NAVSHIPS 0967-006-5000

INSTRUCTION BOOK

for

RF SIGNAL GENERATOR SET AN/URM-26B

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

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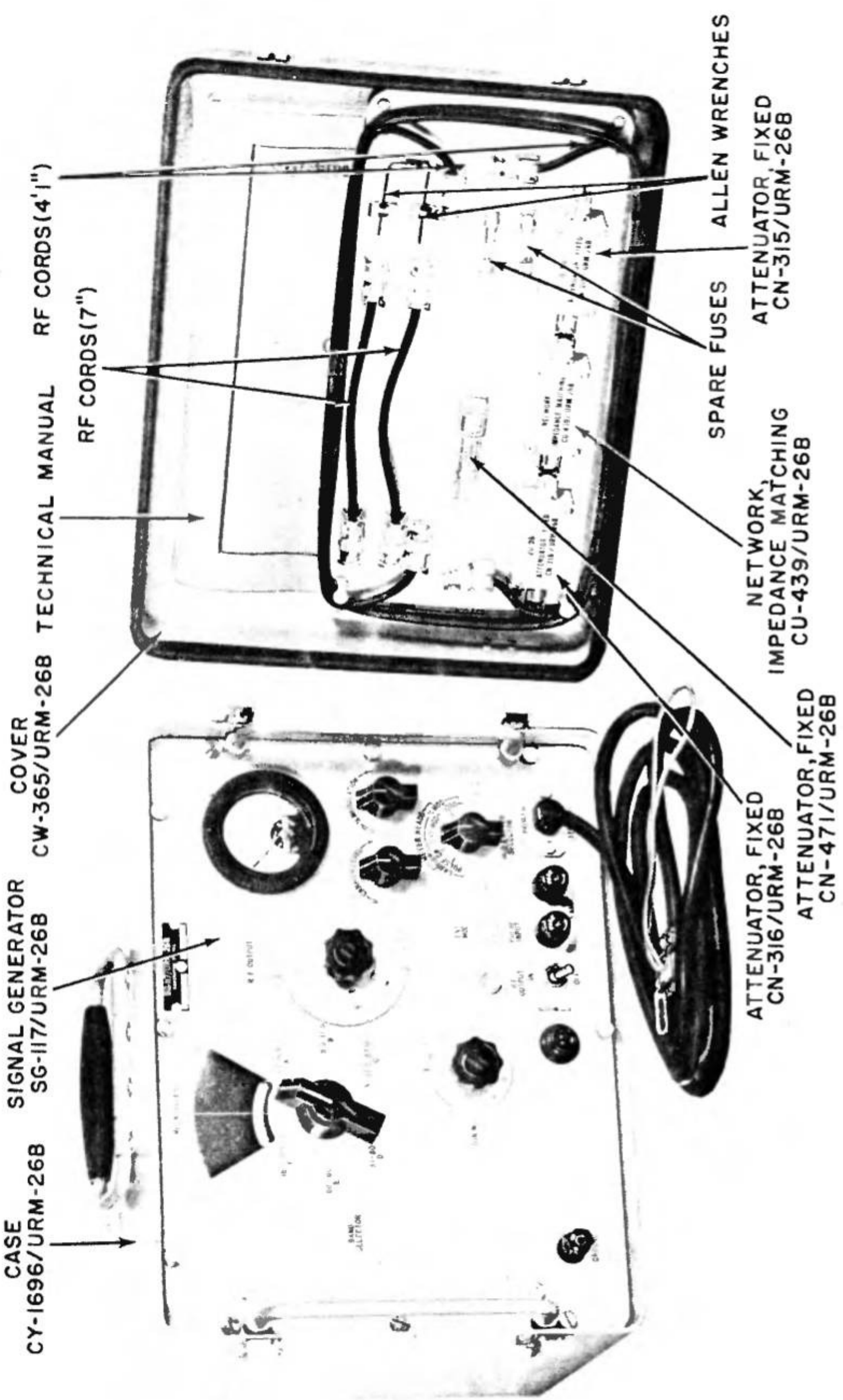


Figure 1-1. RF Signal Generator Set AN/URM-26B, Complete Equipment.

SECTION 1
GENERAL INFORMATION

1-1. SCOPE.

This instruction book contains descriptive material and instructions for operation and maintenance of RF Signal Generator Set AN/URM-26B as manufactured by Winslow Tele-Tronics, Inc., on Contract N00039-69-C-2597. Coverage includes complete information regarding operation, repair, calibration and adjustment of the equipment as well as a detailed explanation of its theory of operation. A complete list of replaceable parts is contained in Section 7.

1-2. PURPOSE AND BASIC PRINCIPLES.

a. RF Signal Generator Set AN/URM-26B is a portable test equipment intended for bench testing of electronic equipment. Its most general use is for alignment and determination of receiver sensitivity, selectivity and gain. Radio frequency (rf) signals generated by this set range from 4 megacycles (mc) to 405 mc continuous wave (cw) or amplitude modulated (am) internally at 400 or 1000 cycles-per-second (cps or cycles) sine wave. Facilities are provided for external modulation by sine waves or pulses.

b. The AN/URM-26B is self-contained in a combination case and cover. It operates from a source of 103 to 126 volts, 50 to 1000 cycles, single phase alternating current (ac).

c. The complete equipment consists of the following components:

(1)	Signal Generator	SG-117/URM-26B
(2)	Power Supply	PP-1215/URM-26B
(3)	Signal Generator Case	CY-1696/URM-26B
(4)	Signal Generator Cover	CW-365/URM-26B
(5)	Impedance Matching Network	CU-439/URM-26B
(6)	Fixed Attenuator	CN-315/URM-26B (6db)
(7)	Fixed Attenuator	CN-316/URM-26B (20db)
(8)	Cord, RF, 4'-1" long	(2 each)
(9)	Cord, RF, 7" long	(2 each)
(10)	Fixed Attenuator	CN-471/URM-26B
(11)	Connector Adapter	UG-201A/U
(12)	Connector Adapter	UG-255/U
(13)	Connector Adapter	UG-605/U
(14)	Wrench for #6 Allen Set Screw	
(15)	Wrench for #8 Allen Set Screw	

1-3. DETAILED DESCRIPTION.

a. Signal Generator SG-117 URM-26B and Power Supply PP-1215/URM-26B are contained within Case CY-1696/URM-26B. All controls, connectors, fuses and the meter of the signal generator are located on the front panel, and are clearly marked for identification by black engraved characters against the grey finish background. Two handles, one on each side of the front panel, serve to facilitate the removal of the signal generator from its case and to protect the panel fixtures from damage. The case has four spring hasps that permit the complete removal of the protective Cover CW-365/URM-26B. The cover includes a plate having spring clips in which the smaller components of the test set are mounted. The cords (rf cables), Allen wrenches and instruction book also are stored in the cover. (See figure 1-1.) Internally the signal generator consists of three major subassemblies:

(1) The radio frequency circuitry which is housed in a rugged cast aluminum shield, and includes the rf oscillator circuit, the waveguide below-cuttoff (piston-type) attenuator, and the filter networks which prevent the appearance of rf current in the external circuit wiring.

(2) The audio modulating and metering circuits that are part of a subassembly mounted on the front panel.

(3) The power supply which is built into a sub-chassis assembly bolted in position in the case. Its input and output are connected to the signal generator by a detachable plug and a short length of cable.

b. The overall dimensions and weight of the equipment are listed in table 1-1.

c. Signal Generator SG-117/URM-26B consists basically of a variable frequency rf oscillator covering the frequency range from 4 to 405 mc in 6 bands. The modulation, metering and adjustment of its rf output are accomplished through the use of auxiliary circuits. A master control switch, marked MOD & METER SELECTOR, selects the various functions of the signal generator and switches the panel meter. The rf output frequency is varied with a calibrated direct-reading dial having a vernier scale. The rf output voltage level is standardized at a red line on the panel meter and varied by a waveguide-below-cutoff (piston-type) attenuator having a direct reading calibrated dial. A modulator stage applies sine wave modulation from an internal audio oscillator, or from an external source, to the rf oscillator, depending on the setting of the MOD & METER switch. The degree of audio modulation is indicated on the panel meter % MODULATION scale. Modulating signal at either 400 or 1000 cycles is available from the internal audio oscillator. Modulation signals with frequencies up to 20,000 cycles may be applied from the external source. When external pulse modulation is applied, the amplitude of the pulse must be at least 40 volts peak value, positive-going. The pulse duration can be between 2 and 40 microseconds (μsec) at frequencies up to 100 mc and between 1 and 40 μsec from 100 mc to 405 mc.

d. Power Supply PP-1215/URM-26B furnishes 180 volts unregulated high voltage direct current (dc) for the operation of non-critical circuits of the signal generator, plus 210 volts regulated to the rf oscillator and other critical circuits, and 6.3 volts ac for the heaters of all electron tubes. The power supply uses a conventional power transformer, full-wave rectifier circuit, well filtered to minimize ripple content. The ac power input circuit to the power supply through 3-prong power plug P102 through front instrument panel has an rf filter network which prevents stray rf current from appearing in the power line.

e. Impedance Matching Network CU-439/URM-26B (see figure 6-13) is a coaxial 51 ohm resistive shunt used to terminate the rf output of the signal generator when working into relatively high impedance loads. It is designed to have a very low voltage standing wave ratio so that it can be inserted into the circuit with a minimum of disturbance. The UG-1094/U coaxial type BNC connectors on each end mate with BNC plugs of rf cords supplied.

f. Fixed Attenuator CN-315/URM-26B (see figure 6-14) is designed to provide 6db attenuation (2:1 voltage ratio) when terminated in 50 ohms impedance. Each end has a type UG-1094/U BNC coaxial connector to facilitate the connection of rf cords supplied.

g. Fixed Attenuator CN-316/URM-26B (see figure 6-15) is designed to provide 20db attenuation (10:1 voltage ratio) when terminated in 50 ohms impedance. Each end has a type UG-1094/U BNC coaxial connector to facilitate connection of rf cords supplied. The input impedance to the fixed attenuators and impedance adapter is 50 ohms.

h. The coaxial rf cords supplied (see figure 1-1) are used in making connections between the signal generator output and the equipment being tested, and to facilitate the insertion of the impedance adapter and fixed attenuators. Two cords, four feet long and two cords seven inches long are supplied. These cords are terminated at each end in type UG-88/U coaxial connectors.

i. Fixed Attenuator CN-471/URM-26B provides 10:1 attenuation when terminated in 70 ohms. The input impedance is 50 ohms. One end is terminated in a female BNC connector receptacle and the other end in a type N connector plug.

j. Connector Adapter UG-201A/U is used to adapt type N female to type BNC male connectors. Connector Adapter UG-255/U is used to adapt type BNC female to type UHF connectors.

1-4. REFERENCE DATA.

a. NOMENCLATURE. – RF Signal Generator Set AN/URM-26B.

b. CONTRACT. – N00039-69-C-2597

c. CONTRACTOR. – Winslow Tele-Tronics, Inc., Eatontown, N.J.

d. COGNIZANT NAVAL INSPECTOR. – Inspector of Navy Materials; Newark, New Jersey.

e. NUMBER OF PACKAGES PER SHIPMENT. – One

f. TOTAL CUBICAL CONTENTS. – See table 1-1.

g. TOTAL WEIGHT. – See table 1-1.

h. FREQUENCY RANGE. – 4 mc to 405 mc. Calibration accuracy ± 0.5%.

i. TUNING BANDS AND RANGES.

(1) 4.0 to 8.5 mc	BAND A
(2) 8.5 to 17.5 mc	BAND B
(3) 17.5 to 37.0 mc	BAND C
(4) 37 to 80 mc	BAND D
(5) 80 to 180 mc	BAND E
(6) 180 to 405 mc	BAND F

j. TYPES OF MODULATION.

(1) Sine wave AM; 0 to 50%.

(a) Internal modulation, 400 or 1000 cps, ±5%.
(b) External modulation, 100 to 20,000 cps.
(c) Input impedance, approximately 5000 ohms at 1000 cps.

(2) External pulse modulation.

(a) Minimum pulse amplitude – 40 volts, positive-going.
(b) Pulse repetition rate – 50 to 5000 pulses per second.
(c) Pulse duration – 2 to 40 μsec up to 100 mc; 1 to 40 μsec from 100 mc to 405 mc.
(d) Input impedance, nominally 70 ohms at pulse frequencies specified.

TABLE 1-1. RF SIGNAL GENERATOR SET AN/URM-26B, EQUIPMENT SUPPLIED

QUANT. PER EQUIP.	NOMENCLATURE		* OVERALL DIMENSIONS			*VOLUME	*WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	RF Signal Generator Set	AN/URM-26B	11-½	14-½	10-¾	1793	31
1	Case	CY-1696/URM-26B					
1	Signal Generator	SG-117/URM-26B					
1	Power Supply	PP-1215/URM-26B					
1	Signal Generator Cover	CW-365/URM-26B					
2	Cord, RF, 4'-1"						
2	Cord, RF, 7"						
1	Impedance Matching Network	CU-439/URM-26B					
1	Fixed Attenuator	CN-315/URM-26B					
1	Fixed Attenuator	CN-316/URM-26B					
1	Fixed Attenuator	CN-471/URM-26B					
1	Connector Adaptor	UG-201A/U					
1	Connector Adaptor	UG-255/U					
1	Connector Adaptor	UG-605/U					
2	Instruction Book						
2	Fuse						
1	Allen Wrench No. 6						
1	Allen Wrench No. 8						
	Spares						

* Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

k. RF OUTPUT VOLTAGES. – From 0.1 to 100,000 microvolts (μv) ±10% up to 100 mc; ±20% up to 405 mc, terminated in 50 ohms.

l. POWER SUPPLY PP-1215/URM-26B REQUIREMENTS.

(1) SOURCE VOLTAGE: 115 volts ac ±10%.

(2) FREQUENCY: 50 to 1000 cps.

(3) PHASE: Single.

m. POWER CONSUMPTION: 38 watts (approx.).

1-5. EQUIPMENT SIMILARITIES.

The overall function of RF Signal Generator Set AN/URM-26B is similar to that of preceding models. It incorporates, however, completely different mechanical and electrical designs. The details of these differences are so numerous that nothing can be gained through comparison with previous models.

1-6. ELECTRON TUBE, CRYSTAL DIODE, FUSE AND INDICATOR LAMP COMPLEMENT.

The applications and types of electron tubes, crystal diodes, fuses, and indicator lamps, together with their locations are listed in table 1-2.

TABLE 1-2. ELECTRON TUBE, CRYSTAL DIODE, FUSE AND INDICATOR LAMP COMPLEMENT

APPLICATION	TYPE DESIGNATION	REFERENCE SYMBOL	LOCATION
	ELECTRON TUBES		
Audio Oscillator	5814A	V101	Audio Subassembly
Modulator	6005/6AQ5W	V102	Audio Subassembly
RF Oscillator	5675	V103	Oscillator Compartment
Pulse Limiter	5726/6AL5W	V104	Audio Subassembly
B+ Full-Wave Rectifier	6X4WA	V201	Power Supply PP-1215/URM-26B
Voltage Regulators	OB2WA	V202, V203	Power Supply PP-1215/URM-26B
	CRYSTAL DIODES		
% Modulation Voltmeter	1N69A	CR101	Audio Attenuator Subassembly
Anti-fm diode	1N82A	CR102	Oscillator Compartment
RF Level Voltmeter	1N82A	CR103	Output Attenuator Subassembly
	FUSES		
Power Line Fuses	MDL-½ F02GR500B	F101, F102	Front Panel
	PILOT LAMPS		
Power Pilot Lamp	NE-51	I101	Front Panel

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL.

a. It is the purpose of the OPERATOR'S SECTION to instruct personnel in the use of RF Signal Generator Set AN/URM-26B as a test instrument. To become thoroughly familiar with the method of operation it is suggested that both Section 4, PRINCIPLES OF OPERATION, and this section be studied carefully.

b. In the development of this section, an attempt has been made to present each step in the logical sequence necessary to place the equipment in operation. If these steps are carefully followed, the operator will avoid damaging the signal generator and will be assured of a correct interpretation of the data indicated by the instrument. Table 3-1 is an operational summary of all front panel controls and connectors.

TABLE 3-1. OPERATIONAL SUMMARY OF FRONT PANEL CONTROLS (See figure 6-1)

REFERENCE SYMBOL	PANEL DESIGNATION	FUNCTION
S102	BAND SELECTOR switch	Selects desired frequency band.
	MEGACYCLES dial	Indicates Output frequency
C122	TUNING dial	Selects desired frequency.
M101	Meter	Indicates rf level (upper scale), and percentage of carrier modulation (lower scale).
AT101	RF OUTPUT attenuator	50 ohm waveguide-below-cutoff (piston type) variable attenuator; adjusts rf output.
R119	CARRIER LEVEL control	In CARRIER division of MOD and METER SELECTOR switch, sets carrier amplitude to standard level indicated by red line on meter M101.
R113	% MODULATION control	Adjust degree of carrier modulation indicated on meter M101 when MOD and METER SELECTOR switch is under % MOD sector.
S101	MOD and METER SELECTOR switch	Selects the source of modulating voltage and modulating circuits of the signal generator, and also switches the function of meter M101.
J101	RF OUTPUT jack	RF output.
J103	EXT MOD PULSE INPUT jack	Input terminal for external modulation. Switched in function by MOD & METER SELECTOR switch.
GROUND	GROUND terminal	GROUND connecting point.
S103	POWER switch	Controls primary power 115V ac.
I101	Pilot lamp	Neon power "on" indicator.

c. The essential details of operation and the necessary precautions to be taken are covered in this section under the following paragraph headings:

3-2. POWER CIRCUIT.

a. Before applying power to the signal generator, turn the CARRIER LEVEL and % MODULATION controls completely counterclockwise.

b. Insert the power plug P102 into the 115V ac power source.

c. Turn the POWER switch to the ON position. Line voltage is now applied to the filament and high voltage power supply circuits. The POWER pilot lamp will glow.

d. To permit the instrument to reach a stable operating condition, allow a 15 minute warm-up period before making any further control settings.

3-3. CHECKING THE METER ZERO.

No electrical zeroing of the panel meter is required.

3-4. SETTING THE CARRIER FREQUENCY.
(See figure 6-1)

a. Turn the MOD & METER SELECTOR switch to CW position.

b. Rotate the BAND SELECTOR switch to the required frequency range.

c. Turn the TUNING dial, which is geared to the MEGACYCLES dial, until the desired frequency appears under the double hairline on the MEGACYCLES dial scale. To avoid parallax error, view the MEGACYCLES scale from the perpendicular angle so that the two hairlines appear as one.

d. The tuning dial has a vernier type 0-100 scale used in conjunction with a 0-1000 unmasked logging scale on the main dial for logging frequency, for frequency interpolation when calibrating the signal generator against a crystal controlled standard and for direct reading of the exact frequency.

e. For reading the exact frequency, it is necessary to read both the MEGACYCLES dial and the vernier TUNING dial, interpolating the fractional megacycles as follows: (see figure 3-1.). At "A" the dial reads '6.5 megacycles'. Note the vernier arrow points at '10'. At "B" the dial reads '6.6 megacycles'. Note the vernier arrow points to '30'. As shown in the figure, the difference in frequency is .1 mc, while the difference in tuning dial units is 20 graduations. Thus; 1 graduation is 1/20 of .1 mc, or .005 mc or 5 kilocycles (kc). If it is desired to set the dial at exactly 6.51 mc, the vernier should be set at '12'.

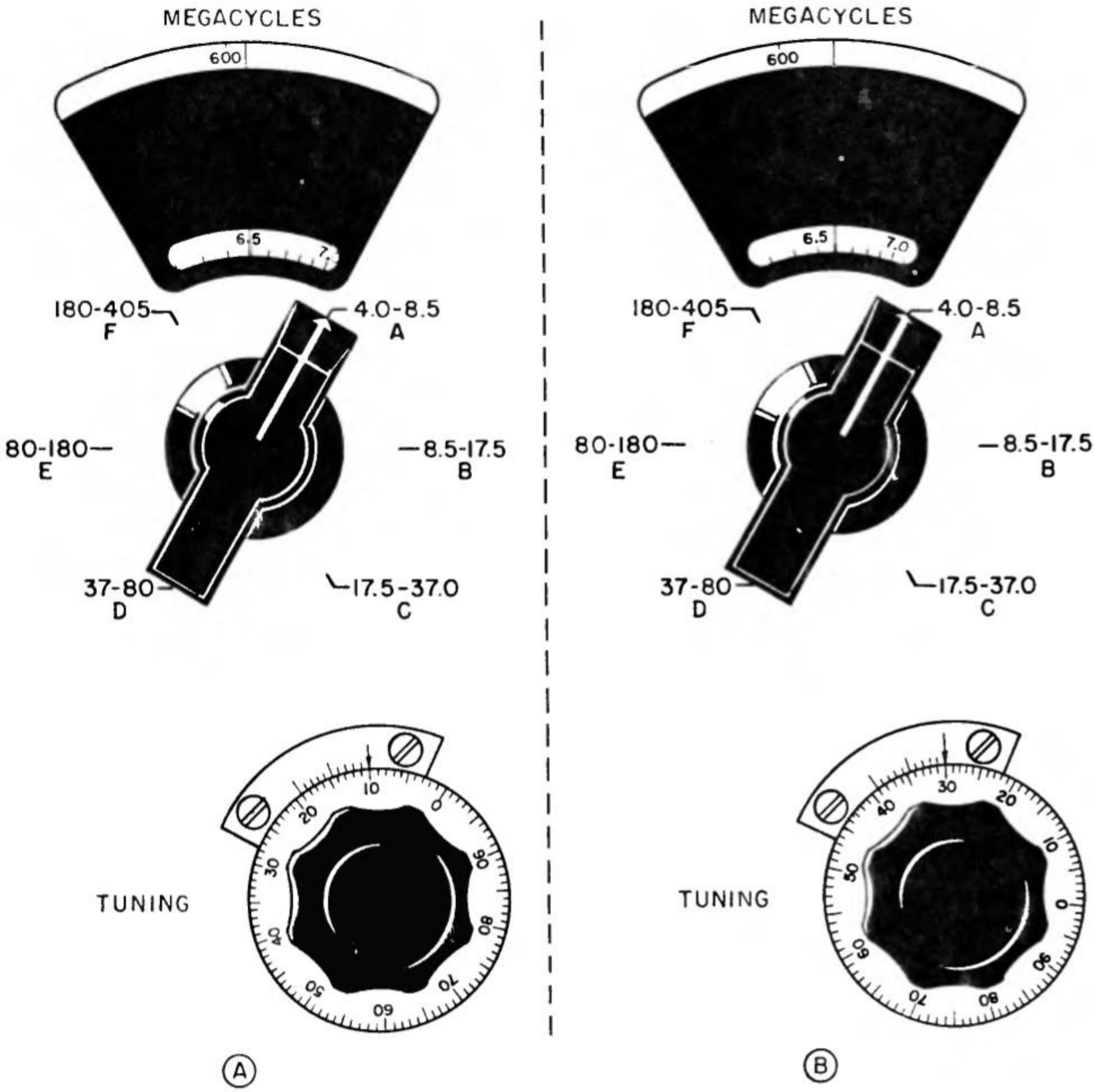
f. For purposes of *logging* a specific frequency, the unmasked logging scale at the top of the MEGACYCLES window is used. See figure 3-2. This reads in even *hundreds* of arbitrary logging units. To record the exact dial setting in the log for future re-setting, record first the whole hundreds as shown at "A", then read the units at the arrow on the tuning dial as shown at "B", finally recording the decimal where a marker on the tuning dial aligns with a marker on the decimal vernier scale, using the marker point after the arrow on the vernier scale as the decimal value as shown at "C".

3-5. ADJUSTING RF OUTPUT VOLTAGE.
(See figure 6-1.)

a. Check that the MOD & METER SELECTOR switch is set to CW position.

b. Advance the CARRIER LEVEL control until the pointer of the panel meter indicates at the red line at the CARRIER LEVEL point. This is the output reference level for all frequencies.

c. Rotate the RF OUTPUT attenuator control until the desired output voltage on the MICROVOLTS scale coincides with the hairline indicator. The voltage indicated



FREQUENCY DIAL		TUNING DIAL
6.6MC	=	30
6.5MC	=	10
0.1 MC	=	20 GRADUATIONS

THEREFORE: BETWEEN 6.5 AND 6.6MC,

EACH TUNING DIAL GRADUATION = $\frac{0.1MC}{20}$ = 0.005MC = 5KC

READ AT ARROW ONLY.

ADD 5KC FOR EACH GRADUATION ABOVE 10 (IN THIS CASE).

Figure 3-1. Diagram Showing Vernier Reading of Frequency Tuning.

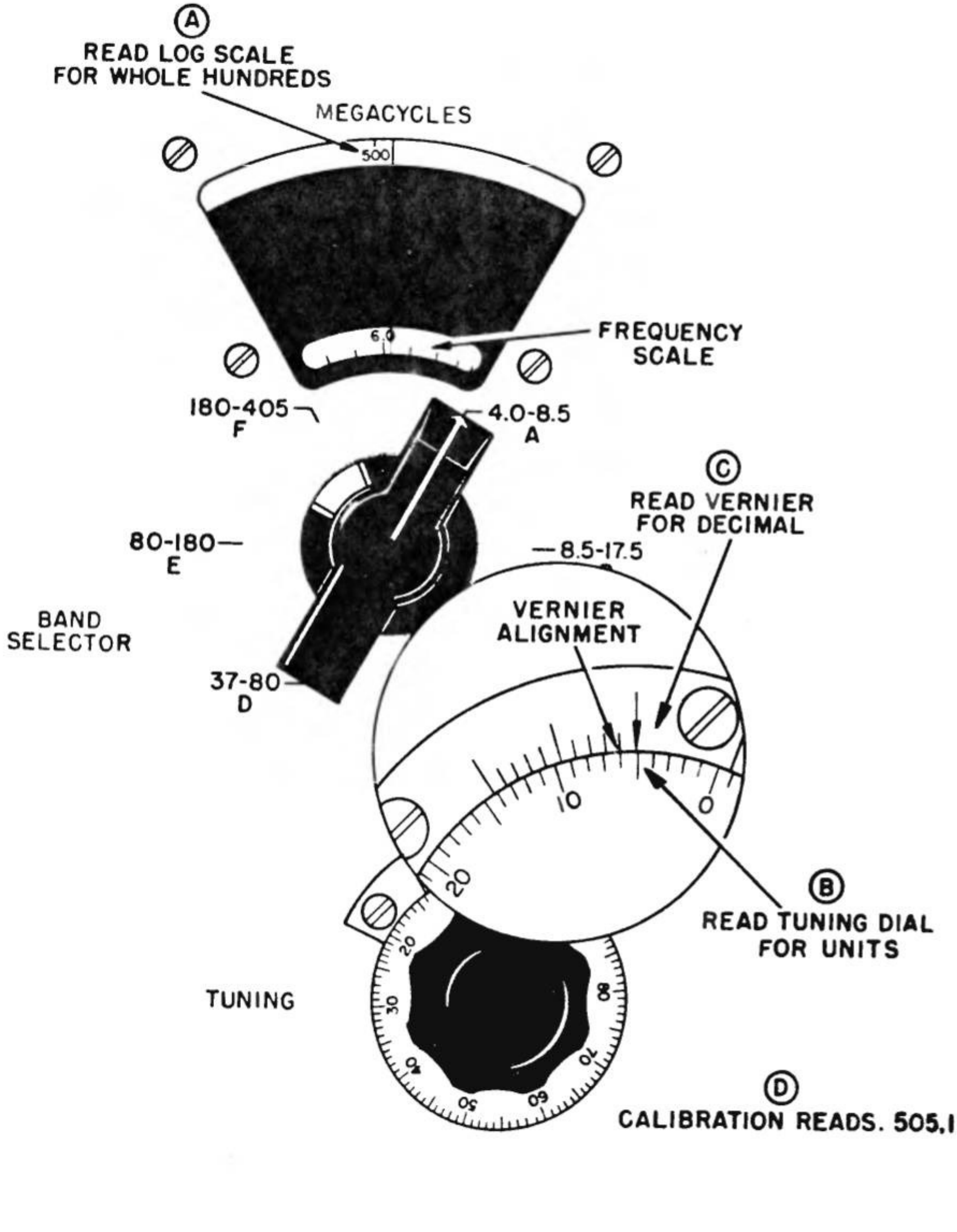


Figure 3-2. Diagram Showing Vernier Reading of Logging Reset.

is the output at J101, RF OUTPUT jack, when the signal generator is properly terminated in 50 ohms. Termination principles are more fully discussed in paragraph 3-9. The RF OUTPUT attenuator dial also has a corresponding scale calibrated in (-) dbm (decibels below one milliwatt).

d. Do not adjust RF OUTPUT voltage after modulation has been applied.

e. Repeat the above procedure whenever the carrier frequency is changed or whenever the signal generator has been on frequency for long periods of time.

f. If changes in frequency or other controls cause pointer of the panel meter to leave the red line setting, readjust CARRIER LEVEL control so that pointer is again at the red line.

3-6. INTERNAL SINE WAVE MODULATION.

(See figure 6-1.)

a. PRECAUTIONS. – Before applying modulation, set the output voltage according to paragraph 3-5 above. If it is necessary to readjust output voltage after modulation has been applied, return the MOD & METER SELECTOR switch to CW position.

b. PROCEDURE.

(1) Set the MOD & METER SELECTOR switch to either 400 or 1000 ~ position in the % MOD sector as required. In both these positions the internal modulation circuits are activated, and the panel meter is switched to indicate the degree of carrier modulation directly on the % MODULATION scale.

(2) Rotate the % MODULATION control until the required modulation percentage is indicated on the panel meter.

3-7. EXTERNAL SINE WAVE MODULATION.

a. RF Signal Generator Set AN/URM-26B can be efficiently modulated by an external sine wave source at frequencies from 100 to 20,000 cycles per second.

b. For external sine wave modulation set up the signal generator according to paragraphs 3-4 and 3-5, then proceed as follows:

(1) Rotate % MODULATION control fully counterclockwise.

(2) Set the MOD & METER SELECTOR switch to EXT position in the % MOD sector.

(3) Connect the external modulation source to the signal generator to EXT MOD PULSE INPUT jack on the front panel.

(4) Use the % MODULATION control to vary the degree of carrier modulation as indicated on the % MODULATION scale of the panel meter.

(5) When it is necessary to change the frequency of rf output, proceed as outlined in paragraph 3-4.

3-8. EXTERNAL PULSE MODULATION.

a. The Signal Generator can be externally modulated by positive-going pulses having a repetition rate from 50 to 5000 pulses per second. For input versus rf output pulse duration see figure 3-3. The minimum pulse amplitude *must be* 40 volts for proper modulation characteristics. See figure 3-4 for RF pulse voltage determination. An analysis of the pulsing circuit is given in par. 4-3. It must be realized that the reading indicated on the dial of the rf output attenuator does not show the absolute output level of the pulse modulated signal. For a given pulse, the relative rf output amplitude can be varied by rotating the RF OUTPUT control; its absolute magnitude can be found from figure 3-4.

b. For external pulse modulation:

(1) Select the required carrier frequency, using the BAND SELECTOR and TUNING controls.

(2) Rotate the MOD & METER SELECTOR switch to PULSE position.

(3) Connect the source of external pulses to the signal generator at panel jack J103, which is now active in PULSE INPUT function.

(4) Adjust the amplitude of the signal rf output pulse by varying the RF OUTPUT attenuator (see figure 3-3 and 3-4). If greater accuracy of pulse width and amplitude is required, monitor the output with Oscilloscope AN/USM-38 and a UHF diode such as 1N126. See figure 4-6 for oscilloscope hookup.

NOTE

Do not attempt to vary the signal generator rf pulse output by varying the amplitude of the modulating pulse input. The signal generator contains a pulse limiting circuit which maintains constant rf pulse level input to the attenuator for modulating pulses of over 40 volts magnitude.

3-9. COUPLING TO EQUIPMENT UNDER TEST.

a. GENERAL. – Four coaxial cords, two that are four feet 1 inch long and two that are 7 inches long, each having a characteristic impedance of 50 ohms are provided for general purpose use in connecting the signal generator to equipment being tested. The following accessory items are furnished with the signal generator to provide proper

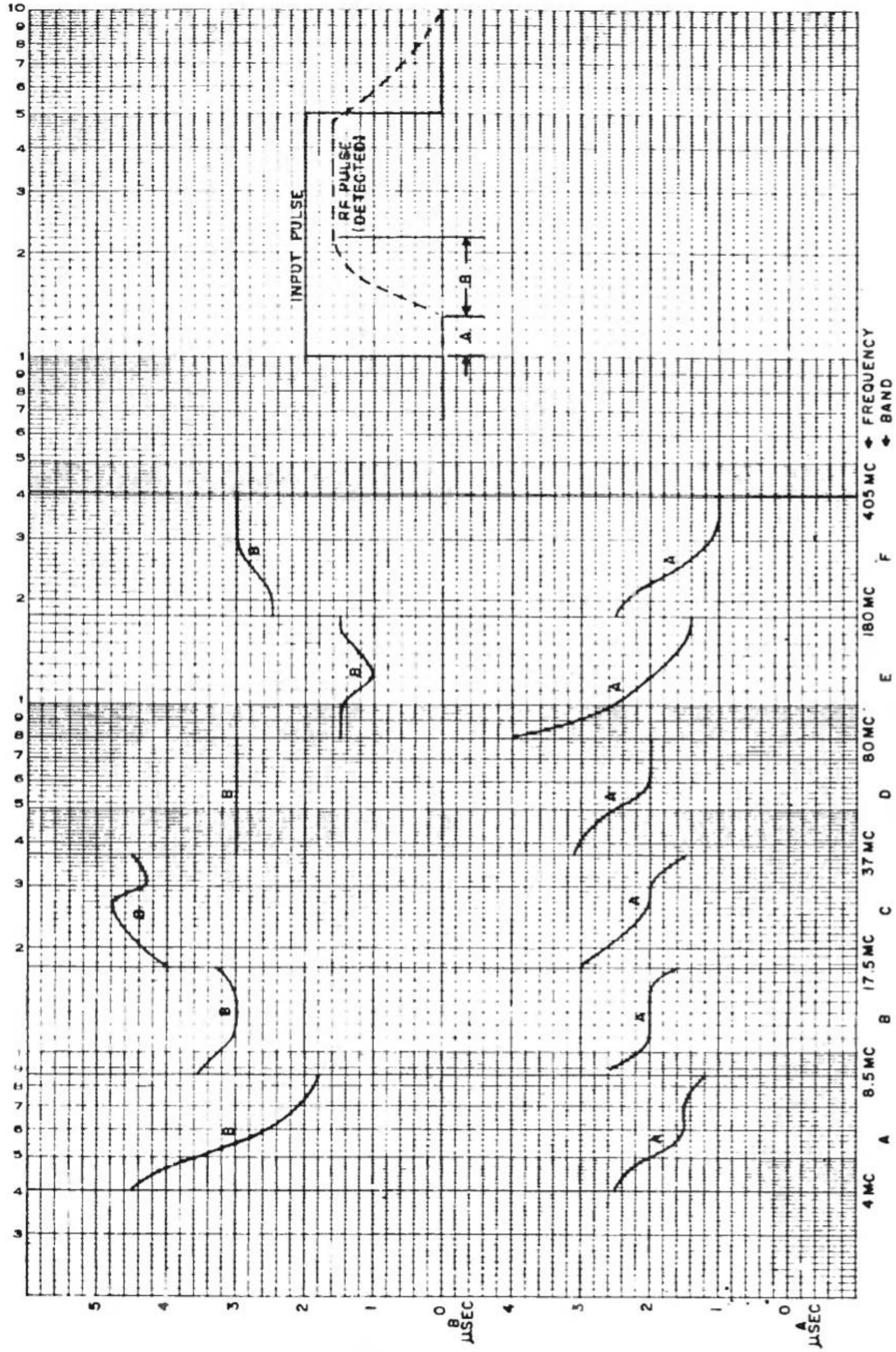


Figure 3-3. Chart of Input-Output Pulse Duration Relationship.

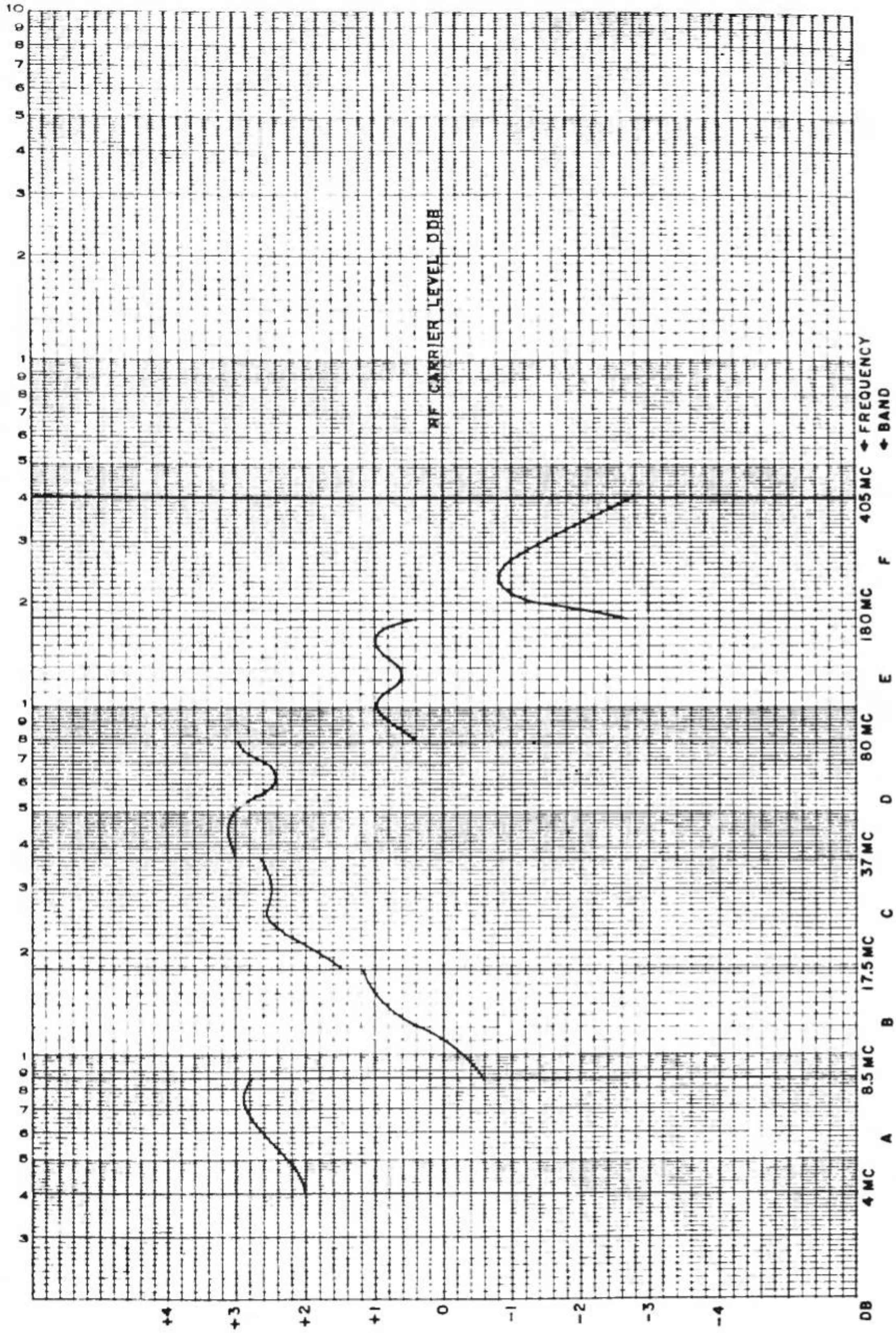


Figure 3-4. Chart of RF Pulse Voltage Determination.

termination and for introducing known losses into the output circuit: Impedance Matching Network CU-439/URM-26B (terminated in 50 ohms), Fixed Attenuator CN-315/URM-26B (6 db fixed loss pad), and Fixed Attenuator CN-316/URM-26B (20 db fixed loss pad). These accessories are designed to work into 50 ohms resistive impedance, both input and output. Their use in terminating the signal generator and in coupling to various impedances is explained in paragraphs 3-10, 3-11, 3-12 and 4-6. Table 3-2 summarizes the various possible load conditions described below and tabulates the specific termination solution.

b. EQUIPMENT WITH INPUT IMPEDANCE OF 50 OHMS. – When the input impedance (resistive) of the equipment being tested is 50 ohms, use one of the furnished RF cords to connect directly to the RF OUTPUT jack J101 on the front panel of the signal generator. The input impedance of the equipment matches the output impedance of the signal generator, therefore the input voltage to the equipment is that indicated directly on the RF OUTPUT attenuator dial. Additional theory is given in paragraph 4-6.

c. EQUIPMENT WITH INPUT IMPEDANCE LESS THAN 50 OHMS. – If the resistive impedance of the input circuit of the receiver or other equipment under test is less than 50 ohms, a non-inductive composition resistor may be added in series with the input element at the receiver under test, so that the sum of the receiver input impedance and the matching resistor will be 50 ohms (see figure 3-5). The total load impedance will then match the signal generator impedance at J101 and standing waves will be minimized. The actual receiver input voltage can be calculated from the formula shown as V LOAD in figure 3-5. As an example of the formula, if the load impedance of the receiver (Z) is equal to 30 ohms, a series matching resistor (R) of 20 ohms should be added in series with the receiver. Dial reading of 10,000 uv will then represent an actual receiver input as follows:

$$V_{LOAD} = \frac{Z \times V_{INDICATED}}{50} = \frac{30 \times 10{,}000}{50} = 6000 \text{ uv.}$$

d. EQUIPMENT WITH INPUT IMPEDANCE SOMEWHAT GREATER THAN 50 OHMS. – With receiver input impedance above 50 ohms, but considerably less than 500 ohms, a non-inductive composition resistor should be added in parallel to the receiver input (shunt) as shown in figure 3-6. The equivalent impedance of the shunt matching resistor and the load should equal the generator impedance (50 ohms). The receiver input voltage will then be equal to the meter indication. For example, if the receiver input impedance (Z) is 120 ohms, select the correct shunt matching resistor (R) as follows:

$$R = \frac{50 \times Z}{Z - 50} = \frac{50 \times 120}{120 - 50} = \frac{6000}{70} = 85.07 \text{ ohms.}$$

It is apparent that meter M101 indication will be the same as the actual input voltage to the receiver.

e. RECEIVER INPUT IMPEDANCE CONSIDERABLY GREATER THAN 50 OHMS. – Where the receiver input impedance is considerably greater than 50 ohms, at values of say 300 to 500 ohms or even greater, a special case of (*d*) above exists, since the required shunt matching resistor approaches 50 ohms as the receiver input impedance passes approximately 500 ohms. Accordingly, a stock resistor of that value is available as Impedance Matching Network CU-439/URM-26B.

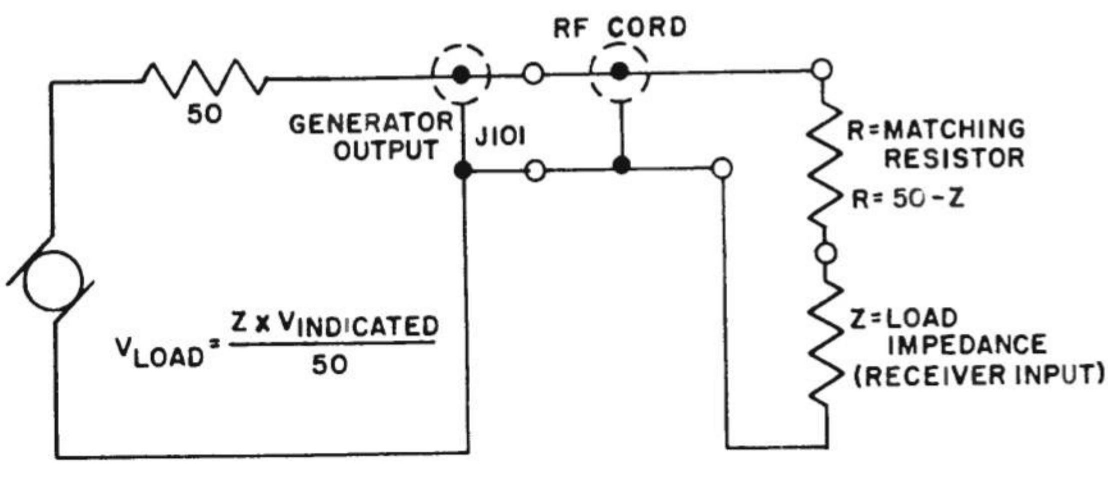
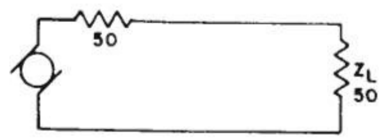
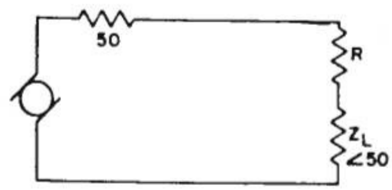
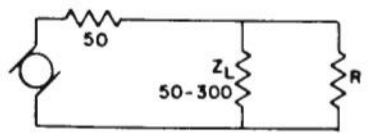
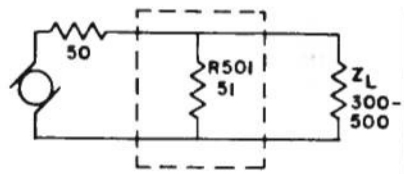
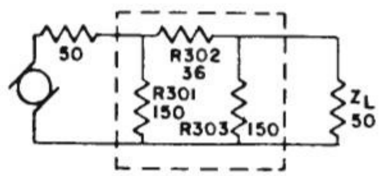
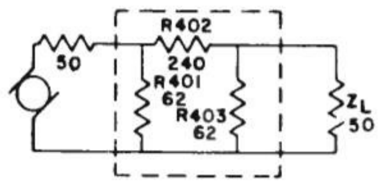
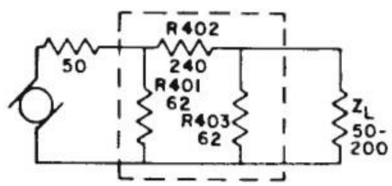


Figure 3-5. Equivalent Circuit of RF Output With Series Matching Resistor Added.

TABLE 3-2. CORRECT METHODS FOR TERMINATING THE SIGNAL GENERATOR AT J101.

LOAD IMPEDANCE	CIRCUIT	ACCESSORY RESISTOR	VOLTAGE APPLIED TO LOAD	REF PAR
50 OHMS		NONE	DIRECT READING	3-9b
LESS THAN 50 OHMS		$R = 50 - Z_L$	$\frac{Z \times V_{INDICATED}}{50}$	3-9c
SOMEWHAT GREATER THAN 50 OHMS (50-300 OHMS)		$R = \frac{50 \times Z}{Z - 50}$	DIRECT READING	3-9d
CONSIDERABLY GREATER THAN 50 OHMS (300-500 OHMS)		IMPEDANCE MATCHING NETWORK CU-439/URM-26B	DIRECT READING	3-9e
50 OHMS WITH 2:1 ATTENUATION		FIXED ATTENUATOR CN-315/URM-26B	$\frac{V_{INDICATED}}{2}$	3-12a
50 OHMS WITH 10:1 ATTENUATION		FIXED ATTENUATOR CN-316/URM-26B	$\frac{V_{INDICATED}}{10}$	3-11a
SPECIAL CASE: 50-200 OHMS WITH 10:1 ATTENUATION		FIXED ATTENUATOR CN-316/URM-26B	CORRECTION FACTOR x $V_{IND.}$ CORRECTION FACTOR = $\frac{Z_L}{4.8(Z_L + 62)}$	3-11e

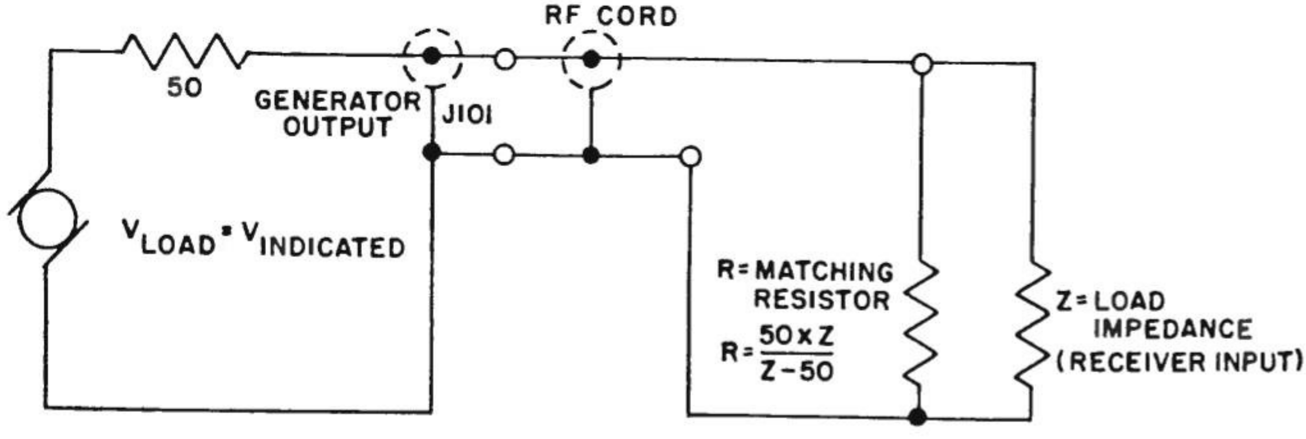


Figure 3-6. Equivalent Circuit of RF Output With Shunt Resistor Added.

3-10. USE OF IMPEDANCE MATCHING NETWORK CU-439/URM-26B.

a. The network may be seen packed in the cover of the generator case in figure 1-1. It consists of a 51 ohm resistor with appropriate UG-1094/U connectors at each end. (See figure 3-7.) In use it is connected as follows: Connector J501 (either end) mates with an end of any rf cord whose other end is plugged into RF OUTPUT jack J101. Connector J502 mates with any rf cord whose other end is plugged into receiver input (see figure 3-9). The dial reading will be approximately correct in microvolts. The rf output calibration will be inaccurate if the impedance matching network is used with receivers whose input impedance is well below 500 ohms; however, where it is difficult to obtain a shunt matching resistor as indicated in paragraph 3-9*d*, the impedance matching network can be used for approximate readings with receiver inputs as low as 200 ohms.

3-11. USE OF FIXED ATTENUATOR CN-316/URM-26B (20db pad). (See figure 3-8).

a. RECEIVER IMPEDANCE AT 50 OHMS. – Where it is desired to cut the RF OUTPUT to one-tenth the

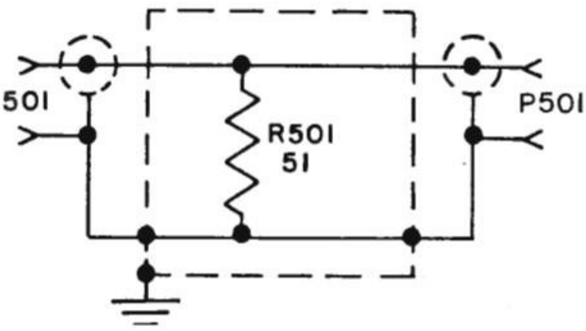


Figure 3-7. Schematic Diagram of Impedance Matching Network CU-439/URM-26B.

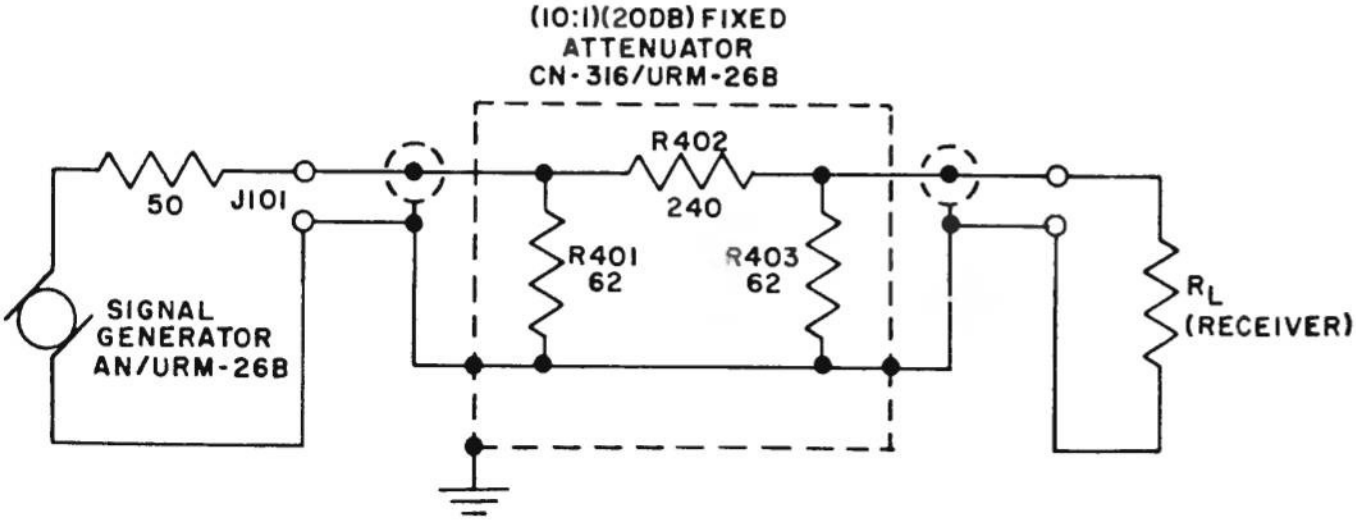


Figure 3-8. Equivalent Circuit of Output of Signal Generator With (10:1) Fixed Attenuator CN-316/URM-26B.

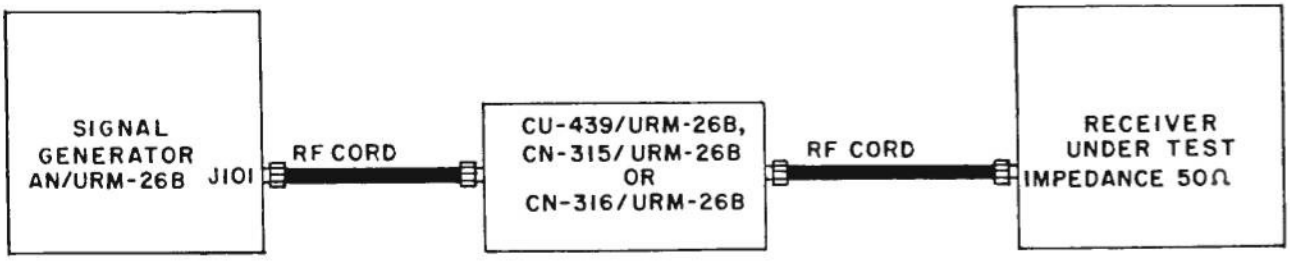


Figure 3-9. Method of Inserting Attenuators and Matching Network Between Signal Generator and Receiver.

reading on the dial (20 db loss) the Fixed Attenuator CN-316/URM-26B is introduced between the output of the signal generator and the input of the receiver (see figure 3-9). Where the input of the receiver is 50 ohms (matching the output of the signal generator), simply divide the apparent reading on the RF OUTPUT dial by the factor of TEN.

b. RECEIVER IMPEDANCE LESS THAN 50 OHMS. – Where the input impedance of the receiver is less than 50 ohms, it will be necessary to insert a series matching resistor between the attenuator and the receiver input as described in paragraph 3-9*c*. To find the attenuated reading:

Dividing Factor = 500/Receiver Z.

Thus; if the input impedance of the receiver is 25 ohms, and the 10:1 attenuator is placed with one end at the output of the signal generator, and the other end at the input of the receiver, with a 25 ohm composition resistor in series with the receiver input and the attenuator to make the proper match –

Dividing Factor = 500/25 = 20.

Thus the microvolt reading on the RF OUTPUT dial would be divided by 20 to show the number of microvolts available at the receiver input at that setting.

c. RECEIVER IMPEDANCE SOMEWHAT GREATER THAN 50 OHMS. – Where the receiver input is above 50 ohms, but considerably less than 500 ohms, and it is desired to show a 10:1 attenuation, connect the attenuator between signal generator and receiver, with a non-inductive composition resistor added in parallel to the receiver (shunt) as shown in input figure 3-6. The equivalent impedance of the shunt matching resistor and the load should equal 50 ohms. See paragraph 3-9*d* for method of determining shunt resistor value. Now, simply divide the microvolt reading of the RF OUTPUT dial by TEN.

d. RECEIVER IMPEDANCE CONSIDERABLY GREATER THAN 50 OHMS. – Where the receiver input impedance is considerably greater than 50 ohms, at values of say 300 or 500 ohms or even greater, a special case of *(c)* above exists, since the required shunt matching resistor approaches 50 ohms as the receiver input impedance passes approximately 500 ohms. Accordingly, connect Impedance Matching Network CU-439/URM-26B through rf cord to the receiver input, then connect Fixed Attenuator CN-316/URM-26B to the impedance matching network, connecting the other end of the fixed attenuator through rf cord to the signal generator. Now, simply divide the microvolt reading of the RF OUTPUT dial by TEN.

e. SPECIAL CASE WHERE RECEIVER IMPEDANCE IS GREATER THAN 50 OHMS BUT MUCH LESS THAN 300 OHMS. – Where it is desired to use the 10:1 loss of the fixed attenuator in equipment whose input impedance is between 50 and 300 ohms, it is unnecessary to use matching shunt resistances such as impedance matching network or calculated composition resistor. The 10:1 attenuator is designed so that no matter what impedance is placed across its output, approximately 50 ohms is reflected to the signal generator. However, the output of the fixed attenuator will equal 1/10 the voltage indicated by the RF OUTPUT dial only when a 50 ohm load is connected across its output. When the input impedance of the receiver is some value other than 50 ohms, as it would be in this special case, a correction factor must be applied to the reading. The apparent reading on the RF OUTPUT dial is then multiplied by the correction factor to find the true reading in microvolts at the receiver input.

$$\text{Correction Factor} = \frac{Z_L}{4.8\,(Z_L + 62)}$$

EXAMPLE: With input impedance Z_L of 100 ohms, using the 10:1 attenuator, what will be the true reading in microvolts at the receiver input if the RF OUTPUT dial reads 10,000 microvolts?

$$\text{SOLUTION:}\quad \frac{Z_L}{4.8\,(Z_L + 62)} = \frac{100}{4.8\,(100 + 62)} =$$

$$\frac{100}{4.8 \times 162} = \frac{100}{777.6} = .1286$$

Using the multiplication factor of .1286 against the apparent reading, 10,000 x .1286 = 1286 microvolts true value.

EXAMPLE: With input impedance Z_L of 70 ohms, using the 10:1 attenuator, what will be the true reading in microvolts at the receiver input if the RF OUTPUT dial reads 15,000 microvolts?

SOLUTION: $\frac{70}{4.8\,(70+62)} = \frac{70}{4.8 \times 132} = \frac{70}{633.6} =$

correction factor of .1104, 15,000 x .1104 = 1656 uv (approximately).

f. DECADE CHECKING. – Besides being very useful in the termination applications described above, the 10:1 fixed attenuator can also be used for checking the decades of the signal generator variable output attenuator AT101 and for obtaining a 10:1 or 20 db attenuation at the receiver without changing the setting of the signal generator. The attenuator calibration procedure is discussed in Section 6.

3-12. USE OF FIXED ATTENUATOR CN-471/URM-26B. Fixed Attenuator CN-471/URM-26B has a 10:1 attenuation and may be used without correction in place of Fixed Attenuator CN-316/URM-26B with receivers whose input impedance is 70 ohms.

3-13. USE OF FIXED ATTENUATOR CN-315/URM-26B (6 db pad). (See figure 3-8 for general diagram; actual component values differ from those shown.)

a. RECEIVER IMPEDANCE AT 50 OHMS. – Where it is desired to cut the RF OUTPUT value exactly in half (6 db loss) the Fixed Attenuator CN-315/URM-26B is introduced between the output of the signal generator and the input of the receiver as shown in figure 3-9. (The method of inserting the fixed attenuator shown in figure 3-9 may be used for either the 2:1 unit or the 10:1 unit.) The schematic diagram of Fixed Attenuator CN-315/URM-26B may be found at the bottom of the main schematic diagram, figure 6-16. Where the input of the receiver is 50 ohms (matching the output of the signal generator), simply divide the apparent reading on the RF OUTPUT dial by the factor of TWO.

b. RECEIVER IMPEDANCE LESS THAN 50 OHMS. – Where the input impedance of the receiver is less than 50 ohms, it will be necessary to insert a series matching resistor between the attenuator and the receiver input as described in paragraph 3-9*c*. The real voltage at the receiver input will be something less than half the RF OUTPUT reading. To find the attenuated reading:

Dividing Factor = 100/Receiver Z.

Thus, if the input impedance of the receiver is 30 ohms, and the 2:1 attenuator is placed with one end at the output of the signal generator, and the other end at the input of the receiver, with a 20 ohm composition resistor in series with the receiver input and the attenuator to make the proper match –

Dividing Factor = 100/30 = 3.33.

Thus the microvolt reading on the RF OUTPUT dial would be divided by 3.33 to show the number of microvolts available at the receiver input at that setting.

c. RECEIVER IMPEDANCE MORE THAN 500 OHMS. – Where the receiver input is more than 500 ohms, and it is desired to show a 2:1 attenuation, connect the attenuator to the output of the signal generator, then connect the Impedance Matching Network CU-439/URM-26B between attenuator and receiver input. Now, simply divide the microvolt reading of the RF OUTPUT dial by TWO.

d. RECEIVER IMPEDANCE BETWEEN 50 OHMS AND 500 OHMS. – Connect the attenuator to the signal generator as described in (*c*) above. Instead of the impedance matching network between the attenuator and receiver input, use appropriate shunt matching resistor as shown in figure 3-6. Now simply divide the microvolt reading of the RF OUTPUT dial by TWO. Unlike the 10:1 attenuator, the 2:1 attenuator is not a constant impedance device, and must therefore always be terminated in 50 ohms in order to reflect a 50 ohm impedance.

3-14. SUMMARY OF OPERATION.

a. GENERAL. – The previous paragraphs in this section discuss in detail the operational procedures for extending the specific uses of RF Signal Generator Set AN/URM-26B. These principles may be applied as required and as determined by the needs of the measurement being made. The purpose of this paragraph is to give a simplified summary of the necessary operations. These operations are pictorially represented in figure 3-10.

b. STEPS IN OPERATION.

STEP 1. Turn POWER switch S103 to OFF.

STEP 2. Turn the CARRIER LEVEL control completely counterclockwise.

STEP 3. Rotate % MODULATION knob fully counterclockwise.

STEP 4. Insert power plug P102 into the source of 115V ac.

STEP 5. Turn MOD and METER SELECTOR switch to CW position.

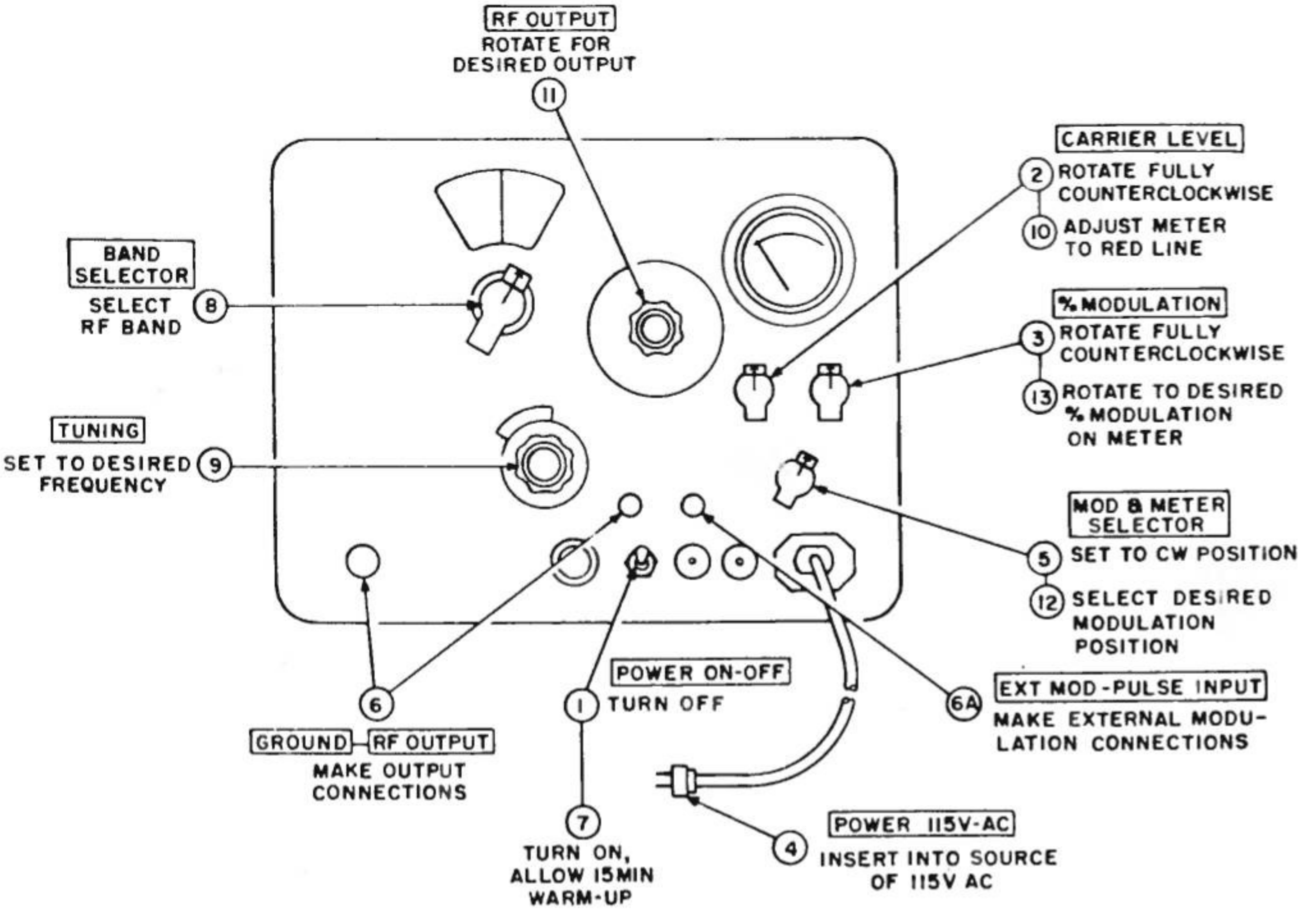


Figure 3-10. Simplified Procedure for Operating RF Signal Generator Set AN/URM-26B.

STEP 6. Make necessary output connections (paragraph 3-9). Output jack J101 is marked RF OUTPUT on panel. If exterior modulation is used, that signal is fed in through J103 marked EXT MOD PULSE INPUT on panel. Connect GROUND terminals of all equipment to each other and to physical ground (if practicable).

STEP 7. Turn POWER switch to ON. Permit a 15 minute warmup.

STEP 8. Select frequency band with BAND SELECTOR switch.

STEP 9. Select frequency with TUNING dial, reading frequency directly from MEGACYCLES window.

STEP 10. Adjust meter M101 to read directly at the red line by rotating CARRIER LEVEL control knob.

STEP 11. Rotate RF OUTPUT control knob for desired output.

STEP 12. Set MOD and METER SELECTOR switch to the appropriate modulation signal: 400 cycles or 1000 cycles for internal audio signal, EXT for any external modulation, CW for unmodulated rf, and PULSE for external pulse modulation.

STEP 13. Rotate % MODULATION knob for desired percentage of modulaton on meter.

Steps 1 to 11 above are adequate for CW conditions. Steps 12 and 13 cover internal or external sine wave modulation. Omit steps 10 and 13 for pulse operation. Recommended hookup for observing pulse waveform is shown in figure 4-6.

3-15. GENERAL INSTRUCTIONS FOR USE AND SUPPLEMENTARY DATA.

a. GENERAL. – The operational principles outlined in this section are general and should be supplemented by the specific data applicable to the equipment being tested.

The particular receiver instruction book should be consulted before making any of the following signal generator tests.

CAUTION

Never connect the RF OUTPUT jack J101 directly to a DC potential since this would very likely burn out termination resistor R130. When making interstage measurements on a receiver, connect a .01 uf capacitor in series with J101 and the receiver point being measured. It must be realized that when this capacitor is so inserted, the voltage indication on RF OUTPUT scale will not reflect an absolutely accurate input voltage to the receiver.

b. RECEIVER TESTS.

(1) SENSITIVITY. – At high radio frequencies, antenna characteristics cannot be easily reproduced, and considerable care must be taken in making receiver sensitivity tests. The voltage available at output jack J101 is always known, but not the voltage at the receiver input terminals a few feet away. This latter voltage is proportional to the signal generator output, but it may be larger or smaller because of the characteristics and terminations of the "transmission line" between the instruments (see par. 3-9). Furthermore, some radio receivers have an excess of sensitivity such that at certain frequencies, the inherent noise level is sufficient to saturate the detector or audio tubes, if the receiver gain controls are advanced too far. Accordingly, all receivers are measured and rated for both CW and MCW sensitivity on the basis of the sensitivity, or gain controls being adjusted so that not more than 60 microwatts of noise is present in the output with no input signal impressed. A dbm (decibel milliwatt) scale is provided on the RF OUTPUT dial for measuring the overall sensitivity of the receiver under test directly in dbm. This dbm scale applies only when the input impedance of the receiver is 50 ohms. This scale is marked from – 7dbm (100,000 microvolts) to – 123 dbm (.1 microvolts). For example; if the minimum detectable sensitivity of a receiver is 1 microvolt, the scale shows that this sensitivity also represents – 107 dbm.

CAUTION

Consult the particular receiver's instruction book for details of the method applicable to that receiver. This is particularly important for wide-band RF or IF amplifiers where overcoupled, regenerative or stagger-tuning is used. Be sure the aligning frequency is correct. Check with a heterodyne frequency meter such as Navy Model LM-13 Frequency Meter and Frequency Meter TS-323/UR or equal to obtain greater frequency accuracy than obtainable with the signal generator.

(2) ALIGNMENT OF NARROW BAND RF OR IF RECEIVERS. – The presence of incidental or parasitic frequency modulation in an AM signal generator may introduce asymmetry in the apparent selectivity curve of the receiver being tested. The effects of frequency modulation in RF Signal Generator Set AN/URM-26B have been kept at a minimum with the incorporation of a frequency compensating network (par. 4-2c). For best results, especially in aligning narrow band stages, the technician should perform all of the following receiver tests (except audio response) by using unmodulated carrier signal. In order to eliminate the need for modulation, insert a high impedance dc voltmeter, such as contained in Electronic Multimeter ME-25A/U, across the load of the receiver second detector. Alignment should then be performed to peak response on this meter.

(3) RECEIVER ALIGNMENT. – The alignment of the intermediate frequency amplifier system of a simple receiver is usually carried out by setting up the signal generator at the proper frequency and working step by step backward through the IF circuits from the second detector to the first detector. Always apply the signal generator to the grid immediately preceding the circuit under adjustment and adjust the trimmers (or variable inductances) for maximum output. In carrying out this procedure, it will be necessary, of course, to reduce the output of the signal generator each time the signal is applied to the grid of a tube at lower power level. In some cases the alignment instructions for the receiver specify that the signal generator input is at a definite point in the receiver and is not changed during the alignment. The next step is to align the radio frequency and oscillator circuits of the receiver. This is accomplished by setting the receiver dial near the high end of the band in question and applying a signal to the input terminals of the receiver. First adjust the RF stage shunt trimmer capacitor for maximum receiver output and then adjust the oscillator shunt trimmer until the receiver output is maximum. The receiver and signal generator frequency scales are then set at the low frequency ends and the oscillator series padder capacitor is adjusted for maximum output. Recheck the high frequency end of the band and repeat the above procedure as necessary.

(4) SELECTIVITY. – The selectivity of a radio receiver is that characteristic which determines the extent to which the receiver is capable of distinguishing between the desired signal and disturbances of other frequencies. Selectivity is expressed in the form of a curve that gives the signal strength required to produce a given receiver output at various frequencies, with the response at resonance taken as the reference. This selectivity is normally obtained by disabling the automatic volume controls system of the receiver, setting the signal generator to the desired frequency, tuning the receiver to this frequency and modulating the carrier signal 30 percent at 400 cycles. The signal generator frequency is then varied by progressive amounts from the receiver tuned frequency, and the signal generator voltage increased as necessary to maintain a controlled receiver output. The unmodulated CW method as described in paragraph 3-14b (2) can also be used. Unless otherwise

specified, the normal receiver output is usually taken as 6 milliwatts into 600 ohms.

(5) AUDIO RESPONSE. – The audio response of a receiver shows the manner in which the electrical output of a dummy load depends upon the modulation frequency. In making this test, connect an audio oscillator such as Navy Model LAJ series, to EXT MOD PULSE INPUT jack J103. Switch MOD and METER SELECTOR to EXT position. Select the desired signal generator frequency and tune the receiver under test to this frequency. Adjust the signal generator for a convenient output. Observe the variation in receiver output as the audio frequency is varied from 400 cycles, keeping the degree of modulation constant at 30 percent. The results of such an audio response test are expressed in the form of a curve with the ratio of actual output to 400 cycle output plotted vertically, and each corresponding audio frequency plotted horizontally. In making this test, care must be taken to avoid overloading the receiver. In the event that the receiver noise or hum level is appreciable, it will be necessary to apply a strong enough signal from the generator to override this interfering effect.

(6) MEASURING RECEIVER GAIN PER STAGE. – RF Signal Generator Set AN/URM-26B is also a useful device for measuring the gain of any particular receiver stage. This is accomplished by applying a signal to the input (and output points) of the stage in question and recording the signal generator voltage required to give the same output at each point. The gain in db is then calculated by:

$$\text{GAIN (db)} = 20 \log \frac{V_{out.}}{V_{in}}$$

c. STANDARD LEVELS. – Standard receiver reference levels are defined as follows:

(1) Standard output level of reference = 6 milliwatts.

(2) Standard noise level = 600 microwatts.

(3) Standard output load = 600 ohms for low impedance output or 20,000 ohms for high impedance output, unless special impedances are provided in the receivers as noted in their instruction books.

d. VOLTMETER USED AS AN OUTPUT METER. – In making measurements when a voltmeter is used as an output meter, the following approximate wattages correspond to the voltages at the load impedance noted:

(1)	1.9 volts at 600 ohms 11.0 volts at 20,000 ohms	6 milliwatts.
(2)	0.19 volts at 600 ohms 1.1 volts at 20,000 ohms	60 microwatts.
(3)	0.77 volts at 600 ohms 4.5 volts at 20,000 ohms	1 milliwatt.

(4) For receivers provided with output meters having a zero level of 6 milliwatts, –20 decibels equals 60 microwatts.

(5) For receivers provided with output meters having a zero level of 60 microwatts, +20 decibels equals 6 milliwatts.

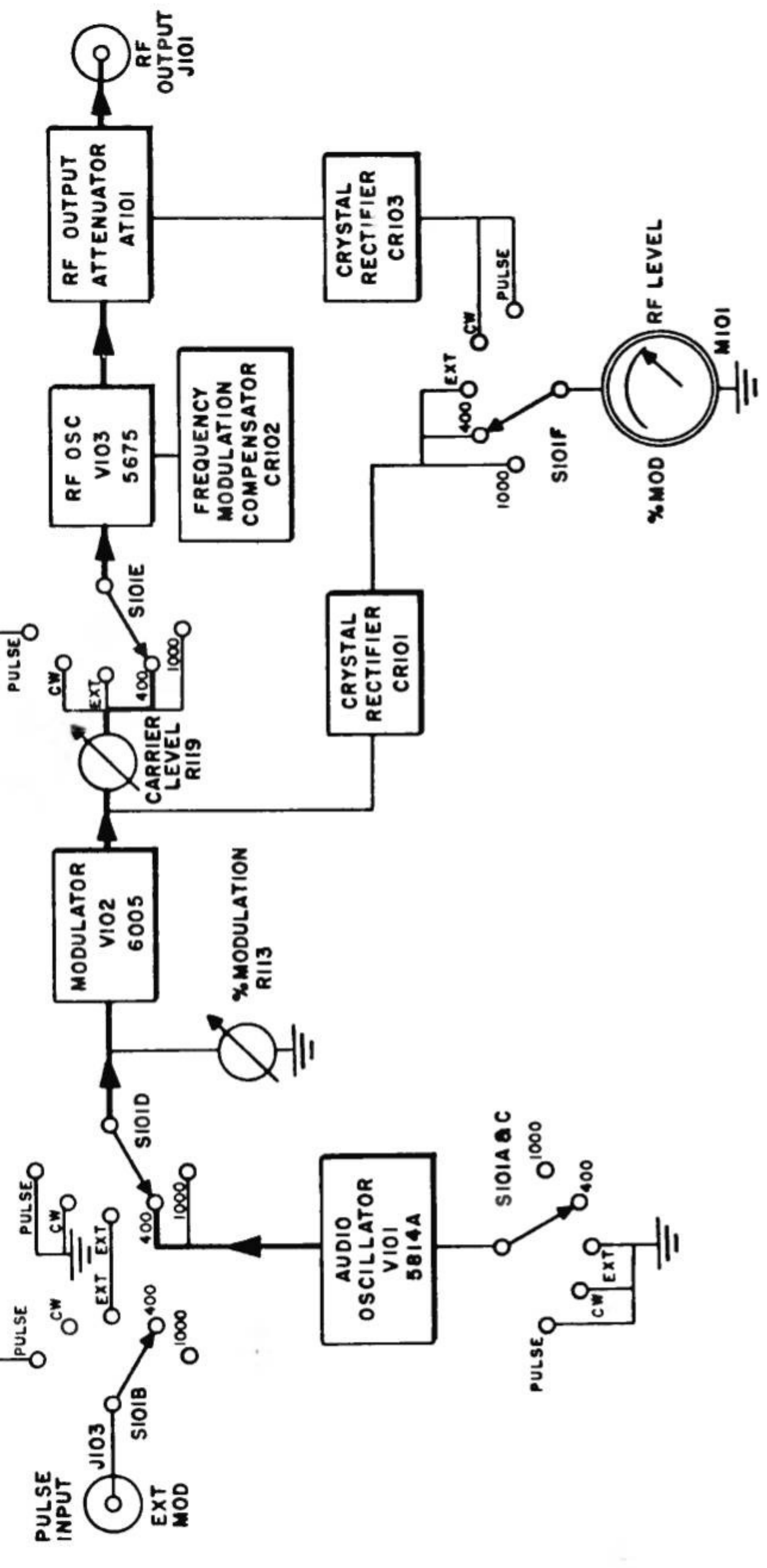


Figure 4-1. RF Signal Generator Set AN/URM-26B, Functional Block Diagram.

SECTION 4
PRINCIPLES OF OPERATION

4-1. GENERAL DESCRIPTION OF CIRCUITS.
(See figure 4-1.)

A simple way of describing RF Signal Generator Set AN/URM-26B is to consider it a small radio transmitter with provision of straight CW operation, modulated CW (as an am transmitter), and pulse modulation when the pulse signal is supplied externally. Switch S101A and C (in the lower left of the diagram) selects 1000 cycles or 400 cycles as the desired modulating frequency for the audio oscillator V101. When switched to EXT, CW or PULSE operation, the audio oscillator is inoperative. When operating on 400 or 1000 cycles, the audio oscillator generates either of those two frequencies (as switched) and passes the signal through S101D to modulator V102. Where CW or PULSE modulation is desired, the modulator stage is grounded by S101D. Where external modulation is provided, S101D permits the external signal to enter by way of S101B from PULSE INPUT EXT MOD jack J103 located on the front panel. If the external modulation is a pulse signal, S101B feeds that signal through pulse transformer T102, with limiting action on the pulse being supplied by pulse limiter V104, and the limited pulse signal is fed to S101E. The percentage of modulation (400 cycles, 1000 cycles or external sine wave) is read on the front panel meter, set by % MODULATION control R113. The output of the modulator is indicated on the front panel meter, and can be set to a predetermined level by CARRIER LEVEL control R119. It is the only signal modulating rf oscillator V103 except when pulse modulation is switched in by S101E. Since voltage-regulated-power source supplies the voltages for the rf oscillator (through all positions except CW and PULSE on S101E) a reading of the audio output of the modulator can be read as a function of modulation percentage. Accordingly, a sample of signal from output of modulator V102 is rectified by crystal rectifier CR101 and is read on meter M101 when appropriately switched in by S101F. The normal sine modulation or pulse modulation is fed through S101E to RF Oscillator V103, which is a variable frequency rf oscillator. Rectifier CR102 is part of the frequency modulation compensator (see paragraph 4-2c). The output of V103 (depending upon switching) is cw, am-rf, or pulse-modulated rf. This output is attenuated by rf output attenuator AT101, and is available at the RF OUTPUT jack J101 on the front panel. A small amount of rf is rectified by crystal rectifier CR103 to provide a reading on the panel meter when S101F is in the CW or PULSE position. A detailed analysis of the principal circuit assemblies is covered in this section under the following headings and paragraphs:

4-2. CW OPERATION.
(see figure 4-2.)

a. GENERAL. – When switches S101C, D and E are turned to the CW position, modulator V102 is grounded through S101D, removing the modulation action from the circuit. Regulated +210 v passes through T101, CARRIER LEVEL control R119, S101E, through Z103, L109 and R123 to supply the plate of rf oscillator V103 through its plate coil L113. The rf oscillator V103 is now free to supply unmodulated signal to its output.

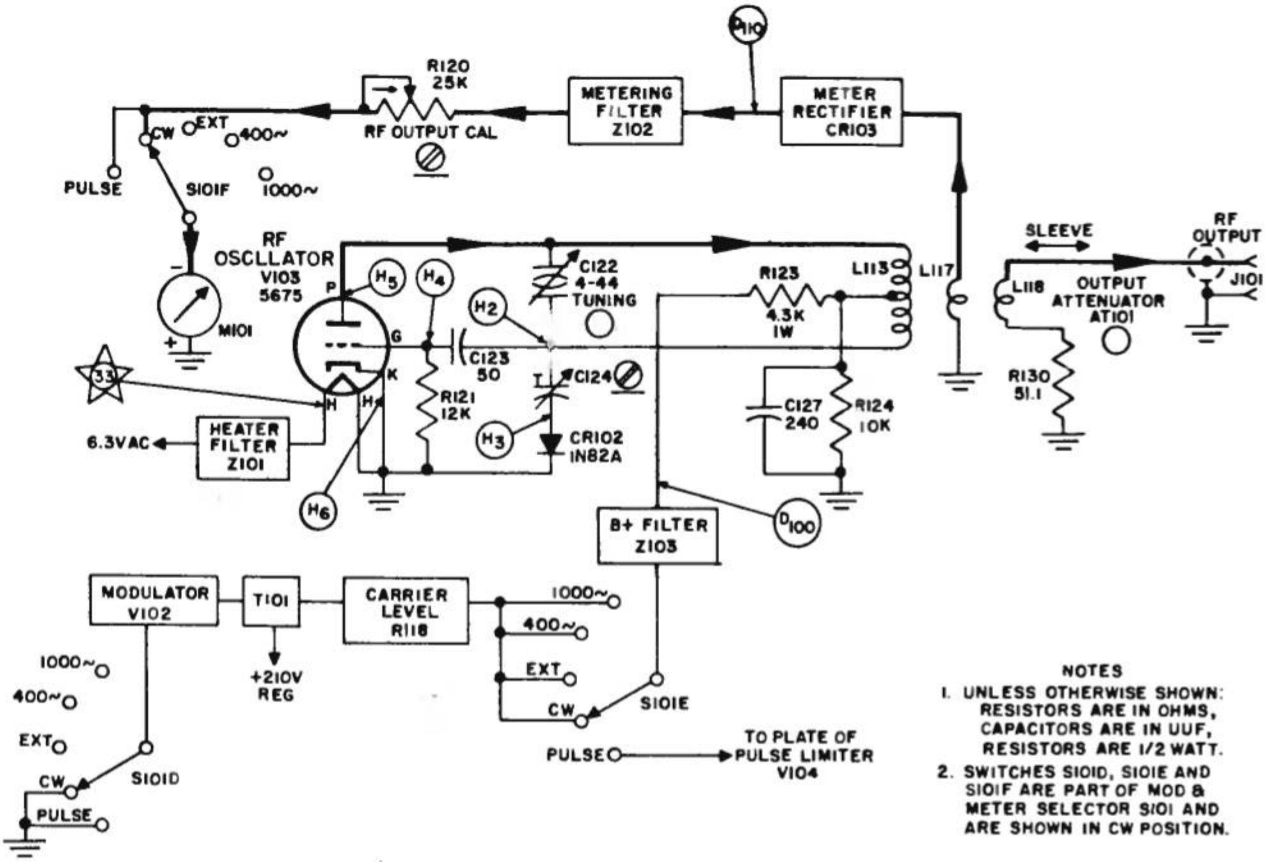


Figure 4-2. Simplified Schematic Diagram of the RF Oscillator, Set at Band C.

b. CARRIER OSCILLATOR. – The carrier oscillator (V103) is completely enclosed in a separate shielded compartment, located on the right side of Signal Generator SG-117/URM-26B when viewed from the rear. The stage operates as a Hartley oscillator on bands A through D by virtue of the tapped plate tank coil L113 being by-passed to ground at its center-tap, through C127, thus providing a coil center-tap connection for the cathode (also at ground potential). Bands A through D have the center-tap of the plate coil grounded similarly. At the two highest bands, the center-tap of the plate coil is above ground. Since the frequencies involved are so high, the interelectrode capacities of V103 predominate, providing a virtual split capacity, with ungrounded center-tap, generally called an ultra-audion oscillator. The six plate coils are mounted on a turret, rotated by the BAND SELECTOR knob on the front panel. Oscillator tube V103 is a type 5675 pencil-type triode, mounted on plated snap-in contacts built on the same sub-assembly that contains the main tuning capacitor C122. Plate voltage and modulation (where used) are introduced through rf choke L109 and dropping resistor R123 (figure 4-2.) as well as through B+ filter Z103. Additional rf filtering is provided by heater filter Z101 not shown in this partial schematic diagram. Class C bias for V103 is developed across grid leak resistor R121 in association with grid blocking capacitor C123. Capacitor C127 provides a low impedance ground path for the center-tap of L113. Resistor R124 keeps the coil center-tap well above dc ground.

c. FREQUENCY MODULATION COMPENSATOR. – Although of no concern in cw operation, parasitic frequency modulation may occur when the carrier oscillator is amplitude modulated. The spurious fm increases the band width of the modulated signal and is undesirable for aligning narrow band receivers. The reason for parasitic fm is best explained in terms of the variable reactance introduced by the modulating signal across the oscillator tank. When the audio modulating voltage is applied to oscillator tank coil L113 (figure 4-2.), the instantaneous plate resistance Rp of oscillator V103 is varied accordingly. See figure 4-3 for the equivalent circuit. The only change has been in the arrangement on the paper. The circuit is the same as figure 4-2. The variation in instantaneous plate resistance is shown as a variable resistor Rp. At the same time the second half of the tank coil is across the grid circuit. Across the grid coil is the FM Compensator, consisting of diode CR102 and a small factory-set trimmer, C124, which allows some of the tank energy to pass through the diode. The diode is a rectifier, thus acting as variable resistor in the grid circuit to offset the variable resistance Rp in the plate circuit. Since grid and plate ends

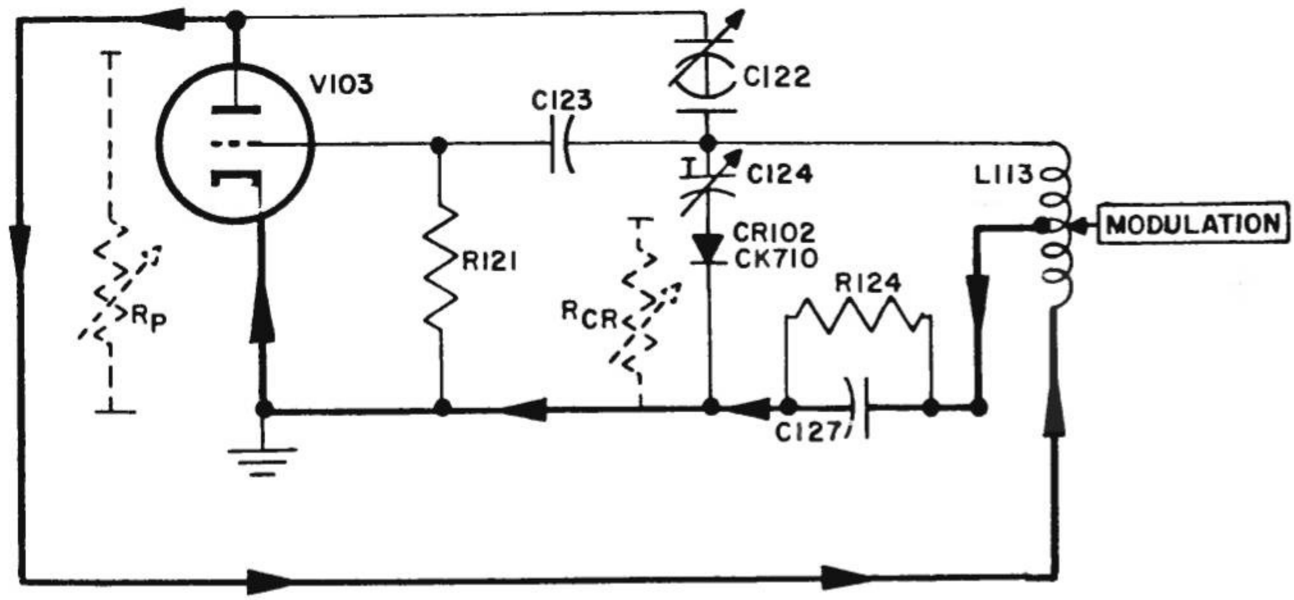


Figure 4-3. Equivalent Circuit of RF Oscillator With Frequency Modulation Compensator.

of the tank coil are 180° apart, their opposing variable resistances (which vary as the modulation) cancel out, minimizing the frequency shift of the carrier tank frequency.

d. CARRIER LEVEL MEASURING CIRCUIT. – (See figure 4-4.) The carrier level is measured *only in CW position* of MOD and METER SELECTOR knob. A small loop (L117) between the rf oscillator tank circuit and

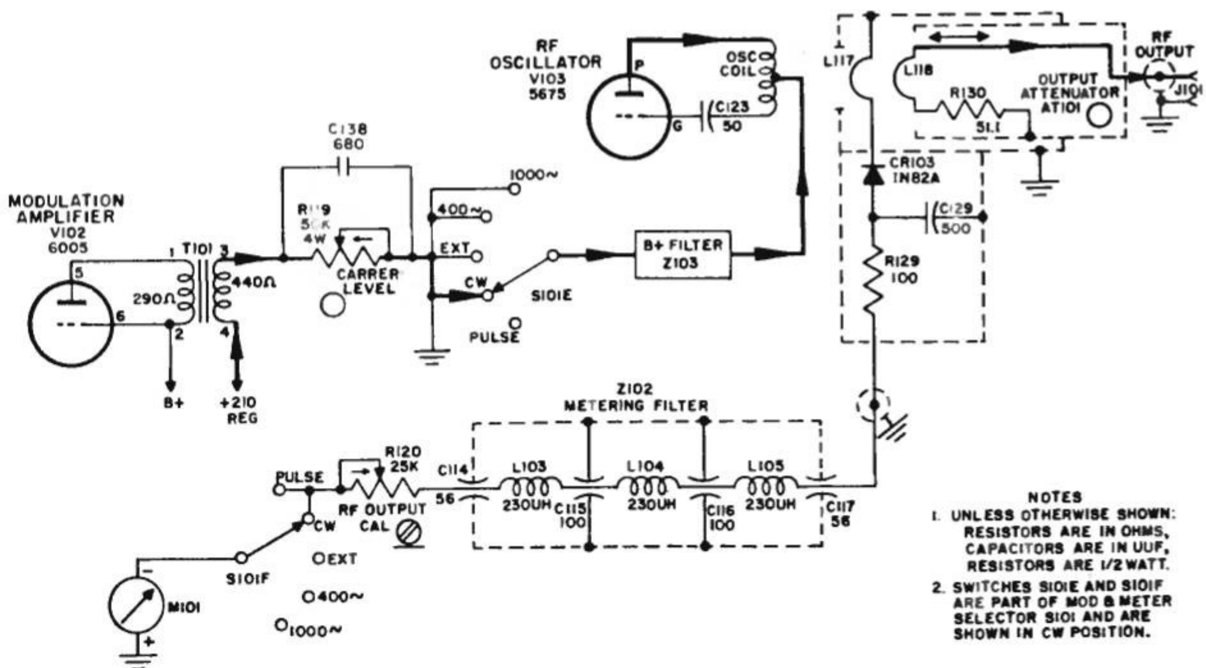


Figure 4-4. Simplified Schematic Diagram of the Waveguide-Below-Cutoff Attenuator and RF Level Monitoring.

the output coil takes off a small portion of the carrier energy, rectifies it with CR103 and filter C129, R129. The rectified voltage of carrier level passes through Z102 metering filter consisting of C114, L103, C115, L104, C116, L105 and C117. Because of large circulating rf currents in the region of the oscillator tank circuit, filter Z102 is required to remove any trace of rf from the carrier level measuring line. The rectified filtered voltage is factory-set for a balanced zero reading by means of Rf Output Cal R120. It is a screwdriver adjustment behind the panel and does not require re-setting during normal operation. The rectified voltage passes through S101F and is read on M101. The B+ supply for the rf oscillator tank is fed through Z103 B+ Filter, switched in through S101E, controlled by CARRIER LEVEL control R119 in series with the +210 volts (regulated) fed through T101. When set for CW operation the rf oscillator plate voltage is controlled by CARRIER LEVEL control on the front panel. The control is varied for the appropriate carrier frequency until M101 needle is at the red arrow.

e. VARIABLE RF OUTPUT ATTENUATOR. – (See figure 4-4.) The output coil L118 feeds the rf output, whether cw or modulated, to RF OUTPUT jack, J101, on the front panel. The output terminating resistor R130 is within the attenuator casing. The attenuator AT 101 is the Waveguide-Below-Cutoff type in which L118 is moved by a gear arrangement within a waveguide, varying its energy-pickup from the oscillator coil. The gearing includes the RF OUTPUT dial on the front panel, which reads directly on the outer logarithmic scale in microvolts and on the inner linear scale in (–) dbm.

4-3. PULSE MODULATION CIRCUIT.

(See figure 4-5 and 4-6.)

a. PULSE TRANSFORMER. – RF Signal Generator Set AN/URM-26B can be externally pulse modulated (via J103). The minimum pulse amplitude of the external source must be 40 volts. with a repetition rate between 50 and 5000 pps. A suggested oscilloscope hookup to observe pulse waveform is shown in figure 4-6. The simplified schematic diagram of the pulse modulation circuit is shown in figure 4-5. The pulse modulating signal is applied to the plate of rf oscillator tube V103 via EXT MOD PULSE INPUT jack J103, rf filter choke, L121, switch S101B, pulse transformer T102, limiting resistors R133 and R131, switch S101E, B+ filter Z103 and oscillator coil. Note that the only plate supply for the rf oscillator stage is the pulse voltage. Thus, with no pulse signal present, the rf oscillator ceases to operate. As the positive pulse voltage is applied to the oscillator tank, the oscillator plate is momentarily positive, permitting the oscillator to function *for the duration of the pulse voltage.* Consequently the rf output is pulsed-CW of the general wave-form shown in figure 4-6.

b. PULSE LIMITER. – To prevent overloading the rf oscillator with input pulses of high amplitude, Pulse Limiter V104 has positive 210 volts applied to its cathode, with its plate exposed to the incoming pulse. Pulse inputs of 40 volts or more are stepped up by pulse transformer T102 to a value suitable for plate voltage for rf oscillator V103. If the pulse input voltage is excessive (of such a value as to place the plate of pulse limiter V104 above 210 volts) the pulse limiter diode V104 will conduct, lowering

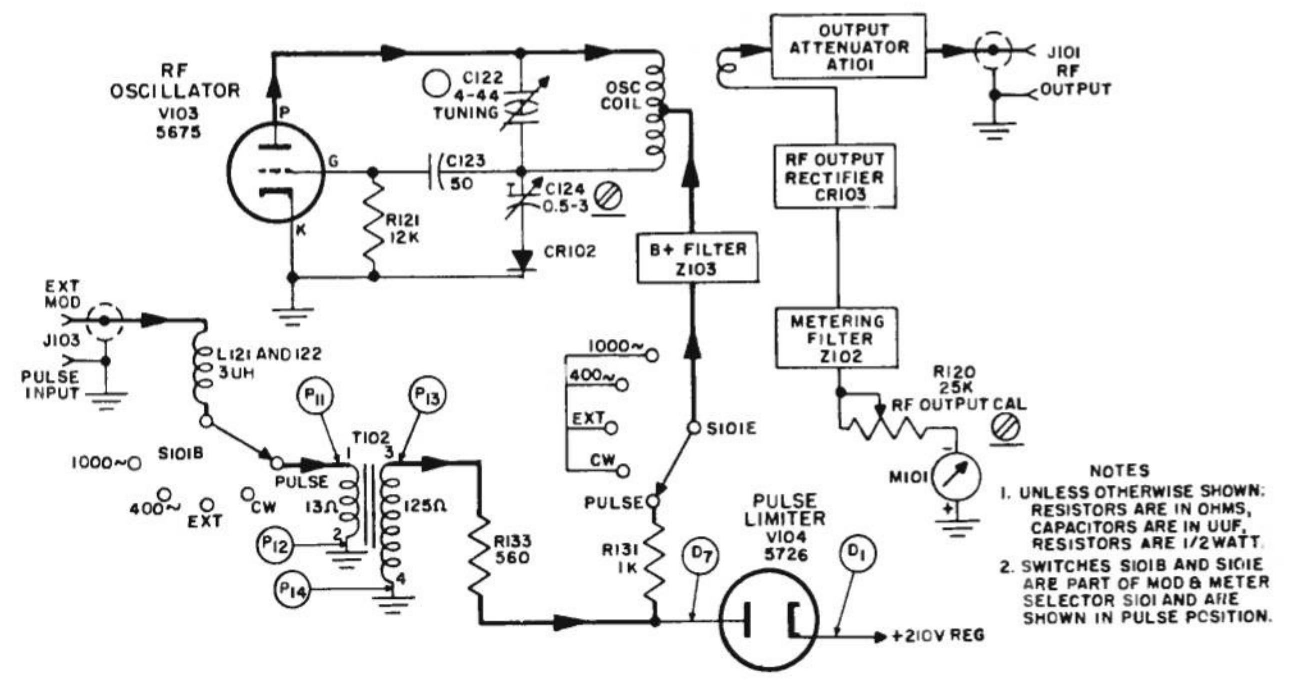


Figure 4-5. Simplified Schematic Diagram Showing Pulse Limiter and RF Oscillator Stages When Switched to Pulse Position.

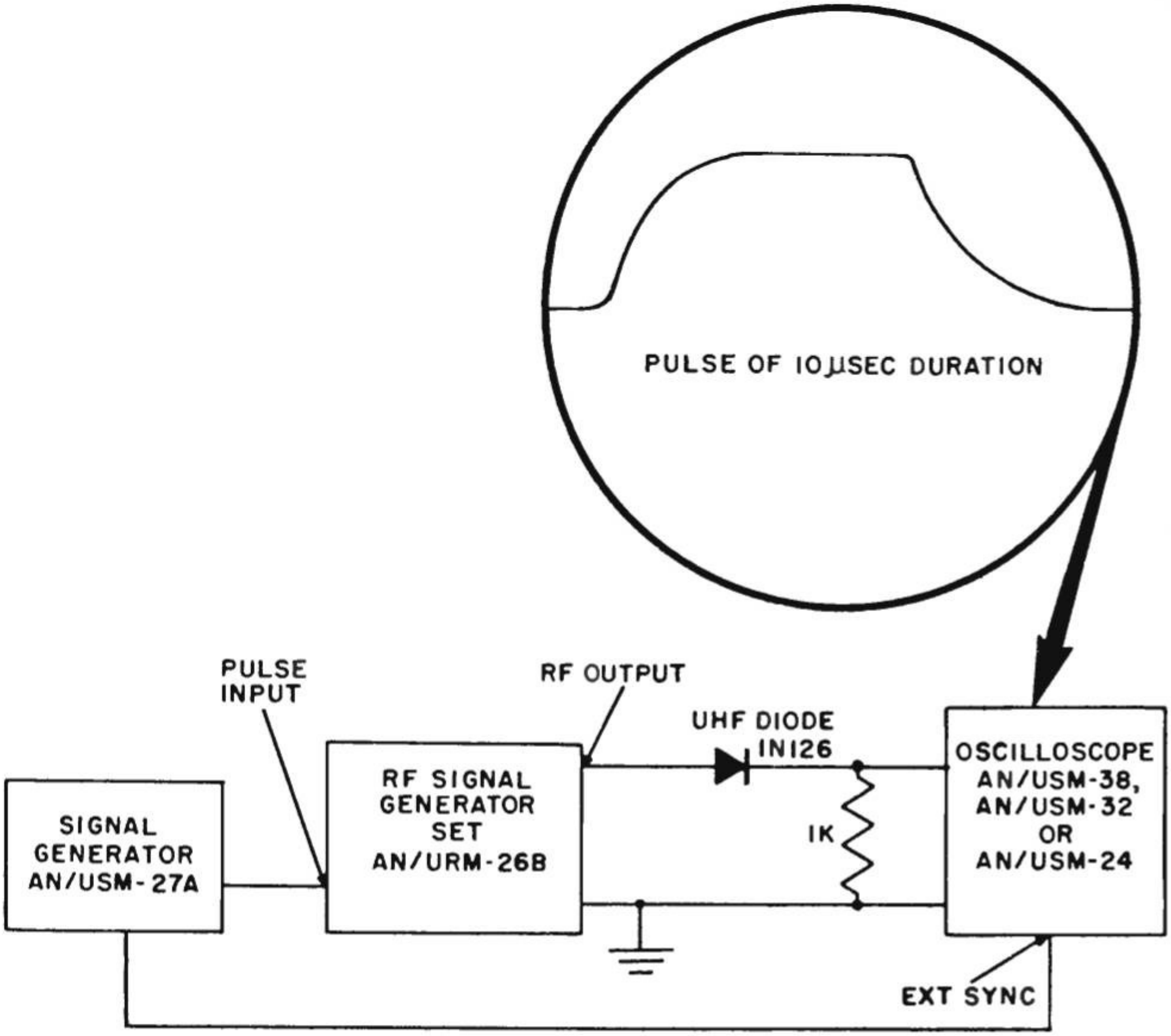


Figure 4-6. Oscilloscope Hookup to Observe Pulse Waveform.

the resistance of the limiter tube, flattening the peaks of the input pulse at the ±10 volt level. This clipping action protects the rf oscillator from overloading.

4-4. INTERNAL MODULATION CIRCUIT.

An internal source of modulation voltage is provided by a built-in audio oscillator. The audio oscillator and modulator are described in detail below.

a. AUDIO OSCILLATOR. – The audio oscillator is mounted on a sub-chassis on the left side of the signal generator (when viewed from the back) and is a standard Wien-bridge oscillator using a type 5814A dual-triode (V101). The oscillator generates an audio signal of either 400 or 1000 cycles per second, depending upon the position of MOD and METER SELECTOR switch S101. When S101C is in the EXT, CW or PULSE position (see figure 4-7) the audio oscillator grid is grounded, cutting off the oscillator.

An external modulating voltage may then be applied to the EXT MOD PULSE INPUT jack J103 on the front panel. Figure 4-7 is a simplified schematic diagram of the audio oscillator when set for 1000 cycles. For purposes of clarity, the mechanics of the MOD and METER SELECTOR switch S101 have been omitted. When S101 is switched to 400 cycle operation, resistors R112 and R110 are replaced with other values as required for the other frequency. The stage shown in figure 4-7 shows the dual-triode tube as two separate triodes, with V101A as the oscillator section and V101B as the inverter-amplifier section of the stage. Signal developed in V101A leaves the plate, proceeds through C104 to V101B. Here it is amplified and inverted, leaving its plate and is fed back through C102, C101 and R112 to the input of V101A *in phase* with the originating signal at

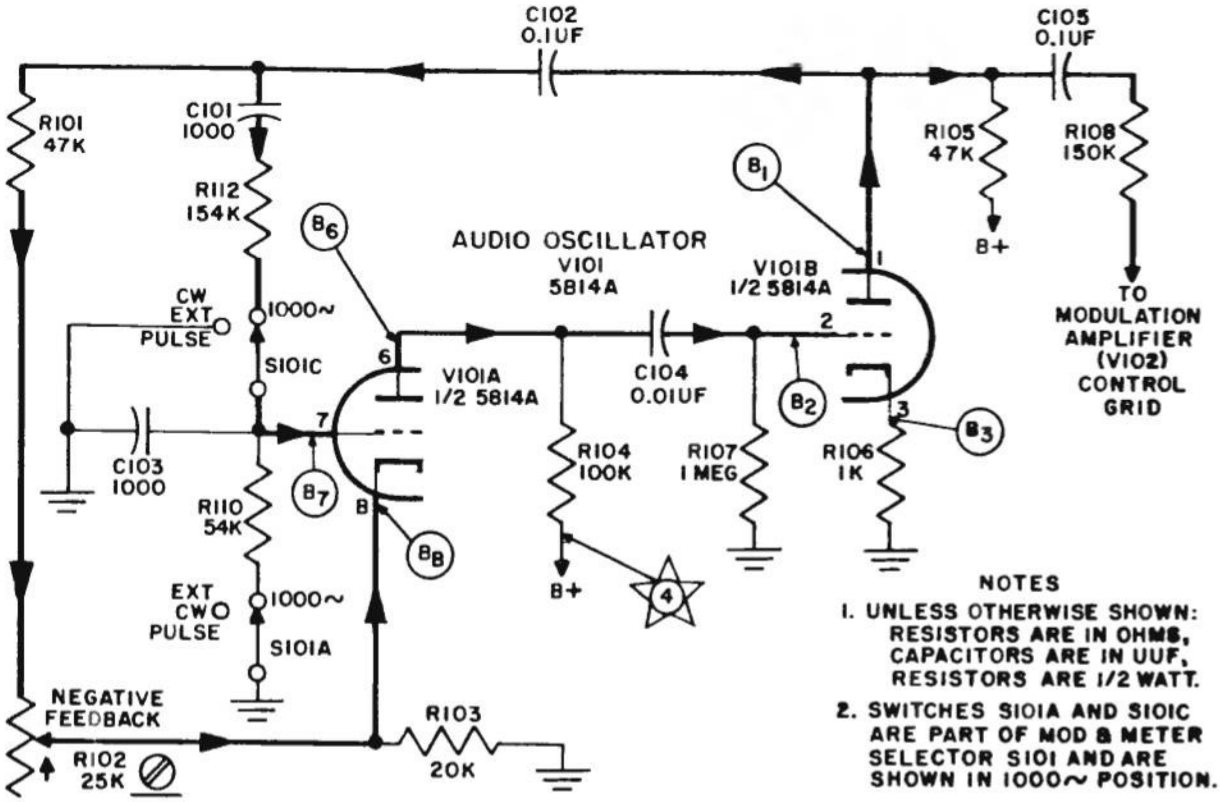


Figure 4-7. Simplified Schematic Diagram of the Audio Oscillator Set for 1000 Cycle Operation.

the grid of V101A. The *positive feedback* voltage thus fed back to the grid of V101A reinforces the initial signal, sustaining oscillations. The frequency-determining elements are C101, R112, C103, and R110, whose time constants determine oscillator frequency.

An alternate signal path from plate of V101B through C102, R101 and audio feedback control R102 supplies degenerative feedback to the cathode. The Wien bridge circuitry provides that the voltage across R103 is in phase with the output voltage from V101B, with positive feedback (at grid of V101A) exceeding the negative feedback (at cathode of V101A). The balance of the bridge is controlled by R102, controlling the phase-shift of the negative feed-back voltage. Degenerative or negative feed-back is provided by the voltage-divider network consisting of R101, R102 and R103. Capacitor C102 is a dc blocking capacitor, as is C104. Resistors R104 and R105 are the plate load resistors for the two triodes. Resistor R107 is the grid return for the inverter-amplifier stage, and R106 is its cathode return. The reinforced oscillations of V101A are amplified by V101B and pass through network C105 and R108 to the modulation amplifier (V102) control grid, supplying the desired modulation frequency. (A more complete discussion of the principles of the Wien-bridge oscillator may be found in Radar Electronic Fundamentals, NAVSHIPS 900,016).

b. MODULATOR. – (See figure 4-8.) The input to modulator V102 is selected by switch S101D. In the 400 or 1000 cycle position, the input to modulator V102 comes from the output of audio oscillator. In the EXT position, switches S101B and S101D permit an external signal via J103, through rf chokes L121 and L122, stabilized by R132 to V102. When S101D is switched to CW or PULSE position, the modulation amplifier is shorted to ground. In other than the CW or PULSE position, the modulator provides a measurable degree of sine wave plate modulation to the rf oscillator V103 (see figure 4-8) by amplifying signal fed to the modulation amplifier input grid. The signal is then amplified by V102, passing through modulation transformer T101, through CARRIER LEVEL control R119, through S101E and Z103 to the rf oscillator coil tank. Resistors R114 and R115 provide cathode bias. Resistor R115 is by-passed by C107 to smooth out the cathode bias, but R114 (a smaller resistor) is left unby-passed to introduce enough degeneration to decrease distortion in the stage. The CARRIER LEVEL control R119 is a front panel control for setting M101 to the red line on the meter.

c. % MODULATION CIRCUIT. – Since the plate voltage of the RF Oscillator V103 (see figure 4-8) is supplied through modulation transformer T101 at a regulated 210 volts, the percentage of modulation is directly

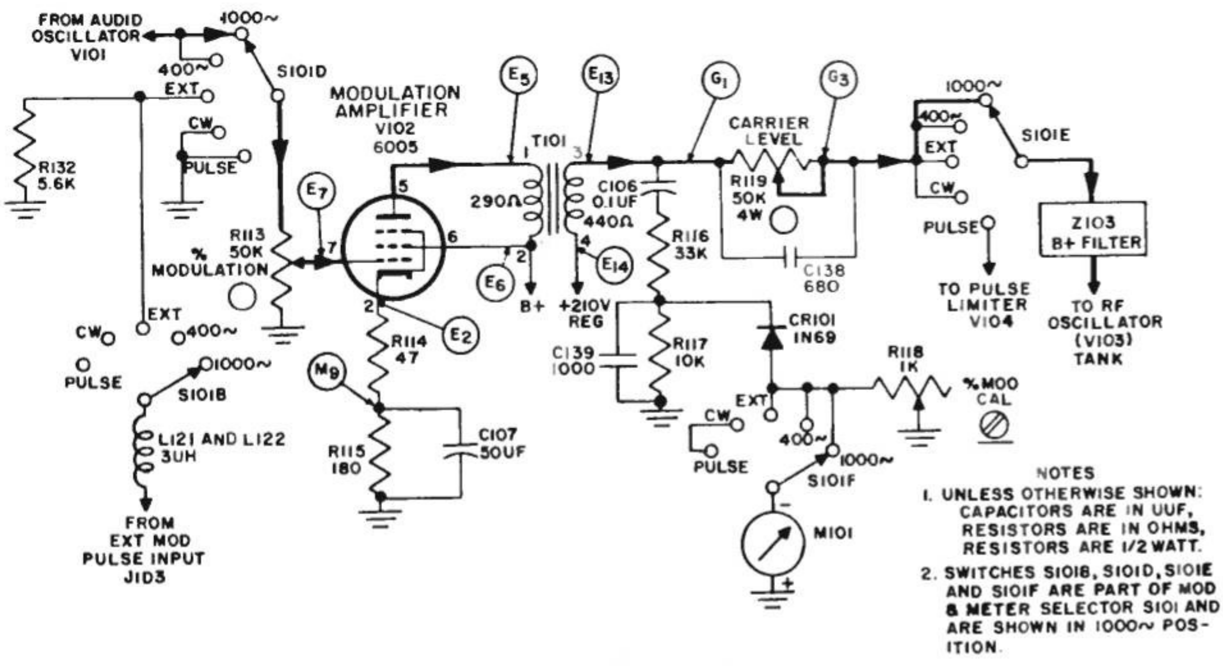


Figure 4-8. Simplified Schematic Diagram of the Modulation Amplifier and % Modulation Meter Circuit.

proportional to the amount of modulating voltage introduced and is independent of the actual carrier voltage. This is explained by the fact that 100% modulation is introduced when the modulating voltage swings the instantaneous plate potential from zero to twice the dc plate voltage. Smaller modulating voltages therefore result in lower degrees of modulation. The desired percentage of modulation is selected by means of % MODULATION potentiometer R113 (see figure 4-8) and is read directly from meter M101. The modulating voltage is applied to V102 across R113. A part of the modulating voltage is taken off C106 blocking capacitor and voltage divider R116 and R117, rectified by CR101 and read by M101 when MOD and METER SELECTOR switch is in the 400∿, 1000∿ or EXT position. Adjustment R119 sets the meter sensitivity by internal screwdriver adjustment when calibrating M101 for percent modulation.

4-5. EXTERNAL MODULATION CIRCUIT.

(See figure 4-9)

If the built-in 400 cycle or 1000 cycle sine wave generator is not desired for modulating the rf output, then any external sine wave generator supplying frequencies up to 20,000 cycles (approximately 2 to 10 v r.m.s.) may be used, feeding the external modulation source into the EXT MOD PULSE INPUT jack J103 on the front panel, with the MOD and METER SELECTOR in EXT position. The signal entering J103 goes via rf choke L121 through switch S101B and S101D to the grid of modulation amplifier V102. The modulation signal is amplified by V102, continuing through modulation transformer T101 and CARRIER LEVEL control R119 through S101E and Z103 (B+ filter) to the tank circuit oscillator coil of rf oscillator V103, and thus modulating the rf output in the same manner as that performed by the internal modulating frequencies. Note that switch S101C shorts out the grid of Audio Oscillator V101 when in the EXT position, making the local audio oscillator inoperative when an external modulating frequency is used.

4-6. TERMINATING THE SIGNAL GENERATOR.

Signal Generator SG-117/URM-26B has a characteristic output impedance of approximately 50 ohms (resistor R130) (see figure 4-4.). The microvolts input to a receiver under test will be accurate only when the signal generator is terminated in approximately 50 ohms resistive at the receiver end of the test cable. This voltage under terminated conditions is read directly on the MICROVOLTS scale of the RF OUTPUT dial. Two RF Cords 7" long and two RF Cords 4' -1" long are provided for making the necessary output connections (see figure 1-1). All four cables are identical except for length and consist of RG-58C/U cables with one type UG-88/U connector at each end. The characteristic impedance of these cables is approximately 50 ohms and there will be no standing wave losses between the signal generator and receiver if the receiver end is terminated in approximately 50 ohms. Most modern Navy receivers present a resistive input impedance of 50 ohms. This is especially true for receivers covering frequency ranges above 50 mc. In these cases, the output of the generator at the RF OUTPUT jack J101, can be connected direct to the receiver input. The microvolt reading determined from the RF OUTPUT dial will accurately represent the input voltage to the receiver under

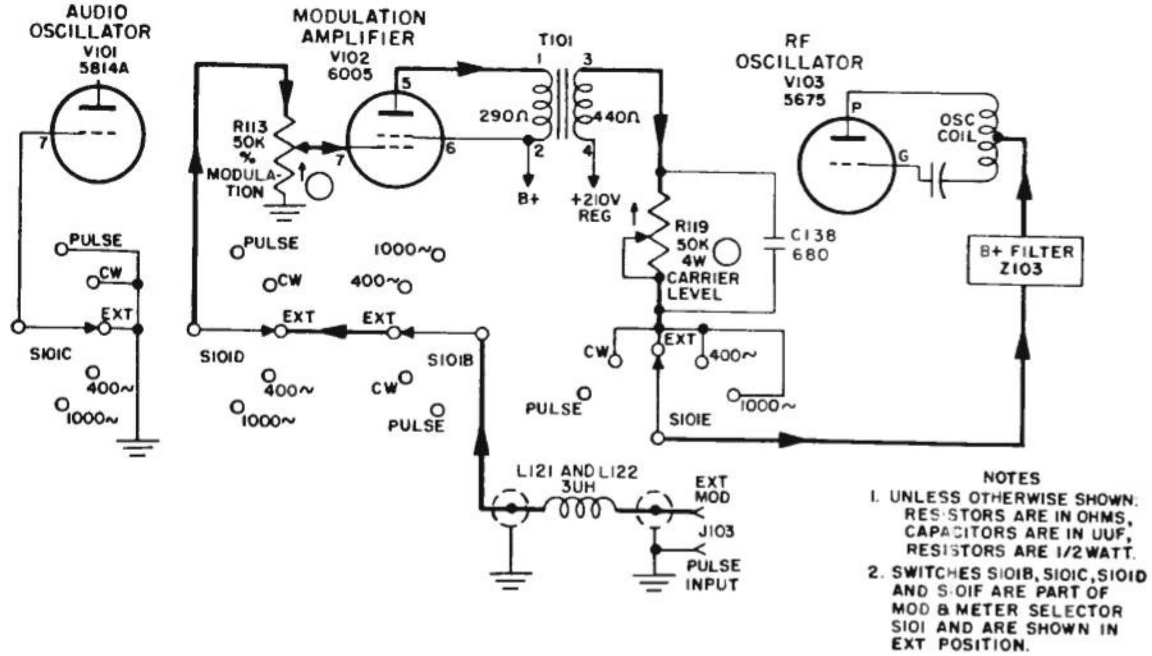


Figure 4-9. Simplified Schematic Diagram showing External Modulation.

test. Where attenuation of the output is desired, or where the receiver input impedance is different from that of the signal generator output, it is necessary to use special terminating circuits. These are discussed in paragraphs 3-9, 3-10, 3-11, and 3-12.

4-7. POWER SUPPLY PP-1215/URM-26B.

(See figure 4-10 and 6-16.)

Power Supply PP-1215/URM-26B is an integral part of the RF Signal Generator Set AN/URM-26B and is completely contained in a separate sub-chassis located to the rear of Signal Generator SG-117/URM-26B. It employs a full-wave type rectifier tube type 6X4WA, conventional power transformer, with output filtered to minimize ripple content. Both input (115 v ac +10%, single phase, 50 to 1000 cycles) and outputs, unregulated high voltage at 180 volts for the operation of non-critical circuits of the signal generator. plus 210 volts regulated to the rf oscillator and other critical circuits, and 6.3 volts ac for the heaters of all electron tubes, are brought to receptacle J201 mounted on the power supply chassis. Power supply jack J201 mates with plug P101 on the signal generator unit.

a. When plug P102 at the front panel is connected to a 115 v ac source, the input voltage is delivered to the power supply via rf filters L119, L120, C130 and C131 (see figures 4-10 and 5-1.), and through fuses F101 and F102. Power switch S103 on the front panel switches power for the whole signal generator set, lighting panel lamp I101 when switch is placed in ON position. Power transformer T201 provides a 6.3 v filament winding for all filaments, including rectifier V201. Centertap of the high-voltage winding is grounded in the conventional manner. The rectified output of V201 is filtered by filter capacitors C201 and C202A and filter choke L201. At the output of the filter network the dc path divides, part passing through R201 voltage-dropping resistor for unregulated output B+ with additional filtering by C202B, and part passing through voltage-dropping resistor R202, with additional filtering by C203-1, to provide regulated +210 volts.

b. The voltage regulators OB2WA have a nominal voltage rating of 105 volts, so two regulators are required for the 210 volt regulated output. The voltage across V203 and V202 remains constant over a fairly wide range of current (5 to 30 ma) passing through the tube. This property exists because the degree of ionization of the gas in the tubes varies with the amount of current through the tube. When a large current is passed, the gas is highly ionized and the internal impedance of the tube is low. When a small current is passed, the gas is ionized to a lesser degree and the internal impedance is high. Over the operating range of the tube, the product of the current through the tubes and the internal impedance of the tubes is practically constant. If the supply voltage (output of R202) drops, the voltage across V202-V203 would tend to drop. However, the gas in the glowtubes deionizes slightly and less current passes through the tube. The current

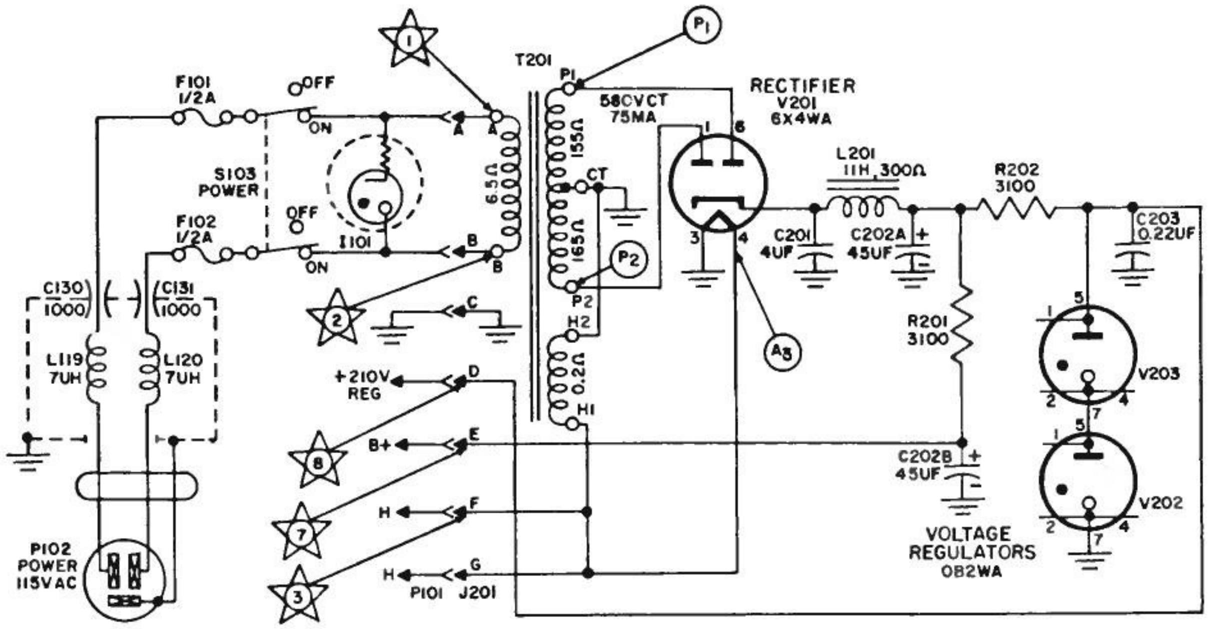


Figure 4-10. Schematic Diagram of Power Supply PP-1215/URM-26B.

through the series dc dropping resistor R202 is also decreased by the amount of this current decrease in the glow tubes. This would develop sufficiently smaller voltage drops across the R202 to maintain the required stable 210 volts drop across the glow tubes. A rise in supply voltage is similarly compensated.

c. The regulator tubes also provide a stable output voltage when the load impedance varies. If the load increased, more current would flow through the dropping resistor R202. This would tend to drop the 210 v DC output voltage across the regulator tubes. However, this voltage drop tendency slightly deionizes the regulator tubes, resulting in an increase in its internal impedance. This increase in glow tube impedance, relative to the DC impedance of the series dropping resistor, again raises the power unit output voltage to the required 210 v DC.

SECTION 5
TROUBLE-SHOOTING

5-1. GENERAL.

a. The first step in trouble-shooting RF Signal Generator Set AN/URM-26B is to determine that a trouble actually exists. If the equipment is not operated correctly, certain indications of trouble might be present when there is actually nothing wrong with the equipment. The technician should be thoroughly familiar with Section 3, Operator's Section before attempting to analyze the indicated defect.

b. After a positive determination is made that the signal generator is defective, the next step is to *sectionalize* the fault. Sectionalization means tracing the fault to the *major component* (such as the power supply unit) or *circuit* (such as the internal audio modulating circuit) responsible for the abnormal condition. The next step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal operation.

c. A preliminary check shall be made before proceeding with any trouble-shooting procedure. Visual inspection shall come before any actual instrument servicing. The first check shall include such items as indicator lamps, position of power switches, fuses, loose cables, charred insulation, broken wires, control settings, physical damage and everything that can be observed with the senses and the fingertips. The subject of fuses is covered in paragraph 5-2*b*. The Routine Check Chart covered in paragraph 5-3 checks routine performance. Where trouble-shooting with instruments is indicated, use recommended instruments listed in paragraph 5-4.

d. The functional section trouble-shooting charts following make up quickaction charts which show normal indications of operating sections. Where you find a section whose indication is not normal, you have isolated the particular section (and possibly the part) at fault. You will be referred to the proper paragraph for repair procedures. Where it is necessary to disassemble a section to get to the test points, you will be referred to the necessary disassembly paragraph.

5-2. PERIODIC TESTING.

a. ROUTINE MAINTENANCE CHECK CHART. – The construction of Signal Generator Set AN/URM-26B is such that preventive maintenance measures are limited. Periodic testing of the equipment to determine if it is in proper working order should be performed in accordance with the step-by-step procedure given in Table 5-1, ROUTINE CHECK CHART. If the signal generator is used frequently (several times a week), these checks should be made before use; otherwise they should be made weekly. All symbol designations given in Table 5-1 refer to Front Panel Diagram, figure 6-1, unless specified otherwise.

Note

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE BUREAU OF SHIPS MANUAL OF THE LATEST ISSUE.

b. FUSE FAILURE. – Symptoms of fuse failure and fuse locations are given in Tables 5-2 and 5-3. Spare fuses are provided in clips in the case cover.

CAUTION

Never replace a fuse with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been corrected.

c. LUBRICATION. – All gears and moving shafts should be lubricated periodically with Aero Lubriplate manufactured by Fisk Brothers, Newark, New Jersey.

5-3. PERFORMANCE STANDARDS.

Table 5-1 provides a routine check chart for operator to check performance. The first column shows what is being checked, the second column provides instructions on how to check, while the third column indicates normal performances and precautions.

5-4. TEST EQUIPMENT REQUIRED FOR MAKING REPAIRS AND TROUBLESHOOTING.

The technician may find a wide variation of applicable test equipment to use in making repairs or for trouble-shooting on RF Signal Generator Set AN/URM-26B. To achieve the best results, however, the test equipment listed below, or its equivalent, are recommended.

TABLE 5-1. ROUTINE CHECK CHART.

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS AND REMARKS
1. INSTALLATION	Before connecting signal generator power plug P102 to an ac source, make sure the equipment is properly set up in accordance with instructions given in Section 3. *a*. POWER switch (S103) in OFF position. *b*. CARRIER LEVEL control (R119) fully counterclockwise. *c*. % MODULATION control (R113) fully counterclockwise. *d*. RF OUTPUT attenuation control (AT101) fully counterclockwise.	See that all cables and wires are in good condition and that connections are properly made.
2. POWER SUPPLY	Set controls as follows: *a*. CARRIER LEVEL control (R119) fully counterclockwise. *b*. % MODULATION (R113) fully counterclockwise. *c*. Connect power plug P102 to a source of 115 volts, 50 to 1000 cps power.	The indicator lamp I101, POWER, should light. If not, check the front panel fuses (see Table 5-3) and indicator lamp. (Note: I101 is a neon glow type lamp and it can be checked only by applying 115 v ac.).
3. International Modulation and Modulation Metering check	*a*. Turn the MOD and METER SELECTOR switch (S101) to 400 cycle position. *b*. Advance the % MODULATION control (R113) and at the same time watch the panel meter. The meter pointer should rise smoothly to full scale. *c*. Repeat for 1000 cycle position.	This test checks out the % MODULATION control (R113), the basic meter (M101), and the internal sine wave modulating circuits.
4. CARRIER LEVEL check	*a*. Turn the % MODULATION control completely counterclockwise. *b*. Turn the MOD and METER SELECTOR switch (S101) to CW position. *c*. Rotate the CARRIER LEVEL control (R119) clockwise while simultaneously observing the panel meter (M101). The meter pointer should advance smoothly to the red line on the upper scale. *d*. Repeat check for all six detented frequency band positions. *e*. Check for smooth mechanical operation and positive detent action. See that the dial mask locates properly.	This operation checks the capability of the rf oscillator on each band, and the rf level metering circuit.
5. FREQUENCY DIAL	Rotate the TUNING knob clockwise until the MEGACYCLES dial turns to its extreme position; then rotate it counterclockwise to the opposite extreme position. Check that the mechanical action is smooth and that no binding or slipping occurs. See that full dial coverage is obtained.	This is a mechanical check only.
6. RF OUTPUT Attenuator Dial	Rotate the RF OUTPUT dial from one extreme to the other. The mechanical action of this control is firm but smooth; there should be no roughness or binding at any point.	This is a mechanical check only.

TABLE 5-2. SYMPTOMS OF FUSE FAILURES.

INDICATOR LAMP	ALL ELECTRON TUBES	METER M101	OPEN FUSE	VALUE (AMPS)	COMMENTS
Not Lighted	Filaments off	No reading	F101	½	Check also power supply cables, connectors, and the POWER switch S103.
Not Lighted	Filaments off	No reading	F102	½	

TABLE 5-3. FUSE LOCATIONS.

SYMBOLS	LOCATIONS	PROTECTS	AMPS	VOLTS
F101 F102	1. Physically located in fuse-holders on the front panel of the signal generator (see figure 6-1.) 2. Electrically located in the primary of power transformer T201. See figure 4-10.	Primary of power transformer T201.	½	250
F103 F104	Physically located on ferrule clips in the case cover.	Spares for F101 and F102.	½	250

a. Multimeter AN/PSM-4 (multimeter with dc sensitivity of 20,000 ohms/volt, ac sensitivity of 1000 ohms/-volt).

b. Multimeter AN/USM-116.

c. Oscilloscope AN/USM-17.

d. Frequency Counter AN/USM-207.

e. Another Signal Generator Set AN/URM-26B of known good accuracy, or equivalent crystal-controlled calibration standard, with frequency range from 4 to 400 mc.

5-5. FUNCTIONAL SECTION TROUBLE-SHOOTING AND REPAIR.

Each functional section of the signal generator is separated in the trouble-shooting techniques below:

a. POWER SUPPLY PP-1215/URM-26B. – Remove power supply in accordance with paragraph 6-3*b*. Using Table 5-4 as guide, follow the steps in order, checking the necessary test points with Multimeter AN/PSM-4 (or any equivalent multimeter with dc sensitivity of 20,000 ohms per volt and ac sensitivity of 1000 ohms per volt). See figure 4-10 for the schematic diagram and figure 5-1 for the test point diagram. Take the preliminary action indicated in the third column of table 5-4 and see the normal indication in the next column. The last column directs you to the next step. All tests on the power supply are made with the one multimeter, with the signal generator set plugged in and turned on.

b. AUDIO OSCILLATOR. – Expose the audio oscillator section (see paragraph 6-9). Set the signal generator operating in 1000 cycle position. Using Table 5-5 as guide, follow the steps in order, connecting Multimeter AN/USM-116 (or any equivalent vacuum-tube-voltmeter) to the proper test points, taking the preliminary action indicated in the third column of the table, then see the normal indication in the next column. The last column directs you to the next step. Fig. 5-2 is the test point diagram, and figure 5-3 is the wiring diagram. Figure 4-7 is the partial schematic diagram.

c. MODULATOR. – Note figure 5-2 showing test points of modulator, with figure 5-3 showing wiring diagram. Use Table 5-6 as guide, follow the steps in order, connecting Multimeter AN/USM-116 (or any equivalent vacuum-tube-voltmeter) to the proper test points, taking the preliminary action indicated in the third column of the table, then see the normal indication in the next column. The last column directs you to the next step.

TABLE 5-4. POWER SUPPLY PP-1215/URM-26B, FUNCTIONAL SECTION TROUBLE-SHOOTING CHART (See figures 4-10, 5-1 and 5-2.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	(All test points taken from figure 5-1).	(All voltage tests made with power supply connected to signal generator, with equipment on and operating.)	(All indication will be visible on Multimeter AN/PSM-4. Switch appropriate ranges as required.)	
1	1 and 2	On ac scale, connect probes of multimeter between test points 1 and 2.	115 volts (same voltage as is provided by the source supply.) Pilot light I101 will be ON. This measures voltage at the primary of power transformer.	If indication is normal, proceed to next step. If not normal, make a note that power is not reaching primary of power transformer.
2	3	On ac scale, connect black probe to chassis, red probe to test point.	6.3 volts (filament). This measures voltage across filament winding.	If indication is normal, proceed to next step. If step 1 is normal, but this step is not, an open circuit in the power transformer is indicated. Confirm by reading voltage between test point 3 and terminal H2.
3	A_3	On ac scale, connect black probe to chassis, red probe to test point.	6.3 volts (filament). This measures filament voltage at filament of V201 tube.	If indication is normal, proceed to next step. If step 2 is normal, but this step is not, check continuity of wiring from test point 3 to test point A3.
4	P_1 and P_2	This test point need be checked only if next two test points do not give normal indication. On ac scale, connect test probes to point P_1 and P_2.	550 to 580 volts. This measures plate winding of power transformer, end to end.	If indication is not normal, but all preceding steps are normal, there may be a faule in the plate winding of the power transformer, or short in rectifier tube V201 or its associatd circuit.
5	7	On dc scale, connect black probe to chassis, positive probe to test point.	180 volts. This measures the unregulated dc output of the power supply.	If indication is normal, proceed to next step. If abnormal, but all preceding steps were normal, there may be failure in the filter system or dropping resistors.
6	8	On dc scale, connect black probe to chassis, positive probe to test point.	210 volts. This measures the regulated output of the power supply.	If indication of this step and all previous steps are normal, the power supply shall be considered in normal operating condition. If all previous steps are normal, but this step is abnormal, then failure may be due to R202, C203, V202 and V203.

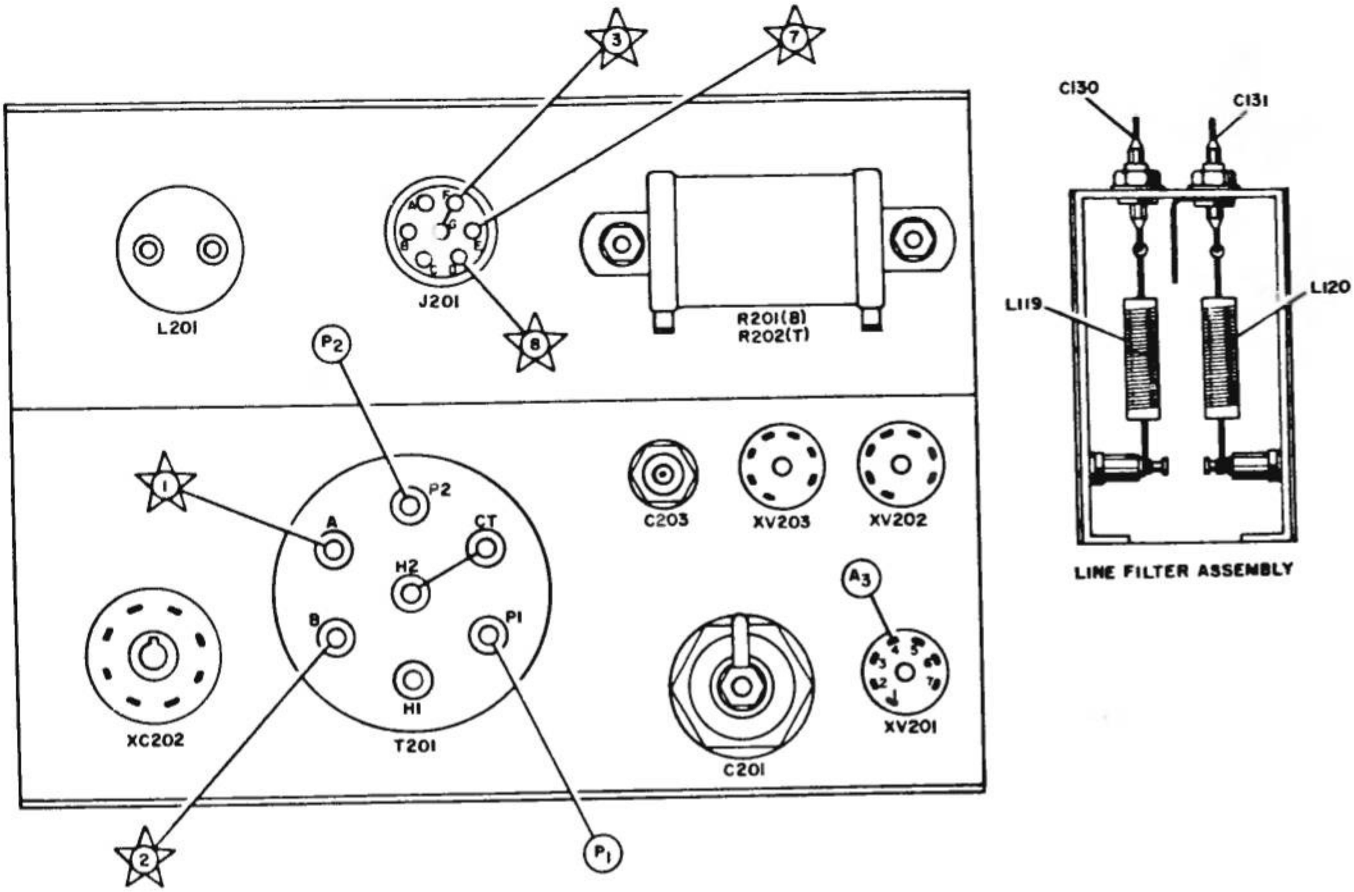


Figure 5-1. Power Supply PP–1215/URM-26B with chassis Folded Flat and Line Filter Assembly.

d. PULSE MODULATOR. – Expose the pulse limiting stage (see paragraph 6-9), so that the test points are available as in figure 5-2. Figure 4-5 shows the simplified schematic diagram. Figure 4-6 shows the oscilloscope hookup to observe pulse waveform. Figure 5-3 shows the wiring diagram of this stage. Figure 5-4 shows the audio and metering section terminal board. Figure 5-5 shows the modulation and pulse transformers. Using Table 5-7 as guide, follow the steps in order, connecting the appropriate test instruments as follows (see figure 4-6). Turn on signal generator, set for 100 mc, CW. Set CARRIER LEVEL so meter reads to red line. Switch to PULSE. Turn on the pulse generator (Signal Generator AN/USM-27A) to 10 Usec pulse length, +PULSE, 40 PULSE VOLTS, PULSE REP RATE KC to 0.1, connecting PULSE OUT to PULSE INPUT J103 of signal generator. Connect SYNC OUT of pulse generator to EXT SYNC terminal of Oscilloscope AN/USM-17. Connect RF OUTPUT J101 of signal generator through 1N126 UHF Diode to the V. INPUT of the oscilloscope. The SYNC VOLTS control of the pulse generator will adjust the trace to synchronization with the switch in + SYNC position on the pulse generator. Set the oscilloscope horizontal sweep to 100 cps. Take the preliminary action indicated in the third column of Table 5-7, then see the normal indication in the next column. That last column directs you to the next step.

e. RF OSCILLATOR. – Expose the rf oscillator stage (see paragraph 6-5) so that the test points are exposed as in figure 5-6. Figure 5-7 shows the metering crystal pickup mount. Figure 4-2 shows the simplified schematic diagram for this stage. Using Table 5-8 as guide, follow the steps in order, connecting the appropriate test instruments to the proper test points. Take the preliminary action indicated in the third column of the table, then see the normal indication in the next column. The last column directs you to the next step.

5-6. TUBE SOCKET ELECTRICAL MEASUREMENTS.

a. The majority of faults must be localized by checking the voltage and resistance at the tube sockets and at key test points in the circuit. The key test points have been specified in Tables 5-4 to 5-8. Figure 5-9, RF Signal Generator Set AN/URM-26B, Voltage and Resistance Chart lists diagrammatically the voltage and resistance measured from all tube socket connections to chassis ground.

TABLE 5-5. AUDIO OSCILLATOR SECTION, FUNCTIONAL SECTION TROUBLE-SHOOTING CHART (See figures 4-7, 5-2, 5-3 and 5-4.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	(All test points taken from figure 5-2, except as otherwise noted.)	(All voltage test made with signal generator operating in 1000 cycle position, with % MODULATION control in maximum counterclockwise position.)	(All indication will be shown on Multimeter AN/USM-116 appropriate range.)	
1	★3	On ac scale, connect black probe to chassis, red probe to test point.	6.3 volts (filament). This measures voltage across filament of V101.	If indication is normal, proceed to next step. If abnormal, trace wiring and take reading at test point OE4 and OD4, all of which reads 6.3 volts.
2	B_1	On dc scale, connect black probe to chassis, positive probe to set point.	+100 volts (plate of V101 at pin 1).	If indication is normal, proceed to next step. If abnormal, remove V101 and test again. Voltage should double with tube out of socket.
3	★4 (Fig. 5-4)	On dc scale, connect black probe to chassis, positive probe to test point.	+180 volts (unregulated voltage supply).	If indication is normal proceed to next step. If abnormal, check output of regulator tube at power supply, step 8, Table 5-4. If this step is normal, but step (2) above is abnormal, check voltage at each end of R105 to localize failure. Terminal 4 is high end of R105. Terminal M7 is low end of R105.
4	B_6	On dc scale, connect black probe to chassis, positive probe to test point.	+157 volts (plate of V101 at pin 6).	If indication is normal proceed to next step. If abnormal, check test point with V101 out of socket. Reading should increase 50 volts. If step (3) is normal, but step (4) is abnormal, check voltage at each end of R104 to localize failure. See figure 5-4. Terminal 4 is high end of R104. Terminal M8 is low end of R104.
5	B_8	On dc scale, connect black probe to chassis, positive probe to test point.	10 volts (cathode voltage, pin 8, V101).	If indication is normal proceed to next step. If abnormal, note incorrect voltage at pin 8, V101, possibly incorrect setting of audio feed back control R102.
6	B_3	On dc scale, connect black probe to chassis, positive probe test point.	2 volts (cathode voltage, pin 3, V101).	If indication is normal, proceed to next step. If abnormal, note incorrect voltage at pin 3, V101.
7	B_7	On dc scale, connect black probe to chassis, positive probe to test point.	ZERO volts (grid voltage, pin 7, V101).	If indication is normal proceed to next step. If abnormal, check C103, R110.
8	B_2	On MINUS DC scale, connect black probe to chassis, positive probe to test point.	-2 volts (grid voltage, pin 2, V101).	If indication is normal, proceed to next step. If abnormal, check R107, C104.
9	E_7 (Fig. 5-2 and 6-7)	Replace Multimeter AN/USM-116 with Oscilloscope AN/USM-17. Connect the V. INPUT probe of oscilloscope to test point.	Pure sine wave. Adjust R102 until sine wave is distorted by over driving and clipping. Then back up the control to true sine wave.	This is a normal adjustment procedure, the last step of audio oscillator section checking, indicating normal performance of entire stage.

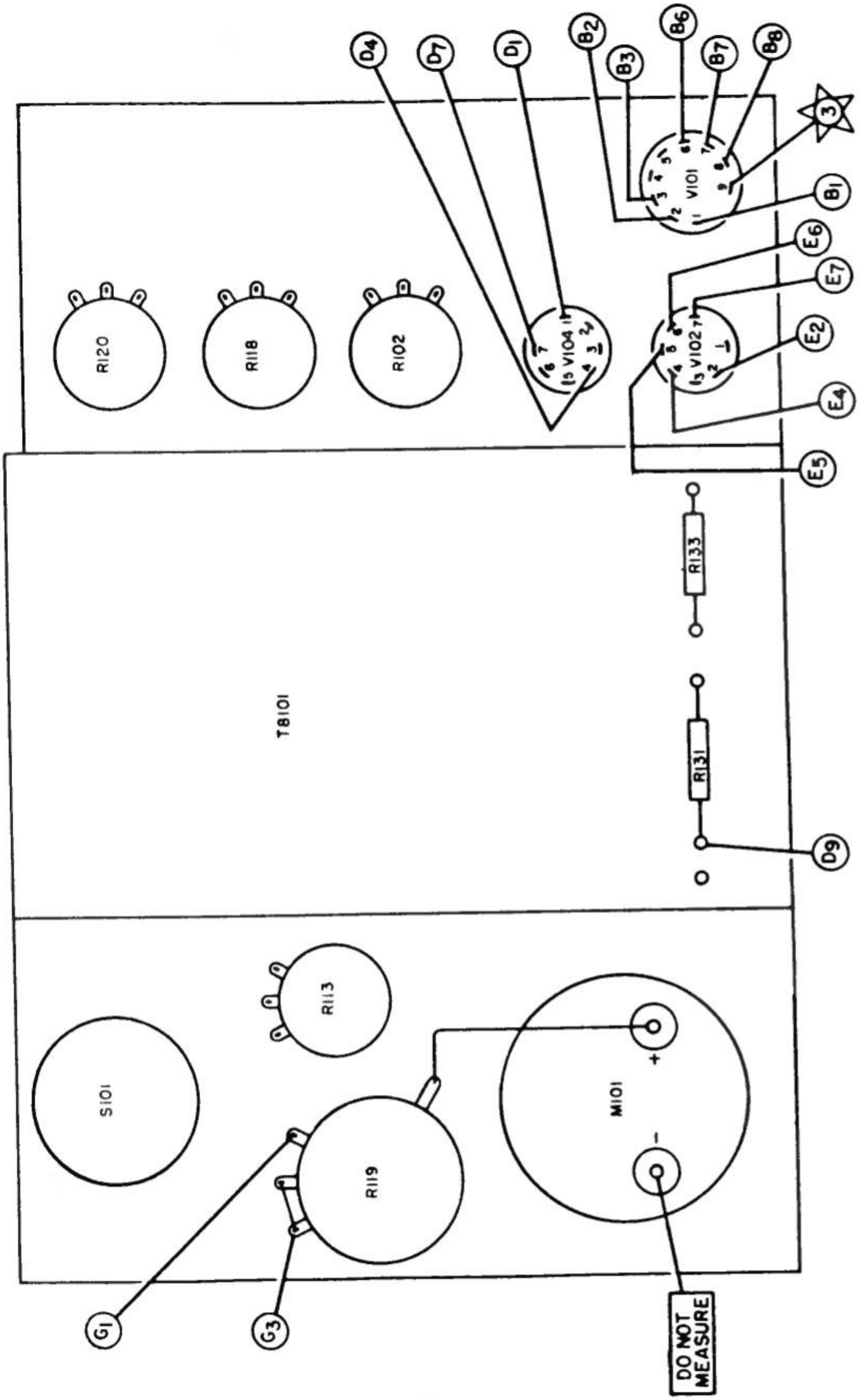


Figure 5-2. Test Points; Audio Oscillator, Modulator and Pulse Circuits with Chassis Folded Back.

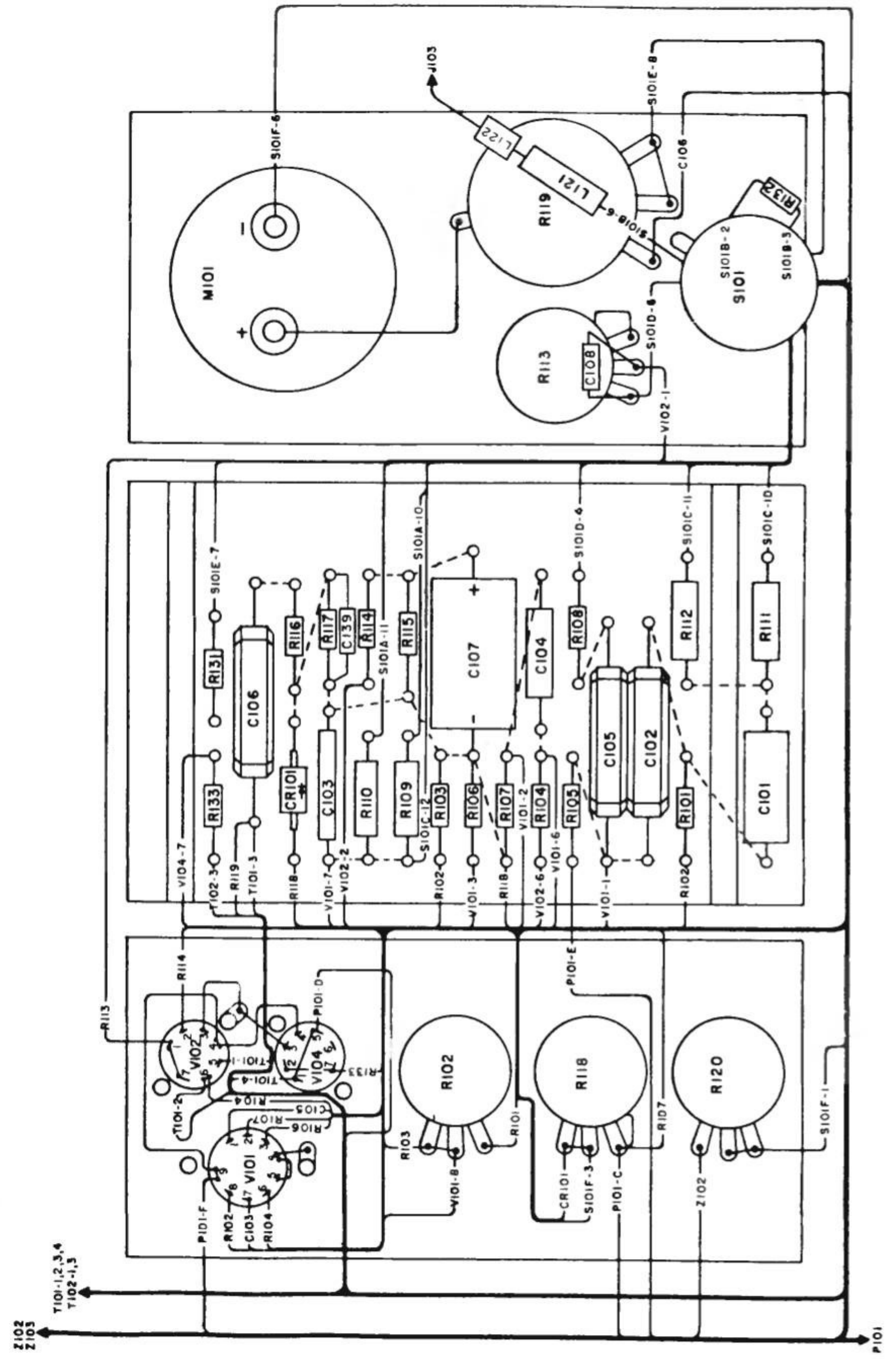


Figure 5-3. Wiring Diagram; Audio Oscillator, Modulator and Pulse Circuits, with Chassis Folded Back.

TABLE 5-6. MODULATOR SECTION, FUNCTIONAL SECTION TROUBLE-SHOOTING CHART
(See figures 4-8, 5-2, 5-3 and 5-4.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	(All test points taken from figure 5-2 except as otherwise noted.)	(Turn on signal generator; set for 5 mc, CW. Set CARRIER LEVEL so meter reads to red line. Switch to 1000 cycles. Adjust % MODULATION to 30%.)	(All indication will be shown on Multimeter AN/USM-116 on appropriate range.)	
1	E_4	On dc scale, connect black probe to chassis, red probe to test point.	6.3 volts (filament). This measures voltage across filament of V102.	If indication is normal, proceed to next step. If abnormal, trace wiring and take reading at test point O E4 and O D4, all of which reads 6.3 volts.
2	E_5	On dc scale, connect black probe to chassis, positive probe to test point.	180 volts. This is the voltage at plate pin 5 of V102.	If indication is normal, proceed to next step. If abnormal, check voltage at terminal 1 of T101 (figure 5-5). Both points should read 180 volts.
3	E_6	On dc scale, connect black probe to chassis, positive probe to test point.	180 volts. This is the voltage at acreen pin 6 of V102.	If indication is normal, proceed to next step. If abnormal, check voltage at terminal 2 of T101 (figure 5-5). Both points should read 180 volts.
4	E_2	On dc scale, connect black probe to chassis, positive probe to test point.	8 volt. This is the voltage at cathode pin 2 of V102.	If indication is normal, proceed to next step. If abnormal, check R114, R115 and C107.
5	M_9 (figure 5-2.)	On dc scale, connect black probe to chassis, positive probe to test point.	6.5 volts. This is the tie point between R114 and R115.	If indication is normal, proceed to next step. If abnormal, check R114, R115 and C107.
6	E_7	On ac scale, connect black probe to chassis, positive probe to test point.	3 volts ac. This is the voltage at grid pin 7 of V102.	If indication is normal, proceed to next step. If all preceding steps are normal, but step 6 is abnormal, check Audio Oscillator, Table 5-5, since that stage must operate normally for proper reading of this step.
7	E_7	Same conditions as step (6) above Vary % MODULATION control on front panel. (Return control to 30% position after completing this step.)	Voltage indication at test point varies smoothly with variation of control	If indication is normal, proceed to next step. If abnormal, check R113 (Figure 5-2)
8	G_1 and G_3 (figure 5-2.)	On ac scale, connect probes to test point. Vary CARRIER LEVEL control on front panel.	0 - 142 volts, varying smoothly with variation of control.	If indication is normal, proceed to next step. If abnormal, check R119.

TABLE 5-6 (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
9	(E_5) (figure 5-5.)	On dc scale, connect black probe to chassis, positive probe to test point.	180 volts. This is voltage at terminal 1 of T101.	If indication is normal, proceed to next step. If abnormal, check test point O E5 figure 5-2, direct connection to this point.
10	(E_6) (figure 5-5.)	On dc scale, connect black probe to chassis, positive probe to test point.	180 volts. This is voltage at terminal 2 of T101.	If indication is normal, proceed to next step. If abnormal, check test point O E6 figure 5-2, direct connection to this point.
11	(E_{13}) (figure 5-5.)	On dc scale, connect black probe to chassis, positive probe to test point.	210 volts. This is voltage at terminal 3 of T101.	If indication is normal, proceed to next step. If abnormal, check test point O G3 figure 5-2, direct connection to this point.
12	(E_{14}) (figure 5-5.)	On dc scale, connect black probe to chassis, positive probe to test point.	210 volts. This is voltage at terminal 4 of T101.	If indication is normal, but step (11) is abnormal, fault may be in secondary winding of T101 or *loading* beyond terminal 3 of T101.

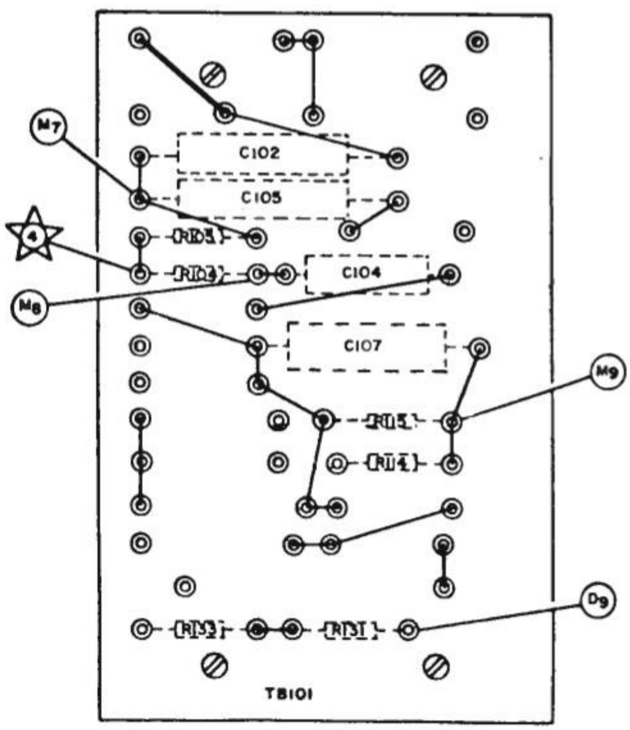


Figure 5-4. Audio and Metering Section Terminal Board, Outside View.

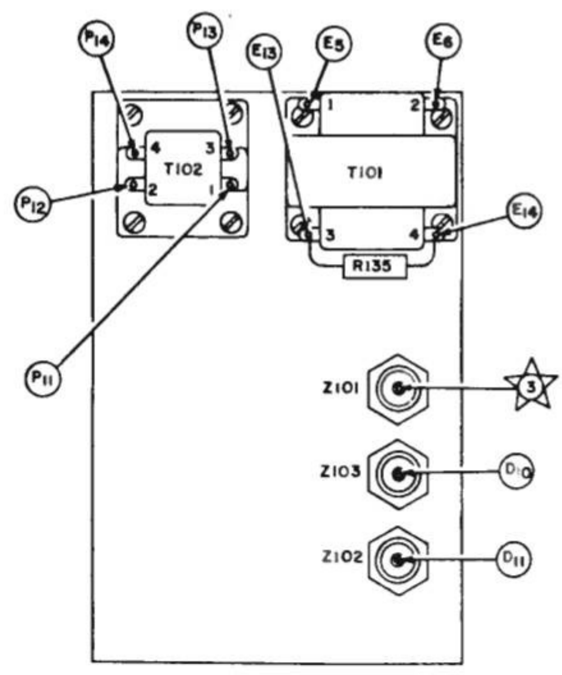


Figure 5-5. Modulation and Pulse Transformers. and Filters
Figure 5-7. Metering Crystal Pickup Mount.

TABLE 5-7. PULSE MODULATOR, FUNCTIONAL SECTION TROUBLE-SHOOTING CHART
(See figure 4-5, 4-6, 5-2, 5-3, 5-5.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Signal	Set up instruments as indicated in paragraph 5-5d. As connected in pragraph 5-5d, adjust oscilloscope and signal generators for clearest signal. Adjust PULSE VOLTS on pulse generator to 40.	On screen of Oscilloscope AN/USM-17. Trace on screen as shown in inset of figure 4-6.	Proceed to next step in any case.
2	Signal	With conditions as in step (1) above, vary PULSE VOLTS control above and below 40.	Trace on screen remains at same amplitude as PULSE VOLTS control goes above 40. Trace on screen gradually reduces in amplitude as PULSE VOLTS control goes below 40.	If indication is normal, then entire pulse operation is normal, and additional testing in this stage is unnecessary. If indication is abnormal, proceed to next step.
3	(P_{11}) (figure 5-5.)	Remove UHF Diode 1N126 and 1K resistor from set-up shown in figure 4-6. Using the V. INPUT probe of the oscilloscope, connect to test point.	Trace on screen similar to that shown in figure 4-6, except for shorter rise time and decay time of the pulse.	If indication is normal, proceed to next step. If abnormal, check further by turning PULSE VOLTS control to maximum. If still abnormal, check T102, L121 and MOD and METER SELECTOR switch setting and action. If still abnormal feed the output of pulse generator directly to oscilloscope to check testing instruments. If trace appears, reconnect and repeat step (3).
4	(P_{13}) (figure 5-5.)	Connect the V. INPUT probe to test point.	Trace described in step (3) above with greater amplitude.	If indication is normal, proceed to next step. If step (3) was normal but this step is abnormal, unsolder wire from terminal 3 of T102 and repeat this step. If normal without the wire, resolder the wire and proceed to next step. If abnormal without the wire, test T102.
5	(D_7) (figure 5-2.)	Connect the V. INPUT probe to test point.	Trace described in step (4) above.	If indication is normal, proceed to next step. If abnormal, remove V104 from socket and test this step again. If still abnormal, check R133. If normal with V104 out of socket, but abnormal with tube in place, check V104.

TABLE 5-7. (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
6	D_9 (figure 5-2.)	Connect the V. INPUT probe to test point.	Trace described in step (4) above.	If indication is normal, proceed to next step. If abnormal, check R131.
7	D_{10} (figure 5-5.)	Connect the V. INPUT probe to test point.	Trace described in step (4) above.	If indication is normal, then pulse circuit may be considered as normal. If this step is normal, but steps (1) and (2) are still abnormal, then trouble is indicated in rf oscillator stage.
8	D_1 (figure 5-2.)	Remove oscilloscope. Connect Multimeter AN/USM-116 by switching to dc scale, connecting black probe to chassis, positive probe to test point.	210 volts. This measures regulated voltage to cathode of V104.	This is merely an operational check. The voltage indication should be correct whether the pulse generator is connected or not. If abnormal, remove V104 and test again. If still abnormal, trace wire to regulated power supply. If indication is normal with tube out, but abnormal with tube in place, check V104.
9	D_4 (figure 5-2.)	On ac scale, connect black probe to chassis, red probe to test point.	6.3 volts. This measures voltage across filament of V104.	This is merely an operational check. If this indication is abnormal, then all previous conclusions on this stage are incomplete, since this stage has been inoperative.

b. Except where specified in the footnotes to figure 5-9, all measurements were made with a 20,000 ohms per volt dc meter, and a 1000 ohms per volt ac meter such as contained in Multimeter AN/PSM-4, or TS-352/U or equivalent.

WARNING

High voltages up to 580 volts are exposed when the signal generator is being tested outside of the cabinet. Exercise great care in handling the instrument under these conditions. Highest voltages are in the power supply sub-chassis.

5-7. TYPICAL TROUBLES.

Test instruments like the RF Signal Generator Set AN/URM-26B are always used in conjunction with instruments being tested, so it may be confusing to the technician when trouble is detected, as to whether the trouble is in the instrument being tested, or in the signal generator. To quickly determine whether the trouble is in the signal generator, disconnect the signal generator from the equipment being tested and quickly run through the checks shown in Table 5-9, Typical Troubles. All possible troubles shown in the first column should be checked. The second column shows the normal indication when the signal generator is operating correctly. The third column shows typical nature of trouble with the symptoms of the trouble. The last column is the recommended check and remedy for the fault.

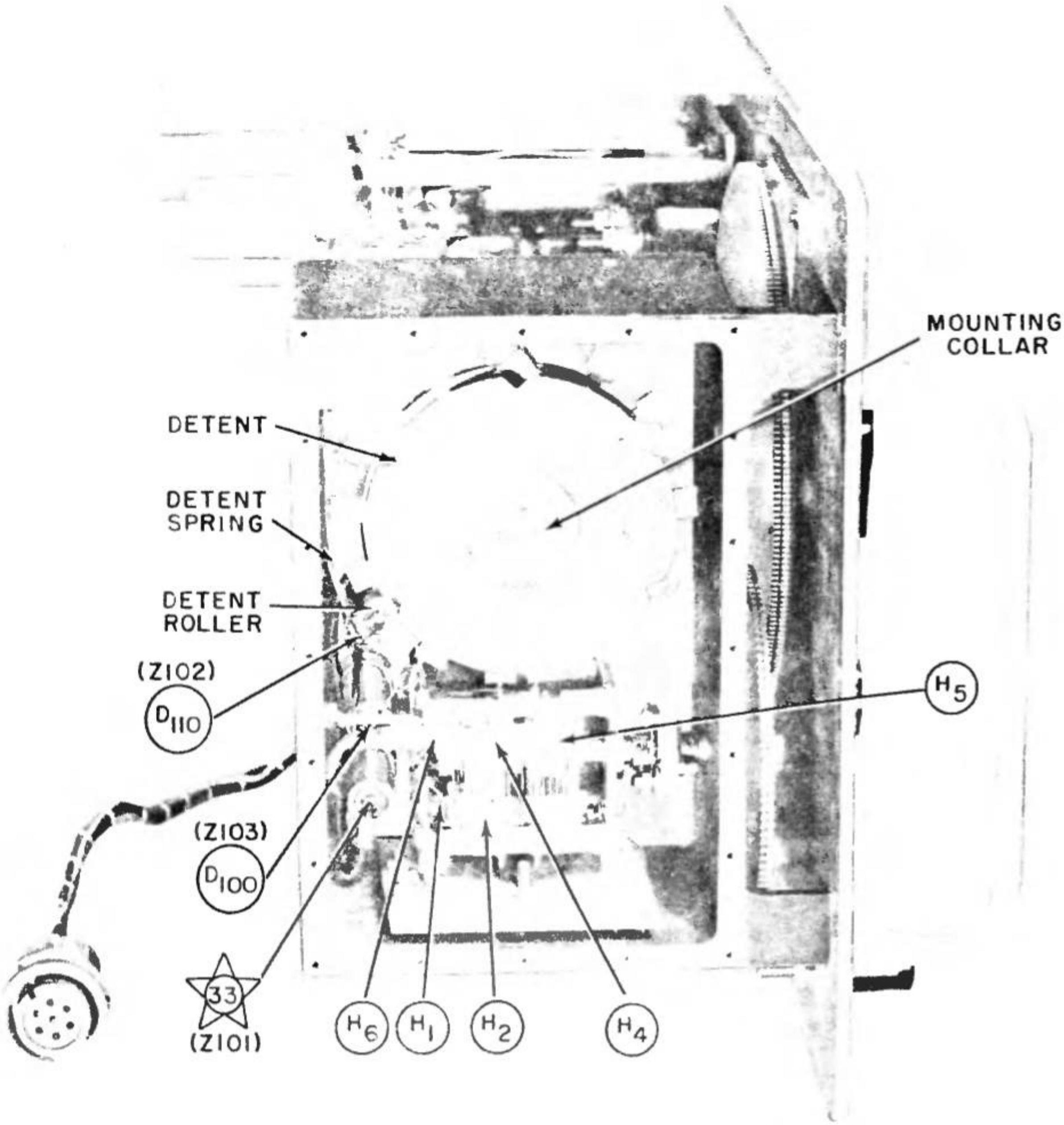


Figure 5-6. RF Oscillator Stage Showing Test Points.

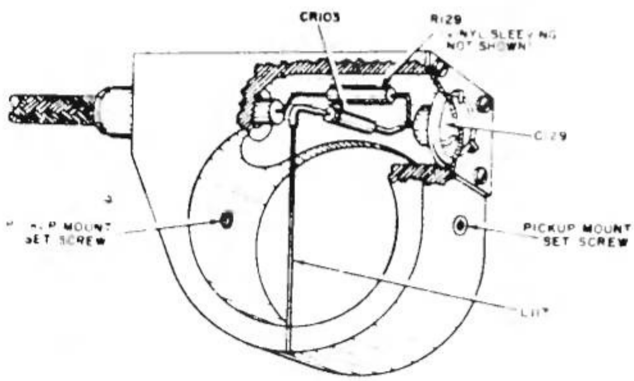


Figure 5-7. Metering Crystal Pickup Mount

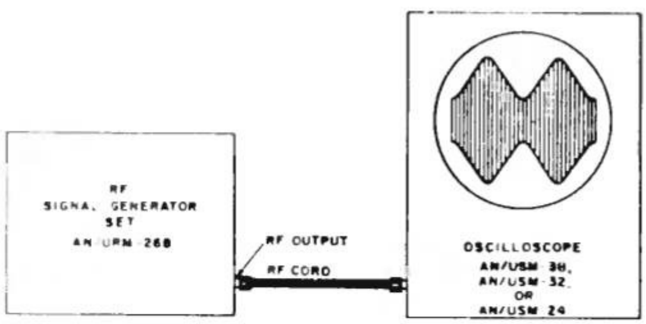


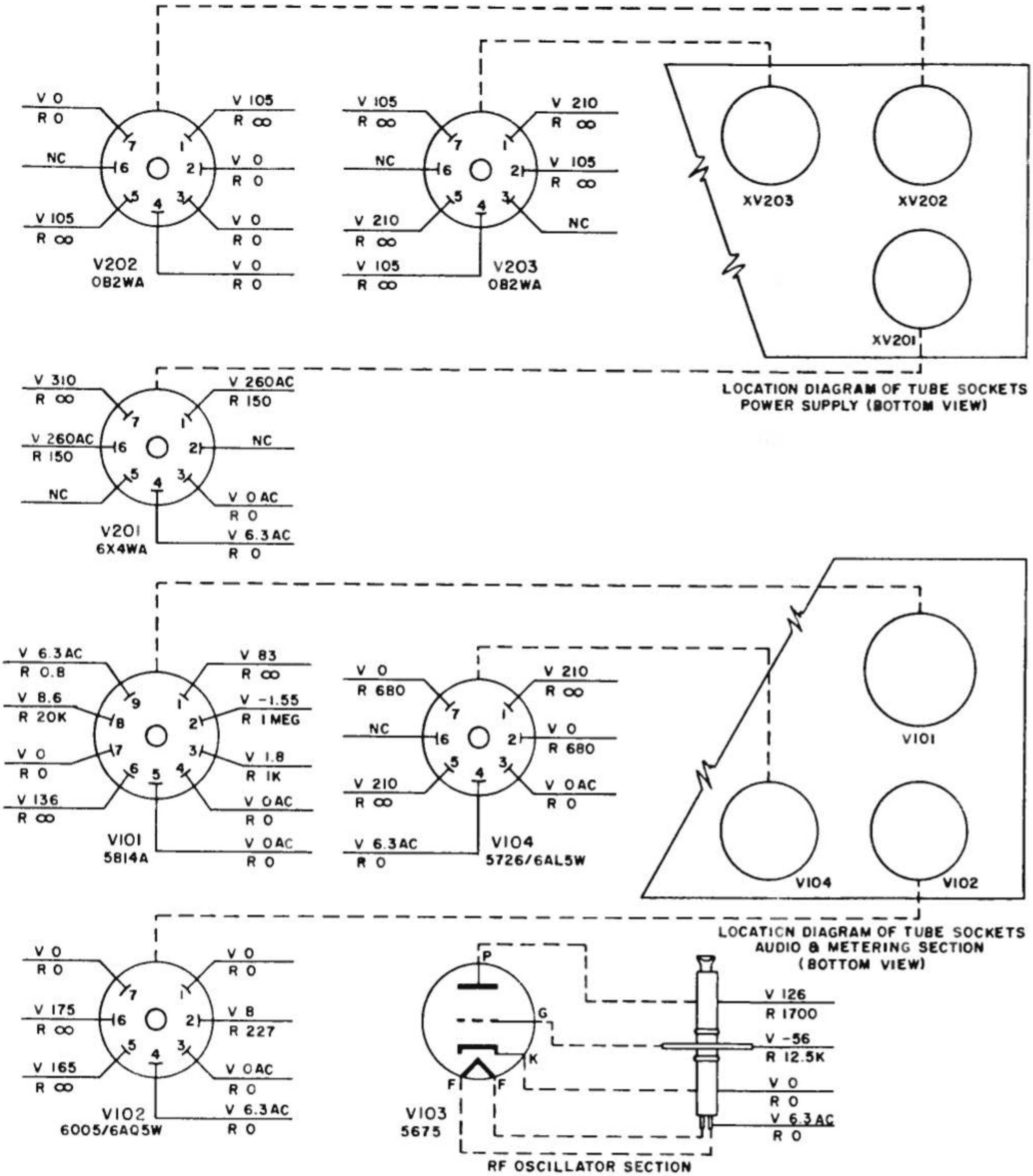
Figure 5-8. Oscilloscope Hookup to Observe RF Output.

TABLE 5-8. RF OSCILLATOR SECTION, FUNCTIONAL SECTION TROUBLE-SHOOTING CHART
(See figure 4-2, 5-6, 5-7.)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	(All test points taken from figure 5-6 except as otherwise noted.)	Follow procedures set forth in paragraphs 3-5 and 3-6, setting the signal generator at 5 mc with 1000 ∿ modulation, RF OUTPUT control at 100K.	(All indication will be shown on Multimeter AN/USM-34 appropriate range, unless otherwise noted.)	CAUTION: Tube V103 is fragile. Do not handle unless it is important for trouble-shooting. Filament leads are especially fragile.
1	33	On ac scale, connect black probe to chassis, red probe to test point.	6.3 volts (filament). This measures filament across V103.	If indication is normal, proceed to next step. If abnormal, remove V103 and test again. If still abnormal trace for filament voltage at either side of Z101.
2	H_5	On dc scale, connect black probe to chassis, positive probe to test point.	110 volts. This measures voltage at plate of V103. This voltage subject to slight variations.	If indication is normal, proceed to next step. If abnormal, remove V103 and test again. Voltage should rise to 210 volts with tube removed. If 210 volts is not obtained with tube removed, check step (3) below. If step (3) is normal but step (2) is not, check for continuity of plate coil in use. Switch bands to try another coil.
3	D_{100}	On dc scale, connect black probe to chassis, positive probe to test point.	200 volts. This measures voltage at oscillator side of filter Z103.	If indication is normal, proceed to next step. If abnormal, test other side of Z103 (see test point O D10, figure 5-5) for continuity of Z103.
4	H_2	On dc scale, connect black probe to chassis, positive probe to test point. (Avoid shorting across trimmer or diode CR102 will be damaged.)	110 volts. This is same potential at test point O H5 in step (2).	If indication is normal, proceed to next step. If abnormal, check coil in use for continuity. Switch bands to try another coil.
5	H_1	On dc scale, connect black probe to chassis, positive probe to test point.	0.38 volts. This measures voltage across CR102.	If indication is normal, proceed to next step. If abnormal, check CR102.
6	H_4	On MINUS DC scale, connect black probe to chassis, positive probe to test point.	-54 volts. This measures voltage at grid of V103.	If indication is normal, proceed to next step. If abnormal, check R121, C123. NOTE: C123 is integral part of main tuning capacitor C122 and is used to make contact with grid disc of V103.

TABLE 5-8. (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
7	(P110)	Replace Multimeter AN/USM-116 with Oscilloscope AN/USM-17, connect ground to chassis, the V. INPUT of oscilloscope to test point. Set oscilloscope horizontal sweep to 1000 cycles. (See figure 5-8.)	SINE WAVE, Varying % MODULATION control on front panel should vary amplitude of trace accordingly.	If indication is normal, remove oscilloscope and read panel meter. If panel meter reads normal, consider this portion of test completed and go directly to final test, step 9. If indication is abnormal, proceed to next step.
8	Figures 5-7, 4-4 and 5-5	If trouble is suspected in metering crystal pickup mount, turn off signal generator. Remove test equipment. Remove metering crystal pickup mount (paragraph 6-5f).	Make static test of components in pickup mount. Make ohmmeter test from end of cable to splice inside mount to check R129. Forward and reverse resistance checks will test CR103. Removal of 4 screws from outside plate allows test of C129 for possible short.	If component checks prove normal, then pickup mount may be considered normal. Go to final test. If component checks prove one or more components abnormal, replace thos components.
9	Final test	Following the layout in figure 5-8, set up the signal generator and oscilloscope, with 1000 cycle modulation at 4 mc with 50% modulation. Set up oscilloscope as described in Step 7 above.	Trace shown on the oscilloscope figure 5-8. Varying % MODULATION control on front panel should cause amplitude of trace to vary accordingly. Varying RF OUTPUT dial on front panel should cause amplitude of trace to vary accordingly. Varying CARRIER LEVEL dial on front panel should cause amplitude of trace to vary accordingly. Varying TUNING dial on front panel should make changes in rf carrier trace within modulation waveform. Switching to 400 cycles should make it necessary to reset oscilloscope accordingly. Switching to CW should change trace to full sweep of trace without modulation envelope.	If Final Test proves normal, the signal generator may be presumed to be normal, except for possible frequency inaccuracy. That test is covered in paragraph 6-10.



NOTES

FOR RESISTANCE MEASUREMENTS, %MOD & CARRIER LEVEL FULLY CW. UNPLUG P101 FROM J201 AND LINE CORD FROM POWER OUTLET. SET S101 AT PULSE, S102 AT BAND A.

FOR VOLTAGE MEASUREMENTS, EQUIPMENT MUST BE OPERATING, SET AT 1000 CYCLES MODULATION, CARRIER AT 5MC, 30% MODULATION, ATTENUATOR AT MAXIMUM OUTPUT.

READINGS TAKEN WITH MULTIMETER ME-25A/U, OR SIMILAR MULTIMETER HAVING A RESISTANCE OF 20,000 OHM/VOLT DC AND 1,000 OHMS/VOLT AC.

KEY TO SYMBOLS

V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.

AC INDICATES AC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.

R INDICATES DC RESISTANCE WITH ALL PLUGS DISCONNECTED.

NC INDICATES NO CONNECTION.

Figure 5-9. Signal Generator Voltage and Resistance Chart.

TABLE 5-9. TYPICAL TROUBLES.
(See figure 6-1.)

TROUBLE	NORMAL INDICATION	NATURE OF TROUBLE	CHECK AND REMEDY
POWER INPUT 1. Rotate the CARRIER LEVEL and % MODULATION control completely counter-clockwise and turn the POWER switch S103 on.	Pilot lamp I101 lights.	Pilot lamp I101 does not light.	Indicates no ac applied to primary of power transformer T201 (See figure 4-10). *a.* Check front panel fuses F101, F102. *b.* Check ac source and the continuity thru power plug P102. *c.* Check mating of the plug P101 and jack J201 located on the power supply chassis.
CW RF OUTPUT METERING 2. Rotate MOD and METER SELECTOR switch S101 to CW position. Advance the CARRIER LEVEL control R119 while observing panel meter M101.	Pointer on meter M101 moved toward, and at least up to, the red line on the upper scale.	Meter pointer does not move, or will not advance to red line.	Check circuit operation Step 3. Normal operation indicates that the rf output level metering circuit is faulty. Check the meter M101 by momentarily switching the MOD and METER SELECTOR to 400∿ position (See Step 7.) Check the crystal circuit for continuity and conduction ratio as follows: Temporarily turn switch S101 to EXT position and measure dc resistance through R120 to ground and note the reading. Reverse the test leads and repeat the measurement. The difference in reading indicates the effectiveness of the diode. The same reading regardless of the polarization of the ohmmeter indicates a short circuited crystal diode or other component; make continuity checks. Open circuit reading indicates open circuited component or crystal diode.
3. Connect RF OUTPUT jack J101 to receiver under test (see paragraph 3-9).	Output indication from receiver observed.	No output from receiver (assuming receiver is operating properly).	Operation under step 2, O.K. is an indication of a defect in the attenuator (AT101) which may be caused by burned out resistor R130, open coaxial cable leading from the attenuator to panel jack J101. Measure dc resistance from center pin of J101 to ground (normally 50 ohms).
RF OSCILLATOR 4. Operation as in Steps 2 and 3.	Normal indication in both Steps 2 and 3.	Trouble indication in both Steps 2 and 3.	Trouble indication under both 2 and 3 is indicative that the rf oscillator circuit (V103) is not functioning. The following are possible causes for failure and their remedy. *a.* Check operation on each band. *b.* Check that regulated B+ is applied to plate circuit of the oscillator. *c.* Check tube V103. *d.* Check plug P101 connection to jack J201 located on power supply chassis. *e.* Check capacitor C111 and resistor R121.

TABLE 5-9. (Continued)

TROUBLE	NORMAL INDICATION	NATURE OF TROUBLE	CHECK AND REMEDY
PULSE MODULATION 5. Place the MOD and METER SELECTOR switch S101 to PULSE position.	Meter (M101) needle remains at extreme left position and does not move when CARRIER LEVEL control R119 is advanced.	See Step 6.	See Step 6.
6. Apply suitable external pulse to PULSE INPUT panel jack J103 (see paragraph 3-8). Connect the RF OUTPUT jack J101 to a radio receiver or demodulator probe and oscilloscope combination.	Pulsed rf output observed. Amplitude of pulse varies with setting of RF OUTPUT attenuator. Slight reading indicated on panel meter depending on the duty ratio of the applied pulse.	No pulsed RF output at panel Jack J101.	Indicates that dc pulses are not supplying plate voltage of sufficient amplitude to operate the oscillator V103 (assuming that the rf oscillator operates normally in CW position). Check the pulse limiter tube V104, RF choke L121. Make sure that the polarity of the input pulse modulation is positive going.
INTERNAL SINE WAVE MODULATION 7. Set the rf carrier circuits for cw operation (See paragraph 3-4). Connect rf output to receiver. Set switch S101 to 400∿ position. Slowly rotate the % MODULATION control (R113) clockwise and at the same time observe meter M101. Repeat for 1000∿ position.	The pointer of meter M101 rises smoothly at least to the 50 percent calibration mark on the lower scale. Modulation pattern is present in receiver output.	Meter M101 remains at the extreme left of scale and does not move when R113 is rotated. No modulation pattern present on rf carrier.	Check for normal operation in both 400∿ and 1000∿ positions. *a.* If no modulation in 400∿ position only, check the setting of the audio oscillator feedback adjustment R102. Check resistors R109, R111 and associated contacts on switch S101. *b.* If no modulation in 1000∿ position only, check resistors R110 and R112 and associated contacts on switch S101. *c.* If no modulation in both 400∿ and 1000∿ positions of S101, perform the circuit operation given in Step 8 of this chart. If Step 8 operation normal check audio oscillator tube, V101 coupling capacitor C105 and resistor R108, check continuity through switch S101; make voltage and resistance checks at the socket of V101.
EXTERNAL SINE WAVE MODULATION 8. Set S101 to EXT position and apply a sine wave audio signal to EXT MOD jack J103. Slowly rotate the % MODULATION control clockwise.	The pointer of meter M101 rises smoothly to the 50 percent calibration mark on the lower scale. Modulation pattern present in receiver output.	Meter M101 remains at the extreme left of scale and does not move when R113 is rotated. No modulation pattern present on rf carrier.	Perform circuit operation 7; if O.K. check continuity from panel jack J103 to and through S101.

TABLE 5-9. (Continued)

TROUBLE	NORMAL INDICATION	NATURE OF TROUBLE	CHECK AND REMEDY
MODULATION METERING 9. Steps 7 and 8 combined.	Meter M101 indication in both Step 7 and Step 8 normal.	Modulation pattern present on rf carrier but meter M101 does not show a reading in either Step 7 or Step 8.	Indicates trouble in modulation metering circuit. Check C106, R116, S101 for open circuit, and crystal diode CR101 (1N69) for open or short circuits.
SINE WAVE MODULATION AMPLIFIER 10. Steps 7 and 8 combined.	Modulation pattern present in receiver output in both Step 7 and Step 8.	Absence of modulation pattern and no reading on M101 in both Steps 7 and 8.	Indicative of a defect in the MODULATOR amplifier. Check tube V102. Make voltage and resistance check at the socket of V102. (See figures 5-2, 5-3 and 5-4). Check continuity through switch S101.
POWER SUPPLY Remove power supply from case. (See paragraph 6-3*b*.)			
WARNING POTENTIALS UP TO 600 VOLTS EXIST IN THIS EQUIPMENT. USE EXTREME CARE IN HANDLING AND WHEN PERFORMING TESTS.			
REGULATED +210v CIRCUIT 11. Measure this voltage at pin D of jack 201.	Regulated voltage remains constant at 210 volts.	Regulated output voltage higher than plus 210 volts. *a.* Regulated output voltage much lower than +210 volts. *b.* No regulated voltage output.	Indicates defective voltage regulation circuit. Check VOLTAGE REGULATOR tubes V202 and V203. *a.* Check for leaky filter capacitor C202A. Check unregulated B+ voltage as given in Step 12 of this table. Check capacitor C203 for short circuit. *b.* Check resistor R202 for open circuit. Perform checks given in Step 12 of this table.
UNREGULATED B+ CIRCUIT 12. Measure at pin E of jack J201.	Unregulated B+ approximately 180 volts.	Unregulated output voltage much lower than +180 volts. No regulated voltage output.	Check rectifier tube V201. Check filter capacitors C201, C202A, C202B and for open circuit and for leakage resistance. Check resistance of R201, L201 and T201. Check ac power input circuit as outlined in Step 1 of this table. Check rectifier tube V201 (if tube is defective, perform the following tests before inserting a new one). Check filter capacitors C201, C202A, C202B and C203 for short circuit. Check resistor R201 and choke L201 for open circuit.
OVERALL POWER SUPPLY 13. Ripple voltage.	Negligible amount of 120 cps hum modulation voltage on rf carrier.	Excessive 120 cps hum modulation pattern in modulated or unmodulated rf carrier output.	Indicative of faulty filter section in power supply. Check filter capacitors C201, C202A, C202B and C203 also choke L201, for defects suggested in Step 11 and 12 above.

SECTION 6
MAINTENANCE

6-1. FAILURE REPORT.

FAILURE REPORT

Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Naval Electronics Systems Command. However, the importance of providing complete information cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember - there are two sides to the failure report-

"YOUR SIDE"

Every FAILURE REPORT is a boost for you.

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"NAVELEX SIDE"

The Bureau of Ships uses the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest District Publications and Printing Office.

6-2. TUNING AND ADJUSTMENT.

The Operator's Section (Section 3) describes the normal operation (including adjustment) of the signal generator. A trouble symptom chart is included in Table 6-1 where checks can be made for normal operation and trouble symptoms can be quickly spotted. References to paragraphs with detailed information is given where required. Start at the top and keep working down, following the arrows to only those blocks which apply to the condition noted. No instruments are required for the simple checking. Where instruments are needed for detailed trouble-shooting, the instruments listed in paragraph 5-4 will apply.

6-3. REMOVE THE SIGNAL GENERATOR AND POWER SUPPLY FROM THE CASE.

a. REMOVING RF SIGNAL GENERATOR SG-117/URM-26B. – Since this is a precision instrument, great care should be taken when removing it from the case for maintenance purposes. Carefully follow this procedure:

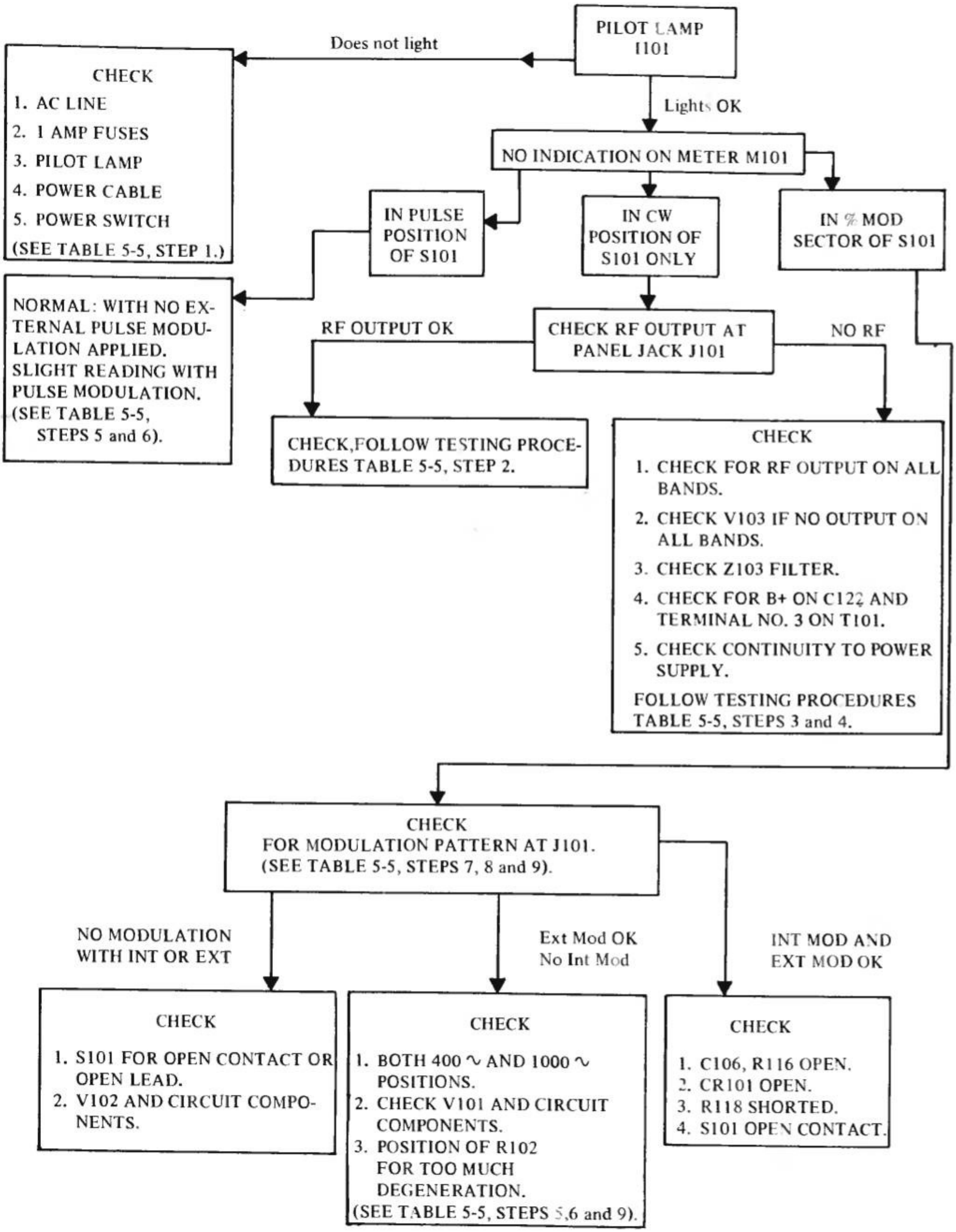
(1) Loosen the twelve captive screws (marked "X"; see figure 6-1) located around the outer edge of the front panel.

(2) Gently pull the signal generator chassis from the case, using the lifting handles provided on the front panel. The signal generator can be completely removed because the cable connecting it with the power supply is purposely long enough to enable the power supply to remain in the case while the signal generator is out.

b. REMOVING POWER SUPPLY PP-1215/URM-26B.

(1) Ordinarily, the power supply should not be removed from the case. The signal generator operates normally with the power supply left in the case.

TABLE 6-1. TROUBLE SYMPTOM CHART.



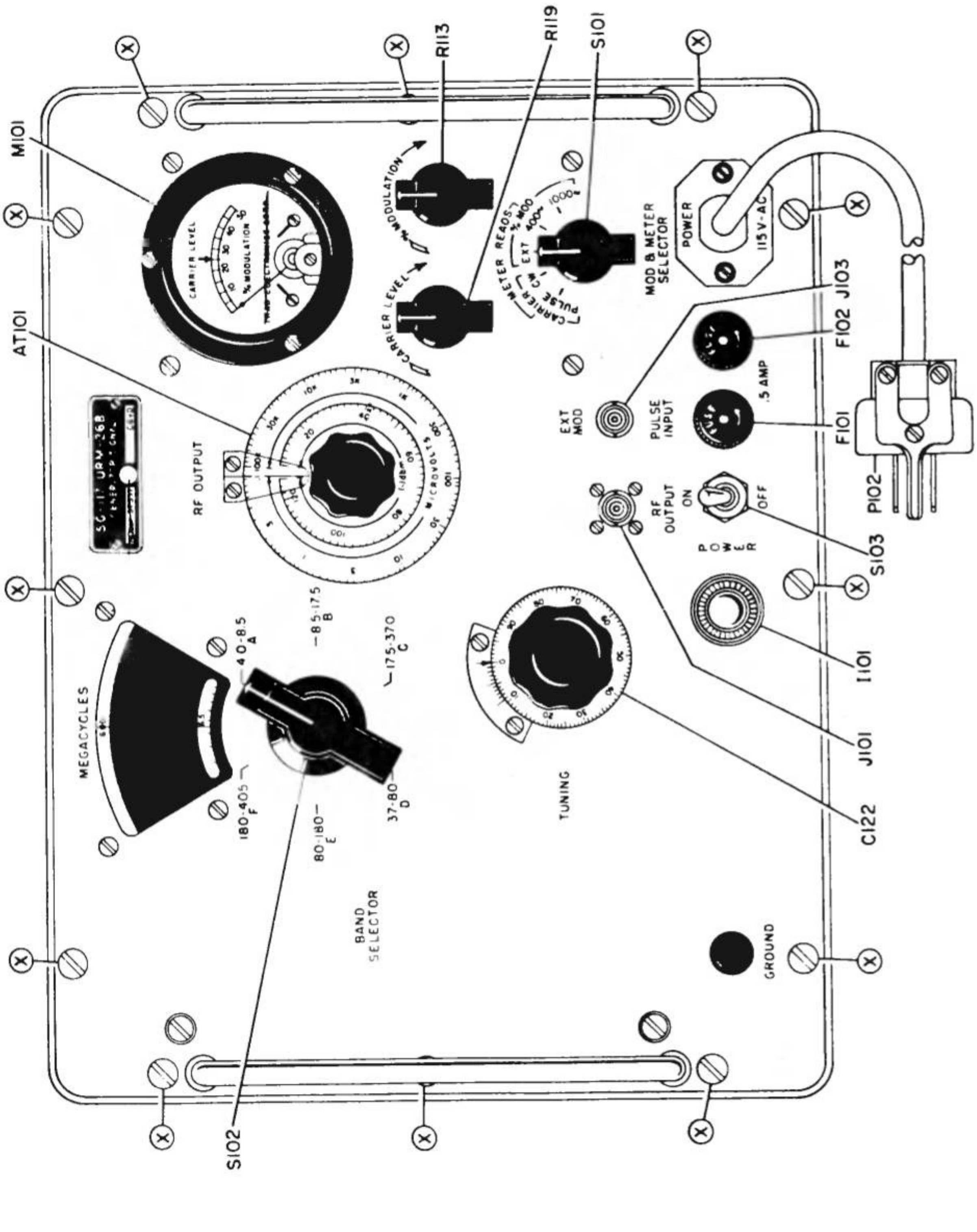


Figure 6-1. Front Panel View for Removal of RF Signal Generator SG-117/URM-26B from Case.

(2) To work on the power supply, it is necessary to remove it from the case. Take out three bindinghead screws located on the bottom of the case, and three others located on the rear of the case. These screws are marked "Y" in figure 6-2.

WARNING

High voltages up to 580 volts are exposed when the signal generator is being tested outside of the cabinet. Exercise great care in handling the instrument under these conditions.

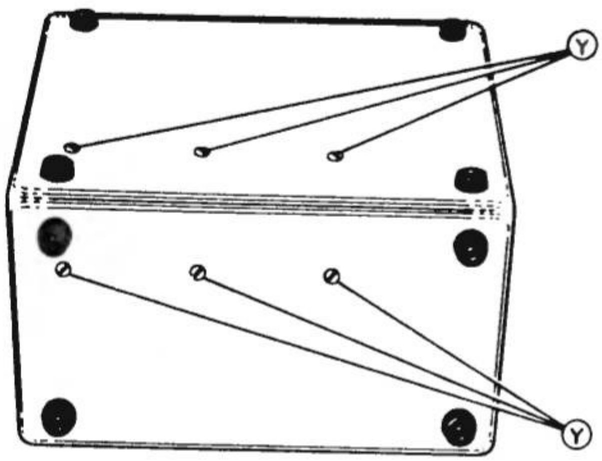


Figure 6-2. Rear View for Removal of Power Supply PP-1215/URM-26B from Case.

6-4. REMOVAL AND REPLACEMENT OF PARTS.

a. Whenever repairs are made involving the removal or replacement of any component part, the part removed should be marked or tagged for identification and its exact position in the equipment carefully noted and recorded so that when the new part, or the same part, is replaced the equipment will be the same as before. This precaution is particularly important when replacing rf components such as coils and capacitors. The correct location of these parts and their associated wiring plays an important part in the proper operation of the equipment.

b. Whenever any parts are replaced with new ones always use the identical type listed and described in Section 7, Table 7-1. When the exact part is not immediately available and it is absolutely necessary to operate the equipment, substitute a similar part having approximate electrical and mechanical characteristics. This is not recommended as a normal procedure and the exact replacement should be ordered. The substitute part should be removed as soon as the exact replacement is received.

6-5. REMOVING AND REPLACING RF OSCILLATOR COMPONENTS.

Whenever it is necessary to calibrate the signal generator or to replace any rf components, it will be necessary to expose the rf section. These instructions are meant to be used only when indications are clear that the rf oscillator section must be opened. Do not casually open this critical unit for routine servicing. Where necessary, carefully follow this procedure for disassembling the rf oscillator section. (See figures 5-6 and 5-7, figures 6-3 through 6-7.)

a. REMOVING RF OSCILLATOR COVER PLATE. –, Remove the 20 screws and lockwashers holding rf compartment cover. Remove the cover. This exposes the rf oscillator compartment.

b. REMOVING RF OSCILLATOR TUBE V103. (See figure 5-6.) – CAUTION: Tube V103 is very fragile and should be removed only when really necessary. Disconnect filament socket by carefully drawing the socket off in a line with the tube pins to avoid damaging the tube. Next, insert index finger under plate end of tube, raising tube while spreading the plate bracket with thumb of same hand. This frees one end of the tube. Gently work out entire tube by continuing to raise plate end until tube is free. Use only fingers, avoiding undue strain on disc seal.

c. REMOVING COIL TURRET. – Using No.8 Allen wrench, loosen 2 set-screws on mounting collar (see figure 5-6). Raise the detent spring. Remove detent roller. Centering detent spring between wiper contacts of the turret, lift the turret out with the fingers.

d. REMOVING TUNING CAPACITOR. – Unsolder black tube filament lead from ground point of capacitor. Unsolder ground strap from capacitor to case. Unsolder white and blue wire (oscillator B+). Remove the three tuning capacitor mounting screws (6 x 32) with washers (See figure 6-3.) holding tuning capacitor to casting. *(Avoid disturbing the adjustment of the three stand-off adjustment-alignment ¼" studs.)* Work the tuning capacitor out gently with the fingers. (It may be of aid to vary the TUNING dial to a point more favorable for removal of the tuning capacitors; see figure 6-5.)

e. REMOVING A COIL FROM THE TURRET. (See figure 6-4.) – Remove the two coil-bracket screws for the faulty coil. Unsolder the 3 coil leads. The coil and its holder are now free. Now, remove the coil from the holder by unscrewing the hex-nuts at the end. The replacement coil must be first attached to the coil-bracket, then the coil-bracket assembly is attached to the turret.

f. REMOVING METERING CRYSTAL PICKUP MOUNT. (See figure 5-7.) – Unsolder cable from Z102 (Test point D110, figure 5-6.). With No.6 Allen wrench, loosen pickup mount set screws. It is necessary to lower the attenuator cylinder slightly. This is done by unscrewing cylinder retaining screw slightly (see figure 6-3) and

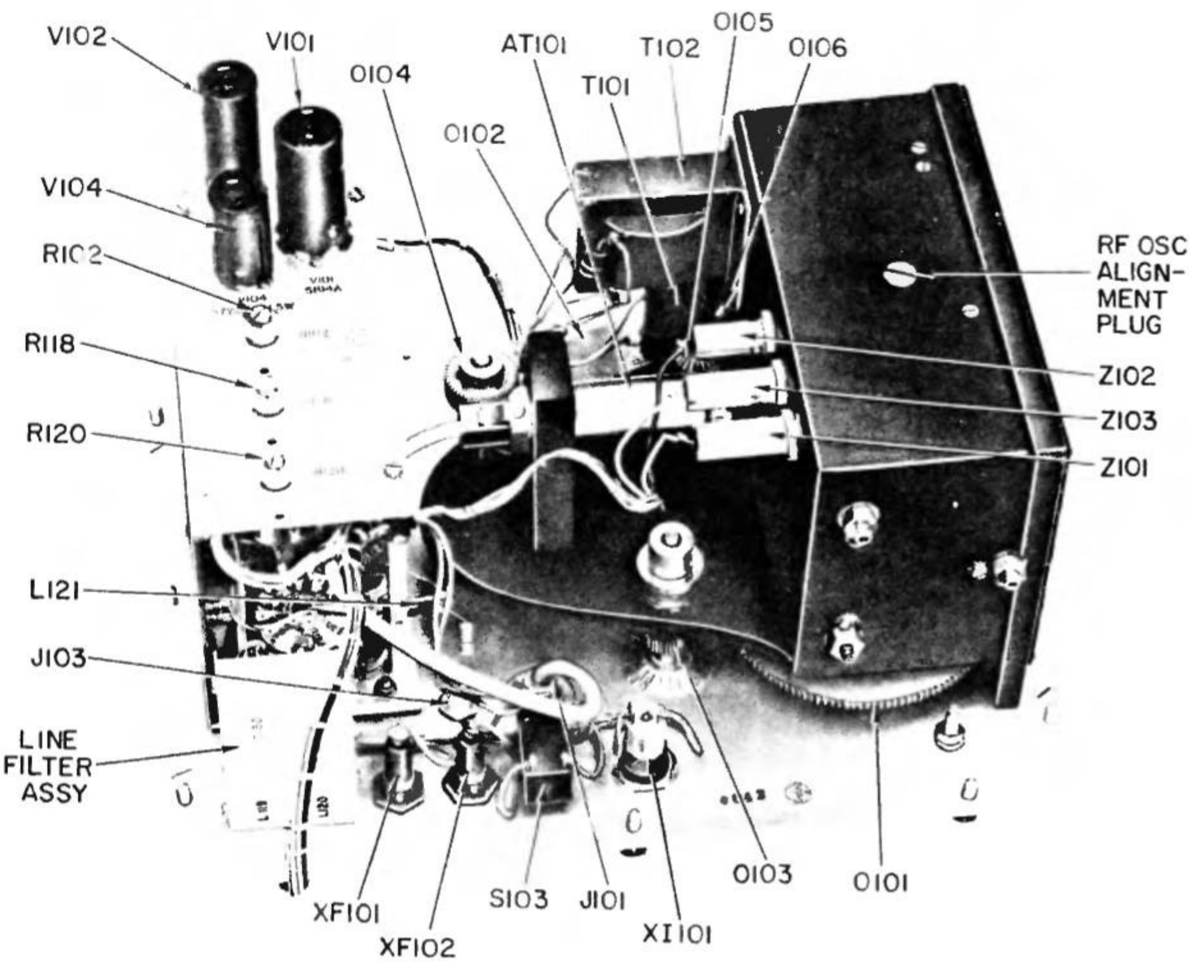


Figure 6-3. Rear View of Signal Generator SG-117/URM-26B.

slipping cylinder down enough to free the pickup mount. Remove mount completely by withdrawing with fingers.

6-6. REMOVING RF ATTENUATOR.

The technician is cautioned against unnecessary removal of this unit. Only if R130 or L118 or a mechanical component requires replacement should the attenuator be removed. If removed and replaced, it is necessary to follow with recalibration procedures (see paragraph 6-11). To remove rf attenuator first remove the metering crystal pickup mount (see paragraph 6-5f). Then unscrew cylinder retaining screw (see figure 6-3). This frees the cylinder, which can be drawn out through the rf compartment side. Remove the output cable by unscrewing the hex retaining collar which attaches the rf output cable to the front panel. Pull the cable out of the connector. Loosen the two screws holding the anti-backlash bearing against the piston (see figure 6-6). Draw the piston assembly out through the rf compartment side.

6-7. DISASSEMBLY OF RF ATTENUATOR.

Remove the two slotted-head screws in the attenuator head (see figure 6-6). With a pencil-tip iron unsolder coil L118 from the attenuator head. While the solder joints are still fluid, draw up the coil. It will come off, together with the insulating disc. Loosen two set-screws in piston head and remove head from piston. Remove grounding screw. Remove resistor R130. When replacing resistor, shape end into hook for grounding screw. Other end of resistor is soldered to L118.

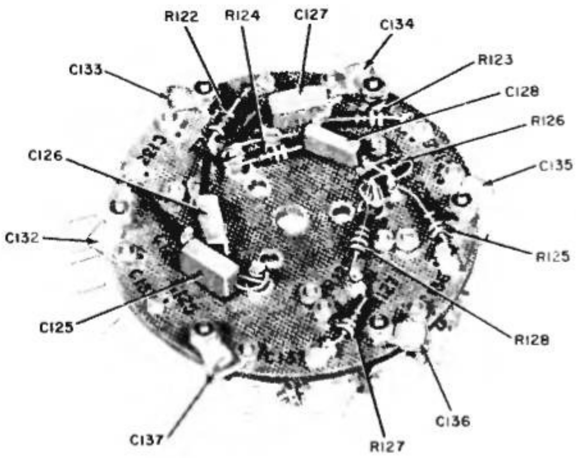


Figure 6-4. Oscillator Coil Turret, Top and Bottom Views

NOTE

After rf attenuator is reassembled, it will be necessary to calibrate microvolts output (see paragraph 6-11).

6-8. REMOVING LOW–PASS FILTER SUBASSEMBLY.(See figures 6-3 and 5-6.)

Unsolder the wires connected to the filter subassembly it is desired to remove. The outside connector is shown in figure 6-3. The inside connector is shown in figure 5-6. If the rf oscillator cavity is not open, it is necessary to expose it as described in paragraph 6-5a. With soldered leads freed, the filter subassembly is removed as a complete cylinder by unscrewing it from the outside back of the oscillator cavity.

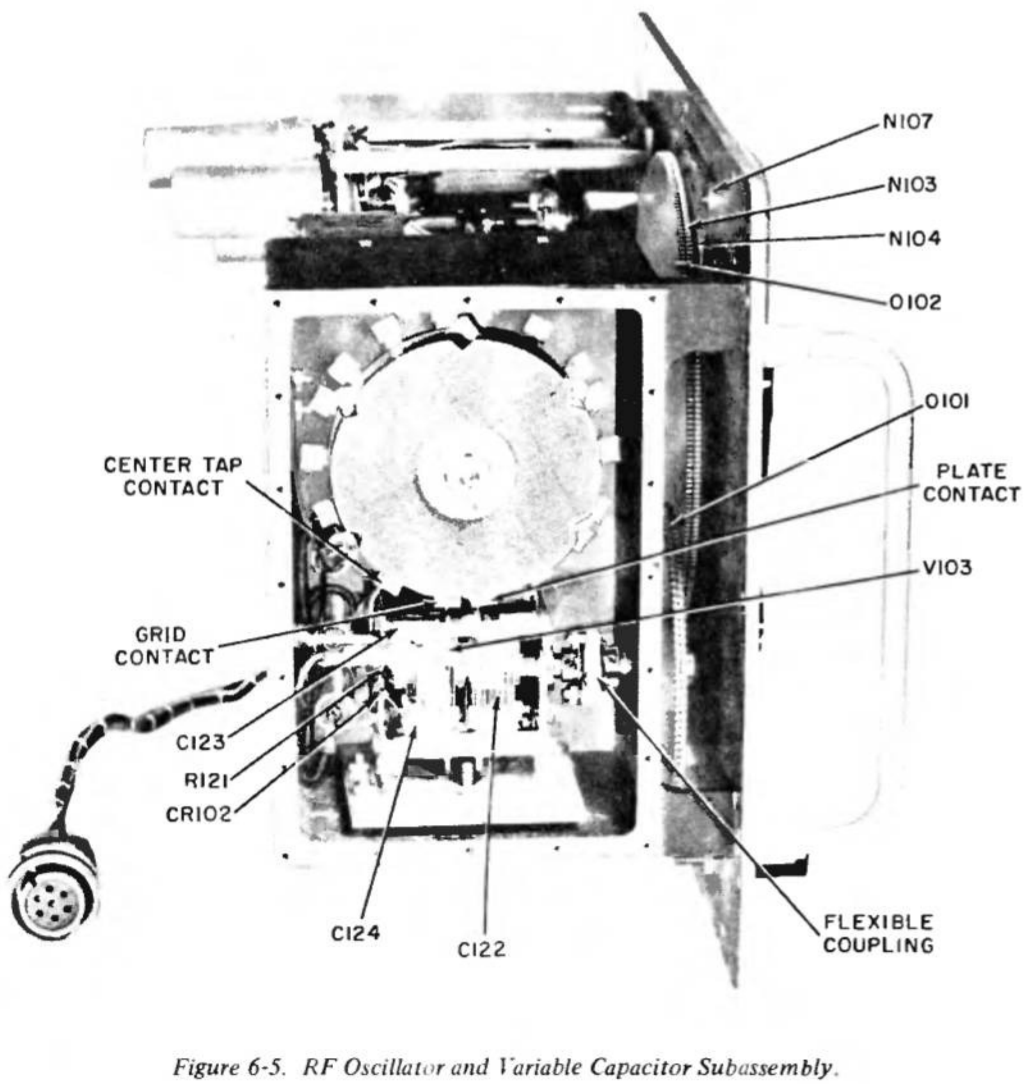


Figure 6-5. RF Oscillator and Variable Capacitor Subassembly.

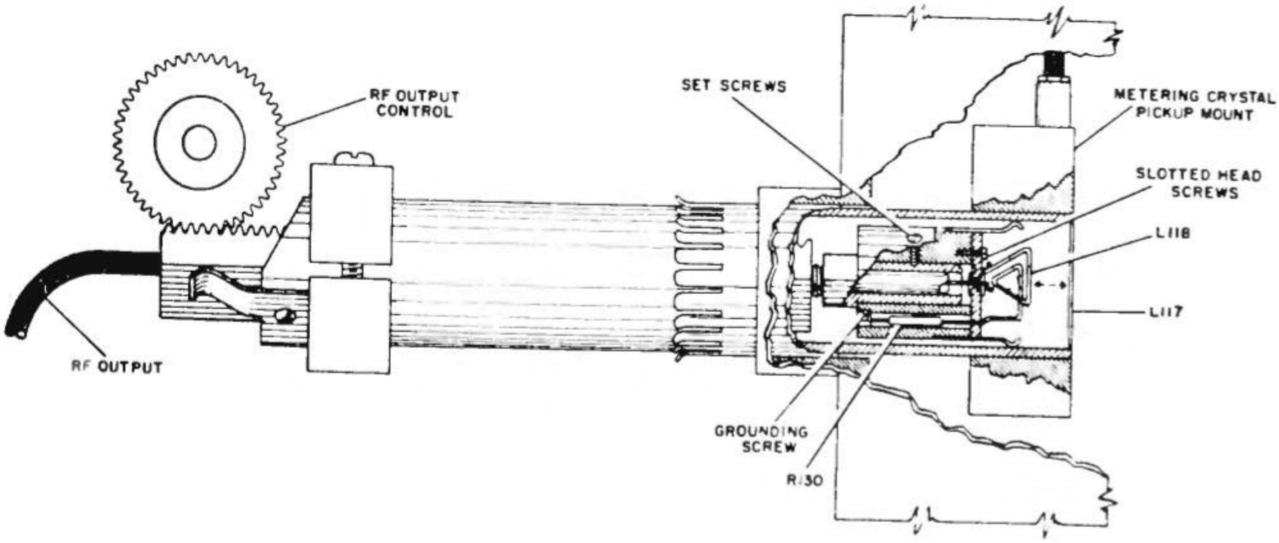


Figure 6-6. Waveguide-Below-Cutoff Attenuator Cut-Away View, Showing Internal Construction.

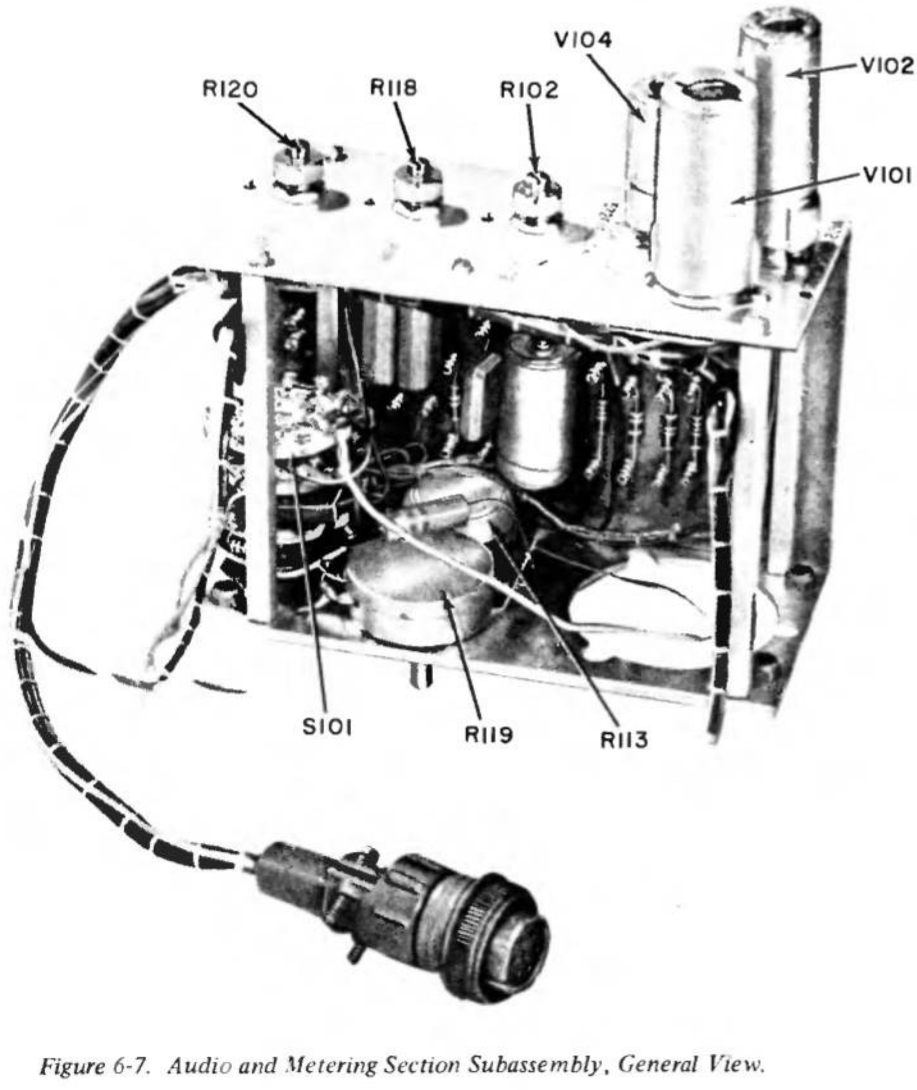


Figure 6-7. Audio and Metering Section Subassembly, General View.

6-9. REMOVING AUDIO COMPARTMENT.

The audio, pulse and metering section subassembly is exposed when the signal generator is removed from its case (see paragraph 6-3). The general view of this subassembly is shown in figure 6-7. Accessibility to all the parts is limited, since the subassembly is shaped like the letter "U" laid on its side. However, the top section is easily removed by removing the 4 screws shown in figure 6-7. The top is then lifted up and folded back, as shown in figure 6-8.

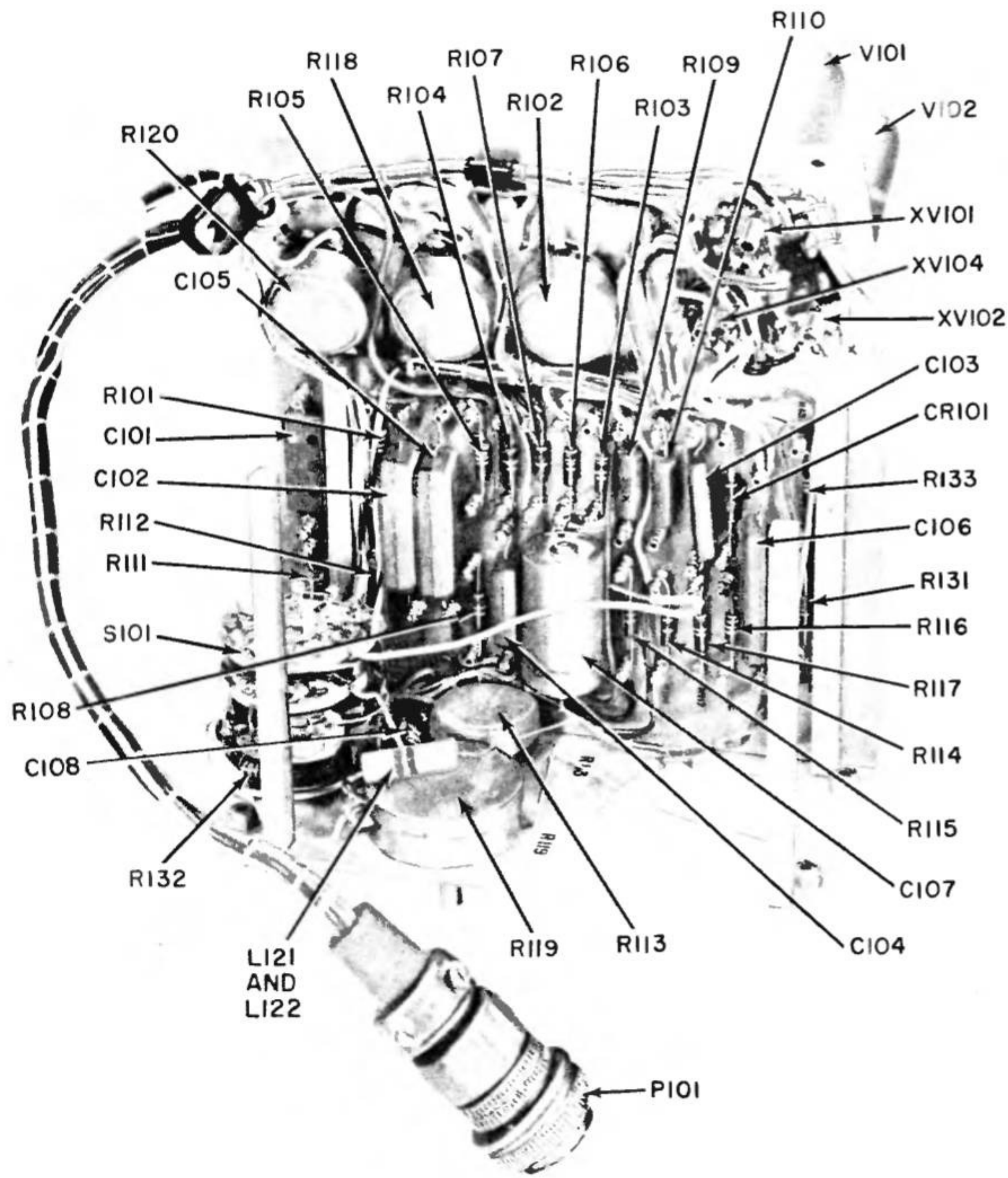


Figure 6-8. Bottom View of Audio and Metering Section Sub-chassis.

TABLE 6-2. FREQUENCY CALIBRATION DATA

FREQUENCY RANGE	LOW END – ADJUST COIL		HIGH END – ADJUST TRIMMER (AND CHECK LOW END)	
BAND	FREQUENCY	COIL	FREQUENCY	TRIMMER
A	4 mc	L111	8.5 mc	C132
B	8.5 mc	L112	17.5 mc	C133
C	17.5 mc	L113	37 mc	C134
D	37 mc	L114	80 mc	C135
E	80 mc	L115	180 mc	C136
F	180 mc	L116	405 mc	C137

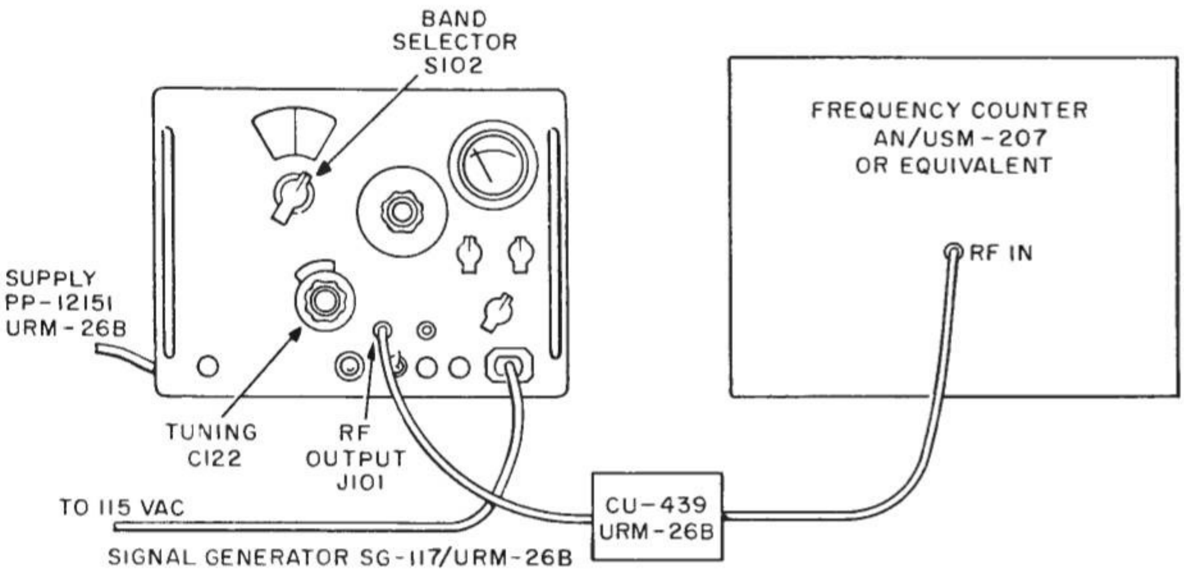


Figure 6-9. Recalibration Setup.

6-10. RECALIBRATING RF OSCILLATOR (See Table 6-2, figures 6-3, 6-4 and 6-9.)

a. WHEN TO RECALIBRATE. — The signal generator should be recalibrated whenever the frequency error is in excess of ±1%, and whenever any oscillator part is replaced. This recalibration is accomplished by adjusting the applicable coils and trimmers. Because of the precision required, recalibration should be performed only as required, and by qualified maintenance personnel with adequate equipment. (A jig to replace the rf oscillator cover plate, with hole for trimmer adjustment should be prepared by maintenance personnel.)

b. RECOMMENDED TEST EQUIPMENT FOR RECALIBRATING.

(1) Frequency Counter
AN/USM-207 or equivalent.

(2) Impedance Match
CU-439/URM-26B

c. RECALIBRATION SET UP. — Remove the signal generator from its cabinet (see paragraph 6-3a). Interconnecting power cable is of sufficient length as to permit the instrument to operate satisfactorily out of the cabinet.

Connect the RF OUTPUT of the signal generator to the impedance match. Connect the output of the impedance match to the input of the frequency counter. Unscrew the oscillator alignment plug (see figure 6-3) from the case of the oscillator coil section, exposing the slug of the coil in use. Replace rf oscillator cover plate with jig plate with hole exposing trimmer of the coil in use. Plug in the ac cord of the signal generator. Turn on the signal generator and the frequency counter.

d. RECALIBRATION PROCEDURE AT THE LOW END.

(1) Set BAND SELECTOR dial to BAND A (lowest frequency band) on signal generator.

(2) Switch MOD and METER SELECTOR to CW position on signal generator.

(3) Turn TUNING dial until lowest frequency is shown in MEGACYCLES window.

(4) Make certain power is plugged in and signal generator is ON.

(5) Adjust RF OUTPUT dial for 100K.

(6) Switch frequency counter to appropriate range and exact setting of 4 mc (see Table 6-2).

(7) Adjust tuning dial of signal generator for 4 megacycles. The frequency counter should read 4 megacycles ±.5%. If it does not, use an insulated screwdriver and adjust the core of the coil in use, as available through the oscillator alignment hole, moving the slug in or clockwise to increase inductance and decrease frequency, moving the slug out or counterclockwise to decrease inductance and increase frequency. Adjust until the counter reads exactly 4 mc.

e. RECALIBRATION PROCEDURE AT THE HIGH END. – After the low frequency end of the coil is recalibrated, it is necessary to recalibrate the high frequency end. This is done by means of the trimmer adjustment.

(1) Leaving the instruments at the settings of sub-paragraph d above, turn TUNING dial on signal generator until highest frequency is shown in MEGACYCLES window.

(2) Adjust tuning dial of signal generator for 8.5 megacycles. The frequency counter should read 8.5 megacycles ±.5%.

(3) If it does not, adjust the trimmer of the coil in use, as available through the trimmer alignment hole in the oscillator shield plate.

(4) Readjust coil for optimum accuracy at both low and high frequency ends of the band.

f. RECALIBRATION PROCEDURE FOR ALL BANDS. – Following the procedures in sub-paragraphs d and e above, switch through all the bands, adjusting coil core and trimmer capacity for optimum accuracy at both low and high frequency ends of the band. Replace the alignment hole plugs when the recalibration is through.

CAUTION

After the necessary adjustments have been made on the upper and lower ends of the band being calibrated, the corresponding calibrations should be correct throughout the frequency range. If not, the main tuning capacitor C122 may be defective. One common way that this variable capacitor becomes defective is through plate bending. Never bend the plates of the capacitor in attempting to make an adjustment.

6-11. RECALIBRATING MICROVOLTS OUTPUT.

a. WHEN TO RECALIBRATE. – The RF OUTPUT dial should be recalibrated whenever any component connected to the dial or attenuator AT 101 has been removed, or whenever it is suspected that the voltage error is greater than ±10% up to 100 mc or ±20% above 100 mc.

CAUTION

Only designated calibration laboratories should re-calibrate RF OUTPUT (adjust variable attenuator) except in an emergency. If such resetting of the microvolts output is deemed necessary, precautions should be noted to prevent damage to coils L-117 and L-118: Remove cover from RF Oscillator and Variable Capacitor Subassembly (see figure 6-5). Damage to coils L-117 and L-118 will result if they are permitted to touch each other with force. Throughout any adjustment visually note these parts and prevent any possibility of their touching while the RF output (variable attenuator) is gently moved throughout its range.

b. RESETTING MICROVOLTS SCALE. – Resetting the microvolts scale should be done only with the help of a rf power measuring set (bolometer). In case such an instrument is not available, an approximate method is given below.

(1) Set up the signal generator for CW operation at 5 mc (see paragraph 3-4).

(2) Connect Impedance Matching Network CU-439/URM-26B to RF OUTPUT jack on front panel, through the short RF Cord.

(3) Connect the other end of the network to the ac input of Multimeter AN/USM-34 (through appropriate probe adapter).

(4) Test RF OUTPUT dial by turning it completely counter-clockwise. It should read 100K at the stop. If it does not, loosen the two set screws in the dial hub (located below attenuator driving gear, figure 6-3) and reset the dial so it reads 100K at the stop.

(5) Turn on the signal generator and the multimeter (if not already turned on).

(6) Adjust CARRIER LEVEL control so meter reads at SET CARRIER red line.

(7) Adjust the multimeter to the proper ac range (1 volt scale). Depress the PRESS FOR PEAK TO PEAK lever on the multimeter, reading the RMS scale on the 1 volt range. If the actual reading on the multimeter is ±10% of .1 volt, then the instrument is within tolerance. If the instrument is not within tolerance, adjust R120 RF OUTPUT CAL (see figure 5-3) until the multimeter reads within ±.1 volt.

(8) Change the frequency on the signal generator to 7 mc. Go through steps (1) to (7) again. If there is a change in setting of R120, go through the 4 mc setting and find one setting which permits the microvolts output to be within tolerance of both positions.

(9) Change the frequency of the signal generator to the low and high end of all bands up to 100 mc, going through the re-setting procedures above, leaving R120 setting at a point within tolerance of all check points.

c. CHECKING DECADE OF MICROVOLTS SCALE. – The decades (decimal parts of the maximum 100K output of the RF OUTPUT dial) should be checked whenever mechanical or electrical repairs affecting the attenuator are made. In general, this will be an overhaul activity, since any possible correction calls for experienced maintenance. Checking, however, can be done in the field as follows:

(1) Set signal generator for CW operation at 5 mc (see paragraph 3-4).

(2) Connect long RF Cord to RF OUTPUT jack on the front panel.

(3) Terminate cord with (10:1) Fixed Attenuator CN-316/URM-26B.

(4) Connect the 10:1 attenuator to Impedance Matching Network CU-439/URM-26B using short RF Cord.

(5) Connect the other RF Cord to the other end of the impedance matching network, connecting the other end of the cord to a sensitive receiver such as Navy Model RBC.

(6) Connect the dc probe of Multimeter ME-25A/U across the second detector in the receiver (i.e. from pin 5 of V305 to ground in the RBC).

(7) Tune the receiver to the signal generator frequency (5 mc) with AVC off. Be sure not to overload the receiver.

(8) Adjust RF OUTPUT dial for a reading of 100K.

(9) Record the receiver output level as indicated on Multimeter ME-25A/U.

(10) Reduce the signal generator output to read 10K.

(11) Remove the attenuator and its cord, leaving the impedance matching network and its cord completing the circuit between generator and receiver.

(12) Adjust RF OUTPUT dial until the level shown on Multimeter ME-25A/U is the same as in step (9) above.

The difference in reading on the RF OUTPUT dial represents the output error. For example; if RF OUTPUT reading of 9.8K gives the same level on the multimeter as shown in step (9), the voltage error is 2 parts in 100 or 2%.

(13) Repeat the above procedure for all decades, such as 1K, 100, 10 and 1.

(14) An appreciable error on all or some decades, indicates that something is wrong with the drive system of the attenuator.

(15) Slight voltage errors may be present. For greatest accuracy in use of the instrument, these errors should be recorded and correction factors applied in use for maximum accuracy during alignment.

6-12. RECALIBRATING PERCENTAGE MODULATION. (See figure 6-10).

The precentage of modulation should be recalibrated whenever it is suspected that the error is greater than ±10%.

a. Remove RF Signal Generator Set AN/URM-26B from cabinet (see paragraph 6-3*a)* leaving the power supply connected by its cable.

b. Set up the signal generator for CW operation at 5 mc carrier frequency (see paragraph 3-4).

c. Connect the output of the signal generator through rf cord to the input of Navy Model RBC Receiver.

d. Connect Oscilloscope AN/USM-38 across the second detector of the receiver (from pin 5 of V305 to ground in the RBC).

e. Tune the receiver to the CW (5 mc) signal of the signal generator, using the receiver meter or connecting the dc probe of Multimeter ME-25A/U across the second detector of the receiver.

f. Apply 400 cycle modulation to the signal generator. Adjust % MODULATION dial for a reading of 50% on the panel meter.

g. Adjust R113 % MODULATION control (see figure 3-1) until the modulated pattern on the oscilloscope corresponds to 50% modulation (see figure 6-10).

h. Rotate % MODULATION dial for 30% modulation on panel meter and check oscilloscope pattern. If oscilloscope does not show 30% modulation, readjust R113.

i. Repeat adjusting R113 until both modulations read nearly correct, but favor the more widely used modulation.

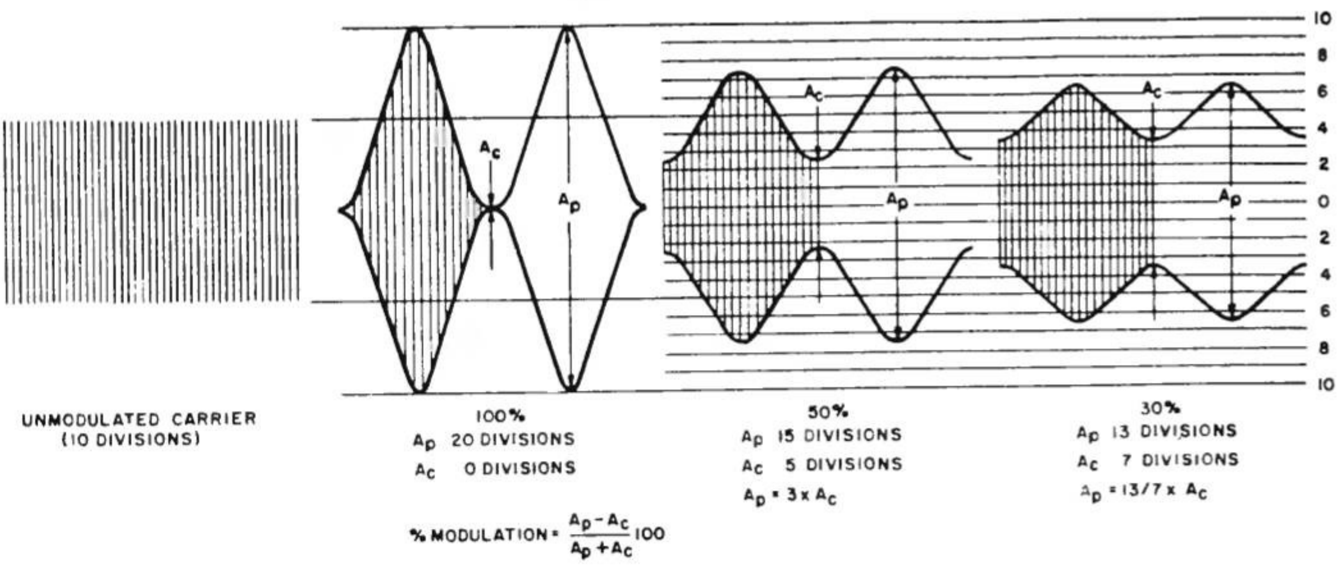


Figure 6-10. Precentage Modulation Chart.

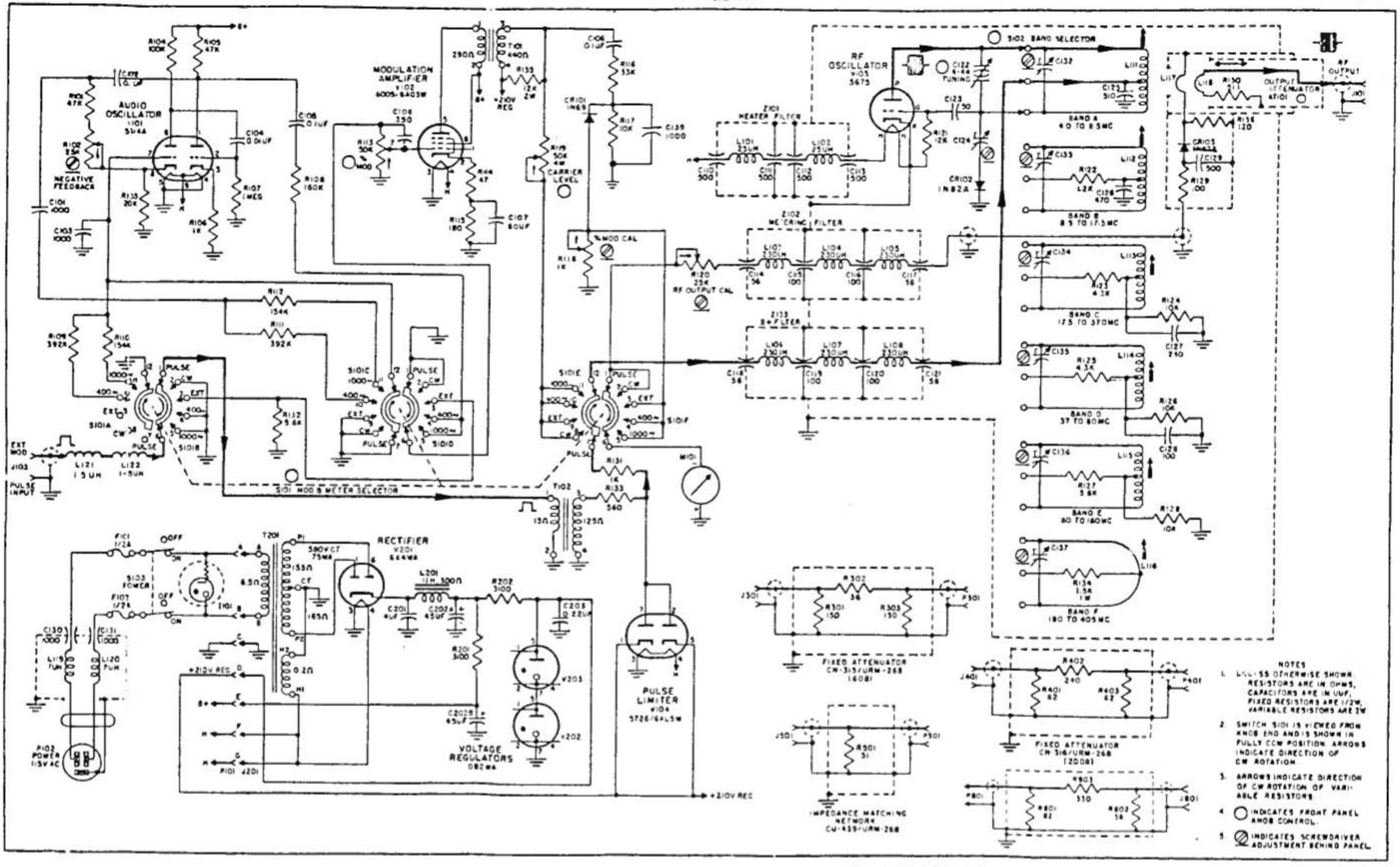
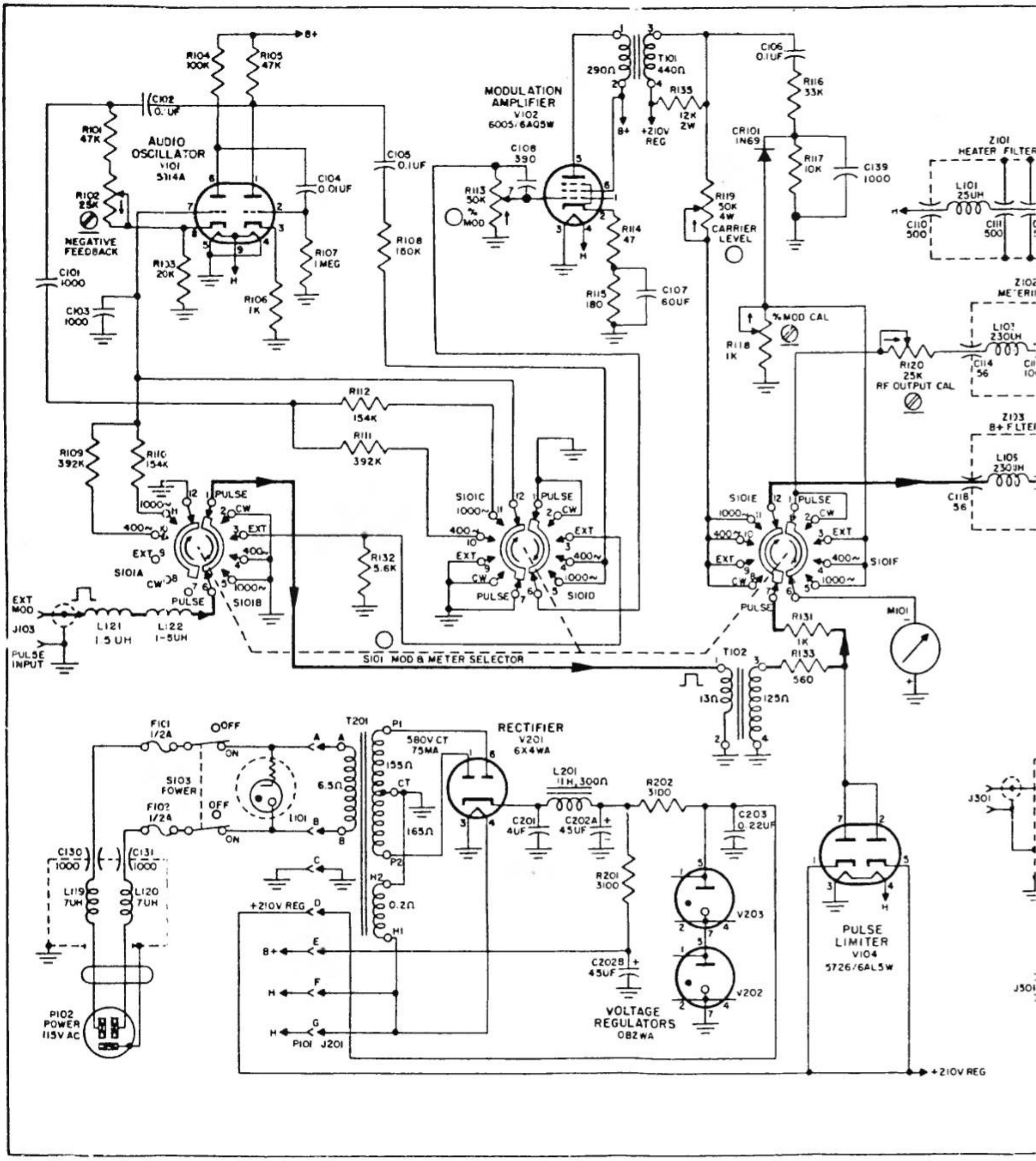


Figure 6-16. RF Signal Generator AN/URM-26B, Overall Schematic


AUDIO OSCILLATOR
V101
5814A
NEGATIVE FEEDBACK
R101 47K
R102 25K
R104 100K
R105 47K
C102 0.1UF
C104 0.01UF
C105 0.1UF
R107 1MEG
R108 150K
R133 20K
R106 1K
C101 1000
C103 1000
MODULATION AMPLIFIER
V102
6005/6AQ5W
C108 390
R113 50K
% MOD
R114 47
R115 180
C107 60UF
T101
290Ω
440Ω
R135 12K 2W
+210V REG
B+
C106 0.1UF
R116 33K
R117 10K
C139 1000
CR101 1N69
R119 50K 4W
CARRIER LEVEL
R118 1K
% MOD CAL
R120 25K
RF OUTPUT CAL
Z101 HEATER FILTER
L101 25UH
C110 500
C111 500
Z102 METERING
L103 230UH
C114 56
Z103 B+ FILTER
L105 230UH
C118 56
R112 154K
R111 392K
R109 392K
R110 154K
S101A
S101B
S101C
S101D
S101E
S101F
PULSE
CW
EXT
400~
1000~
R132 5.6K
EXT MOD
J103
PULSE INPUT
L121 1.5 UH
L122 1.5UH
S101 MOD & METER SELECTOR
T102
13Ω
125Ω
R131 1K
R133 560
M101
F101 1/2A
F102 1/2A
OFF
ON
S103 POWER
I101
T201
6.5Ω
580V CT 75MA
155Ω
CT
165Ω
0.2Ω
RECTIFIER
V201
6X4WA
L201 11H, 300Ω
C201 4UF
C202A 45UF
R202 3100
C203 0.22UF
R201 3100
C202B 45UF
V203
V202
VOLTAGE REGULATORS
OB2WA
+210V REG
B+
H
P101
J201
C130 1000
C131 1000
L119 7UH
L120 7UH
P102 POWER 115V AC
PULSE LIMITER
V104
5726/6AL5W
J301
+210V REG

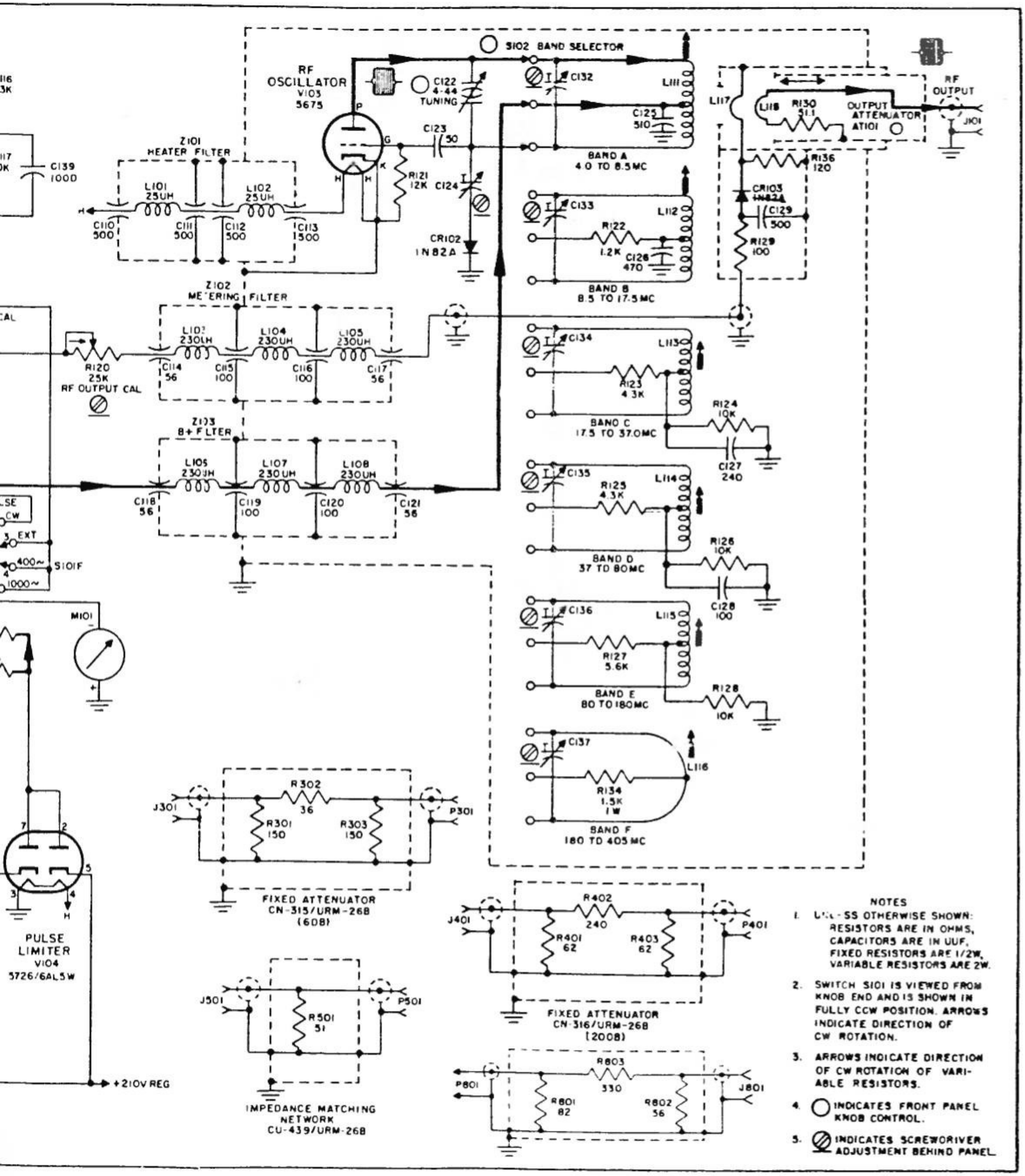


Figure 6-16. RF Signal Generator AN/URM-26B, Overall Schematic.