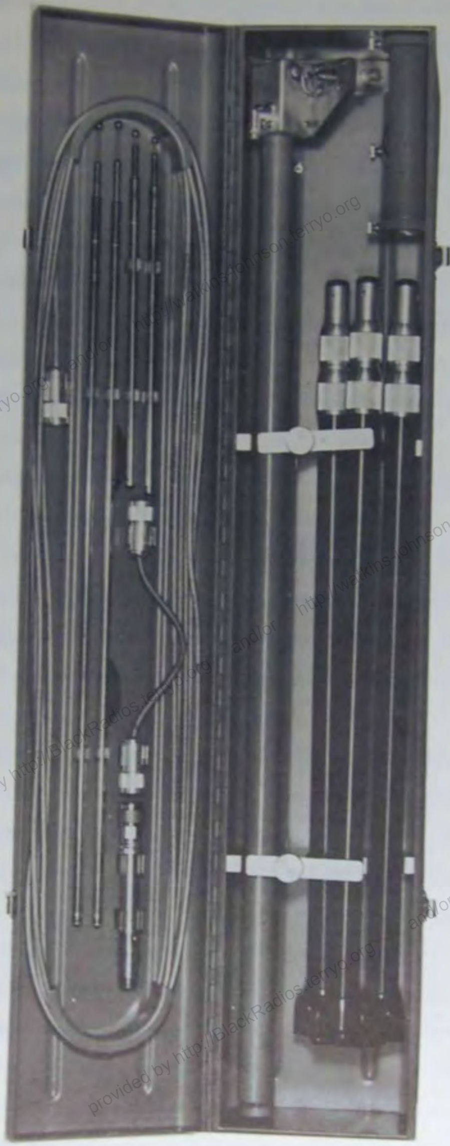


Figure 3-1. Antenna Components

2. MEASURING FIELD INTENSITY

a. By Substitution. With the antenna erected, the dipole elements adjusted to length for the frequency to be measured, and the unit on and functioning with all connections made, field intensity is determined in the following manner.

(1) Set the INPUT switch to ANT., the LOG-LIN switch to LIN, the METER switch to Av (unless the measurement is being made on a TV picture carrier, in which case set the switch to Pk), the IF GAIN control two-thirds clockwise, and the IF ATTENUATOR switch to X1.

(2) Plug a headset into the PHONES jack and set the AUDIO GAIN control one-third clockwise. Orient the antenna for the direction of the signal to be received. Adjust receiver tuning for maximum indication on the microvolt meter, setting the IF ATTENUATOR as required to keep the pointer on scale. Use the headset to identify the signal, setting the AUDIO GAIN as required.

(3) After the signal is definitely identified, carefully tune for maximum meter indication and adjust the IF GAIN control to place the meter pointer at a definite point, say 4.8, near the center of the scale.

(4) Set the INPUT switch to OSC. Set the signal generator to the frequency being received (approximately) and adjust the output for a set level reading. Adjust the signal generator tuning and ATTENUATOR control to obtain an on-scale reading on the microvolt meter.

(5) Making sure that the receiver is exactly tuned to the signal and that the signal generator is exactly tuned to the receiver (and that its output is at set level), adjust the signal generator attenuator as required to give the same microvolt meter indication on the OSC as on the ANT position of the input switch. Note the reading on the signal generator attenuator dial.

(6) Referring to the calibration curve for the receiver attenuator range employed, multiply the signal generator attenuator reading by the frequency factor to obtain field intensity in microvolts per meter.

b. Direct Reading Method. To simplify a series of measurements at one frequency it is possible to adjust the receiver gain so that the instrument becomes direct reading in field intensity.

As an illustrative example, assume that a series of measurements were to be made at 100 mc. The first measurement would be made by the substitution method. Suppose in this case the signal generator attenuator read 600 microvolts and that the frequency factor (from the calibration curves) was 3.7. In this case the field intensity would be 600 x 3.7 = 2,200 microvolts per meter. By adjusting receiver gain so that on the X1000 IF attenuator step the meter read 2.2, the instrument would become direct reading in field intensity. Note: If the signal to be measured required the IF attenuator to be set to X10,000 or if the 40 db pad were required, the appropriate frequency factor calibration curves should be used.

As frequency is increased, more receiver gain is required to make the instrument direct reading. Above about 150 mc it is desirable to reduce gain, instead, and multiply the meter reading by a factor of 10.

3. MEASURING TV PICTURE SIGNALS

The composite video signal from a TV transmitter varies in amplitude from 100% (reference level) at peak of sync to 75% at the blanking level (corresponding to black level) and to 12.5% at a maximum white level. In any case the peak power, corresponding to the peak of sync, is maintained constant.

In terms of voltage output from a linear detector in the receiver the average is 78% of peak for a true black picture and 23% of peak for a true white picture.

With the METER switch on Av the microvolt meter circuit becomes nonlinear near full scale with a peak-to-average ratio greater than about 2 due to overload of the stage driving the detector. For this reason it is not recommended to use the meter above half scale in the Av position when receiving a TV signal.

With the meter switch in Pk there is some nonlinearity at the lower scale indications, as shown by figure 2-2 and explained in the theory of operation.

To obtain maximum accuracy when making measurements (by substitution) on TV picture signals the following procedure should be followed:

a. The meter switch should be in the Pk position. The peak voltmeter should be set up for the same reading on Pk and Av at 1 and 10 on the meter using a CW signal as outlined under the peak voltmeter setup procedure.

b. The levels of the signal generator and the signal being measured should always be compared at the same point, say 5.0, on the meter.

c. A correction factor obtained from figure 2-2 may be applied, or a correction factor may be obtained by observing the deviation from the true peak-to-average ratio of a black picture. A true black picture has an average value equal to 78% of the peak value. This means that if the meter is adjusted using the IF gain control, to read 3.9 in the Av position on a true black picture, the meter should read 5.0 on peak. Any reading less than 5.0 represents an error and can be corrected for by a suitable multiplying factor.

SECTION 4

MAINTENANCE

1. IF ALIGNMENT

a. Equipment Required. The following equipment or its equivalent is required to perform the IF alignment:

(1) Sweep generator. RCA WR-59C or equal.

(2) Oscilloscope with a direct-coupled vertical amplifier and a means of calibrating the deflection voltage. DuMont 304-A or equal.

(3) RF signal generator accurately calibrated for frequency at 21.4 mc.

(4) One, each, 220-ohm, 1000-ohm, and 15-ohm 1/2-watt carbon resistors.

(5) The 40 db coaxial pad supplied with the 107-A equipment.

(6) Miscellaneous coaxial cables and coaxial adapters as required. When using the WR-59C sweep generator, the following are needed: (a) a cable of suitable length, made from RG-58/U or Rg-55/U cable, with a UG-88/U connector on one end and an Amphenol 75-MC1F on the other end; (b) a cable of suitable length, made from RG-58/U or RG-55/U cable, with a UG-88/U connector on each end (W-104, the cable connected between the RF attenuator and the RF amplifier input, can be used for this cable); (c) two UG-201/U type N to BNC adapters; and (d) one UG-29B/U type N straight adapter.

b. General Instructions. The IF alignment procedure also includes the adjustment of C-112. If the setting of C-112 has been disturbed, it is recommended that the few minutes of extra time required to go through the complete IF alignment procedure be taken rather than attempting adjustment of C-112 alone.

Throughout the alignment procedure the oscilloscope is to be connected to the terminal of S-107 that connects to C-118 and to ground. S-107 is the AM-FM switch, and C-118 is the coupling capacitor to the audio gain control. Unless otherwise noted, panel controls should be set as follows: Recorder off. LOG-LIN switch to LIN. AM-FM switch to AM. Audio gain control to minimum. IF gain controls to maximum. IF attenuator to X1.

The marker generator signal at 21.4 mc should be coupled in as required to produce a suitable marker pip. Check that the marker generator connection does not upset the response shape by disconnecting the marker generator and observing that the response shape does not change. In general, the marker signal can be coupled in by connection to a turn or two of insulated wire wrapped around the sweep generator lead near the point of connection to the circuit under test.

To avoid extraneous coupling or regeneration the sweep and marker generator leads should dress out and away (towards the input end) from the stages already tuned.

The adjustment procedure should be carefully followed, and adjustments should be made in the order given.

c. Adjustment of T-308. Set S-107 to FM. Remove V-304. Connect the sweep generator between the grid pin 1 of V-305 and ground (on the ear of the socket mounting strap nut). Set the sweep generator output to maximum (or for a 5-volt peak-to-peak scope deflection). Adjust the slugs of T-308 for the normal "S" shaped discriminator response with the center frequency at 21.4 mc. Peak separation should be about 750 kc.

d. Adjustment of T-307. Set S-107 to AM. Replace V-304 and remove V-303. Connect the sweep generator between the grid pin 1 of V-304 and ground on the ear of the socket mounting strap nut. Set the sweep generator output for about a 3-volt peak scope deflection. Adjust the slugs of T-307 for a symmetrical response curve centered at 21.4 mc. The response should be approximately flat top with 3 db bandwidth of about 1.75 mc.

e. Adjustment of T-305, T-306. Replace V-303. Remove V-301 and V-302. Solder the 220-ohm resistor to the grid pin 1 of V-303 and to ground on the ear of the socket mounting strap nut. Solder the 1000-ohm resistor to the grid pin 1. Connect the sweep generator between the 1000-ohm resistor and ground (on the grounded lead of the 220-ohm resistor). Set the sweep generator output for about 5 volts peak scope deflection. Adjust the IF gain controls as required to reduce the gain to one half. Adjust T-305 and T-306 for a symmetrical response curve centered at 21.4 mc. The response shape should be flat top or slightly round nosed with a 3 db bandwidth of about 450 kc.

f. Adjustment of T-303, T-304. Leave the IF gain controls as set above. Remove the 220-ohm and 1000-ohm resistors. Replace V-302. Solder the 15-ohm resistor to the grid pin 1 of V-302 and to ground on the ear of the socket mounting strap nut. Solder the 1000-ohm resistor to the grid pin 1. Connect the sweep generator between the 1000-ohm resistor and ground (on the grounded lead of the 15-ohm resistor). Set the sweep generator output for about 2.5 volts peak scope deflection. Adjust T-303 and T-304 for a symmetrical response curve centered at 21.4 mc. The response shape should be flat top or slightly round nosed.

g. Adjustment of T-301, T-302. Remove the 15-ohm and 1000-ohm resistors. Replace V-301. Set the IF gain controls to maximum. Replace the IF amplifier bottom cover and tighten all screws. Disconnect the IF amplifier input cable P-101 and connect the sweep generator through the 40-db 50-ohm coaxial attenuator, using adapters and 50-ohm cables as required to keep a rigorously coaxial system between the output of the sweep generator and the input to the IF amplifier. Set the sweep generator output for about 10 volts peak scope deflection. Adjust the IF gain controls as required to reduce the gain to one fourth. Set the sweep generator output for about 5 volts peak scope deflection. Adjust T-301 and T-302 for a symmetrical response curve centered at 21.4 mc. The response shape should be flat top or slightly round nosed.

h. Adjustment of T-201, T-202. Leave the IF gain controls set as above. Reconnect the IF amplifier input cable. The RF amplifier bottom cover should be in place. Set the receiver dial to 55 mc. Remove V-203. Set the IF attenuator to X1. Connect the sweep generator to the RF amplifier input jack J-201. Set the sweep generator output for about 5 volts peak scope deflection. Adjust T-201 and T-202 for a symmetrical response curve centered at 21.4 mc. The response shape should be flat top or slightly round nosed.

i. Adjustment of C-112. After the adjustment of T-201 and T-202 has been completed, switch the IF attenuator to the X10 position and increase the output from the sweep generator as required to produce the same amplitude of scope deflection and observe the IF response shape. Adjust C-112 if required to give the same response shape with the attenuator on the X10 range as is obtained on the X1 range.

2. NORMAL FIELD RF ALIGNMENT

The only adjustments normally required in the field are those of C-213 and L-206 to set the oscillator frequency. C-213 is a ceramic trimmer. Turning its screw clockwise increases capacity. L-206 consists of parallel leads running from V-203 to an inductuner terminal. Separating these leads decreases inductance. In general, an adjustment of only C-213 is required. Before making any adjustments, check the mechanical indexing of the dial. The index mark below 54 mc should be under the pointer when the dial mechanism is turned against the inductuner stops. If this is not the case, loosen the set screws on the dial hub and set the dial accordingly.

The adjustment procedure is as follows: Tune in a signal of exactly 55 mc and note the dial reading. If the dial reads too high, it means that there is too much capacity in C-213. Adjust C-213 as required for a dial reading of 55 mc when the signal is tuned in. Tune in a signal of exactly 245 mc and note the dial reading. If the dial reads too high, it means that there is too much inductance in L-206. Adjust L-206 as required for a dial reading of 245 mc when the signal is tuned in. Note: The RF amplifier bottom cover has some effect on oscillator frequency and should be in place when the dial readings are observed.

3. COMPLETE ALIGNMENT PROCEDURE

a. General. The first step of a complete alignment procedure consists of setting up the dial mechanically and adjusting the local oscillator frequency as noted in the normal field alignment procedure above. The second step of the complete alignment procedure consists of setting the tuning adjustments and coupling adjustments on the interstage network between the RF amplifier plate and the mixer grid, using visual alignment techniques.

b. Equipment required.

(1) A sweep generator having at least 10 mc sweep width that can be continuously tuned from 54 to 250 mc. The sweep generator output impedance should be 50 ohms unbalanced. Sweep output of about .02 volt is required.

(2) An oscilloscope with means of calibrating the deflection voltage. DuMont 304-A or equal.

(3) Coaxial cables and adapters, as required, to connect between the sweep generator and J-201 on the RF amplifier chassis in a rigorously coaxial system.

c. Procedure. Connect the oscilloscope through a 47K 1/2-watt resistor to TP-201 on the RF amplifier chassis. Set the scope gain until 0.1 volt peak to peak gives a convenient deflection. Connect the sweep generator to J-201. Set the receiver dial to 55 mc. Set the sweep generator frequency to 55 mc, the output level as required to get a convenient scope deflection, and the sweep width as required. Set the IF attenuator and/or the IF gain control as required until the IF suck-out tracking marker is visible on the response curve. Adjust C-205 and C-209 until the marker is approximately centered on the response curve, and then adjust L-204 until the response curve is essentially flat top.

Set the receiver dial to 250 mc. Set the sweep generator frequency to 250 mc and adjust the output and sweep width as required. Adjust L-203 and L-205 until the marker is approximately centered on the response curve, and then adjust C-208 for a flat-top or slightly overcoupled response. Increasing capacity decreases coupling.

Repeat the adjustments at 55 and 250 mc as required, and then observe the position of the tracking marker on the response curve as the receiver is tuned across the band. If the marker tends to ride down one side or the other of the response curve, make an adjustment of tuning at the appropriate setup point to compensate. The RF bandwidth is much greater than the IF bandwidth, and, in general, the RF response has little, if any, effect on overall receiver response shape.

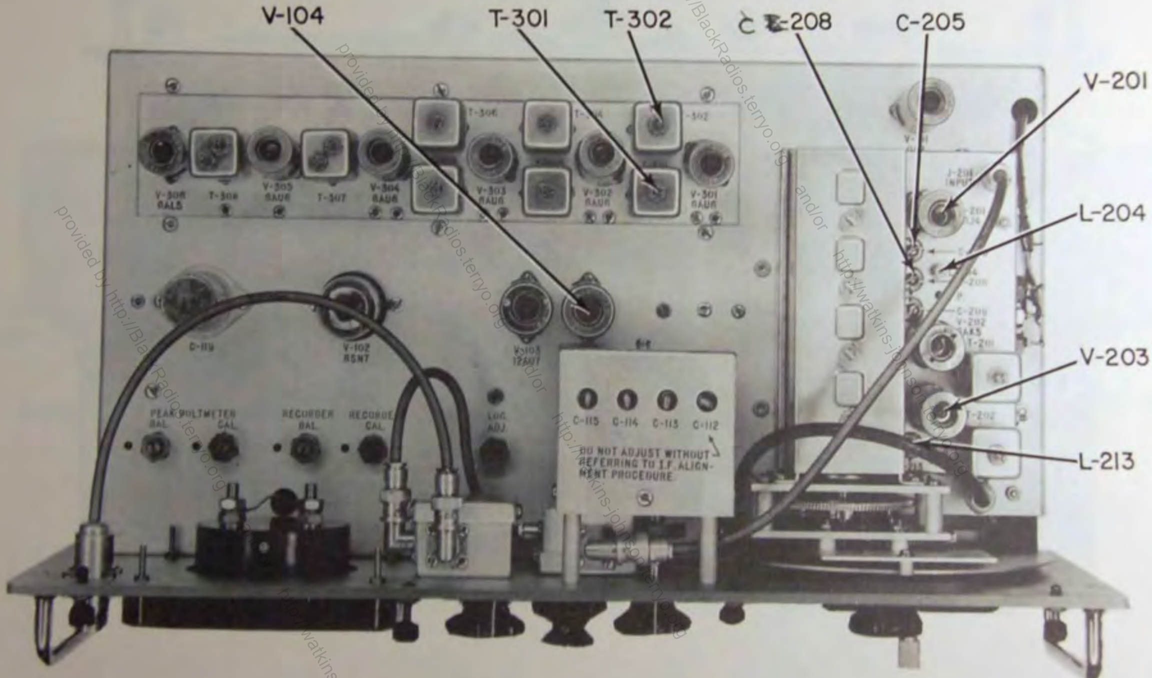


Figure 4-1. Receiver, Top View

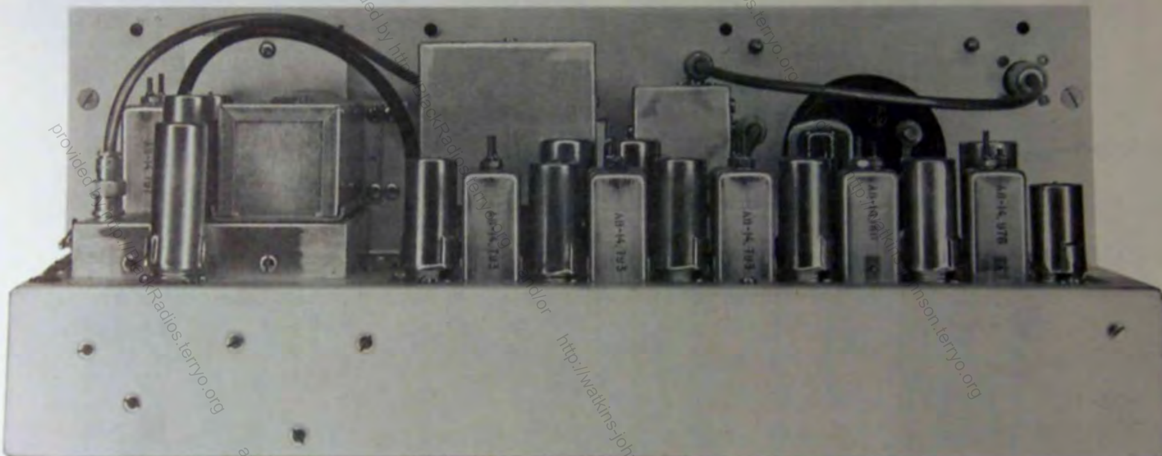


Figure 4-2. Receiver, Rear View

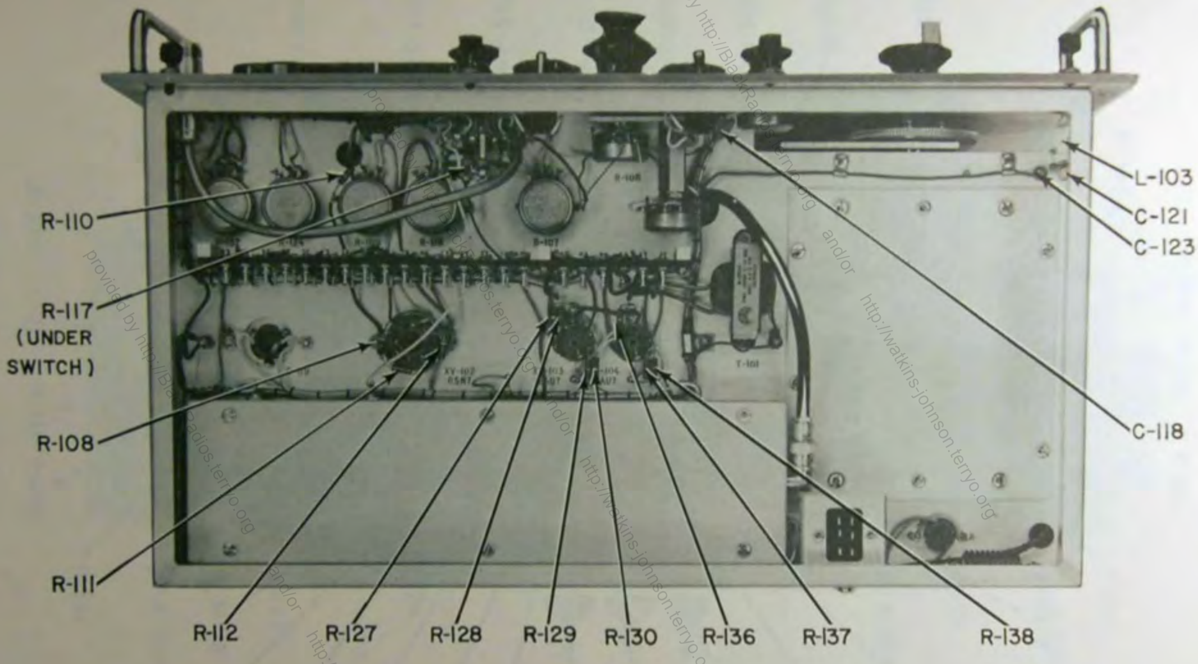


Figure 4-3. Receiver, Bottom View

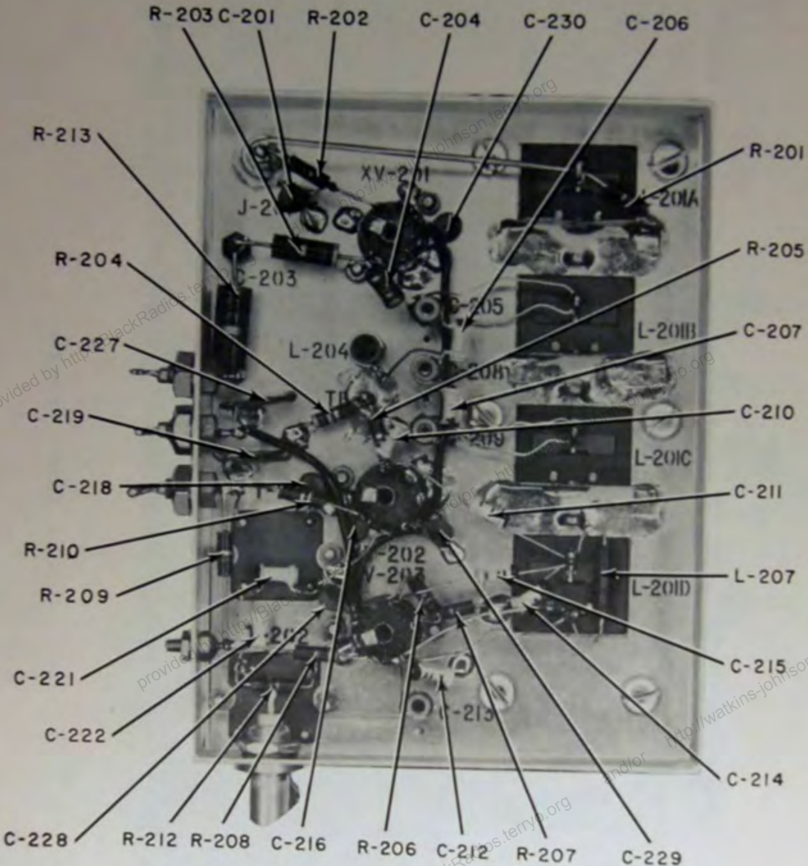


Figure 4-4. RF Strip

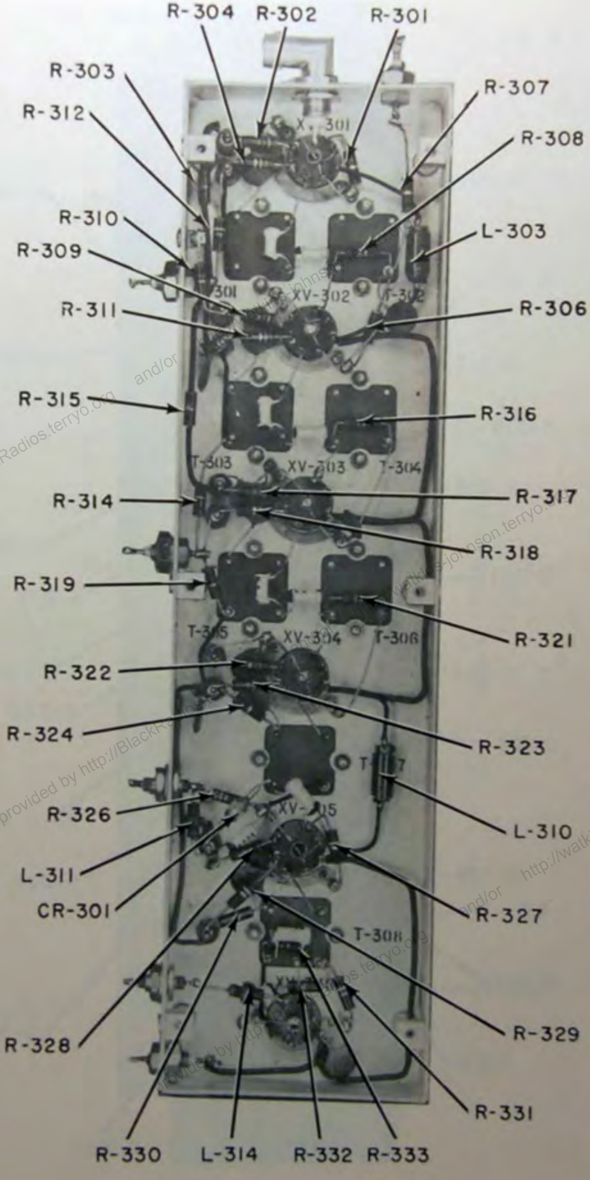


Figure 4-5. IF Strip, Resistors, etc.

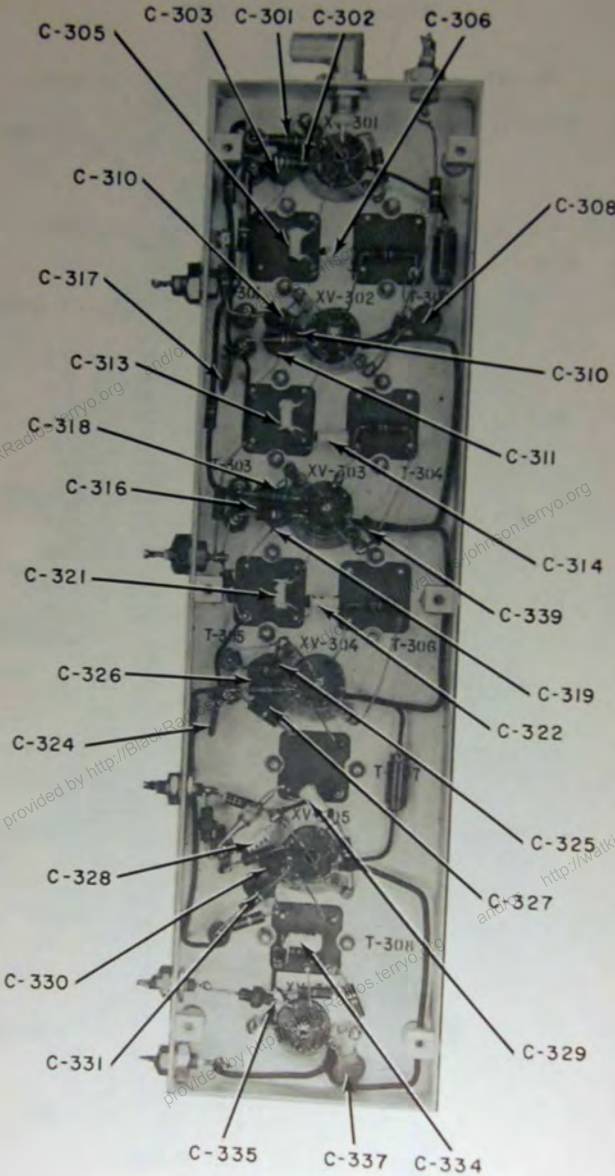


Figure 4-6. IF Strip, Capacitors

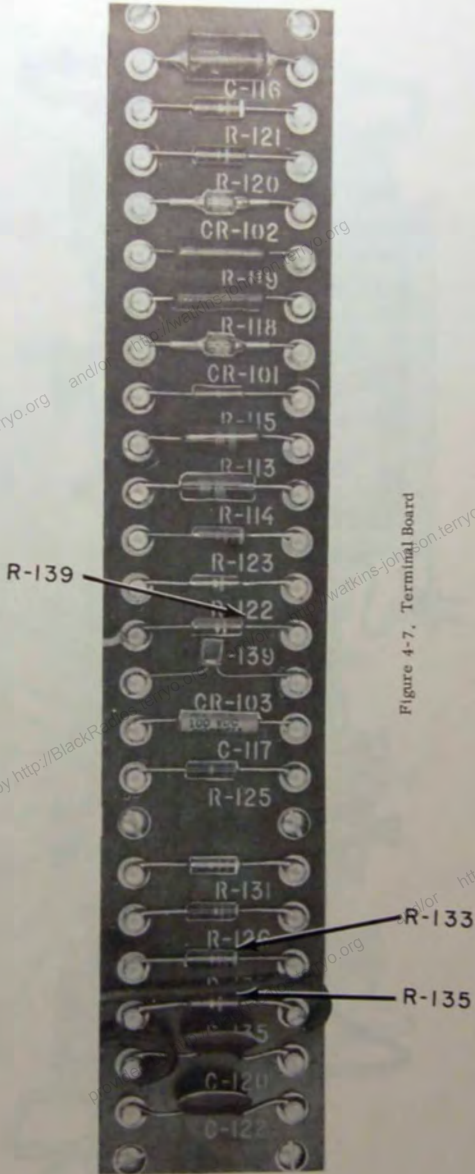


Figure 4-7. Terminal Board

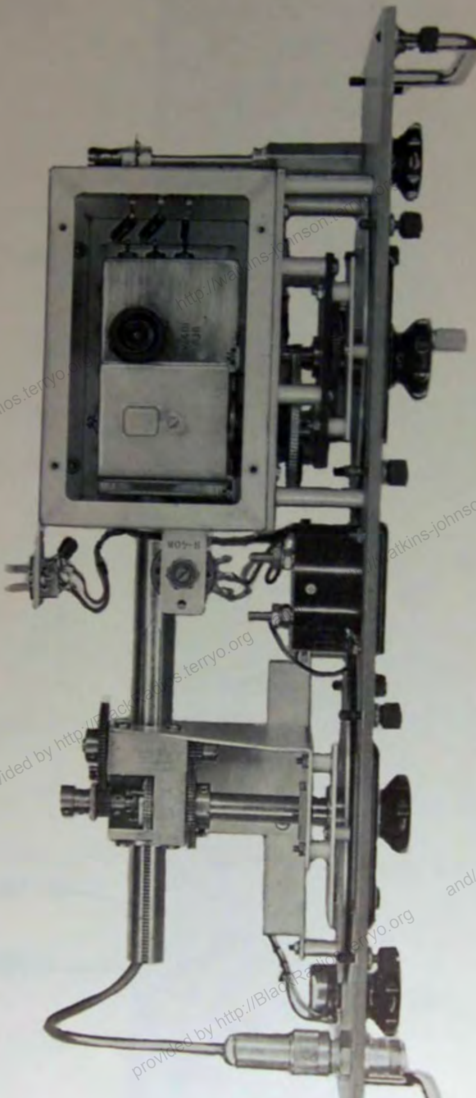


Figure 4-8. Oscillator, Top View

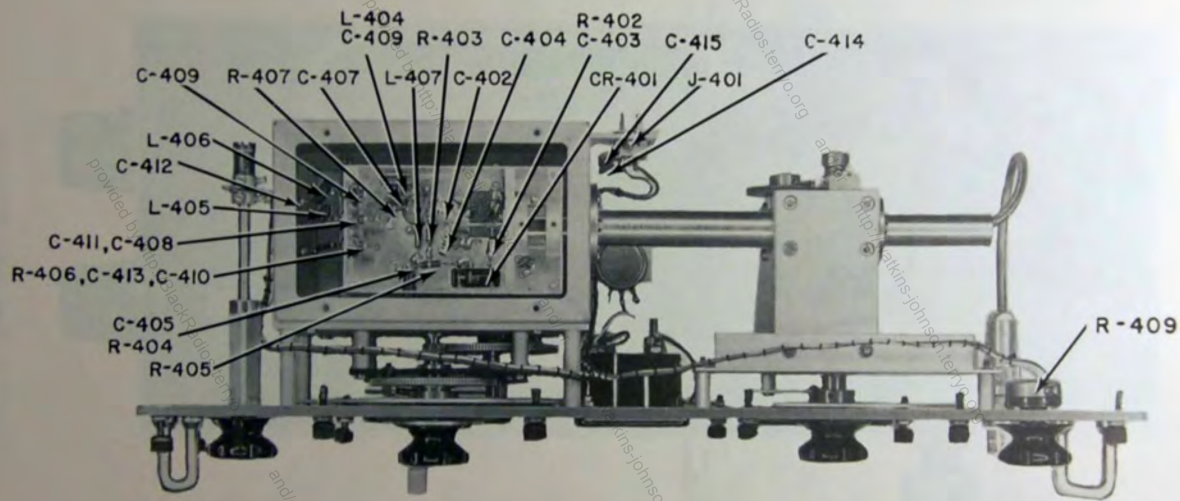


Figure 4-9. Oscillator, Bottom View

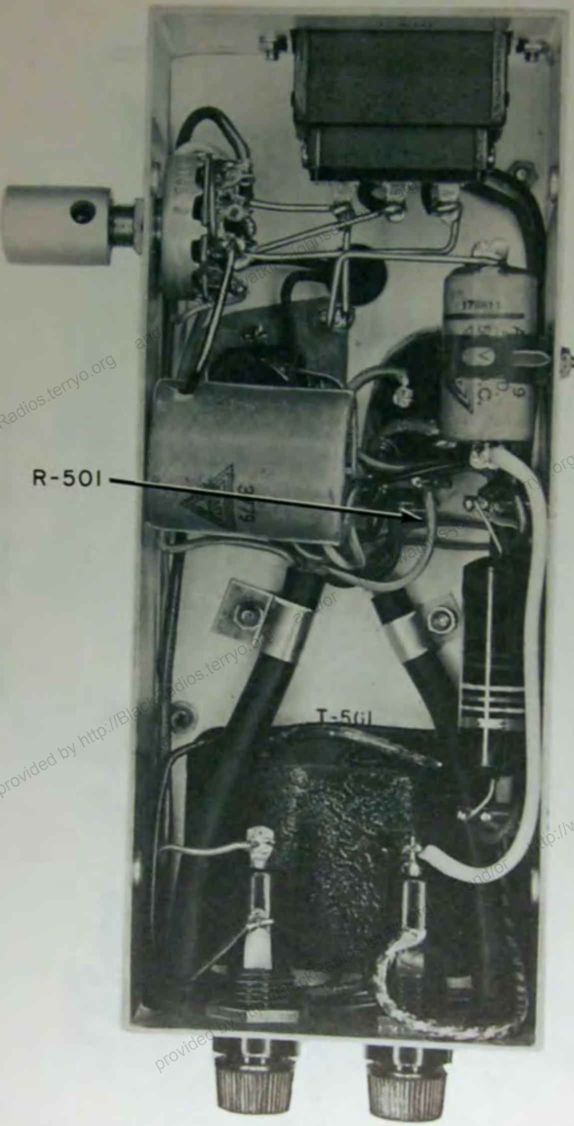


Figure 4-10. Power Supply, Bottom View

SECTION 5

MAINTENANCE PARTS LIST

When ordering replacement parts, give the equipment name and model number, and the symbol number and description of each item ordered.

Replacement parts which will be supplied against an order may not be exact duplicates of the original parts. However, only minor differences in the electrical or mechanical characteristics will be involved and, consequently, will in no way impair the operation of the equipment.

SYMBOL	DESCRIPTION AND MANUFACTURER
C-101	CAPACITOR: Ceramic, 2.4 μμf ±.1 μμf, 500V, Erie NPO-A
C-102	Same as C-101
C-103	Same as C-101, except part of S-102. Not separately replaceable.
C-104	Same as C-101, except part of S-102. Not separately replaceable.
C-105	CAPACITOR: Ceramic, 20 μμf ±5%, 500V, Erie NPO-A
C-106	CAPACITOR: Ceramic, 10 μμf ±5%, 500V, Erie NPO-A
C-107	Same as C-106
C-108	Same as C-106
C-109	CAPACITOR: Ceramic, 30 μμf ±5%, 500V, Erie NPO-T
C-110	CAPACITOR: Ceramic, 68 μμf ±5%, 500V, Erie N150-T
C-111	CAPACITOR: Mica, 100 μμf ±5%, 500V, Elmenco CM15E101J
C-112	CAPACITOR: Ceramic, trimmer, 4-30 μμf, 500V DC, Erie TS2A-N500
C-113	Same as C-112
C-114	Same as C-112
C-115	Same as C-112
C-116	CAPACITOR: Paper, .1 μf ±20%, 200V, Aerovox P-82Z
C-117	CAPACITOR: Film, 10,000 μμf, 100V, Cornell-Dubilier STM1S1
C-118	CAPACITOR: Ceramic, 10,000 μμf GMV, 500V, Sprague 29C9B8
C-119A&B	CAPACITOR: Electrolytic, 20-20 μf 25V, with metal base, Cornell-Dubilier B00-50
C-120	Same as C-118
C-121	CAPACITOR: Ceramic, feedthru, 470 μμf GMV, 500V, Sprague 507C8
C-122	Same as C-118
C-123	CAPACITOR: Ceramic, 470 μμf ±10%, 500V, Erie GP2-331
C-201	CAPACITOR: Ceramic, .001 μf ±20%, 1000V, Sprague 40C230A
C-202	Same as C-101
C-203	CAPACITOR: Ceramic, button, 1000 μμf GMV, 500V, Sprague 507C2
C-204	Same as C-123
C-205	CAPACITOR: Ceramic, trimmer, 0.5-3 μμf, 500V, Erie 3115-01-0R5
C-206	Same as C-101
C-207	Same as C-101
C-208	CAPACITOR: Ceramic, trimmer, 1-6 μμf, 500V, Centralab 829-6
C-209	CAPACITOR: Ceramic, trimmer, 1-3.8 μμf, 500V, Centralab 829-6
C-210	CAPACITOR: Ceramic, 10 μμf ±10%, 500V, Erie NPO-A
C-211	CAPACITOR: Ceramic, 1.0 μμf, ±.1 μμf, 500V, Erie NPO-A
C-212	CAPACITOR: Ceramic, 8.2 μμf ±.5 μμf, 500V, Erie NPO-A
C-213	Same as C-208
C-214	CAPACITOR: Ceramic, 6.2 μμf ±.25 μμf, 500V, Erie NPO-A
C-215	CAPACITOR: Ceramic, 5.1 μμf ±.25 μμf, 500V, Erie NPO-A
C-216	Same as C-203
C-217	Same as C-201
C-218	Same as C-201
C-219	Same as C-118
C-220	Same as C-212, except part of T-201. Not separately replaceable.
C-221	CAPACITOR: Ceramic, 2.0 μμf ±.1 μμf, 500V, Erie NPO-A
C-222	Same as C-221
C-223	CAPACITOR: Ceramic, 15 μμf ±10%, 500V, Part of T-202. Not separately replaceable.
C-224	CAPACITOR: Ceramic, feed-thru, 1000 μμf, GMV, 500V, Sprague 514C1
C-225	Same as C-224
C-226	Same as C-224
C-227	Same as C-118
C-228	Same as C-201
C-229	Same as C-201
C-230	Same as C-201
C-301	CAPACITOR: Ceramic, 4700 μμf, GMV, 500V, Sprague 20C8
C-302	Same as C-301
C-303	Same as C-301
C-304	Same as C-212, except part of T-301. Not separately replaceable.
C-305	Same as C-221
C-306	Same as C-221

SYMBOL	DESCRIPTION AND MANUFACTURER
C-307	CAPACITOR: Ceramic, 39 µµf ±5%, 500V. Not separately replaceable.
C-308	Same as C-301
C-309	Same as C-301
C-310	Same as C-301
C-311	Same as C-301
C-312	Same as C-212, except part of T-303. Not separately replaceable.
C-313	Same as C-221
C-314	Same as C-221
C-315	Same as C-307, except part of T-304. Not separately replaceable.
C-316	Same as C-301
C-317	Same as C-301
C-318	Same as C-301
C-319	Same as C-301
C-320	Same as C-212, except part of T-303. Not separately replaceable.
C-321	Same as C-221
C-322	Same as C-221
C-323	Same as C-307, except part of T-306. Not separately replaceable.
C-324	Same as C-301
C-325	Same as C-301
C-326	Same as C-301
C-327	Same as C-301
C-328	Same as C-210
C-329	CAPACITOR: Ceramic, 47 µµf ±10%, 500V, Erie NPO-T
C-330	CAPACITOR: Ceramic, .002 µµf ±10%, 500V, Erie HA-801
C-331	Same as C-301
C-332	CAPACITOR: Ceramic, 33 µµf ±10%, 500V. Part of T-308. Not separately replaceable.
C-333	CAPACITOR: Ceramic, 22 µµf ±5%, 500V. Part of T-308. Not separately replaceable.
C-334	CAPACITOR: Ceramic, 39 µµf ±5%, 500V, Erie N030-T.
C-335	Same as C-329
C-336	Same as C-224
C-337	Same as C-301
C-338	Same as C-224
C-339	Same as C-301
C-340	Same as C-224
C-341	Same as C-224
C-401	Same as C-205
C-402	Same as C-106
C-403	Same as C-211
C-404	CAPACITOR: Ceramic, 51 µµf ±5%, 500V, Erie NPO-T
C-405	Same as C-123
C-406	Same as C-201
C-407	Same as C-123
C-408	Same as C-224
C-409	Same as C-224
C-410	Same as C-224
C-411	Same as C-224
C-412	Same as C-224
C-413	Same as C-224
C-414	Same as C-301
C-415	Same as C-301
C-416	CAPACITOR: Ceramic, 3.3 µµf ±10%, 500V. Stackpole GA
C-501	CAPACITOR: Ceramic, .5 µµf, 50V, Mallory RF 481
C-502A &B	CAPACITOR: Electrolytic, 40-40 µf, 450V, Cornell-Dubilier BO-450
C-503	CAPACITOR: Paper, .039 µf ±10%, 1000V, Sprague 73P393910
CR-101	SEMICONDUCTOR DEVICE: Raytheon 1N66A
CR-102	Same as CR-101
CR-103	SEMICONDUCTOR DEVICE: Raytheon 1N301
CR-301	Same as CR-101
CR-401	CRYSTAL: Raytheon 1N72
CR-501	SEMICONDUCTOR DEVICE: Rectifier, Sarkes Tarzian 78-D

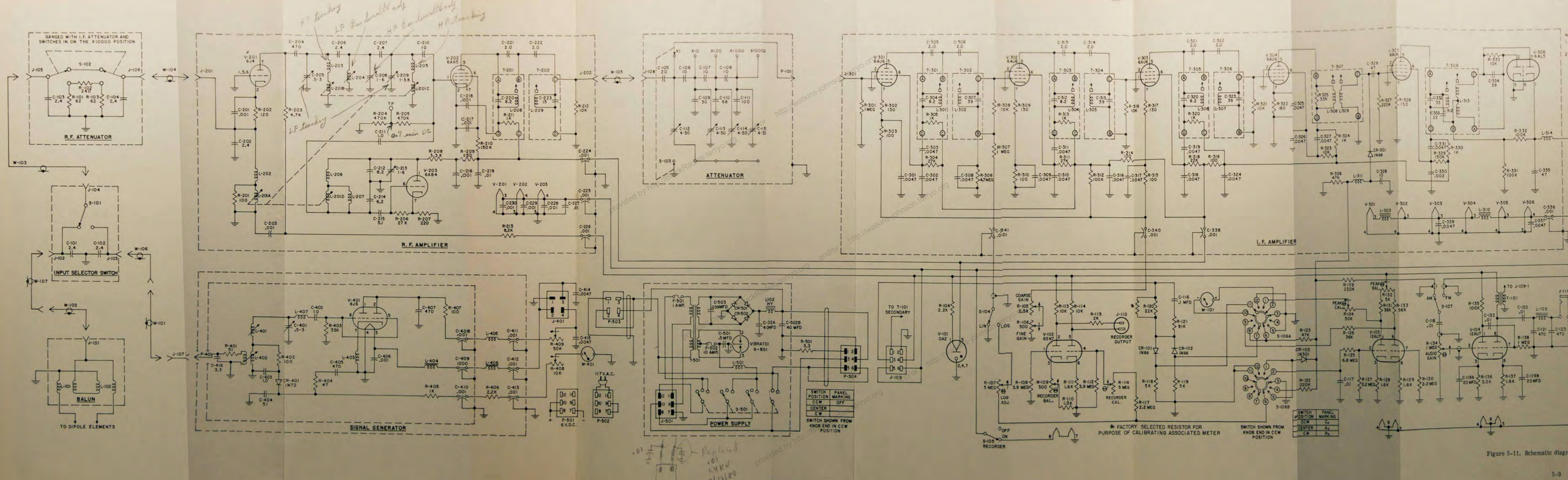
SYMBOL	DESCRIPTION AND MANUFACTURER
CR-502	Same as CR-501
E-601	ATTENUATOR: Nems-Clarke part/dwg no. A-21, 762
E-602	CABLE: Antenna, Nems-Clarke part/dwg no. B-30, 609
E-603	CABLE: Coupling, Nems-Clarke part/dwg no. A-21, 940
E-604	CASE: Carrying, Nems-Clarke part/dwg no. D-50, 303
E-605	DIPOLE: Long, Nems-Clarke part/dwg no. A-21, 525
E-606	DIPOLE: Short, Nems-Clarke part/dwg no. C-40, 267
E-607	MAST: Calibrated section, Nems-Clarke part/dwg no. A-20, 956-B
E-608	MAST: Third section, Nems-Clarke part/dwg no. A-20, 418-C
E-609	MAST: Upper section, Nems-Clarke part/dwg no. C-40, 199
E-610	TRIPOD: Standard senior, Quick-Set SS3-2080
E-611	T-ADAPTOR: Antenna support, Nems-Clarke part/dwg no. A-21, 547
F-501	FUSE: 1 amp, 4AG Bussman AGS
F-502	FUSE: 10 amp, 4AG Bussman AGS
G-501	VIBRATOR: Mallory 825C
J-101	CONNECTOR: Receptacle, type no. UG535/U
J-102	Same as J-101
J-103	CONNECTOR: Receptacle, type no. UG928/U
J-104	Same as J-101
J-105	Same as J-103
J-106	Same as J-103
J-107	CONNECTOR: Receptacle, type no. UG30/U
J-108	Same as J-101
J-109	CONNECTOR: Receptacle, Cinch Jones P-306-AB
J-110	CONNECTOR: Receptacle, Cinch Jones S-202-B
J-111	CONNECTOR: Receptacle, Mallory A2A
J-201	CONNECTOR: Receptacle, type no. UG1094/U
J-202	CONNECTOR: Receptacle, type no. UG1098/U
J-301	Same as J-202
J-401	CONNECTOR: Plug, Cinch Jones P-304AB
J-501	CONNECTOR: Plug, Cinch Jones P-2406-DB
L-101	COIL: RCA 73591
L-102	Same as L-101
L-103	COIL: Nems-Clarke part/dwg no. A-14, 805
L-201 A, B, C, D	INDUCTUNER: VHF, Mallory # 8304
L-202	INDUCTANCE: # 14 Bus wire
L-203	INDUCTANCE: Copper strip, .010 thick, x 1/8 wide
L-204	COIL: Nems-Clarke part/dwg no. A-21, 386
L-205	INDUCTANCE: # 20 Bus wire
L-206	Same as L-205
L-207	COIL: Nems-Clarke part/dwg no. A-16, 174
L-208	COIL: Part of T-201. Not separately replaceable.
L-209	COIL: Part of T-202. Not separately replaceable.
L-301	COIL: Part of T-301. Not separately replaceable.
L-302	COIL: Part of T-302. Not separately replaceable.
L-303	COIL: Nems-Clarke part/dwg no. A-16, 563
L-304	COIL: Part of T-303. Not separately replaceable.
L-305	COIL: Part of T-304. Not separately replaceable.
L-306	COIL: Part of T-305. Not separately replaceable.
L-307	COIL: Part of T-306. Not separately replaceable.
L-308	COIL: Part of T-307. Not separately replaceable.
L-309	COIL: Part of T-307. Not separately replaceable.
L-310	Same as L-303
L-311	COIL: Nems-Clarke part/dwg no. A-14, 804
L-312	COIL: Part of T-308. Not separately replaceable.
L-313	COIL: Part of T-308. Not separately replaceable.
L-314	Same as L-311
L-401	COIL: Mallory S-1 per part/dwg no. 600517-1, modified Nems-Clarke part/dwg no. B-13, 815

SYMBOL	DESCRIPTION AND MANUFACTURER
L-402	COIL: Nems-Clarke part/dwg no. A-21, 385
L-403	CHOKE: Nems-Clarke part/dwg no. A-15, 042
L-404	CHOKE: Nems-Clarke part/dwg no. A-14, 805
L-405	Same as L-404
L-406	Same as L-404
L-407	COUPLING ANTENNA: Nems-Clarke part/dwg A-21, 224
L-501	COIL: Filter, J. Fast A3779BA
L-502	COIL: Choke, 8 hy, Stancor C-1709
M-101	METER: Marion, #55 per Nems-Clarke part/dwg no. B-15, 401
M-401	METER: Marion, #52S per Nems-Clarke part/dwg no. A-21, 274
P-101	CONNECTOR: Plug, type no. UG-260/U
P-401	CONNECTOR: Plug, type no. UG-536/U
P-501	CONNECTOR: Cinch Jones S-406CCT
P-502	Same as P-501
P-503	CONNECTOR: Plug, Cinch Jones S-304CCT
P-504	CONNECTOR: Plug, Cinch Jones S-306CCT
R-101	RESISTOR: Fixed composition, 62 μμf ±1%, part of S-102. Not separately replaceable.
R-102	RESISTOR: Fixed composition, 240 μμf ±1%, part of S-102. Not separately replaceable.
R-103	Same as R-101
R-104	RESISTOR: Fixed wirewound, 2.2K ±3%, 25W, Dalohm RH-25
R-105	RESISTOR: Variable composition, 2.5K ±10%, 2W, Allen Bradley JA1N200P252UA
R-106	RESISTOR: Variable composition, 500 Ω ±10%, 2W, Allen Bradley JA1N200P501UA
R-107	RESISTOR: Variable composition, 5 meg ±20%, 2W, Allen Bradley JA1L040S505MC
R-108	RESISTOR: Fixed composition, 3.9 meg ±10%, 1/2W, Allen Bradley EB-3951
R-109	RESISTOR: Variable composition, 500 Ω ±10%, 2W, Allen Bradley JA1L040S501UC
R-110	RESISTOR: Fixed composition, 1.3K ±5%, 1/2W, Allen Bradley EB-1325
R-111	RESISTOR: Fixed composition, 1.6K ±5%, 1/2W, Allen Bradley EB-1625
R-112	Same as R-108
R-113	RESISTOR: Fixed composition, 10K ±5%, 1W, Allen Bradley GB-1035
R-114	Same as R-113
R-115	RESISTOR: Fixed composition, 2K ±5%, 1/2W, Allen Bradley EB-2025
R-116	Same as R-107
R-117	RESISTOR: Fixed composition, 2.2 meg ±10%, 1/2W, Allen Bradley EB-2251
R-118	RESISTOR: Fixed carbon, 5K ±1% 1/2W, Aerovox CP-1/2
R-119	Same as R-118
R-120	RESISTOR: Fixed composition, 22K ±5%, 1/2W, Allen Bradley EB-2235
R-121	RESISTOR: Fixed composition, 91K ±5%, 1/2W, Allen Bradley EB-9135
R-122	RESISTOR: Fixed composition, 220K ±10%, 1/2W, Allen Bradley EB-2241
R-123	RESISTOR: Fixed composition, 47K ±5%, 1/2W, Allen Bradley EB-4735
R-124	RESISTOR: Variable composition, 50K ±10%, 2W, Allen Bradley JA1L040S503UC
R-125	RESISTOR: Fixed composition, 6.8 meg ±10%, 1/2W, Allen Bradley EB-6851
R-126	RESISTOR: Fixed composition, 36K ±5%, 1/2W, Allen Bradley EB-3635
R-127	Same as R-117
R-128	Same as R-111
R-129	Same as R-111
R-130	Same as R-117
R-131	Same as R-126
R-132	RESISTOR: Variable composition, 5K ±10%, 2W, Allen Bradley JA1L040S502UC
R-133	Same as R-126
R-134	RESISTOR: Variable composition, 1 meg ±10%, 2W, Allen Bradley JS1N200P105RA
R-135	RESISTOR: Fixed composition, 100K ±10%, 1/2W, Allen Bradley EB-1031
R-136	RESISTOR: Fixed composition, 3.3K ±10%, 1/2W, Allen Bradley EB-3321
R-137	Same as R-111
R-138	RESISTOR: Fixed composition, 1 meg ±10%, 1/2W, Allen Bradley EB-1051
R-139	Same as R-122
R-201	RESISTOR: Fixed composition, 100 Ω ±5%, 1/2W, Allen Bradley EB-1015
R-202	RESISTOR: Fixed composition, 120 Ω ±5%, 1/2W, Allen Bradley EB-1215
R-203	RESISTOR: Fixed composition, 4.7K ±5%, 1W, Allen Bradley GB-4725
R-204	RESISTOR: Fixed composition, 470K ±10%, 1/2W, Allen Bradley EB-4741

SYMBOL	DESCRIPTION AND MANUFACTURER
R-205	Same as R-204
R-206	RESISTOR: Fixed composition, 27K ±5%, 1/2W, Allen Bradley EB-2735
R-207	RESISTOR: Fixed composition, 220 Ω ±5%, 1/2W, Allen Bradley EB-2215
R-208	RESISTOR: Fixed composition, 3.3K ±5%, 1/2W, Allen Bradley EB-3325
R-209	RESISTOR: Fixed composition, 150 Ω ±10%, 1/2W, Allen Bradley EB-1511
R-210	RESISTOR: Fixed composition, 150K ±10%, 1/2W, Allen Bradley EB-1541
R-211	RESISTOR: Fixed composition, 1K, ±10%, 1/2W, Part of T-201. Not separately replaceable.
R-212	RESISTOR: Fixed composition, 10K ±5%, 1/2W, Allen Bradley EB-1035
R-213	RESISTOR: Fixed composition, 8.2K ±5%, 2W, Allen Bradley HB-8225
R-301	Same as R-138
R-302	RESISTOR: Fixed composition, 130 Ω ±5%, 1/2W, Allen Bradley EB-1315
R-303	Same as R-201
R-304	RESISTOR: Fixed composition, 27K ±10%, 1/2W, Allen Bradley EB-2731
R-305	Same as R-211, except part of T-301. Not separately replaceable.
R-306	RESISTOR: Fixed composition, 4.7 meg ±10%, 1/2W, Allen Bradley EB-4751
R-307	Same as R-138
R-308	Same as R-212
R-309	Same as R-302
R-310	Same as R-201
R-311	Same as R-304
R-312	RESISTOR: Fixed composition, 100K ±5%, 1/2W, Allen Bradley EB-1045
R-313	Same as R-211, except part of T-303. Not separately replaceable.
R-314	RESISTOR: Fixed composition, 100 Ω ±10%, 1/2W, Allen Bradley EB-1011
R-315	Same as R-201
R-316	Same as R-212
R-317	Same as R-302
R-318	RESISTOR: Fixed composition, 22K ±10%, 1/2W, Allen Bradley EB-2231
R-319	Same as R-314
R-320	Same as R-211, except part of T-305. Not separately replaceable.
R-321	Same as R-212
R-322	RESISTOR: Fixed composition, 180 Ω ±5%, 1/2W, Allen Bradley EB-1815
R-323	Same as R-212
R-324	RESISTOR: Fixed composition, 1K ±10%, 1/2W, Allen Bradley EB-1021
R-325	RESISTOR: Fixed composition, 33K ±5%, 1/2W. Part of T-307. Not separately replaceable.
R-326	Same as R-123
R-327	Same as R-122
R-328	RESISTOR: Fixed composition, 150 Ω ±5%, 1/2W, Allen Bradley EB-1515
R-329	Same as R-210
R-330	Same as R-324
R-331	Same as R-312
R-332	Same as R-312
R-333	Same as R-212
R-401	RESISTOR: Fixed composition, 51 Ω ±5%, 1/2W, Allen Bradley EB-5105
R-402	Same as R-201
R-403	RESISTOR: Fixed composition, 33K ±5%, 1/2W, Allen Bradley EB-3335
R-404	RESISTOR: Fixed composition, 47 Ω ±5%, 1/2W, Allen Bradley EB-4705
R-405	RESISTOR: Fixed composition, 1K ±5%, 1/2W, Allen Bradley EB-1025
R-406	RESISTOR: Fixed composition, 2.2K ±5%, 1/2W, Allen Bradley EB-2225
R-407	Same as R-201
R-408	RESISTOR: Variable composition, 10K ±10%, 2W, Allen Bradley JA1L040S103UC
R-409	RESISTOR: Variable composition, 50K ±10%, 2W, Allen Bradley JAIN200P503UA
R-501	RESISTOR: Fixed composition, 3.3 Ω ±10%, 1W, Allen Bradley type GB-33G1
S-101	SWITCH: SPST, Centralab 1460 modified by Nems-Clarke A-11,979
S-102	SWITCH: 20 db section of Daven RF Attenuator 50 Ω, 2%, type spec. 2786, Shop modify per A-11,978

SYMBOL	DESCRIPTION AND MANUFACTURER
S-103	SWITCH: Wafer, 3 section; 3 Centralab type "Y" wafers coaxially mounted; section "A" per Nems-Clarke dwg. no. A-20,916; section "B" per Nems-Clarke dwg no. A-20,915; section "C" per Nems-Clarke dwg no. A-20,914.
S-104	SWITCH: Toggle, SPDT, Cutter-Hammer 8282K14
S-105	Same as S-104
S-106	SWITCH: Rotary, Nems-Clarke part/dwg no. A-16,066 meter function
S-107	Same as S-104
S-501	SWITCH: Rotary, Mallory 3143J
T-101	TRANSFORMER: Audio output, Merit A-2934
T-201	TRANSFORMER: IF, Nems-Clarke part/dwg no. AB-14,797
T-202	TRANSFORMER: IF, Nems-Clarke part/dwg no. AB-16,181
T-301	Same as T-201
T-302	TRANSFORMER: IF, Nems-Clarke part/dwg. no. AB-14,793
T-303	Same as T-201
T-304	Same as T-302
T-305	Same as T-201
T-306	Same as T-302
T-307	TRANSFORMER: IF, Nems-Clarke part/dwg no. AB-16,180
T-308	TRANSFORMER: IF, Nems-Clarke part/dwg no. AB-14,976
T-501	TRANSFORMER: Power, Airdesign P60864 per Nems-Clarke part/dwg no. B-11,682
V-101	TUBE: Electron, 0A2
V-102	TUBE: Electron, 6SN7GTB
V-103	TUBE: Electron, 12AU7
V-104	Same as V-103
V-201	TUBE: Electron, 6J4
V-202	TUBE: Electron, 6AK5
V-203	TUBE: Electron, 6AB4
V-301	TUBE: Electron, 6AU6
V-302	Same as V-301
V-303	Same as V-301
V-304	Same as V-301
V-305	Same as V-301
V-306	TUBE: Electron, 6AL5
V-401	TUBE: Electron, 6J6
W-101	CABLE ASSEMBLY: per Nems-Clarke B-16,219-1
W-102	CABLE ASSEMBLY: per Nems-Clarke B-16,219-8
W-103	CABLE ASSEMBLY: per Nems-Clarke B-16,219-3
W-104	CABLE ASSEMBLY: per Nems-Clarke B-16,219-4
W-105	CABLE ASSEMBLY: per Nems-Clarke B-16,219-5
W-106	CABLE ASSEMBLY: per Nems-Clarke B-16,219-6
W-107	CABLE ASSEMBLY: per Nems-Clarke B-16,219-7
XCR-401	HOLDER: Crystal, Grayhill 17YY-1001
XF-501	FUSEHOLDER: Bussman HCM
XF-502	Same as XF-501
XG-501	SOCKET: Vibrator, Amphenol 77-M1P4
XV-101	SOCKET: Electron tube, Elco BR-151-BC
XV-102	SOCKET: Electron tube, TS101P01
XV-103	SOCKET: Electron tube, Elco BR-283-BC
XV-104	Same as XV-103
XV-201	SOCKET: Electron tube, Mycalex 70A115
XV-202	Same as XV-201
XV-203	Same as XV-201
XV-301	Same as XV-101
XV-302	Same as XV-101
XV-303	Same as XV-101
XV-304	Same as XV-101
XV-305	Same as XV-101
XV-306	Same as XV-101
XV-401	Same as XV-201

SYMBOL	DESCRIPTION AND MANUFACTURER
	AC LINE CORD: Cornish 3530, 10 feet BATTERY POWER CABLE: Alpha # 1957 type S CABLE: 4 conductor, Alpha # 1246 CABLE: 6 conductor, Alpha # 1247/6 TUBE SHIELD: TS-102U03, for V-101 TUBE SHIELD: TS-103U02, for V-103 TUBE SHIELD: TS-103U02, for V-104 TUBE SHIELD: TS-102U02, for V-201 TUBE SHIELD: TS-102U01, for V-202 TUBE SHIELD: TS-102U02, for V-203 TUBE SHIELD: TS-102U02, for V-301 TUBE SHIELD: TS-102U02, for V-302 TUBE SHIELD: TS-102U02, for V-303 TUBE SHIELD: TS-102U02, for V-304 TUBE SHIELD: TS-102U02, for V-305 TUBE SHIELD: TS-102U01, for V-306 TUBE SHIELD ASSEMBLY: 1 base, T5-1001; 1 shield, T5-1020, 1 ring, T5-1005; International Electronic Research Corp. VIBRATOR CLAMP: Mallory GC-7



NOTES:
1. RESISTOR VALUES ARE MEASURED IN OHMS.
2. CAPACITOR VALUES LESS THAN 1 ARE MEASURED IN MICROFARADS.

Figure 5-11. Schematic diagram, 107A RF Test Set.