T.O. 12P5-2APN2-2
(Formerly AN 16-30APN2-3

HANDBOOK
MAINTENANCE INSTRUCTIONS

RADIO SETS
AN/APN-2 AN/APN-2Y
AN/APN-2B

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5-39	2 March 1949
5-40	2 March 1949
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6-36A	17 November 1948
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6-40	17 November 1948
6-40A	17 November 1948
6-40B	17 November 1948
6-40C	17 November 1948
6-40D	17 November 1948
6-40E	17 November 1948
6-40F	17 November 1948
6-40G	30 August 1949
6-40H	30 August 1949
6-40J	30 August 1949
6-41—6-42	17 July 1951
6-43	30 April 1948
6-44	30 April 1948
6-45—6-46	30 April 1948
6-47—6-48	30 April 1948
6-49—6-50	30 April 1948
6-51—6-52	30 April 1948
6-53—6-54	30 April 1948
6-55	30 April 1948
6-56	30 April 1948
6-57	17 November 1948
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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

★

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Continued)

LIST OF ILLLUSTRATIONS (Cont'd)

LIST OF ILLUSTRATIONS (Cont'd)

DESTRUCTION OF ABANDONED MATERIEL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:—

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:—

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

★

UNSATISFACTORY REPORT

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54, listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

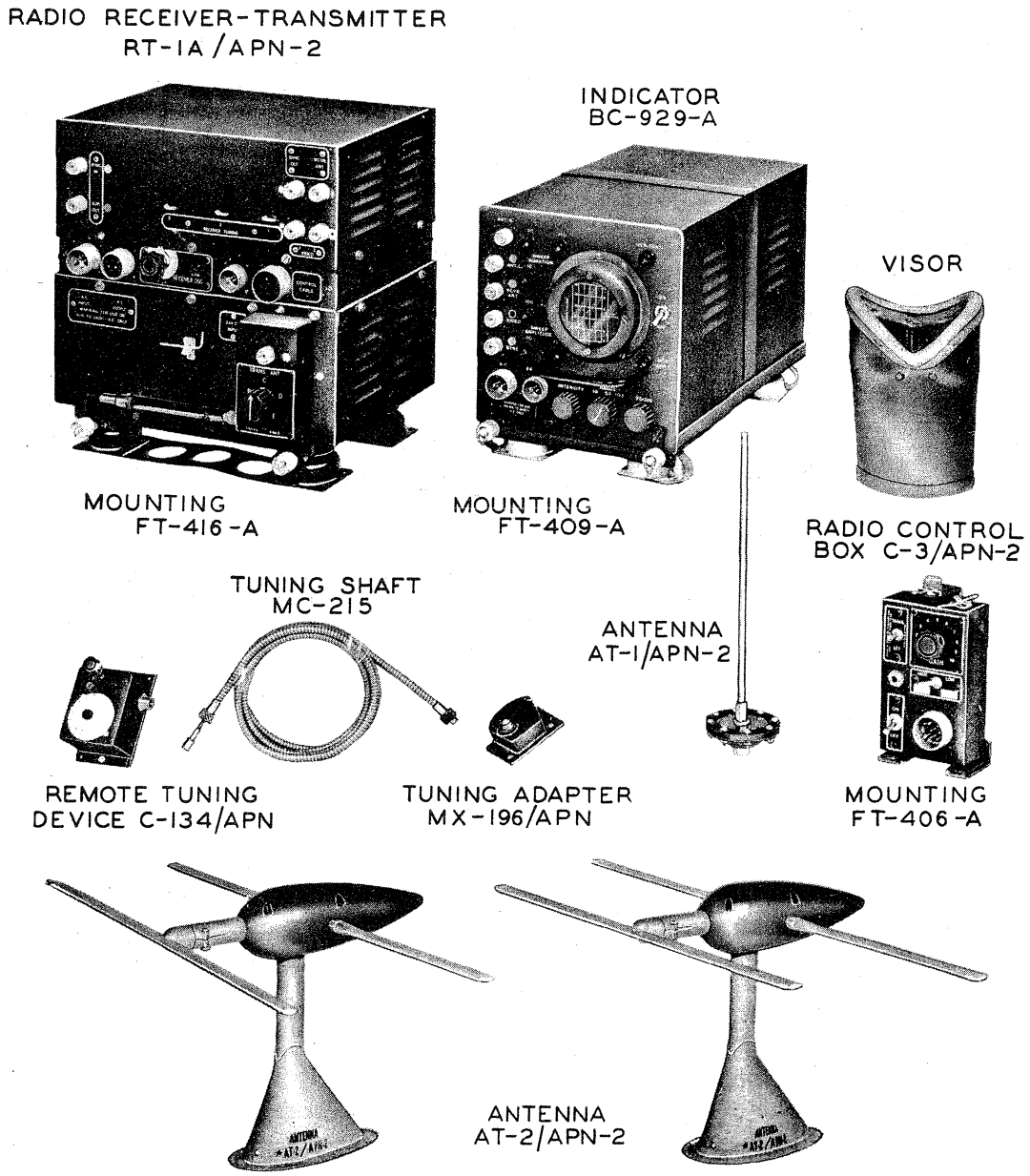


Figure 1-1. Radio Set ★AN/APN-2—Assemblies

SPECIAL NOTICE

Radio Set ★AN/APN-2 differs from Radio Set ★AN/APN-2Y in its low-voltage, d-c-operated components. Radio Set ★AN/APN-2 is designed to operate on 24 volts dc, and Radio Set ★AN/APN-2Y is designed to operate on 12 volts dc. The only difference in external appearance between the two sets is in the nomenclature on the nameplates and the d-c input panel markings. In general, only Radio Set ★AN/APN-2 will be mentioned in this text, but all information will also pertain to Radio Set ★AN/APN-2Y except for specific explanations of the d-c circuits. For explanations covering both Indicator BC-929-A (24 volts) and Indicator BC-929-AZ (12 volts), the term Indicator BC-929-(*) will be used. All symbolized photographs, sectional schematic diagrams, voltage and resistance charts in this manual represent production under Order No. 1515-DAY-44. To obtain data on changes affecting equipments manufactured under earlier order numbers, refer to the table of modifications, section VI, paragraph 5. Some Radio Sets ★AN/APN-2 have been modified to make Radio Set AN/APN-2B. Instructions for Radio Set AN/APN-2B are located in Section 6, paragraph 6 of this publication.

SECTION I

GENERAL DESCRIPTION

1. GENERAL.

a. Radio Set ★AN/APN-2 is a complete airborne navigational radio equipment which, in conjunction with suitable ground beacon stations, enables the airplane in which it is installed to fulfill the following functions:

(1) Land parachute troops at a designated point at night.
(2) Land gliders at a designated point at night.
(3) Maintain airborne supply operations in isolated positions.
(4) Demarcation of bombing line for close-support bombers.
(5) Identification of HQ for reporting by short-range radio.
(6) Identification of advanced units.
(7) Homing on high-power base beacons.

b. The receiver (responder) section will receive on either of two adjacent pre-set frequencies which are within 5 megacycles of each other and within the range of 214 to 234 megacycles. The transmitter (interrogator) will transmit on any one of five pre-set frequencies, (214, 219, 224, 229, and 234 megacycles). A transmitter frequency selector knob ("TRANS. FREQ.") makes any one of these five frequencies readily available for transmission during flight.

c. Altitude and temperature are performance-limiting factors in the operation of this equipment. The maximum altitude for efficient operation is approximately 50,000 feet. For satisfactory operation, the temperature should be not less than —55° Centigrade (—68° Fahrenheit) nor more than 55° Centigrade (131° Fahrenheit). These limits apply to conditions of continuous operation; for short periods not exceeding 30 seconds, the equipment can be operated in temperature as high as 71.1° Centigrade (160° Fahrenheit). The maximum operating range, under favorable conditions, is 100 miles.

d. The equipment consists of an interrogator-responder unit, an indicator, a control box, one transmitting antenna, two receiving antennas, and the necessary interconnecting cables and plugs. (See fig. 1-1.)

e. The power requirements for Radio Set ★AN/APN-2 are as follows:

(1) The components are normally connected for 115-volt a-c operation at 400 to 2400 cycles per second. However, transformer taps are provided for operation from an 80-volt a-c- aircraft supply. (See fig. 5-1).

(2) A-C power for operating Radio Set ★AP/APN-2 is normally obtained from the plane's inverter through a junction box. If the plane's inverter cannot supply the additional power required by Radio Set ★AN/APN-2, a separate inverter which is capable of supplying 180 volt-amperes at either 80 or 115 volts must be installed.

(3) The 24-volt d-c power and the 12-volt d-c-power, used in the operation of Radio Set ★AP/APN-2 and Radio Set ★AN/APN-2Y, respectively, are obtained from the airplane battery. Refer to table 1-1 for more complete information concerning the power requirements of the various components.

Note

The major assemblies with nomenclature ending in -A and -2 contain d-c components designed for 24-volt operation; those ending in -AZ and -2Y contain d-c components designed for 12-volt operation.

2. EQUIPMENT SUPPLIED.

(*See figure 1-1.*)

The weight and overall dimensions of the equipment supplied as part of Radio Set ★AN/APN-2 are given in the table 1-2.

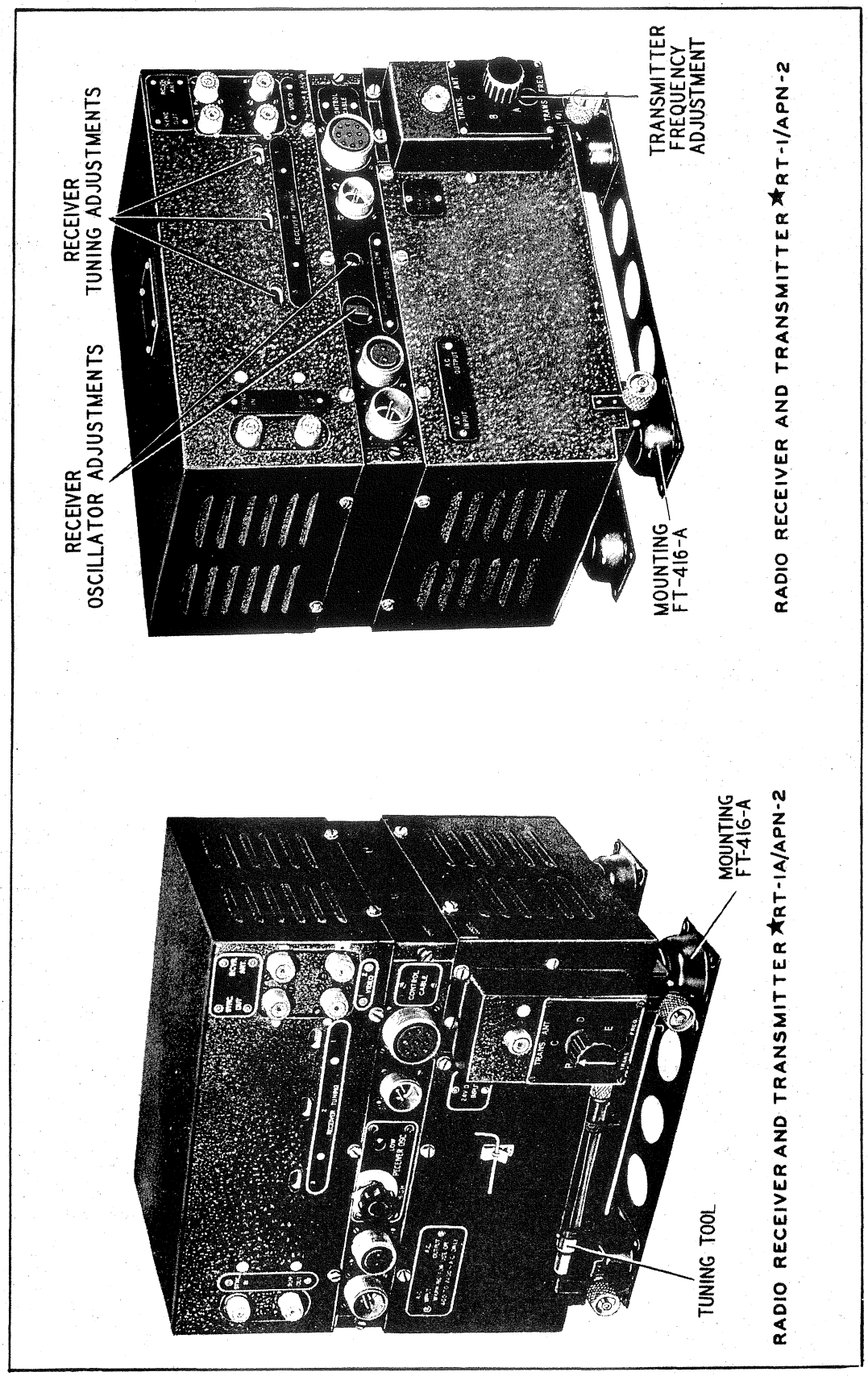


Figure 1-2. Radio Receiver and Transmitter ★RT-1/APN-2 and ★RT-1A/APN-2

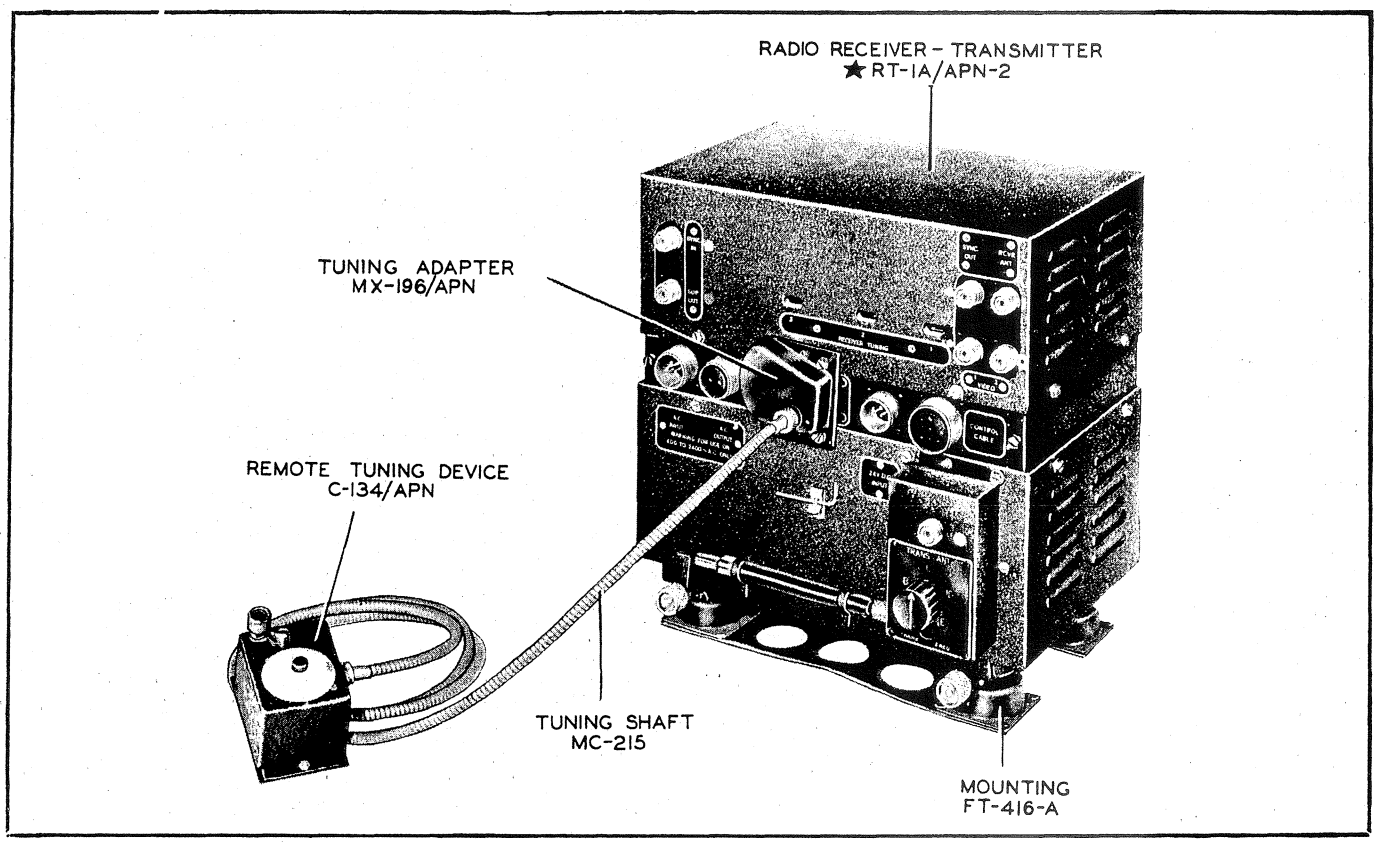


Figure 1-3. Radio Receiver and Transmitter ★RT-1A/APN-2—Equipped for Remote Tuning

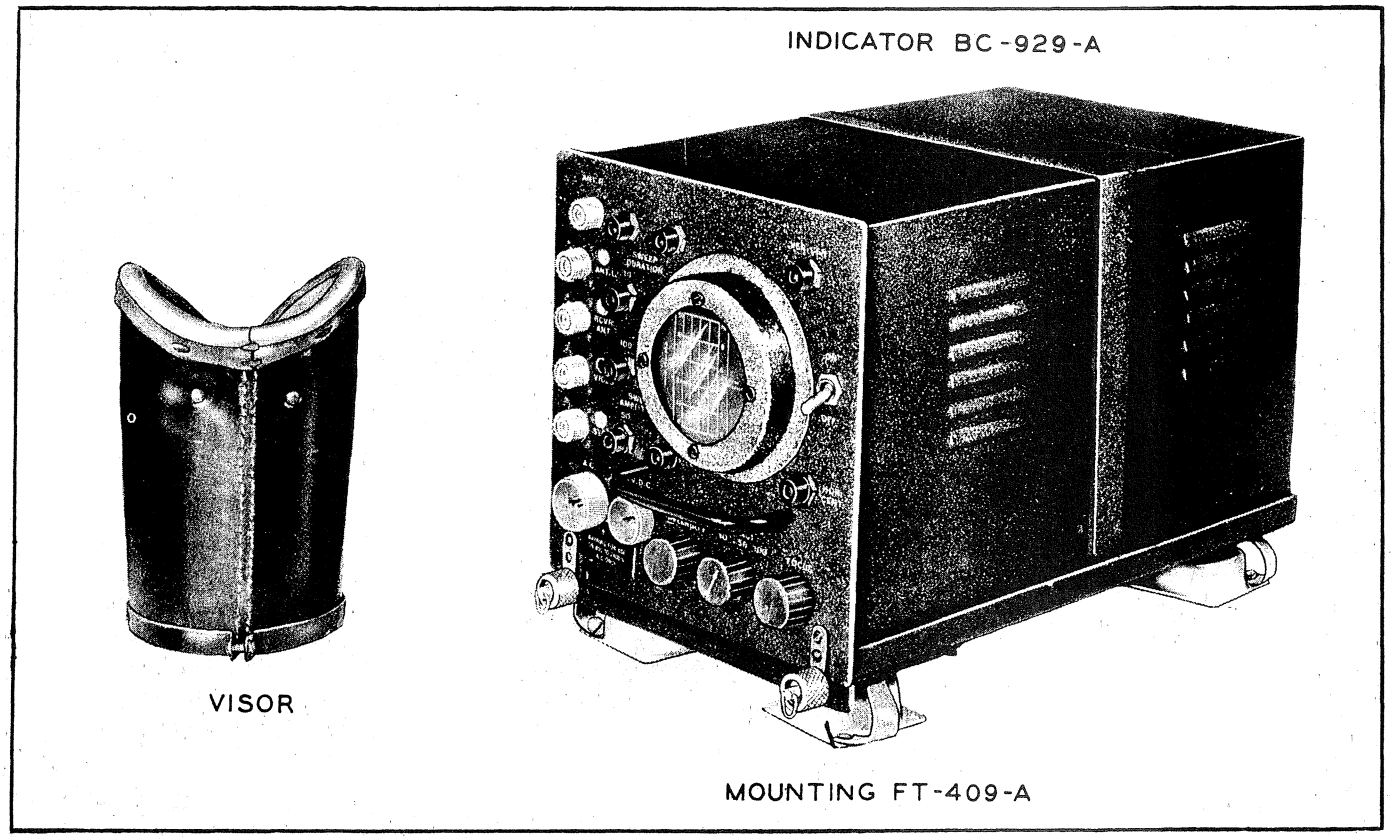


Figure 1-4. Indicator BC-929-A

TABLE 1-1.—Power Requirements*

Unit	*AC*					*DC*	
	Volts	*Amperes*	*Frequency (cps)*	*Volt-Amperes*	*Power Factor*	*Volts*	*Amperes*
Radio Receiver.....	115	1.23	400-2400	142	0.95	24	0.5
and Transmitter.....	80	1.77	400-2400	142	0.95		
*RT-1A/APN-2							
Indicator.....	115	0.33	400-2400	38	0.95	24	0.5
BC-929-A.....	80	0.48	400-2400	38	0.95		
Radio Receiver.....	115	1.23	400-2400	142	0.95	12	1.0
and Transmitter.....	80	1.77	400-2400	142	0.95		
*RT-1/APN-2Y							
Indicator.....	115	0.33	400-2400	38	0.95	12	1.0
BC-929-AZ.....	80	0.48	400-2400	38	0.95		

*For 12 or 24 volts d-c input, and 80 or 115 volts a-c input.

TABLE 1-2—Equipment Supplied as Part of Radio Set ★AN/APN-2

Quantity per Equipment	*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Overall Dimensions (inches)*	*Weight (Pounds)*	*Numerical Series of Reference Symbols*
1	Radio Receiver and Transmitter	*RT-1/APN-2 or *RT-1A/APN-2	*RT-1/APN-2 or *RT-1A/APN-2	12⅛ x 13 x 8¾	34.0	100-299
1	Indicator	BC-929-(*)	BC-929-(*)	8⅞ x 8¾ x 16	26.0	300-399
1	Radio Control Box	*C-3/APN-2	*C-3/APN-2	3 x 3⅝ x 7¼	1.25	400-499
2	Antenna (Receiving)	*AT-2/APN-2 or *AT-2A/APN-2	*AT-2/APN-2 or *AT-2A/APN-2		4.75	
1	Antenna (Transmitting)	*AT-1/APN-2	*AT-1/APN-2		1.00	
1	Mounting (Control Box)	FT-406-A			0.5	
1	Mounting (Indicator)	FT-409-A			2.5	
1	Mounting (Receiver-Transmitter)	FT-416-A			2.5	
1	Alignment Tool					
*1	Tuning Adapter	MX-196/APN	MX-196/APN		1.00	
*1	Remote Tuning Device	C-134/APN	C-134/APN		0.8	
*1	Tuning Shaft	MC-215	MC-215			
12	Coaxial Connector	PL-259	49195			
1	AN Connector (2 contacts)	AN-3108-18-3P	AN-3108-18-3P			
2	AN Connector (2 contacts)	AN-3108-18-3S	AN-3108-18-3S			
2	AN Connector (2 contacts)	AN-3108-16S-4S	AN-3108-16S-4S			
1	AN Connector (9 contacts)	AN-3108-22-17P	AN-3108-22-17P			
1	AN Connector (9 contacts)	AN-3108-22-17S	AN-3108-22-17S			
As required	Radio Frequency Cable	RG-8/U or equal	RG-8/U or equal			

*These items make up a remote receiver-tuning arrangement for use with Radio Receiver and Transmitter ★RT-1A/APN-2.

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

TABLE 1-3.—Equipment Required but not Supplied as Part of Radio Set ★AN/APN-2

Quantity	*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Function or Required Characteristics*
As required	2-Conductor Power Cable	(Std. power and lighting cable)	(Std. power and lighting cable)	Power cables.
As required	9-Conductor Cable			Control box cable.

4. TEST EQUIPMENT REQUIRED BUT NOT SUPPLIED.

TABLE 1-4.—Test Equipment Required but not Supplied as Part of Radio Set ★AN/APN-2.

Quantity	*Name of Unit*	*Army Type Designation*	*Navy Type Designation*	*Function or Required Characteristics*
	Field Test Equipment, including:			For field tests.
1	Signal Generator	I-196-B		Frequency range, 214-234 megacycles.
1	Frequency Meter	BC-906-D		Frequency range, 214-234 megacycles.
1	Range Calibrator	BC-949-A		Calibration of indicator range scales.
1	Indicator	BC-936-A		Checks power output and pulse width of transmitter.
2	Cord	CD-800		Coaxial interconnecting.
1	Cord	CD-799		A-C power cord.
	Base Test Equipment, including:			For depot tests.
1	Modulator Unit	BC-1203-A		
2	Cord	CD-800 or CD-869		48″ long. 48″ long.
1	Cord	CD-935		72″ long.
1	Cord	CD-1034		48″ long.
1	Oscilloscope			RCA Type 158 (or equivalent).
1	Signal Generator			G.R. Type 804-C
	Miscellaneous Test Equipment:			
1	Voltmeter IS-189 or equal			
1	Headset			
1	Dummy Antenna			50 ohms, 1 watt, carbon.

5. DESCRIPTION OF MAJOR ASSEMBLIES.

a. RADIO RECEIVER AND TRANSMITTER ★RT-1A/APN-2.

(1) This unit is a complete transmitter and receiver which will transmit and receive on any one of five pre-set frequencies (214, 219, 224, 229, and 234 megacycles). A transmitter-frequency selector knob, "TRANS. FREQ.", makes any one of these five frequencies readily available for transmission during flight. Any two adjacent receiving frequencies of the above five may be pre-adjusted so that either one may be readily selected while in flight by a switch on the control box.

(2) This unit is housed in a black wrinkle-finished metal case. The front panel contains seven female sockets for coaxial connectors, two 2-prong male and one 2-prong female socket for power connectors, and one 9-prong female socket for power and control connections.

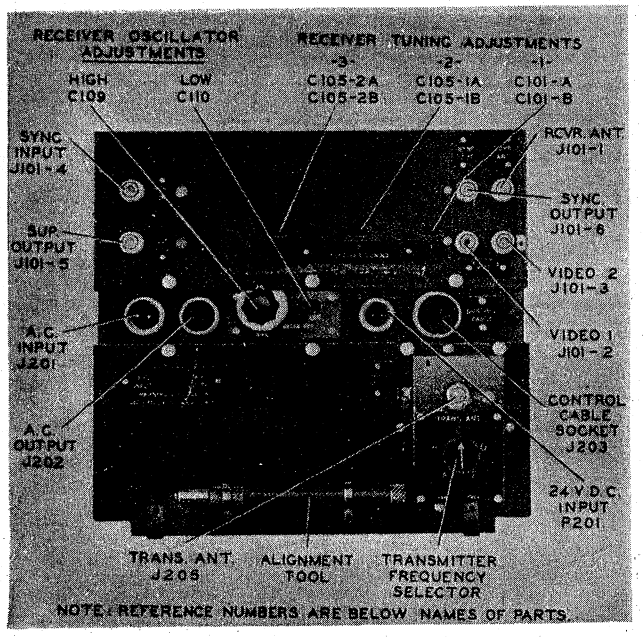


Figure 1-5. Radio Receiver and Transmitter ★RT-1A/APN-2—Showing Controls

(3) Three receiver r-f tuning adjustments are accessible through windows in the case of the receiver marked "RECEIVER TUNING" "1", "2", and "3". The local oscillator of the receiver is tuned by a slotted shaft accessible through an opening marked "RCVR OSC." "LOW", and a pointer-knob marked "RCVR OSC" "HIGH". The knob may be removed and a remote receiver-tuning arrangement substituted when it is necessary to mount the receiver-transmitter in a place remote from the operator. A knob mounted on a panel marked "TRANS. FREQ." provides for selection of any one of the five pre-set transmitting frequencies. A window below this knob exposes a slotted shaft for making tuning adjustments for the five transmitting frequencies. See figure 1-5 for identification of these controls.

Note

Radio Receiver and Transmitter ★RT-1/APN-2 is operationally the same as Radio Receiver and Transmitter ★RT-1A/APN-2 except that the receiver oscillator "HIGH" frequency adjustment is made by screwdriver adjustment instead of a knob adjustment.

b. REMOTE TUNING ASSEMBLY.
(See figure 1-3)

(1) REMOTE CONTROL DEVICE C-134/APN.—This unit is housed in a small black metal case suitable for attachment to the aircraft structure. On the top of the unit is a tuning crank and a white calibrated scale. A receptacle is provided on the side of the case to accommodate Tuning Shaft MC-215.

(2) TUNING ADAPTER MX-196/APN.—This unit is housed in a small metal case suitable for attachment to the case of the radio receiver and transmitter. A shaft projects from the unit which, when attached to the radio set, engages the "RECV. OSC." "HIGH" tuning shaft. The tuning adapter is attached to the receiver and transmitter by two retaining screws.

(3) TUNING SHAFT MC-215.—This shaft is composed of a movable center shaft enclosed in a metal sheath, and is provided with knurled nuts for attaching one end of the shaft to the remote-tuning device and the other end of the shaft to the tuning adapter.

c. INDICATOR BC-929-(*).
(See figure 1-4)

(1) Indicator BC-929-(*) consists of a cathode-ray tube with associated sweep-generating circuits and a motor-driven switch. This switch alternately connects the right and left receiving antenna leads to the receiver input, and the corresponding video output of the receiver to the right and left horizontal-deflection plates of the cathode-ray tube.

(2) The function of the indicator is to show visually on the calibrated scale mounted in front of the screen of the cathode-ray tube the signals received by the respective receiving antennas after the signals have passed through the receiver section of the receiver-transmitter. Both nautical- and statute-mile scales are provided.

(3) The indicator has five coaxial sockets marked as follows: "ANT.R.", "ANT.L.", "RCVR.-ANT.", "VIDEO", and "SYNC"; also sockets marked "A.C." and "24 V.D.C." or "12 V.D.C.". There are eight screwdriver adjustments on the front panel, marked as follows: "HOR. CENT." and "VERT. CENT." for horizontal and vertical centering of the image on the indicator screen, "SWEEP DURATION" "10", "50", and "100" for adjusting the time duration of the sweep (one for each setting of the "RANGE" switch), and "SWEEP AMPLITUDE" "10", "50", and "100" for adjusting the rate of sweep rise (one for each setting of the "RANGE" switch). There are three knobs on the

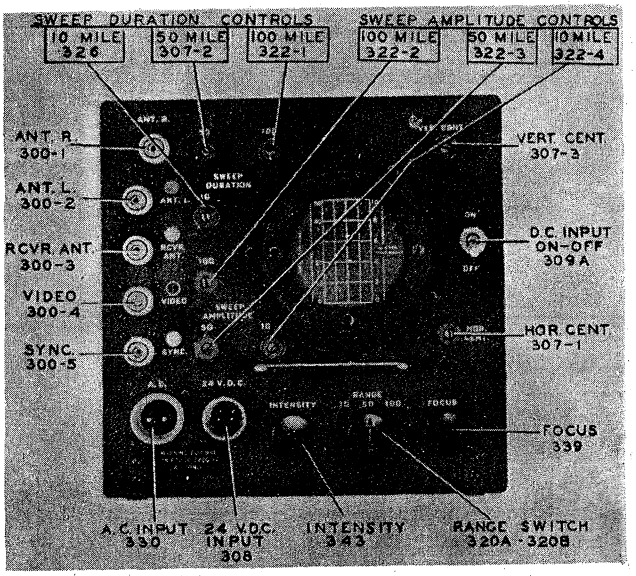


Figure 1-6. Indicator BC-929-(*)—Showing Controls

lower part of the panel, "INTENSITY" and "FOCUS" for adjusting the intensity and focus of the image on the indicator screen, and "RANGE" for selecting one of the three range scales ("10", "50", and "100"). The "ON-OFF" switch on the front panel controls the d-c power for operating the motor switch in the indicator. (See fig. 1-6 for control identification.)

d. RADIO CONTROL BOX ★C-3/APN-2 *(See figure 1-7).*—This unit contains a switch to turn Radio Set ★AN/APN-2 on and off, a receiver-gain control, a frequency-selector switch, and a phone jack. The "ON-OFF" switch controls the a-c and d-c power to the receiver-transmitter and the a-c power to the indicator. The "TRANS.-KEY" switch has three positions, "KEY" for momentary operation, "TRANS." for constant operation, and a center position for stand-by operation. The "GAIN" control adjusts the output of the receiver. The "HIGH-LOW" switch selects the operating frequency of the receiver.

e. ANTENNA ★AT-2/APN-2 (RECEIVING).—This unit consists of a vertical dipole and a director, mounted on a single standard with a bakelite housing. There are two of these antennas used on an installation, one on each side of the fuselage, mounted with the director toward the front of the airplane. (See figs. 1-8 and 2-3.)

Note

Antenna ★AT-2/APN-2 has been modified by the addition of suitable braces to strengthen the antenna against breakage due to vibration. See figures 6-17 and 6-18 for instructions on the mounting modification kit on this antenna. Antenna ★AT-2/APN-2 with the items of the modification kit attached is designated Antenna ★AT-2A/APN-2.

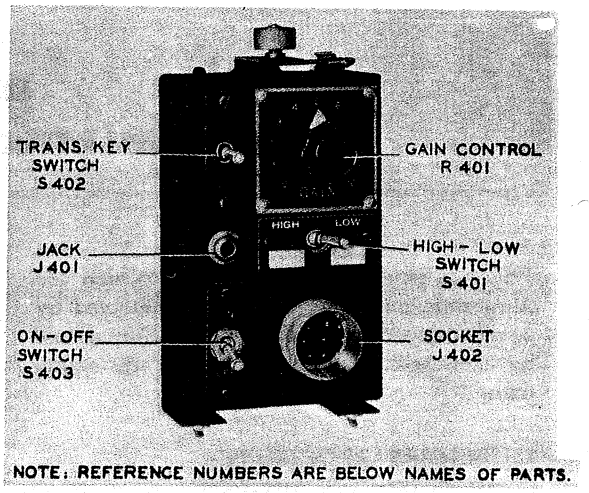


Figure 1-7. Radio Control Box ★C-3/APN-2

f. ANTENNA ★AT-1/APN-2 (TRANSMITTING).—This unit is a quarter-wave stub, vertically polarized, and mounted under the nose of the fuselage. Radio Frequency Cable RG-8/U is used with Plugs PL-259 to connect the transmitter output to the transmitting antenna. (See figs. 1-8 and 2-3.)

6. INTERCHANGEABILITY OF MAJOR ASSEMBLIES.

a. Any Indicator BC-929-A from Radio Sets SCR-729-A or from Radio Set ★AN/APN-2 may be used with Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APW-2.

b. Any Indicator BC-929-AZ can be used with Radio Receiver and Transmitter BC-800-AZ, or with Radio Receiver and Transmitter ★RT-1/APN-2Y.

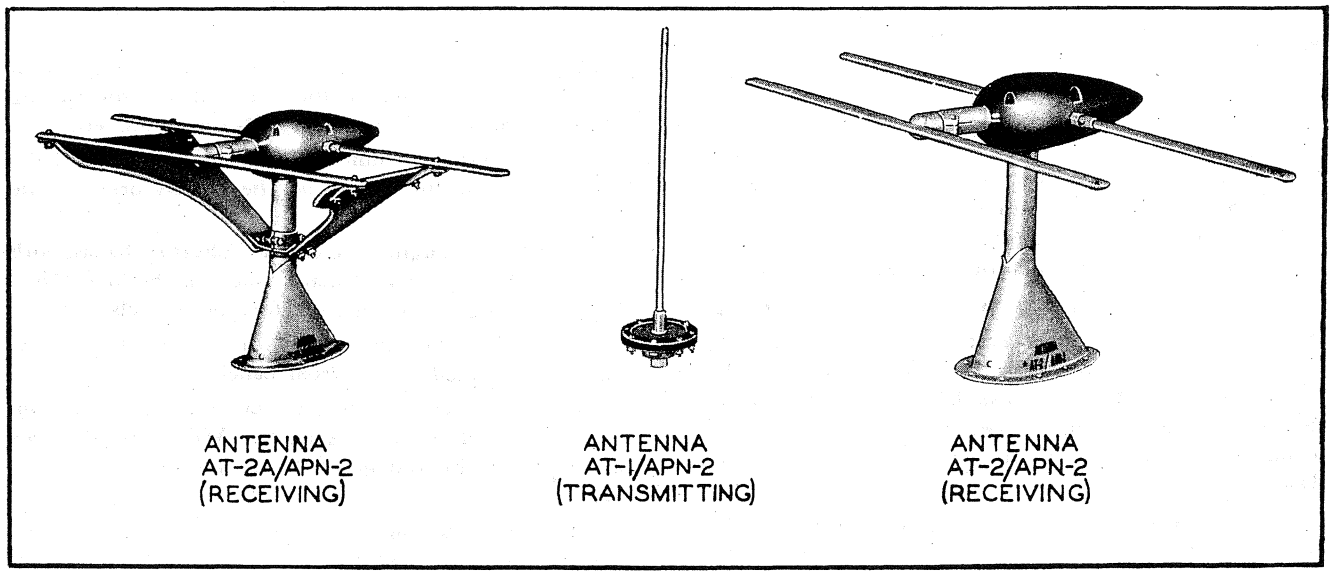


Figure 1-8. Antennas ★AT-1/APN-2 (Transmitting), ★AT-1/APN-2 and ★AT-2A/APN-2 (Receiving)

SECTION II
INSTALLATION AND ADJUSTMENT

WARNING

This equipment employs voltages which are dangerous, and may be fatal, if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

1. PRELIMINARY PROCEDURE.

a. UNPACKING EQUIPMENT.—Radio Set ★AN/APN-2 is shipped from the factory with all tubes in place. Carefully lift the units out of the cartons and place them on the bench. Use extreme care in removing the indicator unit to protect the cathode-ray tube from injury. When all units have been unpacked, check against table 1-1 to make certain that all assemblies are included.

b. BENCH WORK.—Place Radio Set ★AN/APN-2 on the shop bench and give it a thorough visual inspection for broken, damaged, or loose parts. Follow the inspection by a complete operational check. Any damaged or defective parts should be reported immediately through the proper channels, and the necessary steps taken to repair or replace the damaged items.

(1) GENERAL.—The workbench shall be provided with the necessary mountings for each unit of the equipment, and the required cable assemblies to interconnect the units. Install the transmitting and receiving antennas outside the building, simulating the actual plane installation as nearly as possible. Install a metal shield between the right and left receiving antennas to obtain the proper directional effect. A-C and d-c power sources should be available, providing 12 or 24 volts d.c., and 115 or 80 volts, 400 to 2400 cycles ac.

CAUTION

Connect Radio Set ★AN/APN-2 to a 400-2400 cycle a-c supply *only*. Connecting the equipment to a 60-cycle a-c source will cause the power transformers to burn out.

(2) RADIO RECEIVER AND TRANSMITTER ★RT-1A/APN-2.—Make certain the proper model (Radio Receiver and Transmitter ★RT-1A/APN-2 or ★RT-1A/APN-2Y) is provided, according to the battery voltage in the plane in which the equipment is to be installed. Inspect the receiver-transmitter unit as follows:

(a) Remove the white screws which hold the covers on the transmitter and receiver chassis, and lift the chassis assembly out of the lower cover.

(b) Place the chassis assembly on the bench, being careful not to bump rectifier tube JAN-5U4G against the bench, because it can easily be broken in this manner.

(c) Remove the four black corner screws holding the two chassis together, and lift the receiver chassis straight up until the two chassis are disengaged. Turn the receiver chassis over to the right, laying it upside down on the bench.

(d) Disconnect the Jones plug which interconnects the receiver and transmitter chassis.

(e) Thoroughly inspect the receiver and the transmitter chassis on both the top and bottom for damage, such as broken tubes, sockets, wiring, capacitors, resistors, or controls.

(f) Check the primary connections of the power transformers on the transmitter chassis to make certain they are correct for the voltage of the a-c power source in the plane. (See fig. 5-1.)

Note

If connections are incorrect, the required changes should be made at this time, so that the equipment will be operating on the correct voltage when the operational check is made. The equipment leaves the factory connected for use on 115 volts ac. Operating the equipment on the incorrect a-c input voltage may cause damage or reduce operating efficiency.

(g) Replace the chassis and covers and attach the unit to its mounting on the bench.

(3) INDICATOR BC-929-(*).—Inspect the indicator as follows:

(a) Loosen the two round knurled holding nuts at the lower front corners of the case, and turn the locking screw on the rear of the case a half-turn to the left.

(b) Slide the indicator chassis forward out of the case, being careful not to let the chassis drop to the bench.

(c) Thoroughly inspect the indicator chassis, both top and bottom, for damage, such as broken tubes, sockets, wiring, capacitors, resistors, or controls.

(d) See that the proper scale (nautical or statute miles) is installed on the front panel.

(e) Check the power-transformer-primary connections by reference to figure 5-1. Make sure that they are right for the voltage of the a-c power source in the plane.

(f) If the inspection discloses no damage, replace the chassis in the case and attach the unit to its proper mounting on the work bench.

(4) OVERALL OPERATIONAL CHECK. — Using the proper cables, connect the major units, the receiving and transmitting antennas, and the power supplies according to the cording diagram in figure 8-1.

IMPORTANT

The transmitter *must* be connected to either the transmitting antenna, a 50-ohm dummy antenna, to Indicator BC-936-A (which contains a 50-ohm dummy antenna), before the equipment is turned on. Otherwise, the transmitting oscillator tube, JAN-2C26, will be damaged. Use a 50-ohm, 1-watt resistor as a dummy antenna for the transmitter.

(a) On Control Box ★C-3/APN-2, place the "TRANS.-KEY" switch in the center (stand-by) position, and the "ON-OFF" switch on the "ON" position.

(b) Make sure the blower on the transmitter chassis is operating, either by noting its sound, or by placing the hand in front of the vent holes in the rear of the chassis or in front of the oscillator-tuning opening in the front of the chassis.

(c) Wait approximately two minutes for the tubes to warm up, then place the "TRANS.-KEY" switch in the "TRANS." position, and turn the indicator "ON-OFF" switch to the "ON" position.

(d) Make sure the antenna-video switching motor is operating normally.

(e) Turn the "GAIN" control on the control box to the maximum counter-clockwise position, and check the operation of the "FOCUS" and "INTENSITY" controls to see that a sharp, clear trace can be obtained on all three positions of the range switch. (See fig. 2-1.)

(f) Turn the "GAIN" control to the maximum clockwise position. If the receiver sensitivity is normal, hash or grass, with a horizontal amplitude of about one-eighth of an inch, will appear on each side of the vertical trace, as in figure 2-2. Make this check with the control box "HIGH-LOW" switch in each position.

(g) If the receiver sensitivity is low, as indicated by little or no hash on either "HIGH" or "LOW" position, replace the receiver-transmitter unit with another unit, and send the defective unit to the repair station to be repaired or aligned.

(h) With the "TRANS. KEY" switch in the "TRANS." position, a signal should appear at the bottom of the trace, as in figures 2-1 and 2-2. This signal indicates normal transmitter operation. If this signal does not appear, replace the receiver-transmitter unit with another, and send the defective unit to the repair station.

(i) If these checks indicate normal operation, the equipment is ready to be installed in the plane.

2. INSTALLATION

a. GENERAL.

(1) The major assemblies of Radio Set ★AN/APN-2 are designed for maximum flexibility in installation. The receiver-transmitter unit and the indicator unit are shock-mounted, but the control-box mounting is fastened directly to the plane's structure. These mountings are not a part of the unit, but are attached to the structure of the plane, and remain in place when the units are removed for repair or replacement.

(2) Placement of the major assemblies and the antennas will be determined by the type of plane and the

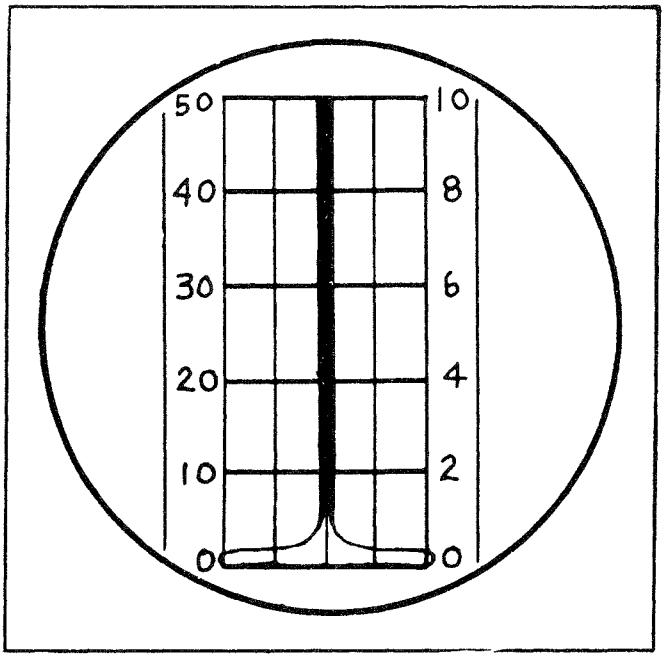


Figure 2-1. Indicator Screen, Sweep Trace and Transmitter Signal

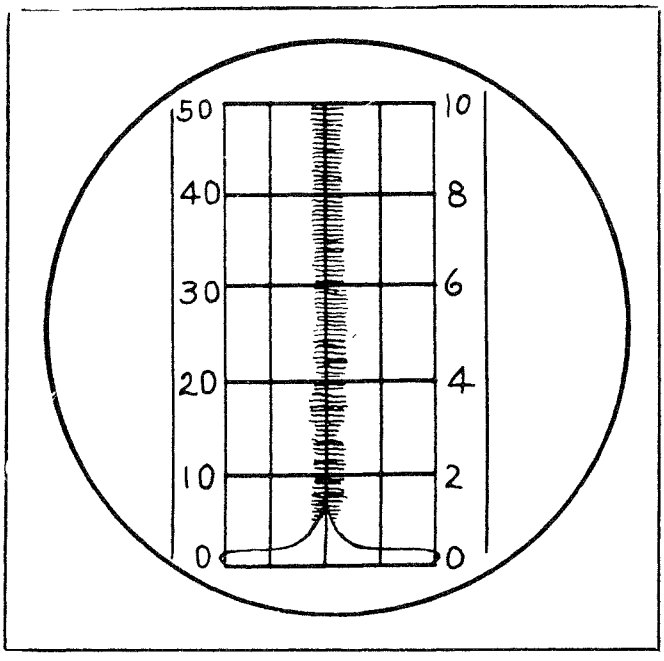


Figure 2-2. Indicator Screen, Receiver Hash and Transmitter Signal

space available. Interfering action with other equipment will be held to a minimum if the equipment is properly bonded and shielded.

(3) When locating the equipment, leave sufficient space for proper ventilation, free movement of the units on the shock mountings, and for attaching the cable connectors.

b. RADIO RECEIVER AND TRANSMITTER ★RT-1A/APN-2.

(1) Whenever possible, mount the receiver-transmitter unit so the side containing the connectors and adjustments is easily accessible to the operator when he is sitting in a normal position in front of the indicator.

(2) Minimum clearance space of three inches should be left at the ends and back of the unit to allow free vibration on the shock mounting, and for proper ventilation of the unit.

(3) Fasten the receiver-transmitter shock mounting, Mounting FT-416-A, securely to the structure of the plane, and ground it carefully to the structure of the plane with heavy bonding braid.

(4) Place the receiver-transmitter unit on the shock mounting with the pins on the lower rear corners of the unit inserted in the holes on the mounting. Lift the two knurled nuts on the front of the mounting and tighten them down securely on the two lugs on the lower front corners of the unit.

(5) Attach the interconnecting cables as shown in the cording diagram, figure 2-1. Leave sufficient cable slack between the receiver-transmitter unit and the first cable clamp so the unit can rock freely on its shock mounting without straining or causing sharp bends in the cables.

(6) If it is impractical to mount the receiver-transmitter unit where it is accessible to the operator, a remote-tuning attachment may be used, and the unit placed as required. However, the above instructions regarding clearance space, mounting, and cable connection still apply. The remote-tuning device is described in section I, paragraph 5*b*, and the following instructions describe its installation.

c. ATTACHMENT OF REMOTE-TUNING ASSEMBLY. *(See figure 1-3).*

(1) Remove the two screws located near the center of the front side, just above and below the "RCVR OSC." panel marking, on the receiver-transmitter case.

(2) Place Tuning Adapter MX-196/APN over the opening for the "RCVR OSC" "HIGH" adjustment, fitting the adapter until the shaft engages the oscillator tuning shaft.

(3) Fasten the adapter in place with the two screws which were removed.

(4) Securely fasten Remote Control Device C-134/APN to the aircraft structure near the ★AN/APN-2 control box, and where it will be easily accessible to the operator when in a normal position in front of the indicator.

(5) Attach one end of Tuning Shaft MC-215 to the tuning adapter and the other end to the remote-control device.

d. INDICATOR BC-929-(*).

(1) Mount the indicator unit in a position which will permit the operator, while sitting in a normal position, to view the indicator screen at all times.

(2) Minimum clearance space of three inches should be left at the sides and back of the indicator unit for free vibration on the shock mounting, and for proper ventilation of the unit.

(3) Securely fasten the indicator shock mounting, Mounting FT-409-A, to the structure of the plane, and ground it carefully to the structure with heavy bonding braid.

(4) Place the indicator unit on the mounting with the pins on the lower rear corners of the unit inserted in the holes in the mounting. Lift the two knurled binding nuts on the front of the mounting and tighten them down securely on the two lugs on the lower front corners of the unit.

(5) Attach the interconnecting cables as shown in the cording diagram, figure 8-1. Leave sufficient cable slack between the unit and first cable clamp so the unit can rock freely on its shock mounting without straining or causing sharp bends in the cables.

e. RADIO CONTROL BOX ★C-3/APN-2.

(1) Mount the control box within easy reach of the operator when he is sitting in a normal position in front of the indicator.

(2) Securely fasten the control-box mounting, Mounting FT-406-A, to the structure of the plane. No additional ground braid is necessary, as the mounting is not an insulated shock mounting, and ground is also provided through the control-box cable to the receiver-transmitter unit.

(3) Loosen the knurled binding nut on top of the control box, and place the two lugs on the bottom of the control box in the holes in the bottom legs of the mounting. Push the top of the control box into the mounting with the threaded binding screw in the slot provided for it. Hold the control box firmly against the mounting and securely tighten the knurled binding nut.

(4) Attach the control-box cable and tighten the connector coupling nut.

f. ANTENNA ★AT-2A/APN-2.— Mount the two receiving antennas on opposite sides of the fuselage, near the front of the plane, so the maximum directional effect will be obtained in the forward direction. Mount these antennas so that the directors and dipoles re perpendicular to the longitudinal axis of the plane, and with the director (shorter rod) toward the front of the plane. (See No. 2. in fig. 2-3.)

(1) Radio Frequency Cable RG-8/U must be used for the antenna cables. Run these cables from the indicator unit, through the hollow support base of the receiving antennas, and connect the inner conductor of the

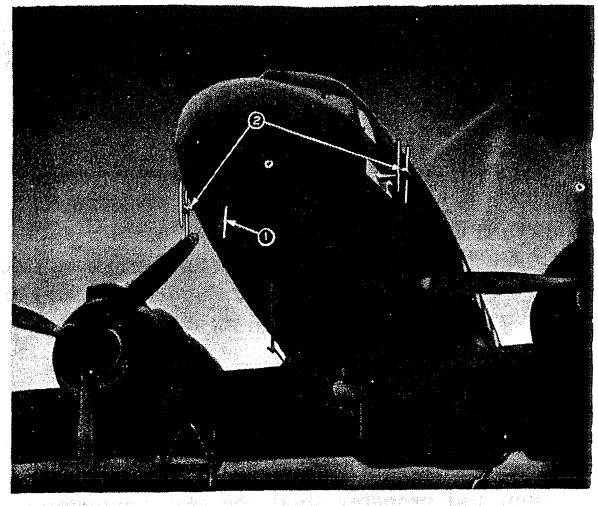
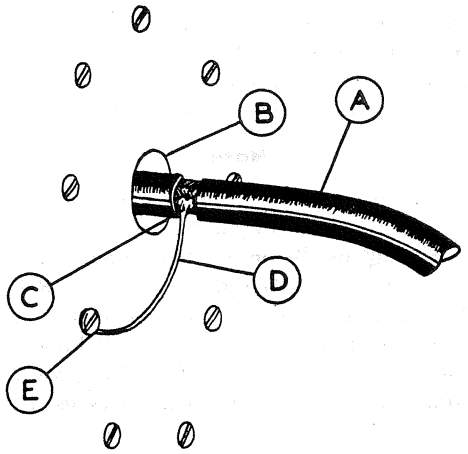
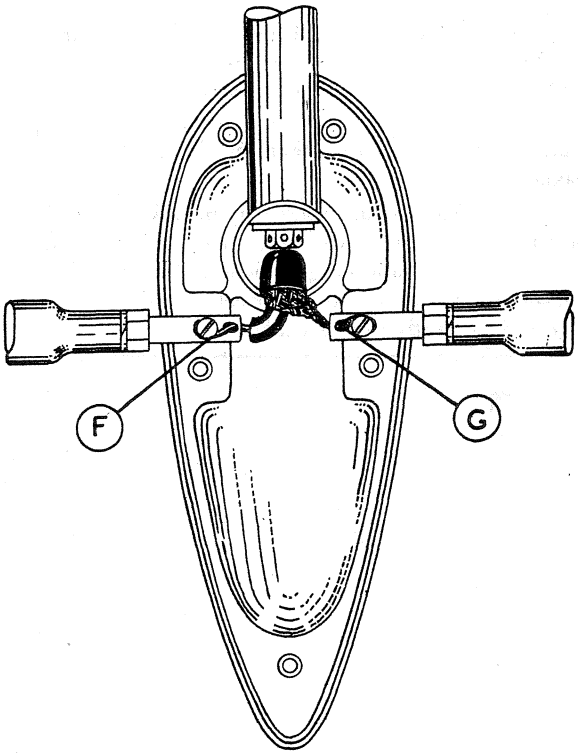


Figure 2-3. Antenna ★AT-1/APN-2 and Antennas ★AT-2/APN-2 Mounted on Airplane

coaxial cable to the upper dipole element, and the coaxial cable shield to the lower dipole element. These connections must be strong mechanical connections, carefully soldered. Use extreme care to prevent short circuits at this point. Ground the shield of each receiving-antenna cable to the skin of the ship with a lead of minimum length. (See fig. 2-4.)





A—Coaxial transmission line.

B—Hole through airplane skin from antenna base.

C—Shield on coaxial transmission line. Remove approximately ½-inch of outside rubber insulation.

D—Ground lead. Solder one end of ground lead to exposed shield and wrap other end under head of antenna base mounting screw. The ground lead must be kept as short as possible.

E—Antenna base mounting screw.

F—Center conductor.

G—Shielded braid.

Figure 2-4. Receiving Antenna ★AT-2/APN-2—Showing Electrical Connections and Method of Grounding Antenna Cable Shield

Note

Some models of Antenna ★AT-2/APN-2 have a ring added to reinforce the flange on the base. (See fig. 2-5.) The bolts that hold the antenna to the fuselage pass through this ring. It should not be necessary to make rings for antennas not having them supplied.

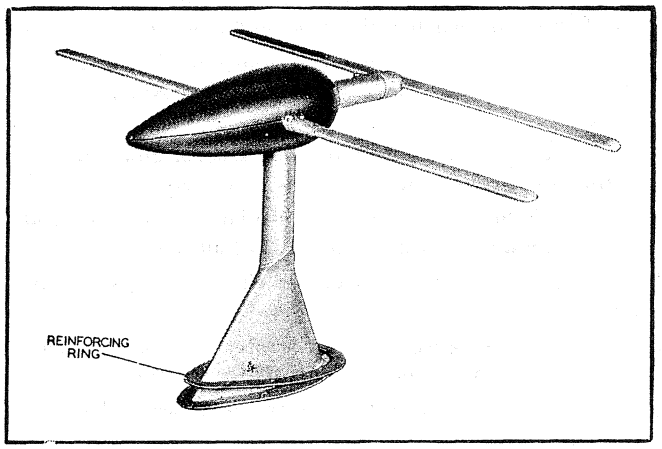


Figure 2-5. Antenna ★AT-2/APN-2 With Reinforcing Ring

g. ANTENNA ★AT-1/APN-2.—Mount the transmitting antenna on the under side of the fuselage near the front of the airplane (See No. 1 in fig. 2-3.) Use Radio Frequency Cable RG-8/U and Plug PL-259 to connect the transmitter output to the antenna.

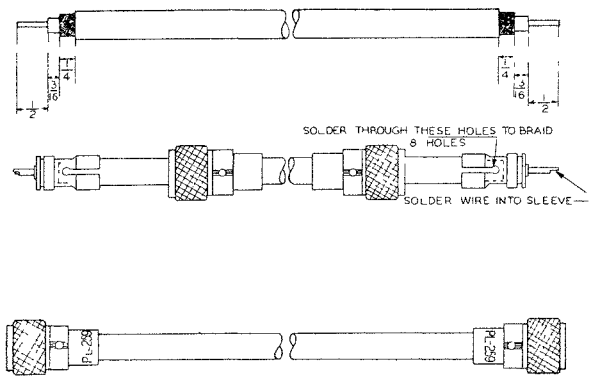
Note

On early models of Radio Set ★AN/APN-2 having a 200-mmf coupling capacitor from the transmitting oscillator to the antenna-output terminal, the cable length from the "TRANS ANT" terminal to the antenna was critical. For these installations, 18½ feet of Radio Frequency Cable RG-8/U was found to give most satisfactory results at all frequencies used. On the present models of Radio Set ★AN/APN-2, the coupling capacitor has been reduced to 5 mmf, and any convenient length of Radio Frequency Cable RG-8/U can be used.

h. CORDING.

(1) COAXIAL CABLES.—All coaxial cables used in interconnecting the major assembles of Radio Set ★AN APN-2, the antenna cables, and the cables to associated equipment, must be made of Radio Frequency Cable RG-8/U (or equivalent) 50-ohm, single-conductor coaxial line.

(*a*) All coaxial cables may be any length required for the installation. However, each cable should be as short as possible, allowing sufficient slack for free vibration of the units on their shock mountings, and for large radius bends in the cable.



a–REMOVE $\frac{15}{16}$ INCH OF THE RUBBER INSULATION FROM EACH END OF THE CABLE

b–REMOVE $\frac{11}{16}$ INCH OF THE BRAID SHIELD FROM EACH END OF THE CABLE

c–REMOVE $\frac{1}{2}$ INCH OF THE INNER INSULATION FROM EACH END OF THE CABLE

d–PLACE A PL-259 CONNECTOR ON EACH END OF THE CABLE

e–REFER TO THE ABOVE ILLUSTRATIONS FOR SOLDERING THE BRAID SHIELD AND THE INNER CONDUCTOR TO THE CONNECTOR

f–SLIP THE THREADED CLAMP OF THE CONNECTOR INTO POSITION

Figure 2-6. Coaxial Cable Fabrication Instructions

(*b*) Where coaxial cables must be clamped to the structure of the plane, the clamp must not be tight enough to flatten the cable.

Note

If a coaxial cable is flattened it is likely to short out, also its characteristic impedance is changed, impairing operation.

(*c*) Determine the length required for each cable, then cut and prepare the ends and attach the connector according to the information given in figure 2-6.

CAUTION

Use extreme care when soldering the shield braid to the connector body. Using too much heat at this point will damage the inner insulation, and probably short the two conductors. On the other hand, a strong mechanical connection, properly soldered, is very necessary.

(2) POWER CABLES.—Standard 2-conductor aircraft power and lighting cable is used to make up the a-c and d-c power cables. These cables may be any required length, consistent with good cabling.

(*a*) Determine the length required for each cable and cut off the proper amount from the bulk supply. Disassemble the AN-type connector, and slip the connector shell and ring over the cable.

(*b*) Carefully solder the two conductors to the contact soldering cups, and reassemble the connector.

(*c*) Attach a suitable connector to the other end of the cable, and connect the cable to the equipment, as shown in the cording diagram, figure 8-1.

Note

On the d-c power input cables, the choice of pins to which the positive and negative leads are connected is not critical since the d-c circuit is not grounded to the chassis, and the blower and switching motors will operate correctly with either connection.

(3) CONTROL-BOX CABLE.—This cable is made up of the required length of 9-conductor cable.

(*a*) Cut off the required length of cable and strip off the outer cover for a distance of approximately 1½ inches.

(*b*) If fabric-covered cable is used, bind the end of the fabric cover with strong twine to prevent raveling.

(*c*) Strip ¼ inch of the insulation from each end of each conductor and tin the ends of all wires.

(*d*) Slip the connector shell and ring onto the cable.

(*e*) Using figure 2-7 as a reference, connect each conductor to the proper pin and solder carefully.

(*f*) Repeat this process at the other end of the cable.

(*g*) Reassemble the connectors and attach the cable to the control box and the receiver-transmitter unit.

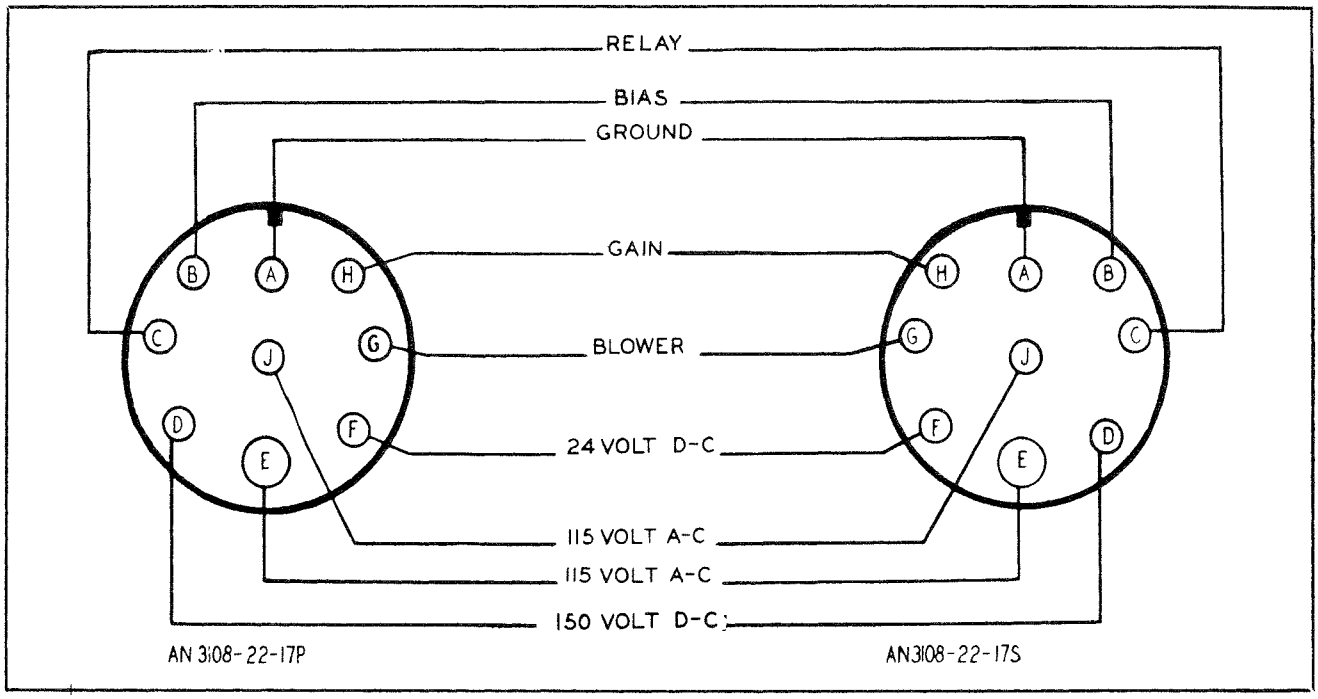


Figure 2-7. Control Cable Plug Connections

(4) CHECKING NEW CABLES.—After each new cable is completed, it must be thoroughly checked for continuity and short circuits. Using the low-range scale of an ohmmeter, check each conductor of each cable, including the shields of the coaxial cables, for continuity. Shake, roll, or wiggle the cable, while making this check, to uncover any poor connections. Using the high-range scale of the ohmmeter, check for leakage or short circuits between the inner and outer conductor of the coaxial cables, and between conductors of the other cables.

(5) CONNECTION.—When all cables have been completed and carefully checked. connect them to the proper receptacles, as shown in the cording diagram, figure 8-1.

(a) Support or bind each cable so it will not swing in flight, or come in contact with sharp objects.

(b) See that each mounting base is properly grounded, and that long cables are properly bonded to the structure of the plane, as required.

(6) COLOR-CODING NEW CABLES.— New cables should be color-coded to correspond to the colored dots near the receptacles on each unit. This system simplifies cable connecting, and assures that each cable will be used in the same position when reconnecting the units. Table 2-1 shows the color-code system used with Radio Set ★AN/APN-2.

TABLE 2-1.—Connection Color Code System Used Radio Set ★AN/APN-2

*Radio Receiver and Transmitter *RT-1A, APN-2*		*Indicator BC-929-(*)*	
Receptacle	*Color*	*Receptacle*	*Color*
RCVR. ANT.	Blue	ANT. R.	Green
TRANS. ANT.	Orange	ANT. L.	Red
SYNC. OUT.	Yellow	RCVR. ANT.	Blue
VIDEO	Black	VIDEO	Black
VIDEO	Aluminum	SYNC.	Yellow
SUP. OUT.	Brown		
SYNC. IN.	Lavender		

3. AFTER INSTALLATION ADJUSTMENT.

a. GENERAL *(See figure 6-1.)*—The following test equipment is used to check and align Radio Set ★AN/APN-2 in the aircraft.

(1) Range calibrator BC-949-A, used to calibrate the indicator.

(2) Indicator BC-936-A, used to check transmitter.

(3) Signal Generator I-196-B, used to align receiver r-f and oscillator circuits.

(4) Frequency Meter BC-906-D, used to adjust transmitter and other test units.

(5) Cord CD-800, for interconnecting units (two required).

(6) Cord CD-799, a-c power cord (one required).

b. CALIBRATION OF INDICATOR BC-929-(*) FOR NAUTICAL MILE SCALE.—Range Calibrator BC-949-A, used to calibrate the indicator, is an a-c operated device; therefore, the primary tap on its power transformer must be connected properly for the a-c input voltage. It is necessary to remove the calibrator chassis from the case to check the connection. Two scales are provided for the indicator screen, one calibrated in nautical miles, and the other calibrated in statute miles. To calibrate the indicator, the video signal from the receiver is removed, and the signal developed in the calibrator for each of the three ranges is fed into the indicator for calibration purposes. To calibrate the indicator for nautical miles refer to figure 8-2 and proceed in the following manner:

(1) Disconnect the plug from the socket marked "SYNC" on the indicator and connect it to the socket marked "SYNC INPUT" on the range calibrator.

(2) Connect Cord CD-800 from socket marked "SYNC OUT" on the range calibrator to the socket marked "SYNC" on the indicator

(3) Disconnect the plug from the socket marked "VIDEO" on the indicator.

(4) Connect Cord CD-800 from the socket marked "VIDEO" on the indicator to the "VIDEO OUTPUT" socket on the range calibrator.

(5) Disconnect power plug from the "A.C." socket on the indicator and connect it to "A.C. IN" on the range calibrator. Connect one end of Cord CD-799 to the socket on the range calibrator marked "A.C. OUT" and the other end to the "A.C." socket on the indicator.

(6) Connect the 50-ohm, 1-watt dummy-antenna load from the center conductor of "TRANS. ANT." to ground.

(7) Place the "ON-OFF" switches on the control box and the indicator in the "ON" position and, after three minutes, the "TRANS.-KEY" switch in the "TRANS." position.

(8) Set the "NAUTICAL MILES" range switch on the range calibrator in the "10"-mile position and the "RANGE" switch on the indicator in the "10"-mile position. The indicator screen will now have a wavy line symmetrically located on both sides of the vertical center line. The points used in calibration are the points of minimum horizontal width, each representing one mile. (See fig. 2-8, part C.) There should be 10 peaks showing on each side of the vertical center line for calibration of each range. The number of these peaks is controlled by the "SWEEP DURATION" adjustment associated with each range. On the 10-mile range the signal from the range calibrator will not be as sharp, nor have as great an amplitude on the indicator screen, as will the 50- and 100-mile signals. Care must be taken in counting the 10 peaks on this range, especially the upper peaks on the screen.

(9) Adjust the "INTENSITY" control for readable brilliance.

(10) To align the indicator, adjust the "HOR. CENT." control to exactly center the vertical trace line on the indicator screen and adjust the "SWEEP DURATION 10" control for 10 peaks.

(11) Adjust the "VER. CENT." control to place the second calibration point on the two-mile horizontal line. (See fig. 2-8, part C.)

(12) The eighth calibration point should fall on the eight-mile horizontal line. If not, make screwdriver adjustment of the "SWEEP AMPLITUDE 10" control until it does.

(13) Slightly readjust the "VER. CENT." control if necessary to realign the two-mile calibration point again.

(14) Adjust the "SWEEP DURATION 10" control to cut off the signal at the 10-mile horizontal line on the indicator scale.

Note

Normally on Radio Set ★AN/APN-2, the "VERT. CENT." adjustment is made only at the two-mile point on the 10-mile range. No further changes in this setting on the 50- and 100-mile ranges should be made. However, if any one of these ranges is used more frequently, or requires greater accuracy in calibration, make the "VERT. CENT." adjustment at the second calibration point on that range only.

(15) Turn the "RANGE" switch on the indicator and "NAUTICAL MILES" switch on the range calibrator to the "50"-mile position and adjust the "SWEEP DURATION 50" control for 10 peaks. Each calibration point now represents five miles.

(16) Adjust the "SWEEP AMPLITUDE 50" control until the eighth calibration point is on the 40-mile horizontal line. (See fig. 2-8, part B.)

(17) Adjust the "SWEEP DURATION 50" control until the signal stops at the 50-mile horizontal line.

(18) Turn the indicator "RANGE" switch and the range calibrator "NAUTICAL MILES" switch to the "100"-mile range, and adjust the "SWEEP DURATION 100" control for 10 peaks. Each calibration point now represents 10 miles.

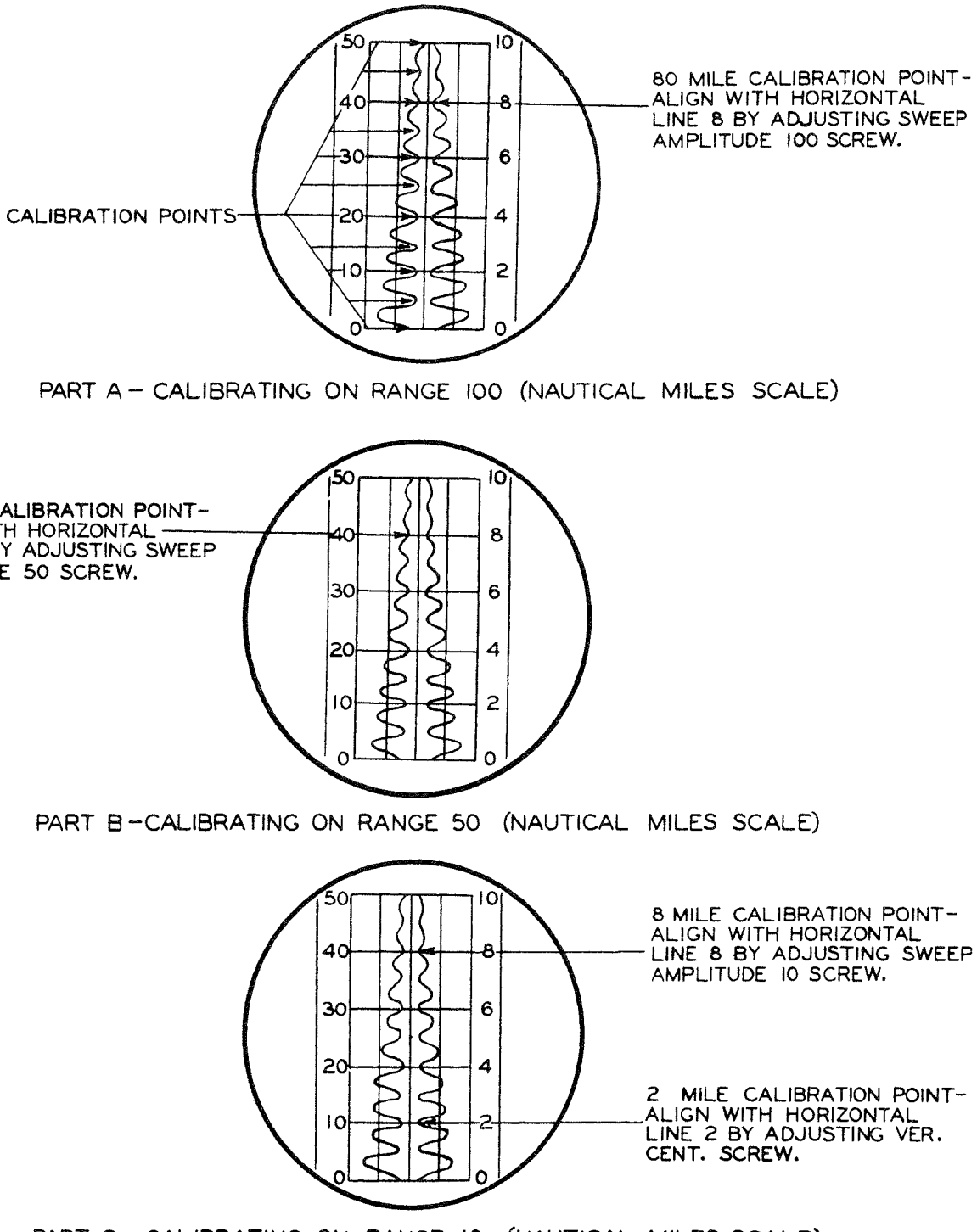
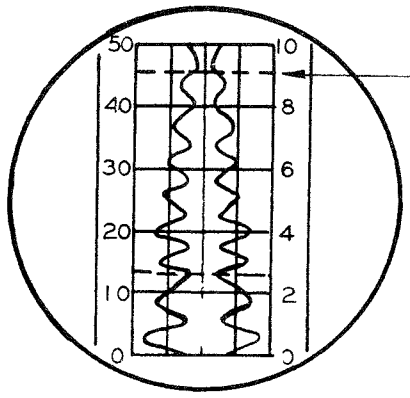


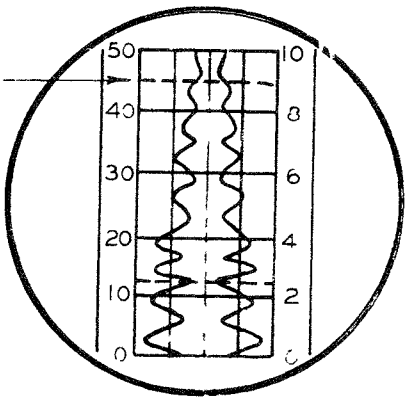
Figure 2-8. Indicator BC-929-A—Calibration in Nautical Miles



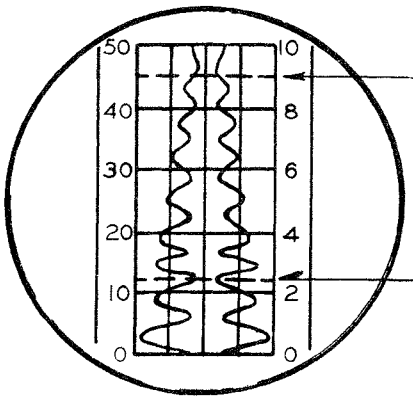
8TH CALIBRATION POINT— ALIGN WITH 9 ∠ MILE HORIZONTAL DOTTED LINE BY ADJUSTING SWEEP AMPLITUDE 100 SCREW

PART A —CALIBRATING ON RANGE 100 (STATUTE MILES SCALE)

8TH CALIBRATION POINT — ALIGN WITH 46 MILE HORI — ZONTAL DOTTED LINE BY ADJUSTING SWEEP AMPLI — TUDE 50 SCREW.



PART B— CALIBRATING ON RANGE 50 (STATUTE MILES SCALE)



8TH CALIBRATION POINT — ALIGN WITH 9 2 MILE HORIZONTAL DOTTED LINE BY ADJUSTING SWEEP AMPLITUDE 10 SCREW

2ND CALIBRATION POINT ALIGN WITH 2.3 MILE HORIZONTAL DOTTED LINE BY ADJUSTING VERNIER SCREW.

PART C —CALIBRATING ON RANGE 10 (STATUTE MILES SCALE)

Figure 2-9. Indicator BC-929-A—Calibration in Statute Miles

(19) Adjust the "SWEEP AMPLITUDE 100" control until the eighth calibration point is on the 80-mile horizontal line. (See fig. 2-8, part A.)

(20) Adjust the "SWEEP DURATION 100" control until the signal stops at the 100-mile horizontal line.

(22) Disconnect the range calibrator and its associated cables, and reconnect the regular cables according to the cording diagram in figure 8-1.

c. CALIBRATION OF INDICATOR BC-929-(*) FOR STATUTE-MILE SCALE.—The indicator may also be calibrated for statute miles, using the same range calibrator and the same procedure as in nautical-mile calibration. Replace the indicator nautical-mile scale with the statute-mile scale provided and make the adjustments to the dotted lines on the statute-mile scale. The upper dotted line on the statute-mile scale represents 92, 46, and 9.2 statute miles; the lower dotted line represents 23, 11.5, and 2.3 statute miles, respectively, for the 100-, 50-, and 10-mile ranges. Using these dotted lines (see fig. 2-9) for the upper and lower calibration points on the indicator, while using the 100, 50, and 10 nautical-mile ranges on the range calibrator, causes the 80, 40, and 8 statute-mile points to fall on the proper horizontal lines on the statute scale. The same is true for the 20, 10, and 2 statute-mile points.

d. ADJUSTING TRANSMITTER FREQUENCY, USING FREQUENCY METER BC-906-D.—The transmitter is adjusted to five frequencies, 214, 219, 224, 229, and 234 megacycles, corresponding to positions "A", "B", "C", "D", and "E", respectively, on the "TRANS. FREQ." control knob. Adjust each position in the following manner:

(1) Adjust frequency meter as follows:

(a) Open frequency-meter front cover and remove the collapsible antenna. Insert antenna (at full length) into the hole in the top of the unit marked "ANTENNA".

(b) Set the "HI-LO" switch on the frequency meter to the "HI" position, and the "ON-OFF" switch to the "ON" position.

(c) Set the fequency-meter dial carefully to the desired frequency (214 mc for position "A"), as determined by the frequency-meter chart.

Note

To find the dial setting on the chart for the desired frequency, move the decimal point one place to the left (21.4). Find 21.4 in the vertical column at the left side of the chart, on one of the four pages. From this figure move horizontally across the page to the intersection with the curve. From the intersection move vertically and read the dial setting directly under the point of intersection at the bottom of the page. Interpolation may be necessary.

(2) Place the "TRANS-KEY" switch on the control box in the center (stand-by) position, and place the "ON-OFF" switch in the "ON" position.

(3) Wait approximately three minutes for the transmitter tubes to warm up properly, then place the "TRANS-KEY" switch in the "TRANS." position.

(4) Place the frequency meter where the meter will be visible, and with the frequency-meter antenna near the "TRANS. ANT." socket. (See fig. 8-3, position 1.)

(5) Set the "TRANS. FREQ." control knob to the "A" position (214 mc).

(6) Use the tuning tool (combination screwdriver and socket wrench attached to the front of Radio Receiver and Transmitter *RT-1A/APN-2) to adjust the transmitter frequency. The transmitter-frequency adjustment is reached through the window in the front of the case marked "TRANS. FREQ.". With the socket wrench (supplied with the set), loosen the locking nut of the adjustment, and then, with the fibre screwdriver, rotate the adjustment for greatest dip of the meter on the frequency meter. Tighten the locking nut with the socket wrench, holding the adjustment screw with the screwdriver so that the frequency adjustment will not be changed.

(a) Rotate the "TRANS. FREQ." control knob, and return it to channel "A." This will relieve the strain on the detent mechanism caused by the pressure applied to the adjustments.

(b) Check the frequency with Frequency Meter BC-906-D.

(c) If the frequency of the transmitter is slightly high, loosen the locking nut and turn the screw-driver adjustment to the right. If the frequency is slightly low, turn the screw-driver adjustment to the left. Tighten the locking nut and again rotate the "TRANS. FREQ." control knob before rechecking the frequency.

Note

The operator will shortly learn from experience the approximate amount of adjustment necessary to set the frequency for each channel.

(d) Repeat the procedure in subparagraphs 3*d*(6) through 3*d*(6)*(c)* for all channels ("A," "B," "C," "D," and "E").

(7) Some planes will shield the frequency meter so completely from transmitting antenna that it will be necessary to make an external connection to pick up the signal. Use Cord CX-16/TPN-1 to connect the receptacle marked "ANT. TEST" on the frequency meter to the receptacle marked "RCVR. ANT." on the indicator. This connects the frequency-meter input to the receiving antennas. (See fig. 8-3, position 2.)

Note

Cord CX-16/TPN-1 is supplied as auxiliary equipment when requested, but may be made up at the base by placing Plug PL-259 and Coupling MC-277 on the ends of a 3-foot length of Radio Frequency Cable RG-8/U or WC-549-A.

(8) Set the frequency-meter dial to 219 megacycles, the "TRANS. FREQ." control knob to the "B" position, and repeat step (6) above (par. 3*d*).

Note

All five of the transmitter-frequency adjustments are made through the same window.

(9) Set the frequency-meter dial to 224 megacycles, the "TRANS. FREQ." control knob to the "C" position, and repeat step (6) above (par. 3*d*).

(10) Set the frequency-meter dial to 229 megacycles, the "TRANS. FREQ." control knob to the "D" position, and repeat step (6) above (Sect. II; par 3*d*).

(11) Set the frequency-meter dial to 234 megacycles, the "TRANS. FREQ." control knob to the "E" position, and repeat step (6) above (Sect. II; par. 3*d*).

e. CHECKING TRANSMITTER POWER OUTPUT, USING TEST INDICATOR BC-936-A.

(1) With all power turned off, disconnect the transmitter-antenna cable from the "TRANS. ANT." receptacle on the front of the receiver-transmitter unit, See figure 8-4 for proper connections.

(2) Disconnect the video cable from the "VIDEO" receptacle on the indicator unit and lay this cable aside.

(3) Connect the short cable attached to Test Indicator BC-936-A to the "VIDEO" receptacle on the indicator.

(4) Using Test Cord CD-800, connect the transmitter-output receptacle "TRANS. ANT." to the receptacle marked "TRANS. IN" on the test indicator.

(5) Place the "ON-OFF" switch on the control box in the "ON" position, the "ON-OFF" switch on the indicator in the "ON" position and after two minutes place the "TRANS.-KEY" switch in the "TRANS." position. With the test-indicator "POWER-PULSE" switch in the "POWER" position, a single, vertical trace line should appear on the indicator screen.

(6) With the "HOR. CENT." control, shift the vertical trace to the right-hand vertical line on the indicator screen, as in figure 2-10.

(7) Press the momentary-contact switch on the test indicator marked "PUSH". The transmitter signal should now appear on the indicator screen approximately as shown in figure 2-11. The power output is determined by the position of the lower left tip of the signal pattern. If this tip extends to, or beyond, one and one-half divisions to the left of the center line on the indicator screen, the power output may be considered to be above the minimum allowable value of 0.5 kilowatt. These are visual comparison checks and can not be read in terms of power output in watts.

f. CHECKING TRANSMITTER PULSE WIDTH, USING TEST INDICATOR BC-936-A.—This check is made with the test indicator connection as in Section II, paragraph 3*e*, steps (1) through (5). (See fig. 8-4.)

(1) With the "HOR. CENT." control, shift the vertical trace back to the original center-line position.

(2) Place the "PULSE-POWER" switch on test indicator in the "PULSE" position, and the "RANGE" switch on Indicator BC-929(*) in the 10-mile position.

(3) Press the push button on the test indicator marked "PUSH". The transmitter signal should now appear on the indicator screen as the rectangular pulse shown in figure 2-12. With the "RANGE" switch on the indicator set at "10", this pulse should extend vertically a distance of approximately one-fourth the first vertical division on the indicator screen.

Note

Make this check only after the indicator has been properly calibrated, as the "VERT. CENT." adjustment will affect the position of the signal, and its apparent vertical height.

(4) Disconnect the test indicator and reconnect the cables for normal operation, as shown in the cording diagram, figure 8-1.

g. ALIGNING RECEIVER OSCILLATOR AND R-F STAGES, USING TEST SIGNAL GENERATOR I-196-B.—The receiver local-oscillator is tuned to two different frequencies, which are selected by the "HIGH-LOW" switch on the control box. These two frequencies may be anywhere in the 214-234 megacycle band, but must be within five megacycles of each other. The equipment leaves the factory tuned to 234 megacycles for the "HIGH" frequency position and 229 megacycles for the "LOW" frequency position. These frequencies will be used in this example. Because of the wide bandwidth of the r-f stages, no switching is necessary in these circuits; the r-f and mixer stages are tuned to a frequency halfway between the "HIGH" and "LOW" oscillator settings, thereby providing equal sensitivity for both frequencies.

(1) Calibrate the test signal generator to the receiver "HIGH", "LOW", and midpoint frequencies with the frequency meter, as follows:

(*a*) Remove the collapsible antenna from inside the cover of the frequency meter and insert it into the receptacle marked "ANTENNA" on top of the frequency meter and extend the antenna full length.

(*b*) Place the signal generator on its side with Frequency Meter BC-906-D behind it and so that the antenna of the frequency meter lies along the side of the signal generator.

(*c*) Set the "HI-LO" switch on the frequency meter to the "HI" position, and turn the "ON-OFF" switch to the "ON" position.

(*d*) Set the dial of the frequency meter to correspond to the desired high-frequency setting (234 mc).

(*e*) Place the signal-generator "ON-OFF" switch in the "ON" position and adjust the signal-generator dial within the "HI-G-RE" range until the maximum dip is obtained on the frequency meter. Carefully mark this point with a sharp pencil so it may be returned to later.

(*f*) Set the frequency meter for the low frequency (229 mc) and repeat step (*e*).

(*g*) Set the frequency meter for the midpoint frequency, halfway between the high and low frequencies (231.5 mc), and repeat step (*e*) above.

(*h*) Turn the signal generator "OFF" until ready for use.

(2) Set the signal generator directly in front of the plane, about 10 feet from the nose, *with the side bearing the nameplate facing the airplane.* If the signal-generator batteries are weak, or if the oscillator is considerably detuned, it may be necessary at first to place the signal generator closer to the receiving antennas. (See fig. 2-13.)

(3) Place the "ON-OFF" switch on Control Box ★C-3/APN-2 in the "ON" position, the "HIGH-LOW" switch in the "HIGH" position, and the "ON-OFF" switch on Indicator BC-929-(*) in the "ON" position.

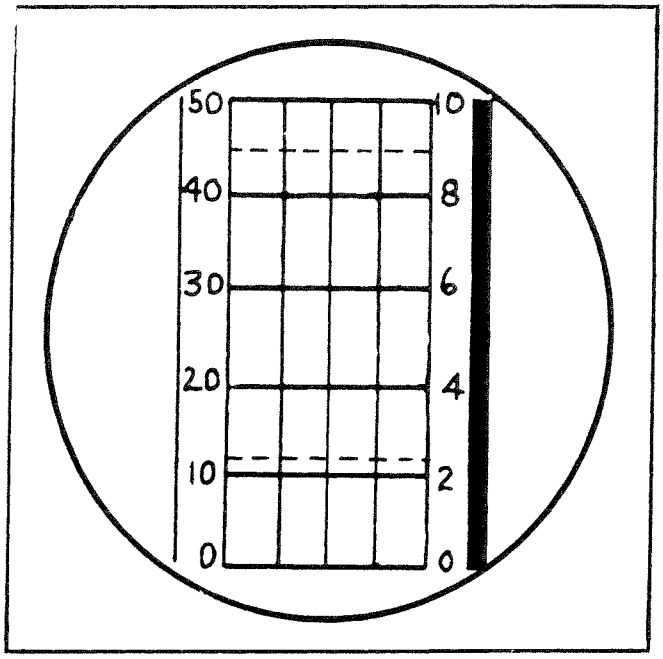


Figure 2-10. Indicator BC-929-A—Trace Adjusted for Power Output Check

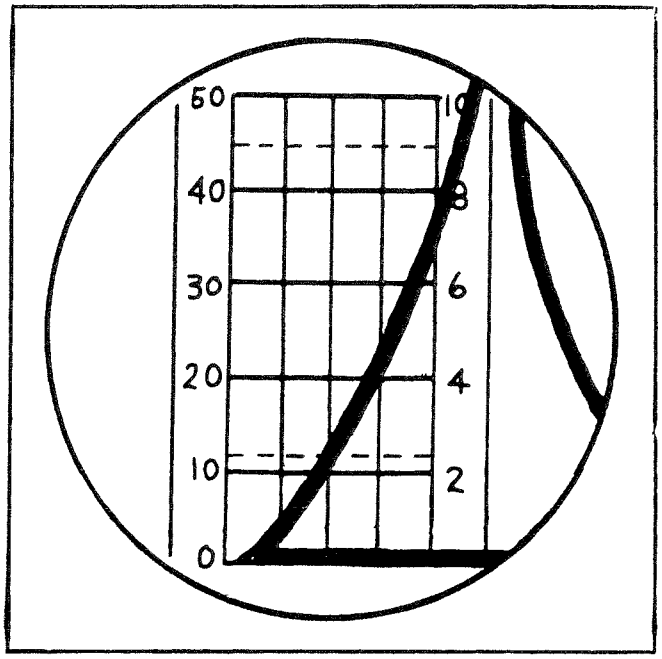


Figure 2-11. Indicator Screen, Power Output Signal

(4) Turn the range switch on the indicator to the "100"-mile position.

(5) After allowing for a three-minute warm-up, place the "TRANS.-KEY" switch to the "TRANS." position.

(6) Set the signal-generator dial to the point previously calibrated for center frequency, and place the "ON-OFF" switch in the "ON" position.

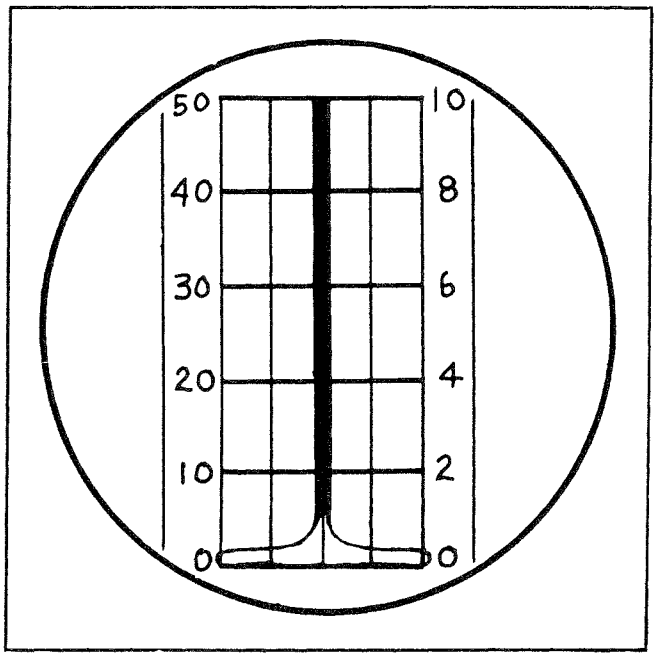


Figure 2-12. Indicator Screen, Transmitter Pulse-Width Signal

(7) Adjust the "RCVR. OSC. HIGH" control of the receiver-transmitter for maximum horizontal amplitude of the received signal, as seen on the indicator screen.

IMPORTANT

Keep the receiver-gain control low to prevent limiting of the received signal. If the signal from the signal generator cannot be received, move the signal generator closer to the plane for preliminary adjustments.

(8) Unlock the "RECEIVER TUNING" adjustments "1", "2", and "3" on the front of the receiver and adjust each for maximum signal on the indicator screen. Again make sure that the gain control is not high enough to cause limiting of received signal.

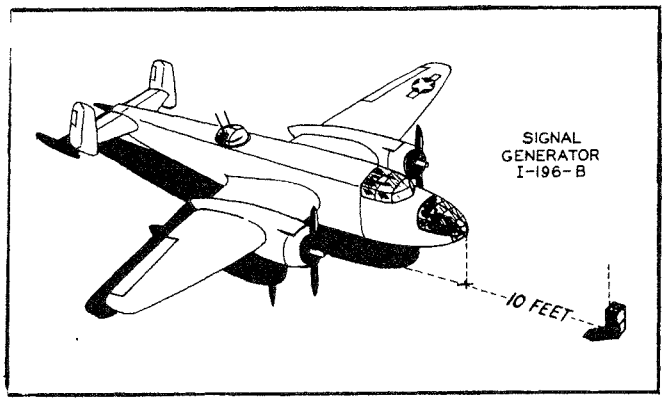


Figure 2-13. Method of Using Signal Generator I-196-B for Receiver Alignment

(9) After carefully tuning these three stages, tighten locking nuts on "1", "2", and "3", making sure the adjustments are not disturbed. This is a final adjustment for the r-f stages and should not be changed unless another group of frequencies is to be set up.

(10) Set the signal-generator dial to the point previously calibrated for the "HIGH" frequency.

(11) With the "HIGH-LOW" switch in the "HIGH" position, adjust the "RCVR. OSC." "HIGH" control for maximum received signal on the indicator screen.

IMPORTANT

Always adjust "RCVR. OSC." "HIGH" before "RCVR.OSC." "LOW".

(12) Set the signal-generator dial to the point corresponding to the desired "LOW" frequency, as previously marked.

(13) With the "HIGH-LOW" switch in the "LOW" position, adjust "RCVR. OSC." "LOW" control for maximum received signal on the indicator screen.

This completes the receiver tuning.

Note

If Radio Set ★AN/APN-2 is to be remotely tuned by the use of Remote Tuning Device C-134/APN, Tuning Shaft MC-215, and Tuning Adapter MX-196/APN, the "RCVR-OSC" "HIGH" adjustment should be tuned to each of the two frequencies being used. Then note each position of the dial on Remote Tuning Device C-134/APN so that the receiver may be readily tuned to either of the two frequencies while in flight. The "HIGH-LOW" switch on Radio Control Box ★C-3/APN-2 must be left in "HIGH" position, because Tuning Adapter MX-196/APN covers up the "RCVR-OSC" "LOW" adjustment.

h. CHECKING RECEIVER DIRECTIONAL INDICATION USING SIGNAL GENERATOR I-196-B.

(1) Place the signal generator approximately 50 to 75 feet to the right of the airplane, at an angle of about 45 degrees from the heading of the plane, *with the side bearing the nameplate facing the airplane.* (See fig. 2-14.)

(2) The signal amplitude on the right side of the indicator screen should be greater than on the left.

(3) Repeat this check with the signal generator to the left of the airplane. The signal amplitude should be greater on the left side.

(4) Repeat this check with the signal generator directly in front of the airplane. The signal amplitude should be equal on both sides of screen center line.

(5) When the preceding checks have been completed and normal operation of the equipment is indicated, Radio Set ★AN/APN-2 is ready for flight operation.

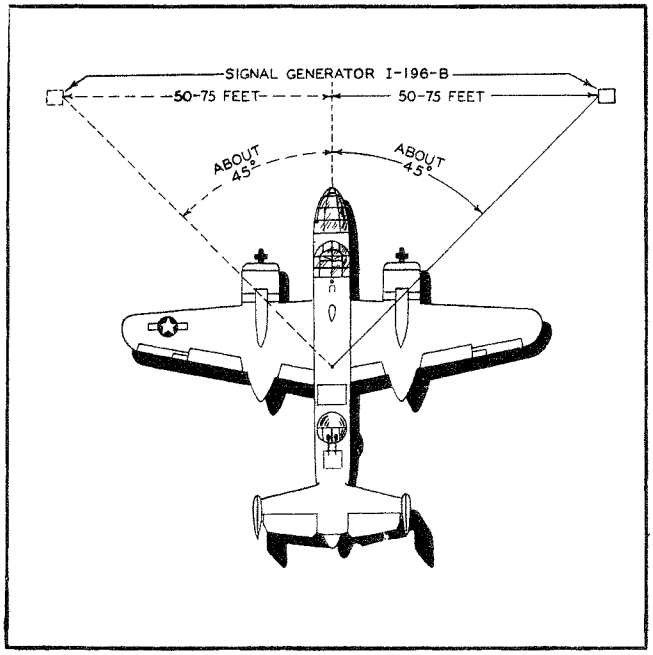


Figure 2-14. Method of Using Signal Generator I-196-B to Check Receiver for Directional Indication

SECTION III
OPERATION

CAUTION

Do not operate the receiver-transmitter at any time without the proper load connected to the "TRANS. ANT." socket.

1. TO START AND STOP THE EQUIPMENT.

a. TO START THE EQUIPMENT.

(1) Place the "TRANS.-KEY" switch in the stand-by (mid) position.

(2) Turn the "INTENSITY" and "GAIN" controls to the maximum counter clockwise position.

(3) Place the "ON-OFF" switches on Control Box ★C-3/APN-2 and on Indicator BC-929-(*) in the "ON" position.

Note

The "ON-OFF" switch on the indicator controls only the d-c power to the antenna-video switch motor.

(4) After a three-minute warm-up period, place the "TRANS.-KEY" switch on the control box in the "TRANS." position. Adjust the "FOCUS" and "INTENSITY" controls on the indicator until a clear, sharp trace is obtained, as shown in figure 2-1.

(5) Adjust the "GAIN" control until grass appears on the indicator screen. The grass (hash) shows that the receiver is operating and the signal on the base line shows that the transmitter is operating. (See fig. 2-2.)

(6) Check the receiver for normal operation, indicated by grass on the indicator screen for both the "HIGH" and "LOW" positions of the "HIGH-LOW" switch on the control box.

Note

Radio Receiver and Transmitter ★RT-1A/APN-2 differs only from Radio Receiver and Transmitter ★RT-1/APN-2 in that the screwdriver adjustment on the "RCVR.-OSC.-HIGH" control has been replaced by a tuning knob which allows the operator to tune the receiver for maximum response while in flight. If Radio Receiver and Transmitter ★RT-1A/APN-2 is mounted in a remote or inaccessible position in the airplane, the tuning knob may be replaced by Tuning Adapter MX-196/APN, which, in conjunction with Remote Tuning Device C-134/APN and Tuning Shaft MC-215, permits the operator to tune for maximum response while sitting at his normal position. Remote Tuning Device C-134/APN should be mounted close to Indicator BC-929-(*).

b. TO STOP THE EQUIPMENT.—Place the "ON-OFF" switch on the control box and on the indicator in the "OFF" position and set the "TRANS.-KEY" switch to the mid-position (stand-by).

2. FLIGHT OPERATION.

a. LOCATING GROUND BEACON.

(1) Turn on the equipment and check, as instructed in paragraph 1*a*, this section.

(2) Turn the "RANGE" switch on the indicator to the "100"-mile position.

(3) Place the "HIGH-LOW" switch on the control box to the position which is determined by the transmitting frequency of the ground beacon. If remote tuning is used, adjust Remote Tuning Device C-134/APN to the assigned frequency.

(4) Set the "TRANS. FREQ." switch to the position "A", "B", "C", "D", or "E", as directed by the Officer-in-Charge.

(5) Determine the position of the "TRANS.-KEY" switch as follows:

(*a*) If the location of the ground beacon is secret, hold the "TRANS.-KEY" switch in the "KEY" or intermittent position only long enough to obtain the desired information. Since the ground transpondor beacons will not transmit unless interrogated, the enemy will thus be less likely to gain knowledge of the beacon's location.

IMPORTANT

The switch must be held in the "KEY" position for the desired period of transmission.

(*b*) For continuous operation, place the "TRANS.-KEY" switch in the "TRANS." position.

(*c*) for stand-by operation (non-transmitting), place the "TRANS.-KEY" switch in the center position.

(6) Adjust the receiver "GAIN" control to the proper level. Each operator will have his individual opinion as to this setting. However, the gain should be high enough to provide a clear indication of the incoming signal.

(7) When the airplane is within the range of the ground beacon, place the "TRANS.-KEY" switch in the "TRANS." position. A signal should appear on the screen of the indicator unit, showing the distance from the beacon and its direction from the heading of the plane. Range is read to the bottom of the received pulse. (See fig. 3-1.)

* Any issue letter is applicable.

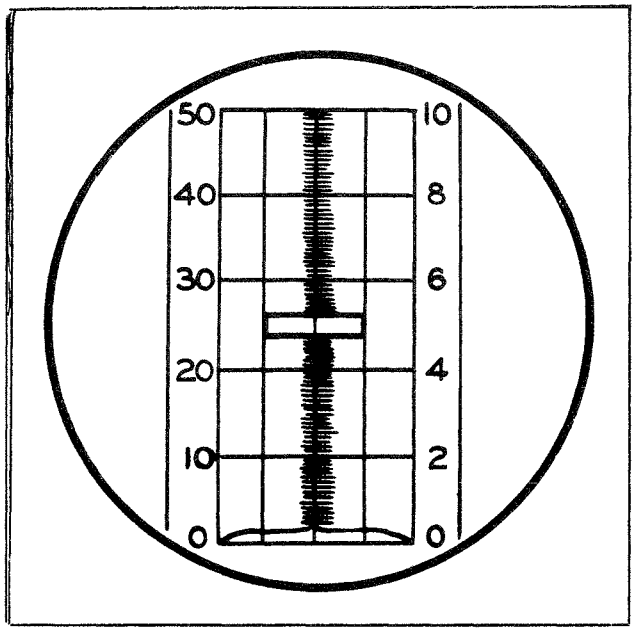


Figure 3-1. Indicator Screen, Response to Beacon Directly Ahead

(8) If the signal on the right of the center line is larger, the beacon is to the right of the line of flight of the airplane and turning the airplane to the right will equalize the right and left signals. If the signal on the left of the center line is larger, turning to the left will equalize the signals. (See fig. 3-2.)

(9) The range is reduced, as the airplane approaches the beacon, by changing the position of the "RANGE" switch.

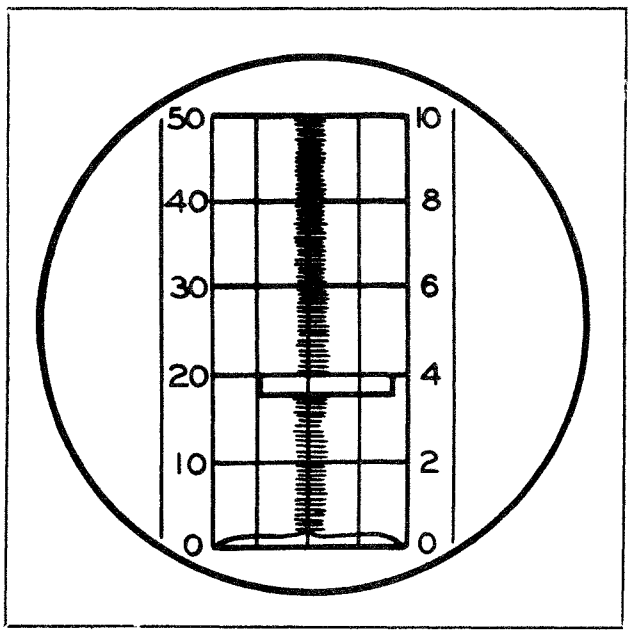


Figure 3-2. Indicator Screen, Beacno to Right of Airplane Heading

IMPORTANT

Keep the "GAIN" control adjusted so that the received signal is never greater than two divisions on either side of the center line.

(10) As the airplane approaches the beacon, the received signal gradually approaches the zero line. At the time the airplane is very near the beacon, the received signal and the transmitter pulse occupy approximately the same space.

(11) Turn the "GAIN" control fully clockwise so the received signal will be large. At the instant the plane is directly over the beacon, the received signal will collapse, leaving only the transmitted pulse.

Note

The operator must have practice in actually locating various types of ground beacons to obtain a reasonable degree of accuracy. The reception from the various ground beacons differs widely.

b. A METHOD OF LOCATING A PLACE AT A GIVEN DISTANCE BEYOND THE BEACON.

(1) Follow the procedure given in paragraph 2*a*, this section, until the airplane is directly over the beacon.

(2) Establish direction by compass or other means.

(3) Proceed past the location of the beacon, and the receiving signal will gradually rise above the transmitted signal.

(4) Read the scale to find the distance past the beacon.

c. USE WITH BEAM APPROACH BEACON SYSTEM (BABS).

(1) GENERAL INFORMATION.

(*a*) The indication which is received on the airborne indicator is a rather wide pulse, appearing to be about 2 miles in duration and contains coded information enabling the operator to determine whether he is "on-course", to the right, or to the left.

(*b*) The "on-course" pattern is illustrated in figure 3-3. Range is measured from the lower edge of

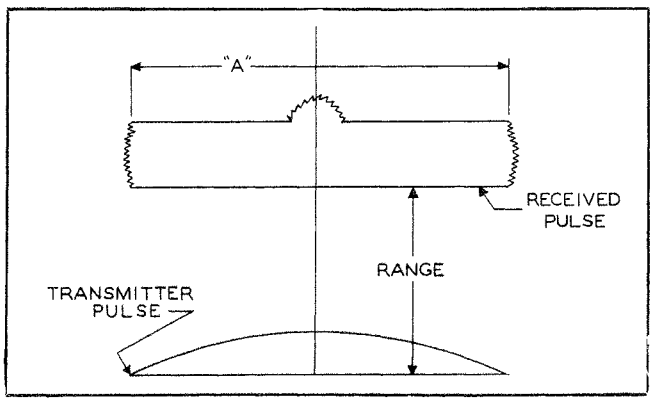


Figure 3-3. Indicator Responding to Beacon (On Course)

the transmitter pulse to the lower edge of the received pulse as shown in the figure. When the plane is flying the "on-course" beam, the overall amplitude of the pulse (measured across the indicator screen), as represented by "A", is constant. No evidence of coding will be visible. This does not mean that the echo need necessarily be equally spaced across the vertical trace when "on-course", for if the ship is crabbing, the picture will be displaced on one side. Figure 3-4 represents a ship crabbing down the "on-course" beam. Note that "A" is still constant. If the ship moves off to the right, it moves into the "dash" area and coding becomes visible, the degree of coding being a function of the number of degrees the ship is off to the right.

(c) The "dash" or "plane to the right" indication is a momentary collapse of the echo occurring at regular intervals. Figure 3-4 shows this effect in which "B" represents the amplitude of the longer interval of coded time and "C" is the momentary collapse. It appears to the observer, then, the echo's normal size is "B", broken at regular intervals by short decreases to "C".

(d) The "dot" or "plane to the left" indication is a momentary increase in the echo occurring at regular intervals. Figure 3-6 shows the effect when the ship is off to the left of the beam, which is exactly the opposite to the indication shown in figure 3-5. Here the normal amplitude of the echo, "B", momentarily increases to the amplitude "C" at regular intervals.

(e) In figures 3-5 and 3-6, the ratio of maximum echo to minimum echo will enable the radar operator to estimate how many degrees "off course" the aircraft is flying. In figure 3-5 the airplane would be about five degrees to the right, and in figure 3-6 the airplane would be about five degrees to the left. The signal ratio-selector relationships are given in the table below. (See fig. 3-7.)

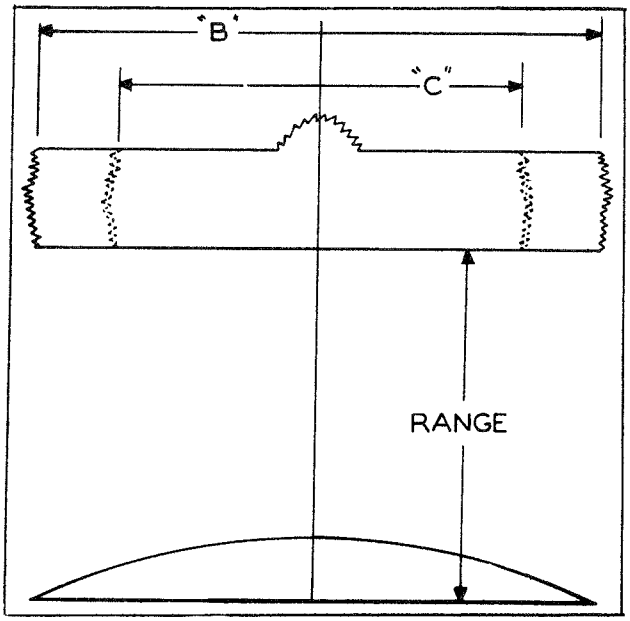


Figure 3-5. Indicator Responding to Beacon (Plane to Right)

SIGNAL RATIO-SECTOR RELATIONSHIPS

Ratio	Sector
4:3	1
2:1	2
4:1	3
00:1	4

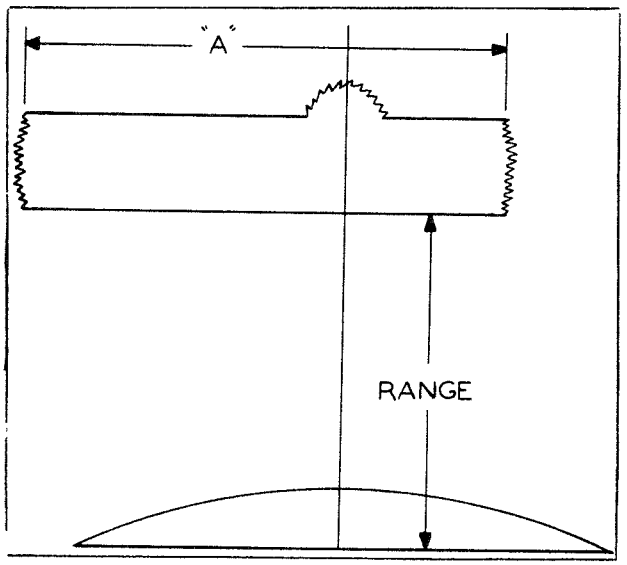


Figure 3-4. Indicator Responding to Beacon (Crabbing)

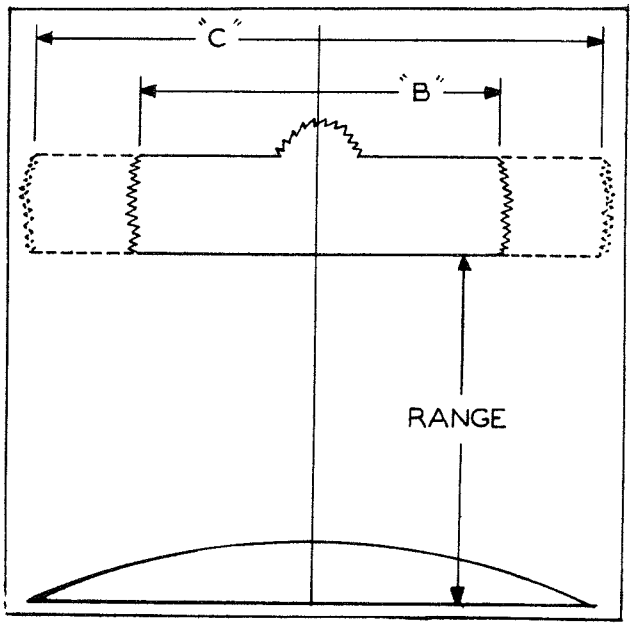


Figure 3-6. Indicator Responding to Beacon (Plane to Left)

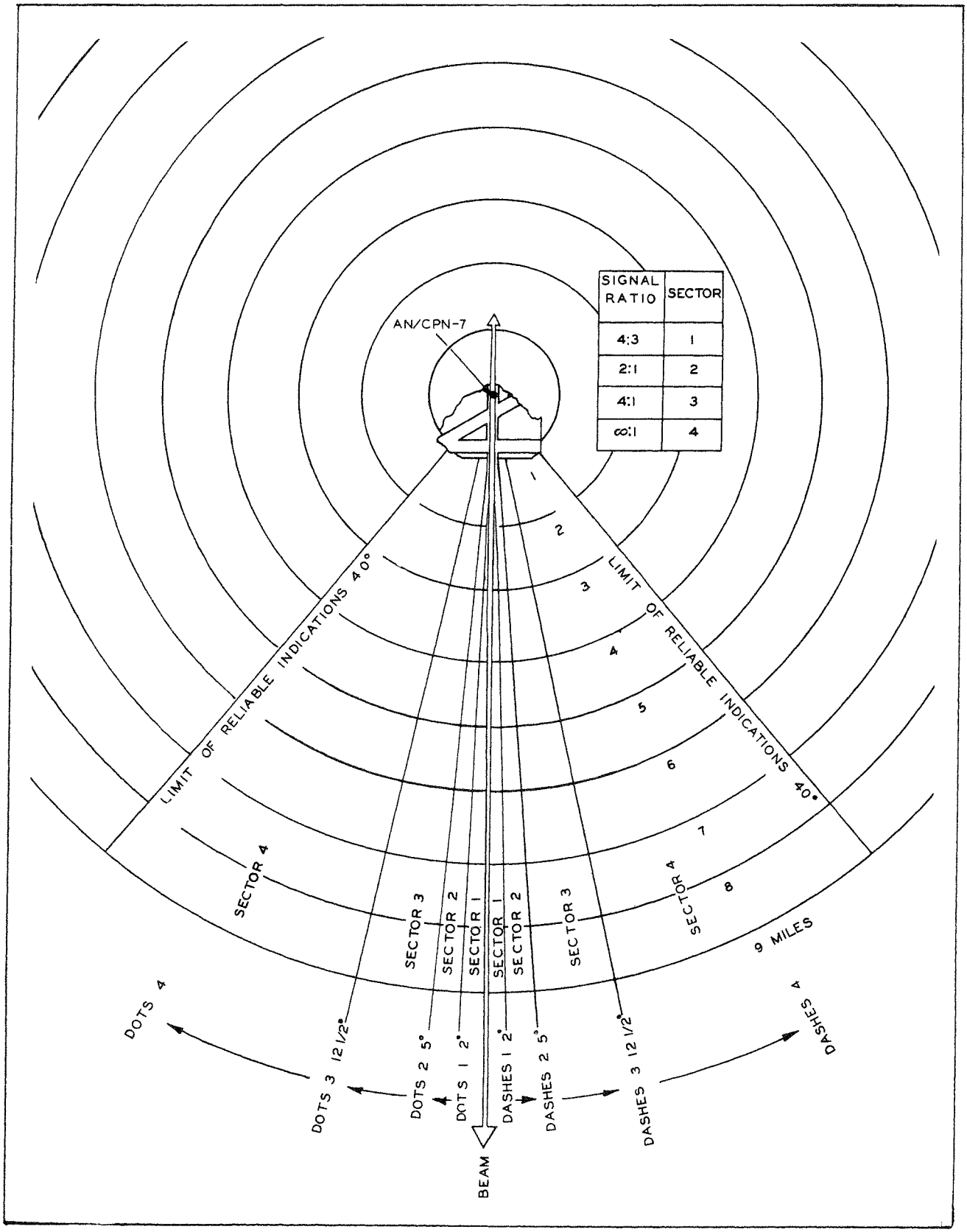


Figure 3-7. Signal Ratio and Sector Plot

Note

The above ratios and sectors will vary slightly with the types of aircraft because of the different locations of antennas, and with air fields because of the differences in terrain, location of hangars, etc. However, it is sufficiently accurate to give the aircraft an approximate location when far from the runway direction or beam. The ratios do not vary in a linear manner, but approximately logarithmically.

(f) The tactical operation employed in making a blind approach using BABS is comparatively simple. It is, however, a method with which the radar operator must be thoroughly familiar in order that a high degree of success be attained. Before attempting an actual approach, he should make at least a dozen or more practice runs, preferably with the pilot with whom he flies.

(2) PROCEDURE.

(a) Locate the airfield and proceed as given in paragraph 2*a*, this section, until over the beacon.

(b) Turn the "HIGH-LOW" switch on the control box to the "LOW" position, or the remote tuning knob to the assigned frequency. A BABS signal will appear on the indicator as illustrated in figures 3-3, 3-4, 3-5, and 3-6.

(c) If the compass bearing of the runway with respect to the BABS equipment is not known, obtain it from the control tower of the airfield by the use of the regular communications equipment.

(d) In case this information is not available from the control tower, proceed as follows:

1. After the BABS signal is picked up as in *(b)* above, the operator should direct the pilot to make a circle around the BABS equipment having a radius of 3 or 4 miles at an altitude of about 1000 feet.

2. During the circle, observe the character of the BABS signal received. The strongest signal with the correct BABS dot and dash indication will be the one showing the approach direction. (The "GAIN" control should be set at a point giving a signal of approximately two division on the indicator.)

(e) Direct the pilot to fly away from the BABS equipment to a distance of approximately 8 to 10 miles depending upon the landing characteristics of the airplane.

(f) The airplane should be flying the on-course signal for approximately 1 mile before making a "procedure turn" thus heading the airplane directly toward the BABS equipment.

(g) Instruct the pilot to turn to the right or left to keep the airplane "on-course" according to the signal appearing on the indicator.

(h) Keep the pilot informed as to the range so that he can determine his rate of descent.

(i) A trial-run is usually made before the final approach is made.

(j) When the ship breaks through the overcast, the pilot makes the landing by visual means.

d. RUDIMENTARY COMMUNICATION (IDENTIFICATION).

(1) The transmitter output may be keyed either by plugging Plug PL-55 attached to a key into the jack on Control Box ★C-3/APN-2 or by keying with the "TRANS-KEY" switch on the control box by placing this switch on and off the "KEY" position.

(2) The associated ground equipment, such as Beacon Transmitter Receiver AN/TPN-1, can be keyed for a reply and the keyed response observed on Indicator BC-929-A.

SECTION IV
THEORY OF OPERATION

1. GENERAL.

(See figure 4-1.)

Radio Set ★AN/APN-2 is airborne receiving-transmitting equipment designed to aid in aircraft navigation by indicating to the pilot the relative location of coordinated ground beacon stations. Radio Receiver and Transmitter ★RT-1A/APN-2 transmits a pulse-modulated signal of from 3.5 to 6 microseconds duration to the ground station and receives an answering pulse. The coding and frequency of the received signal provide identification of the ground station. Indicator BC-929-(*) gives a visual representation of the distance and the direction of the ground station with respect to the line of flight. Radio Control Box ★C-3/APN-2 contains the operating controls for the equipment.

2. DETAILED FUNCTIONING.

a. RADIO RECEIVER AND TRANSMITTER ★RT-1A/APN-2.

(1) GENERAL.

(a) RECEIVER SECTION.—The receiver section of the receiver-transmitter is a superheterodyne with two stages of r-f amplification followed by a mixer tube, oscillator, and five stages of i-f amplification. The output contains a detector and limiter tube and two video stages. The r-f stages are tuned as a pre-flight adjustment to the mid-point of two selected frequencies (separated by 5 megacycles) and are broad enough to accept either one. The frequency selector switch in the control box adjusts the local oscillator to either of two

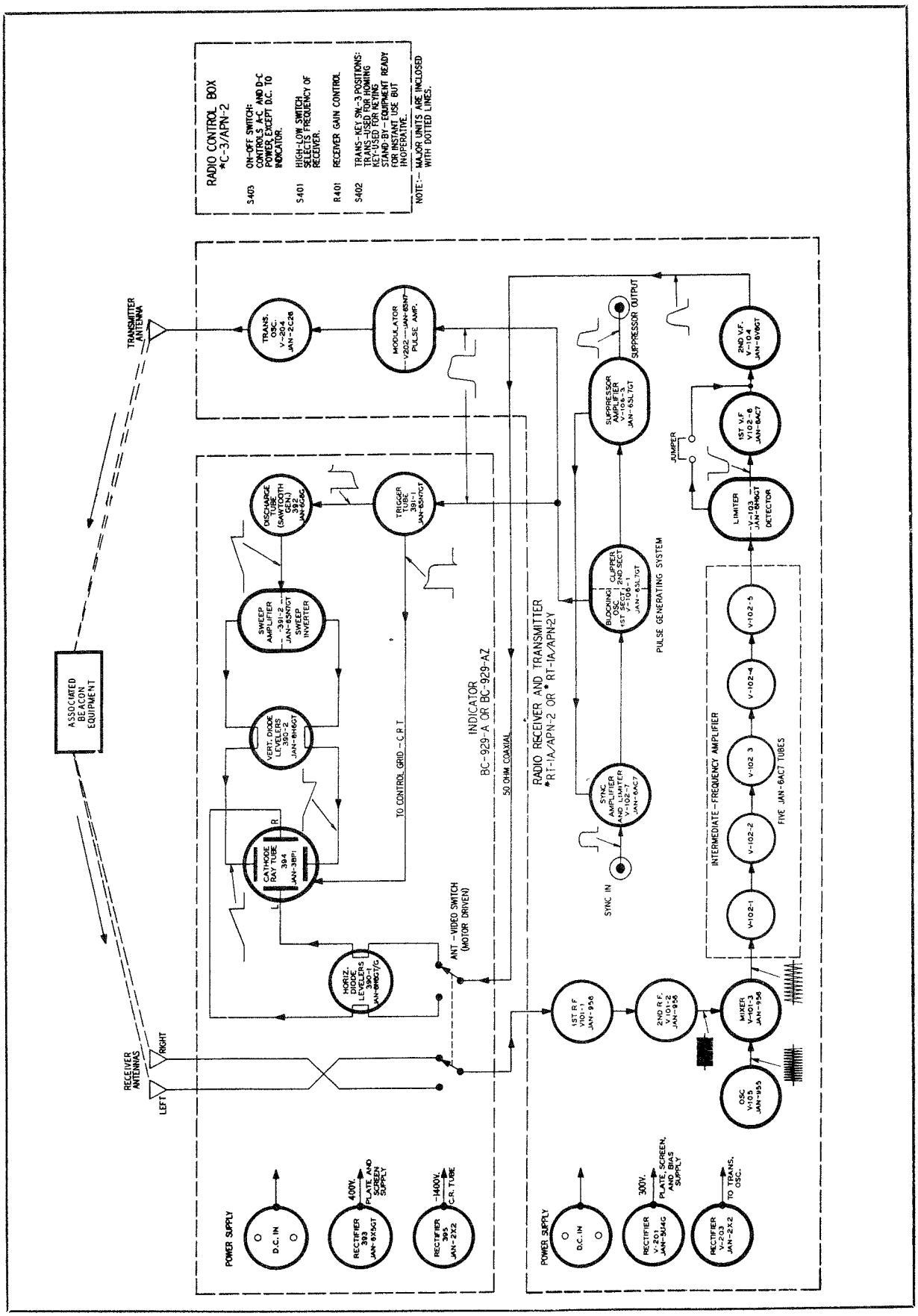


Figure 4-1. Radio Set ★AN/APN-2—Functional Block Diagram

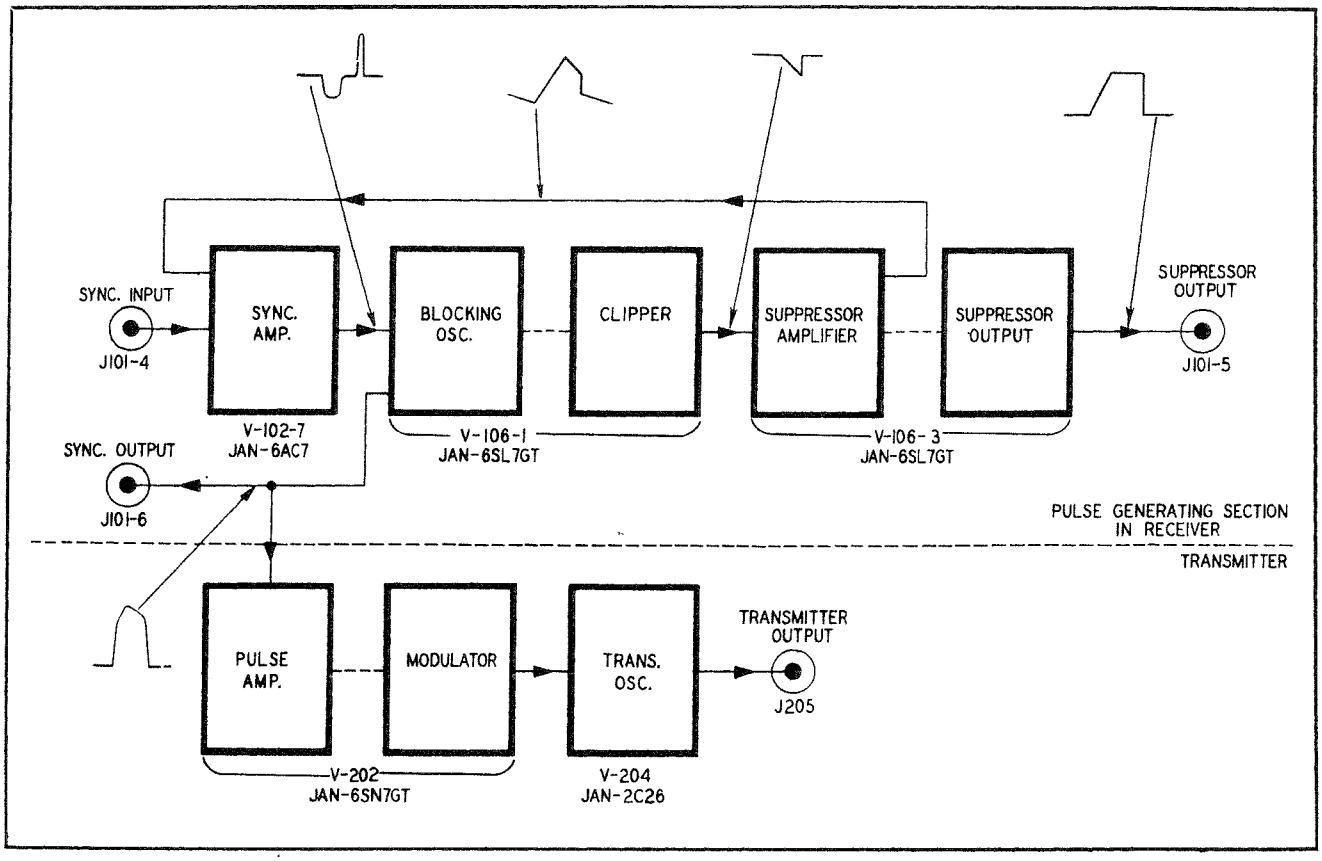


Figure 4-2. Pulse-Generating Section and Transmitter, Block Diagram

pre-set frequencies within the range between 214 and 234 megacycles. When provided with remote tuning, the receiver oscillator is tuned to the preadjusted frequency by the remote tuning device, and the "HIGH-LOW" switch is left in the "HIGH" position.

(b) PULSE-GENERATOR SECTION. — The pulse-generating and synchronizing circuit, situated on the receiver chassis, generates pulses, which modulate the transmitter and trigger the vertical sweep circuit in the indicator unit simultaneously. The circuit also includes the necessary circuits to synchronize the transmitter pulse directly with, or at some sub-multiple of, the pulse repetition frequency of associated equipment in the aircraft, and an output pulse to suppress other associated equipment on the airplane during Radio Set ★AN/APN-2 transmission pulse. (See fig. 4-2.)

(c) TRANSMITTER SECTION.—The transmitter chassis contains one modulator and one oscillator tube, and the power supply for both the receiver and the transmitter. The pulse from the blocking oscillator is amplified and shaped by the modulator tube and used to pulse-modulate the transmitter oscillator. The resulting high-frequency pulse is capacity-coupled to the transmitting antenna through connector J205. The antenna radiates signals to trigger associated ground beacon equipment. The transmitter is capable of transmission on any one of five pre-set frequencies in the range between 214 and 234 megacycles.

(2) RECEIVER CIRCUITS.

(a) R-F, OSCILLATOR, AND MIXER CIRCUITS.

1. The signal introduced into the antenna circuit through connector J101-1 from the antenna system is amplified by the two r-f amplifier stages and appears across the resonant impedance in the grid circuit of the mixer stage. This tuned circuit consists of disc capacitors C105-2A, C105-2B, and inductance L102-2, which is tapped near the lower end for introduction of the oscillator signal. Acorn tube JAN-956 is used in the r-f and mixer stages. The 5-megacycle band width of the r-f and mixer stages occurs below the 50 percent down point on the band-pass curve. (See fig. 5-40.)

2. The oscillator consists of an acorn tube JAN-955 in a series-fed Hartley circuit shown in figure 4-3. The output of this stage is fed to the tap on the mixer inductance. A tap on oscillator coil L106 can be connected to capacitor C110 by actuating relay K101. This relay is controlled by the "HIGH-LOW" switch on the control box and provides for the shifting of the oscillator frequency, thus allowing the remote selection of two pre-adjusted receiver frequencies.

(b) I-F CIRCUITS.—The resulting i-f signal at the plate of the mixer tube is fed to the grid of the first of five single-tuned i-f amplifier stages, each using

tube JAN-6AC7. The i-f amplifier operates at a center frequency of 30 megacycles and is permeability tuned. The 5-megacycle band width, obtained by damping the tuned circuits in each stage, occurs below the 50-percent down point on the band-pass curve.

(c) DETECTOR AND VIDEO CIRCUITS.— The amplified i-f signal is then fed to the cathode of diode detector tube V-103 (the first section of tube JAN-6H6G/GT). The detector output is taken as a negative video pulse from diode load resistors R117-1 and

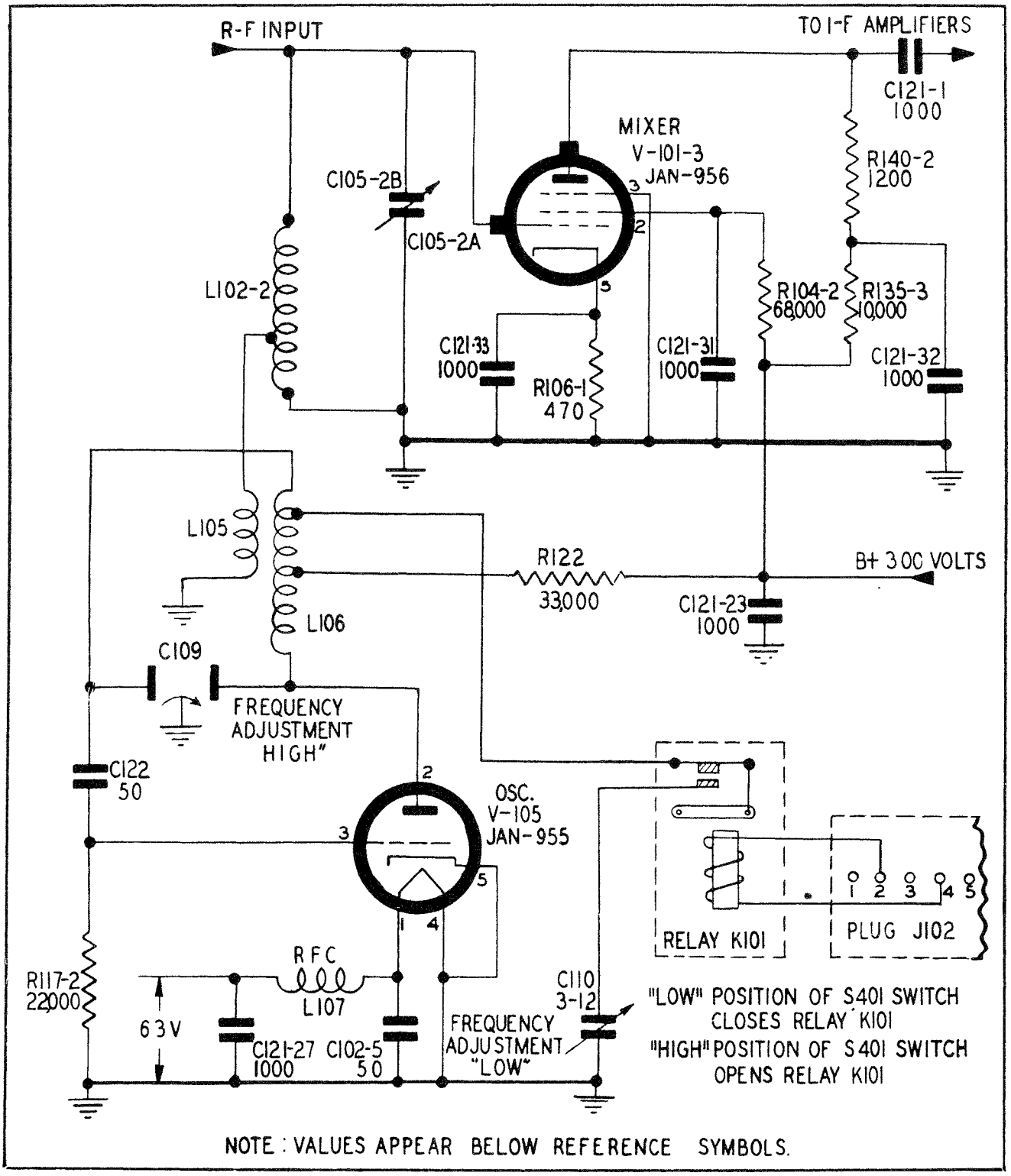


Figure 4-3. Receiver Oscillator and Mixer Stages, Sectional Diagram

R118, and is fed directly to the grid of the first video amplifier. The second diode of tube V-103 is used as a limiter on the output of the first video amplifier tube V-102-6 (JAN-6AC7). The cathode of this diode is sufficiently above ground potential to permit pulses of approximately 100-volt amplitude to develop at the plate of the first video stage. At this point the diode conducts, thus preventing the voltage from reaching a higher value. The amplified video signal is fed to the video output tube JAN-6V6GT (V-104). This tube is connected as a cathode-follower and has a low-impedance output. The video output passes through a low-capacity concentric line to the indicator unit through connector J101-3 and to associated equipment (if used) through capacitor C115 and connector J101-2.

(3) PULSE-GENERATING SECTION.

(See figure 4-4.)

(a) The pulse-generating section has three functions:

1. It generates an output pulse that triggers the transmitter oscillator and the vertical sweep of the indicator.

2. It permits synchronization of the transmitter pulse of Radio Set ★AN/APN-2 with associated equipment.

3. It provides an additional signal for use as a blanking pulse for other associated equipment in the airplane during transmission.

(b) The blocking-oscillator circuit uses one section of tube JAN-6SL7 (V-106-1) and has a natural frequency of approximately 230 pulses per second when operating without synchronized input. Two separate pulses are derived from this circuit. One drives the pulse-amplifier section of the modulator tube and synchronizes this action with the vertical sweep of the indicator; the other furnishes a blanking pulse for associated equipment in the airplane.

(c) If Radio Set ★AN/APN-2 is used in combination with other equipment, a synchronizing pulse is fed from the associated equipment to the grid of tube JAN-6AC7, V-102-7, a pulse amplifier and limiter. This tube, not used in ordinary operation, is zero-biased and has low screen voltage so that any input above 10 volts will cause plate-current saturation, thus limiting the amplification to a definite level. To insure that plate-current saturation is reached on each synchronizing pulse, a regenerative action is introduced by feeding a positive pulse from the first section of tube V-106-3 to the suppressor grid of the sync amplifier tube.

(d) The synchronizing pulse is introduced into the blocking-oscillator circuit through the primary winding of transformer T101. The synchronizing pulse may have a repetition rate anywhere between 300 and 2000 pulses per second.

(e) When the frequency of the synchronizing pulse is greater than the oscillator's natural blocking frequency (230 cycles), and the amplitude is greater than 10 volts, the oscillator will be pulled into step and run synchronously with this input pulse. The oscillator will synchronize on every incoming pulse, when the repetition rate is between 230 and 550 cycles. If the repetition rate of the incoming pulse lies between 550 and 1100 cycles, the oscillator will synchronize on alternate pulses. For frequencies of 1100 to approximateley 1650 cycles, the synchronization will be on every third pulse; higher frequencies will mean higher division ratios up to a 2000-cycle limit of incoming synchronizing pulses. In all cases, the oscillator frequency will fall between 230 and approximately 550 cycles and will be the same frequency or a submultiple frequency of the synchronizing pulses.

(f) The voltage developed in the grid circuit of the blocking oscillator is shown at A in figure 4-4. The portion of this waveform marked 1-2 is the result of discharging capacitor C117-2. Two actuating voltages are derived from this part of the waveform. The rising potential, because of the comparatively slow discharge of capacitor C117-2, triggers the clipper section of tube V-106-1 at a given amplitude (point 1), and, as this amplitude increases, it reaches a potential sufficient to trigger the blocking oscillator again (point 2), approximately 50 microseconds later.

(g) The clipper section of tube V-106-1 is held below cutoff, for practical purposes, by the charge on its cathode bypass capacitor. On the preceding pulse, the current flow through the 4.7 megohm cathode resistor, R127-1, charged the two 0.1-microfarad cathode bypass capacitors, C107-3A and C107-3B, so that the capacitor plates connected to the cathode are positive. Because of the high resistance of the cathode resistor, this charge leaks off slowly, holding the cathode positive, with respect to the grid, thus biasing the tube below cutoff. Before this capacitor can discharge sufficiently to allow the grid to go positive with respect to the cathode, another pulse from the blocking oscillator arrives at the clipper grid and drives the tube into conduction. The low voltage on the clipper plate sets a low saturation point for the tube; therefore, the positive peak on the input pulse from the blocking oscillator is clipped off. The resulting waveform at the clipped plate is a sawtooth with an amplitude of approximately 30 volts negative and a duration of 40 to 150 microseconds.

(h) The negative sawtooth pulse from the clipper tube is applied to the first grid of suppressor-amplifier tube, V-106-3 through coupling capacitor C112-3. (See fig. 4-5.) Tube JAN-6SL7GT (V-106-3) is also a twin triode. In its quiescent state between pulses, the first section of this tube is conducting at a level determinated by its cathode bias. When the negative pulse from the clipper tube is applied to the grid, the tube is quickly driven to cutoff by the first few volts of the negative pulse, and held in this state for the duration of the negative pulse. The resulting waveform at the first plate is an almost rectangular positive pulse, having an amplitude of approximately 50 volts, and a duration of 40 to 150 microseconds.

(i) A portion of the positive pulse from the first section of tube V-106-3 is taken off at the junction of the plate-divider resistors, R105-4 and R105-3, and applied

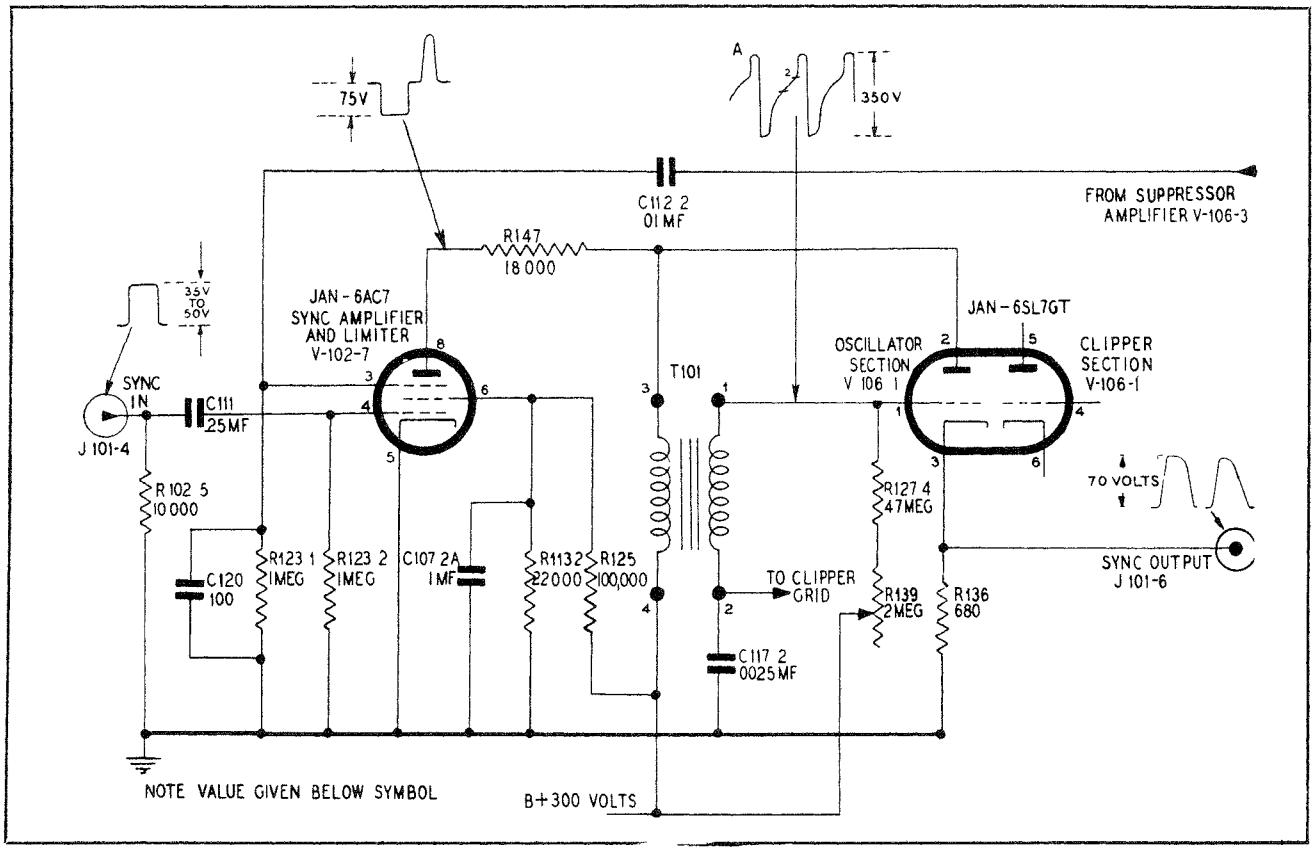


Figure 4-4 Pulse-Generating Section, Sectional Diagram

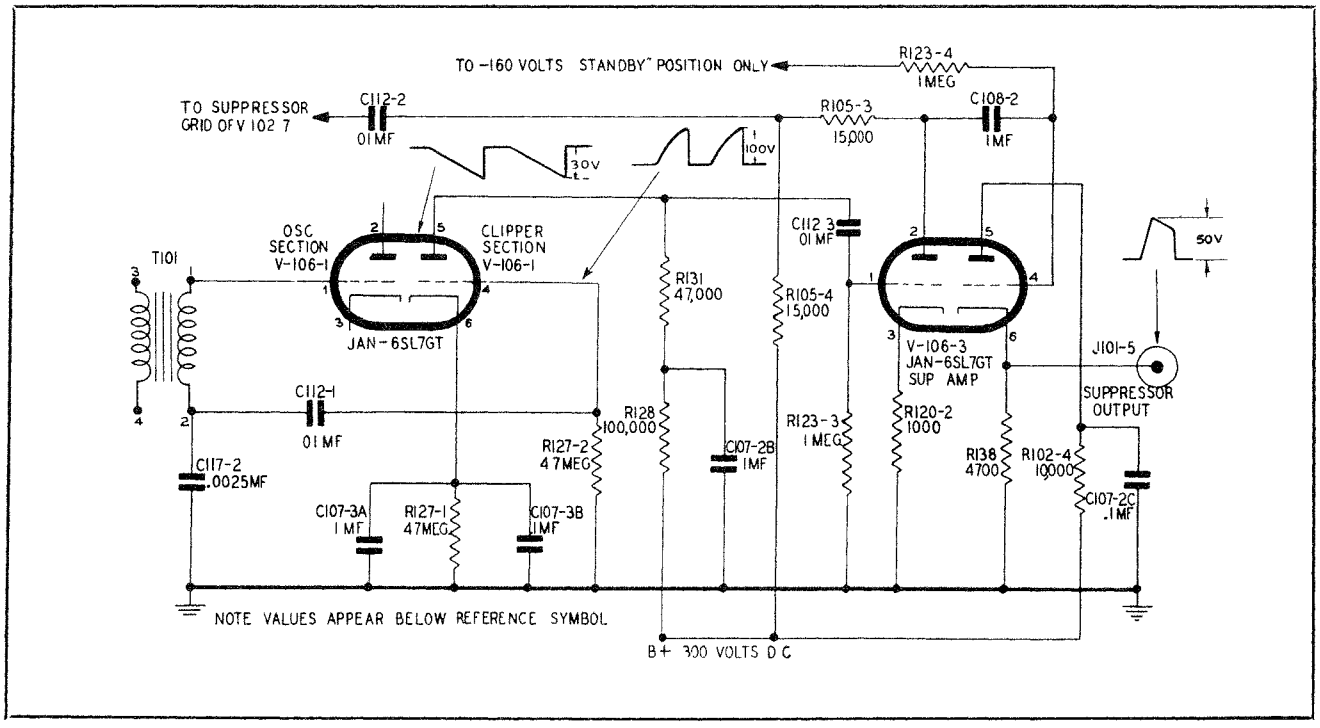


Figure 4-5 Suppressor-Pulse Circuits, Sectional Diagram

to the suppressor grid of sync amplifier and limiter tube V-102-7, through coupling capacitor C112-2. This pulse is applied 40 to 150 microseconds ahead of the next synchronizing pulse that will trigger the blocking oscillator. This action places the sync amplifier tube in a sensitive condition *only* when the blocking oscillator tube is ready to be triggered.

(f) The full output pulse from the first section of suppressor-amplifier tube V-106-3 is applied to the second grid through coupling capacitor C108-2. In its quiescent state, this tube is held near cutoff by its cathode bias, and is quickly driven to saturation when the positive pulse is applied to the grid. This tube is connected as a cathode follower; that is, the output is taken off at the cathode, and the output pulse closely follows the waveform of the input pulse, with a slightly lower amplitube. The cathode-follower circuit provides a low-impedance output circuit for use with low-impedance coaxial interconnecting cables. This suppressor pulse is applied to the blanking circuit of the associated equipment in the aircraft 40 to 150 microseconds before each transmitted pulse from Radio Set ★AN/APN-2. The suppressor amplifier tube and its associated circuits are not used in the normal operation of Radio Set ★AN/APN-2 or Radio Set ★AN/APN-2Y.

(4) INTERCHASSIS CONNECTIONS. *(See figure 8-11)*—The d-c and a-c power required is obtained through plug J102 from the power supply, located on the transmitter chassis. Additional terminals on this plug also serve to connect the receiver and pulse-generating circuit to appropriate circuits in the transmitter. Terminal 1 is the ground connector. Terminals 2 and 4 supply power for energizing the band-switching relay of the local oscillator. This circuit is controlled by the "HIGH-LOW" switch in the control box. Terminal 3 supplies alternating current for the tube heaters, and terminal 5 connects the manual "GAIN" control on the control box to the screen-grid circuits of the second r-f and first i-f tubes. Terminal 6 supplies stand-by bias to the first video amplifier and to the suppressor-amplifier output stage. Terminal 7 supplies 300 volts direct current for the plates of all tubes and the screens of all tubes except the second r-f and first i-f stages. Terminal 8 supplies the synchronizing pulse from the blocking oscillator to the pulse-amplifier section of the modulator.

(5) TRANSMITTER CIRCUITS.

(a) PULSE AMPLIFIER AND MODULATOR. *(See figure 4-6.)*—This circuit employs a twin triode tube JAN-6SN7 (V-202). One section amplifies

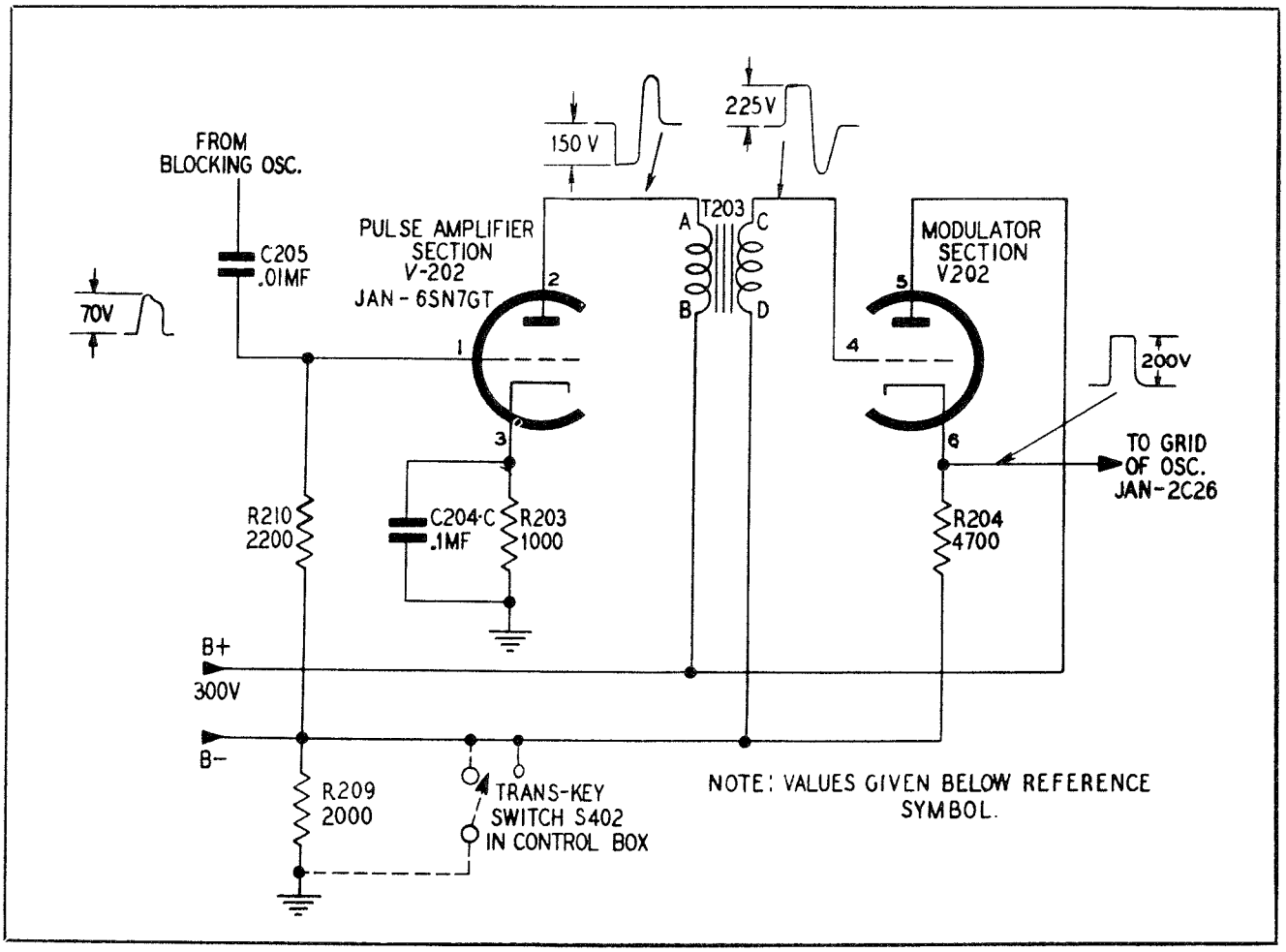


Figure 4-6. Modulator Stage, Sectional Diagram

the pulse received from the blocking oscillator of the receiver. The other section, connected as a cathode follower, modulates the transmitter oscillator. Positive pulses appear on the cathode load and are fed to the low- r-f potential end of the oscillator-grid circuit. This pulse has a peak amplitude of about 225 volts and a duration of about 6 microseconds.

(b) OSCILLATOR. *(See figure 4-7.)*—Oscillator tube JAN-2C26 (V-204) is connected with quarter-wave parallel lines in the plate and grid circuits, tuned by capacitor C206. The inductor lines are shorted for r-f at the low-potential ends by capacitor C207. The oscillator is normally held at cutoff by a positive voltage applied to the cathode from the low-voltage supply. The

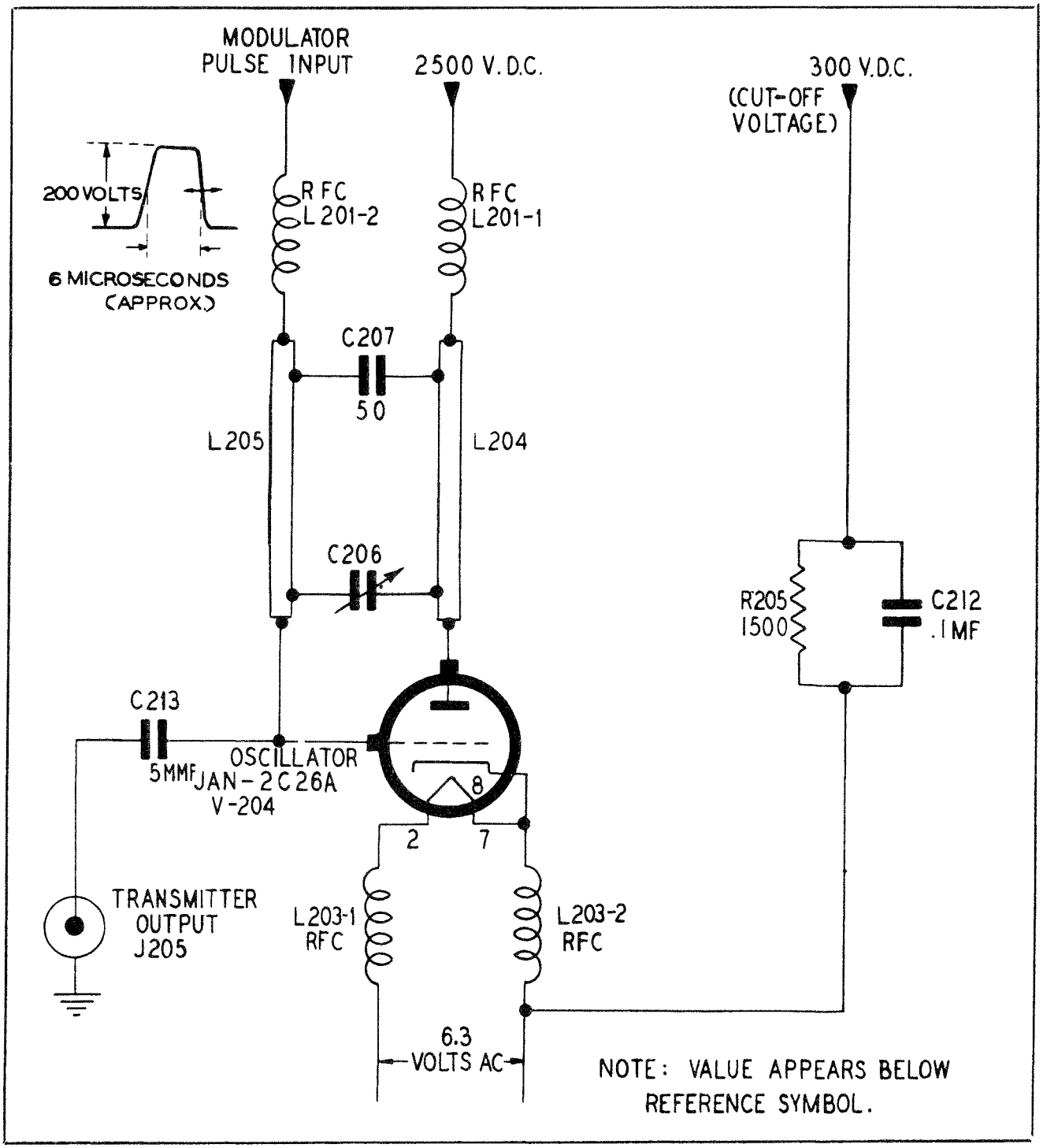


Figure 4-7. Transmitter-Oscillator Stage, Sectional Diagram

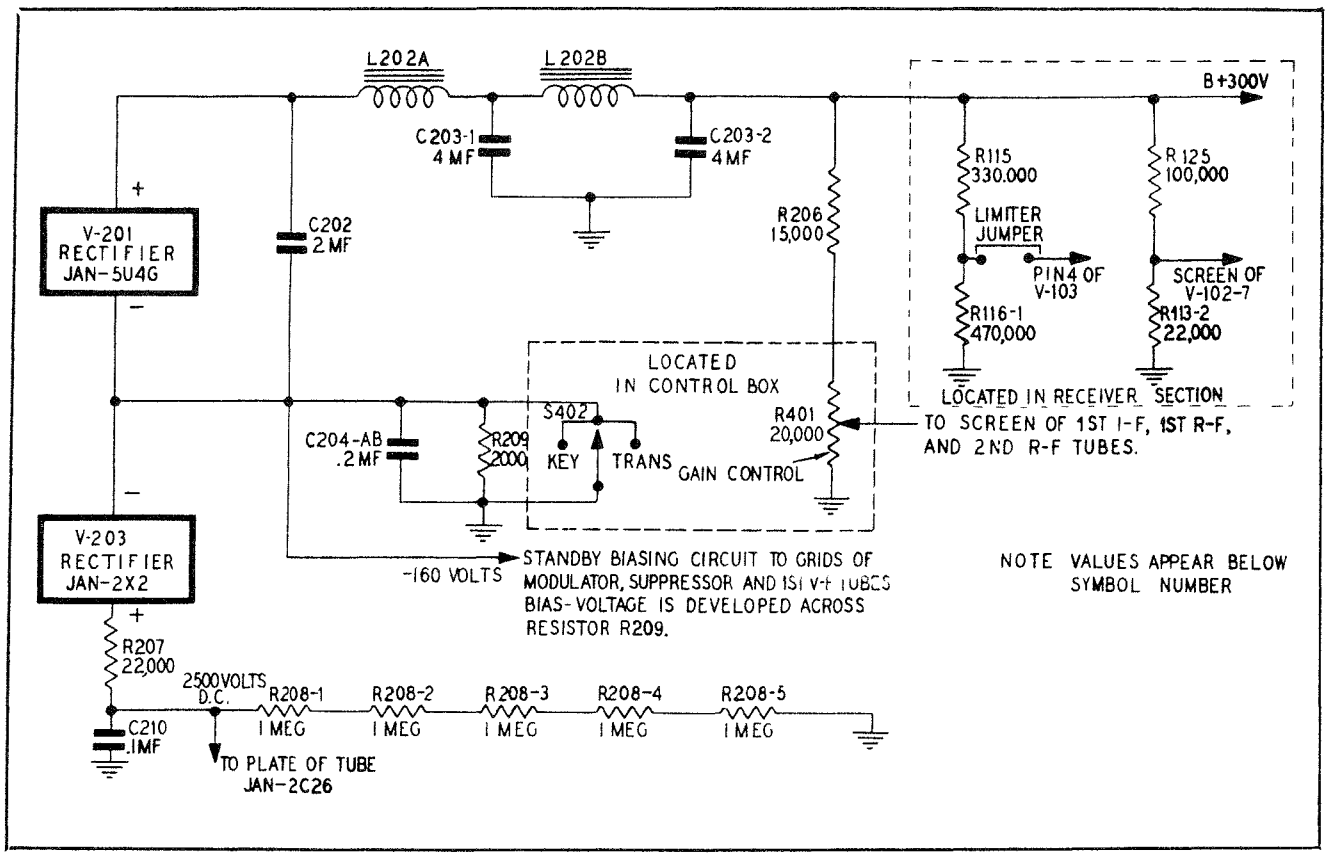


Figure 4-8. Receiver-Transmitter Power Supply and Bias System, Sectional Diagram

positive modulator pulse applied to the grid will overcome the influence of the positive potential on the cathode, and cause the tube to conduct and oscillate. Oscillation will continue during the time the modulator pulse is applied to the grid. When the modulator pulse is no longer applied, the bias voltage will again control the current flow in the tube, returning the oscillator to cutoff to await another pulse from the modulator. Power from the oscillator is coupled through a concentric line to the antenna.

(6) POWER-SUPPLY CIRCUITS. *(See figure 4-8.)*—The a-c input voltage of either 115 volts or 80 volts, having a frequency of from 400 to 2400 cps is fed to the primaries of power transformers T201 and T202 through socket J201. Transformer T201 is a step-up transformer, supplying the plate voltage to both low- and high-voltage rectifier circuits. Transformer T202 is a step-down transformer, supplying filament voltages to both transmitter and receiver.

(a) LOW-VOLTAGE SUPPLY. — The low-voltage rectifier tube JAN-5U4G (V-201) is a full-wave rectifier, supplying plate and screen voltages to the receiver, plate voltage to the modulator tube, and bias to the transmitter oscillator. The positive output is taken from the filament of the tube and passes through chokes L202A and L202B. Filtering is accomplished by use of these chokes and capacitors C202, C203-1 and C203-2. Terminals 5 and 7 of connector J204 carry plate and screen voltages to the receiver tubes. The return path of the direct current is through resistor R209 to the center tap of the transformer secondary on stand-by position of the "TRANS-KEY" switch. When this switch is in the operating position (either "TRANS" or "KEY"), the transformer center-tap connects directly to ground.

(b) HIGH-VOLTAGE SUPPLY. — Tube JAN-2X2 (V-203), a half-wave rectifier, furnishes high-voltage direct current to the transmitter oscillator plate. The return path of this d-c circuit is through the same circuits as given in subparagraph *(a)* above.

(c) BIAS SUPPLY.—The voltage drop developed across resistor R209 is used as bias to hold at cutoff the video circuit, the suppressor circuit, and the modulator circuit, while the "TRANS.-KEY" switch is in stand-by (center) position. Throwing the switch either way, shorts out resistor R209 and permits normal operation.

b. INDICATOR BC-929-(*).

(1) GENERAL.—Indicator BC-929-(*) (see fig. 4-9) gives a visual representation of distance and direction, with respect to the line of flight, to a ground beacon station. The indicator consists primarily of a 3-inch cathode-ray tube with a calibrated scale and associated circuits. The frequency of the sweep voltage, generated in the indicator circuits and applied to the vertical-deflection plates, is controlled by the pulse-generating cir-

cuit of Radio Receiver and Transmitter ★RT-1A/APN-2. A motor-driven switch alternately connects the video output of the receiver to the right and left horizontal-deflection circuits and at the same time switches the r-f input of the receiver first to the right, and then to the left, receiving antenna. The sweep duration and vertical amplitude are adjustable by controls on the front of the indicator unit. Direct-current power for operation is obtained from two rectifier circuits in the indicator and also from the battery on the plane.

(2) VIDEO INPUT AND HORIZONTAL-DEFLECTION CIRCUITS.

(a) VIDEO INPUT. *(See figure 4-10.)*—The video signal, a positive output from the receiver, is fed through connector 300-4 to switch 301, section B. This motor-driven switch has two sections. Section A controls the switching of the right and left receiving antennas to the r-f section of the receiver. Section B switches the video output of the receiver to the right and left horizontal-deflection plates of the cathode-ray tube in synchronism with the switching of the right and left antennas to the receiver.

(b) HORIZONTAL LEVELER.

1. Video output of the receiver is switched alternately through capacitors 302-1 and 302-2 and chokes 346-1 and 346-2 to the horizontal deflection plates of the cathode-ray tube. Twin diode tube JAN-6H6GT/G (390-1) is used a diode leveler.

2. Video voltage from capacitors 302-1 and 302-2 is applied alternately to the two cathodes of this tube. Resistor 303-1 is connected from cathode to plate of the left-hand section of the tube, and resistor 303-2 is connected from cathode to plate of the right-hand section.

3. A positive pulse fed through capacitor 302-2 to the horizontal-deflection plate of the cathode-ray tube would normally cause the image to deflect to the left. With a signal of this polarity the left-hand diode does not conduct. (See fig. 4-10.) When the polarity of the incoming voltage reverses, the left-hand diode will act as a short circuit, causing the image on the cathode-ray tube to return to its normal center position.

4. When the input signal from the video plug is switched through capacitor 302-1 to the other plate of the cathode-ray tube, the same action takes place; the image shown will extend to the right and, on returning to its original position, will never pass the center line.

(c) HORIZONTAL CENTERING.—To control the position of the beam in the horizontal plane, two potentiometers are used to adjust the fixed voltage on the horizontal plates. In the earlier models, horizontal centering was accomplished with one potentiometer 307-3. Because of a slight misalignment of the electron gun and deflection plates in some cathode-ray tubes, the best focus often occurred on one side of the screen. A second potentiometer, 307-4, was added to secure better results.

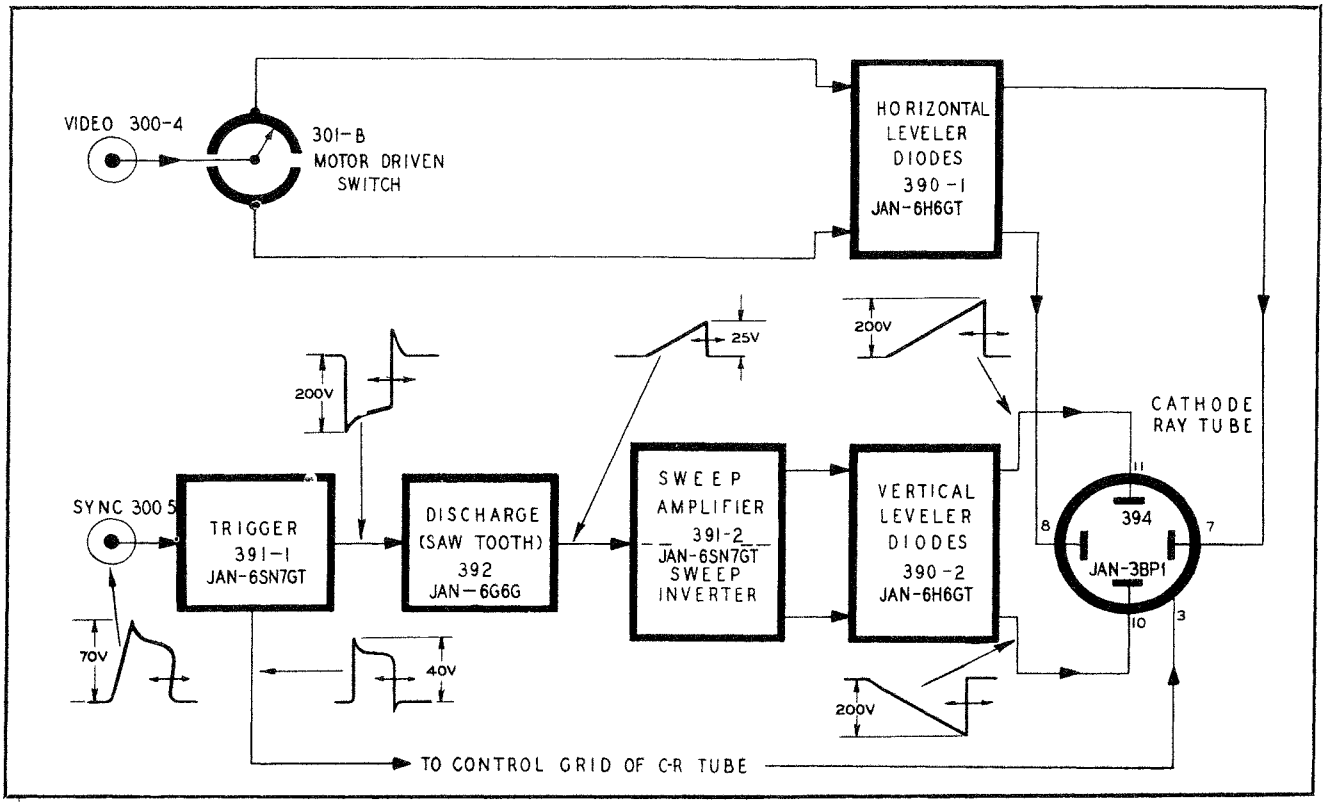


Figure 4-9. Indicator BC-929-(*)—Functional Block Diagram

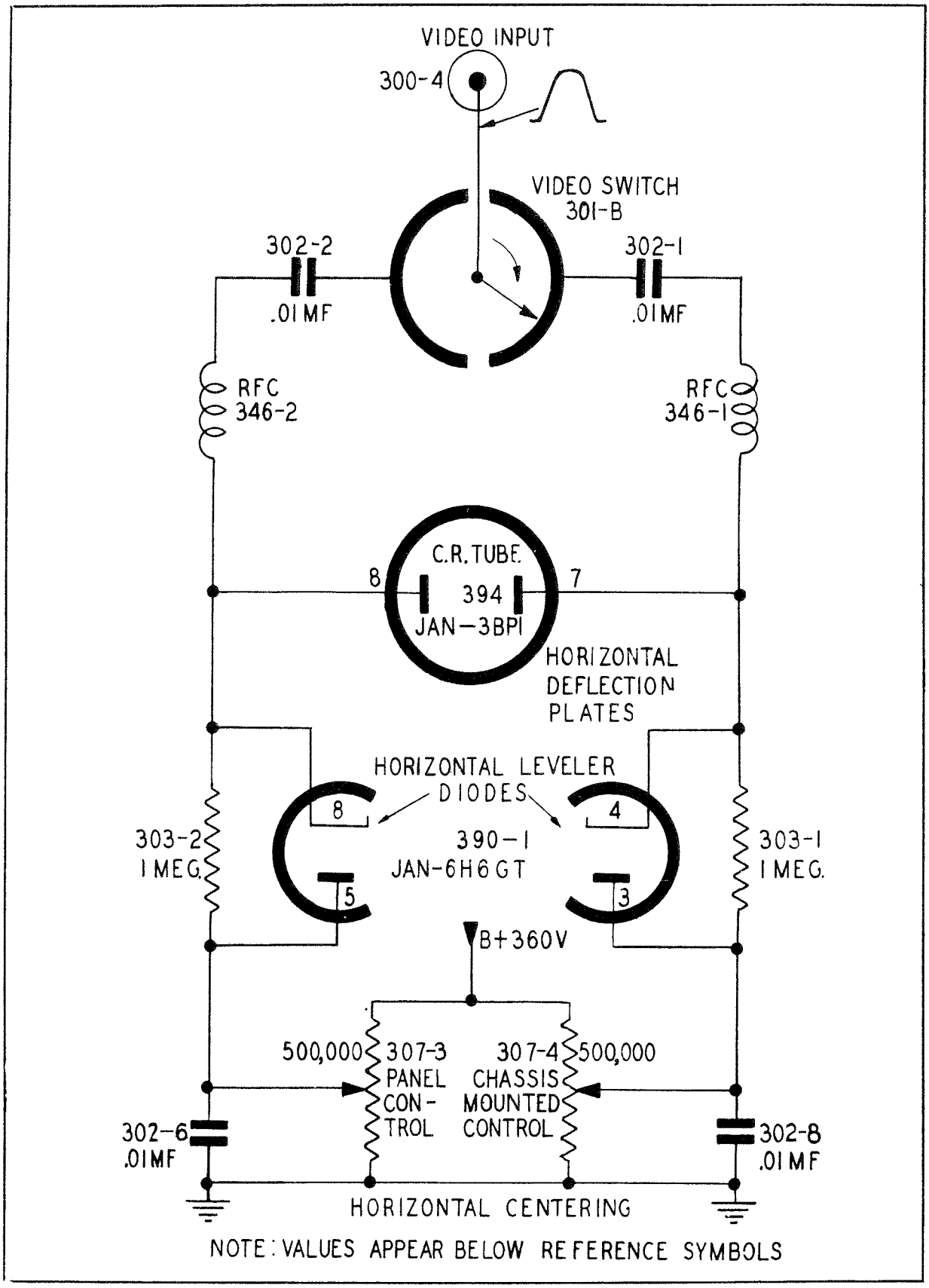


Figure 4-10. Horizontal—Deflection Diode Leveler, Sectional Diagram

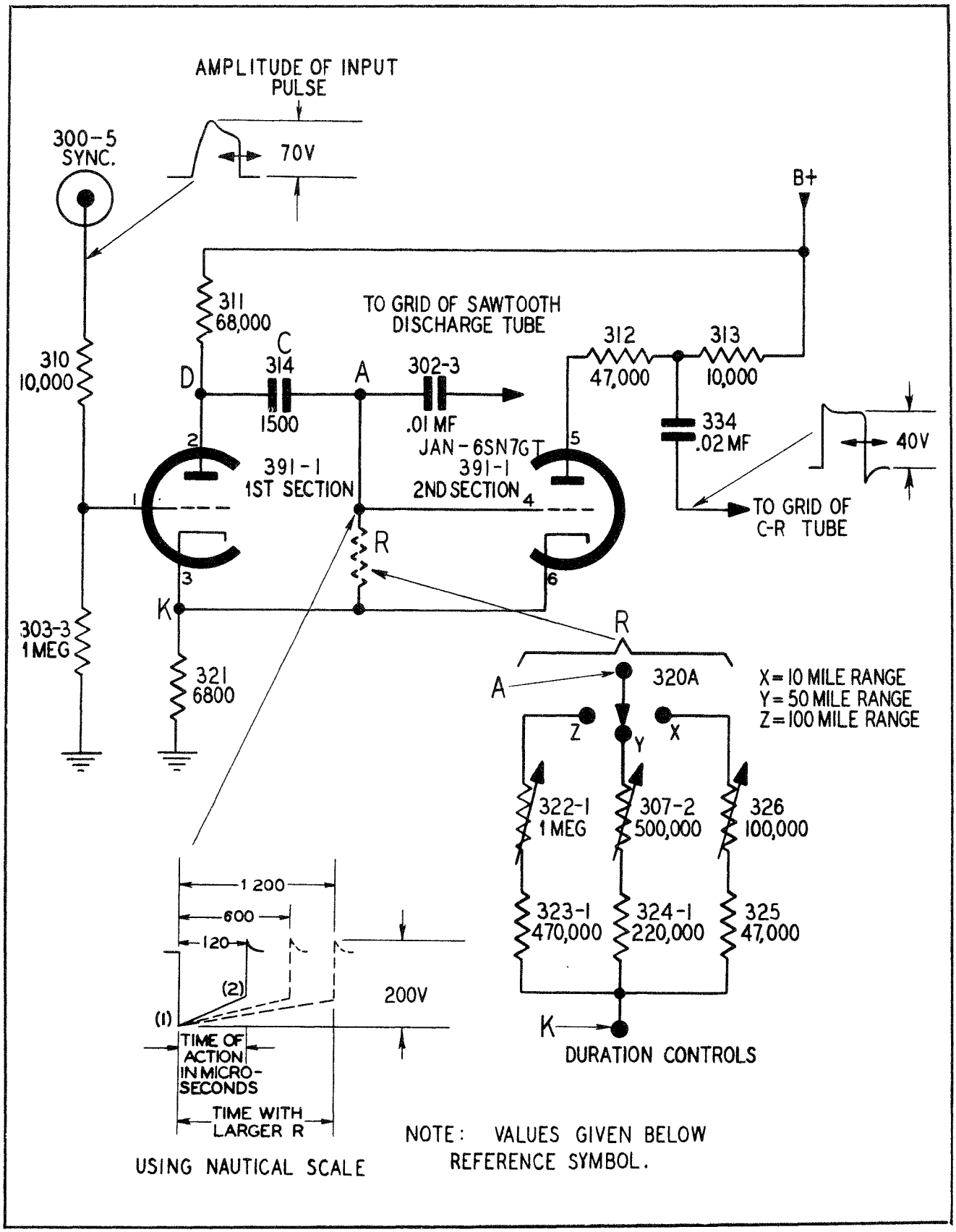


Figure 4-11. Trigger Circuit, Sectional Diagram

(3) SWEEP SYNCHRONIZING CIRCUITS.

(a) TRIGGER CIRCUIT.

(See figure 4-11.)

1. In its quiescent state, the input section of tube JAN-6SN7 (391-1), is held at cutoff until it receives a driving pulse from the blocking-oscillator tube, V-106-1. This pulse is applied simultaneously to the vertical-sweep circuit and to the modulator. The pulse has a time duration of from 4 to 6 microseconds and a repetition rate of from 215 to 260 pulses per second. In the quiescent state, plate current flows only in the right-hand section of trigger tube 391-1. The high plate current of this section produces a sufficient voltage drop across cathode resistor 321 to bias the left-hand section to cutoff.

2. The full d-c supply voltage is on the plate of the left-hand section, and since there is no plate-current flow through plate resistor 311, capacitor 314 is consequently charged to this voltage. The introduction of a positive pulse on the grid of this section offsets the effect of the high bias, causing the tube to conduct suddenly.

3. Plate current begins to flow in resistor 311, and the sudden change in voltage is transmitted through capacitor 314 to the grid resistor of the right-hand section. Current flowing through this grid resistor biases the right-hand section, cutting off the plate current. Capacitor 314 will gradually discharge through the resistor, tending to equalize the lower plate voltage of the left-hand section. As it discharges, the voltage across the grid resistor will decrease until plate current flows again in the right-hand section.

4. By this time, however, the original pulse has been removed and the left-hand section stops conducting, because its grid is again at a high negative potential. The cycle will be repeated upon the arrival of the next triggering pulse from the timing circuit.

5. In the quiescent state, point A, (see fig. 4-11) is practically at cathode potential, and point D is at a high positive potential, because there is no drop across resistor 311. When the left-hand section conducts, point D drops in potential by an amount equal to the voltage drop across resistor 311. Point A also drops in potential by the same amount, but the voltage across capacitor C does not change quickly. Capacitor C now slowly discharges. Since the potential of point D is fixed, the potential of A must rise as C changes to the new potential through R.

6. The rate of rise of this voltage depends upon the value of grid resistor R. When the grid of the right-hand section has returned from the high negative voltage, the tubes start conducting again. This condition reacts at point D, which quickly increases in potential, followed by an equal increase at point A.

(b) DURATION-CONTROL CIRCUIT.—The period of time over which this action extends is adjustable by varying the value of the grid resistor R. This

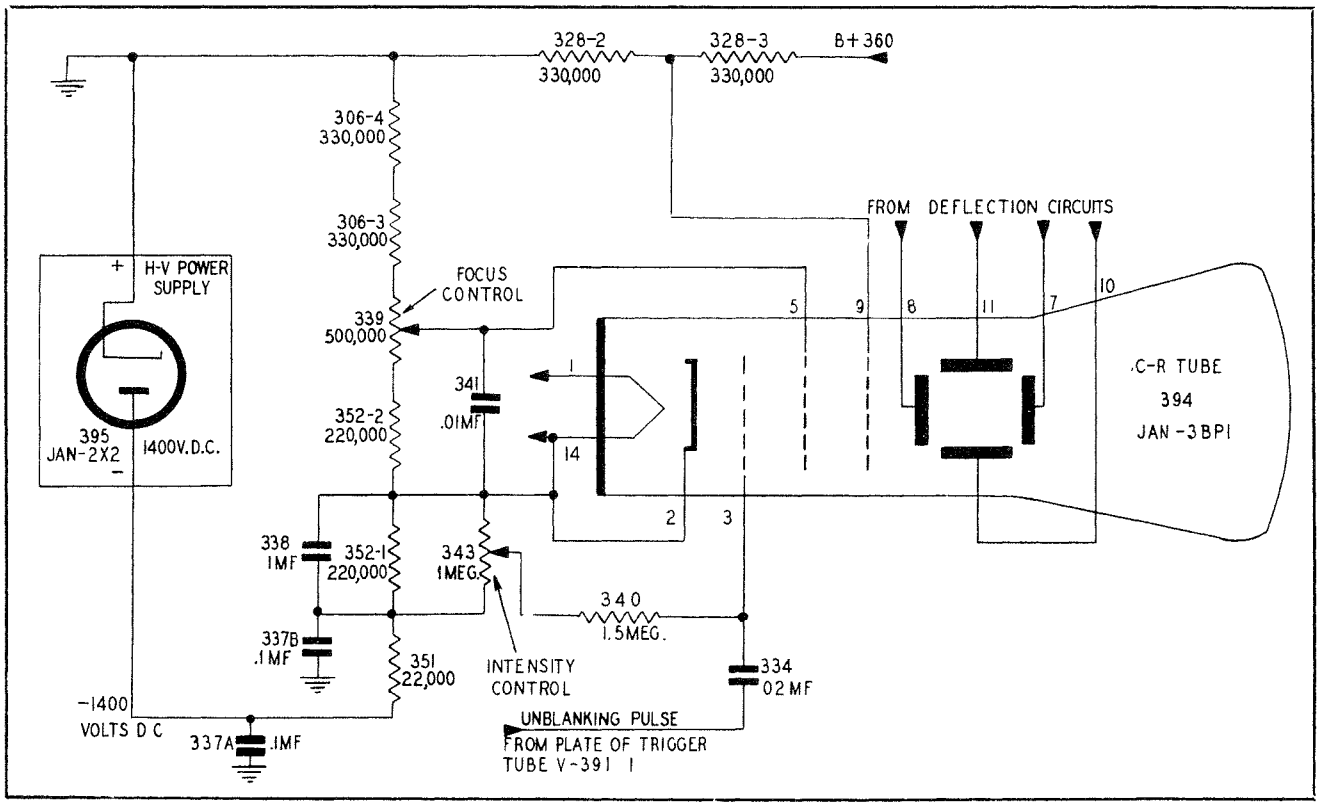


Figure 4-12. Cathode-Ray Tube Circuits, Sectional Diagram

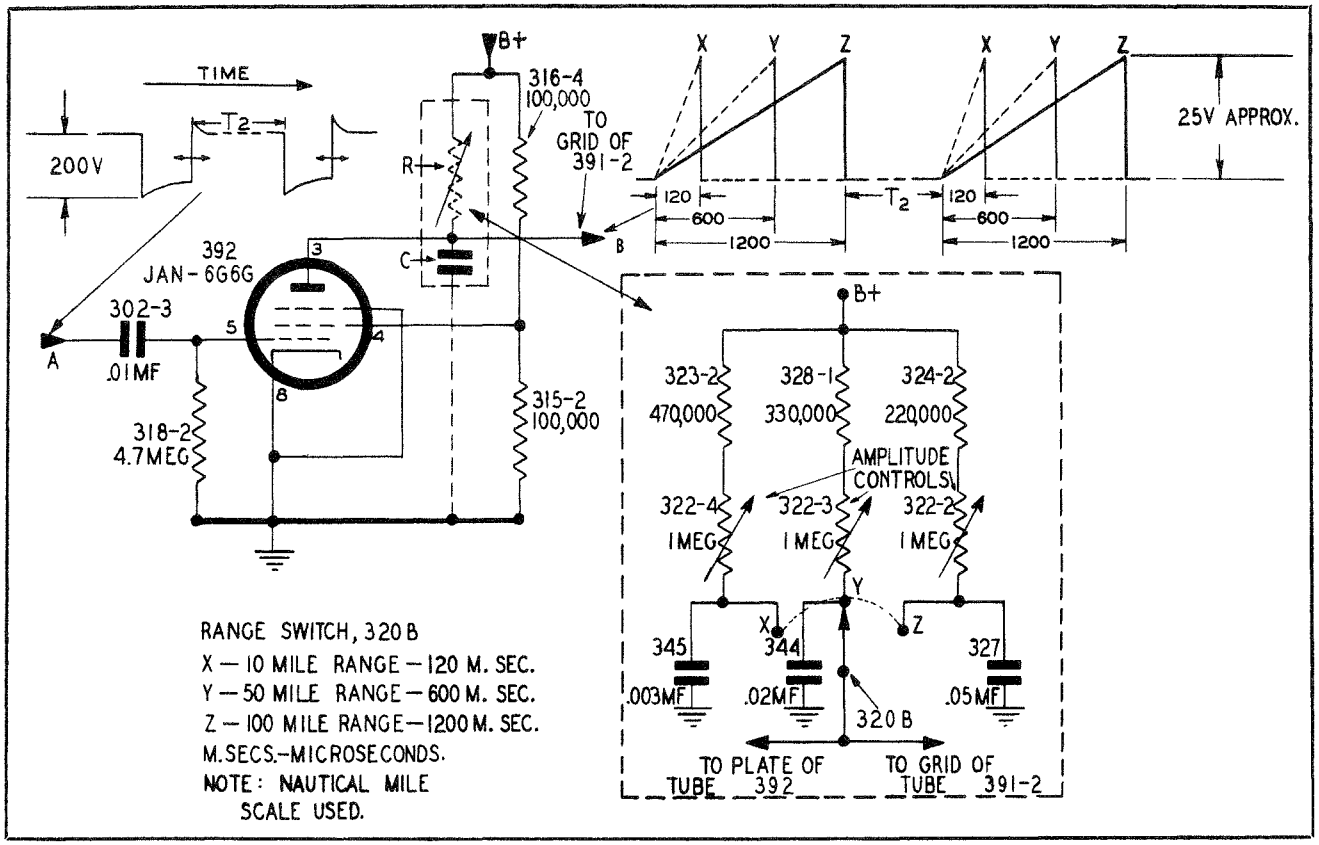


Figure 4-13. Discharge-Tube Circuit, Sectional Diagram

changes the rate of discharge of capacitor 314 and thus the time action of the circuit. Increasing R lengthens the time, as indicated in figure 4-11. In the indicator, resistor R consists of a resistance network as shown. Rapid selection of one of three different time intervals is possible through the use of "RANGE" switch 320-A. The time of any individual setting is adjusted by varying the value of the appropriate adjustable resistances 322-1 ("100"-mile range), 307-2 ("50"-mile range), or 326 ("10"-mile range).

(c) BLANKING CIRCUIT. (See figure 4-12.)— From the plate circuit of the right-hand section of the trigger tube, a connection is made to the grid of the cathode-ray tube through capacitor 334. The cathode-ray tube is normally blanked between pulses by bringing its grid to a potential that is more negative than its cathode. A rise in plate voltage on the right-hand section of the trigger tube causes the grid of the cathode-ray tube to become more positive and allows beam current to flow. When the trigger tube returns to its quiescent state, plate current flows again in the right-hand section, and the cathode-ray tube returns to its normal blanked state.

(d) SAWTOOTH DISCHARGE CIRCUIT. *(See figure 4-13.)*

1. The negative pulse developed in the trigger circuit above is fed to the grid of tube JAN-6G6G (392), the discharge tube, through capacitor 302-3. In the quiescent state between pulses, the discharge tube has zero grid bias. The plate current is high and there is relatively little charge on capacitor C, because it is parallel with the plate circuit of the tube. Because of the large plate current of this tube, there is a large voltage drop across plate resistor R.

2. The arrival of a pulse at point A drops the grid of the tube to a large negative value and cuts off the plate current. Capacitor C charges through resistor R at a linear rate. As it does, the voltage drop across resistor R decreases and the potential of point B rises. This is shown in the graph of the potential of point B plotted against time. The end of the input pulse is indicated by a rapid rise in potential of point A. This reduces the negative voltage on the grid of the discharge tube and allows the plate current to increase. Capacitor C then discharges through the tube and the potential of point B quickly drops to the potential of its quiescent state. The circuit then remains in this condition until the arrival of another pulse at the input.

(e) AMPLITUDE-CONTROL CIRCUIT.

1. In the indicator (see fig. 4-13), the resistance-capacitance network is represented by capacitor C and resistor R, which illustrate the network in simplified form. By means of a switch, any one of three RC combinations may be selected. By thus varying the resistance

and capacitance values, the rate of charging capacitor C may be increased or decreased. If the rate of charging is increased, then the output pulse of this circuit will appear as the dotted line in the graph in figure 4-13.

2. The duration of the pulse for each range setting is not changed. This adjustment regulates the rate of rise in potential so that pulses for each range increase to the same amplitude in the time intervals set up in the preceding stage.

3. When properly adjusted for the "10"-mile range, this pulse sweeps the screen from bottom to top in 120 microseconds. The time required for this same sweep, using the "50"-mile, or "100"-mile range, is 600 microseconds for the former and 1200 microseconds for the latter. The time given for these sweeps assumes the use of the nautical-mile scale on the indicator. For individual adjustment on any one of the switch positions, adjustable resistances are provided.

(f) SWEEP-AMPLIFIER AND INVERTER CIRCUITS.

(See figure 4-14.)

1. Since the plate of the discharge tube is coupled directly to the control grid of the sweep-amplifier section of tube JAN-6SN7 (391-2), the sawtooth voltage developed at the plate of the discharge tube is on the grid of the sweep amplifier at the same time.

2. This voltage appears as an amplified negative sawtooth voltage at the plate (pin 2) of the sweep amplifier and is fed through capacitor 302-5 to the lower vertical-deflection plate of the cathode-ray tube. A part

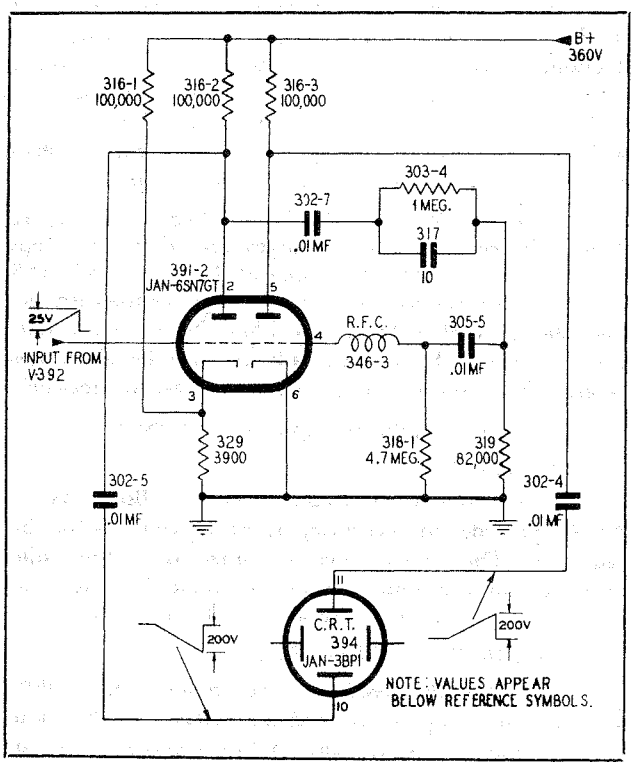


Figure 4-14. Sweep-Amplifier and Inverter Circuits, Sectional Diagram

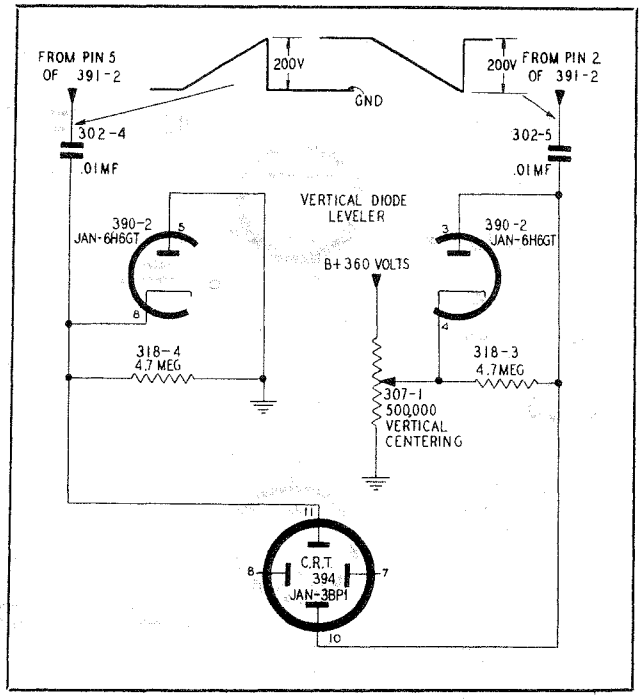


Figure 4-15. Vertical-Deflection Diode Leveler, Sectional Diagram

of this same voltage is applied through capacitor 302-7 and a resistance-capacitance network to the grid of the inverter section of tube 391-2.

3. A positive sawtooth voltage will then be transmitted by the plate of this section of the tube, through capacitor 302-4, to the upper vertical-deflection plate of the cathode-ray tube. To maintain focus at all points on the trace, it is necessary that the instantaneous algebraic sum of the voltages applied to the vertical-deflection plates, with respect to ground, remain constant. This condition exists when the sawtooth voltages, which are opposite in polarity, are equal in amplitude. *Defocusing in a cathode-ray tube will occur with changes in deflecting voltage if the net electrostatic field between the deflection plates and other elements in the cathode-ray tube does not remain constant.*

4. The voltage-divider network, consisting of resistors 303-4 and 319, was introduced to compensate for the amplification of the inverter triode. Since resistor 319 is shunted by circuit and tube capacity, resistor 303-4 is shunted by capacitor 317 in order to obtain uniform attenuation for all components of the sawtooth voltage.

(g) VERTICAL-DEFLECTION AND DIODE-LEVELER CIRCUIT.

(See figure 4-15.)

1. VERTICAL CENTERING.—In order to make full use of the indicator-tube screen, the calibrated scale has its zero line at the extreme bottom. The beam starts its vertical excursion from this point. Since this is not the normal rest point of the beam, it must be moved down to this point by the application of a fixed

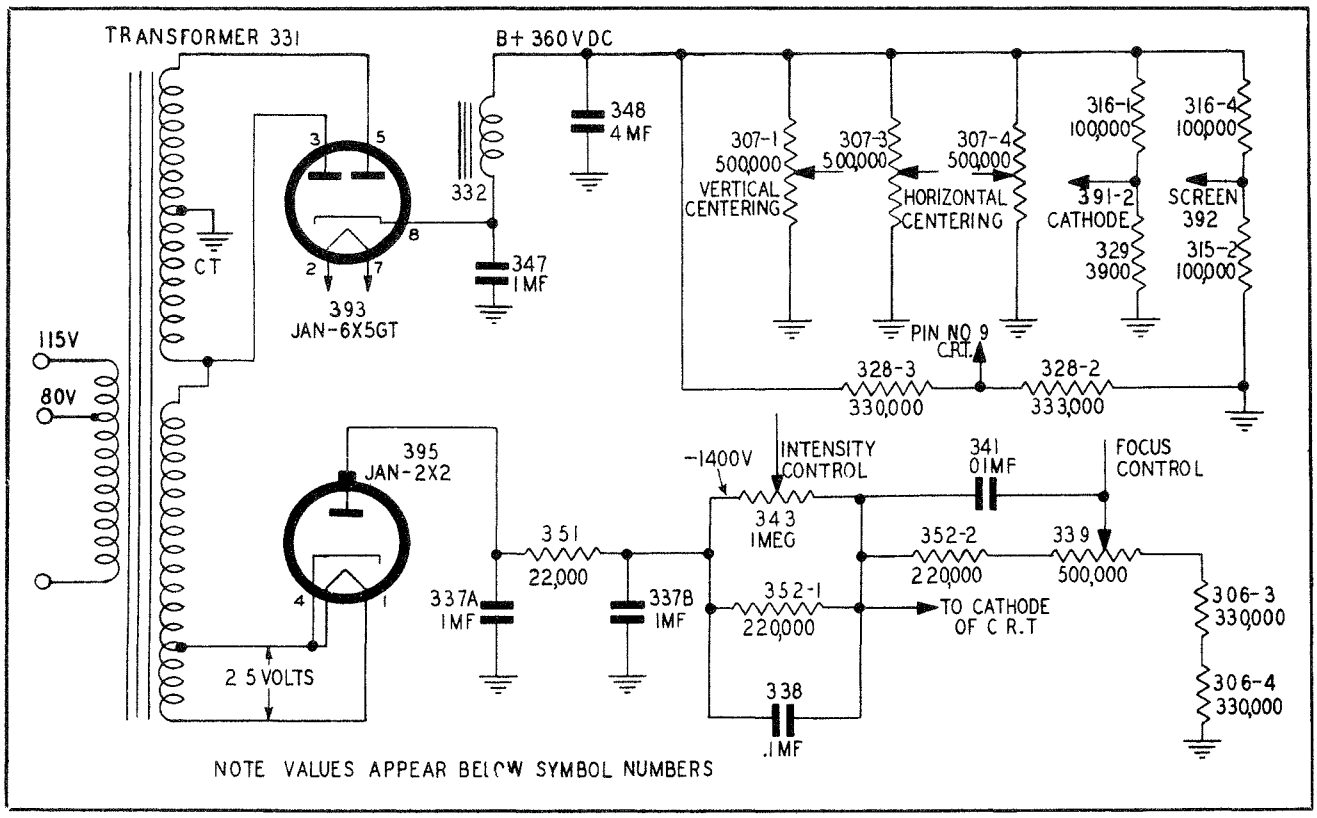


Figure 4-16. Indicator Power Supply and Distribution, Sectional Diagram

d-c potential of approximately 150 volts. This potential is supplied by the d-c power system connected across potentiometer 307-3. The purpose of the potentiometer is the adjustment of this displacement voltage, and the potentiometer is called a vertical-centering control.

2. VERTICAL LEVELER.

a. Twin diode tube JAN-6H6GT/G (390-2) is connected across the output of the sweep amplifier and inverter. (See fig. 4-15.) The plate of the right-hand section of the diode is connected to the output of the sweep amplifier, and the cathode of the left-hand diode is connected to the output of the sweep inverter. Thus, when the amplified sweep voltage is falling in a negative direction, the right diode does not conduct and the lower vertical-deflection plate is driven negative at the same moment the output of the inverter section is driving the upper vertical plate positive.

b. The left-hand diode does not conduct if its cathode is more positive than its plate. Each sawtooth pulse causes capacitors 302-5 and 302-4 to charge slightly. When the pulse is removed, the charge on these capacitors would cause the beam to be displaced below the starting point at the zero line on the scale. This effect is cumulative, and after a series of such pulses, the beam would eventually be displaced a relatively large amount if remedial steps were not taken.

c. In figure 4-15, note that the desired deflection caused by a sawtooth pulse is obtained when the upper deflection plate goes positive and the lower deflection plate negative. Note, also, that the two diode sections of tube 390-2 are so connected that they will conduct when the opposite condition exists. During conduction, a low-impedance path to ground is provided through which capacitors 302-5 and 302-4 can discharge and thus prevent the unwanted deflection. These diodes will have no effect on voltages which cause beam deflection above the zero line on the indicator scale.

(4) POWER-SUPPLY CIRCUITS. *(See figure 4-16.)*—Screen and plate voltages for all tubes except the cathode-ray tube are supplied by tube JAN-6X5 (393), a full-wave rectifier. High voltage for the cathode-ray tube is supplied from tube JAN-2X2 (395), a half-wave rectifier. The various cathode-ray tube electrodes receive their power through a suitable resistor network.

c. RADIO CONTROL BOX ★C-3/APN-2. *(See figure 1-7.)*

(1) GENERAL. — Radio Control Box ★C-3/APN-2 provides the necessary operating controls for the radio set. The control box is connected to the radio receiver and transmitter from connector J402 to connector J203 on the radio receiver and transmitter.

(2) CIRCUIT ANALYSIS.

(a) Switch S403 is the power "ON-OFF" switch controlling the a-c and d-c voltages to the radio receiver and transmitter and the a-c voltage to the indicator. The connections to this switch are made by terminals J, G, F, and E of connector J402.

(b) Switch S401 is the "HIGH-LOW" frequency-selector switch to operate relay K101 on the receiver chassis. This relay connects capacitor C110 to the receiver-oscillator circuit controlling the frequency of operation. The connections to switch S401 are made by terminals C and G of connector J402.

(c) The "TRANS.-KEY" operation switch controls the bias supply to the receiver-output circuit, the pulse-generating circuit, and the modulator circuits, thus providing for continuous, intermittent or keyed transmission. The switch is connected to terminals A and B of connector J402. Jack J401 connected in series with the operation switch provides a connection for a code key.

(d) "GAIN" control R401 varies the screen voltage to the first and second r-f and first i-f amplifier stages, thus controlling the sensitivity of the receiver. The connections to the "GAIN" control are made by terminals A, D, and H of connector J402.

SECTION V

MAINTENANCE

IMPORTANT

Periodic inspections prescribed herein represent minimum requirements. If, because of local conditions, peculiarities of equipment, or abnormal usage, they are found insufficient to assure satisfactory operation of the equipment, local authorities should not hesitate to increase their scope or frequency.

1. INSPECTION.

a. PREFLIGHT CHECK.

Note

If the airplane has been on a flight since the last daily inspection, give Radio Set ★ AN/APN-2 a mechanical check, in accordance with subparagraphs 1b(1) through (6)a, this section.

(1) GENERAL.—After the initial installation of the system in the aircraft, and prior to each flight, a short overall check shall be made to determine if the set is in good working order. If possible, the preflight check should be conducted by personnel familiar with the more detailed Bench Test Procedure. The test data shall be recorded on a check sheet made up in the form shown in figure 5-0 headed "CHECK SHEET FOR PREFLIGHT TESTS OF RADIO SET ★ AN/APN-2 ()." Further, on initial installations, a thorough check shall be made of the installation, including a visual inspection for broken or blown fuses, foreign matter, and loose or broken cables and cable connections. *IT IS IMPORTANT THAT ALL CONNECTIONS BE TIGHT.*

A small auxiliary power supply capable of furnishing 24-volt (1-ampere) d-c power and 110-volt, 400-cycle, a-c power (approximately 175 watts) should be used to furnish the power required to make the preflight tests.

(2) TEST EQUIPMENT REQUIRED.

a. Frequency Meter BC-906-D, which has been recalibrated in accordance with T.O. No. 16-40BC906-22.

b. Signal Generator I-196-B.

c. Indicator BC-936-A.

(3) TEST PROCEDURE.

(*a*) OPERATION CHECK.

1. Set the "TRANS-KEY" switch at the standby (mid) position. Turn equipment on by setting the "ON-OFF" switches on the control box and the indicator at their "ON" positions. After approximately three minutes, set the "TRANS—KEY" switch at the "TRANS" position.

2. Check for proper blower-motor operation in the radio receiver and transmitter by listening for the characteristic sound. If outside noise interferes with this check, moisten finger and hold in front of "RCVR. OSC." "LOW" tuning opening, or at the vent holes at the rear of the chassis. A slight draft of air will be felt, if the blower is operating. If the blower motor does not run, check the d-c input cable for loose plug connections or cable damage.

3. Check the following controls for proper operation: "INTENSITY", "FOCUS", and "RANGE" on the indicator; and the "TRANS-KEY" switch, "GAIN" control and "HIGH-LOW" switch on the control box, as explained in section II, paragraph 4.

(*b*) CHECK OF RECEIVING ANTENNA INSTALLATION.

1. Place Signal Generator I-196-B approximately 50 feet directly in front of the airplane. Adjust the signal generator to the frequency of the receiver section of the radio receiver and transmitter. The received signal, as observed on the indicator screen, should be equal on each side of the center line.

2. Place Signal Generator I-196-B approximately 50 feet in front of the airplane and on an angle of about 45 degrees to the right of the airplane. The name-plate side of the signal generator should be pointed toward the airplane. The received signal, as observed on the indicator screen, should be stronger on the right side.

3. Repeat the operation of subparagraph 2, above, placing the signal generator to the left side of the airplane. The amplitude of the signal, as observed on the indicator, should now be greater on the left side of the screen.

4. If the equipment does not operate as indicated in subparagraphs 1, 2, and 3, above, temporarily interchange the receiver antenna lead connections to "ANT.R." and "ANT.L"., on Indicator BC-929-(*). If the signal, as observed on the indicator screen, remains the same as it was before changing the antenna leads, the trouble is in the indicator, which should be replaced. If the observed signal has changed, the trouble is in

the receiver antennas or their installation. Check continuity of the antenna leads, soldered connections, and the antennas themselves. If the trouble is not found, a complete new receiving antenna installation, including leads, should be made.

(c) TRANSMITTER FREQUENCY CHECK.

Note

Be sure that the Frequency Meter BC-906-D in use has been recalibrated in accordance with T.O. No. 16-40BC906-22 (Calibration of Frequency Meter BC-906-D).

1. Run a loop (single turn) of insulated wire through a louver close to the "TRANS FREQ" adjustment on the radio receiver and transmitter.

2. Clip one end of this wire to the "ANT" terminal on Frequency Meter BC-906-D.

Note

The antenna of the frequency meter should be inserted and extended to its full length in order not to change the frequency calibration.

3. Tune the "TRANS FREQ" adjustments (reached through the hole below the knob) for maximum needle dip on the frequency meter.

4. Repeat the above for each setting (B, C, D, and E) of the "TRANS FREQ" knob. Set the dial of the frequency meter each time to the recalibrated number corresponding to the desired frequency. (A=214; B=219; C=224; D=229; and E=234 megacycles).

(d) TRANSMITTER POWER AND PULSE WIDTH MEASUREMENT.

1. Connect test Indicator BC-936-A between the "TRANS ANT" jack of Radio Receiver and Transmitter RT-1(*)/APN-2 and the "VIDEO" jack of Indicator BC-929-(*).

2. With switch in "POWER" position, press the push-button switch on test indicator. The sweep of Indicator BC-936-A should be deflected no less than 4-½ divisions, approximately 500 watts.

3. With switch in "PULSE" position, press the push-button switch on test indicator. The pulse should appear to be approximately one-half mile wide.

b. DAILY INSPECTION.

Note

The daily inspection is a thorough visual and operating inspection to determine the general condition of the complete equipment and to detect aggravated conditions, maladjustments, and cable breaks. It is not intended to detect slight wear in the early stages of deterioration.

(1) Check all of the antennas for secure mounting and electrical connections.

Note

Clean all dirt and mud from the antenna systems. Pay special attention to the transmitting antenna and its base.

(2) Check each cord for mechanical wear and possible breaks.

(3) Check the plugs and sockets for mechanical defects and loose fittings.

(4) Check the plugs and sockets for good electrical contacts. If necessary, clean with carbon tetrachloride.

CAUTION

Remove plug PL-259 carefully in order not to damage insulation insert in socket SO-239.

(5) Check mountings for live shock action and proper grounding.

(6) Check fuses.

(7) If Radio Set ★AN/APN-2 is transferred to another airplane, check transformer connections. Be sure the transformer connections are correctly connected for either 80-volt or 115-volt a-c operation, depending upon the voltage supplied in the aircraft.

Note

The assemblies are normally connected for 115-volt 400- to 2400-cycle operation. However, taps have been provided on the power transformer of the indicator and on the two power transformers of the receiver-transmitter for 80-volt, 400- to 2400-cycle operation. The correct power connections should be made during the installation of the equipment in the airplane. A check of the tap connections should be made if any unit of the radio set is changed. (See figs. 5-1, 5-2, 5-3, and 5-4 for connections.)

(8) Perform a preflight check, as outlined in paragraph 1*a*, this section.

c. 100-HOUR INSPECTION.—The 100-hour inspection of Radio Set ★AN/APN-2 is a thorough and searching visual and operational inspection and includes the following:

(1) Perform a daily inspection, in accordance with paragraph 1*b*, this section.

WARNING

This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

(2) Remove Radio Receiver and Transmitter ★RT-1A/APN-2 and Indicator BC-929-(*) from the airplane; remove the covers, separate the chassis, and inspect for the following:

CHECK SHEET FOR PRE-FLIGHT TESTS OF RADIO SET AN/APN-2 ( )

The operations listed below shall be checked on each equipment and the operation recorded or checked as indicated.

U — Unsatisfactory S — Satisfactory

Operation	*U*	*S*	*Remarks*
1. "ON-OFF" switch operation a. On Control Box C-3/APN-2 b. On Indicator BC-929-C			
2. Blower Motor operation (Sound)			
3. "INTENSITY" control operation			
4. "FOCUS" control operation			
5. "RANGE" switch operation			
6. "TRANS KEY" switch operation			
7. "GAIN" control operation			
8. Transmitter operation (pulse at bottom of trace)			
9. Receiver operation (grass on screen)			
10. "TRANS FREQ" switch operation			
11. Antenna Installation a. Signal Generator I-196-B in front of airplane b. Signal Generator I-196-B at right of airplane c. Signal Generator I-196-B at left of airplane			
12. Transmitter Frequency Adjustments a. Position A — 214 megacycles b. Position B — 219 megacycles c. Position C — 224 megacycles d. Position D — 229 megacycles e. Position E — 234 megacycles			

Figure 5-0. Preflight Check Sheet

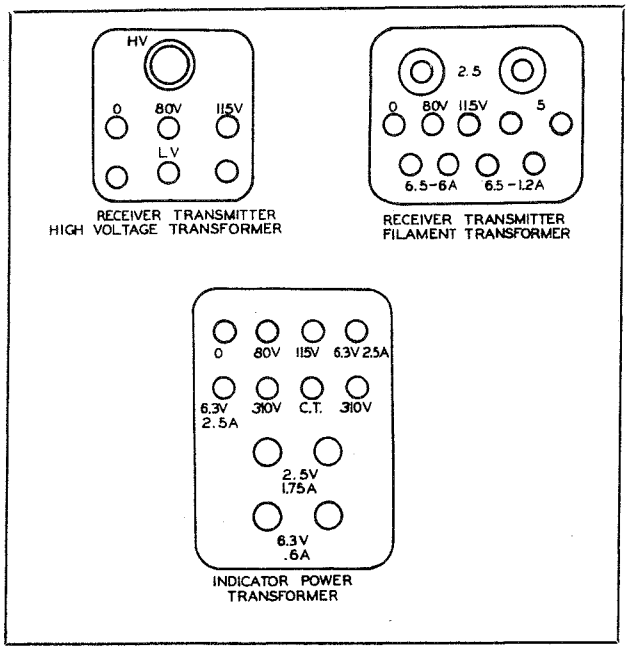


Figure 5-1. Power Transformers, Tap Layout Diagrams

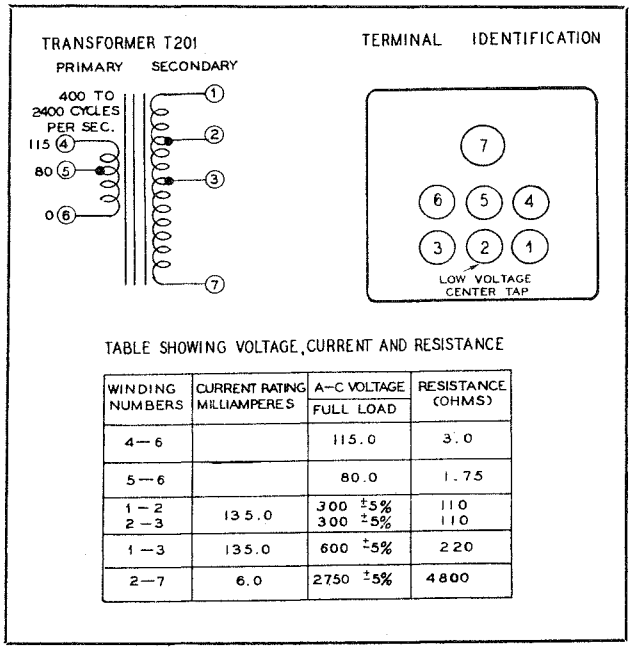


TABLE SHOWING VOLTAGE, CURRENT AND RESISTANCE

WINDING NUMBERS	CURRENT RATING MILLIAMPERES	A-C VOLTAGE FULL LOAD	RESISTANCE (OHMS)
4—6		115.0	3.0
5—6		80.0	1.75
1—2 2—3	135.0	300 ±5% 300 ±5%	110 110
1—3	135.0	600 ±5%	220
2—7	6.0	2750 ±5%	4800

Figure 5-2. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2, Power Transformer T201—Service Data

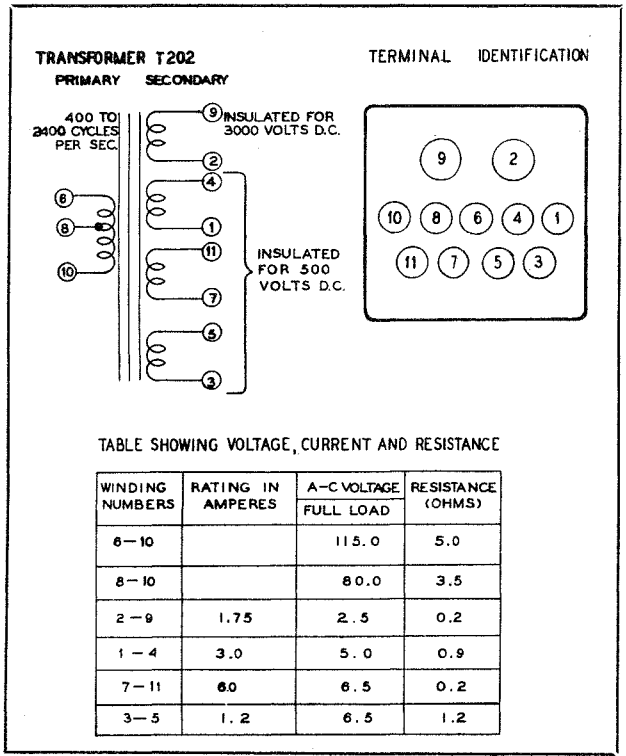


TABLE SHOWING VOLTAGE, CURRENT AND RESISTANCE

WINDING NUMBERS	RATING IN AMPERES	A-C VOLTAGE FULL LOAD	RESISTANCE (OHMS)
6—10		115.0	5.0
8—10		80.0	3.5
2—9	1.75	2.5	0.2
1—4	3.0	5.0	0.9
7—11	6.0	6.5	0.2
3—5	1.2	6.5	1.2

Figure 5-3. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2, Filament Transformmer T202—Service Data

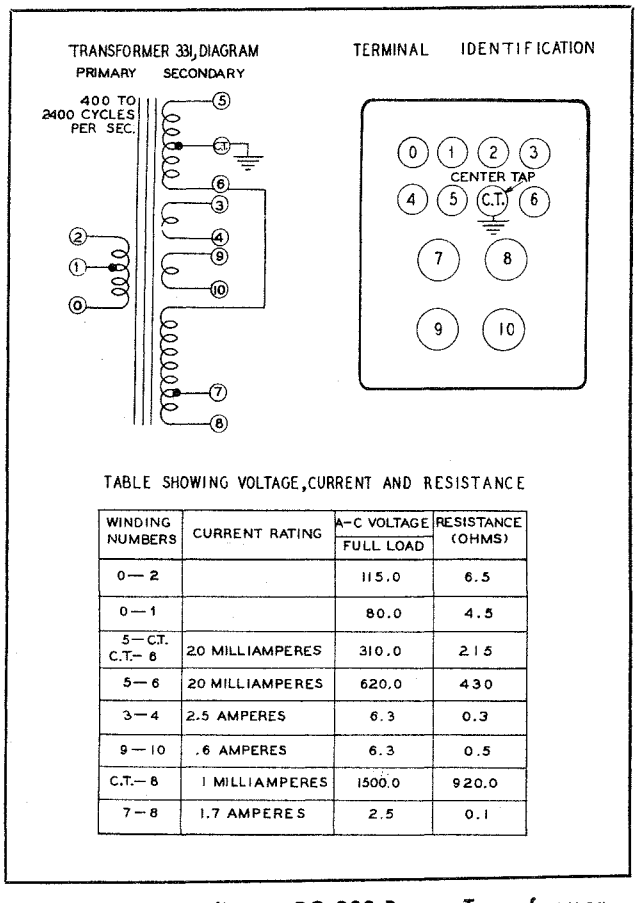


TABLE SHOWING VOLTAGE, CURRENT AND RESISTANCE

WINDING NUMBERS	CURRENT RATING	A-C VOLTAGE FULL LOAD	RESISTANCE (OHMS)
0—2		115.0	6.5
0—1		80.0	4.5
5—C.T. C.T.—6	20 MILLIAMPERES	310.0	215
5—6	20 MILLIAMPERES	620.0	430
3—4	2.5 AMPERES	6.3	0.3
9—10	.6 AMPERES	6.3	0.5
C.T.—8	1 MILLIAMPERES	1500.0	920.0
7—8	1.7 AMPERES	2.5	0.1

Figure 5-4. Indicator BC-929 Power Transformer 331—Service Data

(4) Check the plugs and sockets for good electrical contacts. If necessary, clean with carbon tetrachloride.

CAUTION

Remove plug PL-259 carefully in order not to damage insulation insert in socket SO-239.

(5) Check mountings for live shock action and proper grounding.

(6) Check fuses.

(7) If Radio Set ★AN/APN-2 is transferred to another airplane, check transformer connections. Be sure the transformer connections are correctly connected for either 80-volt or 115-volt a-c operation, depending upon the voltage supplied in the aircraft.

Note

The assemblies are normally connected for 115-volt 400- to 2400-cycle operation. However, taps have been provided on the power transformer of the indicator and on the two power transformers of the receiver-transmitter for 80-volt, 400- to 2400-cycle operation. The correct power connections should be made during the installation of the equipment in the airplane. A check of the tap connections should be made if any unit of the radio set is changed. (See figs. 5-1, 5-2, 5-3, and 5-4 for connections.)

(7) Perform a preflight check, as outlined in paragraph 1*a*, this section.

c. 100-HOUR INSPECTION.—The 100-hour inspection of Radio Set ★AN/APN-2 is a thorough and searching visual and operation inspection and includes the following:

(1) Perform a daily inspection, in accordance with paragraph 1*b*, this section.

WARNING

This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

(2) Remove Radio Receiver and Transmitter ★RT-1A APN-2 and Indicator BC-929-(*) from the airplane; remove the covers, separate the chassis, and inspect for the following:

(a) Check all wiring and terminals for unsatisfactory connections and presence of corrosion and leakage paths.

(b) Check relay K101 for looseness and dirt.

(c) Check all tubes for which testing facilities are available and reinstall serviceable tubes in same sockets from which they were removed. Replace defective tubes.

(d) Check component parts for cracks and breaks.

(e) Check all bolt and screw assemblies for looseness.

(f) Check to locate resistors which appear to have overheated at some time. Check circuits to determine cause for this.

(3) Put the chassis together, replace the covers and reconnect the cables, then give the radio set an operational preflight check, in accordance with paragraph 1*a*, this section.

(4) Refer to section II, paragraphs 3*b* and *c* for complete information on indicator calibration and adjustment. (This adjustment should be made at any other time when conditions warrant.)

(5) If any trouble or faulty operation is encountered, refer to paragraph 2 of this section for an explanation and a remedy for the trouble.

2. TROUBLE-SHOOTING INSTALLED EQUIPMENT.

Note

Make certain that improperly set switches and controls, or loose cables, are not the cause of trouble before major assemblies are replaced.

a. GENERAL.—Look for defective connectors, burned-out tubes, and signs of physical damage. Trace the trouble to a specific major assembly and replace the defective assembly, if it can not be repaired by a simple operation. Observation of the indicator screen will be of great assistance.

b. TUBE REPLACEMENT DATA.

Note

All tubes supplied with this equipment as spares must be consumed prior to the use of tubes from general stock.

(1) To obtain satisfactory tube life, the operating voltage should not exceed 115 volts.

(2) Tubes may always be suspected in case of trouble. When possible, they should be checked in a standard tube tester, or preferably by substitution of tubes known to be good.

(3) All tubes in the receiver-transmitter and indicator may be tested in a standard tube tester except the JAN-2C26 transmitting tube and the cathode-ray tube.

(a) The only reliable test for tube JAN-2C26 and cathode-ray tube JAN-3BP1 is to substitute a tube known to be good, and compare operation.

(4) All tube sockets are identified by commercial tube-type numbers. When replacing a tube, be sure that the tube number corresponds to the socket marking.

WARNING

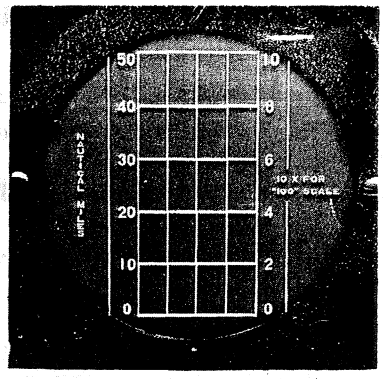
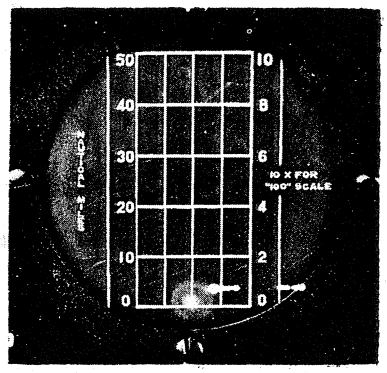
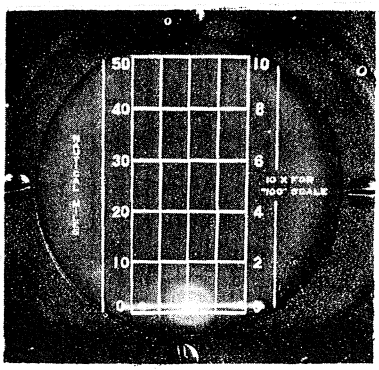
Always turn off power before replacing tubes.

(5) Refer to the following trouble charts for the effect of weak or defective tubes on the operation of the equipment.

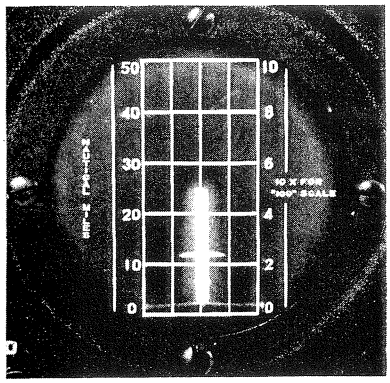
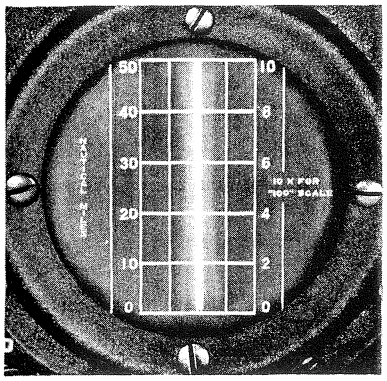
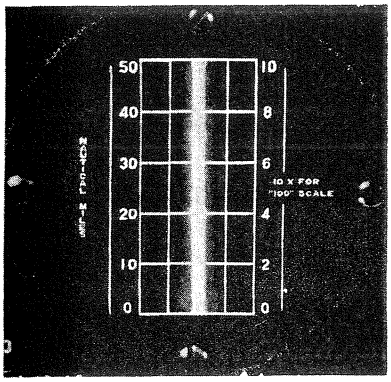
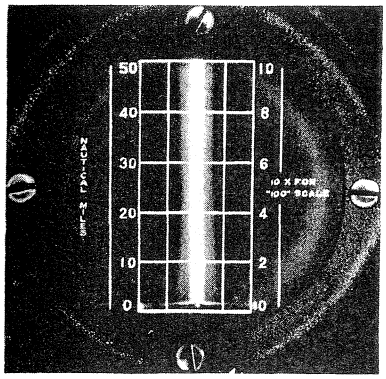
c. TROUBLE DIAGNOSIS FROM THE APPEARANCE OF INDICATOR SCREEN.—The following reproductions show the screen of Indicator BC-929-(*) as it appears with defective tubes, loose or shorted cables, and improper adjustments, as indicated. The remedy in each case is suggested by the cause; for example, a defective tube must be replaced with a good spare; a loose connector must be tightened; and an improper adjustment must be corrected.

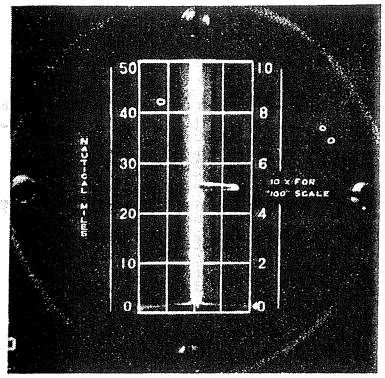
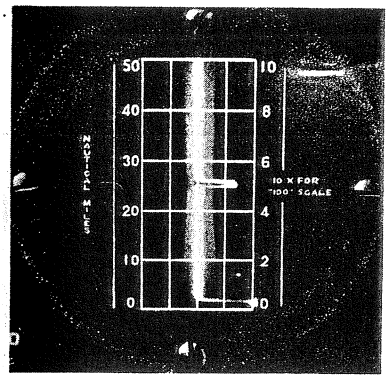
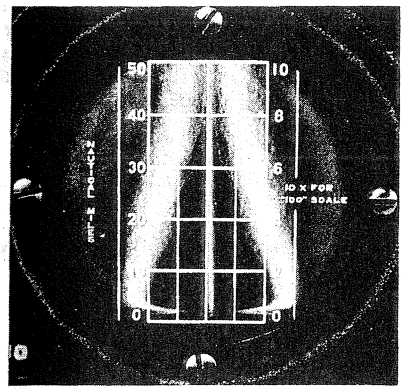
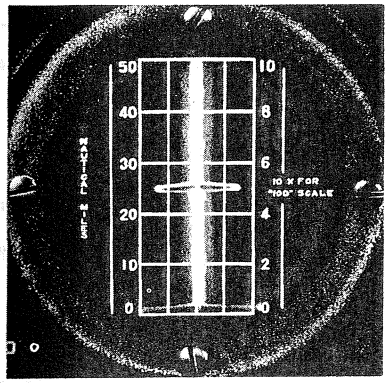
Note

The following information applies equally to Radio Set ★AN/APN-2 and ★AN/APN-2Y.

Appearance of Indicator BC-929-A	*Probable Cause of Trouble*
	1. Improper adjustment of "INTENSITY", "VER. CENT.", "HOR. CENT.", or "FOCUS" control. 2. "ON-OFF" switch on radio control box at "OFF". 3. Loose control cable connection at control box or indicator. 4. Loose a-c power cable connections at radio receiver and transmitter or indicator. 5. Weak or burned out high voltage rectifier tube JAN-2X2 (ref. no. 395) in indicator. 6. Weak or burned out plate voltage rectifier tube JAN-6X5/GT (ref. no. 393) in indicator. In this case the spot will appear with the "INTENSITY" control turned high. 7. Defective cathode-ray tube JAN-3BP1 (ref No. 394) in indicator.
	1. "TRANS.-KEY" switch on control box set on mid-position. 2. Loose "SYNC" cable connection. 3. Sweep channel tubes and modulator tube. 4. Defective transmitting tube. 5. Defective blocking oscillator tube JAN-6SL7/GT (ref. no. V106-1) in receiver. 6. Defective plate voltage rectifier tube JAN-6X5/GT (ref. no. 393) in indicator. 7. Defective low voltage rectifier tube JAN-5U4/G (ref. V-201) in receiver and transmitter.
	1. Loose "SYNC" cable connection at receiver and/or transmitter or indicator. 2. Defective sweep amplifier and output tube JAN-6SN7/GT (ref. no. 391-2) in indicator. 3. Defective discharge tube JAN-6G6/G (ref. no. 392) in indicator. 4. Defective multivibrator tube JAN-6SN7/GT (ref. no. 391-1) in indicator.

AN 16-30APN2-3

Appearance of Indicator BC-929-A	*Probable Cause of Trouble*
	1. "SWEEP AMPLITUDE" control on indicator set too low. 2. Defective sweep amplifier and output tube JAN-6SN7/GT (ref. no. 391-2) in indicator. 3. Defective discharge tube JAN-6G6/G (ref. no. 392) in indicator. 4. Defective multivibrator tube JAN-6SN7/GT (ref. no. 391-1) in indicator.
	1. "ON-OFF" switch on indicator set at "OFF". 2. Loose "VIDEO" cable connection at receiver and transmitter. 3. Defective video tubes JAN-6AC7 (ref. no. V102-6) and JAN-6V6/GT (ref. no. V104) in receiver. 4. Defective second detector and limiter tube JAN-6H6/GT (ref. no. V103) in receiver. 5. Defective i-f tubes JAN-6AC7 (ref. nos. V102-1, 102-2, 102-3, 102-4, and 102-5) in receiver.
	1. Defective transmitting tube JAN-2C26 (ref. no. V204) in radio receiver and transmitter. 2. Defective modulator tube JAN-6SN7/GT (ref. no. V202) in radio receiver and transmitter. 3. Defective high voltage rectifier tube JAN-2X2 (ref. no. V203) in radio receiver and transmitter.
	1. Loose "RCVR. ANT." cable connection at indicator and/or radio receiver and transmitter. 2. Transmitter set on wrong frequency. 3. Receiver set on wrong frequency. 4. Misalignment of r-f stages of receiver. 5. Beacon switch "OFF" or on wrong receiving or transmitting frequency. 6. Defective r-f tubes JAN-956 (ref. nos. V101-1 and V101-2). 7. Defective mixer tube JAN-956 (ref. no. V101-3). 8. Defective local oscillator tube JAN-955 (ref. no. V105).

Appearance of Indicator BC-929-A	*Probable Cause of Trouble*
	1. Beacon to one side of airplane. 2. Loose or shorted antenna cable on side having no received signal.
	1. "ON-OFF" switch on indicator set at "OFF". 2. Loose d-c cable at indicator.
	Excessive B plus voltage causing feed-back in local oscillator filament circuit. (In such cases the radio set should be modified by qualified personnel.)
	Normal operation. Equipment operating properly.

d. TROUBLE LOCATION AND REMEDY.—The following chart lists a few common trouble symptoms and remedies.

TABLE 5-1.—Trouble Chart

Symptom	*Trouble Location*	*Remedy*
Blip: double target, double transmitter pulse (one beacon signal).	Receiver-transmitter	Replace
Blip: Target blip on one side of screen only (with transmitter pulse on both sides).	Antenna and leads on defective side. Indicator	Replace
Control: horizontal control has no effect on position of trace.	Indicator	Replace
Control: vertical control has no effect on position of spot.	Indicator	Replace
Focus: image focus is not affected by "FOCUS" control.	Indicator	Replace
Intensity: image intensity is not affected by "INTENSITY" control.	Indicator	Replace
Oscillation: occurrence of double trace, sweeping widely to right and left of screen.	Receiver-transmitter	Replace
Trace: distorted.	Cables Indicator Receiver-transmitter	Tighten Replace Replace
Transmitter Pulse appears with "TRANS.-KEY" switch in center position.	Control Box Receiver-transmitter	Replace Replace
Transmitter Pulse appears on one side of screen only.	Indicator	Replace
Transmitter will not operate on some frequency settings.	Transmitter antenna cable	On early equipment only, replace with proper length Radio Frequency Cable RG-8/U. (Refer to Section II.), par. 2*g*.
	Receiver-transmitter	Replace

3. TROUBLE-SHOOTING AT REPAIR STATION.

a. PRELIMINARY.—The following tables furnish information on common troubles, their symptoms, and suggested remedies.

TABLE 5-2.—Cause and Remedy Chart

Symptom	*Indicated Source of Trouble*
Receiver Blip: unbalanced.	Unequal electrical characteristics of the two receiving antennas and/or receiving antenna cables.
Blip: target blip on one side of screen only.	Receiving antenna cable. Receiver section of antenna-video switch.
Control: horizontal control has no effect on position of spot.	Cathode-ray tube, JAN-3BP1, (Ref. No. 394), horizontal-centering potentiometer, (reference No. 307-1). Horizontal-leveler tube, JAN-6H6GT/G, (Ref. No. 390-2).
Focus: image focus is not affected by "FOCUS" control.	Cathode-ray tube, JAN-3BP1, (Ref. No. 394). Focus potentiometer, (reference No. 339). Focus-control circuit.

TABLE 5-2.—Cause and Remedy Chart (Continued)

Symptom	*Indicated Source of Trouble*
Intensity: image intensity is not affected by "INTENSITY" control.	Cathode-ray tube, JAN-3BP1 (Ref. No. 394). Intensity potentiometer, (reference No. 343). Intensity-control circuit.
Oscillation: occurrence of double trace, sweeping widely to the right and to the left of the screen.	B plus power supply. Oscillator filament circuit. I-F plate and grid circuits. Grounding terminals of i-f tubes. (Grounding terminals should be bent down and leads made as short as possible.)
Trace: distorted.	"SYNC" cable. Power supply (filters). Horizontal- and vertical-leveler circuits. Antenna-video switch.
Transmitter Pulse appears with "TRANS.-KEY" switch in center position.	"TRANS.-KEY" switch. Power-supply bias resistor, (reference No. R209). Modulator circuit.
Transmitter Pulse appears on one side of screen only.	Video section of antenna-video switch. Video circuit.
Transmitter will not operate on some frequency settings.	Transmitter antenna cable. Transmitter tuning-capacitor plates out of parallel.

b. DETAILED TROUBLE-SHOOTING.—If the following suggested remedies do not correct the trouble, check resistances, voltages, and waveforms.

WARNING

This equipment employs high voltages which can prove fatal. Observe proper caution when the chassis is open and wiring exposed.

TABLE 5-3.—Detailed Trouble Shooting Data

Symptom	*Procedure for Localizing Trouble and Making Repair*
Receiver Blip: unbalanced.	Check to make certain that both receiving antennas are electrically equivalent by temporarily reversing right and left antenna connections. If unbalanced condition does not change to other side, antennas are satisfactory. If unbalanced condition does change to other side when antennas are reversed, antennas or their cables are defective. Make continuity and voltage measurements in video section in indicator. This check should include the video section of the antenna-video switch.
Blip: target blip on one side of screen only.	Check receiving antennas as for receiver blip, unbalanced. Check video circuit and video section of antenna-video switch. Check receiving antenna section of antenna-video switch. Check voltages on pins of cathode-ray tube (refer to fig. 5-16).
Control: horizontal control has no effect on position of trace.	Check horizontal-leveler circuit and potentiometer 307-3.
Control: vertical control has no effect on position of spot.	Check voltages on cathode-ray tube. Check vertical-leveler circuit and potentiometer 307-1.
Focus: image focus is not affected by "FOCUS" control.	Check voltages on cathode-ray tube. Check focus circuit.
Intensity: image intensity is not affected by "INTENSITY" control.	Check voltages on cathode-ray tube. Check components of intensity circuit.
Oscillation: occurrence of double trace, sweeping widely to the right and to the left of the screen.	If B plus voltage is as much as 315 volts, insert a 250-ohm, 10-watt resistor, stock number 3Z6025-42, or equal, between chokes L-202-A and L-202-B. This resistor should be marked with a red dot after installation.

TABLE 5-3.—Detailed Trouble Shooting Data (Continued)

Symptom	*Procedure for Localizing Trouble and Making Repair*
	Bypass end of receiver oscillator-filament choke L107 farthest away from oscillator filament with a 1000-micro-microfarad capacitor, stock No. 31KA1-104, (This capacitor C-121-27 will be found in some sets) or equal, keeping connections as short as possible.
	Dress plate and grid leads of i-f tubes as far from each other as possible.
	Dress filament-bypass capacitors of i-f tubes close to the chassis.
	Check for shorted coupling capacitors in the i-f grid circuits.
	Shorten all ground terminals of i-f tube sockets. Make certain that the ground terminals make good electrical connection to the socket retaining ring.
Trace: distorted.	Check sweep-amplifier circuit.
Transmitter pulse appears on display tube with "TRANS.-KEY" switch in center position.	Check continuity of "TRANS.-KEY" switch; switch in center position should test open circuit. Check bias resistor R209; if value of resistor is not within 20 percent of the rated value, replace the resistor.
	Place a jumper wire across the 47,000-ohm resistor R201. (This resistor has been removed in some sets.)
	Check continuity and voltages in modulator circuit.
Transmitter pulse appears on one side of screen only.	Check continuity and voltage of video circuit. Check continuity of video section of antenna-video switch.
Transmitter will not operate on some frequency settings.	Transmitter tuning-capacitor plates should be checked for parallel alignment. An ohmeter may be used to show up shorts as the capacitor plates are turned.
	Check to make sure that only Radio Frequency Cable RG-8/U is used to the transmitting antenna, (and that the cable is of the proper length (in early equipment). (Refer to paragraph 2*g*, section II.) Replace with the correct cable when necessary and correct for length when necessary.

c. VOLTAGE, RESISTANCE AND WAVEFORM DATA.

(1) The trouble and remedy charts in subparagraphs 3*a* and 3*b*, of this section can be used as a guide for servicing Radio Set ★AN/APN-2. When the trouble is localized to one chassis, the voltage, resistance, and waveform diagrams can be used to find the faulty part. It should be remembered that the voltage and resistance values shown are approximate and will vary from set to set. Voltage and resistance data are given on chassis-layout diagrams, on which the points necessary to check all parts in the circuits have been determined and measured. The points noted on the voltage and resistance charts provide a rapid check on all circuits. One point may check several parts. The part or parts checked can be noted on the schematic diagrams. The oscillograms provide a check for the circuits in which these waveforms are located.

Note

The voltage and resistance values shown in the chassis layouts were obtained from production models (Order Number 1515-DAY-44). When checking older models, some variations in these values will occur because of changed parts. Use the references given below to obtain information concerning changes that may affect the voltage and resistance values of the circuit under test.

(1) Table of modifications, section VI, subparagraph 5*c*.

(2) Schematic diagrams of first production, figures 8-9 and 8-10.

(3) Schematic diagrams of production under Order No. 1515-DAY-44, figures 8-11 and 8-12.

(2) Figures 5-20 to 5-30, inclusive, are actual photographs of the equipment, showing the location and circuit reference numbers of the parts. A complete description of each part may be found by obtaining its reference number on the photographs and referring to the table of replaceable parts, section VII.

(3) Figures 5-6, 5-7, 5-10, 5-11, 5-13, 5-17, and 5-18 are layout diagrams, showing the points on each chassis where the voltage measurements were made. The layouts do not give measurements at all points; however, the measurements give a complete check of the circuits. The schematic diagrams can be used to note the parts checked

by each reading. All measurements were taken from ground unless indicated otherwise. Cathode-ray-tube pin voltages are given in figure 5-16.

(4) Figures 5-8, 5-12, 5-14, and 5-19 are layout diagrams, showing points to be measured for a resistance check of the parts in the circuits. Resistance readings were not made at all points. The points given will provide a resistance check on all parts in the circuits. The schematic diagrams can be used to note the parts checked by each reading.

(5) Figures 5-5, 5-9, and 5-15 are layout diagrams, showing points at which waveforms have been taken. The waveforms give a check on all circuits. Waveforms with double arrows indicate that they may be varied in duration or amplitude by adjusting corresponding controls.

(6) A knowledge of certain governing factors is essential to a complete understanding of the circuit's waveforms. For example, the general shapes of the waves are as drawn. However, the amplitude and duration of the pulses are dependent on the control adjustments and the individual characteristics of the equipment under test.

4. REPLACEMENT OF FUSES AND LAMPS.

There are no fuses and lamps to be replaced.

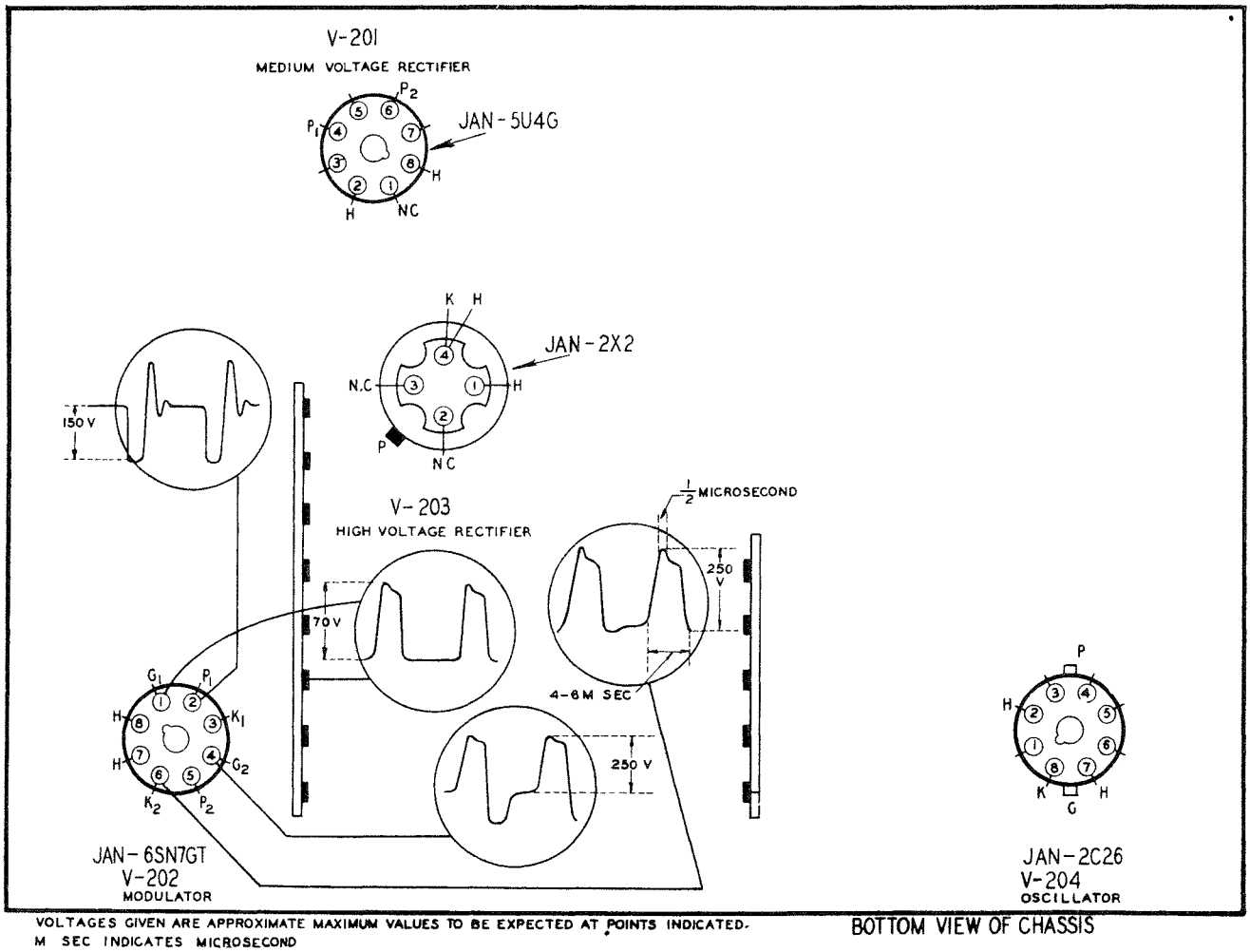


Figure 5-5. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2— Transmitter Waveforms

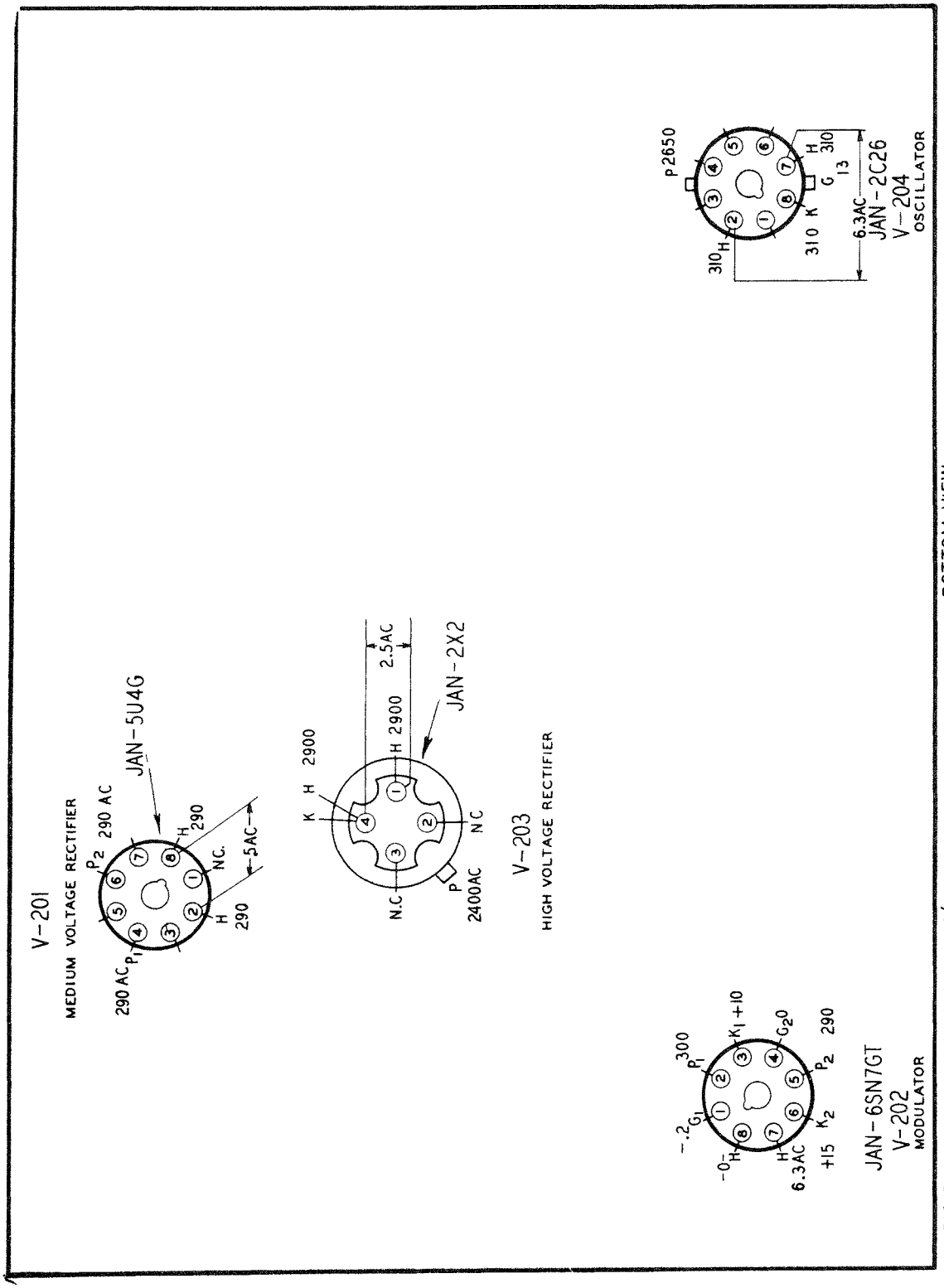


Figure 5-6. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-"A/APN-2— Transmitter Voltage Measurements with 20,000-Ohms-per-Volt Meter

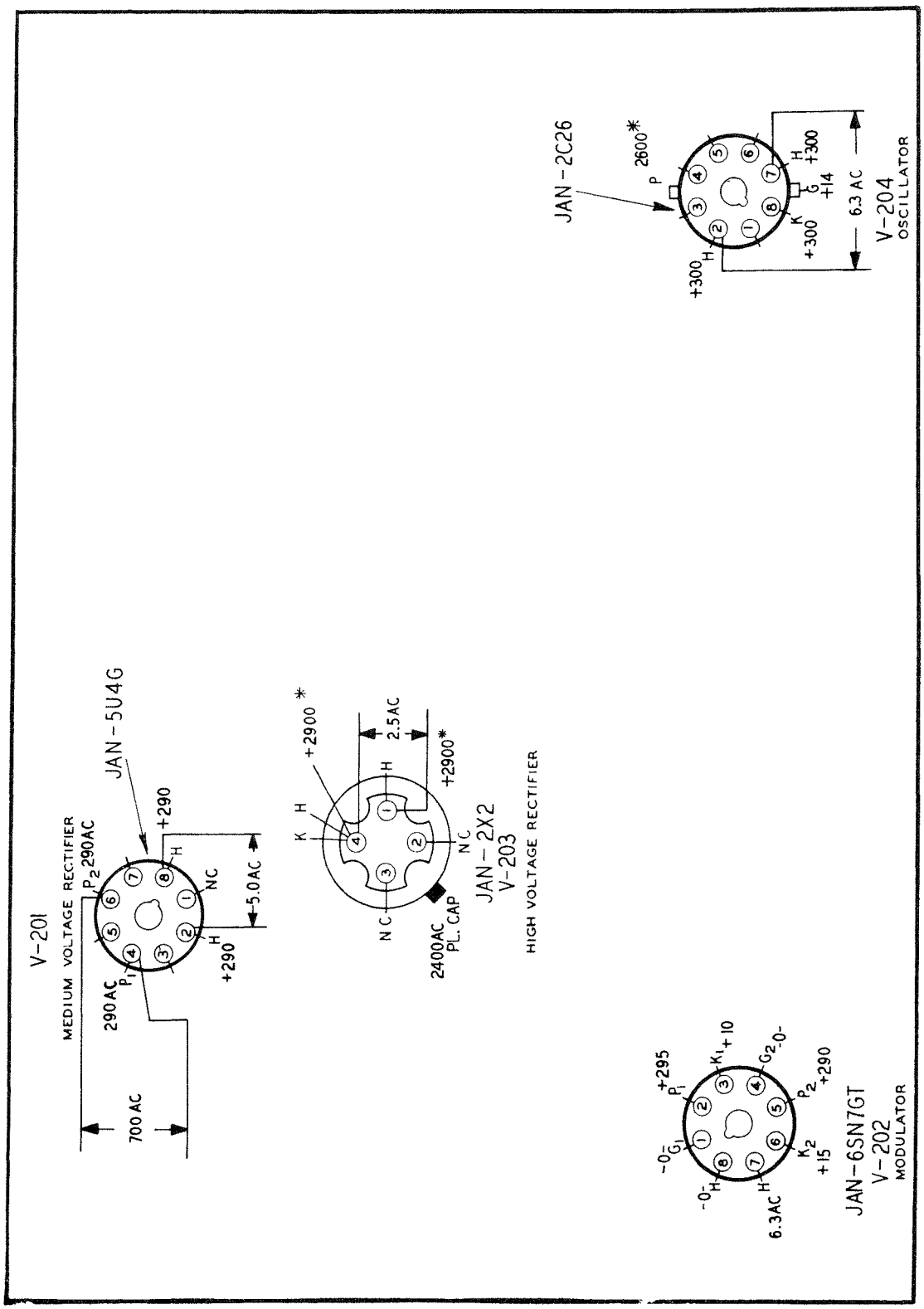


Figure 5-7. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Voltage Measurements with 1,000-Ohms-per-Volt Meter

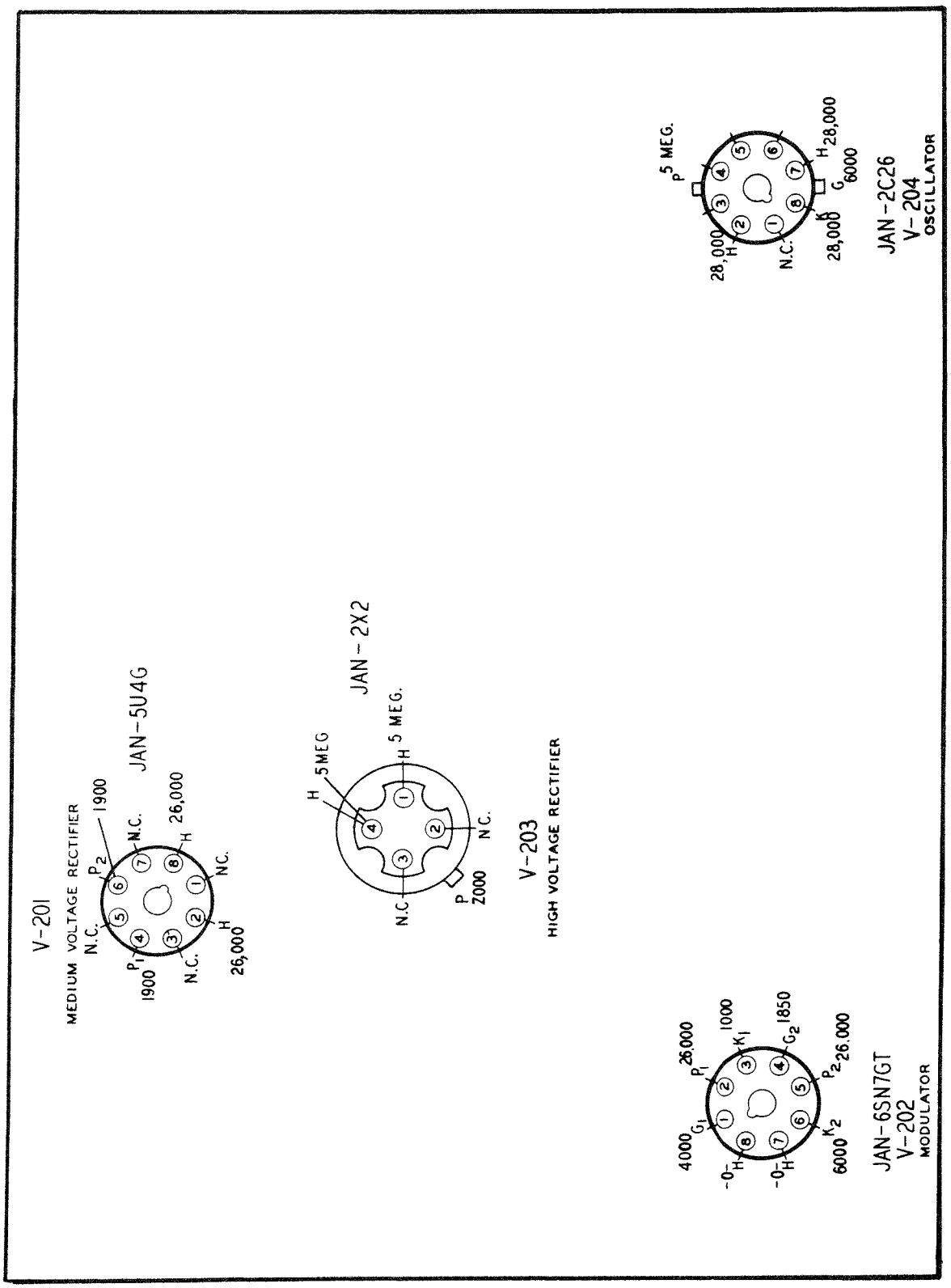


Figure 5-8. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Resistance Measurements

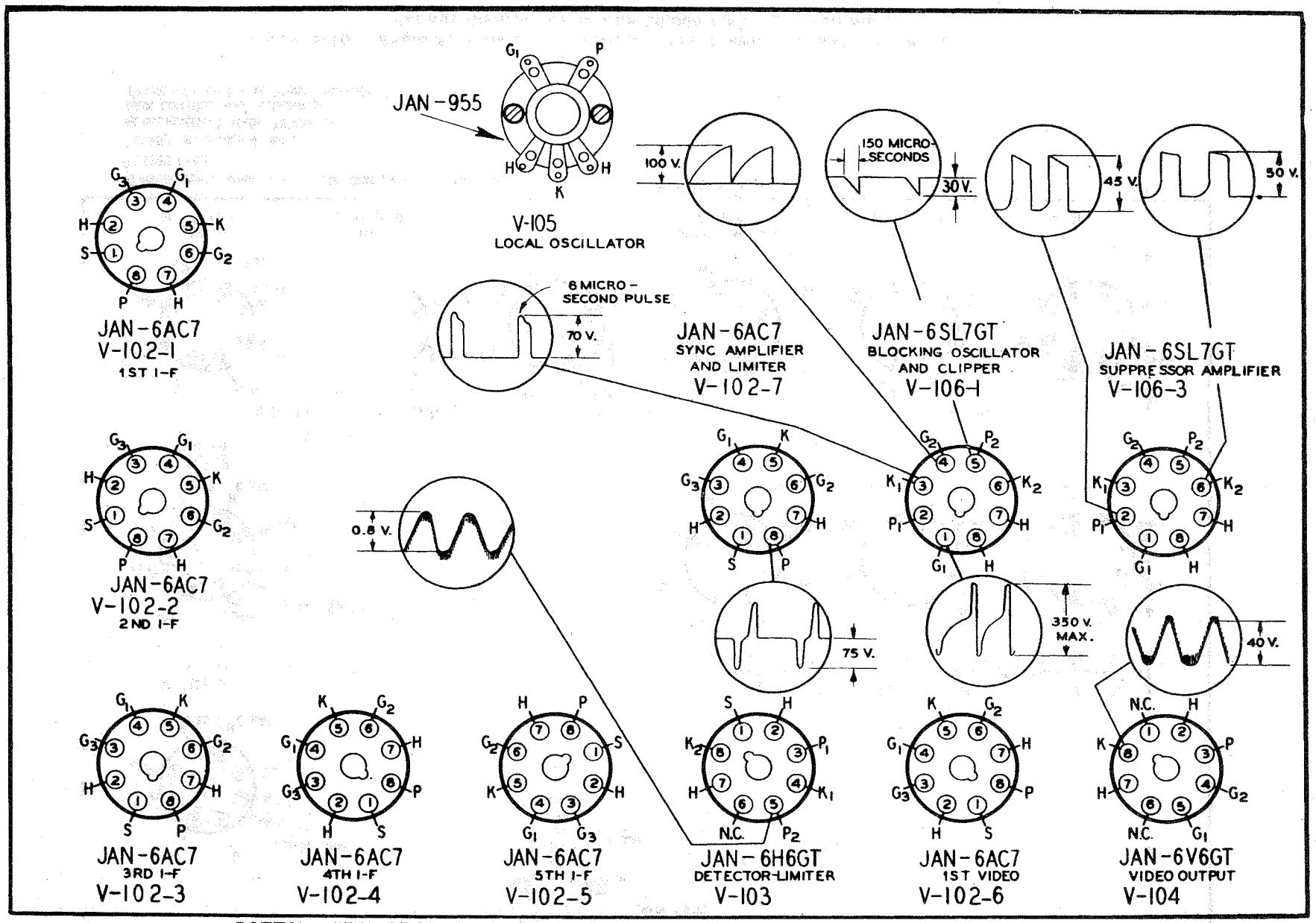


Figure 5-9. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2— Receiver Waveforms

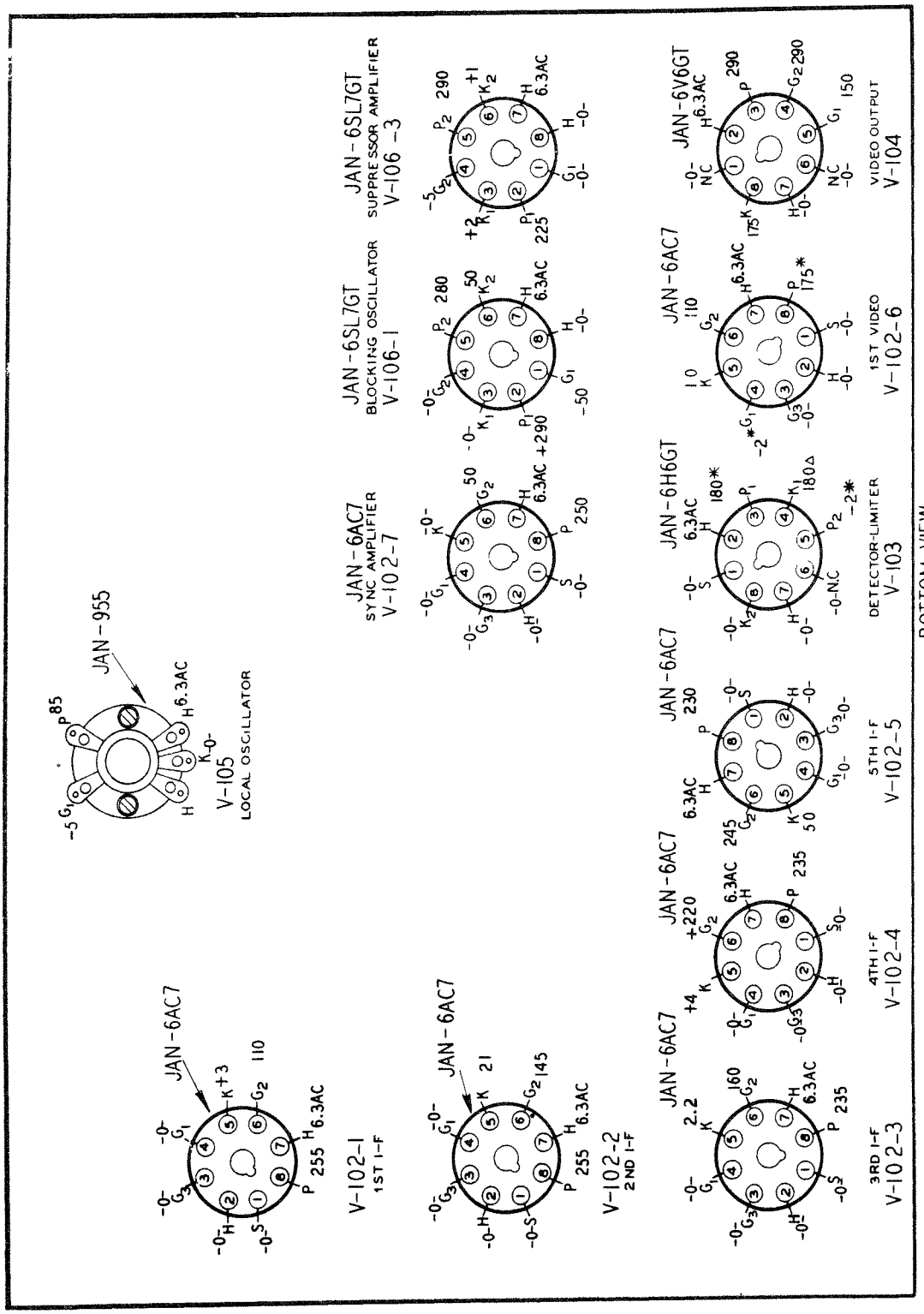
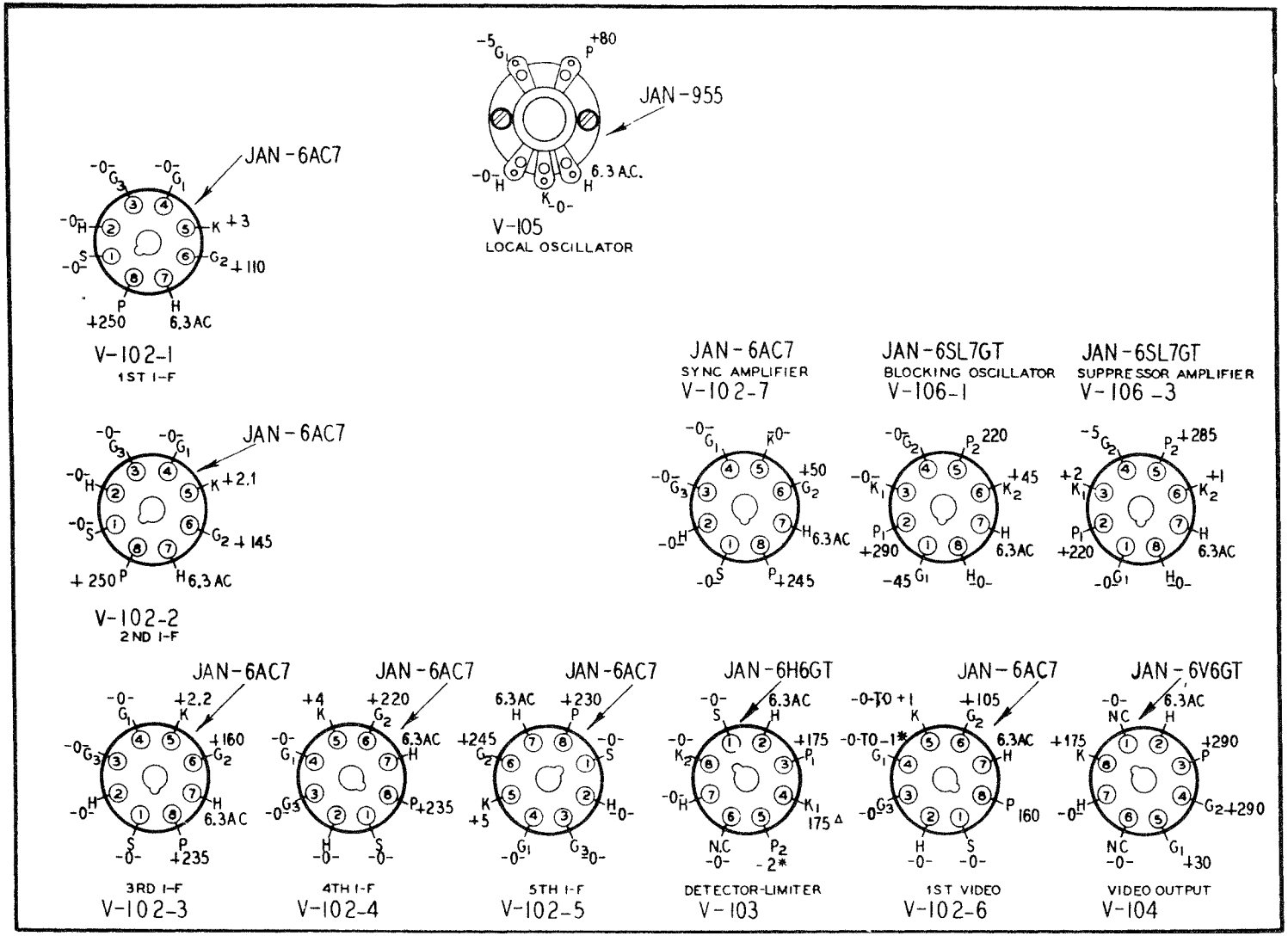
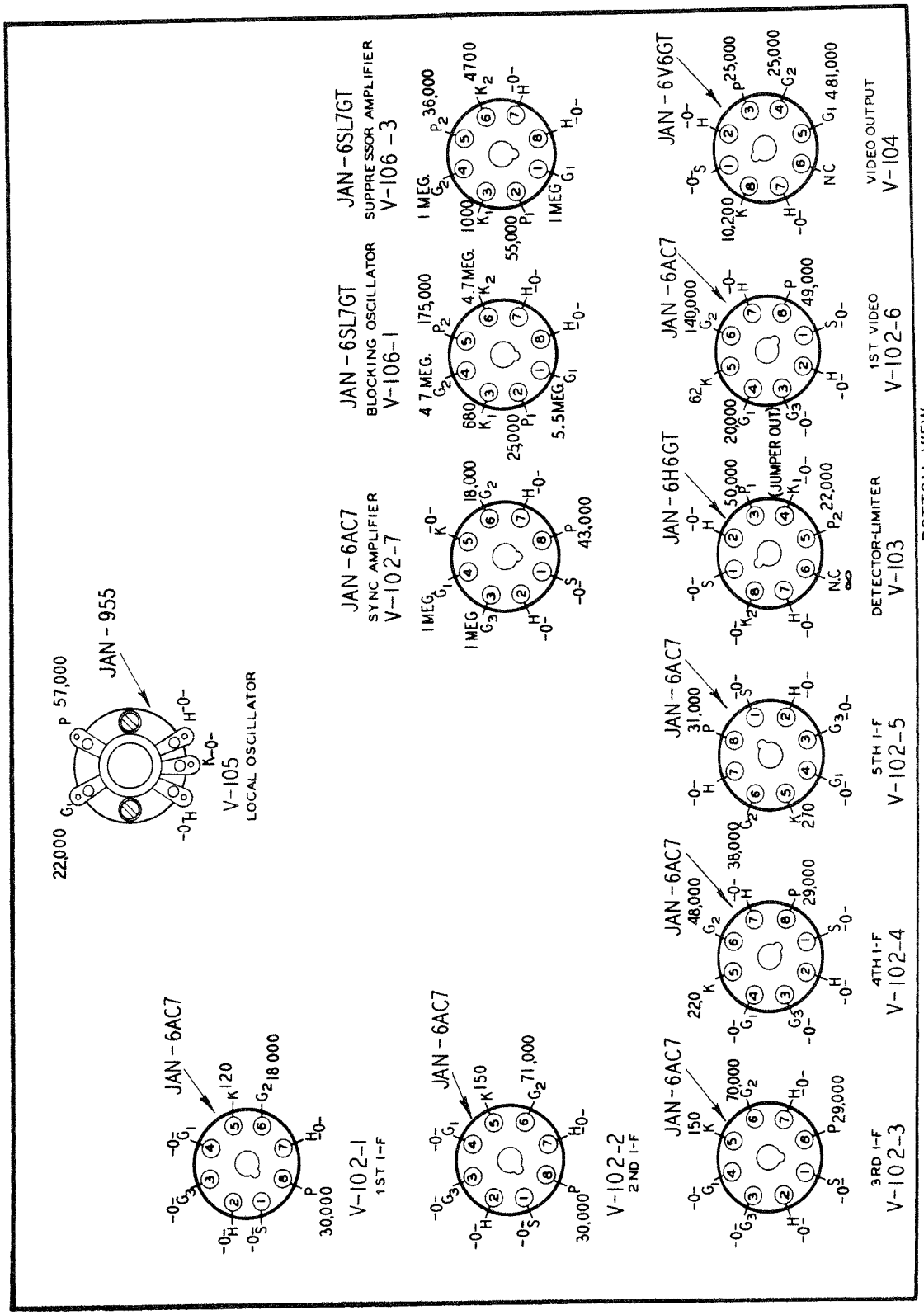


Figure 5-10. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver Voltage Measurements with 20,000-Ohms-per-Volt Meter



MEASUREMENTS MADE TO GND. (CHASSIS) WITH 1000 OHMS/VOLT VOLTMETER
ALL READINGS OF LESS THAN 10 VOLTS MADE ON 10 VOLT SCALE
ALL OTHERS MADE ON 500 VOLT SCALE
Δ LIMITER OUT
* VARIES WITH SIGNAL INPUT
TRANS-KEY SWITCH IN TRANS. POSITION

Figure 5-11. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2 Receiver Voltage Measurements with 1,000-Ohms-per-Volt Meter



DC RESISTANCE MEASUREMENTS FROM TUBE PINS TO CHASSIS WITH CONTROL BOX CONNECTED AND PLUG J102 IN SOCKET J204
POWER DISCONNECTED.
GAIN CONTROL MAXIMUM—LIMITER OUT
TRANS-KEY SWITCH IN STANDBY (CENTER) POSITION

Figure 5-12. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver Resistance Measurements

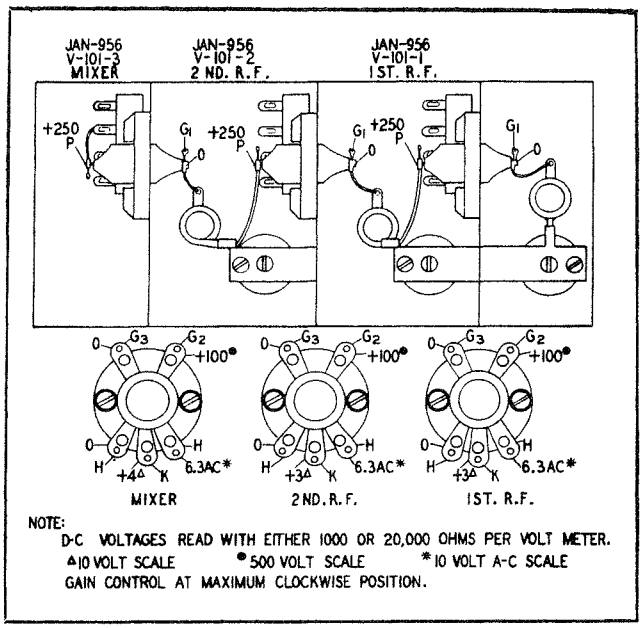


Figure 5-13. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver R-F Unit Voltage Measurements

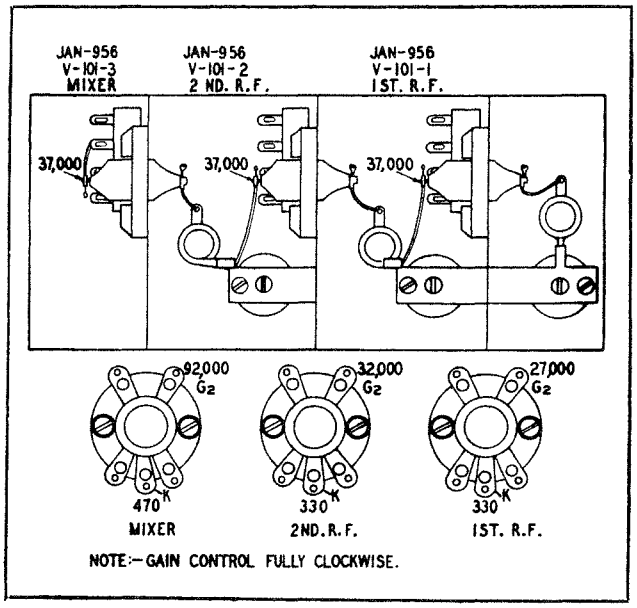
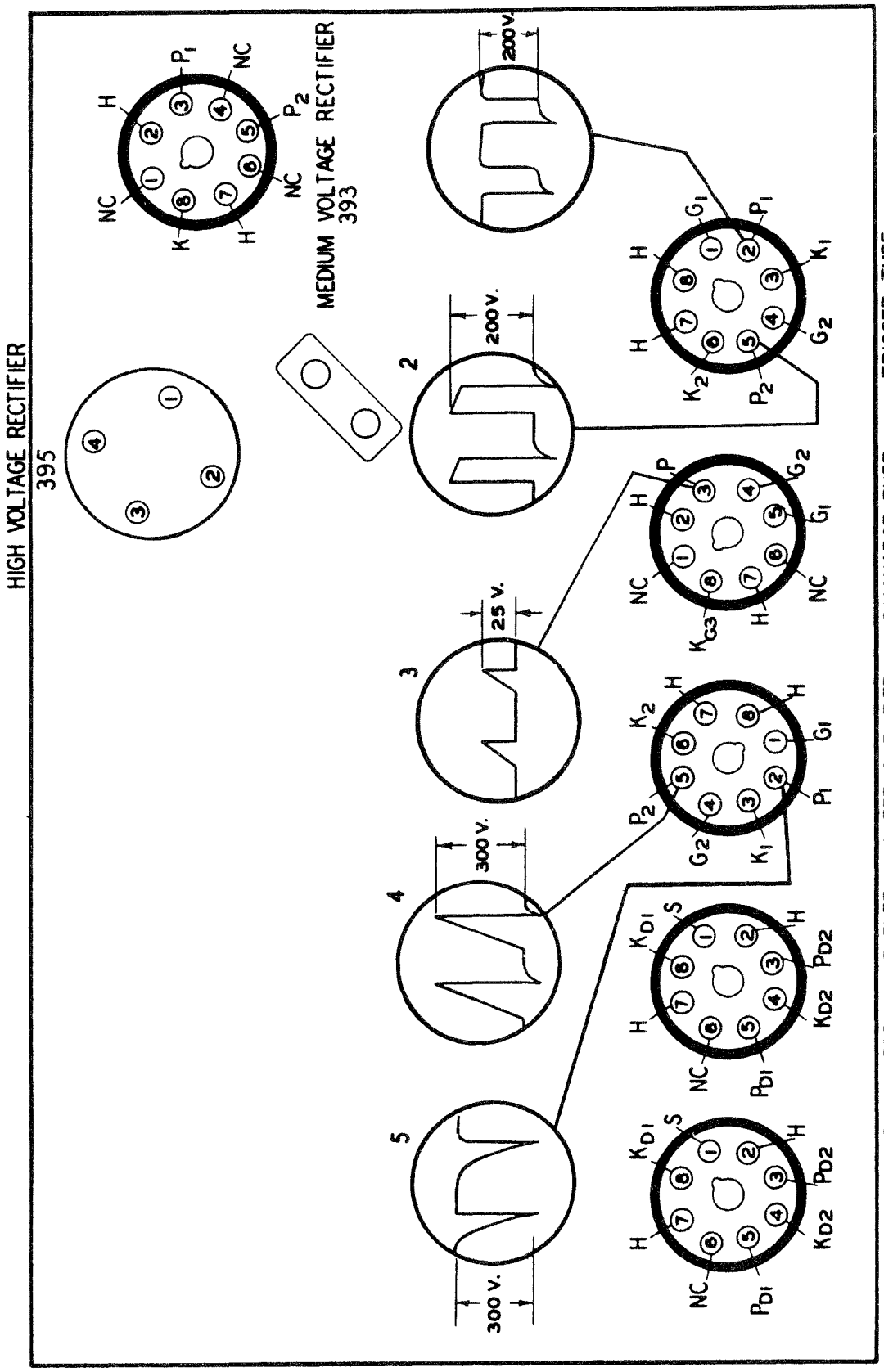


Figure 5-14. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver R-F Unit Resistance Measurements



NOTE:

VOLTAGES GIVEN ARE APPROXIMATE MAXIMUM VALUES TO BE EXPECTED AT POINTS INDICATED.
PULSE DURATION SHOWN AT 4 & 5.
10 MI. RANGE - 120 MICROSECONDS. 50 MI. RANGE - 600 MICROSECONDS. 100 MI. RANGE - 1200 MICROSECONDS.

Figure 5-15. Indicator BC-929-A—Waveforms

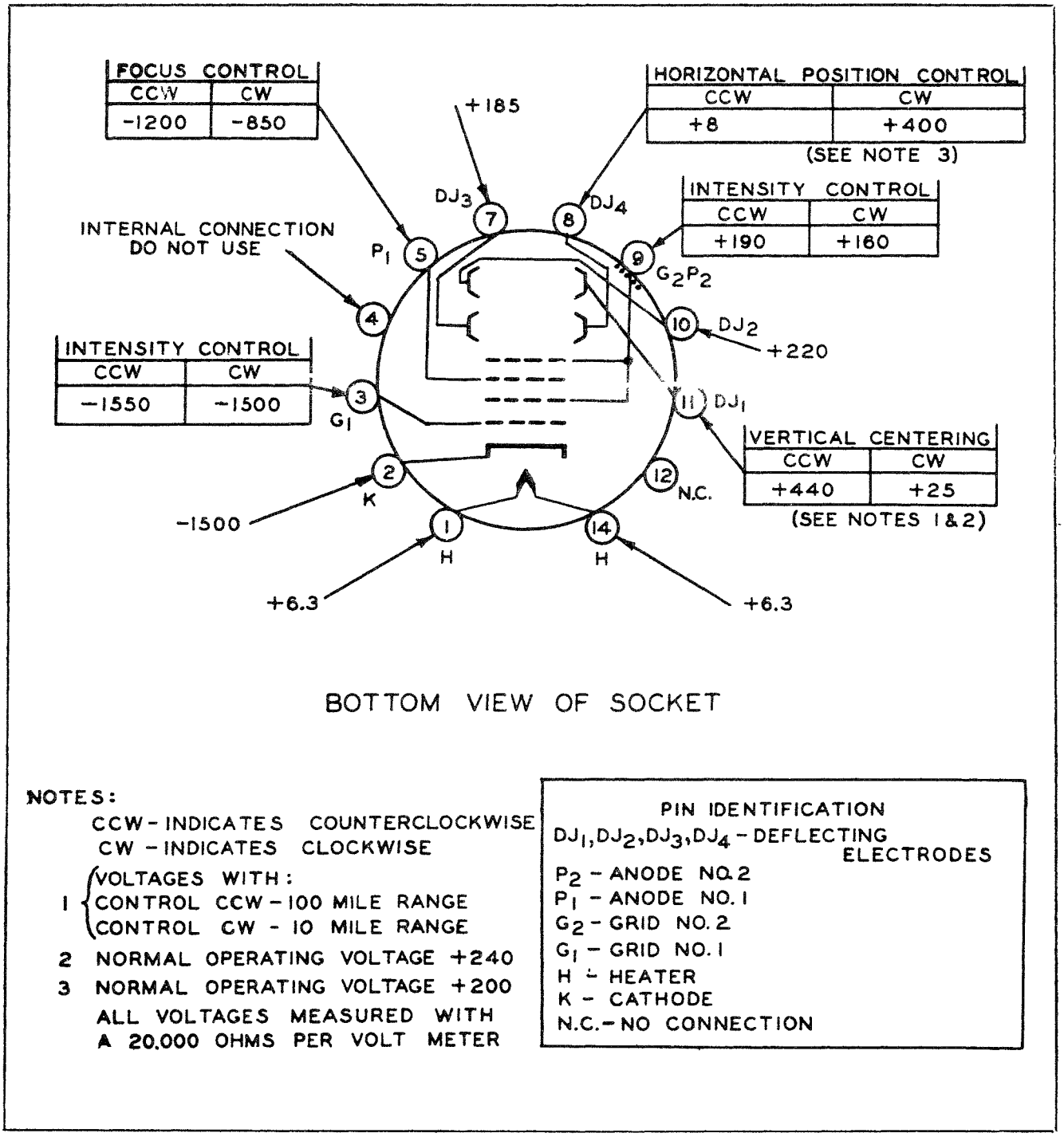
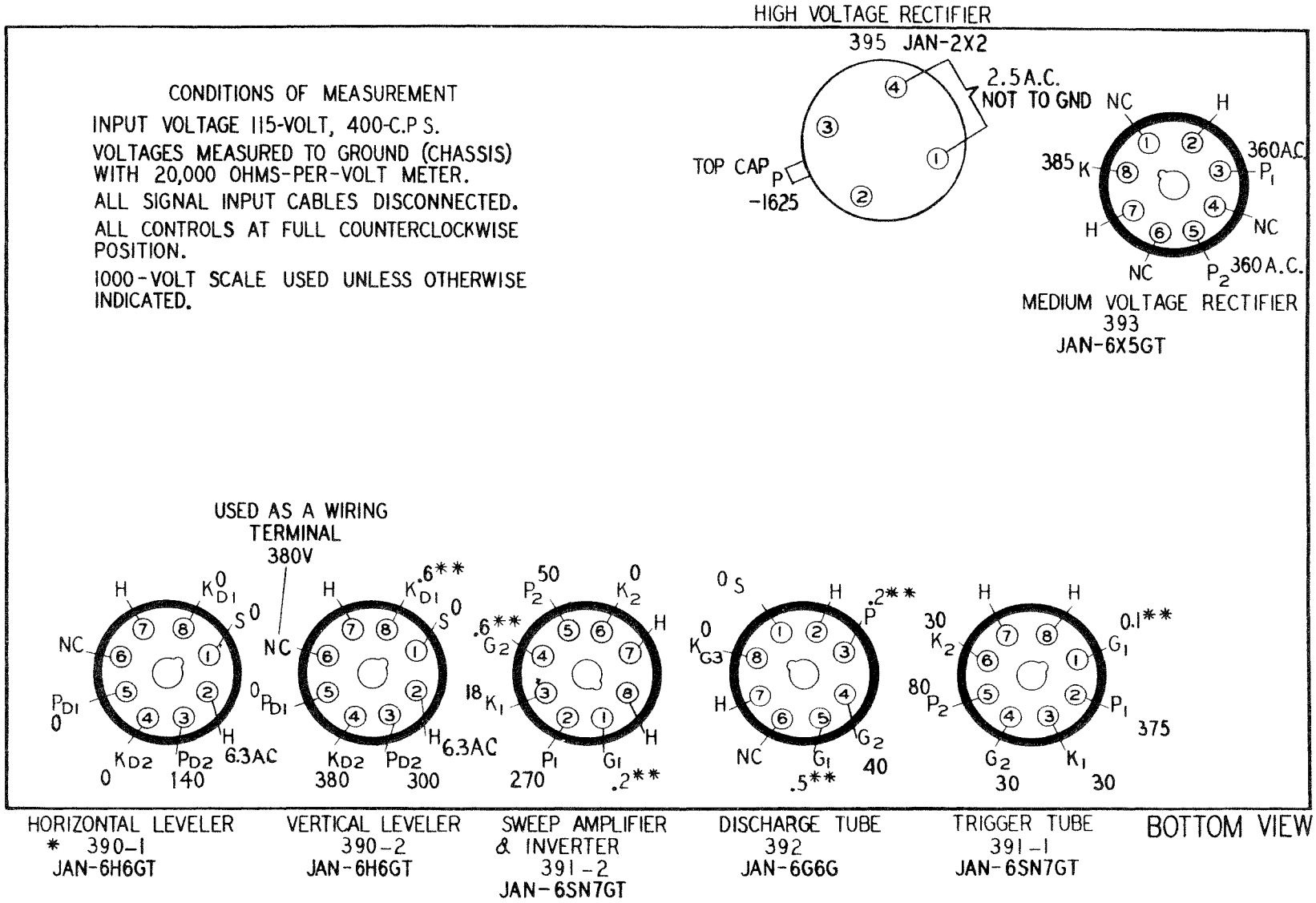


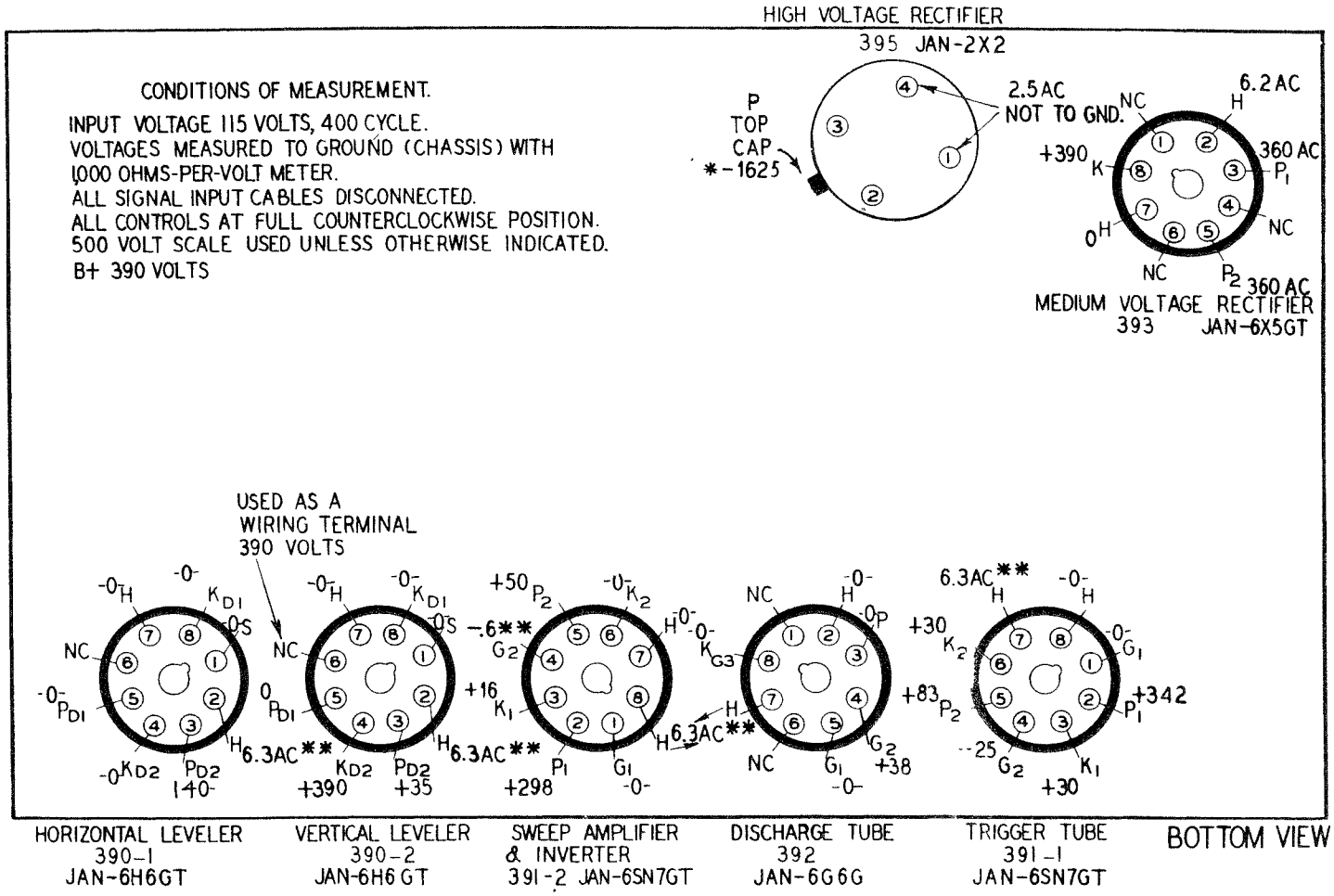
Figure 5-16. Cathode-Ray Tube Socket Voltages



*CHECK PINS 3 AND 4 OF TUBE 390-1 WITH CHASSIS MOUNTED POTENTIOMETER 307-4 FULLY CLOCKWISE FOR INDICATION OF 380 VOLTS. CHECK PINS 5 AND 8 WITH PANEL MOUNTED POTENTIOMETER 307-3 FULLY CLOCKWISE FOR INDICATION OF 380 VOLTS.

**10 VOLT SCALE USED.

Figure 5-17. Indicator BC-929-A—Voltage Measurements with 20,000-Ohms-per-Volt Meter



NOTE:

CHECK PINS 3 AND 4 OF TUBE 390-1 FOR INDICATION OF 390 VOLTS WITH POTENTIOMETER 307-4 FULLY CLOCKWISE.
CHECK PINS 5 AND 8 FOR INDICATION OF 390 VOLTS WITH POTENTIOMETER 307-3 FULLY CLOCKWISE
* 5000 VOLT SCALE USED.
** 10 VOLT SCALE USED.

Figure 5-18. Indicator BC-929-A—Voltage Measurements with 1,000-Ohms-per-Volt Meter

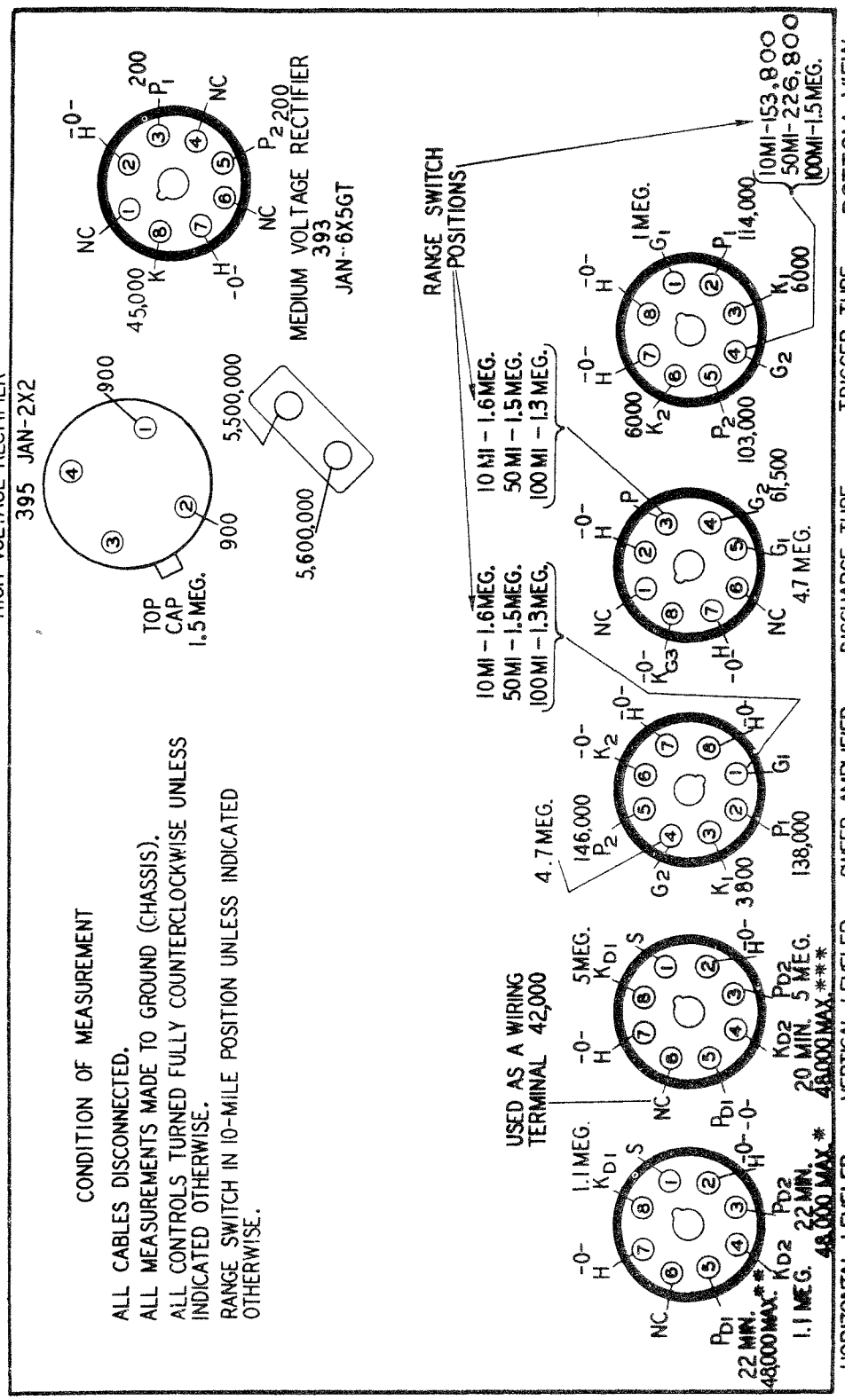


Figure 5-19. Indicator BC-929-A—Resistance Measurements

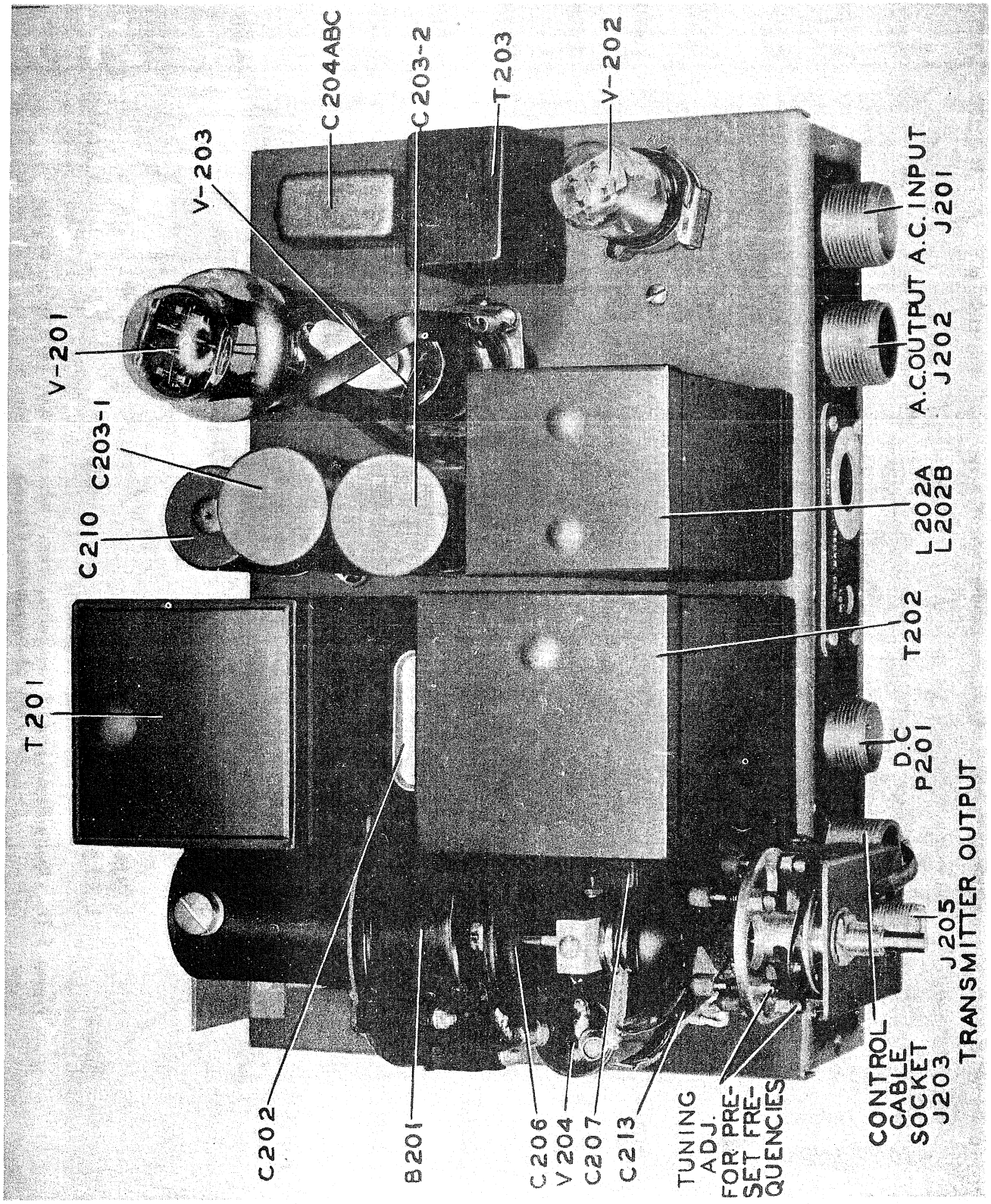


Figure 5-20. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Top View of Transmitter Chassis

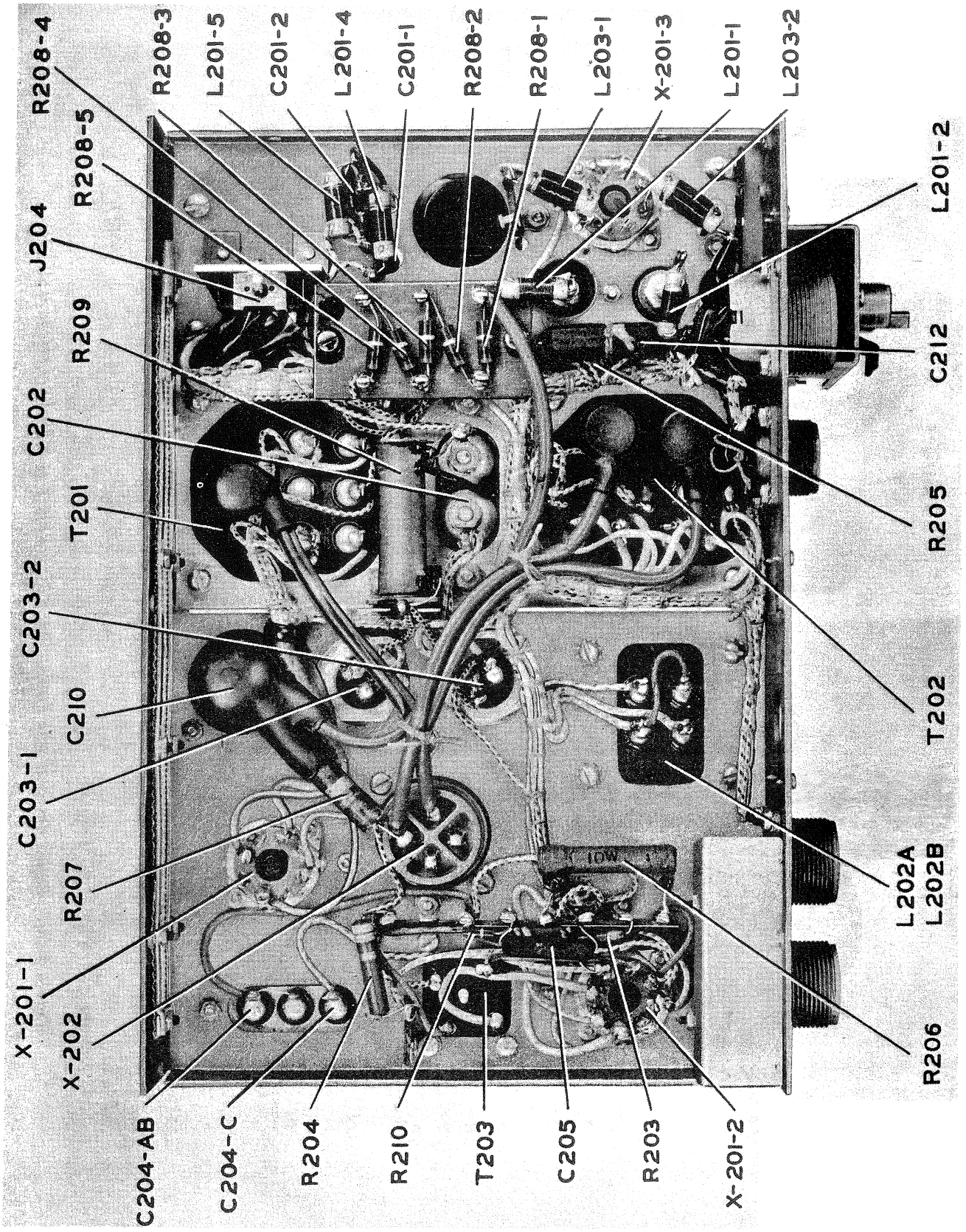


Figure 5-21. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Bottom View of Transmitter Chassis

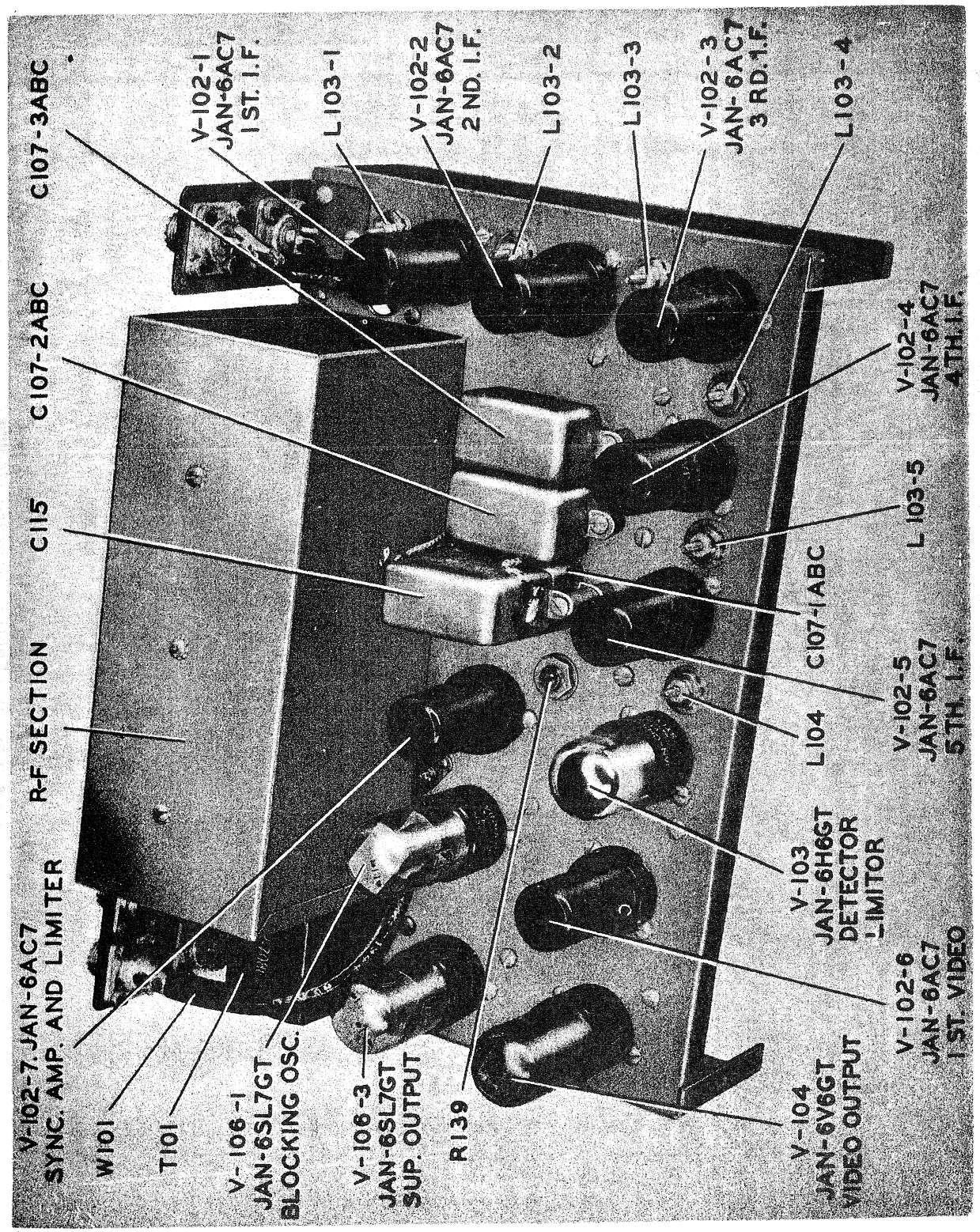


Figure 5-22. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Top View of Receiver Chassis

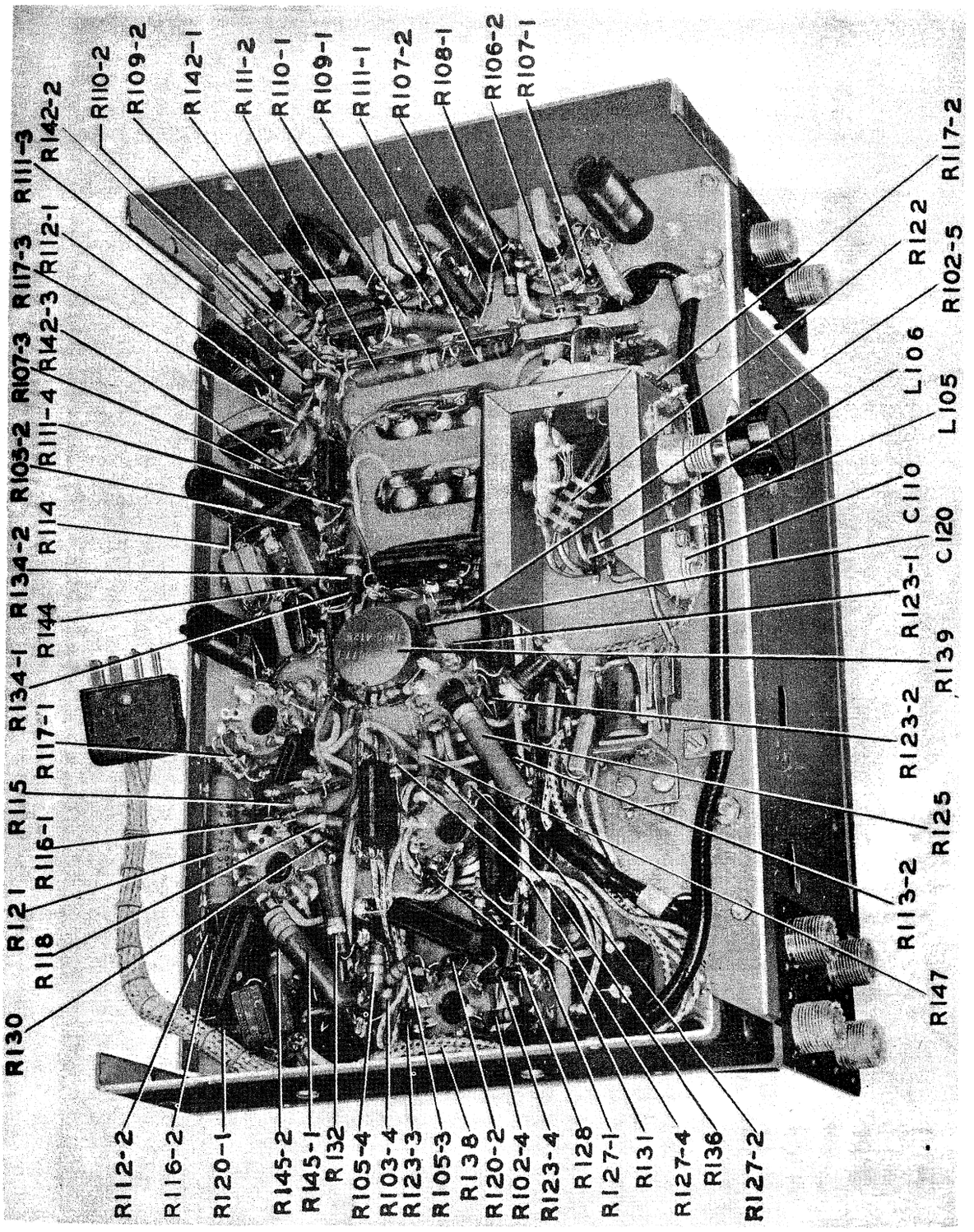


Figure 5-23. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Bottom View of Receiver Chassis, Capacitors Identified

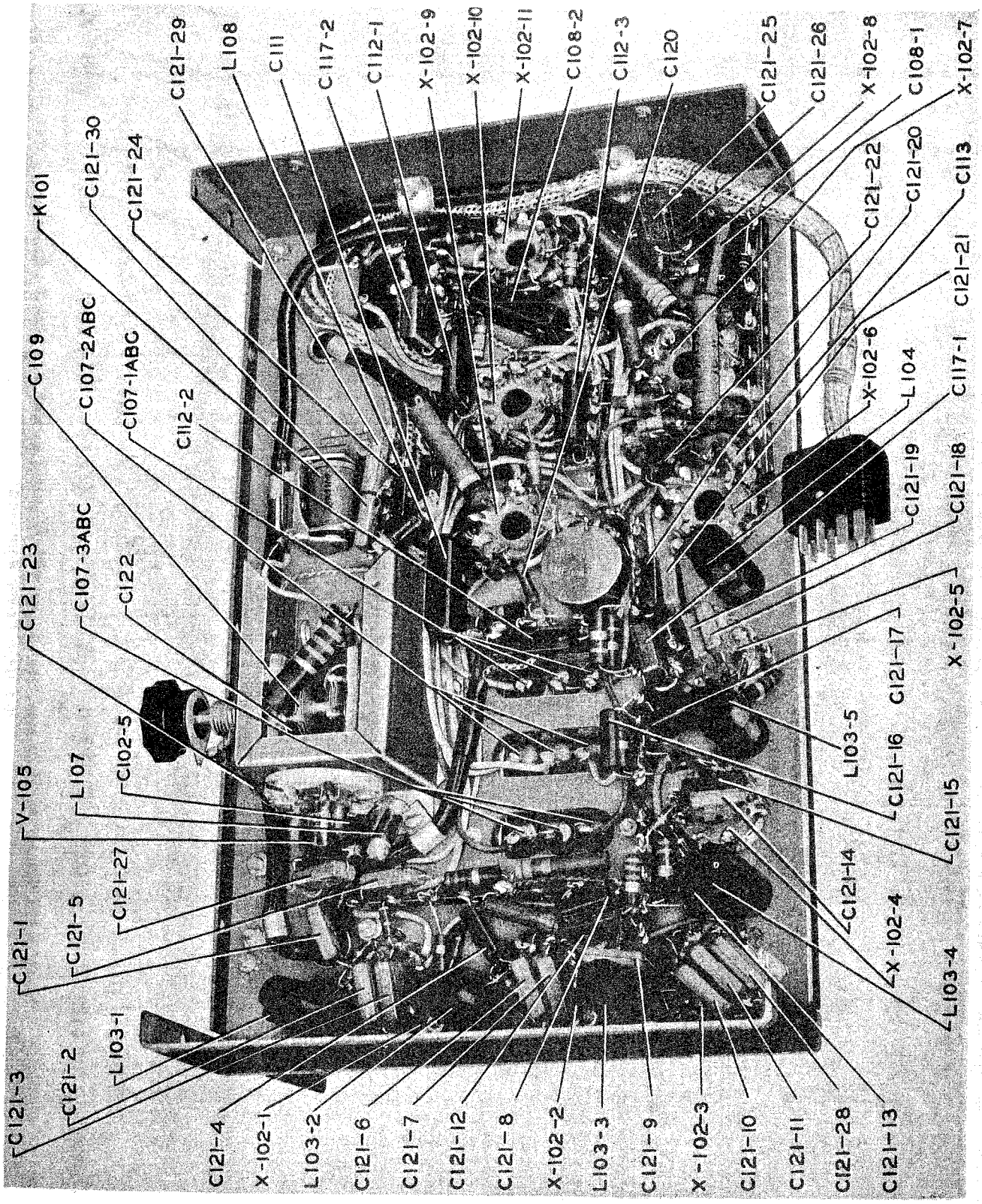


Figure 5-24. ***Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Bottom View of Receiver Chassis, Resistors Identified***

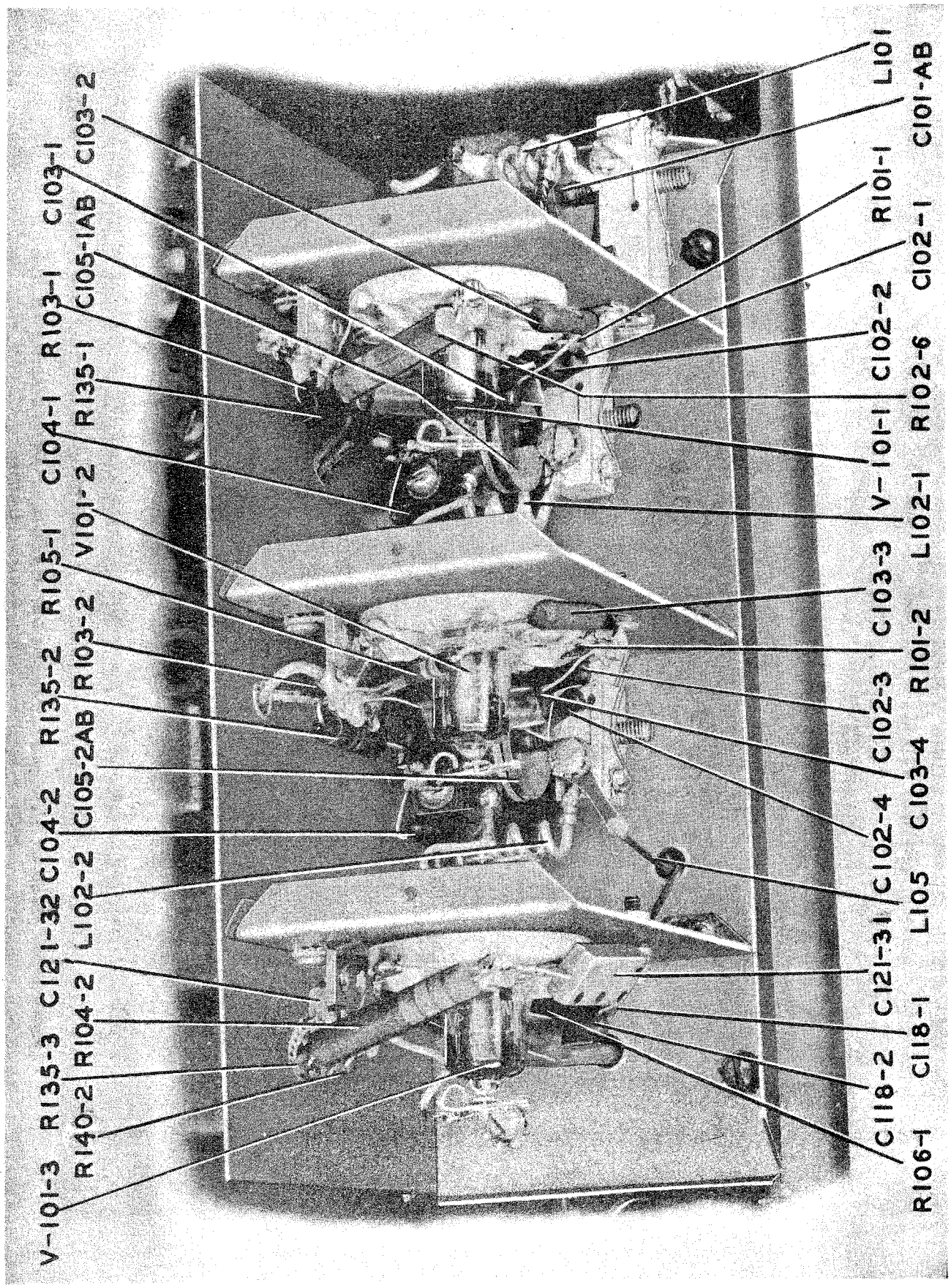


Figure 5-25. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver R-F Unit, Cover Removed

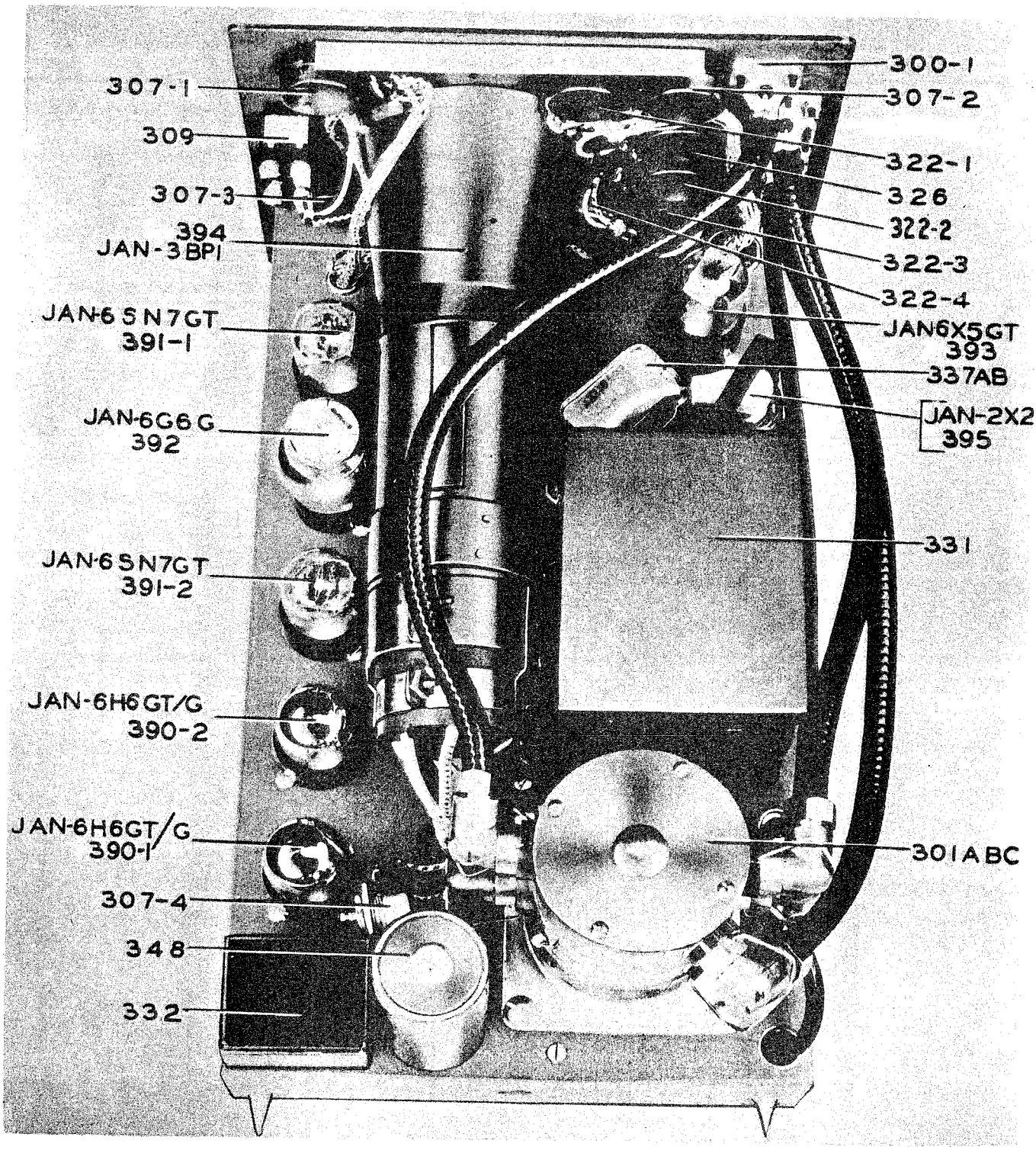


Figure 5-26. Indicator BC-929-A—Top View of Chassis

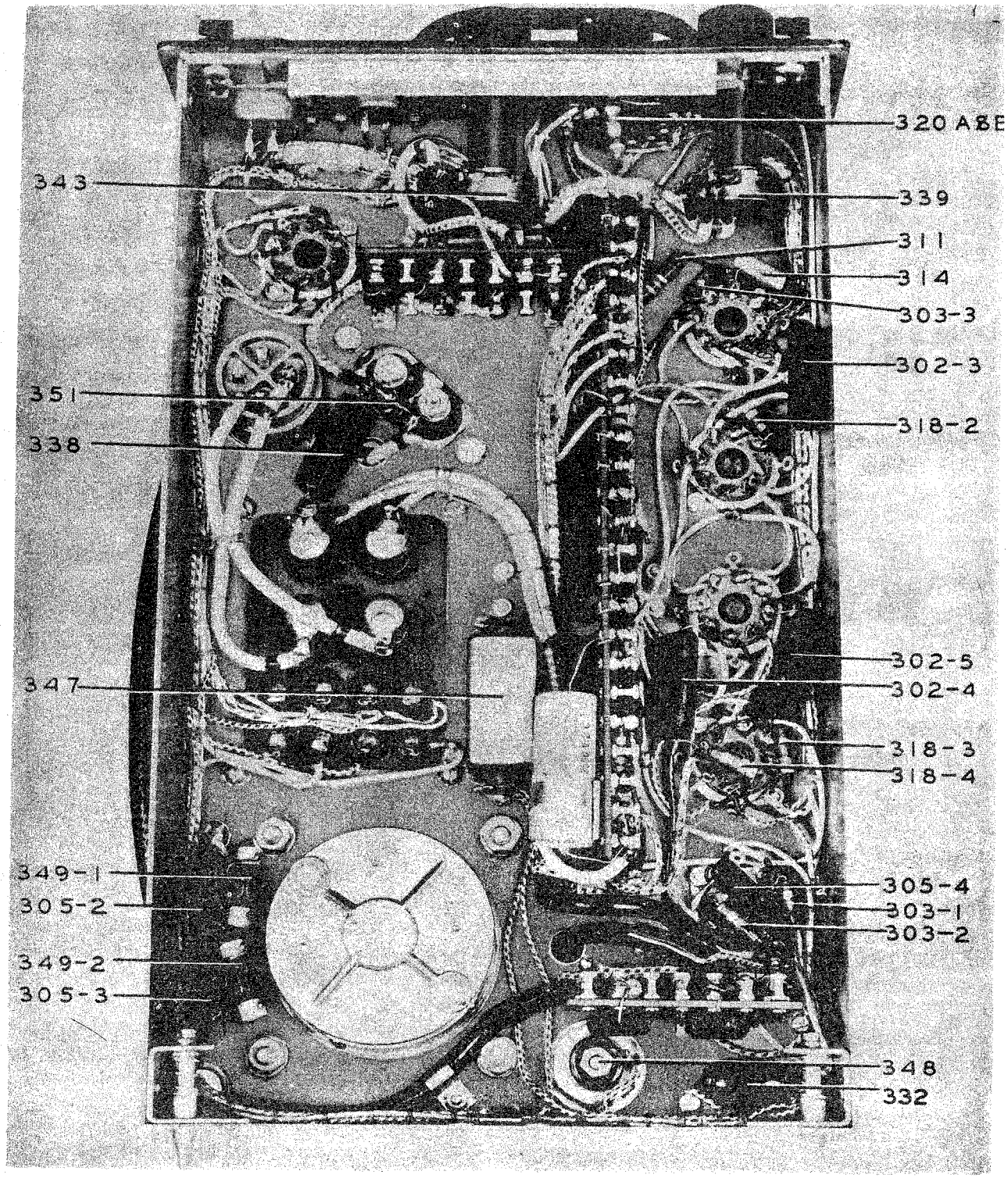


Figure 5-27. Indicator BC-929-A—Bottom View of Chassis

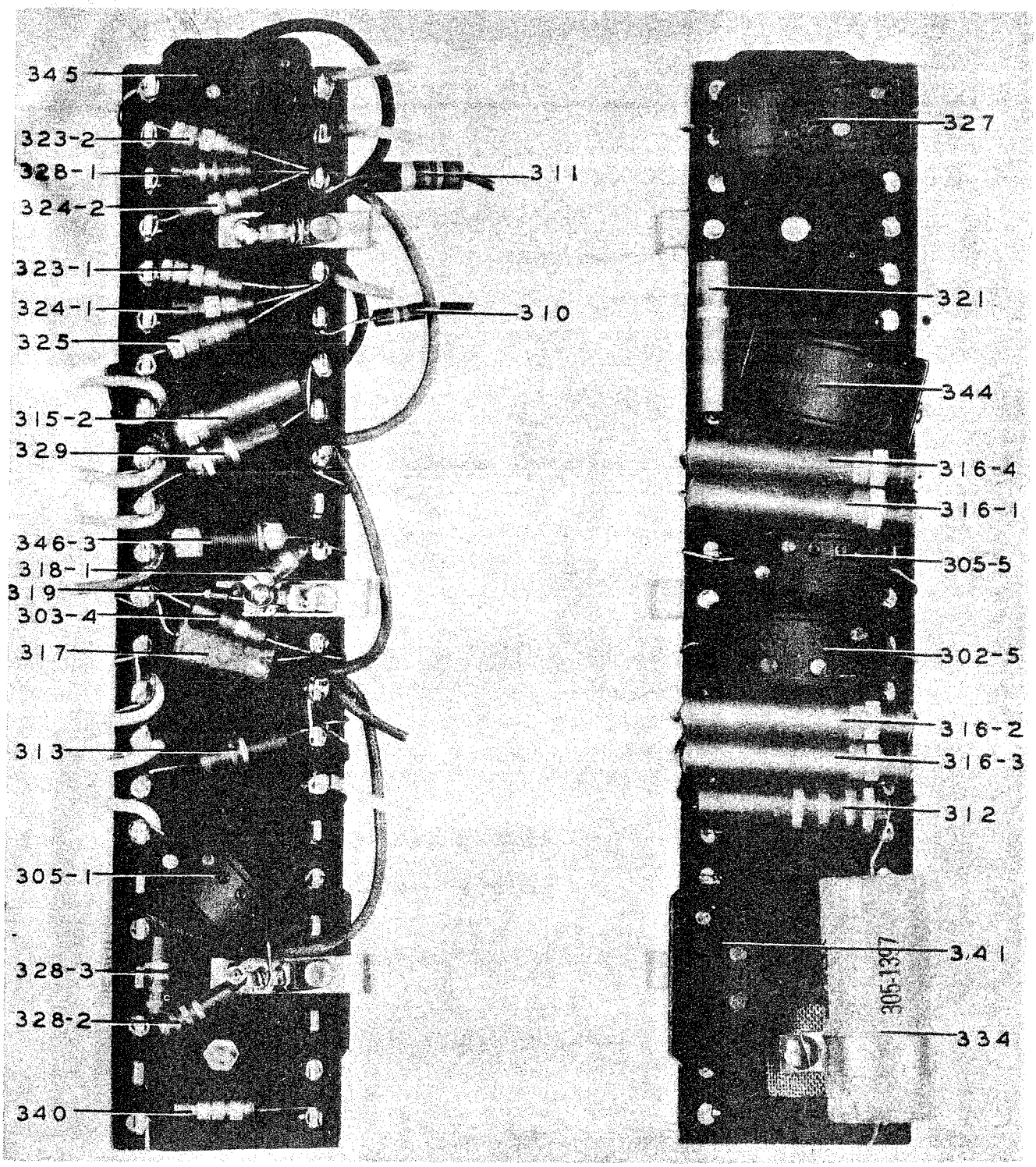


Figure 5-28. Indicator BC-929-A—Chassis, Components Mounted on Each Side of Long Wiring Panel

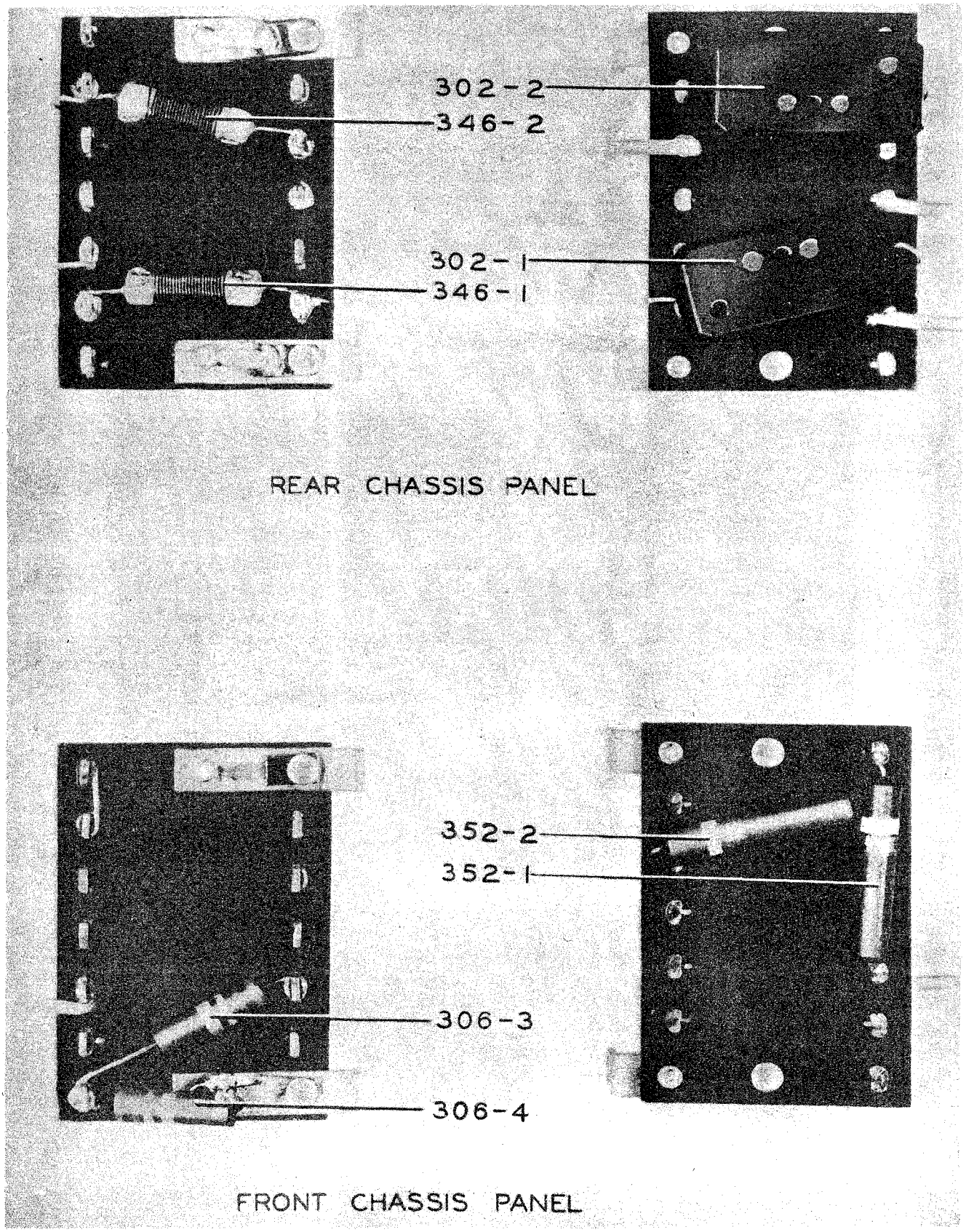


Figure 5-29. Indicator BC-929-A—Chassis, Components Mounted on Each Side of Short Wiring Panels

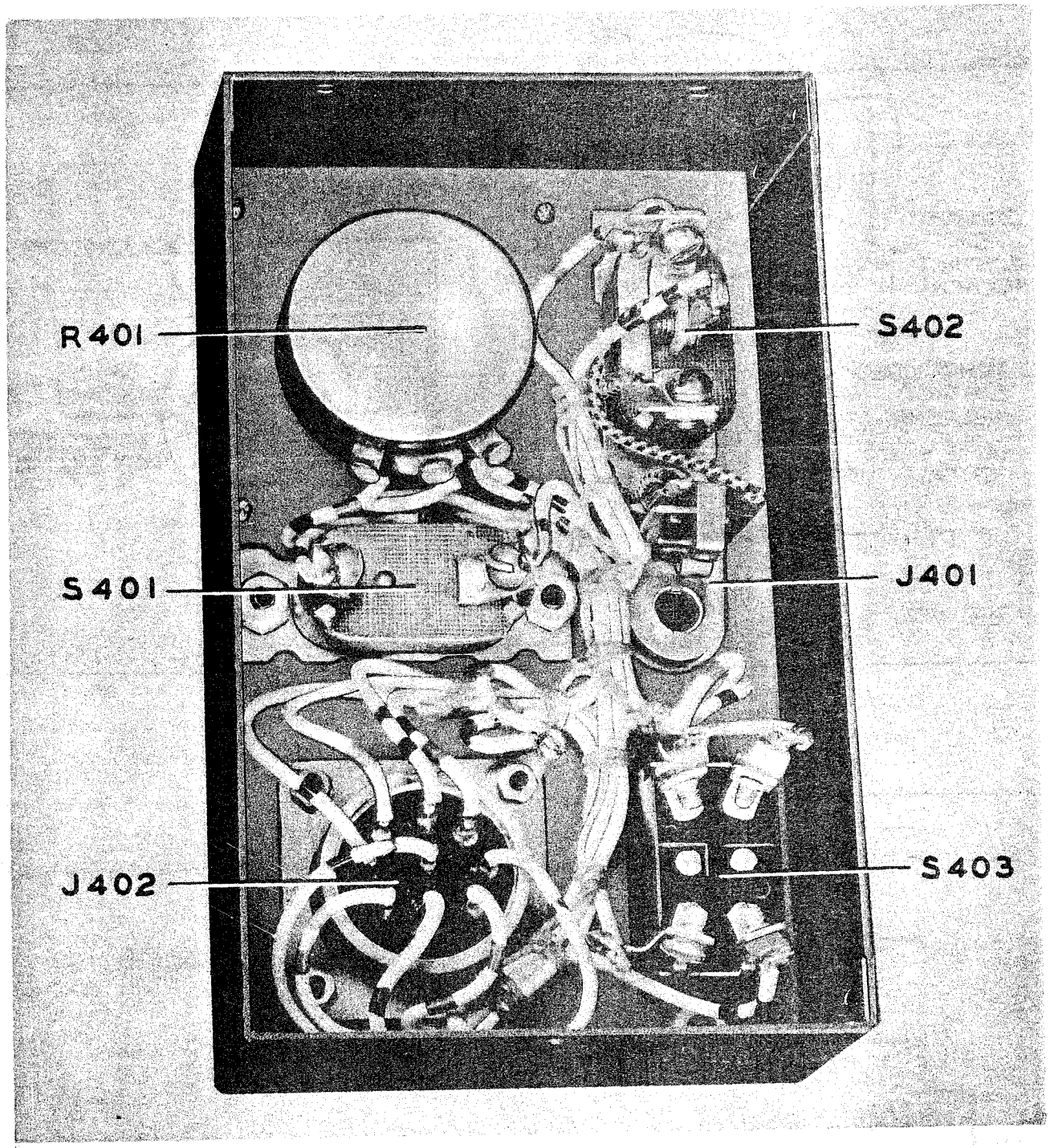


Figure 5-30. Radio Control Box ★C-3/APN-2— Rear Cover Removed

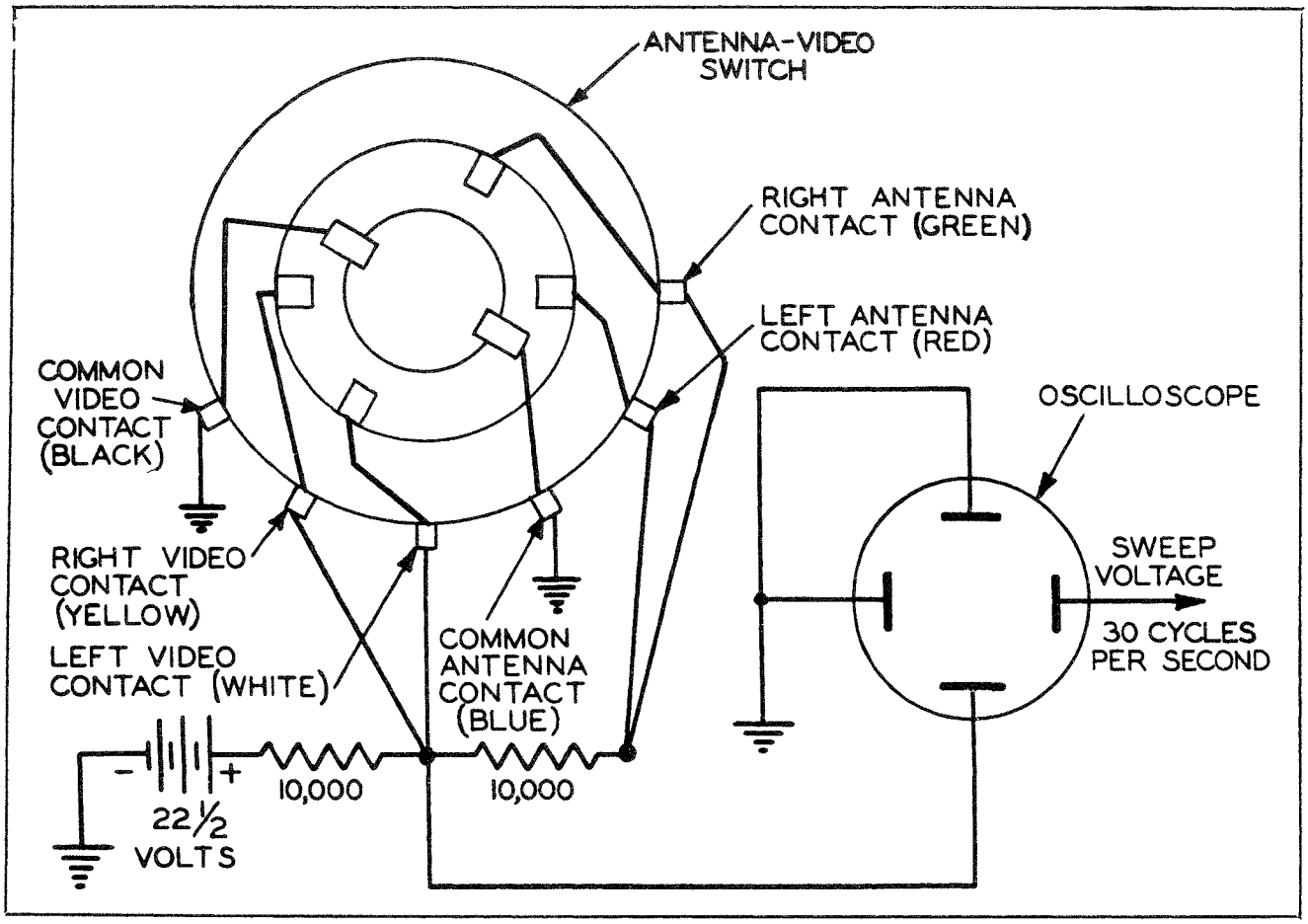


Figure 5-31 Antenna-Video Switch, Diagram of Test Connections

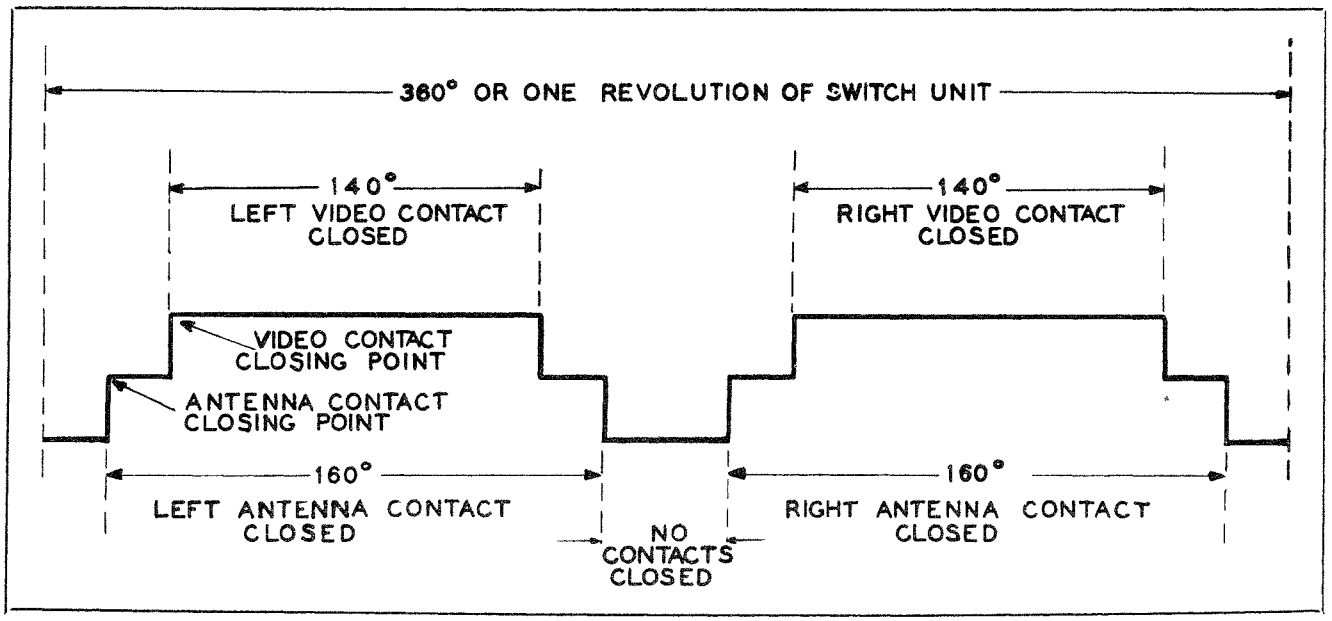


Figure 5-32 Antenna-Video Switch, Waveform Showing Proper Setting

5. SPECIAL MAINTENANCE OPERATIONS.

a. ANTENNA-VIDEO SWITCH ADJUSTMENT.

Note

Switch contacts must never be adjusted unless it is determined that they are defective in some manner by checking with an oscilloscope. Usually all that will be required, as far as general maintenance is concerned, or when excessive noise is apparent on the indicator cathode-ray-tube screen, is to clean the switch contacts periodically with carbon tetrachloride or equivalent cleaning fluid.

(1) The antenna-video switch, located in Indicator BC-929-(*), is designed to switch the right, and then the left, receiving antenna alternately into the receiver, and, in synchronism with the video output, first into the right and then into the left cathode-ray-tube horizontal deflecting plates. This enables relative azimuth bearing to be determined by noting whether the received pulses (beacon signals) are stronger on the right or left side of the indicator screen.

(2) The antenna switch must always close before its corresponding video switch, and this video switch must always open before its corresponding antenna switch. If an antenna switch opens or breaks contact before its corresponding video switch, noise impulses, due to switching, will be seen on the indicator screen.

Note

Intermittent flashes of noise, which curve downward and outward from the base line, will sometimes be noted on the indicator screen. This noise is sometimes called the pine-tree effect. The pine-tree effect is characteristic of the type of motor switch used and is not objectionable. It is caused by the exponential discharge of one plate of the indicator tube when the switch contacts have been broken at the top of some pulse. *This cannot be corrected by alignment or adjustment of the switch.*

b. ANTENNA-VIDEO SWITCH CHECK USING OSCILLOSCOPE.

(1) Disconnect all video and antenna cables from antenna-video switch in Indicator BC-929-(*).

(2) Connect antenna-video switch to battery, oscilloscope, and resistance network, as shown in figure 5-31.

(a) Connect the common contact across the video and antenna switches to ground.

(b) Then connect the right and left video terminals and the right and left antenna terminals to resistance network, as shown.

(c) The connection into the oscilloscope vertical-deflecting plates should be such that, if a positive voltage is fed in, the oscilloscope cathode-ray-tube beam will be deflected downward. If the oscilloscope connections are such that the beam moves upward when a positive voltage is applied, reverse the battery connections.

Note

The resistance and battery values do not necessarily have to be those shown. Keep the resistance high enough and the battery voltage low enough to prevent excessive current flow through antenna and video switch contacts.

(3) Connect Indicator BC-929-(*) to the proper d-c power source and turn the antenna-video switch on by setting the "ON-OFF" switch to the "ON" position.

(4) Turn the oscilloscope on by setting the "INTENSITY-OFF" switch in the "INTENSITY" position.

(5) Make the proper adjustments on the oscilloscope controls until a picture is obtained on the oscilloscope, as shown in figure 5-32.

(6) If the antenna-video switch is properly adjusted, the number of degrees the various antenna and video contacts are closed or open are shown in figure 5-33. A small variation in the antenna contact adjustment from these figures is permissible.

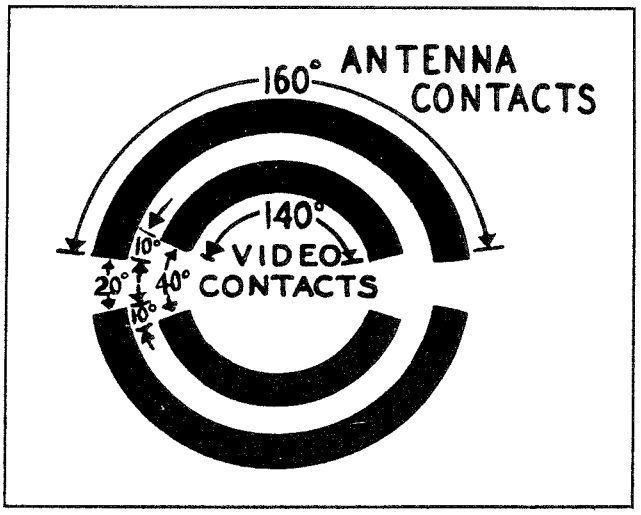


Figure 5-33. Antenna-Video Switch Contact Timing

Note

If the oscilloscope is non-linear, an untrue or distorted trace may be obtained. For example, in figure 5-32, the left video and antenna traces may appear much larger or smaller than the right video and antenna traces and may even appear out of the specified tolerances.

(7) If the picture shown in figure 5-34 is obtained, the video contacts are closing and opening too soon with respect to the antenna contacts, although the length of time that they remain closed is correct. To correct this condition, loosen the two housing clamps, holding the antenna switch to the video-switch section, shown in figure 5-35, thus allowing the antenna-switch housing to be moved with respect to the video-switch housing. Rotate the antenna (top) housing until a picture is obtained as shown in figure 5-32.

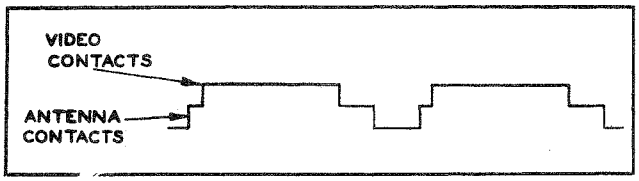


Figure 5-34. Antenna-Video Switch, Waveform Showing Improper Video Setting

(8) If the waveform looks like that shown in figure 5-36, it indicates that one video switch is closing too soon.

Note

In this test setup, the right, or the left, waveform on the screen may show the action of *either* right or left contact, depending on which contact closed first when the motor started turning.

To correct the video adjustment proceed as follows:

(a) Remove the Allen set-screws in the adjusting holes on each side of the video-switch housing. (See fig. 5-35.)

(b) Insert the Allen wrench into each video adjusting screw in turn, and adjust slightly while watching the screen, to determine which screw requires adjustment.

(c) Adjust the desired contact until the waveform shown in figure 5-32 is obtained.

(d) After the contact is properly adjusted, replace the Allen screws in the adjusting holes on each side of the video-switch housing, to keep out dirt and moisture.

(e) The antenna contacts may be adjusted in the above manner, if required.

(9) Chattering or defective contacts can easily be seen when using the oscilloscope for checking. Bad contacts will not always be apparent unless the switch is opening and closing at operating speed. For instance, if a video contact is chattering or breaking contact for an instant when it is supposed to be closed, the oscilloscope trace line will drop at the instant this video contact breaks, as shown in figure 5-37.

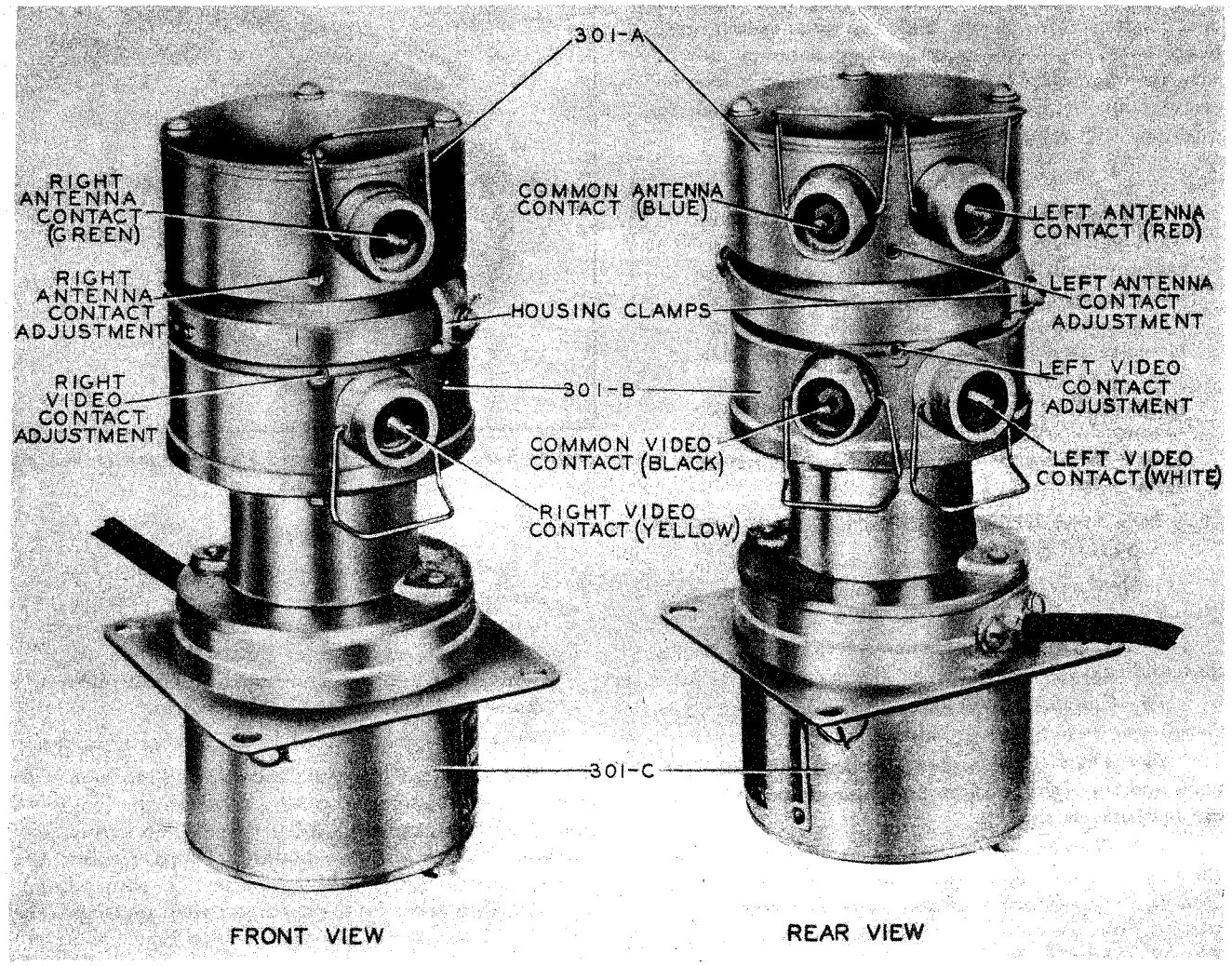


Figure 5-35. Antenna-Video Switch, Connections and Adjustmenets

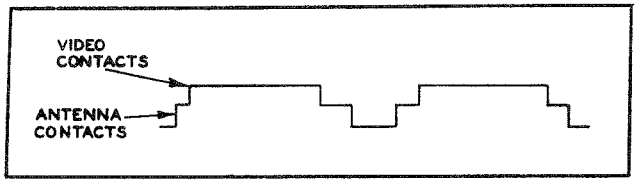


Figure 5-36. Antenna-Video Switch, Waveform Showing Early Closing of One Video Contact

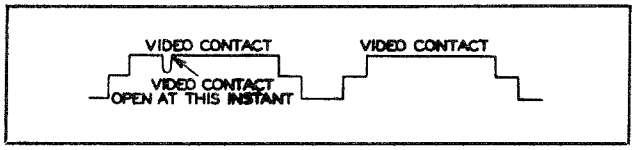


Figure 5-37. Antenna-Video Switch, Waveform Showing Defective Video Contact

(10) To check for defective antenna contacts, the video connections must be removed; the picture shown in figure 5-38 should then be seen. If any chattering occurs (breaking of contact), it will be evidenced by blips on the trace line. (See fig. 38a.)

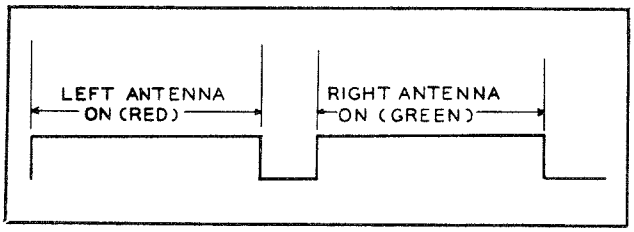


Figure 5-38. Motor Switch Oscilloscope Patterno-Video Contacts Removed

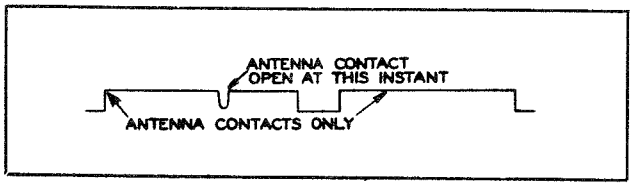


Figure 5-38A. Antenna-Video Switch, Waveform Showing Defective Antenna Contact

(11) It was noted in subparagraph (6) above that antenna contact adjustment may vary slightly. This means that the left antenna contact may open at about the same time the right antenna contact closes, as shown in figure 5-39. However, the right antenna contact must not close *before* the left antenna contact opens.

c. ANTENNA-VIDEO-SWITCH CHECK USING OHMMETER. — The antenna-video switch may be checked by using ohmmeters, if an oscilloscope is not available, as follows:

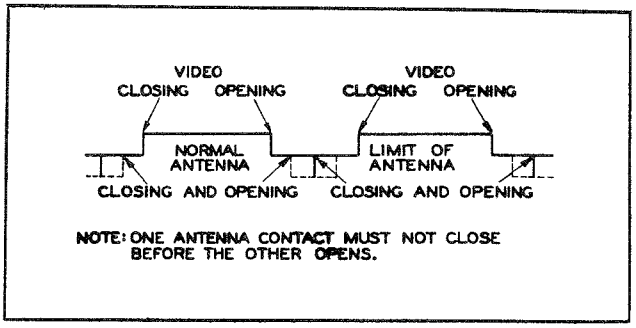


Figure 5-39. Antenna-Video Switch, Waveform Showing Limits of Antenna Switch Setting

(1) Remove the antenna and video cables from the switch unit and connect ohmmeters to the contact channels.

(2) By removing the switch unit's top cover, it is possible to turn the switch rotor manually with a screw driver.

(3) Check the number of degrees of rotation during which different contacts remain closed.

(4) Lay a disc of paper across the top of the switch unit, and note the position of the screwdriver when various contacts open and close. Degrees of rotation can then be checked by using a protractor.

d. REMOVAL OF CATHODE-RAY TUBE.—Exercise particular care in removing the cathode-ray tube from the indicator. Remove the indicator tube as follows:

(1) Loosen the screw which clamps the socket assembly to the tube shield.

(2) Remove the three black screws which hold the indicator range-scale cap to the front panel.

(3) Place the end of the screw driver against the ¾-inch pin extending from the center of the tube base.

(4) Push on the screw driver with one hand while holding the screen end of the tube with the other, in order to prevent the tube from suddenly popping out and dropping to the floor. The screw driver should be used to push the tube completely out of its socket.

e. CABLE SPLICE.

(1) If coaxial cables become broken or damaged, the following is a method of repair which can be used as a temporary measure until the whole cable can be replaced. Use Plug PL-258 and two Plugs PL-259 for each splice. (This connection is equivalent to six inches of coaxial cable. This fact must be taken into account when line length is critical.) A length of coaxial cable can be inserted in a line by using the above method on each end of the patch cable. (It must be borne in mind that the two connectors are equivalent to 12 inches of coaxial cable.)

f. LUBRICATION DATA.—Table 5-4 lists the lubrication required for Radio Set ★AN/APN-2 or ★AN/APN-2Y.

TABLE 5-4.—Lubrication Data

Major Assembly	*Part*	*Type of Lubrication*	*Quantity of Lubrication*	*Lubrication Period*	*Procedure*	*Lubrication Designation at Lowest Expected Ambient Temperature °F on Ground.*				
						−65° to −40°	−40° to −10°	−10° to +32°	+32° to +100°	+100° to +160°
Indicator BC-929-(*)	Antenna-video switching motor bearings	Grease	⅔ fill spaces	Note 1	⅔ fill spaces around bearings with grease	GL	GL	GL	GL	GL
Radio Receiver and Transmitter *RT-1/APN-2 or *RT-1A/APN-2	Blower motor	Grease	⅔ fill space	Note 2	⅔ fill space around bearings with grease	GL	GL	GL	GL	GL

Lubrication Designation	*Specifications*				*Notes*
	ANA	*Army*	*Navy*	*British*	
GL		AN-G-3a	AN-G-3a		1. Service only when disassembled. This item should require no attention for the life of the equipment. 2. Service every 1,000 hours.

6. ALIGNMENT PROCEDURE, USING BASE TEST EQUIPMENT.

a. RECEIVER ALIGNMENT.

(1) EQUIPMENT REQUIRED.—To check and align the various circuits in the receiver section of Radio Set ⋆AN/APN-2, the following equipment is needed:

(a) General Radio Signal Generator Type 804-C or equivalent. (Signal Generator 804-C is the original Signal Generator 804-B modified for pulsating output.)

Note

It is necessary that Signal Generator 804-C be calibrated with Frequency Meter TS-175/U as outlined in section VI, paragraph 6*f*.

(b) Modulator BC-1203-A. (The receiver may be aligned and checked without this unit; see subparagraph 6*a* (4) below.)

(c) A 500,000-ohm, ½-watt resistor.

(d) One 50-micromicrofarad capacitor of small physical dimensions.

(e) One acorn tube clip.

(f) An oscilloscope (RCA Model 158 or equivalent) calibrated for vertical deflection.

(g) One small screw driver of non-conducting material.

(h) One open-end wrench or a pair of pliers.

(i) One ordinary screw driver.

(j) A 115-volt 400- to 2400-cycle a-c power source capable of supplying 200 watts.

(k) A 12- or 24-volt d-c source, as required.

(l) A 115-volt, 60-cycle a-c source.

(2) I-F ALIGNMENT.

(a) The i-f amplifier consists of five stages with six tuned circuits. These are tuned by iron-core slugs and are located to the left and back of the tube side of the chassis. (See fig. 5-22.)

(b) Connect the receiver-transmitter to power sources and control box, as shown in the cording diagram, figure 8-1.

(c) Connect oscilloscope or output meter to "VIDEO 2" of the receiver-transmitter. (See fig. 8-5.) Indicator BC-929-(*) is not sensitive enough for accurate alignment of the receiver intermediate-frequency circuits.)

(d) Remove the grid clip of the mixer tube JAN-956 in the r-f section.

(e) With test clip, connect the 500,000-ohm resistor from the grid to ground.

(f) Connect the 50-micromicrofarad capacitor from the grid to the output of the signal generator.

(g) Connect the shield of the signal generator cable, with as short lead as possible, to ground. (See fig. 8-5.)

(h) Connect the 50-ohm resistor from the center conductor of "TRANS. ANT." on the receiver-transmitter to ground.

(i) Turn oscilloscope on by turning "INTENSITY-OFF" switch to "INTENSITY" and turn signal generator on by setting "POWER-OFF" switch to the "POWER" position.

(j) Turn receiver-transmitter on as follows;

1. With "TRANS.-KEY" switch on control box in the stand-by (mid) position, set "ON - OFF" switch to the "ON" position.

2. After three minutes set "TRANS.-KEY" switch to the "TRANS." position.

(k) Set "GAIN" control on control box to "10."

(l) Set "MODULATION" switch on signal generator to the "INT" position.

(m) Set "PULSE-NORMAL" switch on signal generator to the "NORMAL" position.

(n) Adjust "CARRIER" control on the signal generator to give a dial reading of "100."

(o) Adjust "MODULATION" control on signal generator for a reading of approximately 75 percent.

(p) Set signal-generator frequency dial to 30 megacycles.

(q) Set attenuator dial of signal generator to approximately 20 millivolts.

(r) Tune each i-f stage for maximum output as observed on the oscilloscope, beginning with No. 1 adjustment on the left-hand side of the receiver. To assure the correct maximum setting, start the alignment with the tuning slug turned all the way out. Each stage should be tuned carefully while checking the output on the oscilloscope for a peak as the slugs are turned into the coil. Reduce input from the signal generator by turning the attenuator as required to avoid limiting in video amplifier. The i-f tuning is broad; therefore, no sharp peak will be observed while tuning. Repeat each stage to be sure that the i-f is tuned for maximum. With the i-f band properly aligned and with 400 microvolts input, 75 percent sine-wave modulated internally, the output as measured on the oscilloscope, should be approximately 60 volts.

(s) Measure the i-f band width by tuning the signal-generator frequency dial to 28 megacycles, and then to 32 megacycles. The output voltage as measured on the oscilloscope at 28 and 32 megacycles, should be at least 50 percent of the output voltage at 30 megacycles.

(t) Take care when locking the i-f slugs that the screw driver adjustments are not turned when tightening the locking nuts.

(u) Turn receiver-transmitter off by setting the "ON-OFF" switch to the "OFF" position, and remove the signal-generator leads and reconnect the grid of the mixer tube.

(v) Repeat the above i-f alignment procedure and proceed as follows for i-f alignment of RT-1D/APN-2:

1. With gain control at No. 5 position, the output of the signal generator should be adjusted to provide a video output signal of 40 to 100 volts or approximately 1 to 3 divisions on the scale of Indicater BC-929-( ). During the receiver alignment procedure it will be necessary to reduce the signal input to prevent overloading of the receiver. (An output meter can be used on the VIDEO OUT if desired.)

2. Set the signal generator at 30 megacycles and tune the 1st (L-103-1) and the 6th (L-104) i-f coil adjustment screws to give peak video output voltage. (See fig. 5-22.)

3. Set the signal generator at 28 megacycles and peak the 2nd (L-103-2) and the 4th (L-103-4) i-f coils.

4. Set the signal generator at 32 megacycles and peak the 3rd (L-103-3) and the 5th (L-103-5) i-f coils.

5. Set the signal generator to 30 megacycles and carefully adjust the variable inductance circuit (ML-26) to give minimum shadow on the electric tuning eye (tube type 6E5). (See fig. 6-31.)

6. Repeat the procedure of paragraphs *6a(2)(v)1* through *6* to insure correct alignment of the i-f system. In case a difinite peak is not observed when tuning an i-f stage, carefully check the number of turns on the i-f coil and the lead dress of the associated circuits.

Note

On final adjustment, after inductance (ML-26) has been adjusted as per paragraph *6a(2)(v)5*, peak the 1st (L-103-1) and the 6th (L-104) i-f coils to provide a minimum shadow on the electric tuning eye (tube type 6E5).

7. Tighten the locking nuts which secure the i-f tuning slugs in such a way that the adjustment screws are not turned.

8. Proceed with subparagraph *6a(2)(s)* above.

9. In some cases, when careful alignment does not produce a symmetrical bandpass, it may be necessary to peak the 6th (L-104) i-f coil to 28 or 32 megacycles. This is only necessary when a single off-center peak is 3 or more decibels greater in amplitude than a point equidistant from, and on the other side of resonance. If this adjustment is necessary the overall receiver bandpass characteristics should be checked at several points on each side of resonance when the receiver is tuned according to paragraph *6a(3)*.

(3) R-F AND OSCILLATOR ALIGNMENT, USING SIGNAL GENERATOR 804-C (GENERAL RADIO).

Note

The "HIGH" and "LOW" receiver-frequency adjustments should be tuned to the assigned high and low frequencies, and the r-f adjustments should be tuned to the mid-frequency between the two frequencies used.

(a) Connect the receiver-transmitter, indicator, control box, signal generator and power supplies, as shown in figure 8-6.

(b) Make certain that the 50-ohm dummy load is connected from center conductor of "TRANS. ANT." on the receiver-transmitter to ground.

(c) Turn signal generator on by setting "POWER-OFF" switch to the "POWER" position and turn the receiver-transmitter on as follows:

1. With "TRANS.-KEY" switch on control box in the stand-by (mid) position, set the "ON-OFF" switch to the "ON" position.

2. After about three minutes set "TRANS.-KEY" switch to the "TRANS." position.

(d) Set the "MODULATION" switch on signal generator to the "INT" position.

(e) Set the "PULSE-NORMAL" switch on signal generator to the "NORMAL" position.

(f) Adjust the "CARRIER" control on signal generator to give a dial reading of "100."

(g) Adjust the "MODULATION" control on signal generator to give a reading of approximately 75 percent.

(h) Set the "RANGE" switch on Indicator BC-929-(*) to "100."

(i) Set the signal-generator attenuator dial to approximately 20 millivolts.

(j) Set the signal-generator frequency dial to the midpoint between the assigned "HIGH" and "LOW" frequencies.

(k) Set the "HIGH-LOW" switch on the control box to the "HIGH" position.

(l) Tune "RCVR OSC" control, "HIGH," for a maximum indication of receiver output on the indicator screen. As receiver is tuned, reduce the input voltage to prevent saturation.

(m) Loosen the locking screws on the r-f tuning adjustments, marked "RECEIVER TUNING" "1," "2," and "3," tune r-f adjustment number "1" for maximum output on the indicator, reducing the signal input to the receiver as maximum output is reached so that the output will not cover more than 1½ divisions on the indicator screen.

(n) Repeat procedure in step *(m)* for adjustments "2" and "3."

(o) Retune all three stages and the "RCVR OSC" "HIGH," for maximum output.

(p) A 20-microvolt signal input from the signal generator should give a receiver output which extends at least one division from the center line of the indicator scale. This corresponds to an output voltage of 34 to 40 volts.

(q) Lock the r-f adjustment by tightening the locking screws, and take care not to throw the r-f section out of adjustment.

(r) Adjust the signal-generator microvolt output until the receiver output extends to the second division from the center line of the indicator screen.

(s) Tune the frequency dial of the signal generator to frequencies above the midpoint frequency until the receiver output covers only one division on each side of the center line on the indicator screen. Next tune frequency dial to frequencies below the midpoint frequency until the receiver output again covers only one division on each side of the center line on the indicator screen. The difference between the two frequencies is the over-all band width of the receiver at the midpoint frequency, at 50 percent down point. This band width should be at least 2.5 megacycles. (See fig. 5-40.)

Note

Do not return r-f adjustments in the following procedures.

(t) Set signal generator to the assigned "HIGH" frequency and adjust "RCVR OSC" "HIGH," for maximum receiver output, as observed on the indicator screen.

(u) Set "HIGH-LOW" switch on control box to the "LOW" position.

(v) Set signal generator to the assigned "LOW" frequency.

(w) Tune "RCVR OSC" "LOW," for maximum output, as observed on the indicator screen. This completes the receiver alignment.

Note

If Radio Set ⋆AN/APN-2 is to be remotely tuned by the use of Remote Tuning Device C-134/APN, Tuning Shaft MC-215, and Tuning Adapter MX-196/APN, the "RCVR-OSC" "HIGH" adjustment should be tuned to each of the two frequencies being used. Then note each position of the dial on Remote Tuning Device C-134/APN so that the receiver may be readily tuned to either of the two frequencies while in flight. The "HIGH-LOW" switch on the control box must be left in "HIGH" position because Tuning Adapter MX-196/APN covers up the "RCVR-OSC" "LOW" adjustment.

(4) RECEIVER SENSITIVITY MEASUREMENT USING 75-PERCENT SINE-WAVE MODULATED INPUT.

Note

This procedure is to be used if Modulator Unit BC-1203-A is not available, or as a check of step (5) below.

(a) Connect the radio receiver and transmitter to the control box, the indicator, the signal generator, and the power supplies, as shown in figure 8-6.

(b) The receiver should have been aligned as explained in subparagraphs 6*a* (2) and (3), this section.

(c) Turn the signal generator on by setting "POWER-OFF" switch to the "POWER" position and turn the radio receiver and transmitter on as follows;

1. With the "TRANS.-KEY" switch on the control box in stand-by (mid) position, set "ON-OFF" switch to the "ON" position.

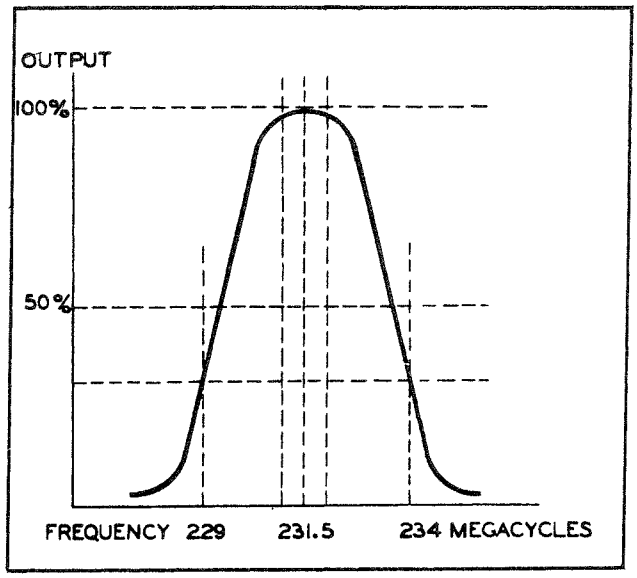


Figure 5-40. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Receiver Selectivity Curve Showing Bandwidth

2. After three minutes set "TRANS.-KEY" switch to the "TRANS." position.

(d) Set "GAIN" control on the control box to "10."

(e) Set "MODULATION" switch on signal generator to the "INT" position.

(f) Set "PULSE-NORMAL" switch on signal generator to the "NORMAL" position.

(g) Adjust "CARRIER" control to give a dial reading of "100."

(h) Adjust "MODULATION" control to give a reading of approximately 75 percent.

(i) Set signal-generator frequency dial to the assigned "HIGH" frequency, and set the "HIGH-LOW" switch on control box to "HIGH."

(j) Set "RANGE" switch on Indicator BC-929-(*) to "100." (Any of the three ranges indicated may be used; however, the "100"-mile range usually gives a better indication for the following adjustments.)

(k) Adjust signal-generator output to 20 microvolts. This should cause the receiver output to cover at least one division on each side of the center line on the indicator screen. (Signal-to-noise ratio should be at least 2:1.)

IMPORTANT

If these tests are made with the indicator "ON-OFF" switch at "OFF,"it is possible that no signal will be indicated, because the antenna-video switch in Indicator BC-929-(*) may have stopped with both video switches open. If this happens, flip the "ON-OFF" switch on the indicator to "ON" briefly and "OFF" again. The signal should now be indicated on one side of the center line.

(l) If more than 20 microvolts are required to give a signal output of one division on the indicator screen, the sensitivity is low and the receiver should be aligned as in paragraphs 6*a* (2) and (3), this section.

(m) Set signal-generator frequency to the assigned "LOW" frequency and place "HIGH-LOW" switch on control box in the "LOW" position.

(n) Adjust signal-generator output to 20 microvolts. This should cause the receiver output to cover at least one division on each side of the center line of the indicator screen.

(5) RECEIVER SENSITIVITY MEASUREMENT USING 100-PERCENT PULSE-MODULATED INPUT.

Note

This procedure should be followed, providing Modulator Unit BC-1203-A is available; if this modulator unit is not available, follow step 6*a* (4) above.

(a) Connect receiver-transmitter to power supplies, Indicator BC-929-(*), signal generator, Modulator BC-1203-A and control box, as shown in figure 5-43.

(b) Turn signal generator on by setting "POWER-OFF" switch to the "POWER" position; turn Modulator Unit BC-1203-A on by setting the "ON-OFF" switch to the "ON" position; and turn the radio receiver and transmitter on as follows:

1. With the "TRANS.-KEY" switch on the control box in the stand-by (mid) position, set the "ON-OFF" switch to the "ON" position.

2. After about three minutes, set the "TRANS.-KEY" switch to the "TRANS." position, and "HIGH-LOW" switch to "HIGH."

(c) Set "MODULATION" switch on signal generator to the "OFF" position.

(d) Set "PULSE-NORMAL" switch on signal generator to the "PULSE" position.

(e) Set "MOD-CAL-USE" switch on Modulator Unit BC-1203-A to the "CAL" position.

(f) Set the signal generator to the assigned "HIGH" frequency, and adjust "CARRIER" control on signal generator to give a dial reading of "100".

(g) Reset "MOD-CAL-USE" switch to "USE".

(h) Set signal generator "OUTPUT" at approximately 60 microvolts.

(i) Set "FREQUENCY P.P.S." control on Modulator Unit BC-1203-A to some point between 300 and 800 p.p.s.

(j) Set "SWEEP TIME BASE" switch on Modulator Unit BC-1203-A to "300". (Other positions on the "SWEEP TIME BASE" switch may be used, but the "300" position usually gives the best results.)

(k) Set "RANGE" switch on Indicator BC-929-(*) to "50" and place "ON-OFF" switch in "ON" position.

(l) Adjust "PULSE DELAY" control on Modulator Unit BC-1203-A until a pulse appears on the indicator screen as shown in figure 5-41.

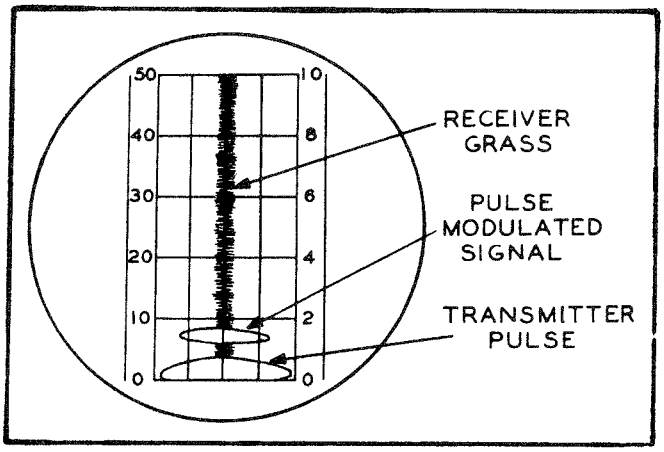


Figure 5-41. Indicator BC-929-A—Signal for Pulse-Modulated Receiver Sensitivity Measurement

Note

If the "PULSE DELAY" control on the modulator unit is adjusted until a pulse appears between the 0- and 10-mile line, the "RANGE" switch on Indicator BC-929-(*) may be set at "10", which gives a clear indication of the pulse. Readjustment of "FOCUS" control on Indicator BC-929-(*) may be necessary.

(m) Adjust output of signal generator to 30 microvolts. This should produce a pulse output on the indicator screen of at least one scale division each side (or one side) of the center line of the indicator display unit.

Note

Signal input requirements with 100-percent pulse modulation are approximately 1½ times the signal input requirements with 75-percent internal sine-wave modulation.

(n) If unsatisfactory sensitivity is noted on pulse modulation, the receiver must be realigned and the overall band width should be checked, by following the procedure in subparagraphs 6*a* (2) and (3), this section.

(6) CHECKING RECEIVER FREQUENCY RANGE.—The following procedure is used to check the range of frequencies covered by the receiver.

(a) Connect equipment, as stated in subparagraphs 6*a* (3), this section.

(b) With the "HIGH-LOW" switch at "HIGH", tune the "RCVR OSC" "HIGH", and the "RECEIVER TUNING" "1", "2", and "3", as in subparagraphs 6*a*(3) (*b*) to 6*a* (3) (*o*), inclusive, this section, with the signal-generator frequency dial set at 234 megacycles.

(c) A 10-microvolt signal input from the signal generator should give a receiver output that covers at least one division on the indicator screen.

(d) Repeat steps (*b*) and (*c*) above, and adjust "RCVR OSC" "LOW" with the signal-generator dial set at 214 megacycles, and the "HIGH-LOW" switch at "LOW."

b. TRANSMITTER ALIGNMENT.

(1) To check the transmitter section of Radio Set

★AN/APN-2 or ★AN/APN-2Y the following equipment is needed:

(a) Frequency Meter BC-906-D.

(b) Indicator BC-936-A.

(c) A 115-volt, 400-2400 cycle a-c power source capable of handling 200 watts, and 24 volts direct current.

(2) Connect Radio Receiver and Transmitter ★RT-1/APN-2 to the power supplies, to Indicator BC-929-A, and to Power Indicator BC-936-A as shown in figures 8-3 and 8-4.

CAUTION

Do not operate transmitter unless "TRANS. ANT." is connected to Indicator BC-936-A or to a resistive 50-ohm dummy load.

(3) Turn Radio Receiver and Transmitter ★RT-1/APN-2 on as follows:

(a) With "TRANS.-KEY" switch on the control box in the stand-by (mid) position, set "ON-OFF" switch to the "ON" position.

(b) After three minutes, set "TRANS.-KEY" switch to the "TRANS." position.

(4) Prepare Frequency Meter BC-906-D for use as follows:

(a) Place rod antenna at full length into socket marked "ANTENNA".

(b) Set "HIGH-LOW" switch in the "HIGH" position (if the meter is very sensitive, better results may be obtained with switch in the "LOW" position).

(c) Set "ON-OFF" switch to the "ON" position.

(5) Set "TRANS. FREQ." control knob to the "A" position.

(6) Set frequency meter dial to the position (number) corresponding to 214 megacycles (see sec. II, paragraph 3, *d*) and hold frequency meter so tip of rod antenna is close to but not touching "TRANS. ANT." on Radio Receiver and Transmitter ★RT-1/APN-2. (See fig. 8-3.)

(7) Loosen the locking nut of the adjustment marked "TRANS. FREQ." with the socket wrench of the tuning tool (combination socket wrench and screw driver supplied with the Radio Receiver and Transmitter ★RT-1/APN-2, and with the screw driver of the tuning tool rotate the screw adjustment of the "TRANS. FREQ." adjustment until the maximum dip of the needle of the frequency meter occurs (the transmitter "A" frequency is now set at 214 megacycles).

(8) Lock the locking nut on the "TRANS. FREQ." adjustment holding screw adjustment with screw driver of tuning tool so as not to detune the "A" frequency.

(9) Repeat steps (5) through (8) inclusive for frequencies "B" (219 megacycles), "C" (220 megacycles), "D" (229 megacycles) and "E" (234 megacycles).

(10) Measure the transmitter power output at 214 megacycles as follows:

(a) With "HOR. CENT." control on the Indicator BC-929-A, shift the sweep trace line to the right hand vertical line on the screen. (See fig. 2-10.)

(b) Set the "TRANS. FREQ." control knob to "A".

(c) Set "RANGE" on Indicator BC-929-A to the "100" position. (Any of the three "RANGE" positions may be used, but the "100" position gives the best indication.)

(d) Set "POWER-PULSE" swith on Indicator BC-936-A to "POWER".

(e) Turn Indicator BC-936-A on by pushing the momentary contact switch marked "PUSH". The transmitter signal will now appear as shown in figure 2-11.

(f) The tip of the signal should extend at least 4½ divisions to the left.

(g) With "HOR- CENT." shift the base line of the signal back to the center or normal position on the indicator screen.

(11) Measure the transmitter pulse width as follows:

(a) Set "RANGE" switch on Indicator BC-929-A to the "10" position.

(b) Set "POWER-PULSE" switch on Indicator BC-936-A to "PULSE".

(c) Turn Indicator BC-936-A on by pushing the momentary contact switch marked "PUSH". The transmitter signal will now appear as a rectangular pulse as shown in figure 2-1.

(d) The pulse should have a width of less than half of one vertical division as in figure 2-1.

(12) Repeat procedures (10) and (11) for frequencies of "B" (219 megacycles), "C" (224 megacycles), "D" (229 megacycles) and "E" (234 megacycles).

c. CHECKING PULSE-GENERATING SECTION.

Note

Radio Set ★AN/APN-2 is not usually used in conjunction with other equipment. Therefore, this circuit is not used and the tube not supplied. However, if Radio Set ★AN/APN-2 is to be synchronized with other equipment, the sync-amplifier and limiter tube JAN-6AC7GT (V-102-7) must be installed and the circuit checked in the following manner.

(1) CHECKING COUNTING-DOWN ACTION.—To check the counting-down action of the pulse-generating section, the equipment needed consists of Modulator Unit BC-1203-A and Oscilloscope RCA-158 (or equivalent).

(a) Connect the receiver-transmitter to power supplies, Modulator BC-1203-A, and oscilloscope, as shown in figure 8-8.

(b) Turn the radio receiver and transmitter on as follows:

1. With "TRANS.-KEY" switch in the stand-by (mid) position, set "ON-OFF" switch to the "ON" position.

2. After three minutes set the "TRANS.-KEY" switch to the "TRANS." position.

(c) Turn the oscilloscope on by setting the "INTENSITY-OFF" switch to the "INTENSITY" position.

(d) Turn Modulator Unit BC-1203-A on by setting "POWER-ON-OFF" switch to the "ON" position.

(e) Set "FREQUENCY" dial on Modulator Unit BC-1203-A to approximately 300 pulses per second.

(f) Set "SWEEP-TIME-BASE" to the "300" position. (The other positions may be used, but the "300" position gives the best results.)

(g) Set "MOD-CAL-USE" switch on Modulator Unit BC-1203-A to the "USE" position.

(h) Set "FIXED-MOD-PULSE" "ON-OFF" switch to the "OFF" position.

(i) Set "TIMING SYNC." switch on oscilloscope to the "ON" position.

(j) Make adjustments on the oscilloscope "CENTERING" and "GAIN" controls and on Modulator Unit BC-1203-A "PULSE DELAY" control, until a suppressor pulse is obtained on the oscilloscope approximately as shown in figure 5-42.

(k) Gradually increase the repetition rate of Modulator Unit BC-1203-A by rotating the "FREQUENCY" dial in the clockwise direction.

(l) As the rate is increased, the repetition rate of the output of the suppressor plate on the oscilloscope will follow the repetition rate of the pulse generator (Modulator Unit BC-1203-A) to between 480 and 600 pulses per second. At some repetition rate between 480 and 600 pulses per second, the pulse will be similar to the original pulse (fig. 5-42), except that the base line will be completely through the bottom of the pulse, as in figure 5-43. The exact repetition rate at which the change occurs is the maximum output repetition rate for the equipment under test.

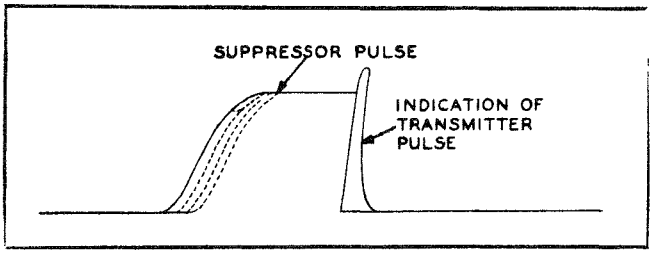


Figure 5-42. Suppressor Pulse Shape With 1:1 Input Synchronization

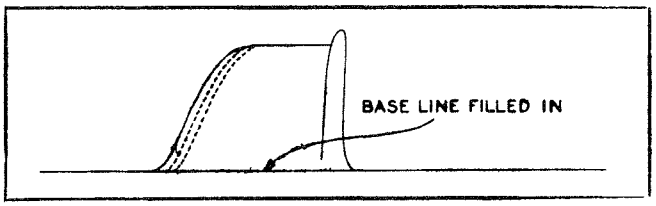


Figure 5-43. Suppressor Pulse When Counting-Down Action Occurs

(m) As the input repetition rate is increased beyond the critical point, further abrupt changes will be observed, as the blocking-tube oscillator divides down 3:1, 4:1, 5:1, etc. However, the first breakover at the 480 to 600 pulses-per-second point is the maximum repetition rate.

(n) The above is a check on the limiting action of JAN-6AC7 (V-102-7) in the sync-amplifier circuit of the receiver. If the output level of tube JAN-6AC7 is higher than normal, the repetition rate of the suppressor pulse will be more than 600 pulses per second.

Note

Potentiometer R139, 2 megohms, is factory-adjusted and controls the free running rate of the blocking oscillator. The adjustment should not be changed unless components of this circuit have been changed.

(2) SUPPRESSOR PULSE MEASUREMENT.

Note

Normal usage of Radio Set ★AN/APN-2 does not require that the suppression circuit be used. However, if other equipment is to be suppressed, tube JAN-6SL7 (V-106-3) must be installed and the circuit checked in the following manner.

(a) Reset the "FREQUENCY" dial on Modulator Unit BC-1203-A to approximately "300".

(b) To measure the suppressor pulse width or duration, use the same test equipment and connections as used in subparagraph 6c, this section, except that the terminal marked "MARKER" on Modulator Unit BC-1203-A must be connected to "SUP OUT" on the receiver or to the oscilloscope input, as shown by the dotted cable in figure 8-8.

(c) The small blips that appear on the oscilloscope are 50 micro-seconds apart. (See fig. 5-44.)

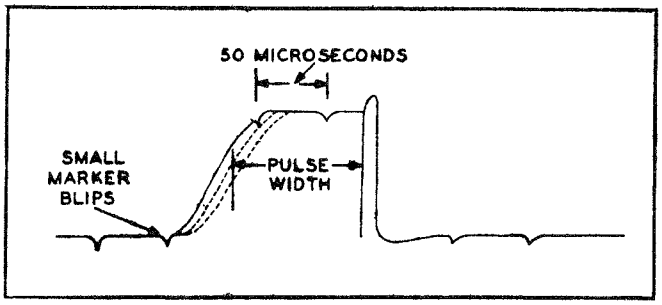


Figure 5-44. Suppressor Pulse-Width Measurement

(d) The pulse width is determined by counting the number of small blips appearing within the duration of the pulse. This width should be between 40 and 150 microseconds.

Note

A small amount of jitter or variation in width of the suppressor pulse is not objectionable.

(e) The suppressor-pulse amplitude should be greater than 30 volts and is measured by observing the amplitude on the oscilloscope screen, which has been previously calibrated in volts.

d. INDICATOR CALIBRATION.—To check the calibration of Indicator BC-929-(*), refer to section II, subparagraphs 3*b* and 3*c*.

7. ALIGNMENT SUMMARY, USING SIGNAL GENERATOR I–196–B, FREQUENCY METER BC–906–D, AND INDICATOR BC–936–A.

Note

The following simplified alignment instructions may be used for inspection check of the radio set. Complete alignment information is given in paragraph 6, this section.

a. RECEIVER-FREQUENCY CHECKS AND ADJUSTMENTS.

(1) Turn Signal Generator I-196-B on and tune to the mid-point of the "HIGH-LOW" frequency calibration points and place the signal generator 10 to 25 feet in front of the airplane in which Radio Set ★AN/APN-2 is installed. The signal generator must be so placed that the side nearest the nameplate faces the airplane.

(2) Turn Radio Set ★AN/APN-2 on as follows:

(a) With the "TRANS.-KEY" switch in stand-by (mid) position, place the "ON-OFF" switch on the control box to the "ON" position.

(b) After three minutes, set the "TRANS.-KEY" switch to the "TRANS." position.

(c) Set the "ON-OFF" switch on Indicator BC-929-(*) to the "ON" position.

(d) Place the "RANGE" switch on the indicator to the "100" position.

(3) Place the "HIGH-LOW" switch on the control box in the "HIGH" position and watch the screen of the indicator for an indication that the signal from the signal generator is received when the "RCVR OSC" "HIGH" tuning shaft is turned. Adjust the "GAIN" control on the control box until a signal of about one-half the maximum amplitude is observed on the screen.

(4) Adjust the "RCVR OSC" "HIGH" tuning shaft on the receiver-transmitter for maximum signal amplitude.

(5) Unlock the tuning shaft of the tuning capacitors, marked "RECEIVER TUNING" "1", "2", and "3", by loosening the screw with the locking washer near adjustments "1", "2", and "3".

(6) Tune "RECEIVER TUNING" adjustments "1", "2", and "3" for maximum signal on the screen.

Note

If no signal appears on the screen, move the signal generator closer to the receiver-transmitter for preliminary adjustments.

(7) Repeat steps (4) and (6) for accurate settings.

(8) Tighten locking screws on "RECEIVER TUNING" "1", "2", and "3". Check to see that the original setting has not shifted.

Note

The "RCVR OSC" "HIGH" adjustment, step (4) above, should be made first.

(9) Adjust signal generator to the high-frequency calibration point.

(10) With the "HIGH-LOW" switch on the control box set to the "HIGH" position, adjust the "RCVR OSC" "HIGH" for maximum signal on the indicator screen. Do not change "RECEIVER TUNING" "1", "2", and "3". After the correct setting has been obtained, do not change the "RCVR OSC" "HIGH" tuning shaft.

(11) Set the signal generator to the low-frequency calibration point. With the "HIGH-LOW" switch on the control box in the "LOW" position, adjust the oscillator tuning shaft, marked "LOW", for maximum output on the indicator screen. After the correct setting has been obtained, do not change the "RCVR OSC" "LOW" tuning-shaft setting.

b. TRANSMITTER-FREQUENCY CHECKS AND ADJUSTMENTS.

Note

The following procedure is to be used when Radio Set ★AN/APN-2 is installed in an airplane. However, this procedure may also be used for a bench check, if a suitable dummy antenna is used.

(1) Use Cord CX-16/TPN-1 to connect the terminal, marked "RCVR ANT", on the indicator unit to the terminal, marked "ANT TEST", on Frequency Meter BC-906-D. (See fig. 8-3.)

Note

Cord CX-16/TPN-1 is used to connect the frequency meter "ANT TEST" to indicator "RCVR ANT" and is furnished as an auxiliary equipment. Cord CX-16/TPN-1 may be made by placing Plug PL-259 and Coupling MC-277 on the ends of a three-foot length of Radio Frequency Cable RG-8/U.

(2) Turn the radio set on as follows:

(a) With the "TRANS.-KEY" switch in the stand-by (mid) position, set the "ON-OFF" switch on the control box to the "ON" position.

(b) After three minutes, set the "TRANS. KEY" switch to the "TRANS." position, and set the "TRANS. FREQ." knob to "A".

(c) Set the "ON-OFF" switch on the indicator to the "ON" position.

(3) Tune the frequency-meter dial to the point of greatest dip of the needle. The dial position (number) should be that corresponding to the correct "A" transmitter frequency (214 megacycles).

(4) If it is found that the transmitter frequency is incorrect, set the dial of the frequency meter to the desired transmitter frequency.

(5) Using the accompanying alignment tool, adjust the transmitter-frequency adjustment screw, accessible through the window in front of the case marked "TRANS. FREQ." Rotate the adjustment for the greatest dip on the frequency meter.

(a) Rotate the "TRANS. FREQ." control knob, and return it to channel "A." This will relieve the strain on the detent mechanism caused by the pressure applied to the adjustments.

(b) Check the frequency with Frequency Meter BC-906-D.

(c) If the frequency of the transmitter is slightly high, loosen the locking nut and turn the screw-driver adjustment to the right. If the frequency is slightly low, turn the screw-driver adjustment to the left. Tighten the locking nut and again rotate the "TRANS. FREQ." control knob before rechecking the frequency.

Note

The operator will shortly learn from experience the approximate amount of adjustment necessary to set the frequency for each channel.

(6) Repeat steps (3), (4) and (5) above with the transmitter and signal generator adjusted to "B" (219 megacycles), "C" (224 megacycles), "D" (229 megacycles), and "E" (234 megacycles) frequencies.

(7) Turn the receiver-transmitter off by setting the "ON-OFF" switch on the control box of the "OFF" position and the "TRANS-KEY" switch to the stand-by or mid-position.

c. TRANSMITTER POWER-OUTPUT AND PULSE-WIDTH CHECKS.

(1) Disconnect transmitting antenna cable from "TRANS. ANT" on the receiver-transmitter, and remove the cable which connects the "VIDEO" on the indicator to the "VIDEO" on the receiver-transmitter.

(2) Connect "VIDEO OUT" on Indicator BC-936-A to "VIDEO" on the Indicator BC-929-(*), and connect "TRANS. IN" on the Indicator BC-936-A to "TRANS. ANT" on the receiver-transmitter using Cord CD-800. (See fig. 8-4.)

(3) Turn the radio set on, following instructions outlined in paragraph 7*b* (2), this section.

(4) Check the transmitter power output as follows:

(a) With "HOR. CENT." control on Indicator BC-929-(*), shift the sweep-trace line to the right-hand vertical line on the screen. (See fig. 2-10.)

(b) Set "RANGE" switch on the indicator to the "100" position. (Any of the three "RANGE" positions can be used, but the "100" position gives the best indication.)

(c) Set "POWER-PULSE" switch on Indicator BC-936-A to the "POWER" position.

(d) Turn Indicator BC-936-A on by pushing the momentary contact switch marked "PUSH". The transmitter signal will now appear as shown in figure 2-11.

(e) The tip of the signal should extend at least 4½ divisions to the left, as shown in figure 2-11.

(f) With "HOR. CENT." control, shift the sweep trace line back to the center or normal position on the indicator screen.

(5) Measure the transmitter pulse width as follows:

(a) Set the "RANGE" switch on Indicator BC-929-(*) to the "10" position.

(b) Set the "POWER-PULSE" switch on Indicator BC-936-A to the "PULSE" position.

(c) Turn Indicator BC-936-A on by pushing the monmentary contact switch marked "PUSH". The transmitter signal will now appear as a rectangular pulse of approximately ¼ vertical division, as shown in figure 2-12.

(6) After inspection, turn the receiver-transmitter off, as indicated in section III, paragraph 1*b*. Remove Indicator BC-936-A from the circuit and reconnect transmitting antenna to "TRANS. ANT." on the receiver-transmitter and reconnect "VIDEO" on the receiver-transmitter to "VIDEO" on the indicator.

8. Refer to installation testing procedure for Antenna AT-96/APN-12 in section VI, paragraph 7.

SECTION VI

SUPPLEMENTARY DATA

1. GENERAL DATA.

a. TUBE COMPLEMENT.

TABLE 6-1.—Tube Complement, Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2

Quantity	*JAN Designation*	*VT Designation*	*Function or Use*
3	JAN-956	VT-238	1st r.f. 2nd r.f., and mixer.
7	JAN-6AC7	VT-112	1st i.f., 2nd i.f., 3rd i.f., 4th i.f., 5th i.f., 1st video, sync amp. and limiter. (Limiter and sync amp. tube not used in normal operation).
1	JAN-6H6GT/G	VT-90A	Detector and limiter.
1	JAN-6V6GT	VT-107B	2nd video.
1	JAN-955	VT-121	Local oscillator.
2	JAN-6SL7GT	VT-229	Oscillator and clipper, pulse shaper and suppressor amplifier. (Sup. amp. tube not used in normal operation).
1	JAN-5U4G	VT-244	Medium-voltage rectifier.
1	JAN-2X2	VT-119	High-voltage rectifier.
1	JAN-6SN7GT	VT-231	Modulator.
1	JAN-2C26		Transmitter oscillator.

TABLE 6-2.—Tube Complement, Indicator BC-929-(*)

Quantity	*JAN Designation*	*VT Designation*	*Function or Use*
2	JAN-6SN7GT	VT-231	Trigger tube, sweep amplifier and inverter.
2	JAN-6H6GT/G	VT-90A	Horizontal leveler, vertical leveler.
1	JAN-2X2	VT-119	High-voltage rectifier.
1	JAN-6X5GT	VT-126A	Medium-voltage rectifier.
1	JAN-6G6G	VT-198A	Discharge tube.
1	JAN-3BP1		Signal indication.

b. FREQUENCY RANGE.—The frequency range of Radio Set ★AN/APN-2 is 214 to 234 megacycles.

c. NUMBER OF PRE-SET FREQUENCIES.—There are two pre-set receiver frequencies, and five pre-set transmitter frequencies. Frequencies used are 214, 219, 224, 229 and 234 megacycles.

d. FREQUENCY STABILITY.—The frequency drift, for normal operation, will be less than plus or minus 1 percent in Radio Set ★AN/APN-2.

e. ELECTRICAL CHARACTERISTICS OF RECOMMENDED ANTENNAS.—The receiver and transmitter antennas each have an impedance of approximately 50 ohms.

f. OUTPUT IMPEDANCE.—The receiver video output impedance is 500 ohms or less; the transmitter output impedance is 50 ohms.

g. INPUT IMPEDANCE.—The receiver has an antenna input impedance of 50 ohms.

h. OUTPUT.—The maximum video output of the receiver is approximately 120 volts. The transmitter peak-power output is between 500 and 800 watts.

i. POWER SUPPLY.—The equipment requires both alternating current (115 volts, 400 to 2400 c.p.s., 180 volt-amperes) and direct current (24 volts, 1 ampere for Radio Set ★AN/APN-2 and 12 volts, 2 amperes for Radio Set ★AN/APN-2Y). The equipment may be operated on 80 volts, 400 to 2400 cps ac, by changing the wiring on the power transformers in the receiver-transmitter in the indicator. (See fig. 5-1.)

j. INPUT CURRENT.—The input current for Radio Receiver and Transmitter ★RT-1A/APN-2 is 1.23 amperes at 115 volts ac, and 0.5 ampere dc (1 ampere for Radio Receiver and Transmitter ★RT-1A/APN-2Y) for the blower motor. For the Indicator BC-929-A, 0.33 ampere is drawn from the 115-volt a-c source, and 0.5 ampere from the d-c source. Indicator BC-929-AZ draws 1 ampere from the d-c source.

k. TYPE OF MODULATION.—The transmitter is pulse-amplitude modulated.

l. METHOD OF MODULATION.—The transmitter oscillator is grid modulated.

m. SENSITIVITY.—With the r-f section tuned to mid-frequency, a 20-microvolt input should produce a 40-volt output for both "HIGH" and "LOW" positions of the "HIGH-LOW" switch.

n. NOISE LEVEL.—With a 20-microvolt signal input, the combined signal and noise level should be more than two times the noise level without signal input.

o. BAND WIDTH.—The band width should not be less than 2.5 megacycles at 1/2 maximum output voltage, measured at the video output.

p. SYNCHRONIZING PULSES.—The synchronizing pulse from associated equipment (if used) should be at least 1/2 microsecond in duration and 10 volts in amplitude. The synchronizing output from the pulse-generating system should be at least 30 volts positive.

q. SUPPRESSOR PULSE. — The suppressor-pulse output (if used) should be approximately 35 volts positive, and should start at least 40 microseconds ahead of the transmitter pulse.

2. FIELD TEST EQUIPMENT.

(See figure 6-1.)

The squadron test equipment used in testing Radio Set ★AN/APN-2 consists of Frequency Meter BC-906-D (see fig. 6-2), Signal Generator I-196-B (see fig. 6-4), Range Calibrator BC-949-A (see fig. 6-5), Indicator BC-936-A (Power-Pulse) (see fig. 6-3), Cord CD-799, and two Cords CD-800.

3. TEST EQUIPMENT IE–45–A.

The depot equipment used in testing Radio Set ★AN/APN-2 (see fig. 6-7) consists of Modulator BC-1203-A, four interconnecting cords, CD-1034, CD-935, and two CD-800 (or CD-869) and one oscilloscope (RCA type 158 or equivalent) and a signal generator (General Radio type 804-C or equivalent). Modulator BC-1203-A is used to check pulse amplitude and duration in the pulse-generating system of the receiver, and receiver sensitivity. See figure 6-6 for schematic diagram.

4. MOISTURE AND FUNGUS PROOFING.

a. GENERAL.

(1) PURPOSE.—The purpose of moisture and fungus proofing is to protect equipment from damage resulting from fungus growth and moisture. The following are the main sources of trouble:

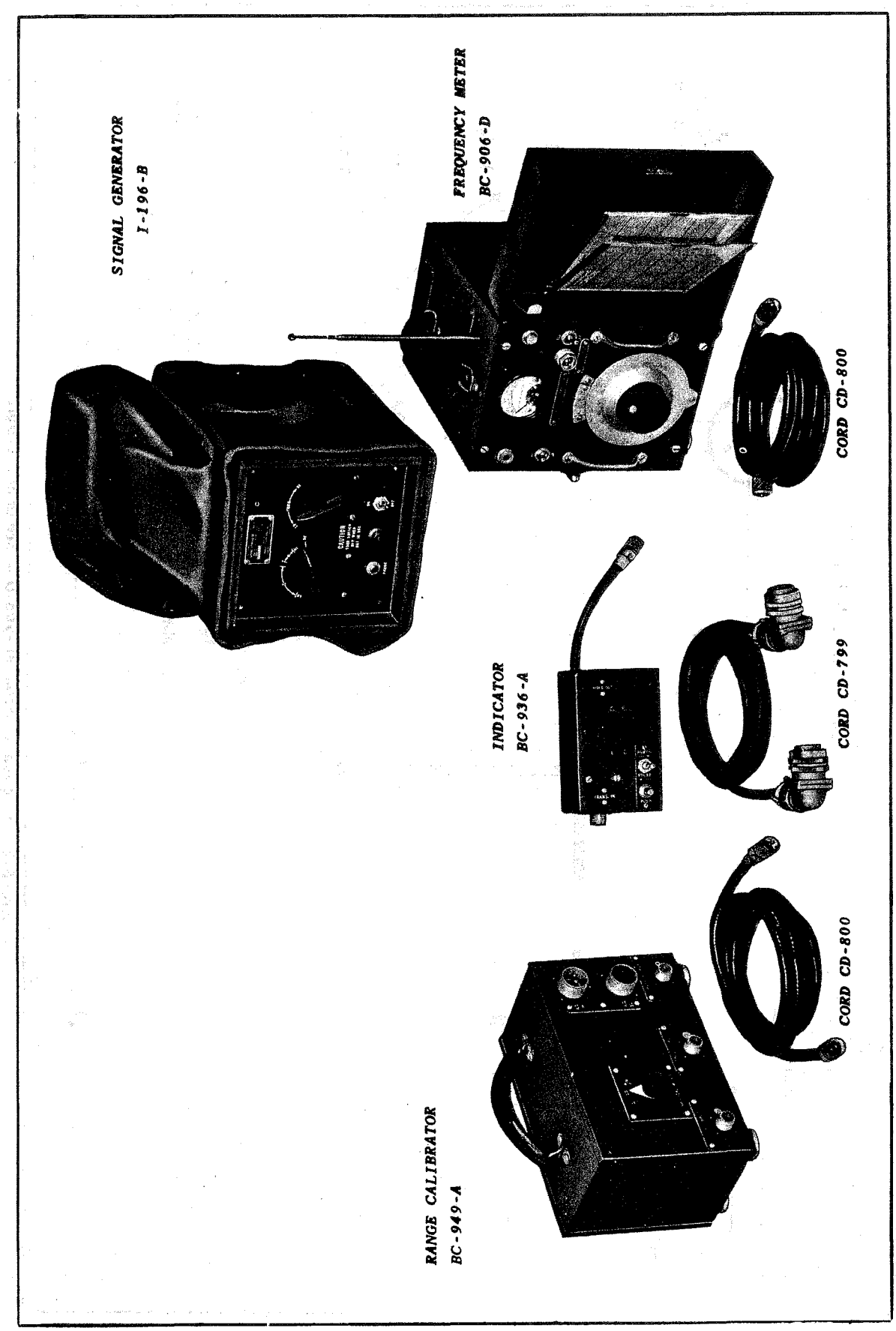


Figure 6-1. Field Test Equipment, Components

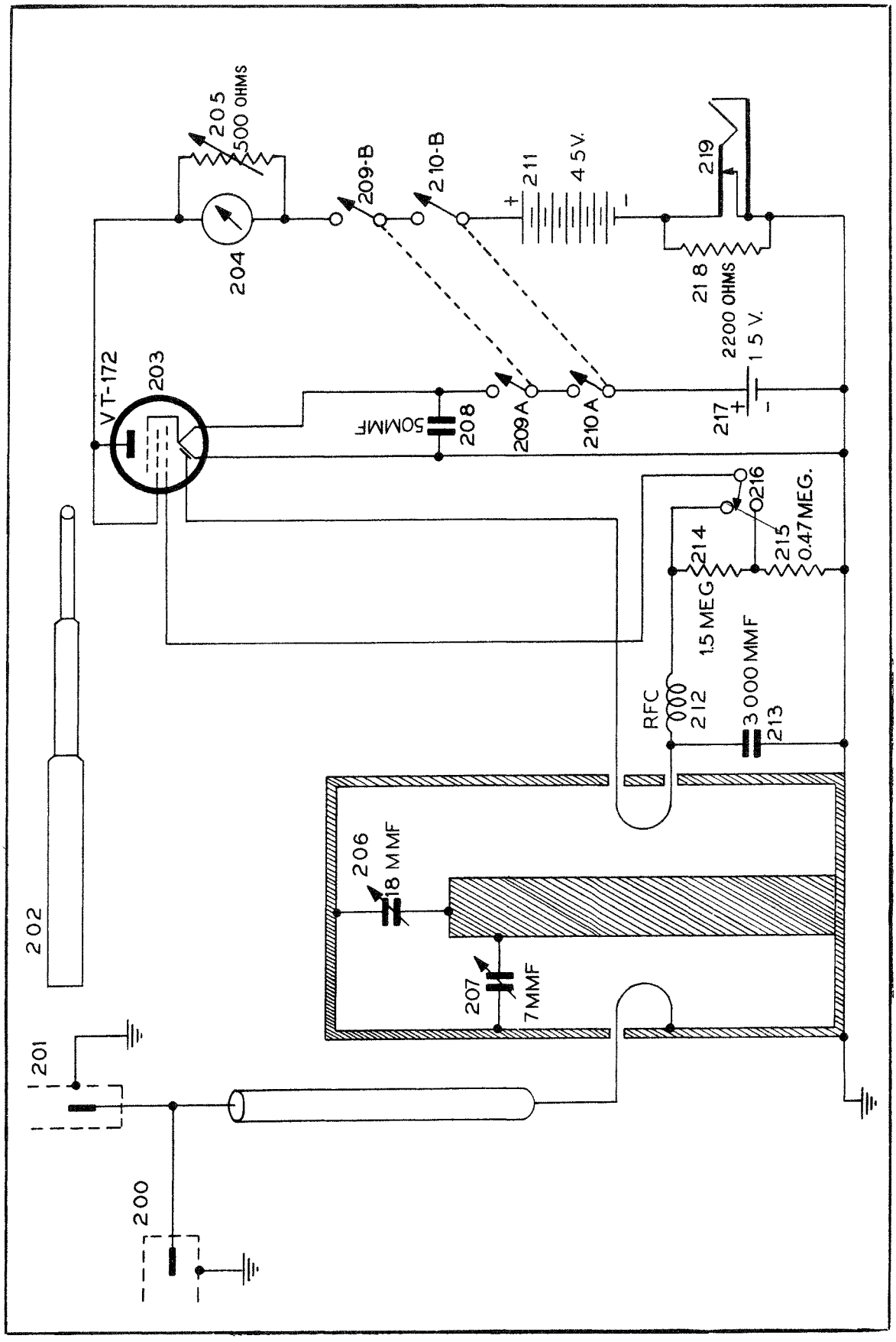


Figure 6-2. Frequency Meter BC-906-D— Schematic Diagram

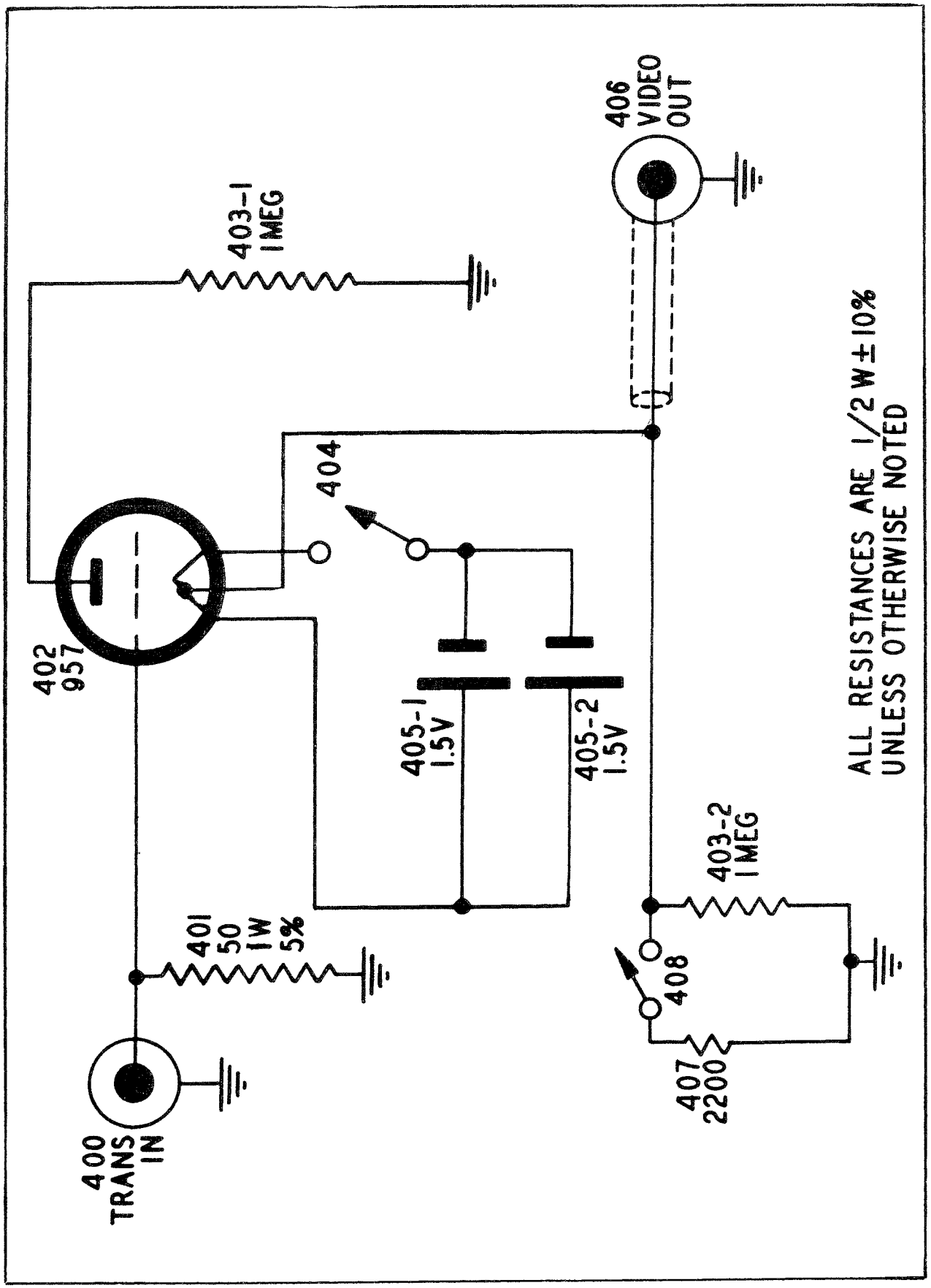


Figure 6-3. Indicator BC-936-A—Schematic Diagram

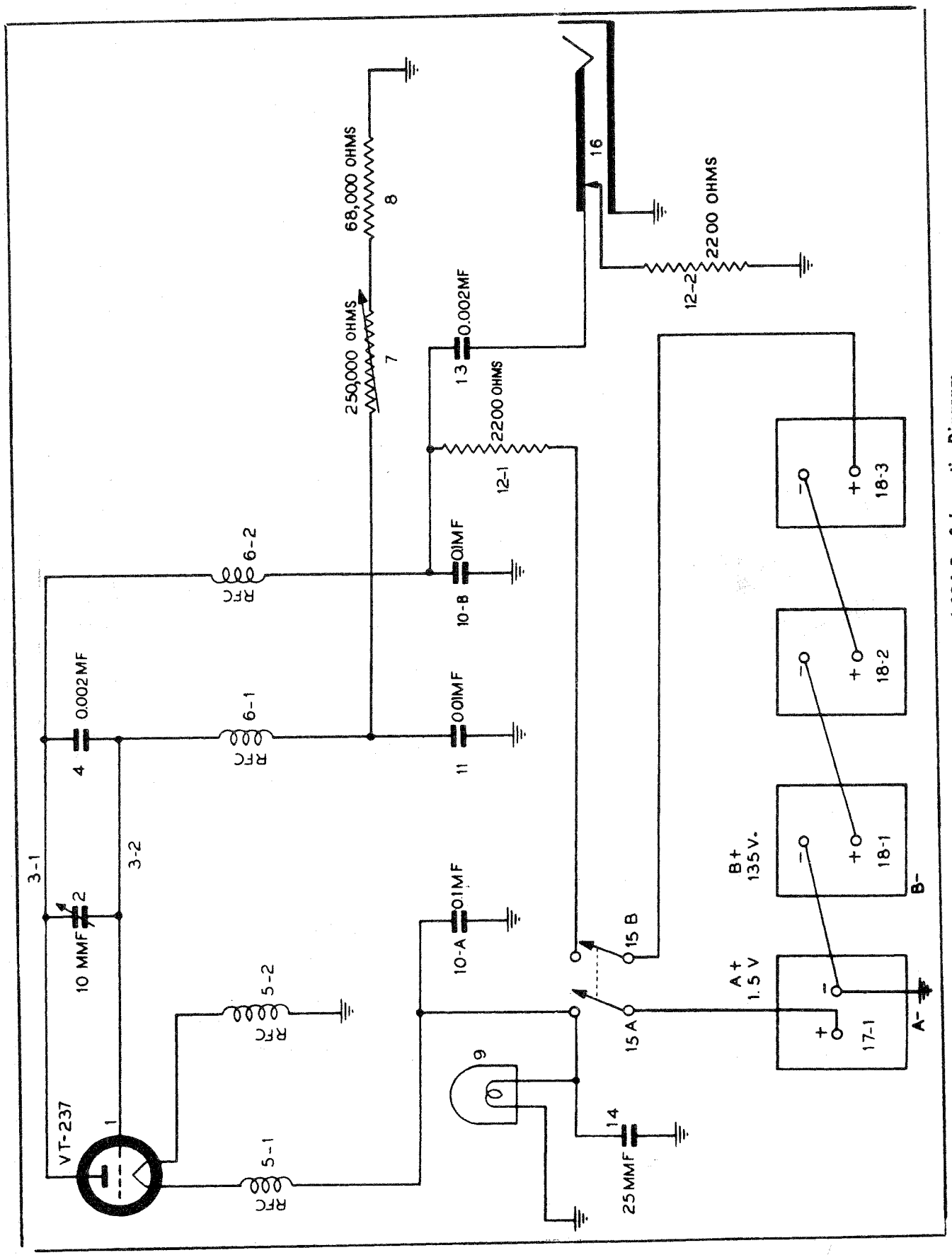


Figure 6-4. Signal Generator I-196-B—Schematic Diagram

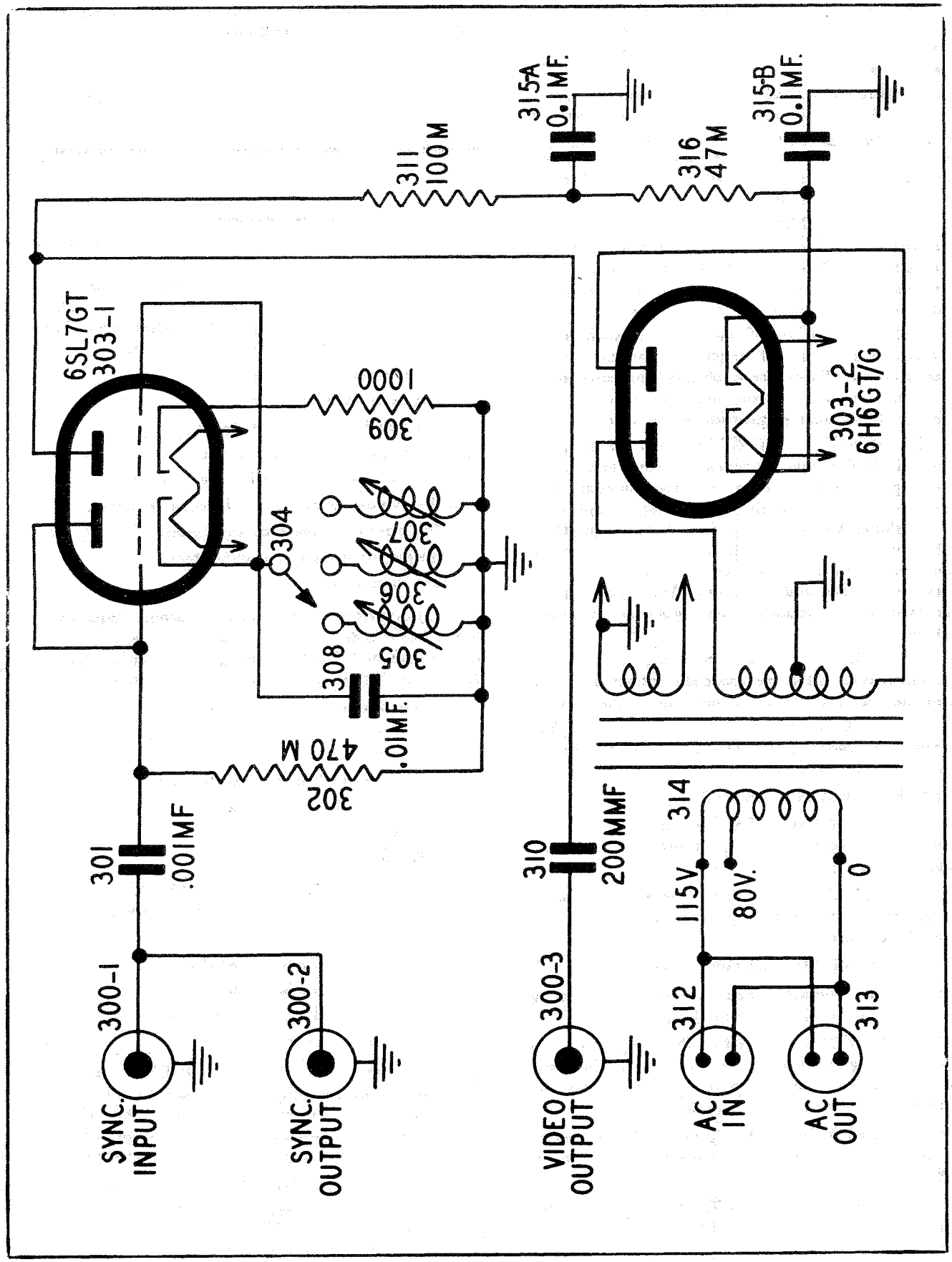


Figure 6-5. Range Calibrator RC-949-A—Schematic Diagram

(a) ABSORPTION.—Many types of materials act as sponges and soak up small quantities of water. This fills the pores of the material, destroying its insulating properties.

(b) BREATHING.—As the temperature varies, the air contained in shield cans, transformers, coils and other parts expands and contracts. The expansion due to heat forces air out of the pores and openings. Upon cooling, the air within the container contracts, "breathing" in moisture-laden air.

(c) CONDENSATION. — Metallic, or other similar surfaces, cool in comparison to the temperature of surrounding air, allow moisture to collect in the form of droplets of water. This will usually take place during the night when the equipment is not in use.

(d) DIFFUSION.—Some insulators, such as certain types of plastics and unglazed ceramics, have a porous structure. These pores, although microscopic in size, conduct moisture throughout the material, thus destroying the insulating qualities of the material.

(e) FUNGUS GROWTH.—Microscopic plant life, found in the temperate zones, but more abundantly in the tropics, feeds on certain cellulose materials used as insulation. This plant life, called fungus, appears as mold or slime. Certain types have been encountered which form into long whiskers on the interior of the equipment. These fungi secrete a corrosive fluid that attacks metal, wood and insulation. They grow rapidly under favorable conditions unless protective measures are taken.

(f) INSECTS.—White ants and termites are very destructive. They are especially attracted by the wax in the wire insulation and on some of the parts.

(g) ELECTROLYSIS.—This action takes place between wires carrying d-c potentials, resulting in the corrosion of the conductors.

(2) PROCESSING METHOD.

(a) CLEANING.—The equipment must first be thoroughly cleaned by removing all dirt, dust, corrosion, fungus, and insects.

(b) REPAIR AND ALIGNMENT.—All necessary repairs must be made to put the equipment in perfect working order.

(c) MASKING.—Certain parts, such as air capacitors, relay contacts, open switches, and adjusting devices must be covered with masking tape.

(d) DRYING.—To restore the equipment to efficient operating condition, the moisture in the parts must be expelled. This is accomplished by baking the equipment in an oven with controlled heat.

(e) SPRAYING.—All parts within the equipment are sprayed with a special moisture- and fungus-proofing lacquer.

(f) RETEST AND ALIGNMENT.—After the lacquer is thoroughly dry the equipment must be retested and realigned.

b. EQUIPMENT REQUIRED.—The following table lists the equipment required, except for the baking oven:

Army Stock Number	*Name of Kit*	*Army-Navy Type Designation*
6Z6609-10	Moisture and Fungus Proofing Equipment	MK-10/GSM
	or	
	Moisture and Fungus Proofing Equipment	MK-2/GSM

(1) Moisture and Fungus Proofing Equipment MK-10/GSM is designed for use in a depot and enough equipment is supplied for the extensive application of the process. The contents of this kit are as follows:

1. Twelve instruction books.
2. Eighteen one-inch paint brushes.
3. Six camel's hair brushes, 3/8" x 1".
4. Sixty gallons of special lacquer.
5. Thirty gallons of special lacquer thinner.
6. Twelve quarts of paint and lacquer remover.
7. Six continuous-pressure spray guns.
8. Twenty-four rolls of masking tape.
9. Six thermometers.

(2) Moisture and Fungus Proofing Equipment MK-2/GSM is designed for use in a continuous program of moisture and fungus proofing as preventive maintenance. The kit consists of the following materials:

1. One instruction book.
2. Four mounting brackets for infrared lamps, with wiring.
3. Two camel's hair brushes, 3/8" x 1".
4. Six one-inch paint brushes.
5. Eight infrared lamps.
6. Ten gallons of special lacquer.
7. Five gallons of special lacquer thinner.
8. One quart of paint and lacquer remover.
9. One continuous-pressure spray gun.
10. Six single-pole electric switches.
11. Four rolls of masking tape.
12. One thermo-electric switch.
13. Two thermometers.

(3) CONSTRUCTION OF OVEN.—The moisture- and fungus-proofing process requires the use of an oven for baking the moisture out of the equipment. This oven must bake the equipment at a temperature of 60°C (140°F) for sufficient time to remove the moisture.

(a) INFRARED-LAMP DRYER.—A number of infrared lamps are supplied with Moisture and Fungus Proofing Equipment MK-2/GSM. These lamps may be made into a small drying oven that is suitable for

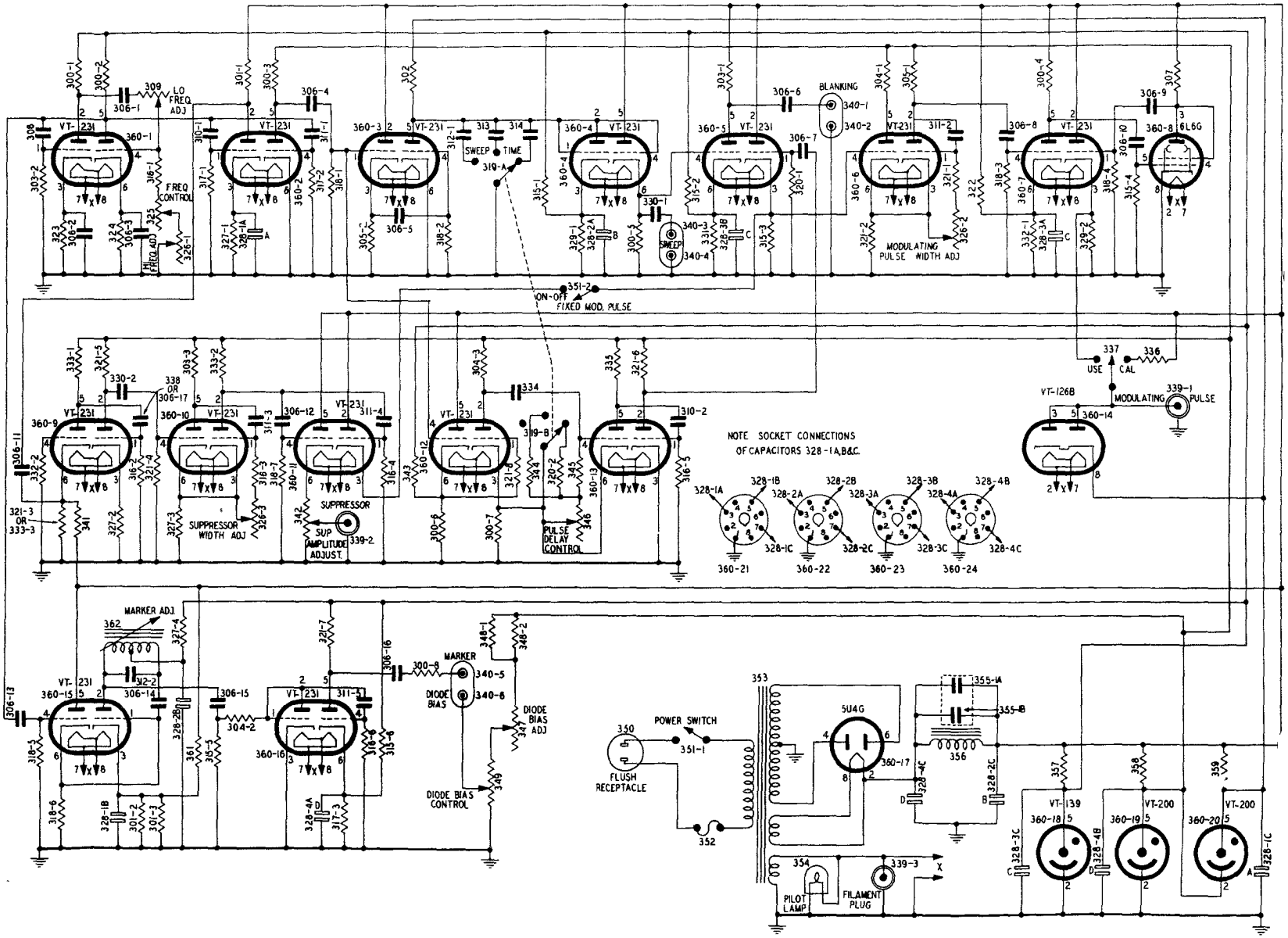
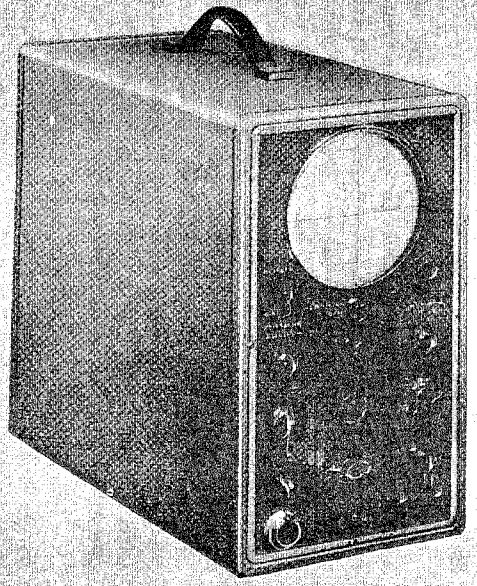
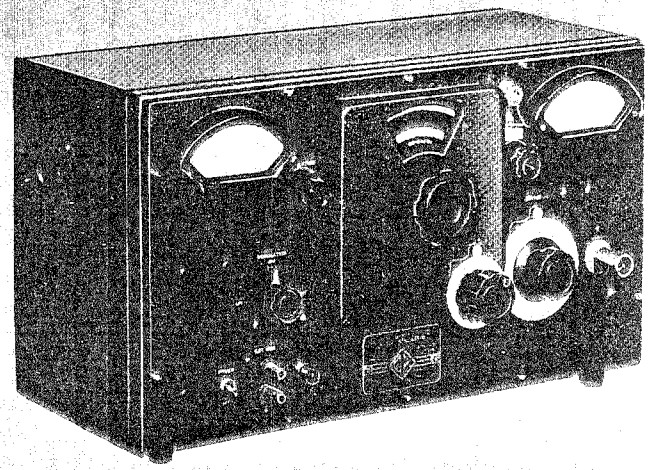


Figure 6-6. Modulator BC-1203-A—Schematic Diagram

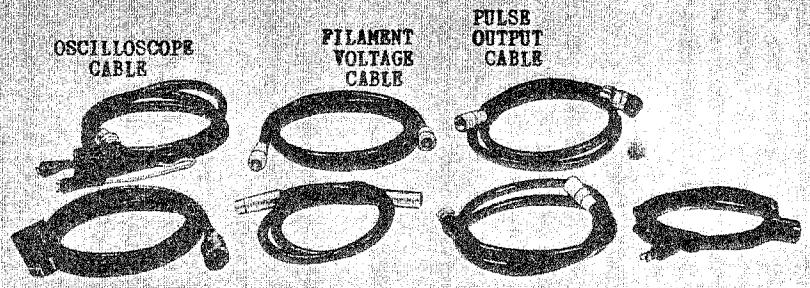
300-1	RESISTOR: 10,000 ohms
300-2	Same at 300-1
300-3	Same as 300-1
300-4	Same as 300-1
300-5	Same as 300-1
300-6	Same as 300-1
300-7	Same as 300-1
300-8	Same as 300-1
301-1	RESISTOR: 10,000 ohms
301-2	Same as 301-1
301-3	Same as 301-1
303-1	RESISTOR: 56,000 ohms
303-2	Same as 303-1
303-3	Same as 303-1
304-1	RESISTOR: 47,000 ohms
304-2	Same as 304-1
304-3	Same as 304-1
305-1	RESISTOR: 2,200 ohms
305-2	Same as 305-1
307	RESISTOR: 20,000 ohms
309	POTENTIOMETER: 50,000 ohms
315-1	RESISTOR: 100,000 ohms
315-2	Same as 315-1
315-3	Same as 315-1
315-4	Same as 315-1
315-5	Same as 315-1
315-6	Same as 315-1
316-1	RESISTOR: 33,000 ohms
316-2	Same as 316-1
316-3	Same as 316-1
316-4	Same as 316-1
316-5	Same as 316-1
316-6	Same as 316-1
317-1	RESISTOR: 12,0000 ohms
317-2	Same as 317-1
417-3	Same as 317-1
318-1	RESISTOR: 470,000 ohms
318-2	Same as 318-1
318-3	Same as 318-1
318-4	Same as 318-1
318-5	Same as 318-1
318-6	Same as 318-1
318-7	Same as 318-1
320-1	RESISTOR: 150,000 ohms
320-2	Same as 320-1
321-1	RESISTOR: 5,600 ohms
321-2	Same as 321-1
321-3	Same as 321-1
321-4	Same as 321-1
321-5	Same as 321-1
321-6	Same as 321-1
321-7	Same as 321-1
322	RESISTOR: 100,000 ohms
323	RESISTOR: 180 ohms
324	RESISTOR: 2,700 ohms
325	POTENTIOMETER: 2 megohms
326-1	POTENTIOMETER: 100,000 ohms
326-2	Same as 326-1
326-3	Same as 326-1
327-1	RESISTOR: 1,200 ohms
327-2	Same as 327-1
327-3	Same as 327-1
327-4	Same as 327-1
329-1	RESISTOR: 22,000 ohms
329-2	Same as 329-1
331	RESISTOR: 39,000 ohms
332-1	RESISTOR: 4,700 ohms
332-2	Same as 332-1
333-1	RESISTOR: 3,900 ohms
333-2	Same as 333-1
333-3	Same as 333-1
335	RESISTOR: 3,300 ohms
336	RESISTOR: 7,000 ohms
341	RESISTOR: 68,000 ohms
342	RESISTOR: 10,000 ohms
343	RESISTOR: 68,000 ohms
344	RESISTOR: 1 megohm
345	RESISTOR: 270 ohms
346	POTENTIOMETER: 500,000 ohms
347	POTENTIOMETER: 10,000 ohms
348-1	RESISTOR: 33,000 ohms
348-2	Same as 348-1
349	POTENTIOMETER: 20,000 ohms
357	RESISTOR: 6,000 ohms
358	RESISTOR: 6,000 ohms
359	RESISTOR: 8,000 ohms
361	RESISTOR: 150,000 ohms
306-1	CAPACITOR: .01 mf.
306-2	Same as 306-1
306-3	Same as 306-1
306-4	Same as 306-1
306-5	Same as 306-1
306-6	Same as 306-1
306-7	Same as 306-1
306-8	Same as 306-1
306-9	Same as 306-1
306-10	Same as 306-1
306-11	Same as 306-1
306-12	Same as 306-1
306-13	Same as 306-1
306-14	Same as 306-1
306-15	Same as 306-1
306-16	Same as 306-1
306-17	Same as 306-1
308	CAPACITOR: 200 mmf.
310-1	CAPACITOR: 25 mmf.
310-2	Same as 310-1
311-1	CAPACITOR: 100 mmf.
311-2	Same as 311-1
311-3	Same as 311-1
311-4	Same as 311-1
311-5	Same as 311-1
312-1	CAPACITOR: 2,000 mmf.
312-2	Same as 312-1
313	CAPACITOR: 1,100 mmf.
314	CAPACITOR: 400 mmf.
328-1A	CAPACITOR: 15 mf.
328-1B	Same as 328-1A
328-1C	Same as 328-1A
328-2A	Same as 328-1A
328-2B	Same as 328-1A
328-2C	Same as 328-1A
328-3A	Same as 328-1A
328-3B	Same as 328-1A
328-3C	Same as 328-1A
328-4A	Same as 328-1A
328-4B	Same as 328-1A
328-4C	Same as 328-1A
330-1	CAPACITOR: .05 mf.
330-2	Same as 330-1
334	CAPACITOR: 800 mmf.
338	CAPACITOR: .01 mf.
355-1A	CAPACITOR: .1 mf.
355-1B	Same as 355-1A
VT-231	JAN-6SN7GT
VT-126B	JAN-6X5GT/G
VT-139	JAN-OD3/VR150
VT-200	JAN-OC3/VR105
VT-115A	JAN-6L6G
360-21	Socket for capacitors 328-1A 328-1B and 328-1C
360-22	Socket for capacitors 328-2A 328-2B and 328-2C
360-23	Socket for capacitors 328-3A 328-3B and 328-3C
360-24	Socket for capacitors 328-4A 328-4B and 328-4C

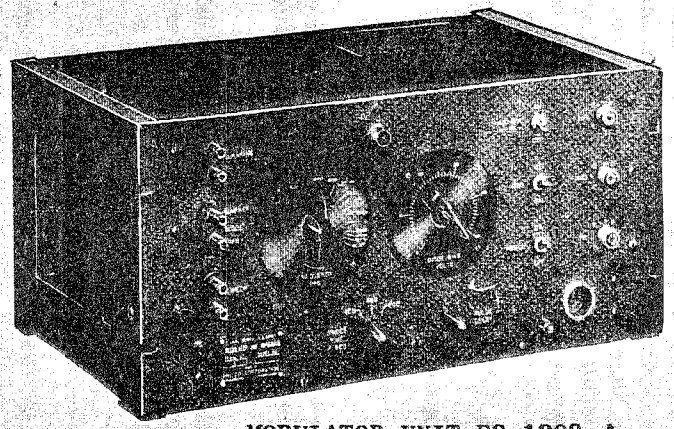


OSCILLOSCOPE, RCA TYPE 158



SIGNAL GENERATOR, GR TYPE 804-B
(MODIFIED FOR POSITIVE PULSE MODULATION)





MODULATOR UNIT BC-1203-A

Figure 6-7. Modulator BC-1203-A and Associated Test Equipment

this work. Mount these lamps on a small table. Adjust the lamps so that they are about twelve inches away from the equipment being baked and shine on the equipment at a thirty-degree angle. The heat is controlled by a thermostat that is placed on top of the equipment being baked. Any desired lamps may be turned on all the time or operated by the thermostat, as the operator wishes, by the many combinations of the switches.

(b) GAS-HEATER OVEN.—A gas heater, combined with a steel chest or an empty drum, will provide an excellent oven.

WARNING

Empty oil and gasoline drums must be flushed thoroughly before using to avoid the possibility of an explosion.

Heat must be controlled in an oven of this type by controlling the flame or by enlarging the vents in the drum or chest.

WARNING

Any gas burned may produce carbon monoxide while burning. Do not use this oven in an enclosed room.

(c) INCANDESCENT-LAMP OVEN. — Any type of steel chest, wooden box, empty drum or packing case may be used. Place a 100-watt incandescent lamp in each corner of the oven. Connect the lamps to a 115-volt a-c or d-c power source. A certain amount of venting will be necessary to permit the water vapor to escape. This type of oven takes longer than the other types to dry out the equipment.

c. DETAILED PROCEDURE.

(1) PARTIAL DISMANTLING.—After the chassis is removed from the case, remove any shielding from the parts to expose as many circuit elements as possible.

(2) MASKING. — Using the masking tape provided in the kit, carefully and thoroughly cover the following parts:

(a) On receiver-transmitter chassis (leave all tubes in place):

1. Low-frequency relay contacts.
2. Oscillator high-frequency and low-frequency tuning capacitors.
3. First v-f plate 2-watt resistors.
4. Screw r-f tuning capacitor plates together.
5. All input and output cable receptacles.
6. 6V6GT output tube, to within 1/8" of top of base.
7. Top of shield plates in r-f unit, and strip on inside of r-f unit cover where these interstage shields touch the cover.
8. Contacts on Jones plug and receptacle.
9. Opening in end of i-f coil forms.
10. Grounding edges of receiver and transmitter chassis.
11. 2X2 power tube, to within 1/8" of top of base.
12. 5U4 power tube, to within 1/8" of top of base.
13. 2C26 osc. tube. to within 1/8" of top of base.
14. Stand-by 20-watt resistor.
15. Transmitter lines and tuning assembly complete (brush phenolic base by hand).

(b) Indicator chassis (leave all tubes in place):

1. Range switch.
2. 6X5 power tube, to within 1/8" of top of base.
3. 2X2 power tube, to within 1/8" of top of base.

(c) Control box:

1. Phone jack.

(d) Mask all other surfaces on which a coating of insulation will prevent proper contact or proper movement.

(3) STAMPING. — The equipment must be stamped "M.F.P." in several places, indicating that the equipment has been treated; also indicate the place and date of treatment.

(4) DRYING PROCESS.—After the equipment has been cleaned and masked, place it in a drying oven for a period long enough to insure complete drying. This drying period will vary, depending on the equipment. The temperature of the oven must be maintained at 60°C (140°F).

(5) SPRAYING.—When certain that the equipment is properly dried, remove the equipment from the oven and spray it as promptly as possible. A thin coat of the special lacquer must be applied before the equipment cools. The mixture proportions are two parts lacquer to one part thinner. Three coats of lacquer are to be applied, allowing ten or fifteen minutes drying time between each coat. The lacquer will harden in about one hour and will be completely dry in four hours. Following the final coat of lacquer, touch up the equipment with a brush. After the lacquer is dry, replace all of the parts that were removed before spraying.

(6) After the equipment is thoroughly dry, it must be given a thorough performance check, and realigned if necessary.

5. MODIFICATIONS IN RADIO SET ★AN/APN-2.

a. GENERAL. Radio Set ★AN/APN-2 has been manufactured under the following order numbers, and in the sequence given, although some orders overlap others (both the order number and the serial number must be considered when referring to any particular set):

(1) Order No. 5759-WF-43:
★AN/APN-2; starting serial No. 1
★AN/APN-2Y; starting serial No. 1

(2) Order No. 272-DAY-44:
★AN/APN-2; starting serial No. 1

(3) Order No. 431-DAY-44:
★AN/APN-2; starting serial No. 1

(4) Order No. 1515-DAY-44:
★AN/APN-2; starting serial No. 1

b. USE OF MODIFICATION TABLE.

(1) There have been many changes in the circuits of Radio Set ★AN/APN-2 since production first started. Each change has been assigned a number which appears in the first column of the table of equipment modifications (table 6-4), and on one or more of the schematic diagrams in section VIII.

(2) Figures 8-9 and 8-10 are schematic diagrams of the first production of Radio Set ★AN/APN-2 under Order No. 5759-WF-43, and contain the change numbers of all such items that were changed on the first schematic. Change items that were added to the circuits after the first schematic was printed appear on the late schematic diagrams, figures 8-11 and 8-12, which show the circuits as of production under Order No. 1515-DAY-44.

(3) The table of equipment modifications indicates the change number, the function of the changed item, the reference number and value of the original part, the manufacturer's number of the original part, the manufacturer's number of the final part, the serial number and the order number at which the change was effective, and a paragraph reference number where additional information on the change can be found.

(4) If the item has been changed only once, the serial number and order number at which the change was effective is given in the time of change column. If the part was changed several times between the early and late productions, then the time of change column will contain only an asterisk, indicating that the changes and the time of change are described in the text following the table of equipment modifications. The last column in the table gives the location of the information for that change. This additional information has the same change number for the item that is shown in the first column of the table of equipment modifications.

(5) Additional changes in reference symbols (shown in Table 6-3 below) were made to correct and improve the symbolization used for the components of Radio Set ★AN/APN-2. These reference-symbol changes do not necessarily represent actual changes in the equipment at the time the symbols were changed. If they represent some previous change of value, both numbers will appear in the table of equipment modifications, with the old reference enclosed in parenthesis. Both numbers will appear together in the table of replacement parts, but only the new reference number will appear on the late schematic diagrams, figures 8-11 and 8-12. On the indicator schematic diagram, a new reference number has been assigned to each tube, and the original number which appears in the early schematic diagram is now used as the socket reference number only. Table 6-3 shows the old reference numbers which have been changed, and the corresponding new numbers which have been assigned.

TABLE 6-3.—Reference-Symbol Changes

Description	*Old No.*	*New No.*
R-F bypass for heater circuit	C106-34	C121-30
R-F bypass for heater circuit at oscillator	C106-31	C121-27
Local oscillator feedback capacitor	C102-6	C122
R-F bypass for B+ lead at mixer	C106-33	C121-29
Mixer screen bypass	C106-3	C121-31
Mixer plate bypass	C106-4	C121-32
Mixer plate-load resistor	R129	R140-2
Mixer to 1st i-f coupling	C106-5	C121-1
1st i-f cathode bypass	C106-6	C121-2
1st i-f screen bypass	C106-7	C121-3
1st i-f plate bypass	C106-9	C121-5
Gain-control-lead bypass at 1st i-f	C106-28	C121-24

TABLE 6-3.—Reference-Symbol Changes (Continued)

Description	*Old No.*	*New No.*
1st to 2nd i-f coupling	C106-8	C121-4
2nd i-f cathode bypass	C106-10	C121-6
2nd i-f screen bypass	C106-11	C121-7
2nd i-f plate bypass	C106-12	C121-8
2nd i-f to 3rd i-f coupling	C106-13	C121-9
3rd i-f cathode bypass	C106-14	C121-10
3rd i-f filament bypass	C106-32	C121-28
3rd i-f screen bypass	C106-15	C121-11
3rd i-f plate bypass	C106-16	C121-12
3rd i-f to 4th i-f coupling	C106-17	C121-13
4th i-f cathode bypass	C106-18	C121-14
4th i-f screen bypass	C106-19	C121-15
4th i-f plate bypass	C106-20	C121-16
4th i-f to 5th i-f coupling	C106-21	C121-17
5th i-f cathode bypass	C106-22	C121-18
5th i-f screen bypass	C106-23	C121-19
5th i-f plate bypass	C106-24	C121-20
5th i-f plate-load resistor	R133	R141
5th i-f to detector coupling	C106-25	C121-21
Detector heater bypass	C106-26	C121-22
1st v-f plate-load resistor	R119-1	R145-1
1st v-f plate-load resistor	R119-2	R145-2
2nd v-f heater bypass	C106-29	C121-25
B+ lead bypass at 2nd v-f	C106-30	C121-26
Timing Circuit		
Sync amp. supp.-grid bypass	C116	C120
Sync amp. plate resistor	R141	R147
Timing-oscillator-grid fixed resistor	R127-3	R127-4
Jones plug on receiver chassis	P101	J102
Power-Transmitter Circuit		
Modulator grid-return resistor	R202	R210
Transmitting-oscillator output coupling	C211	C213
Transmitting-oscillator cathode bypass	C208	C212

TABLE 6-3.—Reference-Symbol Changes (Continued)

Description	*Old No.*	*New No.*
Indicator Circuit		
C-R tube high-voltage bleeder resistor	353-1	306-3
C-R tube high-voltage bleeder resistor	353-2	306-4
Trigger tube JAN-6SN7GT	304-2	391-1
Discharge tube JAN-6G6G	304-3	392
Horizontal-leveler tube JAN-6H6GTG	304-1	390-1
Sweep amp. and inv. tube JAN-6SN7GT	304-4	391-2
Vertical-leveler tube JAN-6H6GTG	304-6	390-2
Low-voltage rectifier tube JAN-6X5GT	304-5	393
High-voltage rectifier tube JAN-2X2	336	395
Cathode-ray tube JAN-3BP1	335	394

c. EQUIPMENT MODIFICATIONS.—Table 6-4 lists the modifications in Radio Sets ★AN/APN-2 and ★AN/APN-2Y.

TABLE 6-4.—Equipment Modification

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — **Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y**

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
1	1st r-f plate-load resistor	R102-1 10,000 ohms ½ watt	R135-1 10,000 ohms 1 watt	66-3103340	66-3104350	5749-WF-43	361	
2*	1st r-f screen resistor and gain-control ircuit	R104-1 68,000 ohms 1 watt	R102-6 10,000 ohms ½ watt	66-3684350	66-3103340	1515-DAY-44	25	Sec. VI, par. 5 *d* (1)
3	2nd r-f plate-load resistor	R102-2 10,000 ohms ½ watt	R135-2 10,000 ohms 1 watt	66-3103340	66-3104350	5759-WF-43	361	
4*	R-F choke in filament lead to r-f and mixer stages	None New part	L108	None	352-1321	5759-WF-43	105	Sec. VI, par. 5 *d* (2)
5*	R-F bypass for filament lead to r-f and mixer stages	None New part	C121-30 (C106-34) 1,000 mmf mica	None	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (2)
6*	Receiver-oscillator "HIGH" tuning capacitor	C109 No change in part or symbol. Circuit changed to ground rotor	C109	756-2205	756-2205	431-DAY-44	142	Sec. VI, par. 5 *d* (3)
7*	R-F bypass for B+ lead at receiver oscillator	C106-27 1,000 mmf ceramic	C121-23 (C106-27) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
8*	Mixer-cathode bypass capacitor	C106-1 1,000 mmf ceramic	C118-1 1,000 mmf ceramic	305-1326	305-1326	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
9*	R-F bypass for B+ at mixer	C106-33 1,000 mmf ceramic	C121-29 (C106-33) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
10*	R-F bypass for filament lead of mixer tube	C106-2 1,000 mmf ceramic	C118-2 1,000 mmf ceramic	305-1326	305-1326	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
11	Mixer-plate dropping resistor	R102-3 10,000 ohms ½ watt	R135-3 10,000 ohms 1 watt	66-3103340	66-3104350	5759-WF-43	361	
12*	R-F bypass capacitor for mixer screen	C106-3 1,000 mmf ceramic	C121-31 (C106-3) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
13*	Mixer plate-load resistor	R103-3 1,500 ohms ½ watt	R140-2 (R129) 1,200 ohms ½ watt	66-2153340	66-2128240	431-DAY-44	1	Sec. VI, par. 5 *d* (5)
14*	Blocking and coupling capacitor between mixer and 1st i-f amp.	C106-5 1,000 mmf ceramic	C121-1 (C106-5) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
15*	Cathode bypass capacitor for 1st i-f	C106-6 1,000 mmf ceramic	C121-2 (C106-6) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
16*	R-F bypass at rec.-osc. heater choke	C106-31 1,000 mmf ceramic	C121-27 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
17*	R-F bypass for B+ lead to 1st and 2nd r-f and 1st i-f screen grids	C106-28 1,000 mmf ceramic	C121-24 (C106-28) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
18*	R-F bypass for heater lead.	C106-29 1,000 mmf ceramic	C121-25 (C106-29) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
19*	R-F bypass capacitor for B+ lead to pulse-generating circuit	C106-30 1,000 mmf ceramic	C121-26 (C106-30) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
20*	R-F bypass capacitor for 1st i-f screen grid	C106-7 1,000 mmf ceramic	C121-3 (C106-7) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
21*	R-F bypass capacitor for plate of 1gt i-f	C106-9 1,000 mmf ceramic	C121-5 (C106-9) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
22*	Coupling and blocking capacitor between 1st and 2nd i-f stages	C106-8 1,000 mmf ceramic	C121-4 (C106-8) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
23*	Cathode bypass capacitor for 2nd i-f tube	C106-10 1,000 mmf ceramic	C121-6 (C106-10) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
24*	Screen grid bypass capacitor for 2nd i-f tube	C106-11 1,000 mmf ceramic	C121-7 (C106-11) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
25*	Plate-load resistor for 2nd i-f tube	R108-2 510 ohms ½ watt	R142-1 680 ohms ½ watt	66-1513240	66-1683240	431-DAY-44	1	Sec. VI, par. 5 *d* (6)
26*	Plate bypass capacitor for 2nd i-f tube	C106-12 1,000 mmf ceramic	C121-8 (C106-12) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
27*	Coupling and blocking capacitor between 2nd and 3rd i-f stages	C106-13 1,000 mmf ceramic	C121-9 (C106-13) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
28*	Cathode bypass capacitor for 3rd i-f tube	C106-14 1,000 mmf ceramic	C121-10 (C106-14) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
29*	Filament bypass capacitor for 3rd i-f tube	C106-32 1,000 mmf ceramic	C121-28 (C106-32) 1,000 mmf	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
30*	Screen-grid bypass capacitor for 3rd i-f tube	C106-15 1,000 mmf ceramic	C121-11 (C106-15) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
31*	Plate load resistor for 3rd i-f tube	R108-3 510 ohms ½ watt	R142-2 680 ohms ½ watt	66-1513240	66-1683240	431-DAY-44	1	Sec. VI, par. 5 *d* (6)
32*	Coupling and blocking capacitor between 3rd and 4th i-f stages	C106-17 1,000 mmf ceramic	C121-13 (C106-17) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
33*	Plate bypass capacitor for 3rd i-f tube	C106-16 1,000 mmf ceramic	C121-12 (C106-16) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
34*	Cathode bypass capacitor for 4th i-f tube	C106-18 1,000 mmf ceramic	C121-14 (C106-18) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
35*	Screen dropping resistor for 4th i-f	R113-1 22,000 ohms 1 watt	R117-3 22,000 ohms ½ watt Schematic correction					
36*	Screen-grid bypass capacitor for 4th i-f tube	C106-19 1,000 mmf ceramic	C121-15 (C106-19) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
37*	Plate-load resistor for 4th i-f tube	R108-4 510 ohms ½ watt	R142-3 680 ohms ½ watt	66-1513240	66-1683240	431-DAY-44	1	Sec. VI, par. 5 *d* (6)
38*	Plate bypass capacitor for 4th i-f tube	C106-20 1,000 mmf ceramic	C121-16 (C106-20) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
39	Oscillation suppressor resistor at 4th i-f plate	None New part	R107-3 120 ohms ½ watt	None	66-1123340	431-DAY-44	1	
40*	Coupling and blocking capacitor between 4th and 5th i-f stages	C106-21 1,000 mmf ceramic	C121-17 (C106-21) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
41*	Cathode bypass capacitor for 5th i-f tube	C106-22 1,000 mmf ceramic	C121-18 (C106-22) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
42*	R-F bypass capacitor at filament of 5th i-f tube	C117 2500 mmf mica	C117-1 2500 mmf mica	None New part	60-20255324	431-DAY-44	1	Sec VI, par. 5 *d* (7)
43*	Screen-grid bypass capacitor for 5th i-f tube	C106-23 1,000 mmf ceramic	C121-19 (C106-23) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
44*	Plate-load resistor for 5th i-f tube	R129 680 ohms ½ watt	R141 (R133) 1,800 ohms ½ watt	66-1683340	66-2183240	*	*	Sec. VI, par. 5 *d* (6)
45*	Plate dropping resistor for 5th i-f tube	R111-5 3,300 ohms 1 watt	R134-1 R134-2 6,800 ohms 1 watt	66-2334340	66-2684356	5759-WF-43	361	Sec. VI, par. 5 *d* (8)
46*	Coupling and blocking capacitor between 5th i-f stage and detector	C106-25 1,000 mmf ceramic	C121-21 (C106-25) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
47*	Plate bypass capacitor for 5th i-f tube	C106-24 1,000 mmf ceramic	C121-20 (C106-24) 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)
48*	R-F bypass at heater of detector and limiter tube	C106-26 1,000 mmf ceramic	C121-22 1,000 mmf mica	305-1326	60-20105407	431-DAY-44	1006	Sec. VI, par. 5 *d* (4)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
49	Plate load, 1st v-f tube	R119 25,000 ohms 5 watts	R1451 (R119-1) R145-2 (R119-2) 47,000 ohms 2 watts	363-1344	66-3475356	1515-DAY44	1	
50*	R-F bypass at suppressor grid of sync amp. and limiter tube	C116 500 mmf mica	C120 (C116) 100 mmf ceramic	305-1325	305-1074	*	*	Sec. VI, par. 5 *d* (9)
51*	Plate dropping resistor for sync amp. and limiter tube	R124 15,000 ohms ½ watt	R147 (R141) 18,000 ohms 10 watts	66-3153240	353-1743	*	*	Sec. VI, par. 5 *d* (10)
52*	Timing osc. grid-leak capacitor	C114 3,000 mmf mica	C117-2 2500 mmf mica	60-20306324	60-20255324	*	*	Sec. VI, par. 5 *d* (11)
53*	Timing osc. grid-leak resistor	R126 3.6 megohms. ½ watt	R127-4 (R127-3) 4.7 megohms ½ watt	66-5363240	66-5473340	431-DAY-44	2394	Sec. VI, par. 5 *d* (11)
54*	Timing osc. grid-leak variable resistor	New part	R139 (R133) 2-megohm potentiometer	353-5077	353-5277	*	*	Sec. VI, par. 5 *d* (12)
55*	Timing osc. cathode resistor	R106-3 470 ohms ½ watt	R136 680 ohms ½ watt	66-1473340	66-1683340	5759-WF-43	100	Sec. VI, par. 5 *d* (13)
56*	Sup. amplifier 1st plate voltage divider	R105-4 15,000 ohms ½ watt	R105-4 15,000 ohms ½ watt	66-3153340	66-3153340	*	*	Sec. VI, par. 5 *d* (14)
57*	Sup. amplifier 2nd cathode load resistor	R127-3 4.7 megohms ½ watt	R138 4,700 ohms ½ watt	66-5473340	66-2473340	*	*	Sec. VI, par. 5 *d* (15)
58*	Modulator 1st section grid-return resistor	R202 1 megohm ½ watt	R210 (R202) 2,200 ohms ½ watt	66-5103340	66-2223340	272-DAY-44 431-DAY-44	1324 1	Sec. VI, par. 5 *d* (16)
59*	Stand-by bias filter resistor	R201 47,000 ohms 1 watt	Removed	66-3474340	None	272-DAY-44	947	Sec. VI, par. 5 *d* (17)
60*	Position of r-f shorting capacitor on trans. osc. tuned lines	C207 Moved to new position in connection with change No. 61. No change in value of symbol.		305-1390	305-1390	5759-WF-43 272-DAY-44 431-DAY-44	1464 1 1	Sec. VI, par. 5 *d* (18)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
61*	Transmitter output coupling capacitor	C211 200 mmf 600 volts	C213 (C211) 5 mmf mica—500 volts	60-10206407	60-00055437	5759-WF-43 272-DAY-44 431-DAY-44	1464 1 1	Sec. VI, par .5 *d* (18)
62*	Transmitter oscillator filament r-f bypass capacitors	C209-1-C209-2 500 mmf	Removed	305-1325	Removed	5759-WF-43	101	Sec. VI, par. 5 *d* (19)
63*	Transmitter-oscillator cathode r-f choke	L201-3 1.5 uh	Choke removed and wiring changed	352-1126	Removed	272-DAY-44	914	Sec. VI, par. 5 *d* (20)
64*	Transmitter-oscillator cathode bypass capacitor	C208 .05 mf paper—600 volts	C212 (C208) .1 mf paper–400 volts	305-1033	305-1513	5759-WF-43	68	Sec. VI, par. 5 *d* (21)
65*	Connections to receptacle for control-box cable	J203 Error in schematic connections only		*	*	*	*	Sec. VI, par. 5 *d* (22)
66*	Plug on interconnecting cable attached to receiver chassis	P101 Schematic error	J102	*	*	*	*	Sec. VI, par. 5 *d* (23)
67*	Motor d-c line, r-f chokes	None New part	349-1, 349-2 R-F chokes	None	352-1321	5759-WF-43	1010	Sec. VI, par. 5 *d* (24)
68	Vertical-sweep discharge-tube, screen-supply resistor	315-1 100,000 ohms 1 watt	316-4 100,000 ohms 2 watts	66-4104347	66-4105340	5759-WF-43	1170	
69*	Vertical-sweep discharge plate-circuit resistor	328 330,000 ohms ½ watt	328-1 330,000 ohms ½ watt	66-4333340	66-4333340	*	*	Sec. VI, par. 5 *d* (25)
70*	Video to horizontal-deflection plates CR tube; r-f chokes	346-1, 346-2 1.5 microhenry	Unchanged except for circuit connections	352-1126	352-1126	431-DAY-44	1	Sec. VI, par. 5 *d* (26)
71*	Sweep-amplifier plate to sweep inverter grid, coupling capacitor	305-4 .01 mf paper 400 volts	302-7 .01 mf 600 volts	305-1023	305-1255	*	*	Sec. VI, par. 5 *d* (27)

*See text reference.

TABLE 6-4.—Equipment Modification (Continued)

Major Assembly:

Model: ★AN/APN-2 or ★AN/APN-2Y — Radio Receiver and Transmitter ★RT-1A/APN-2 or 2Y

Change Number	*Location or Function*	*Original Symbol and Value*	*Final Symbol and Value*	*Original Mfr. No.*	*Final Mfr. No.*	*Time of Change*		*Text Ref.*
						Order Number	*Serial Number*	
72*	Horizontal-centering control, right-deflection plate CR tube	306-1, 306-2 330,000 ohms	307-4 500,000-ohm potentiometer	66-4334347	353-5079	431-DAY-44	26	Sec. VI, par. 5 *d* (28)
73*	Horizontal-centering control bypass capacitor	302-6 .01 mf 600 volts	305-4 .01 mf 400 volts	305-1255	305-1023	*	*	Sec. VI, par. 5 *d* (29)
74*	Vertical-deflection diode-leveler circuit	*	*	*	*	5759-WF-43	1200	Sec. VI, par. 5 *d* (30)
75*	Low-voltage power-supply input filter capacitor	333A 2 mf 600 volts	347 1 mf	305-1305	305-1342	5759-WF-43	1170	Sec. VI, par. 5 *d* (31)
76*	Low-voltage power-supply output filter capacitor	333B 2 mf 600 volts	348 4 mf	352-1059	305-1048	5759-WF-43	1170	Sec. VI, par. 5 *d* (31)
77*	Part of high-voltage-supply divider for CR tube	303-5 1 megohm ½ watt	352-1 220,000 ohms 1 watt	66-5103340	66-4224340	*	*	Sec. VI, par. 5 *d* (32)
78*	High-voltage power-supply filter resistor	315-3 100,000 ohms	351 22,000 ohms +10%, ½ watt	66-4104347	66-3223340	431-DAY-44	2377	Sec. VI, par. 5 *d* (33)
79*	Intensity control for CR tube	339 500,000-ohm potentiometer	343 1-megohm potentiometer	353-5081	353-5122	431-DAY-44	2377	Sec. VI, par. 5 *d* (33)
80*	Part of high-voltage-supply divider to CR tube	342-1 1 megohm 1 watt	352-2 220,000 ohms 1 watt	66-5104347	66-4224340	431-DAY-44	2377	Sec. VI, par. 5 *d* (33)
81*	Focus control CR tube	343 1-megohm ½ watt potentiometer	339 500,000 ohms	353-5122	363-5081	431-DAY-44	2377	Sec. VI, par. 5 *d* (33)
82*	Parts of high-voltage-supply divider CR tube	342-2, 342-3, 342-4 1 megohm 1 watt	306-3, (353-1), 306-4 (353-2) 330,000 ohms 1 watt	66-5104347	66-4334350	431-DAY-44	2377	Sec. VI, par. 5 *d* (33)

*See text reference.

d. ADDITIONAL INFORMATION ON MODIFICATIONS.

(1) CHANGE NO. 2.—To improve the action of the "GAIN" control, the first r-f screen resistor has been changed from 68,000 ohms to 10,000 ohms, and connected to B+ through the gain-control lead, along with the second r-f and first i-f screens.

(2) CHANGES NO. 4 and 5.—R-F choke L108 was originally placed in the filament lead to the r-f and mixer stages. This choke, in combination with capacitor C121-27 (C106-31), acted as an r-f filter to prevent r-f from the oscillator and other random high-frequency noise from getting into the r-f and mixer stages. The addition of this choke was made to improve the signal-to-noise ratio of the receiver. At some later date the circuit wiring was changed slightly to include the oscillator filament lead in this filtered circuit, and another r-f bypass capacitor, C121-30 (C106-34), was added in parallel with capacitor C121-27 (C106-31), at the tube end of choke L108, to improve the action of the filter. This filtered filament lead was extended to the first four i-f stages.

(3) CHANGE NO. 6.—Soon after the threaded receptacle and knob was added to the receiver-oscillator "HIGH" tuning adjustment, it was found necessary to ground the rotor of the oscillator tuning capacitor C109. This change occurred in early production of equipment under order No. 431-DAY-44, at which time the receiver-transmitter nomenclature was changed from ★RT-1/APN-2 to ★RT-1A/APN-2.

(4) CHANGES NO. 7, 8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 32, 33, 34, 36, 38, 40, 41, 43, 46, 47, and 48.—R-F bypass capacitors having reference symbols C106-3 to C106-33, inclusive, were originally 1,000-mmf ceramic capacitors, as produced under order Nos. 5759-WF-43 and 272-DAY-44, and up to serial No. 1006 on order No. 431-DAY-44. Effective with this serial number, the above capacitors were all changed to 1,000 mmf *mica* capacitors. This change was made because the ceramic capacitors showed a tendency to arc over at the low temperature found at high altitude. This arcing, or shorting out, set up regeneration in the receiver circuits, preventing proper operation of the equipment. Later, the reference symbols for these capacitors were changed to C121-1 to C121-32 inclusive (see par. 5*b*(5), this section). Capacitors C106-1 and C106-2 in the mixer circuit were not affected by this condition, and were not changed to mica. However, to distinguish these two capacitors from the mica capacitors, their reference numbers were changed to C118-1 and C118-2, respectively.

(5) CHANGE NO. 13.—Mixer plate-load resistor R103-3, 1,500 ohms, was changed to R129, 1,200 ohms, to prevent i-f oscillation at low temperatures. Resistor R129 up till this time was used as the plate-load resistor for the fifth i-f tube. A new resistor of higher value and bearing the reference number R133 was placed in the fifth i-f plate circuit, and R129 used to replace R103-3 in the mixer plate circuit. Later, reference R129 was changed to R140-2 to clarify symbolization.

(6) CHANGES NO. 25, 31, 37, and 44.—The plate-load resistors for the second, third, fourth, and fifth i-f stages were increased in value to increase the output from each stage, and the overall sensitivity of the receiver. Because of the occurrence of oscillation in the first i-f stage at low temperatures, the stage was placed on a lower operating level by reducing the amplitude of its input signal from the mixer stage (by decreasing the value of the mixer plate-load resistor). This loss of gain was compensated for by increasing the gain from each of the following i-f stages, by increasing the value of each plate-load resistor, as stated above. The value of the fifth i-f plate-load resistor has been changed twice. The original value of resistor R129 was 680 ohms. This is the value and reference number for the fifth i-f plate load, as shown by the early schematic, figure 8-9. At serial number 100 on order No. 5759-WF-43, this value was changed to 1,200 ohms, without changing the reference number. This change was made to increase the receiver output. Effective with serial No. 1 on order No. 431-DAY-44, resistor R129 was removed from the fifth i-f plate circuit and replaced with an 1,800-ohm resistor R133.

CAUTION

By mistake, this 1,800-ohm resistor was first assigned reference No. R133, which was the same reference number used for the 1-megohm potentiometer in the grid circuit of the blocking oscillator. At serial No. 777 on order No. 1515-DAY-44, this mistake was rectified when the value and reference number of the potentiometer was changed to R139, 2 megohms. The fifth i-f plate-load resistor retained reference number R133 until some time later when it was changed to R141. When requisitioning replacement parts, be sure to distinguish between these two items.

(7) CHANGE NO. 42.—Capacitor C117 was added to help prevent regeneration at low temperature. At a later date, another capacitor of this same value was added to the timing circuit (change No. 52), and the reference number of capacitor C117 was changed to C117-1.

(8) CHANGE NO. 45.—The 3,300-ohm 1-watt plate-dropping resistor for the fifth i-f tube was changed to two 6,800-ohm, 1-watt resistors in parallel. This change was made to obtain the desired resistance and wattage to prevent over-heating during long periods of operation.

(9) CHANGE NO. 50.—R-F bypass capacity C116, 500 mmf, was added at serial No. 100 on order No. 5759-WF-43, to improve the stability of the counting-down circuit. At serial No. 1200 on order No. 5759-WF-43, further improvement was obtained by changing the value of capacitor C116 to 110 mmf. Later, the reference symbol was changed to C120 to clarify symbolization.

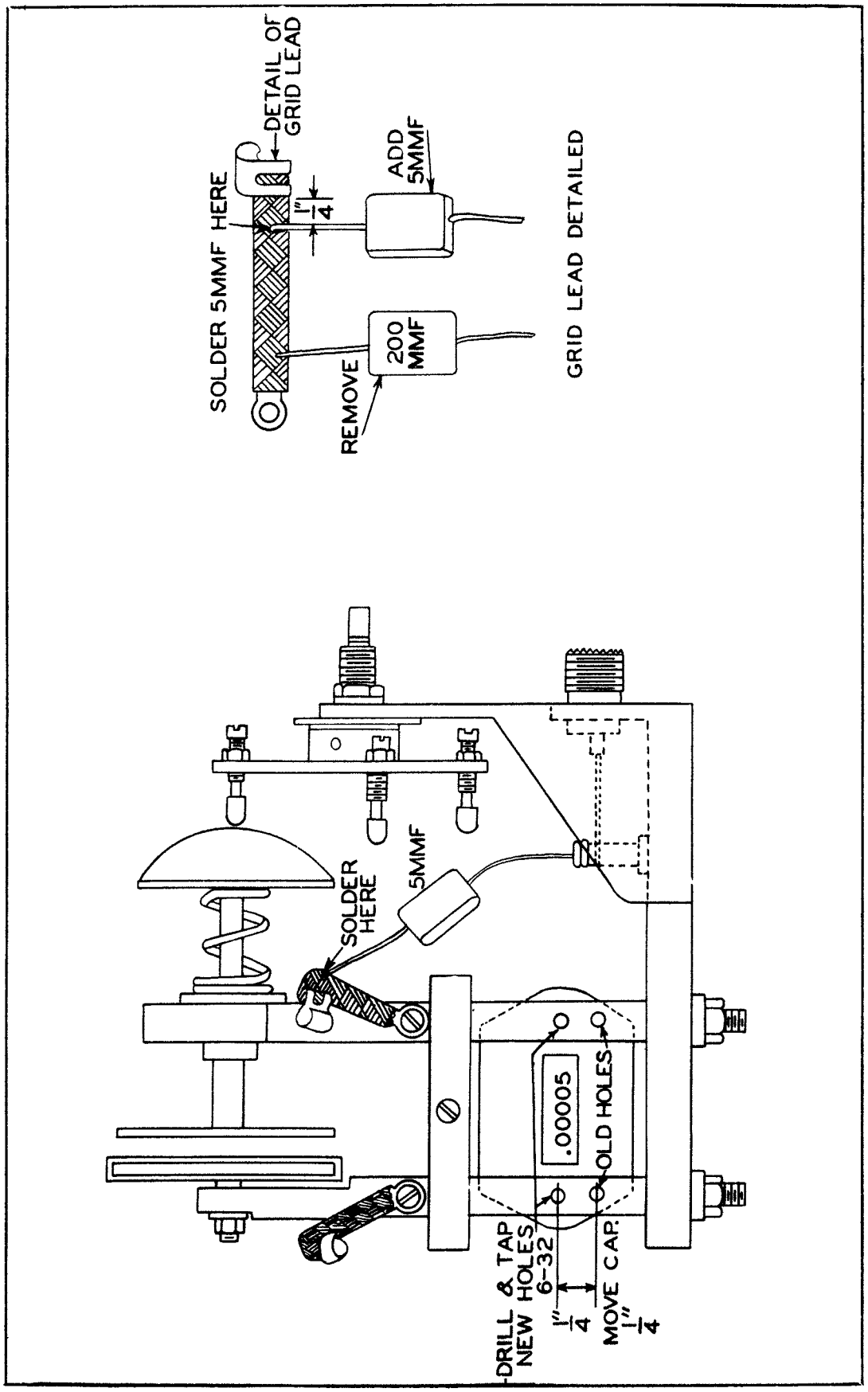


Figure 6-8. Transmitter Oscillator Modification

(10) CHANGE NO. 51.—Sync amplifier plate-dropping resistor R124, 15,000 ohms, was changed to 24,000 ohms, using the same reference number, at serial No. 100 on order No. 5759-WF-43. This change was made to improve the stability of the counting-down circuit when changes in temperature occur. At serial No. 2394 on order No. 431-DAY-44, R124 was changed back to 15.000 ohms, ½-watt carbon, and the reference number changed to R140, Philco part No. 66-3153240. At serial No. 2470 on order No. 431-DAY-44, R140 was changed to 18,000 ohms, ½-watt carbon, and the reference number changed to R141, Philco part No. 66-3183240. Later, the reference symbol was changed to R147, to clarify symbolization. It has been found by experiment that the characteristics of a wirewound resistor are more desirable for the proper operation of this circuit with changing temperature. Therefore, as soon as an 18,000-ohm wirewound resistor is available from the resistor manufacturer, R147 will be changed from carbon to wirewound, but will retain the same reference number. A ½-watt wirewound resistor will efficiently carry the current drawn by the plate, but ½-watt wirewound resistors are not available at the present time, so a 10-watt wirewound resistor will be used, Philco part No. 353-1743.

(11) CHANGES NO. 52 and 53.—The timing-oscillator grid capacitor C114, 3,000 mmf, was changed to 4,000 mmf, using the same reference number, at serial No. 100 on order No. 5759-WF-43. This change was made to improve the stability of the timing circuit when synchronized with associated equipment. At serial No. 2394 on order No. 431-DAY-44, C114 was changed to C117-2, 2,500 mmf. At this same time, the timing-oscillator fixed-grid resistor R126, 3.6 megohms, was changed to R127-3, 4.7 megohms, and the sync amplifier plate-resistor value was decreased (change No. 51). These three changes were made to improve the pulse width and the counting-down operation of the circuit. Later, reference symbol R127-3 was changed to R127-4, to clarify symbolization.

(12) CHANGE NO. 54.—At serial No. 100 on order No. 5759-WF-43, a 1-megohm potentiometer R133 was added to the timing-oscillator grid circuit, to provide a control for the free-running frequency of the oscillator. In order to count-down properly when synchronized with external pulses, the free-running frequency of the oscillator must be between 215 and 260 pulses per second.

CAUTION

At serial No. 1 on order No. 431-DAY-44, the reference symbol R133, by mistake, was assigned to the new fifth i-f plate-load resistor, 1,800 ohms, ½-watt. When requisitioning replacement parts, be sure to distinguish between these two items.

At serial No. 777 on order No. 1515-DAY-44, this potentiometer was changed to 2 megohms, using the reference number R139. This change was made to increase the control range for the circuit, but does not otherwise affect its operation.

(13) CHANGE NO. 55.—The cathode resistor in the timing-oscillator circuit was increased in value from 470 ohms to 680 ohms, reference No. R136. At this same time several other changes were made (changes 51, 52, and 54) to improve the stability of the timing oscillator when synchronized with associated equipment.

(14) CHANGE NO. 56.—Resistor R105-4, 15,000 ohms, part of the voltage divider in the first plate circuit of the suppressor amplifier stage, was scheduled to be changed to R137, 8,200 ohms, at serial No. 100 on order No. 5759-WF-43. This change was to be made to reduce the amplitude of the feed-back signal to the sync amplifier, and improve the stability of the timing circuit when synchronized with associated equipment. This change was never made in production, but some schematic diagrams and parts lists were printed showing the change. The reference number and value for this part in all equipments is R105-4, 15,000 ohms.

(15) CHANGE NO. 57.—The early schematic diagram (fig. 8-9) shows the suppressor-amplifier-output cathode resistor to be R127-3, 4.7 megohms, which is an error. This resistor has always been 4,700 ohms, reference symbol R138.

(16) CHANGE NO. 58.—Modulator grid resistor R202 was decreased in value from 1 megohm to 2,200 ohms, to maintain the narrow pulse width required, with the variations in the values of resistors and capacitors used in the circuit. The reference symbol was changed to R210.

(17) CHANGE NO. 59.—Stand-by-bias filter resistor R201 was removed from the circuit and replaced with a wire jumper. This change was made to increase the stand-by-bias, thereby preventing the transmitter from firing intermittently while on stand-by position.

(18) CHANGE NO. 60 and 61.—Transmitter-output coupling capacitor C211 was changed from 200 mmf to 5 mmf, reference number C213, and its point of connection made closer to the grid cap on the transmitter tube. Also the position of the r-f shorting capacitor C207 was moved ¼" closer to the tube end of the plate and grid lines, L204 and L205. These two changes were made at the same time, to improve the matching between the tube and various lengths of transmission line, and to improve the frequency coverage of the transmitter. Figure 6-8 shows the details of the changes.

(19) CHANGE NO. 62.—The transmitter-oscillator filament bypass capacitors C209-1 and C209-2 were removed from the circuit. These capacitors showed a tendency to breakdown and short out during the oscillator warm-up period, and their use was not necessary for the proper operation of the circuit.

(20) CHANGE NO. 63.—R-F choke L201-3 was removed from the transmitter-oscillator cathode circuit, and the wiring changed to use one of the filament leads in common with the cathode (see the old and the new schematic diagrams in sec. VIII). This change was made to eliminate an irregularity in the trailing edge of the transmitter pulse which caused a slight instability.

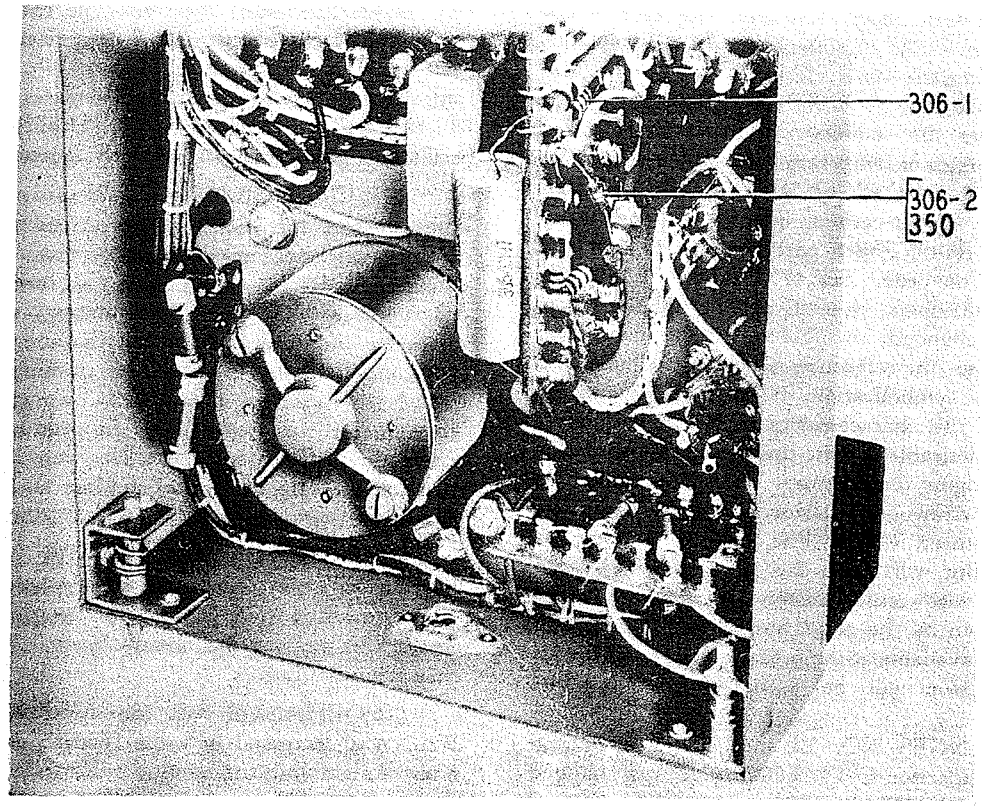


Figure 6-9. Indicator BC-929-(*)—Location of Resistors 306-1 and 350

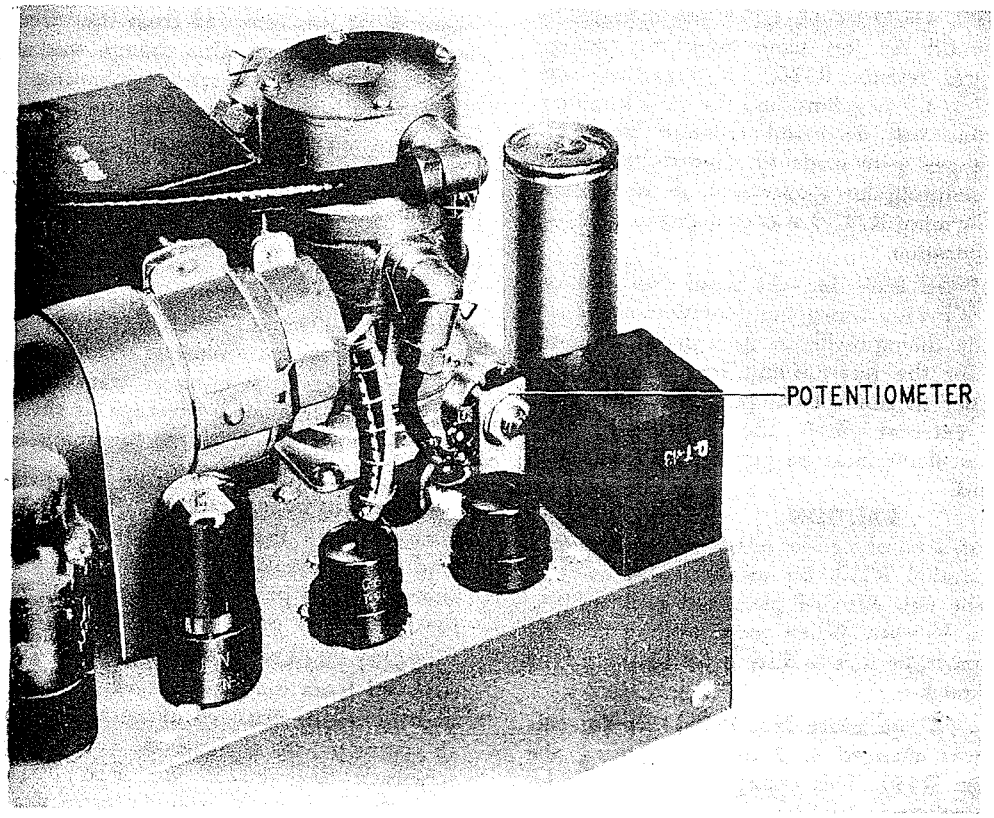


Figure 6-10. Indicator BC-929-(*)—Potentiometer 307-4 Installed

(21) CHANGE NO. 64.—Cathode bypass capacitor C208, for the transmitter oscillator, was changed from .05 mf to .1 mf, reference number C212, to permit the transmitter pulse width to maintain its specified value, and to prevent the transmitter from firing between pulses from the timing oscillator.

(22) CHANGE NO. 65.—An error in the early schematic diagram, figure 8-1, shows reversed connections for pins E and J on the receiver-transmitter receptacle J203 for the control box. See the late schematic diagram, figure 8-11, for proper connections.

(23) CHANGE NO. 66.—The early schematic diagram, figure 8 9, shows the reference number J102 for the Jones plug attached to the receiver chassis. This symbol was changed to P101, as shown on some schematic diagrams. Later, the number was changed back to J102, to clarify symbolization.

(24) CHANGE NO. 67.—Two r-f chokes, 349-1 and 349-2, were added to the d-c input circuit of the antenna-video switch motor 301-C. These chokes were connected as shown in the late schematic diagram, figure 8-12. Some schematic diagrams were printed showing these chokes on the motor side of r-f filter capacitors 305-2 and 305-3. This connection is an error. These chokes, in combination with capacitors 305-2 and 305-3, act as an r-f filter to prevent disturbances, caused by commutation, from being fed back through the d-c line to other equipment.

(25) CHANGE NO. 69.—Resistor 328-1 was symbolized as 328 on some schematic diagrams, which was an error.

(26) CHANGE NO. 70.—R-F chokes 346-1 and 346-2 in the video-horizontal-deflection circuit were relocated for better performance. Figure 8-10 shows the original location, and figure 8-12 shows the final location.

(27) CHANGE NO. 71.—The reference symbol of this capacitor was changed as a schematic reference correction only. The capacitor has always been 600 volts, d.c., working.

(28) CHANGE NO. 72.—Addition of potentiometer 307-4 to the indicator horizontal-centering circuit was made to improve the focusing of the cathode-ray tube. This change was effective in production with serial No. 26 on order No. 431-DAY-44. Because of a slight mis-alignment of the gun and deflection plates in some tubes, the best focus occurs at one side of the indicator screen. When such a tube is focused along the center line, the trace is somewhat blurred. To correct this condition, resistors 306-1 and 306-2 (350) (see fig. 6-9) have been replaced with a 500,000-ohm potentiometer, 307-4. This potentiometer is mounted on a bracket on top of the chassis near the back (see fig. 6-10). Both potentiometer and bracket are obtainable in base spares. In original production, resistor 306-2 was 330,000 ohms. In attempting to correct the above condition, this resistor was changed to 150,000 ohms, reference number 350. This change was effective with serial No. 2495 on order No. 5759-WF-43. The addition of potentiometer 307-4 should be made in the field only if the above trouble is experienced. To install, proceed as follows:

(a) To mount potentiometer bracket, drill one hole 2 7/16" in from side of chassis, and 2 1/16" from rear of chassis; drill the other hole 3/8" in front of first hole, on a line approximately 15° from a second line drawn through the first hole parallel with side of chassis (see fig. 6-11). These measurements are critical, as sufficient room must be available to remove the cathode-ray tube socket.

(b) After bracket and potentiometer have been mounted, remove resistors 306-1 and 306-2 (350) (see fig. 6-9), and make the following wiring changes (see figs. 6-11 and 6-12):

1. Connect a white wire between center arm of potentiometer and terminal 3 of tube socket 304-1.

2. Connect a black wire between counterclockwise terminal of potentiometer and ground lug to which resistor 306-2 was connected.

3. Connect a red wire between clockwise terminal of potentiometer and B+, found at lug 5 of terminal board.

(c) The potentiometer is adjusted as follows:

1. Normally the indicator tube focuses with the new potentiometer adjusted so that the resistance from the center arm to ground is 200,000 ohms, and from the center arm to B+, 300,000 ohms. If the CRT cannot be adjusted properly with the "FOCUS" control under these conditions, proceed as follows:

2. Using two screw drivers, one on the horizontal-centering adjustment, and the other on the new potentiometer, adjust both controls simultaneously, keeping the trace on the center line, until the best focus is obtained.

(29) CHANGE NO. 73.—The reference symbol of this capacitor was changed as a schematic reference correction only. The capacitor has always been 400 volts, dc, working.

(a) At serial No. 801 on order No. 1515-DAY-44, the plate bypass capacitor, 305-4, for the second section (pin 5) of the horizontal-leveler tube, 390-1, was removed from the small wiring panel near the switching motor, and connected directly between pin 5 on the socket and ground. This change was made to eliminate the wire lead between pin 5 and the wiring panel, because it was picking up r-f noise which affected the video signals appearing on the indicator screen.

(30) CHANGE NO. 74.—Resistor 318-4, in the vertical-deflection leveler circuit, was originally in the circuit as shown in figure 8-10, connected directly to the arm of the vertical-centering potentiometer 307-3. This wiring change places the vertical-centering potentiometer in the plate and cathode circuits of the second section of the vertical diode leveler instead of in the first section. This change prevents vertical shift of the CRT base line when the intensity control is changed.

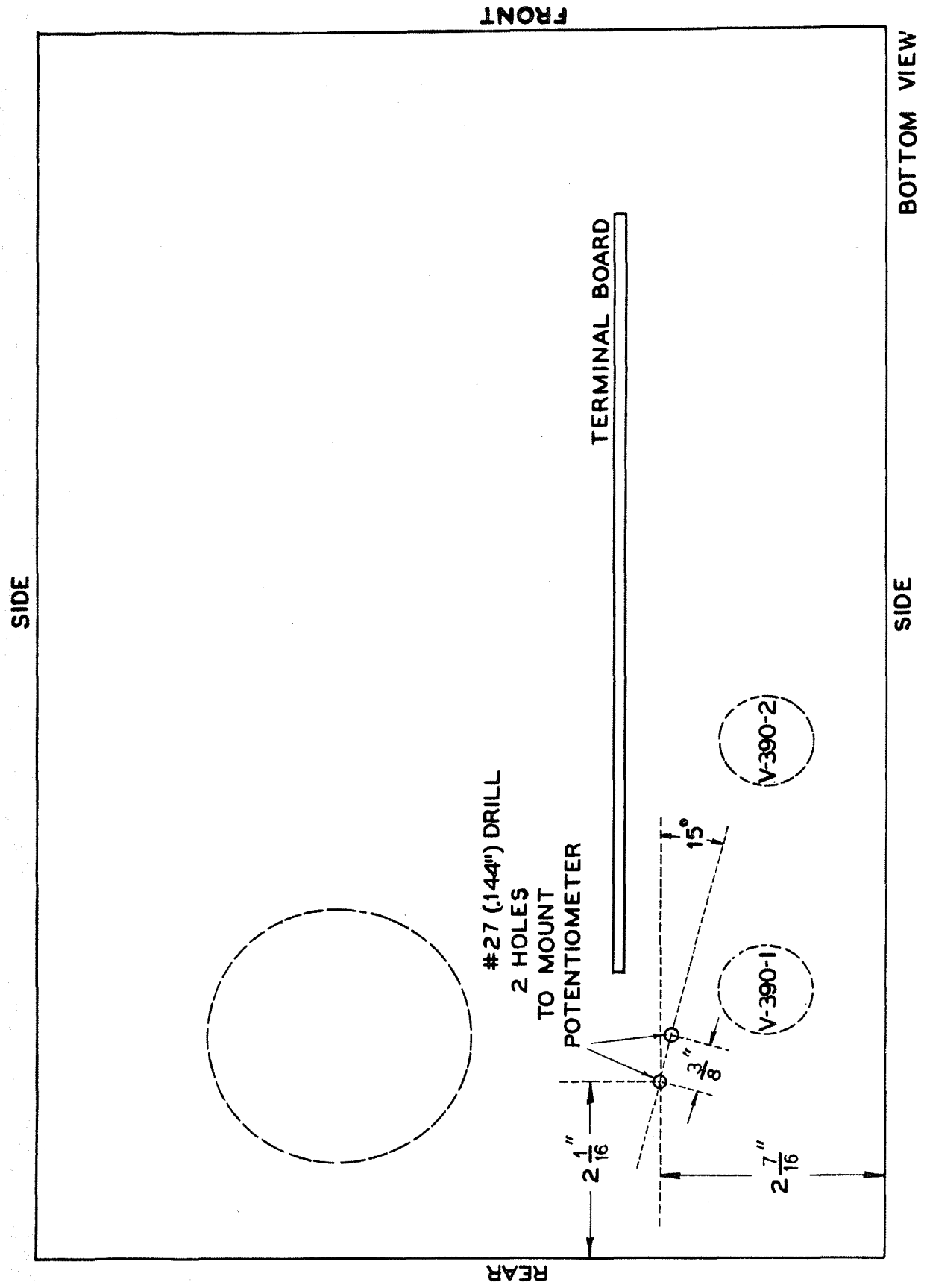


Figure 6-11. Indicator BC-929-(*)—Location of Mounting Holes for Potentiometer 307-4

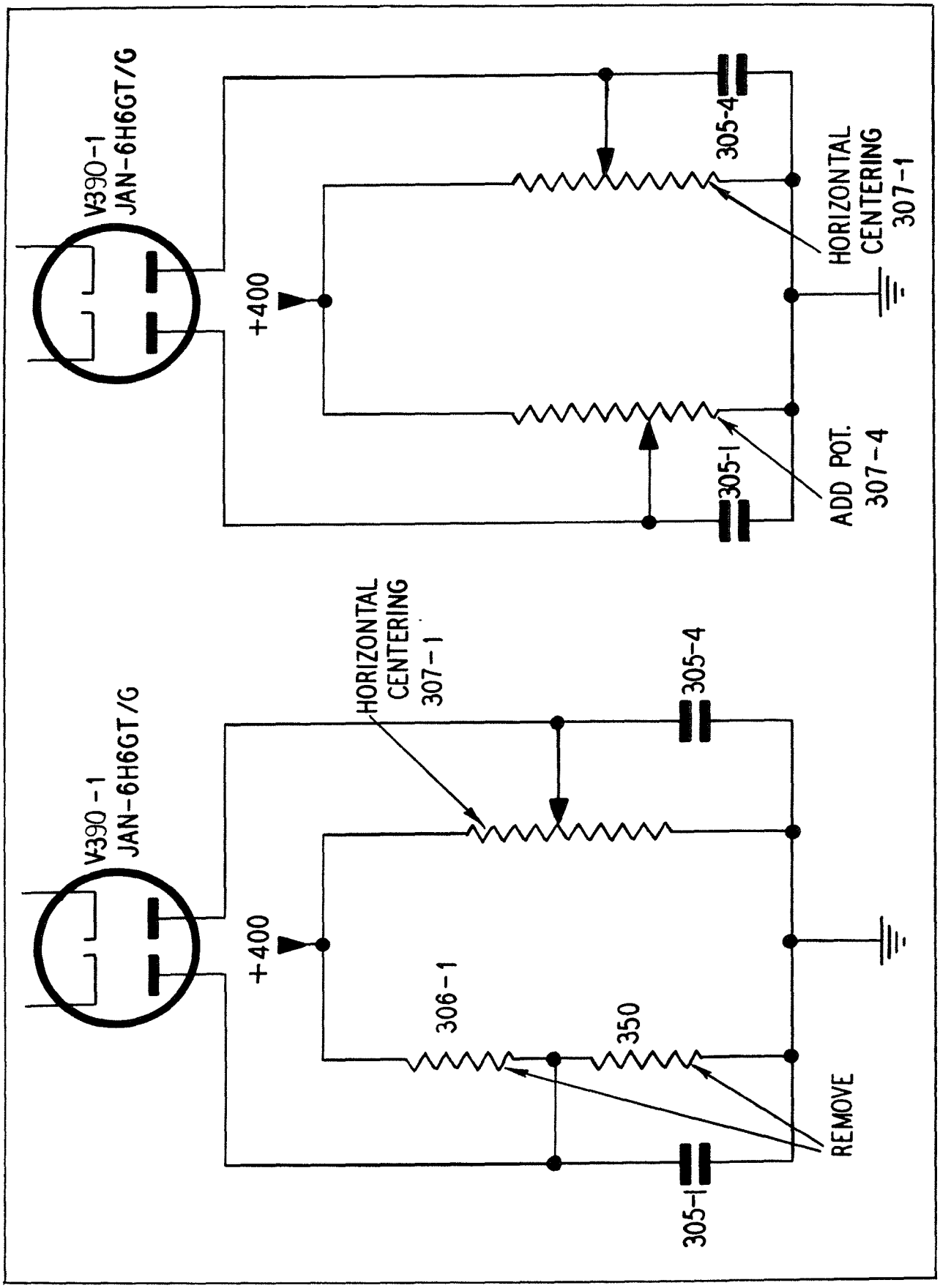


Figure 6-12. Indicator BC-929-(*)—Horizontal Centering, Before and After Modification

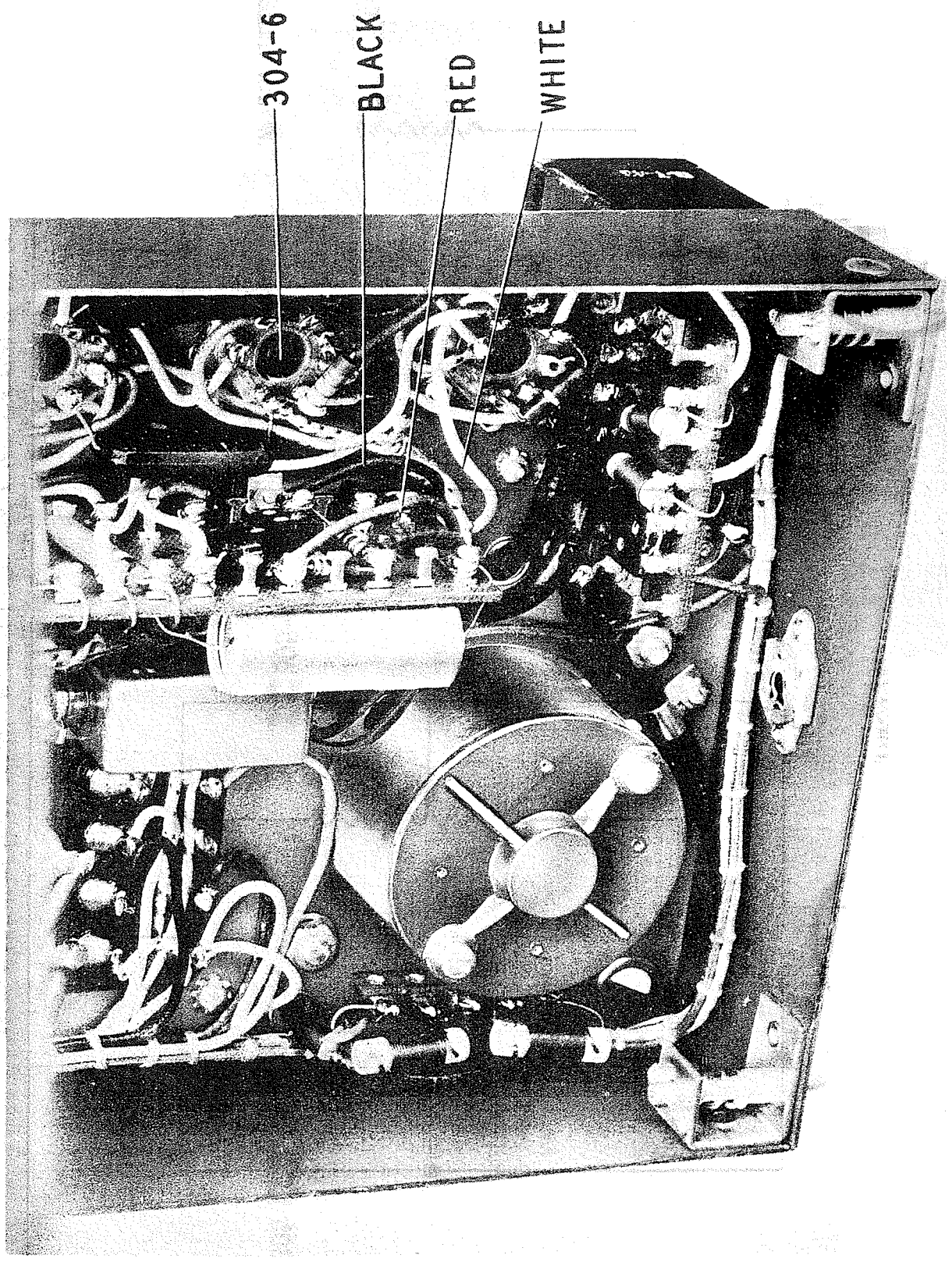


Figure 6-13. Indicator BC-929-(*)—Wires Changed for Potentiometer 307-4

(31) CHANGES NO. 75 AND 76.—Filter capacitors 333A and 333B in one tubular can were replaced by two separate capacitors 347 (Philco part No. 305-1342) and 348 (Philco part No. 305-1048). Capacitor 348, which replaced 333B, is mounted in the same hole used by the original capacitor. The other new capacitor, 347, is mounted on the underside of the chassis, as shown in figure 6-14. When this change is made, it is necessary to drill the chassis as shown at A and B for mounting the capacitor, and as at C for a terminal board.

(32) CHANGE NO. 77.—Resistor 303-5 was removed from the circuit to increase the range of the intensity control, required by variations in some cathode-ray tubes. This removal was effective with serial No. 1010 on order No. 5759-WF-43. Later, the intensity control was changed to 1 megohm, and a 220,000-ohm, 1-watt resistor, 352-1, connected in parallel with it. At this same time the values of all the high-voltage bleeder resistors were changed to improve focus and intensity control for the general run of cathode-ray tubes. This change was effective with serial No. 2377 on order No. 431-DAY-44, and subsequent models.

(33) CHANGES NO. 78, 79, 80, 81, and 82.—These five items were changed to increase the control range of the "INTENSITY" and "FOCUS" adjustments, to cover variations in gun alignment of cathode-ray tubes. The original values are shown in figure 8-10. If trouble of this nature is experienced in the field, proceed with the change in the following manner:

(a) Remove resistor 315-3, 100,000 ohms, connected across the A and B sections of capacitor 337 and replace by resistor 351, a 22,000-ohm, ±10%, ½-watt resistor (see fig. 6-15).

(b) Interchange intensity-control potentiometer 343, 1 megohm, with focus-control potentiometer 339, .5 megohm.

(c) Remove resistors 342-1, 342-2, 342-3 and 342-4, all 1-megohm, 1-watt carbon resistors, from the small terminal board next to the intensity potentiometer.

(d) Connect resistors 306-3 (353-1) and 306-4 (353-2), 330,000-ohm, 1-watt carbon, and resistors 352-1 and 352-2, 220,000-ohm, ±10%, 1-watt, to the small terminal board. Locate resistor 352-1 on the reverse side of the terminal board.

(e) Remove the yellow wire from point A (connecting the focus potentiometer with the terminal board) and connect it at point B.

(f) Connect a new white lead from the end of 352-1 on top of the terminal board to the intensity potentiometer.

(g) Disconnect the two green leads at point C. Reconnect the green lead from potentiometer 343 to point D, and reconnect the green lead from the cathode of the cathode-ray tube to point E.

(h) Check connections, using figure 6-16 as reference.

e. INSTRUCTIONS FOR MOUNTING MODIFICATION KIT ON ANTENNA ★AT-2/APN-2.

(1) Remove loose screws (8-32 x ¾") and nuts (365-832) from dipole and director brackets, and screws (8-32 x 1⅛") and nuts (365-832) from center brackets. (See fig. 6-17.)

(2) Make sure dipoles and director are parallel in horizontal plane.

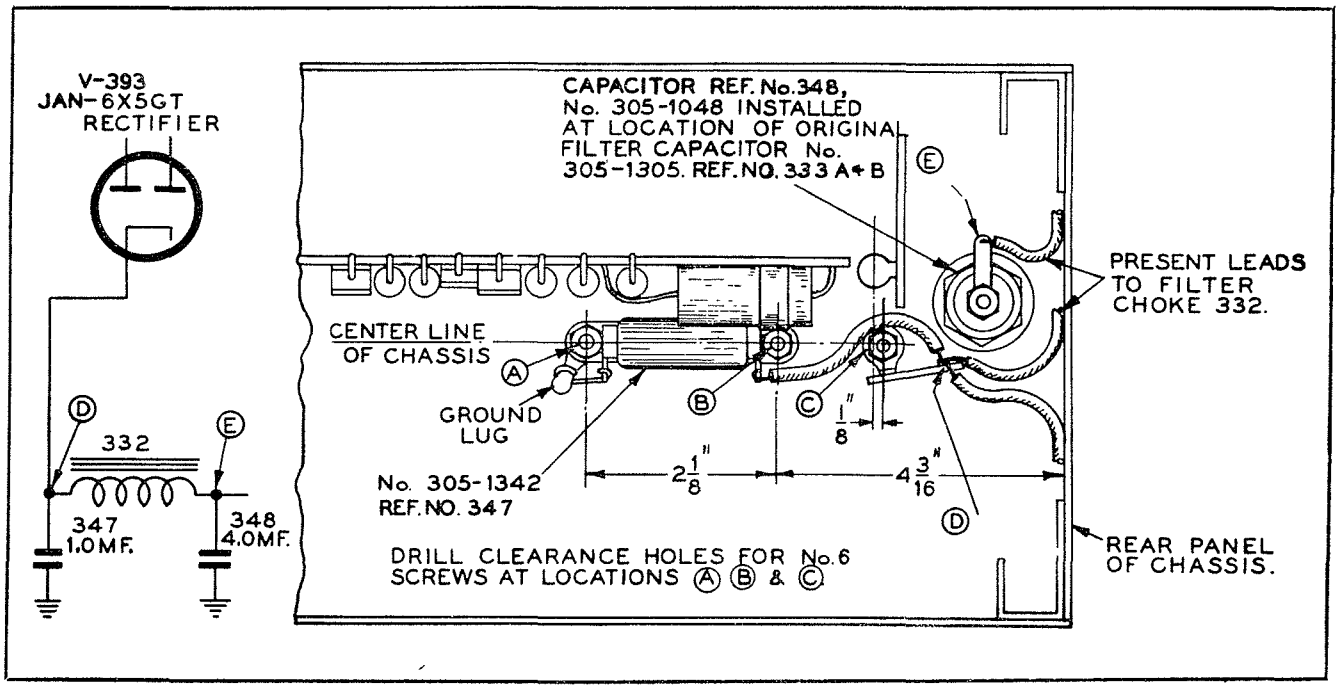


Figure 6-14. Indicator BC-929-(*)—Mounting of Capacitors 347 and 348

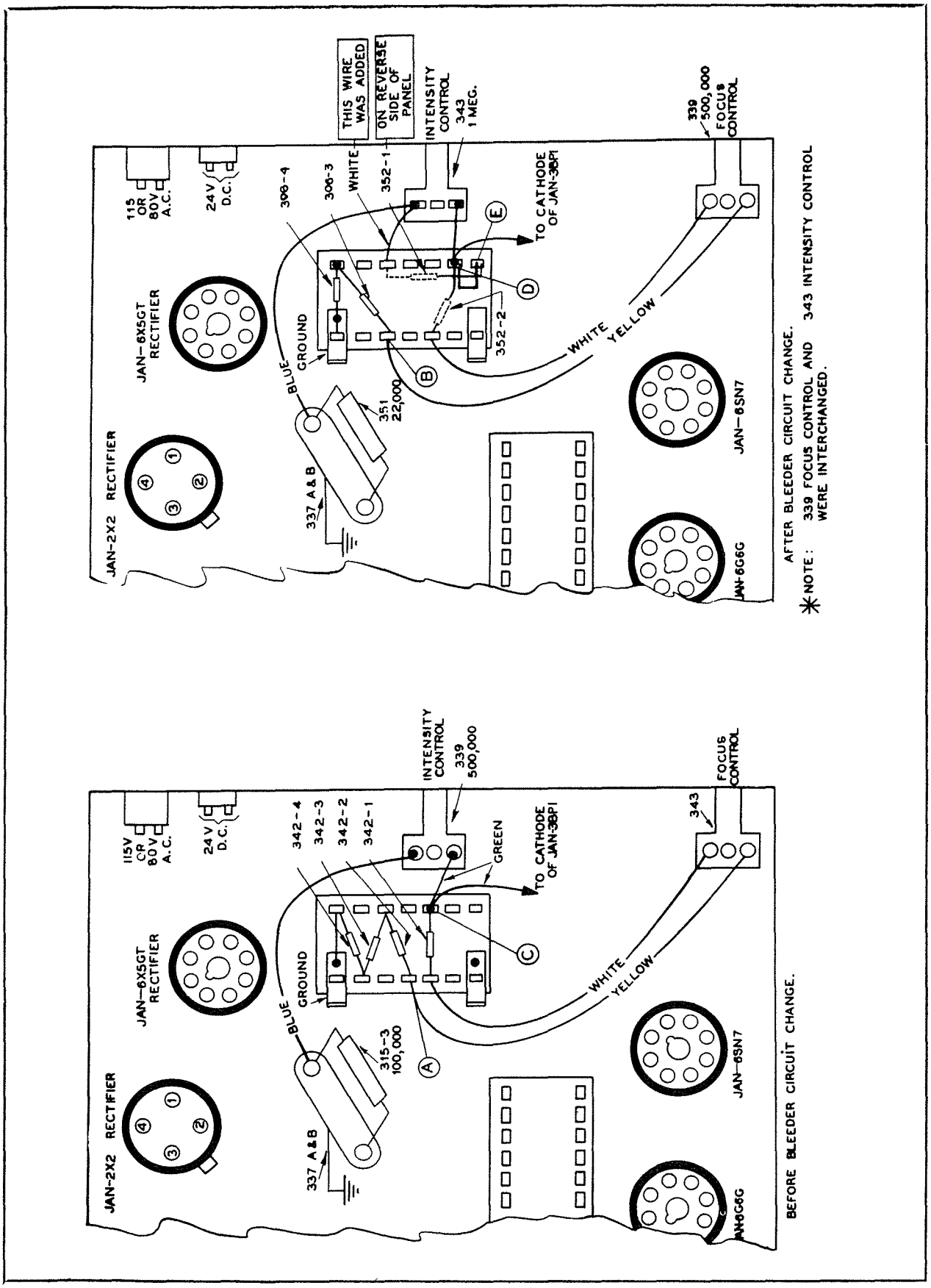


Figure 6-15. Indicator BC-929-(*)—Bleeder Resistor Mounting

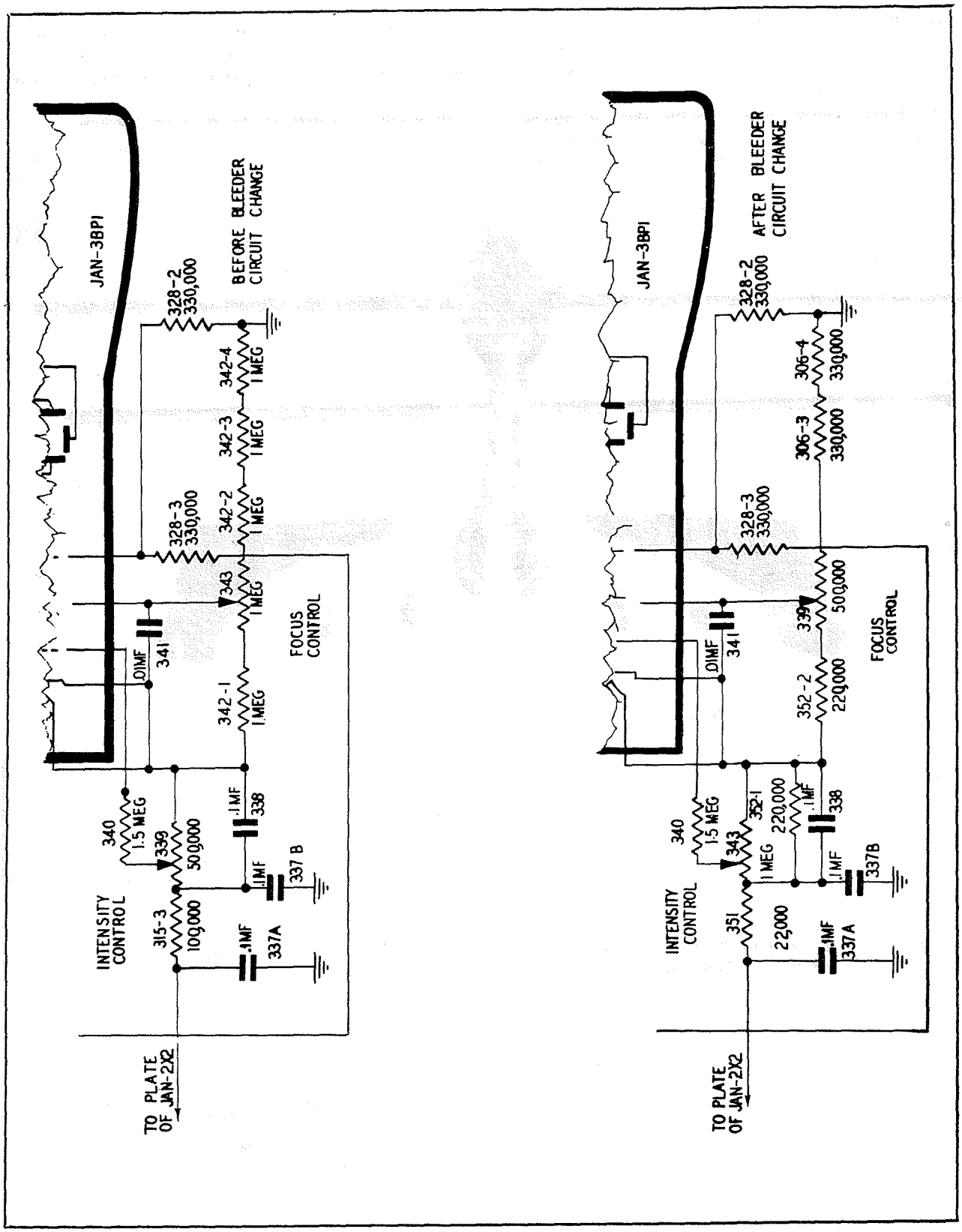


Figure 6-16. Indicator BC-929-(*)—Bleeder Circuit, Before and After Modification

(3) From dimensions shown on diagram, figure 6-18, locate centers and drill No. 16 (.177") diameter holes through dipoles and director tubing.

(4) Assemble center brackets on center tube approximately 2 5/16 inches from bottom of housing. Insert screws on center bracket and draw up nuts snugly.

(5) Adjust corners of wings with edges of dipoles and director. Center holes in wing brackets on tubing. (Make slight adjustment in height and position of center bracket if necessary.)

(6) Insert screws through holes in dipoles and director with head of screw on top of tubing, and draw up elastic stop nuts tightly (wings should clear dipole and director tubing by 1/32" minimum). If filing of plastic is necessary to obtain clearance, refinish edges of plastic with lacquer. Tighten screws on center bracket.

(7) Recheck to make certain that director is not bowed and is parallel to dipoles.

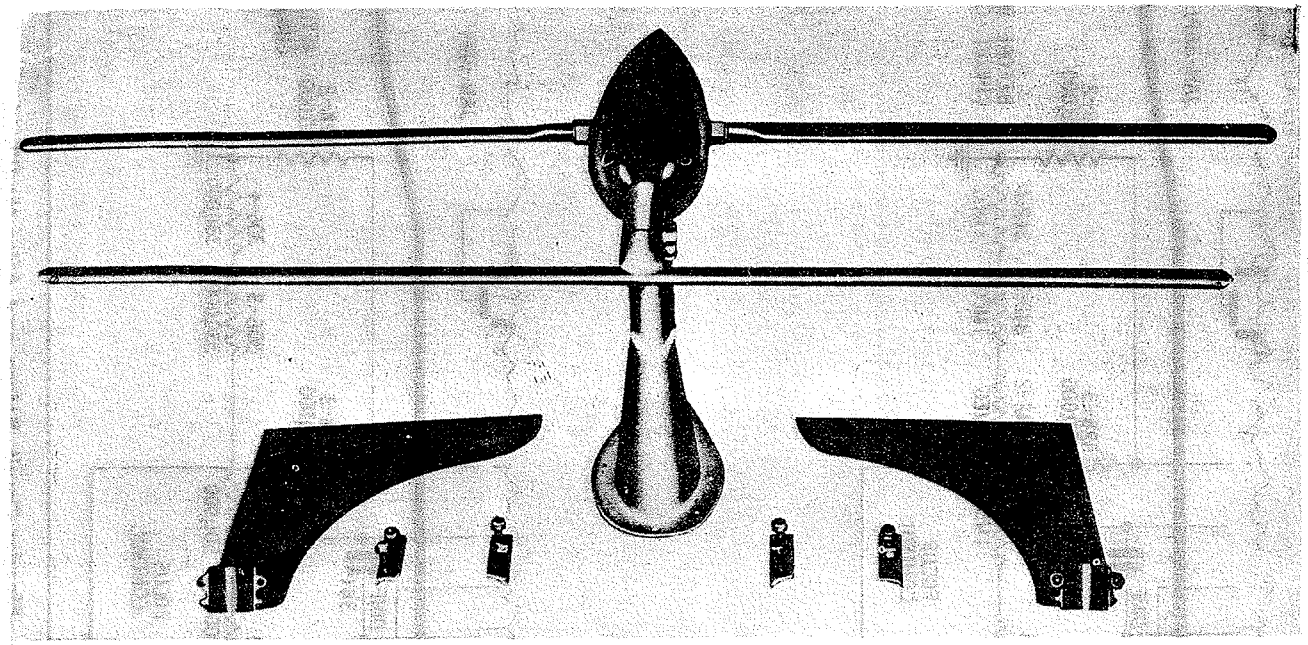


Figure 6-17. Antenna ★AT-2/APN-2 Modification Kit

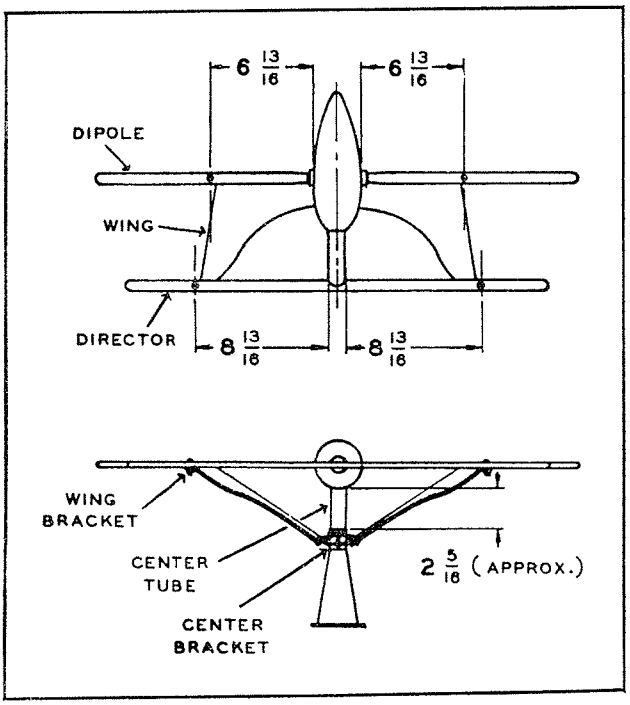


Figure 6-18. Antenna ★AT-2/TPN-2 Modification—Dimensional Drawing

6. INSTRUCTIONS FOR RADIO SET AN/APN-2B (MODIFIED RADIO SET ⋆AN/APN-2).

IMPORTANT

THE FOLLOWING INSTRUCTIONS ARE NOT INTENDED AS A DIRECTIVE TO MODIFY RADIO SET ⋆AN/APN-2. THESE INSTRUCTIONS ARE ONLY TO BE USED IN CONJUNCTION WITH THE REMAINDER OF THIS TECHNICAL ORDER IN CASE RADIO SET AN/APN-2B MUST BE OPERATED OR MAINTAINED.

a. GENERAL.

(1) Radio Set ⋆AN/APN-2 has been modified by extending the range of the receiver "GAIN" (sensitivity) control of Radio Receiver-Transmitter ⋆RT-1A/APN-2 and increasing the 100 mile range of Indicator BC-929-A to 200 miles. The modified receiver-transmitter is Radio Receiver-Transmitter RT-1D/APN-2. This receiver has been modified to improve its adjacent channel rejection by providing a wide band stagger tuned i-f system. The modified indicator is Indicator BC-929-C.

(2) The operating procedures for the modified equipment are the same as the operating procedures for Radio Set ⋆AN/APN-2. Mechanically and electrically Radio Set AN/APN-2B will perform the same functions as Radio Set ⋆AN/APN-2. The only operating function changed is that the 100 mile range of Radio Set ⋆AN/APN-2 is increased to 200 miles for Radio Set AN/APN-2B.

b. MODIFICATION PROCEDURE.

(1) MODIFICATION INSTRUCTIONS TO PROVIDE A STAGGER TUNED I-F SYSTEM FOR RADIO SET AN/APN-2B.—The purpose of this modification is to provide a sharp cut-off, wide band receiver response in order to eliminate reception of signals on adjacent operating channels. The parts for this modification are listed at the end of Section VII, beginning with M-27.

IMPORTANT

WHEN INSTALLING NEW COMPONENTS, KEEP ALL LEADS AS SHORT AS PRACTICABLE.

(a) Separate the upper chassis from the lower chassis as follows:

1. Remove the four corner screws.

2. Remove the three screws on the front and back of the top cover.

3. Remove the tow on each side of the lower cover.

4. Now lift the upper chassis off the lower chassis and turn the upper chassis upside down.

(b) Remove all tubes during this modification to prevent their damage.

(c) Modify the mixer stage (tube 956) as follows:

1. Remove the shield from the r-f section.

2. Replace the plate load resistor R-103-3, with a 2000 ohm, ½ watt resistor MR-103-3. (See fig-6-21.)

(d) Modify the 1st i-f stage (tube 6AC7) as follows: (See figs. 6-19, 6-20 and 6-21.)

1. Use the screw which secured the eight lug terminal strip to mount the insulated terminal M-34-1 near the 1st i-f tube socket X-102-1.

2. Remove cathode resistor R-107-1 (R-106-4 in Receiver-Transmitter RT-1D/APN-2) and the 1000 mmfd cathode bypass capacitor C-106-6. Connect a 1000 mmfd capacitor MC-106-6 between the insulated terminal M-34-1 and the ground terminal originally used for bypass capacitor C-106-6

3. Connect a 180 ohm, ½ watt resistor MR-11 between insulated terminal M-34-1 and the cathode terminal (pin No. 5) of the 1st i-f tube socket X-102-1.

4. Connect a 75,000 ohm, 2 watt resistor MR-35 between the cathode terminal (pin No. 5) of the 1st i-f tube and the B+ terminal of the adjacent terminal strip.

5. Connect a 400 ohm, ½ watt resistor MR-10 between insulated terminal M-34-1 and the nearest ground lug on the 1st i-f socket.

6. Replace plate load resistor R-108-1 with a 3500 ohm, ½ watt resistor MR-108-1.

(e) Modify the 2nd i-f stage (tube 6AC7) as follows: (See figs. 6-19 and 6-21.)

1. Remove the i-f tuning coil L-103-2 from the chassis. Remove the winding from this coil.

2. Use the screw near the side of the chassis which secures the 2nd i-f tube socket, X-102-2, to mount insulated terminal M-34-2. Clip off the half of the solder lug farthest from the tube socket to prevent contact with the chassis.

3. Remove cathode resistor R-109-1 and cathode bypass capacitor C-106-10. Connect a 1000 mmfd cathode bypass capacitor MC-1066-10 between insulated terminal M-34-2 and the ground terminal originally used for bypass capacitor C-106-10.

4. Connect a 180 ohm, ½ watt resistor MR-13 between insulated terminal M-34-2 and the cathode terminal (pin No. 5) of the 2nd i-f tube socket, X-102-3.

5. Connect a 400 ohm, ½ watt resistor MR-12 between insulated terminal M-34-2 and the ground lug on the 2nd i-f socket to which i-f tuning inductance L-103-2 was connected.

6. Replace plate load resistor R-108-2 with a 3500 ohm, ½ watt resistor MR-108-2.

7. Using nine turns of number 22 enameled wire, rewind i-f tuning coil L-103-2. This coil, now having nine turns of wire is referred to as coil ML-103-2. Place the new coil in approximately the same position as the original.

8. Install i-f coil ML-103-2 in the chassis and connect it in the circuit in place of coil L-103-2.

(f) Modify the 3rd i-f stage (tube 6AC7) as follows: (See figs. 6-19 and 6-21.)

1. Drill a number 23 hole in the chassis adjacent to pin number 4 of the 3rd i-f tube socket and mount insulated terminal M-34-3. Clip off the half of solder lug farthest from the tube socket.

2. Remove cathode resistor R-109-2 and cathode bypass capacitor C-106-14. Connect a 1000 mmfd mica capacitor MC-106-14 between insulated terminal M-34-3 and the ground terminal originally used for bypass capacitor C-106-14.

3. Connect a 180 ohm, ½ watt resistor MR-15 between insulated terminal M-34-3 and the cathode terminal (pin No. 5) of the 3rd i-f tube socket X-102-3.

4. Connect a 400 ohm, ½ watt resistor MR-14 between insulated terminal M-34-3 and the ground lug on the 3rd i-f tube socket to which the i-f tuning coil L-103-3 is connected.

5. Replace plate load resistor R-108-3 with a 3500 ohm, ½ watt resistor MR-108-3.

(g) Modify the 4th i-f stage (tube 6AC7) as follows: (See figs 6-19 and 6-21.)

1. Use the screw near the side of the chassis which secures the 4th i-f socket, X-102-4, to mount insulated terminal M-34-4. Clip off the half of the solder lug farthest from the tube socket.

2. Remove i-f tuning coil L-103-4 from the chassis. Remove the winding from this coil.

3. Remove cathode resistor R-113-1 and cathode bypass capacitor C-106-18. Connect a 1000 mmfd mica capacitor MC-106-18 between insulated terminal M-34-4 and the ground terminal on the 4th i-f tube socket to which tuning coil ML-103-4 is connected.

4. Connect a 180 ohm, ½ watt resistor MR-17 between insulated terminal M-34-4 and the cathode terminal (pin No. 5) of the 4th i-f tube socket X-102-4.

5. Connect a 400 ohm, ½ watt resistor MR-16 between insulated terminal M-34-4 and the nearest ground lug on the 4th i-f tube socket.

6. Replace plate load resistor R-108-4 with a 3500 ohm, ½ watt resistor MR-108-4.

7. If the Receiver-Transmitter being modified contains a resistor connected in series between the plate terminal (pin No. 8) of the 4th i-f tube socket and capacitor C-106-21, the 1000 mmfd coupling capacitor to the grid terminal (pin No. 4) of the 5th i-f tube socket, this resistor should be removed. The 1000 mmfd coupling capacitor C-106-21 should then be connected directly to the plate terminal (pin No. 8) of the i-f tube socket.

Note

This capacitor may be replaced with a 1000 mmfd mica capacitor if necessary.

8. Replace screen dropping resistor R-113-1 with a 68,000 ohm, ½ watt resistor MR-113-1. (See fig. 6-19.)

9. Using nine turns of number 22 enameled wire, rewind i-f tuning coil L-103-4. This coil now havinng nine turns of wire is refedded to as coil ML-103-4.

10. Install i-f coil ML-103-4 in the chassis and connect it in place of coil L-103-4.

(h) Modify the 5th i-f stage (tube 6AC7) as follows: (See figs. 6-19 and 6-21.)

1. Use the screw near the side of the chassis which secures the 5th i-f tube socket X-102-5 to mount insulated terminal M-34-5. Clip off the half of the solder lug farthest from the tube socket.

2. Remove cathode resistor R-114 and cathode bypass capacitor C-106-22. Connect a 1000 mmfd mica capacitor MC-106-22 to insulated terminal M-34-5 and the ground terminal originally used for bypass capacitor C-106-22.

3. Connect a 180 ohm, ½ watt resistor MR-19 between insulated terminal M-34-5 and the cathode terminal (pin No. 5) of the 5th i-f tube socket X-102-5.

4. Connect a 400 ohm, ½ watt resistor MR-18 between insulated terminal M-34-5 and the ground lug on the 5th i-f tube socket to which i-f tuning coil L-103-5 is connected.

5. Replace plate load resistor R-129 with a 3500 ohm, ½ watt resistor MR-129.

6. Replace screen dropping resistor R-105-2 with a 68,000 ohm, ½ watt resistor MR-105-2.

(i) Modify the tuning indicator assembly as follows: (See figs. 6-31 and 6-32.)

1. The necessary components for this assembly are listed in section VII, as are all other parts required for this modification.

2. Solder the 1 megohm resistor between pin 2 and pin 4 of the tube socket.

3. Connect the 12-inch red, No. 18 wire to pin 4 of the tube socket.

4. Connect one end of the 12-inch, black, No. 18 wire to pin 5 and the other end to pin 1 of the tube socket.

5. Connect the 12-inch, yellow, No. 18 wire to pin 8 of the tube socket.

6. Connect the 12-inch, green, No. 18 wire to pin 3 of the tube socket.

7. Slip the shell over the wires and press into place over terminals of the tube socket.

8. Lace the cable down to a point three inches from the ends of the wires using lacing cord, or cover with a nine inch piece of insulating tubing.

9. This assembly is now circuit reference number M-28.

(j) Modify the 2nd detector stage (tube 6H6GT/G) as follows:

1. Remove the four lug terminal strip which is located between the 2nd detector tube socket X-102-6 and the 1st video tube socket X-102-7. Also remove all leads connected to this strip. Then remove the connection between pin number 3 of the 2nd detector tube socket and pin number 8 of the 1st video tube socket.

2. Between the 2nd detector tube socket and the 1st video tube socket drill a ⅜ inch diameter hole, centered two inches from the edge of the chassis. (See fig. 6-19.)

3. Mount coil assembly ML-26 on the chassis using the hole just drilled.

Note

Coil assembly ML-26 should have 12 turns of number 22 enameled wire wound in a manner similar to the i-f coils. The spacing between the last turn of the coil and the open end of the coil form should be ½ inch.

4. Connect coil assembly ML-26 between pin number 4 of the 2nd detector (tube 6H6GT/G) tube socket and the adjacent socket ground lug.

5. Connect a 47,000 ohm, ½ watt resistor MR-20 between pin number 4 and pin number 8 of the 2nd detector tube socket X-102-6.

6. Insert the cable attached to tuning indicator tube M-28, in the opening below bypass capacitor C-107-2A. (See fig. 6-31.) Be sure that this cable is routed as shown in fig. 6-19.

7. Connect a 100,000 ohm, ½ watt resistor MR-23 between pin number 3 of the 2nd detector tube socket and an unused terminal on terminal strip T-3. (See fig. 6-19.) To the same terminal on terminal strip T-3 connect the green lead coming from the grid of indicator tube M-27 (type 6E5) and one end of the 1000 mmfd capacitor MC-24.

8. Connect the free end of capacitor MC-24 to the grounded terminal of terminal strip T-3.

9. Connect a 5 megohm, ½ watt resistor MR-21 between pin number 3 of the 2nd detector tube socket and the nearest ground lug on the 2nd detector tube socket.

10. Connect the red lead coming from the target plate of indicator tube M-27 to the 1st lug on terminal T-2. This lug has several other red leads connected to it. It is a source of 300 volts direct current. (See fig. 6-19.)

11. Connect the black lead from the cathode of the indicator tube M-27 to a convenient ground terminal.

12. Connect the yellow lead from the filament of indicator tube M-27 to the ungrounded filament (pin No. 2 or 7) of the sync input tube socket X-102-9. (See fig. 6-19.)

(k) Modify the mounting brackets as follows:

1. Remove the mounting bracket for the "SYNC IN" and "SUP OUT" connectors. In its place mount special bracket M-31. Install the "SYNC IN" and "SUP OUT" connectors on this new bracket.

2. Mount tuning indicator tube bracket M-30 on the side of the r-f shield can as shown in fig. 6-31.

3. Mount rubber grommet M-32 on bracket M-31.

(l) Carefully inspect all wiring in the receiver chassis for properly soldered connections and to insure suitable clearance between uninsulated wiring.

(m) Reassemble the receiver-transmitter unit.

(n) Stencil or paint "RT-1D/APN-2" on the top of the top cover.

(o) Align the i-f and r-f adjustments as outlined in section V.

(2) INDICATOR BC-929-A.

(a) Remove the dust cover by loosening the Dzus fastener in the rear of the indicator and sliding the cover off.

(b) Turn the chassis upside down.

(c) Replace resistor 323-1, 47,000 ohms with a 1.8 megohm, ±10%, ½ watt carbon resistor. This new resistor is assigned Reference Number R-350. (See fig. 6-22.)

(d) Replace the 220,000 ohm resistor 324-2 with a 820,000 ohm, ½ watt resistor. This new resistor is assigned Reference Number R-351. (See figs. 5-28, 6-22 and 8-12.)

(e) Replace the dust cover and tighten the Dzus fastener.

(f) Stencil or paint "BC-929-C" on the top of the dust cover.

(g) Remove the cover from the face of the Cathrode-Ray tube by removing the three screws around the outer edge of the cover.

(h) Remove the four screws that hold the scale in place and insert the plastic 200 mile range scale in front of the green range scale.

Note

If the 200 mile range scale is not available, suitable marks should be made on the scale with India Ink, marked scotch tape or some other method. (See fig. 6-23.)

(i) Replace the cover and tighten all screws.

(j) Remove the "100" mile marks on the front of the indicator by blotting out, and stamp or paint "200" mile marks in their place.

c. CALIBRATION OF INDICATOR BC-929-C.

(1) Calibrate the indicator for the 10 mile and 50 mile ranges in accordance with Section II, Paragraph 3*b through* 3*b*(17).

(2) Calibrate the 200 mile range as follows:

(a) Turn the indicator "RANGE" switch and the range calibrator "NAUTICAL MILES" switch to the "200" mile range and adjust the "SWEEP DURATION 200" control for 20 peaks (four in each division). Each calibration point now represents 10 miles.

(b) Adjust the "SWEEP AMPLITUDE 200" control until the 16th calibration point is on the 160 mile horizontal line. (See fig. 6-24.)

(c) Adjust the "SWEEP DURATION 200" control until the signal stops on the 200 mile horizontal line.

(d) Disconnect the range calibrator and associated cables and reconnect the regular cables according to the cording diagram. (See fig. 8-1.)

d. CALIBRATION AND ADJUSTMENT OF RADIO RECEIVER-TRANSMITTER RT-1D/APN-2 USING RADAR TEST EQUIPMENT AN/UPM-1.

Note

Radar Test Equipment AN/UPM-1 is the standard test equipment to check and adjust Radio Set AN/APN-2B. Test Equipment IE-45-B is the standard substitute. If Radar Test Equipment AN/UPM-1 is available, use the following procedure. If Test Equipment IE-45-B is to be used, follow the procedure in this section, paragraph *6e.*

Radar Test Equipment AN/UPM-1 has been modified so that it could be used to test Radio Set AN/APN-2B. Refer to section VI, paragraph *6b* for a complete description of the modification.

(1) Turn the SPST toggle switch on the front panel of the Radar Test Equipment to the "ON" position.

(2) Calibrate the vertical deflection and the sweep of the oscilloscope of Radar Test Equipment AN/UPM-1. Use the procedure given in figure 6-25.

(3) Adjust the frequency of Oscillator O-12/UPM-1 to 214 megacycles assording to instructions in figure 6-26. Set "DELAY MICROSECONDS" to "25" for this adjustment.

Note

Two hundred and fourteen (214) megacycles is to be used for this adjustment unless otherwise directed by the Officer-in-Charge.

(4) Calibrate the "ATTENUATOR" of Oscillator O-12/UPM-1 for output level according to the instructions in figure 6-27. Move the "ZERO RESET" to 4.5.

(5) Make the following connections and adjustments of Radio Set AN/APN-2B and Radar Test Equipment AN/UPM-1.

(a) "PULSE OUTPUT +" on Radar Test Equipment AN/UPM-1 to "SYNC IN" on Radio Receiver-Transmitter RT-1D/APN-2.

(b) "SYNC OUT" on Radio Receiver-Transmitter RT-1D/APN-2 to "SYNC" on Indicator BC-929-C.

(c) "VIDEO 2" on Radio Receiver-Transmitter RT-1D/APN-2 to "VIDEO" on Indicator BC-929-C.

(d) Make all power connections to Radio-Receiver-Transmitter RT-1D/APN-2, Indicator BC-929-C and Radar Test Equipment AN/UPM-1.

(e) "LF ANT" on Radar Test Equipment AN/UPM-1 to "RCVR ANT" on Radio Receiver-Transmitter RT-1D/APN-2.

(f) Diode Head CV-11/UPM-1 between Radar Test Equipment and "TRANS ANT" on Radio Receiver-Transmitter RT-1D/APN-2.

(g) Set the "GAIN" control on Control Box C-3/APN-2 to maximum clockwise position.

(h) Set "RANGE" on Indicator BC-929-C to "50."

(i) Set "PULSE DELAY MICROSECONDS" on Radar Test Equipment AN/UPM-1 to "400."

(6) Adjust the receiver frequency of Radio Receiver-Transmitter RT-1D/APN-2 as follows:

(a) Adjust "RCVR OSC" "HIGH" for maximum deflection on the oscilloscope screen of Indicator BC-929-C.

(b) Adjust "RCVR TUNING" "1," "2" and "3" for maximum deflection on the oscilloscope screen of Indicator BC-929-C.

IMPORTANT

ALWAYS KEEP THE "ATTENUATOR" CONTROL ON RADAR TEST EQUIPMENT AN/UPM-1 TURNED TO A HIGH ENOUGH ATTENUATION FIGURE SO THAT THE RECEIVER IS NOT SATURATED. (THE SIGNAL SHOULD COVER ONLY ONE OR TWO DIVISIONS ON THE INDICATOR SCREEN.)

(c) Increase the signal input to a point which causes a small deflection of the tuning eye indicator. The "REPETITION RATE" may be set as "1200."

(d) Tune the "RCVR OSC" ("HIGH") and "RCVR TUNING" ("1," "2," and "3") to give a minimum shadow on the tuning eye indicator.

(e) Repeat *(c)* and *(d)*, this paragraph, to obtain best results.

(7) Measure the sensitivity of the receiver of Radio Receiver-Transmitter RT-1D/APN-2 as follows:

(a) Adjust the "ATTENUATOR" on Radar Test Equipment AN/UPM-1 until the signal plus noise on the oscilloscope screen of Indicator BC-929-C is twice the amplitude of the noise.

(b) The "ATTENUATOR DIAL" should read at least 100 db. (If it does not, refer to section V, paragraph 6.)

(8) Adjust the transmitter frequency of Radio Receiver-Transmitter RT-1D/APN-2 as follows:

(a) Adjust Radar Test Equipment AN/UPM-1 according to instructions in figure 6-28.

(b) Place the "TRANS FREQ" knob in position "A."

(c) Adjust Wavemeter TS-133/UPM-1 to 214 megacycles. (Use the calibration charts to obtain the correct dial setting for the desired frequency.)

(d) Tune the "TRANS FREQ" adjustment (located in the hole under the knob), with the tuning tool furnished, for the maximum signal on the oscilloscope screen of Radar Test Equipment AN/UPM-1.

IMPORTANT

IT WILL BE NECESSARY TO MAKE AND LOCK THE ADJUSTMENT, REMOVE THE TOOL, CHECK THE FREQUENCY, THEN READJUST, LOCK AND RECHECK THE FREQUENCY UNTIL IT IS CORRECT (MAXIMUM SIGNAL).

(e) Repeat steps *(c)* and *(d)*, this paragraph, for the remaining four frequencies (positions "B," "C," "D" and "E" of the "TRANS FREQ" knob). ("A" = 214, "B" = 219, "C" = 224, "D" = 229, and "E" = 234 megacycles.)

(9) Check the transmitter power output and pulse width as shown in figure 6-29.

(a) The power output should be at least 500 watts for each of the five frequencies.

(b) The pulse width should be between four and seven microseconds.

(c) After the tests are completed, place the "TRANS FREQ" knob in position "C."

(10) Check the repitition frequency *count down* of the pulse generating circuit as follows:

(a) Connect "PULSE OUTPUT+" on Radar Test Equipment AN/UPM-1 to "SYNC IN" on Radio Receiver-Transmitter RT-1D/APN-2.

(b) Connect Probe Cable W-1205 (cable with the red and black clip leads) to "VERTICAL INPUT AND DIODE HEAD" connector on Radar Test Equipment AN/UPM-1.

(c) Set "SYNC" control on Radar Test Equipment AN/UPM-1 to "INT," "PULSE DELAY" to "25," "SELECTOR" switch to "3," and "SWEEP DURATION" to "40."

(d) Connect red lead of Probe Cable W-1205 to "SYNC OUT" on Radio Receiver - Transmitter RT-1D/APN-2.

(e) Observe the pulse on the oscilloscope screen of Radar Test Equipment AN/UPM-1. The pulse should break the base line with the "REPETITION RATE" switch at "250" and should not break the base line at "1200." This indicates that Radio Receiver-Transmitter RT-1D/APN-2 starts to *count down* somewhere between 250 and 500 pulses per second.

(11) Check the suppression pulse width and amplitude as follows:

(a) Connect "SUP OUT" on Radio Receiver Transmitter RT-1D/APN-2 to "SYNC INPUT" on Radar Test Equipment AN/UPM-1. Use "T" connector M-258 at the "SYNC INPUT" terminal.

(b) Connect Probe Cable W-1205 to "VERTICAL DEFLECTION AND DIODE HEAD" of Radar Test Equipment AN/UPM-1.

(c) Connect the red clip lead of Probe Cable W-1205 to "SYNC INPUT" ("T" connector) of Radar Test Equipment AN/UPM-1.

(d) Set "SYNC" control on Radar Test Equipment AN/UPM-1 to "EXT," "SWEEP DURATION" to "200" microseconds, and "SELECTOR" switch to position "3."

(e) Calibrate the oscilloscope sweep and vertical scale. (See fig. 6-25.)

(f) Observe the suppressor pulse on the oscilloscope screen. This pulse should be between 40 and 150 microseconds duration, and should be at least 30 volts in amplitude.

e. CALIBRATION AND ADJUSTMENT OF RADIO RECEIVER-TRANSMITTER RT-1D/APN-2 USING TEST EQUIPMENT IE-45-B.

Note

Radar Test Equipment AN/UPM-1 is the standard test equipment to check and adjust Radio Set AN/APN-2B. Test Equipment IE-45-B is the standard substitute. If Radar Test Equipment AN/UPM-1 is available, use the procedure outlined in section VI, paragraph 6*d*. If Test Equipment IE-45-B is to be used, use the following procedure.

(1) Calibrate Signal Generator 804-C with Frequency Meter TS-175/U as outlined in section VI, paragraph 6*f*.

Note

Two hundred and fourteen (214) megacycles is to be used for this adjustment unless otherwise directed by the Officer-in-Charge.

(2) Connect Radio Receiver-Transmitter RT-1D/APN-2, Control Box *C-3/APN-2, Indicator BC-929-C, Signal Generator 804-C, and Modulator Unit BC-1203-B to power supplies as shown in fig. 8-7.

(3) Turn the equipment on and adjust as follows:

(a) Place the "POWER-OFF" switch on "POWER" on Signal Generator 804-C.

(b) "ON-OFF" switch on Modulator Unit BC-1203-B to "ON."

(c) Radio Receiver-Transmitter RT-1D/APN-2 "TRANS-KEY" to the mid position and "ON-OFF" to "ON." After about three minutes "TRANS-KEY" to "TRANS."

(d) "MODULATION" on Signal Generator 804-C to "OFF."

(e) "PULSE-NORMAL" on Signal Generator 804-C to "PULSE."

(f) "MOD-CAL-USE" on Modulator Unit BC-1203B to "CAL."

(g) Set Signal Generator 804-C dial to 214 megacycles (or other directed frequency) and adjust "CARRIER" control to give a dial reading of "100."

(h) Reset "MOD-CAL-USE" switch to "USE."

(i) Set signal generator "OUTPUT" to 20 millivolts."

(j) Set "FREQUENCY PPS" on Modulator Unit BC-1203-B to a position between 300 and 500.

(k) Set "SWEEP TIME BASE" on Modulator Unit BC-1203-B to "300" (other positions may be used).

(l) Set "RANGE" switch on Indicator BC-929-C to "50."

(m) Set the "GAIN" control to the maximum clockwise position.

(n) Adjust "PULSE DELAY" control on Modulator Unit BC-1203-B until a pulse appears on the indicator screen. (See fig. 5-41.)

Note

It may be necessary to tune the receiver as outlined in step (4) following this note.

(4) Align the receiver as follows:

(a) Tune the "RCVR OSC" "HIGH" control for maximum pulse amplitude as viewed on the indicator, lowering the "OUTPUT" on the signal generator so as not to saturate the receiver.

(b) Loosen the locking screws on the "RECEIVER TUNING" adjustment "1" and tune for maximum pulse amplitude on the indicator screen. Continue reducing the "OUTPUT" control on the signal generator to prevent saturation in the receiver.

(c)) Increase the signal input to a point which causes a small deflection of the tuning eye.

(d) Tune the "RCVR OSC" ("HIGH") and "RCVR TUNING" ("1," "2," and "3") to give a minimum shadow on the tuning eye indicator.

(e) A 10-microvolt signal input should produce a pulse with amplitude two times that of the noise. That is, the pulse amplitude should equal the noise amplitude, and the pulse amplitude plus the noise amplitude should be two times that of the noise amplitude.

IMPORTANT

THE RECEIVER IS TO BE OPERATED ON ONLY ONE FREQUENCY; THEREFORE, THE "RCVR" "LOW" ADJUSTMENT IS NOT TO BE MADE.

(5) Align the transmitter according to the procedure given in section V, paragraphs 6*b* and 6*c*.

f. CALIBRATION OF SIGNAL GENERATOR 804-C.

(1) Equipment required.

(a) Frequency Meter TS-175/U.

(b) Suitable length of coaxial cable fitted with connector UG-21/U on one end and a general radio connector on the other end.

(c) Headphones fitted with Plug PL-55.

(2) Plug the headphones into either of the "PHONES" jack of Frequency Meter TS-175/U.

(3) Turn on Signal Generator 804-C and Frequency Meter TS-175/U and allow both to warm up for at least 15 minutes.

(4) Connect the output of Signal Generator 804-C to "ANTENNA" socket of Frequency Meter TS-175/U by means of cable described in (1) (*b*) above.

(5) Set dial of Frequency Meter TS-175/U to dial reading of crystal check point nearest the desired frequency and turn power switch to "CHECK." Lock dial.

(6) By means of "CORRECTOR" knob, carefully adjust to zero beat with internal crystal, and unlock dial.

(7) Set dial of Frequency Meter TS-175/U to desired frequency and turn power switch to "OPER." Lock dial.

(8) Set "CARRIER" meter of Signal Generator 804-C to 100 (full scale) and "MODULATION" switch to "OFF."

(9) Carefully tune Signal Generator 804-C to zero beat with Frequency Meter TS-175/U. Record reading of both main dial and vernier dial on tuning knob.

(10) Calibrate Frequency Meter BC-906-D for the desired frequency as described in this section, paragraph 6*g*.

(11) Repeat steps (7), (8) and (9) this paragraph, for such other frequencies as may be desired.

g. CALIBRATION AND RECALIBRATION OF FREQUENCY METER BC-906-D.—Frequency Meter BC-906-D should be calibrated in accordance with the following procedure, and it should be recalibrated at intervals of not over thirty days.

(1) The following equipment is required for the calibration of Frequency Meter BC-906-D.

(a) Frequency Meter TS-175/U (including Antenna AT-66/U or suitable substitute) and its instruction book.

(b) Test Oscillator TS-47/APR and its instruction book.

(c) Connector UG-57/U (Radio Frequency Cable).

(d) Headset HS-33 or suitable substitute.

(2) Prepare Frequency Meter TS-175/U as follows:

(a) Connect Antenna AT-66/U to the "ANTENNA" socket on the front panel, using Connector UG-57/U. If Antenna AT-66/U is not available fabricate a substitute using a one foot length of Cable RG-9/U (or equivalent) with six and one-fourth inches of the shielding braid and vinyl insulation removed from one end, and a radio frequency Plug UG-21/U installed on the other.

(b) Insert the plug of Headset HS-33 into either of the "PHONES" jacks.

(c) Turn the "MODULATION" switch to the "OFF" position.

(d) Turn the "GAIN" control fully clockwise.

(e) Turn the selector switch to "STANDBY" position and allow the tubes to heat for approximately ten minutes.

(f) In the calibration book accompanying Frequency Meter TS-175/U, locate crystal check point for lowest frequency to be calibrated, and set the main tuning dial for this frequency.

(g) Turn the selector switch to the "CHECK" position.

(h) Rotate "CORRECTOR" control until zero beat is obtained in the headset.

(i) Using care to prevent disturbing the "CORRECTOR" control setting, turn selector switch to "OPERATE" position.

(j) If the frequency to be calibrated is the same as the frequency used in paragraph 6*g*(2)(*f*), Frequency Meter TS-175/U is now set for calibrating this frequency. If the frequency to be calibrated differs from that of the crystal check point, as determined in paragraph 6*g*(2)(*f*), this section, carefully adjust the tuning dial to the frequency to be calibrated.

(3) Prepare Test Oscillator TS-47/APR as follows:

(a) Locate Test Oscillator TS-47/APR at the right side of Frequency Meter TS-175/U as shown in fig. 6-18A.

(b) Apply proper power to the test oscillator.

(c) Place the "POWER-OFF" switch in the "POWER" position and allow the test oscillator to warm up.

(d) Turn "MODULATION" switch to "OFF" position.

(e) Set "OUTPUT" control at maximum.

(f) Turn "FREQUENCY" switch to the "115-500" position.

(g) Remove the protective cap from "OUTPUT ANTENNA" socket and extend antenna to full length.
lows:

(h) Turn the oscillator frequency control until the "MEGACYCLE" dial reads the lowest oscillator frequency to be calibrated.

(i) Retune the "OSCILLATOR FREQUENCY" control slightly until zero beat is obtained in the headset plugged into Frequency Meter TS-175/U. Test Oscillator TS-47/APR is now tuned to the frequency to be calibrated, although its dial reading may differ slightly.

(4) Calibrate Frequency Meter BC-906-D as follows:

(a) Insert antenna of Frequency Meter BC-906-D in its socket and extend antenna to full length.

(b) Locate Frequency Meter BC-906-D so its antenna is parallel to and approximately one inch from

the antenna stub of Test Oscillator TS-47/APR. (See fig. 6-18A.)

(c) Place the "ON-OFF" switch in the "ON" position.

(d) Place the "HI-LO" switch in the "HI" position.

(e) Refer to the calibration chart on the cover of Frequency Meter BC-906-D, and set tuning dial to frequency to be calibrated.

(f) Carefully adjust dial to obtain maximum meter dip.

(g) Read dial setting and enter on calibration chart.

(h) Repeat operations directed in paragraphs 6*g*(2)*(f)* through *(j)*, 6*g*(3)*(h)*, 6*g*(3)*(i)*, and 6*g*(4)*(e)*, for each five megacycle step in the frequency meter range.

(i) Join the points on the calibration chart and enter the date that the calibration was effected at the upper end of the curve. If the chart used contains previous calibration curves, draw a wavy line over the superseded curve or curves to indicate their having been superseded.

h. MODIFICATIONS OF RADAR TEST EQUIPMENT AN/UPM-1.

Note

The following modifications of Radar Test Equipment AN/UPM-1 are required when it is to be used for testing and adjusting Radar Set AN/APN-2B.

(1) The following parts are required to accomplish the modification of one Radar Test Equipment AN/UPM-1:

Qty.	*Name of Part*	*Signal Corps Stock Number*	*AF Stock Number*
2	Capacitor, fixed: mica; 0.0082 mfd ±5%	3K3582242	3300-376158455
1	Resistor, fixed: composition; 1.2 megohms ±5%	3RC20BF125J	3300-381166720
1	Resistor, fixed: composition; 2.2 megohms ±5%	3RC20BF225J	3300-381168220
1	Resistor, fixed: composition; 33,000 ohms ±10%; ½ w	3RC30BF333K	3300-381168960
1	Resistor, fixed: composition; 560,000 ohms ±5%; ½ w	3RC20BF564J	3300-381170240
1	Switch, Toggle: SPDT	3Z9846.1	3300-395674000
1	Name Plate: "ON-OFF"	3Z4150-2	3300-388535600

(2) Remove the console rack from the dust cover. (See fig. 6-18B.)

(3) Replace resistors R-101, R-102 and R-103 as follows:

(a) Remove resistor R-101 (220,000 ohms) and replace it with a 560,000 ohm resistor, Signal Corps Stock Number 3RC20BF564J. (See figs. 6-18C and 6-18D.)

(b) Remove resistor R-102 (2.2 megohms) and replace it with a 1.2 megohm resistor, Signal Corps Stock Number 3RC20BF125J. (See figs. 6-18C and 6-18D).

(c) Remove resistor R-103 (10 megohms) and replace it with a 2.2 megohm resistor, Signal Corps Stock Number 3RC20BF225J. (See figs. 6-18C and 6-18D.)

(4) Remove capacitor C-117 (0.04 mfd) and replace it with two 0.0082 mfd capacitors, Signal Corps Stock Number 3K3582242, connected in parallel. (See fig. 6-18E.)

(5) Install the "ON-OFF" switch as follows:

(a) At a point on the front panel, three inches above the bottom edge and 5½ inches from the right edge, drill a hole 15/32 inches in diameter.

(b) Install a toggle switch SPDT, Signal Corps Stock Number 3Z9486.1, and an "ON-OFF" name plate, Signal Corps Stock Number 3Z4150.2. (See fig. 6-18F.)

(c) Remove the connection existing between the terminal post common to resistor R-114 and capacitor C-122, and the terminal post common to resistor R-116 and capacitor C-108. (See figs. 6-18G and 6-18H.)

(d) Disconnect the end of resistor R-114 which connects to the terminal post common to resistor R-114 and capacitor C-122, and solder the removed end to the terminal post common to resistor R-116 and capacitor C-108. (See figs. 6-18G and 6-18H.)

(e) Connect the arm of the toggle switch to the terminal post connected to capacitor C-122. (See figs. 6-18G and 6-18H.)

(f) Connect the top lug of the toggle switch to the terminal post common to resistors R-114 and R-116, and capacitor C-108. (See figs. 6-18G and 6-18H.)

(g) Connect the bottom lug of the switch to any convenient ground. (See fig. 6-18G.)

(6) Remove resistor R-143 (22,000 ohms) and replace it with a 33,000 ohm resistor, Signal Corps Stock Number 3RC20BF333K. (See figs. 6-18I and 6-18J.)

(7) Relabel the Repitition Rate Control, Delay Control, and Switch as follows:

(a) For the Repitition Rate Control type "250-500-1200" on white bond paper and place in position "A" as shown in figure 6-18F. Use clear lacquer as adhesive and cover the label with a coating of clear lacquer for protection.

(b) For the Delay Control type "400" on white bond paper and place in position "B," to cover the existing "800," as shown in figure 6-18F. Use clear lacquer as adhesive, and cover the label with a coating of clear lacquer for protection.

(c) For the Toggle Switch type "FIRST PULSE" on white bond paper and place in position "C" as shown in figure 6-18F. Use clear lacquer as adhesive, and cover the label with a coating of clear lacquer for protection.

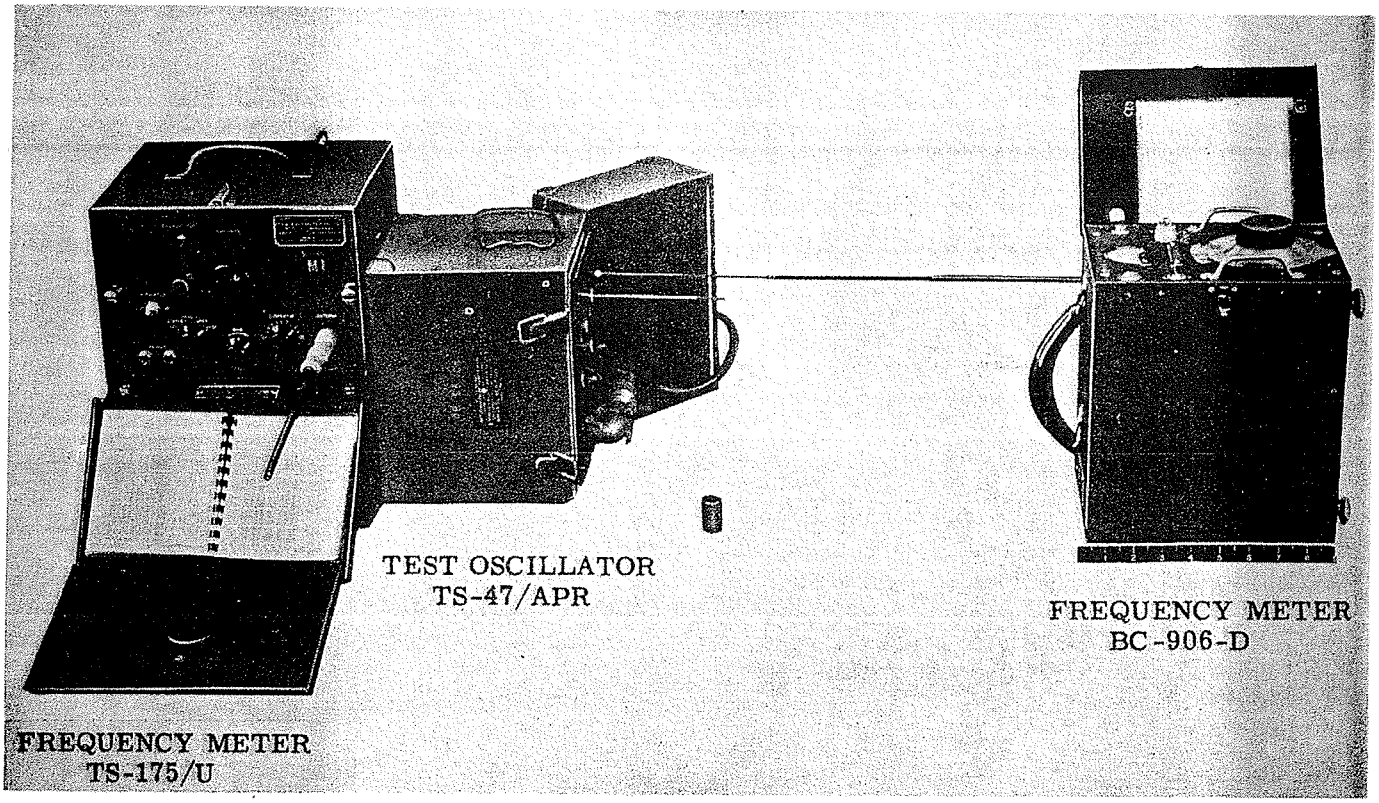


Figure 6-18A. Set-up for Calibration of Frequency Meter BC-906-D

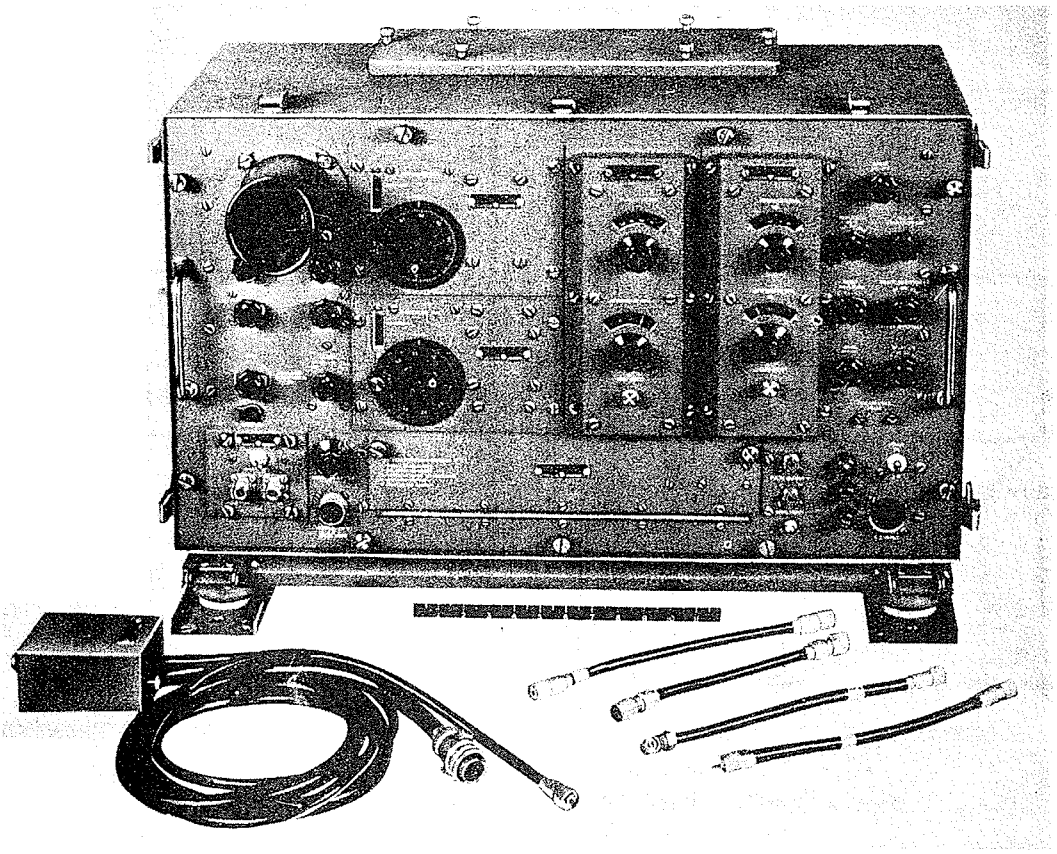


Figure 6-18B. Radar Test Equipment AN/UPM-1

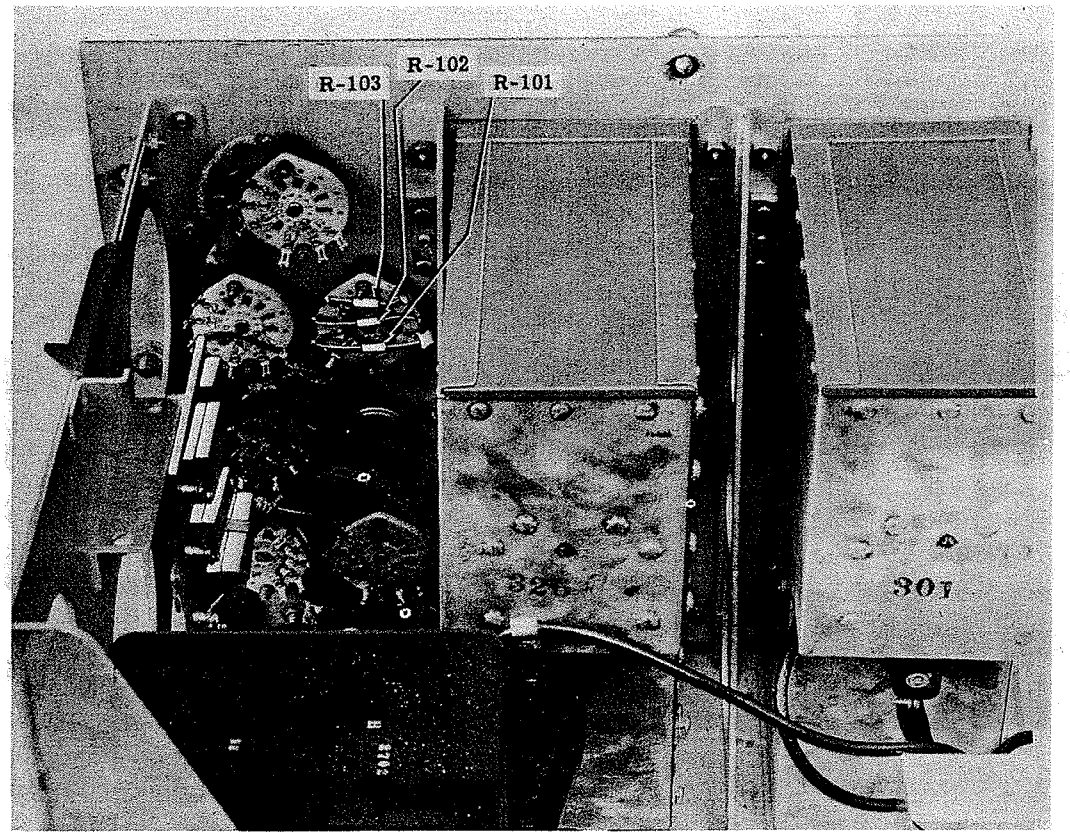


Figure 6-18C. Radar Test Equipment AN/UPM-1—Modification Showing Resistors R-101, R-102, and R-103

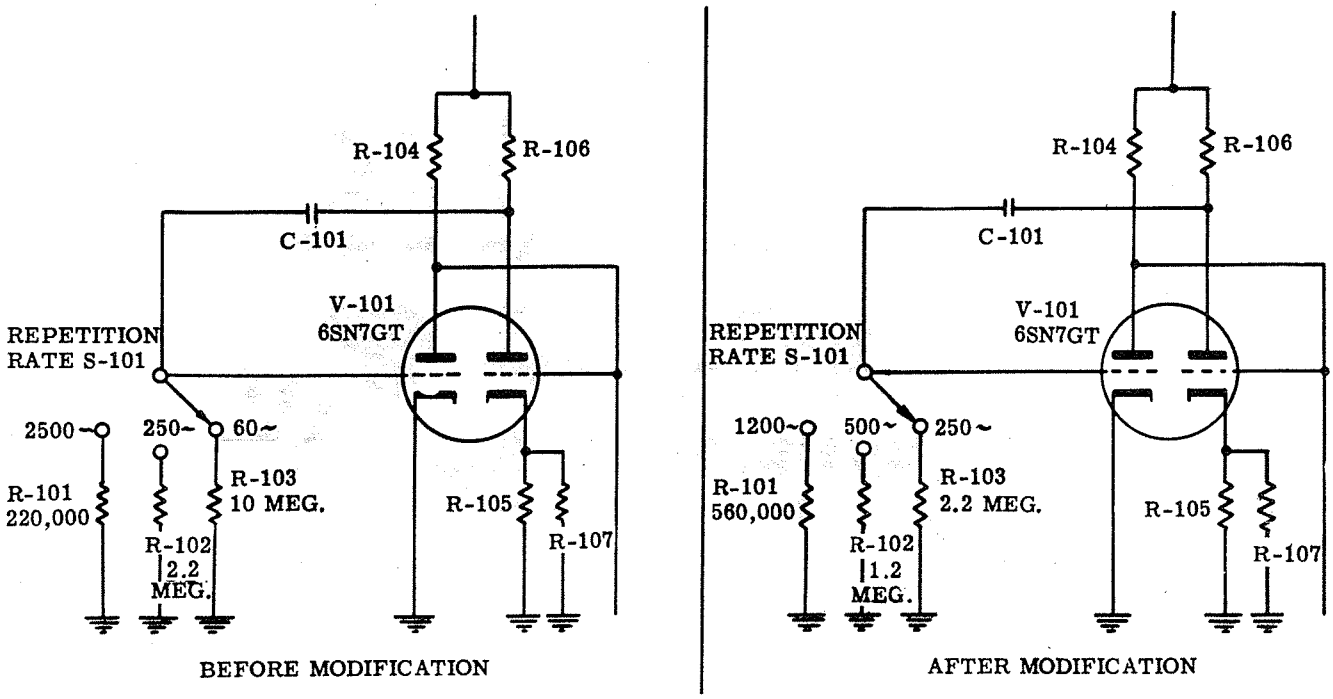


Figure 6-18D. Radar Test Equipment AN/UPM-1—Repetition Rate Circuit Before and After Modification

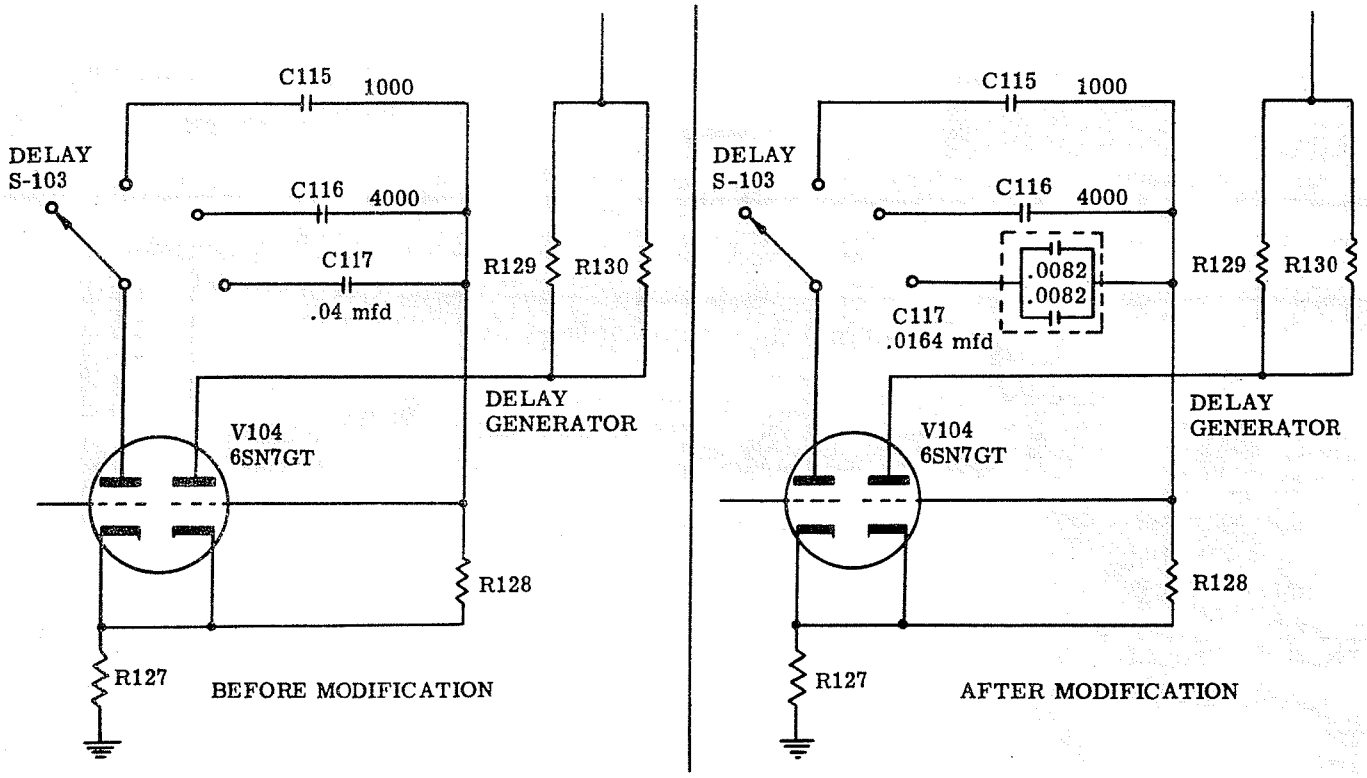


Figure 6-18E. Radar Test Equipment AN/UPM-1—Delay Generator Circuit Before and After Modification

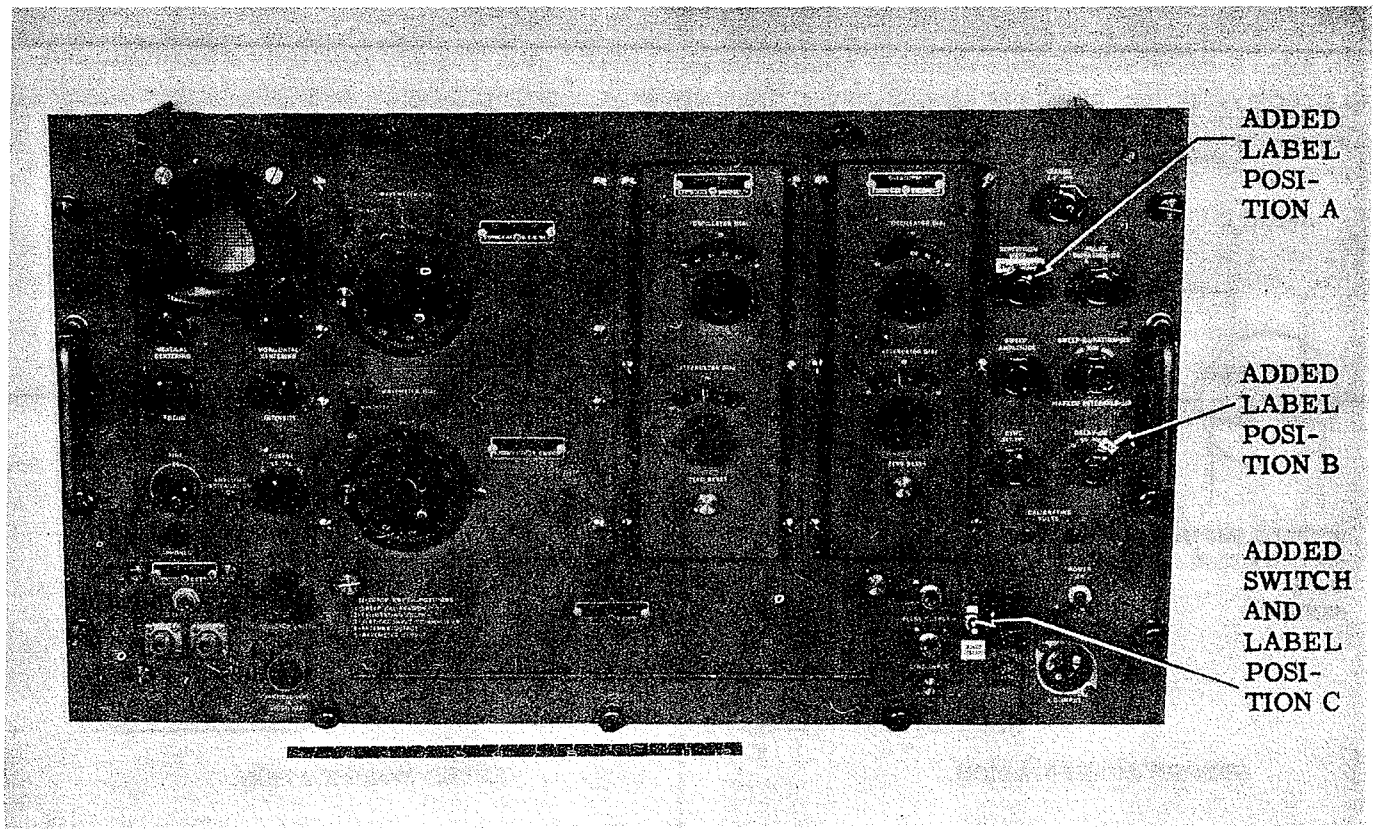


Figure 6-18F. Radar Test Equipment AN/UPM-1—Front Panel After Modification

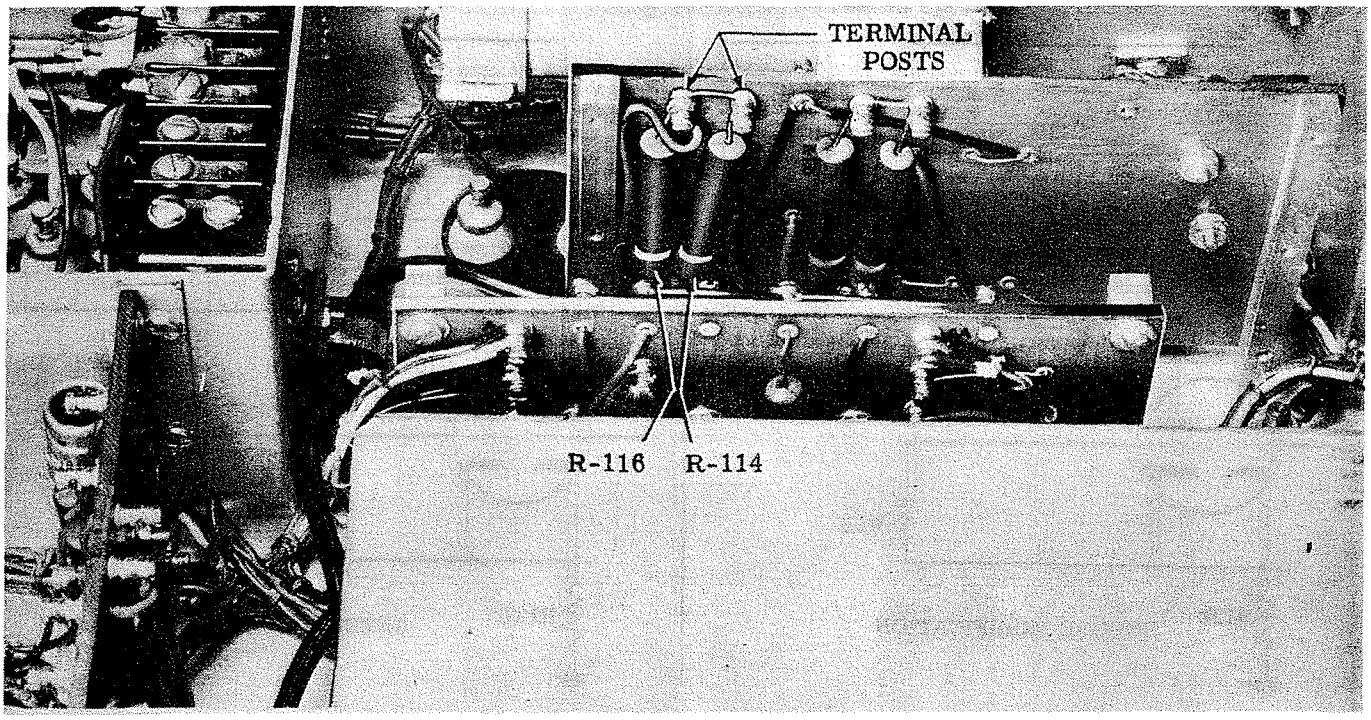


Figure 6-18G. Radar Test Equipment AN/UPM-1—Showing Resistors R-114 and R-116 for Modification

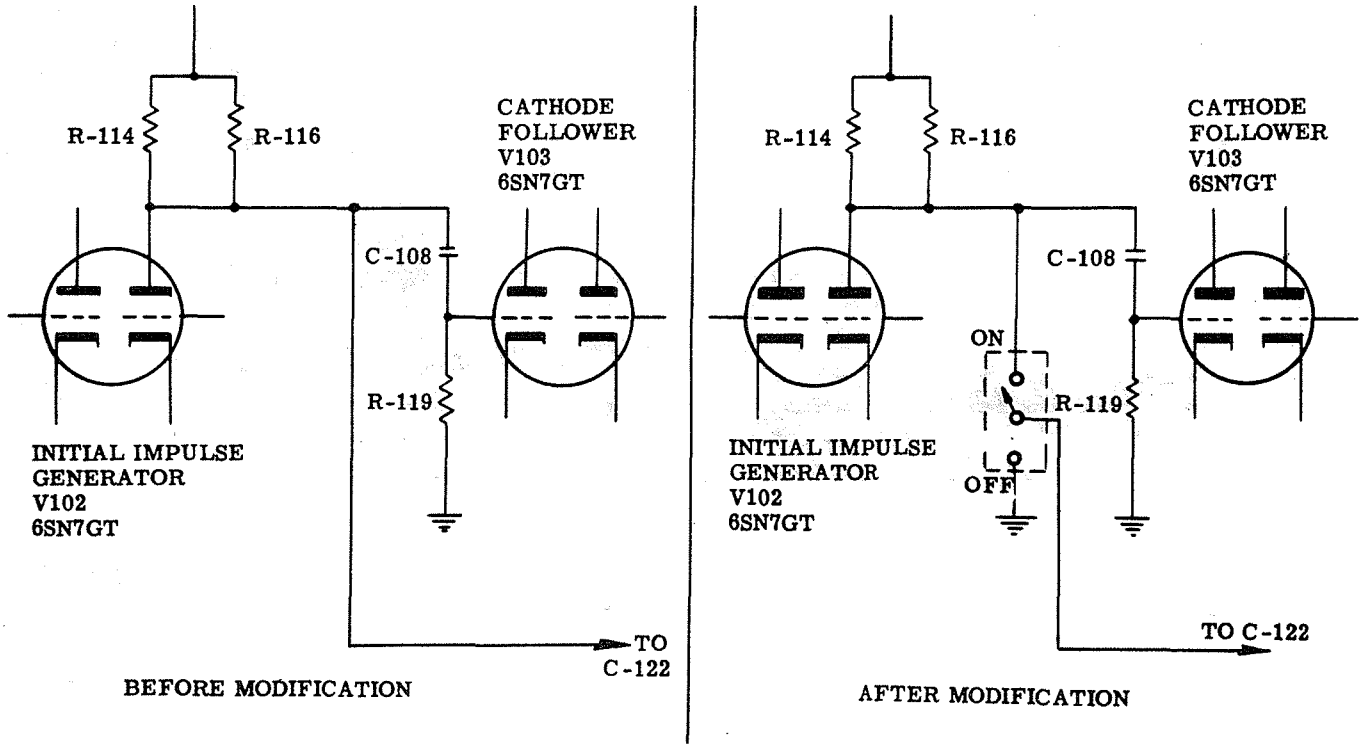


Figure 6-18H. Radar Test Equipment AN/UPM-1—Showing Changes in Circuit by Addition of "ON-OFF" Switch

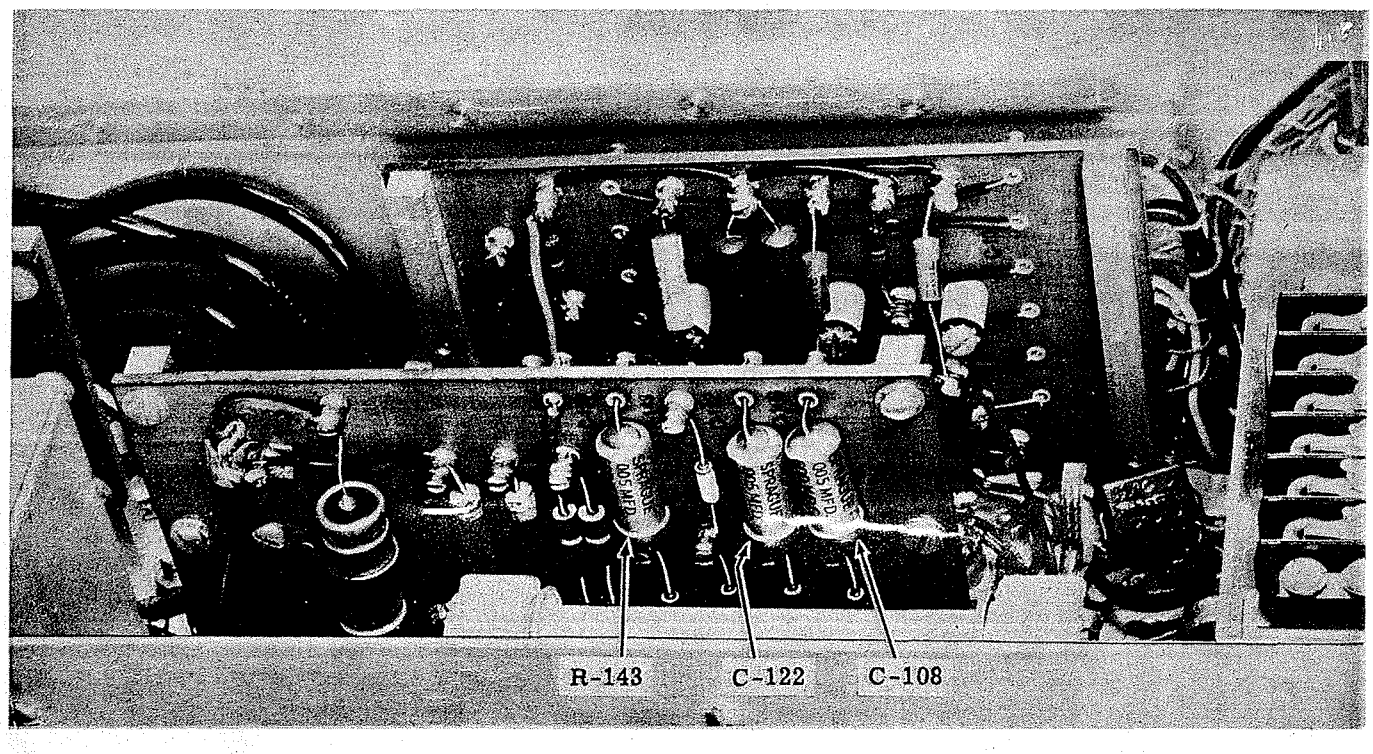


Figure 6-18I. Radar Test Equipment AN/UPM-1—Showing Resistor R-143 and Capacitors C-108 and C-122 for Modification

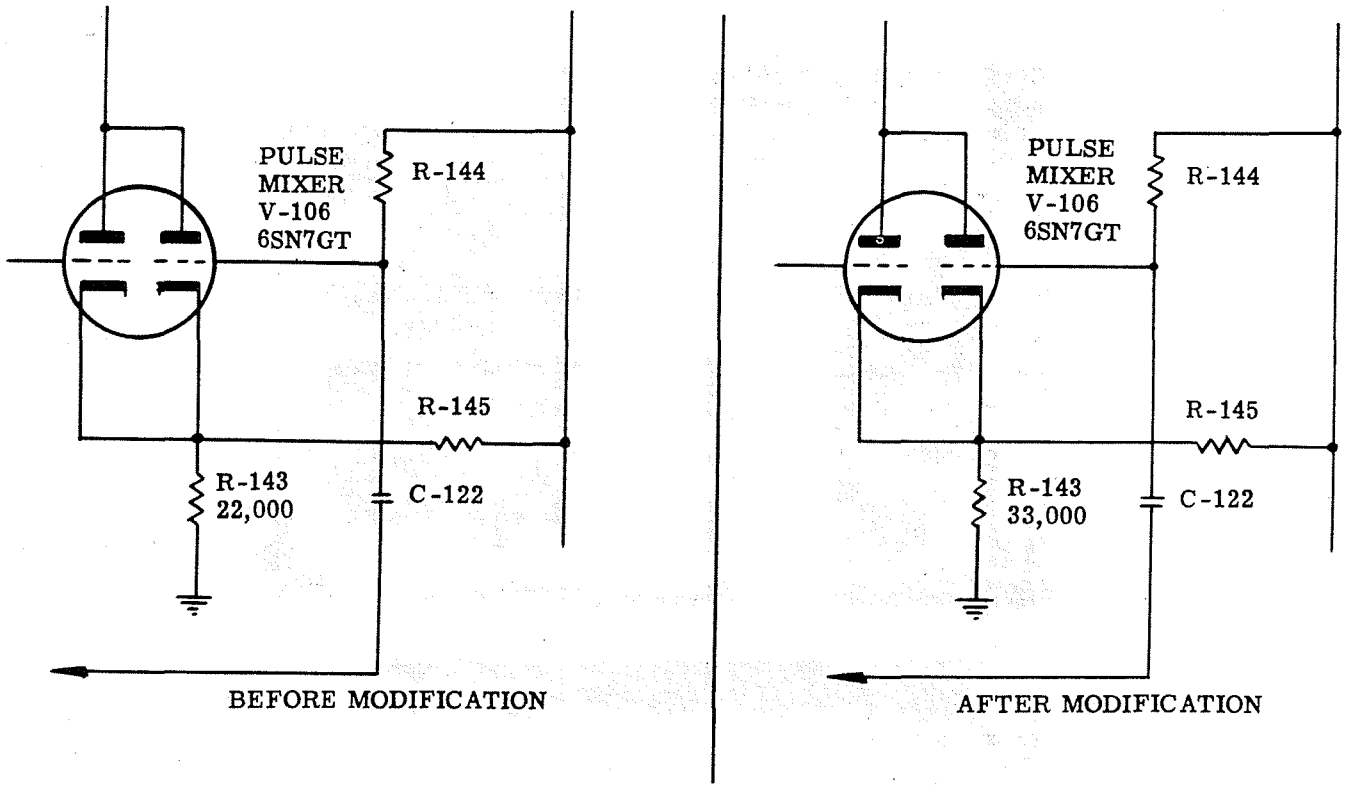


Figure 6-18J. Radar Test Equipment AN/UPM-1—Pulse Mixer Circuit Before and After Modification

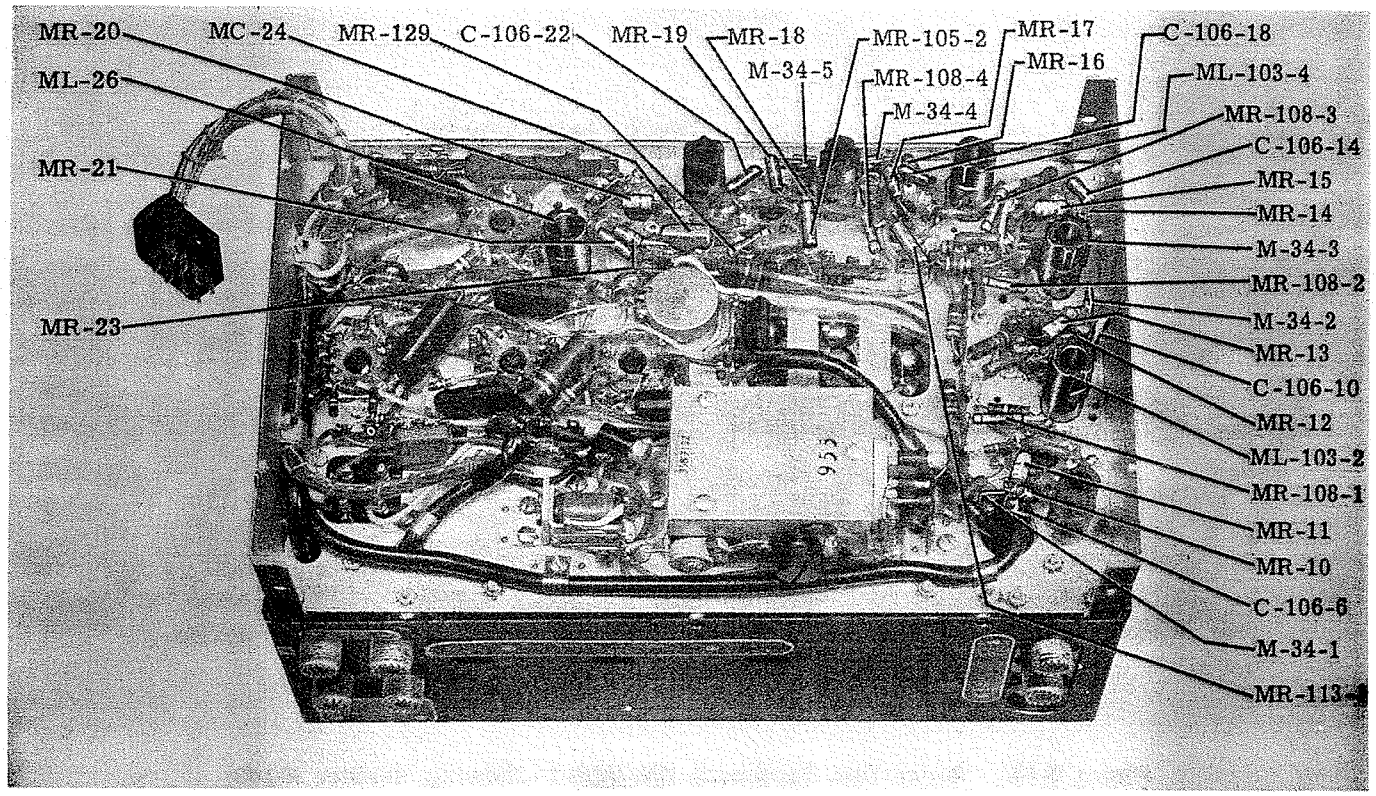


Figure 6-19. Radio Receiver-Transmitter RT-1D/APN-2—Bottom Interior View of Receiver

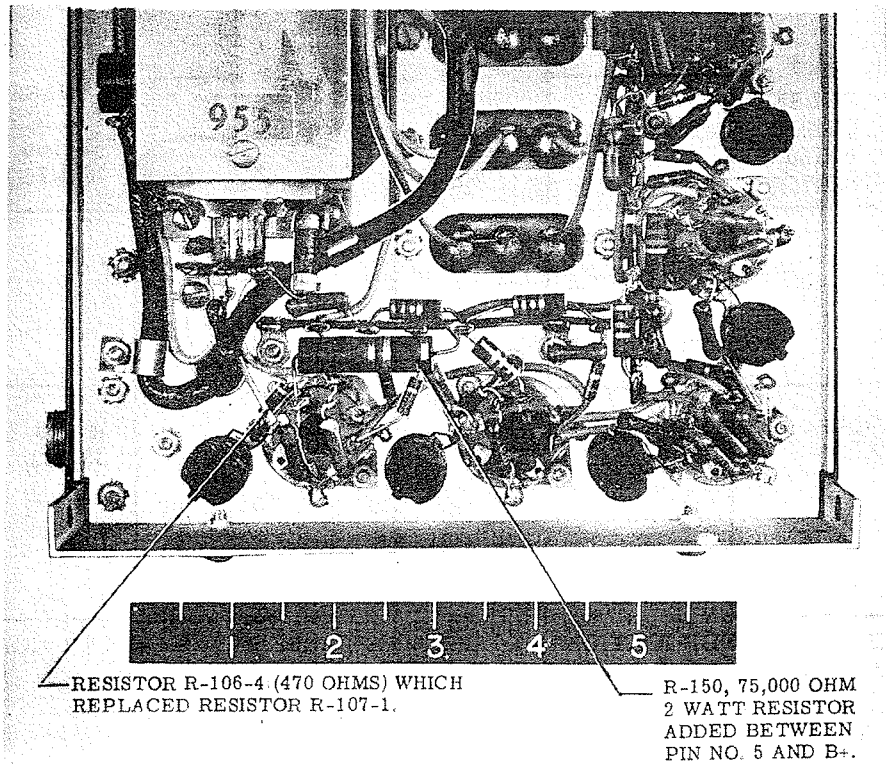


Figure 6-20. Radio Receiver-Transmitter ★RT-1A/APN-2—Bottom View of Top Chassis Showing

7. INSTALLATION TESTING OF ANTENNA AT-96/APN-12.

a. TEST EQUIPMENT REQUIRED.

(1) Portable Wheatstone Bridge: Leeds and Northup, 0.001 ohm to 1000 megohms, s/n 7800-139500, or equivalent.

(2) Portable Megger: I-48B, 0 to 100 megohms, s/n 7800-809000, or equivalent.

(3) A test lead fabricated as shown in figure 6-20A.

(4) A test lead fabricated as shown in figure 6-20B.

b. TESTING PROCEDURE.

(1) Remove the antenna inspection plates and disconnect the transmission lines from all antennae for Radar Sets AN/APN-2B and AN/APN-68.

(2) Using the test leads in figure 6-20B, connect the Portable Wheatstone Bridge to each Antenna AT-96/APN-12 in turn: set the bridge to read resistance less than one ohm. Measure the resistance of each antenna. The resistance of each antenna should be within the limits of 0.001 and 0.004 ohm. If a value within the above limits is not obtained, proceed in accordance with paragraph 7*c*, this section.

(3) Disconnect the transmission lines at Indicator IC-929-C, Receiver-Transmitter RT-ID/APN-2B, and Receiver-Transmitter RT-157/APN-68.

(4) Connect the bridge to the left receiving antenna co-axial cable of Radar Set AN/APN-2B using the test leads of figure 6-20A. Set up the bridge to read resistance below 1 ohm.

(*a*) Re-connect the left wing outer antenna to the tee-connector. Measure the resistance of the outer antenna on the bridge and compare with table 6-5.

(*b*) Re-connect the left wing inner antenna and dis-connect the outer antenna. Measure the resistance of the inner antenna and compare with table 6-5.

(*c*) Re-connect the left wing outer antenna and measure the resistance of the parallel system. Compare with valve 6-5. This reading should be lower than either of the two previous readings.

(*d*) If any reading is over 25% greater than given in table 6-5 the antenna is defective. An erratic reading and hard-to-balance bridge indicates a defective antenna, also. If the antenna is tapped while the bridge is balanced a poor connection will immediately show up as an unbalanced bridge.

(*e*) To isolate the trouble remove the suspected antenna. Change test leads on the bridge to those described in figure 6-20B and connect directly to the antenna. If resistance is higher than 0.030 ohm the antenna should be reworked following instructions given in paragraph 7*c*, this section. This reading allows about 0.026 ohm resistance for the leads and 0.004 ohm for the antenna itself.

(*f*) After reworking the antenna, reinstall and check the tee-connector for loose ends. When the resistance of the antenna check within limits, singly and in parallel, the system can be considered satisfactory,

(5) Repeat the operation on the right receiving antenna.

(6) Connect the bridge to the cable from Radar Set AN/APN-2 transmitting antenna (near nose wheel). Re-connect the antenna, measure resistance and compare with table 6-5.

(7) Connect the bridge to the cable from Radar Set AN/APN-68 transmitting antenna (on fuselage belly). Re-connect the antenna and measure resistance then compare with table 6-5.

(8) Connect the bridge to the cable from AN/APN-68 receiving antenna (on top of vertical fin). Re-connect the antenna and measure the resistance then compare with table 6-5.

(9) When all resistance readings fall at or below the values given in table 6-5 the antenna system is considered satisfactory and all cables should be re-connected.

c. REWORKING ANTENNA.—The antenna may be reworked by removing the co-axial receptacle and cleaning off all traces of ignition sealing compound. Using a suitable tool, spread the segments of the receptacle pin being careful so as not to break them off. Tighten the flat head screw securely and stake with a prick punch or glyptal. Replace the co-axial receptacle and tighten the four mounting screws. Check the resistance of the antenna on the Wheatstone bridge. The resistance of the antenna itself, (excluding the resistance of the leads) should be from 0.001 to 0.004 ohm. If this value is not obtained the antenna must be reworked again for better contact between the receptacle and mast.

d. ANTENNA RESISTANCE MEASUREMENTS.—Several factors must be taken into consideration regarding the resistance readings given in table 6-5. The readings will vary with the temperature of the aircraft. All readings in table 6-5 are taken with the antennae attached to the airplane skin, consequently the additional shunt path of the skin will affect the readings. If an antenna is removed for rework it should be checked on the bridge and then re-installed for final testing. Table 6-5 should be used as a guide and not as an absolute limit. In general it can be said that the resistance should not be over 0.250 ohm for antennae with short cables and 0.350 ohm for antennae with long cables.

TABLE 6-5.—Resistance Measurements Guide for Antenna AT-96/APN-12

Antenna	*B-29*	*B-50*
L wing outer	0.230	0.224
L wing inner	0.230	0.224
L wing both	0.225	0.220
R wing outer	0.230	0.224
R wing inner	0.230	0.224
R wing both	0.225	0.220
Nose wheel	0.300	0.300
Belly	0.080	0.090
Vert. fin	0.165	0.185

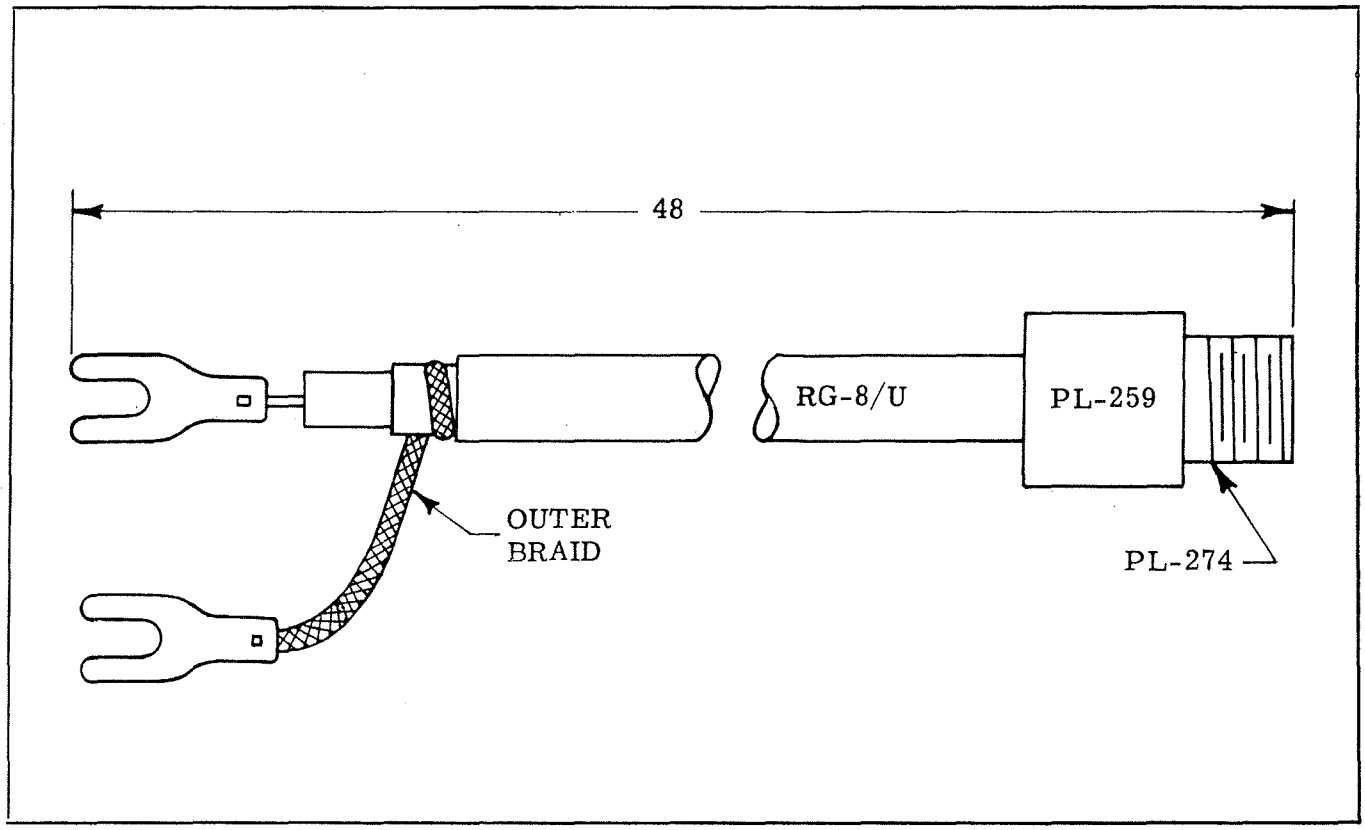


Figure 6-20A. — Test Cord (Terminated with PL-274)—Used with Portable Megger I-48B and Portable Wheatstone Bridge

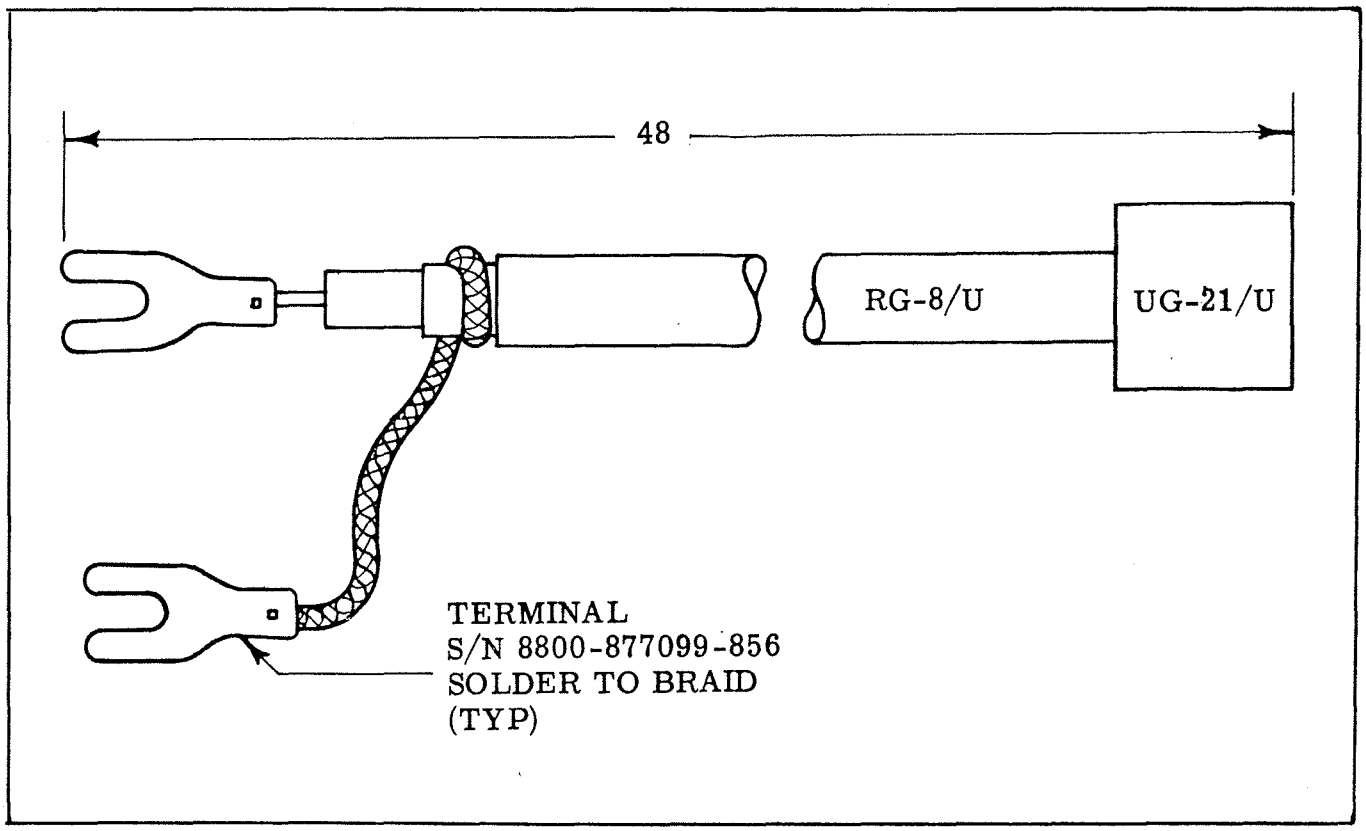


Figure 6-20B. — Test Cord (Terminated with UG-21/U)—Used with Portable Megger I-48B and Portable Wheatstone Bridge

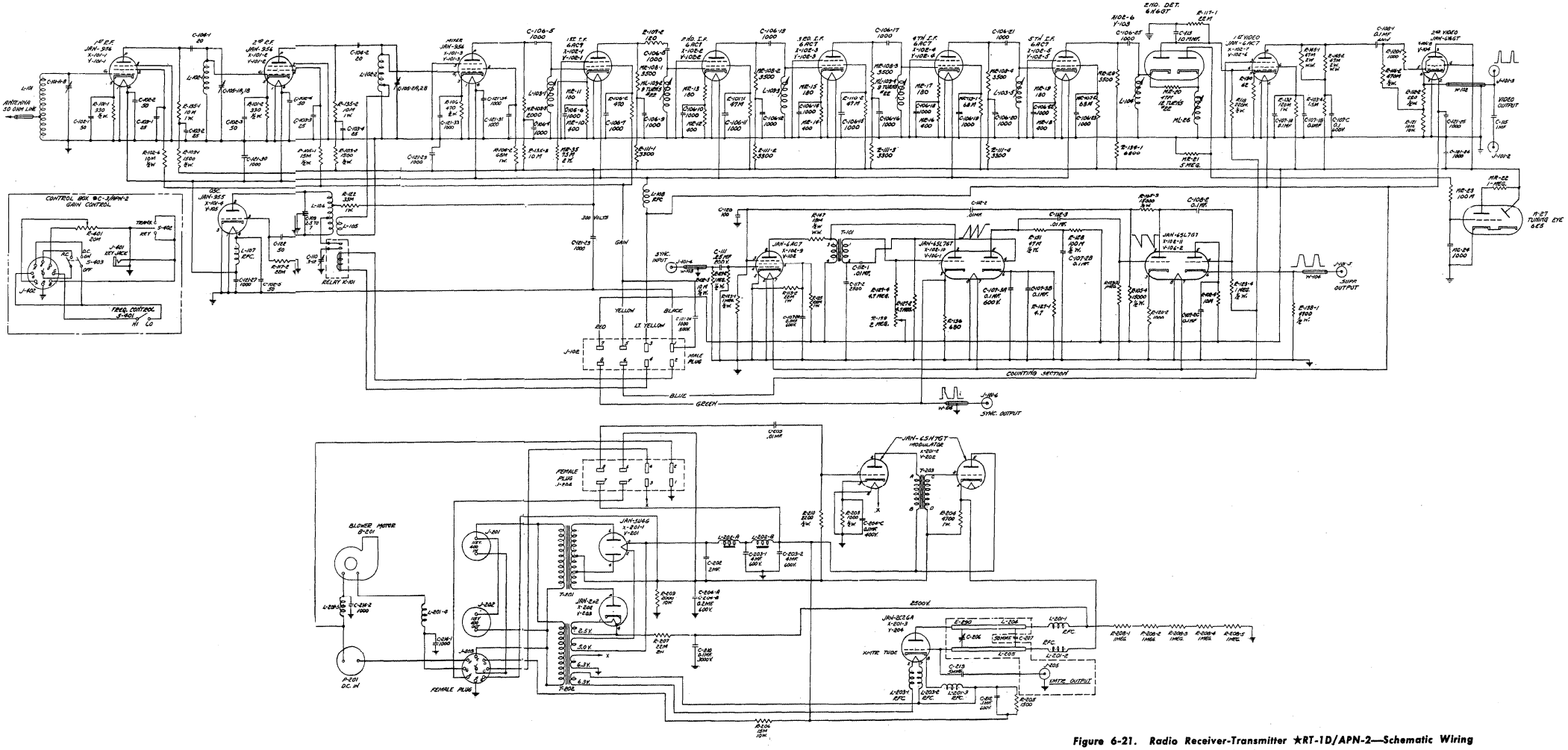


Figure 6-21. Radio Receiver-Transmitter ★RT-1D/APN-2—Schematic Wiring Diagram

*M-DENOTES 1000.

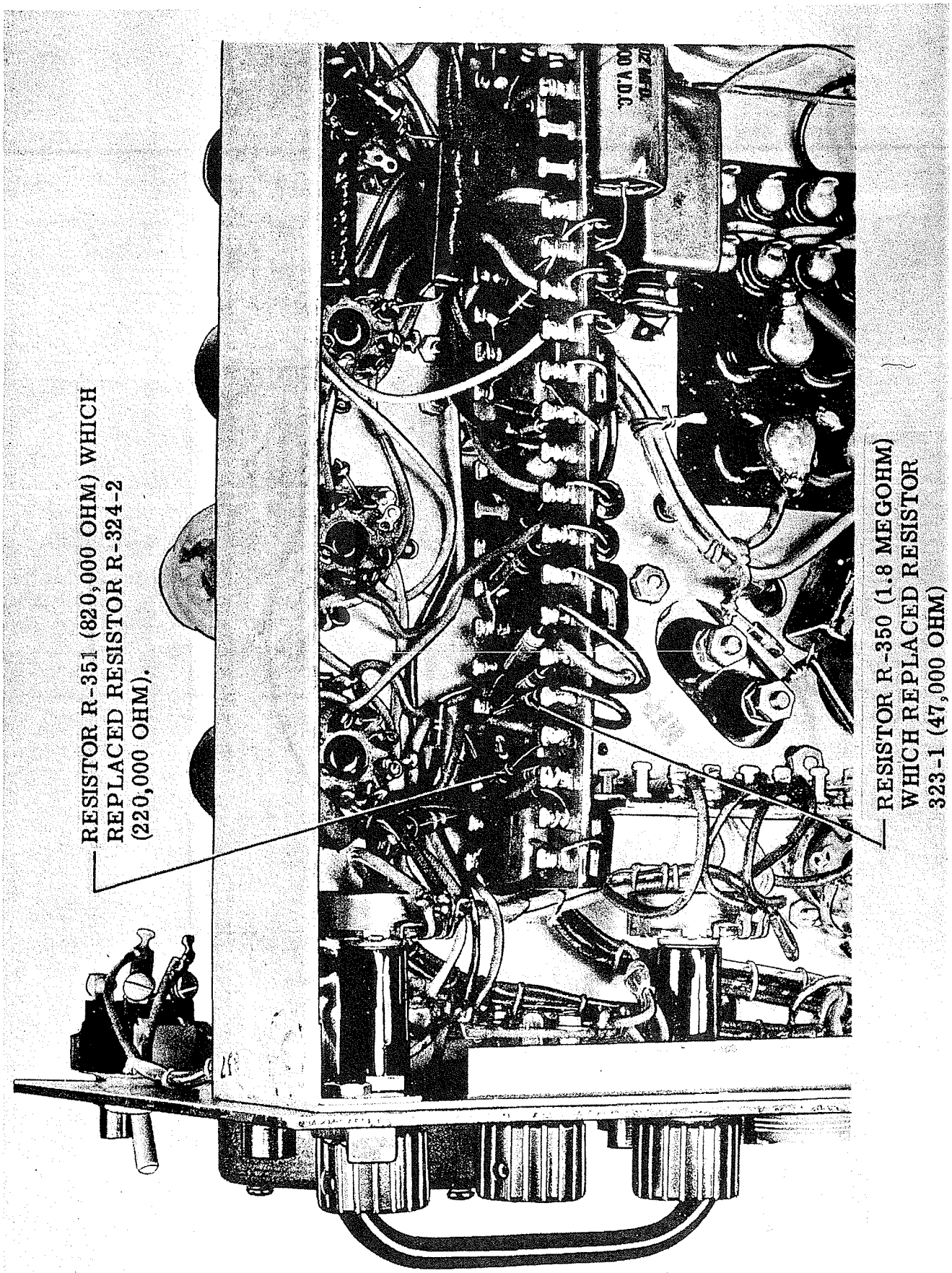


Figure 6-22. Indicator BC-929-C—Bottom View After Modification

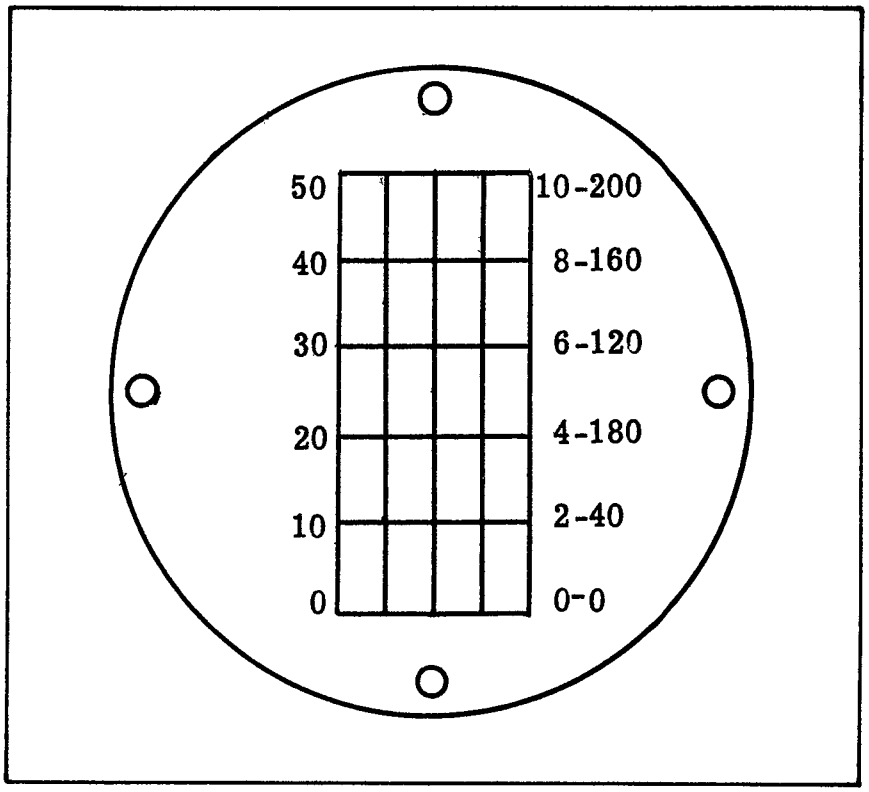


Figure 6-23. Two Hundred Mile Range Scale

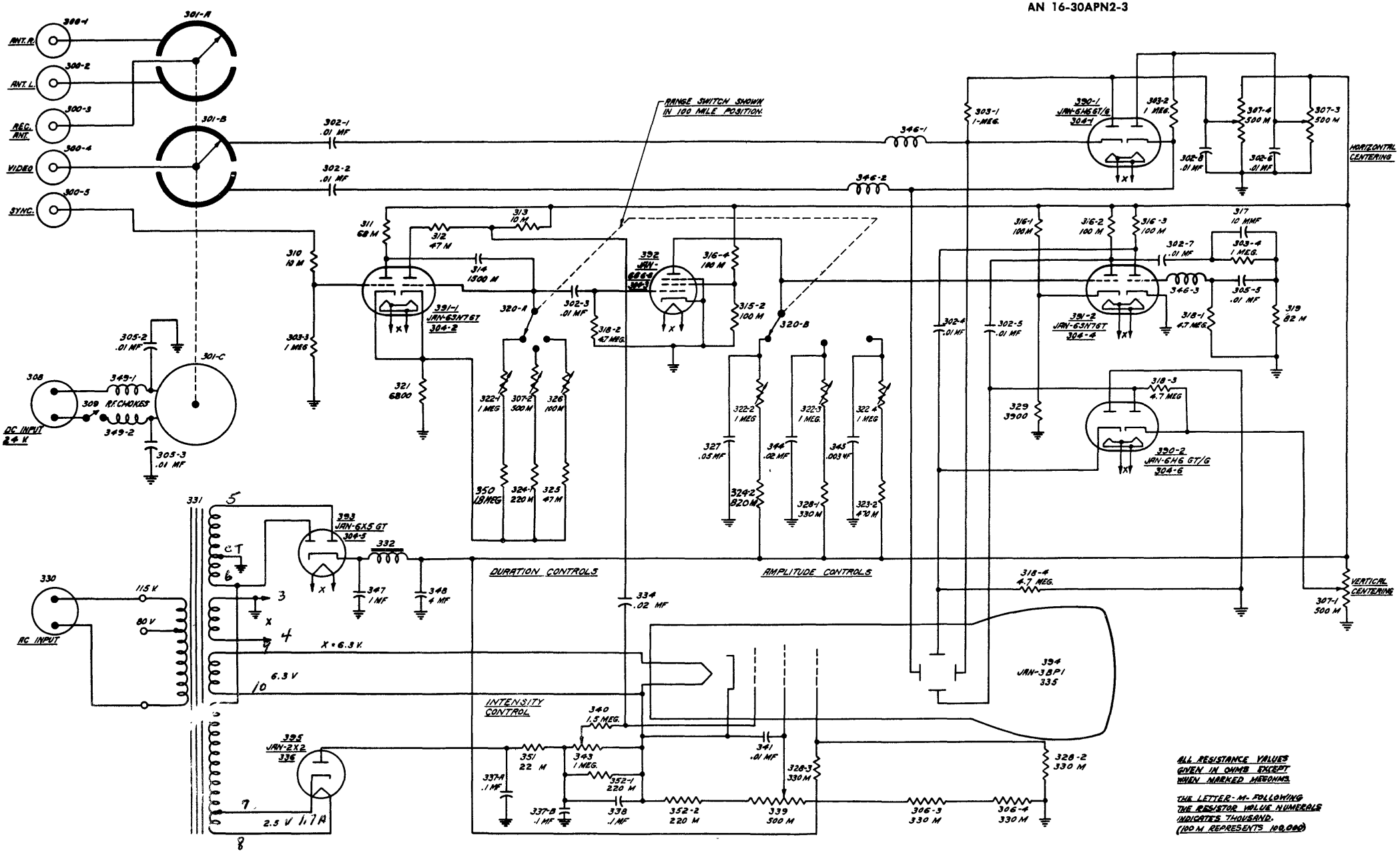


Figure 6-24. Indicator BC-929-C—Schematic Wiring Diagram

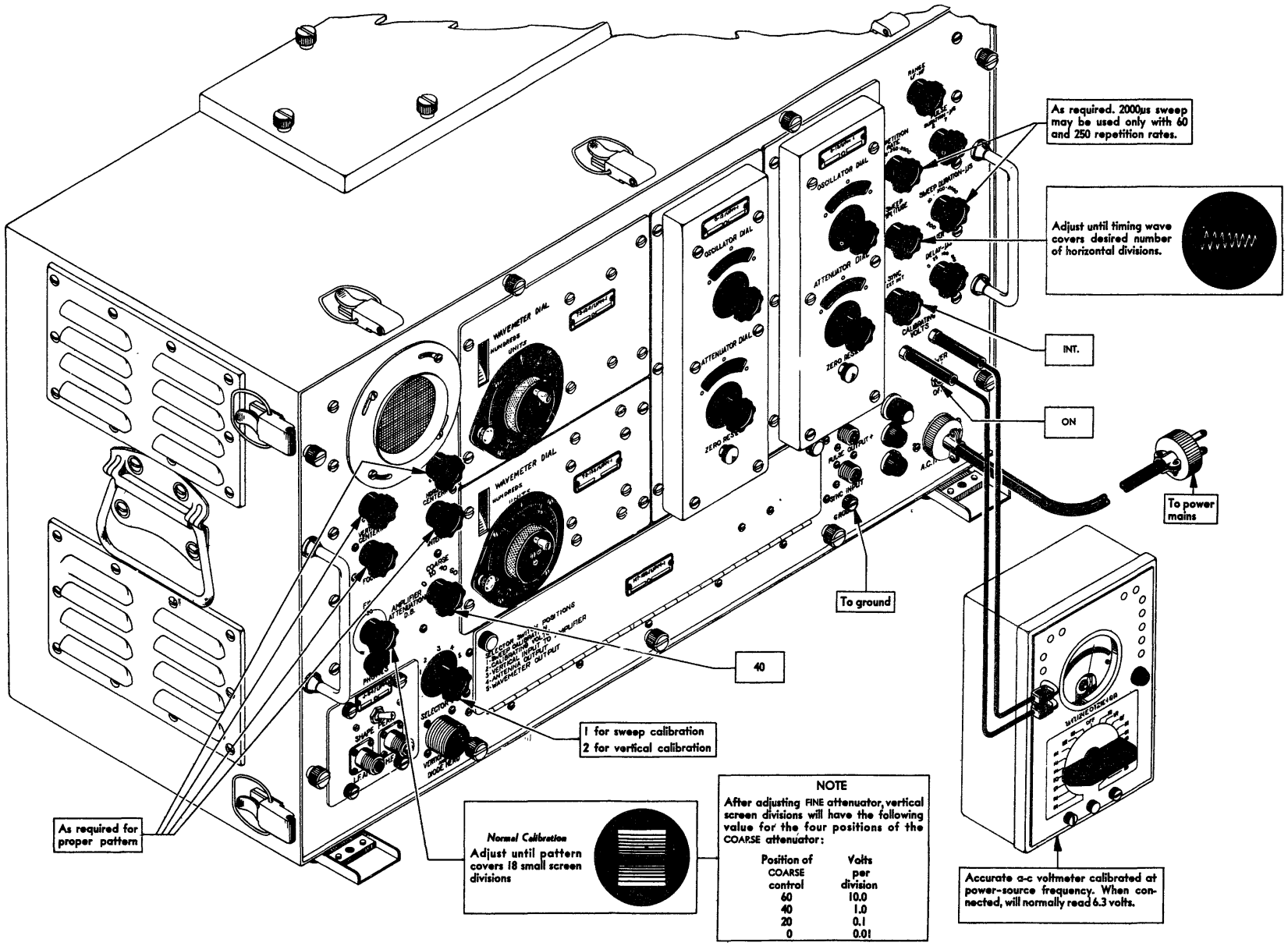


Figure 6-25. Operation Chart—Calibrating Oscilloscope Vertical Input and Sweep (Normal Se

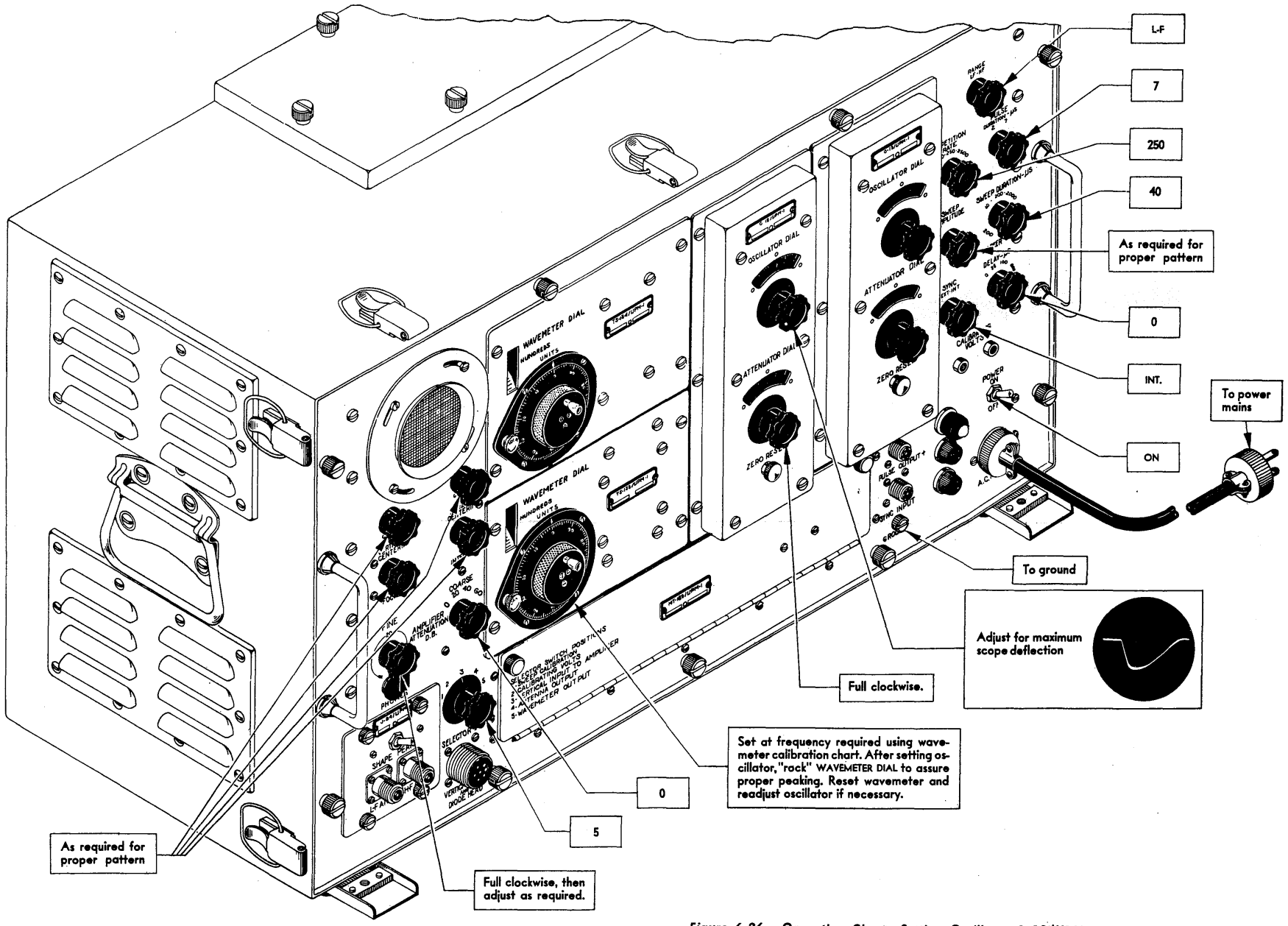


Figure 6-26. Operation Chart—Setting Oscillator O-12/UPM-1 at Spot Frequency

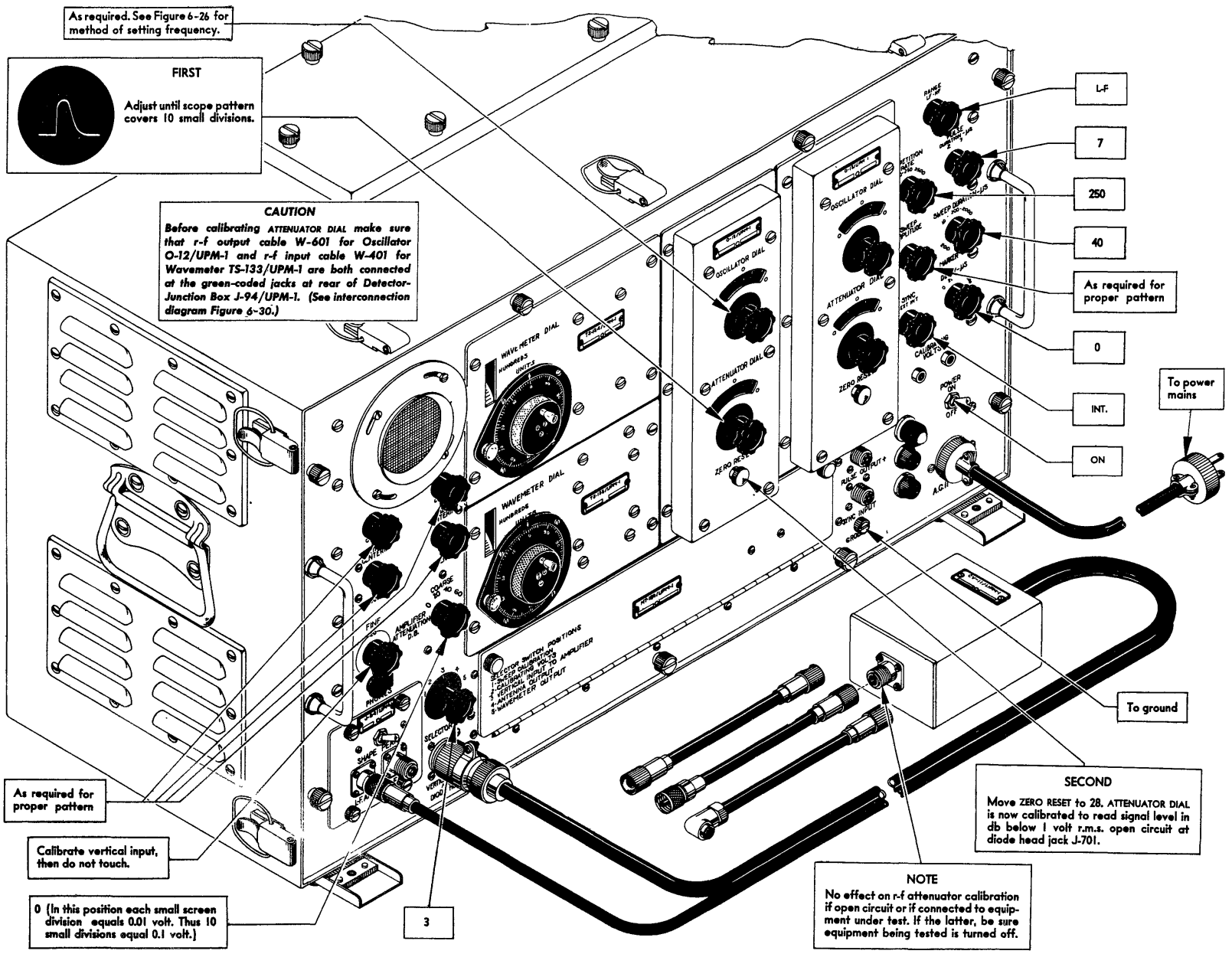


Figure 6-27. Operation Chart—Calibrating R-F Attenuator of Oscillator O-12/UPM-1

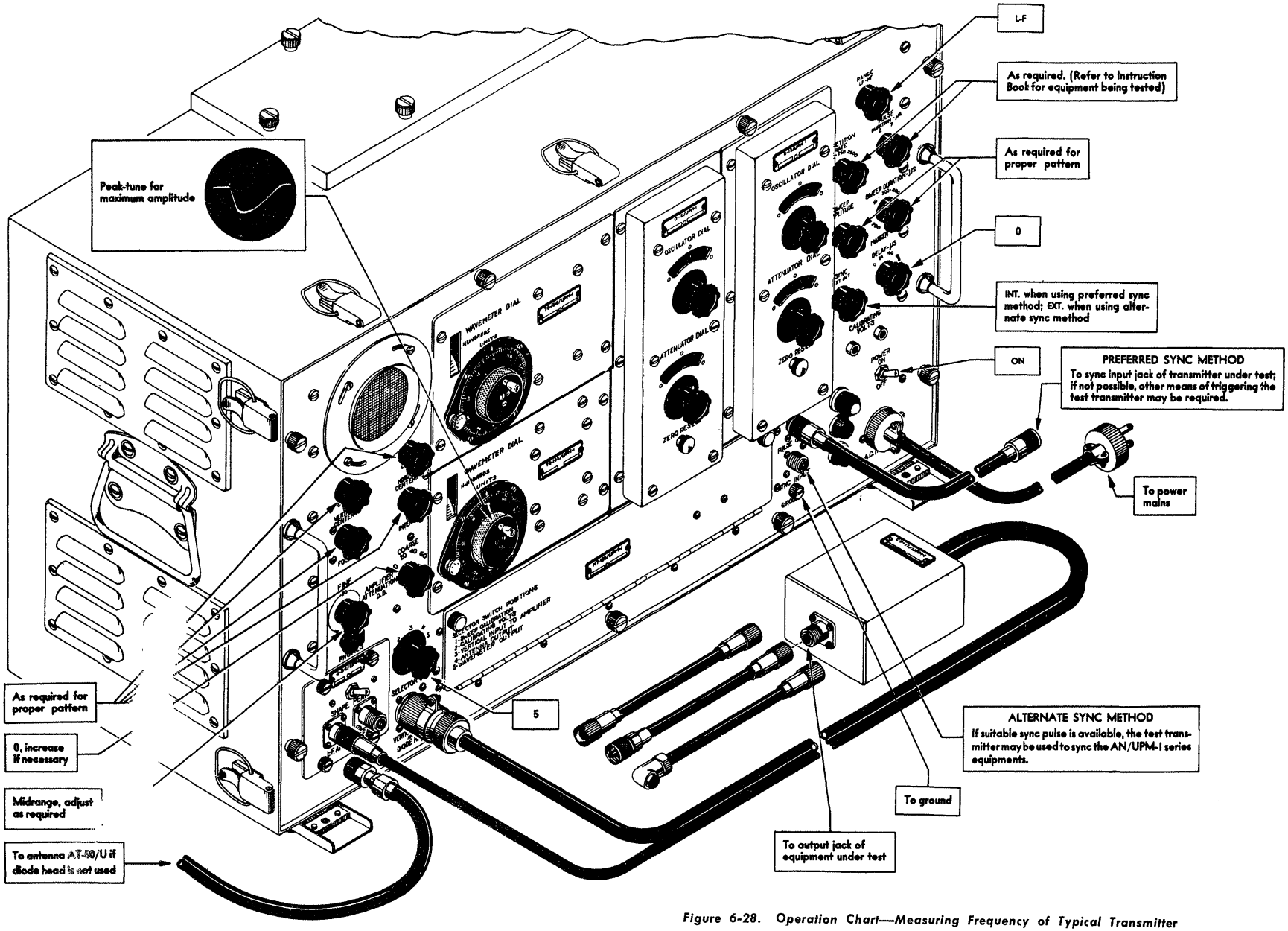


Figure 6-28. Operation Chart—Measuring Frequency of Typical Transmitter ("A" Band)

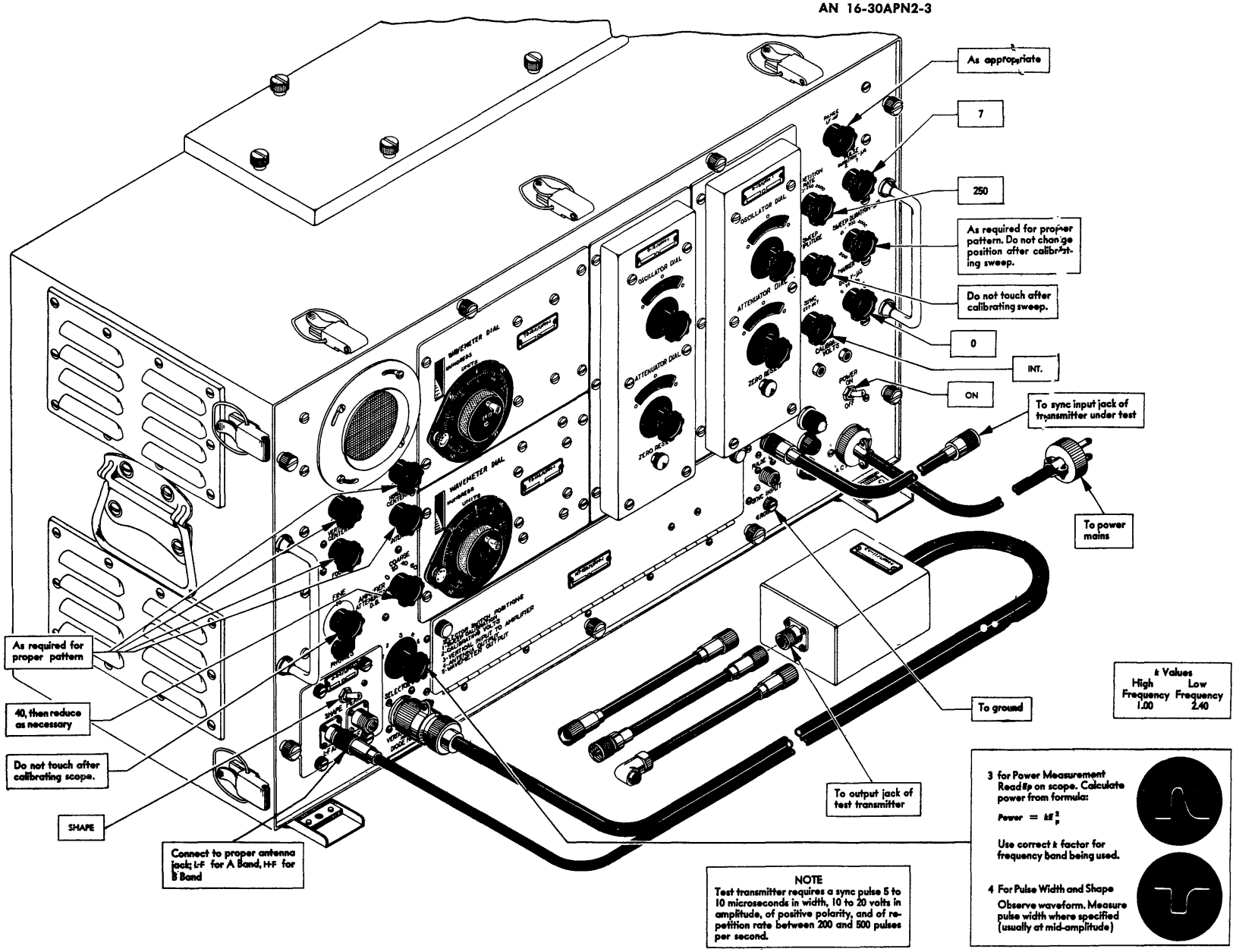


Figure 6-29. Operation Chart—Measuring Power Output and Pulse Width; Observing Waveforms; Triggering a Typical Transmitter

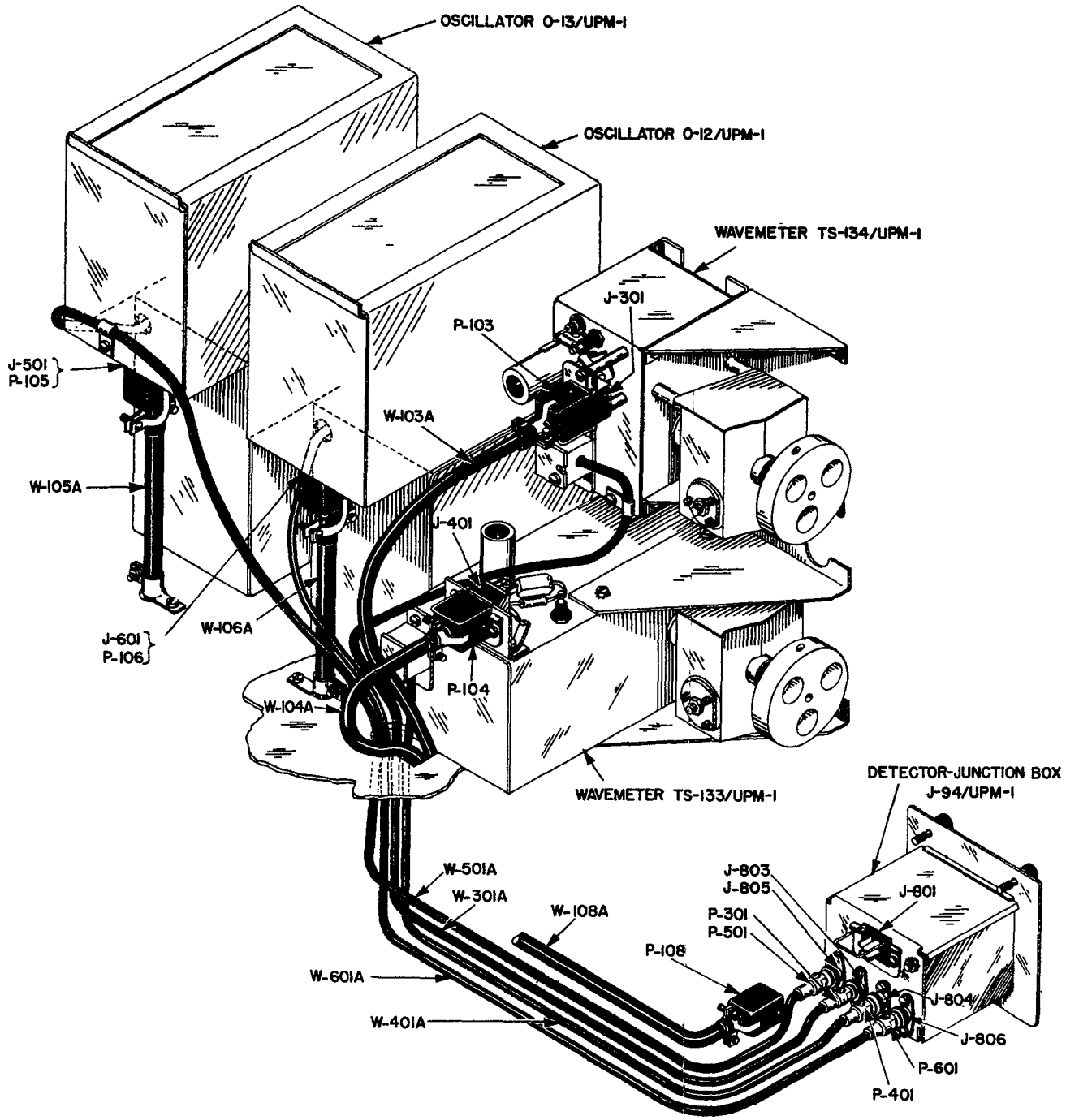


Figure 6-30. –Radar Maintenance Equipment AN/UPM-1 Series, Major Units Interconnection Diagram

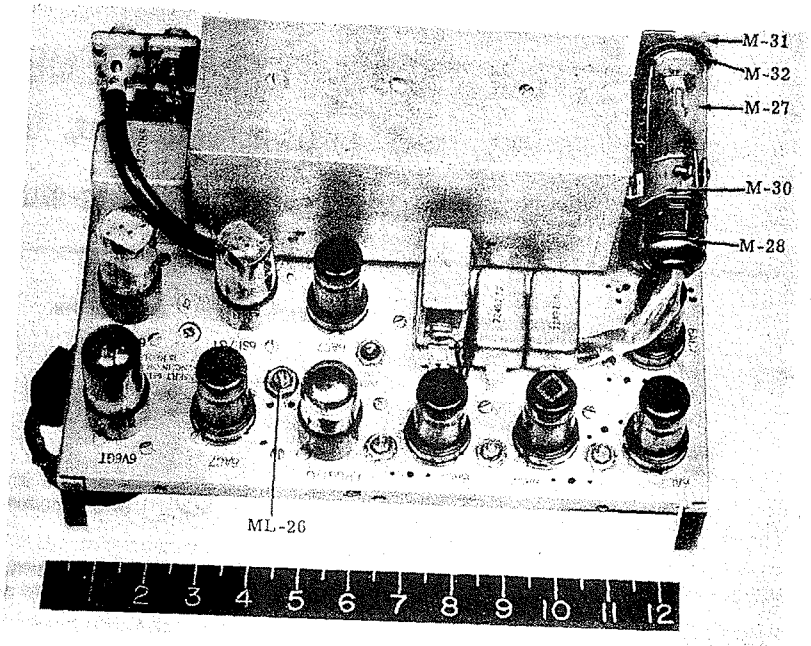


Figure 6-31. Radio Receiver-Transmitter RT-1D/APN-2—Top Interior View of Receiver

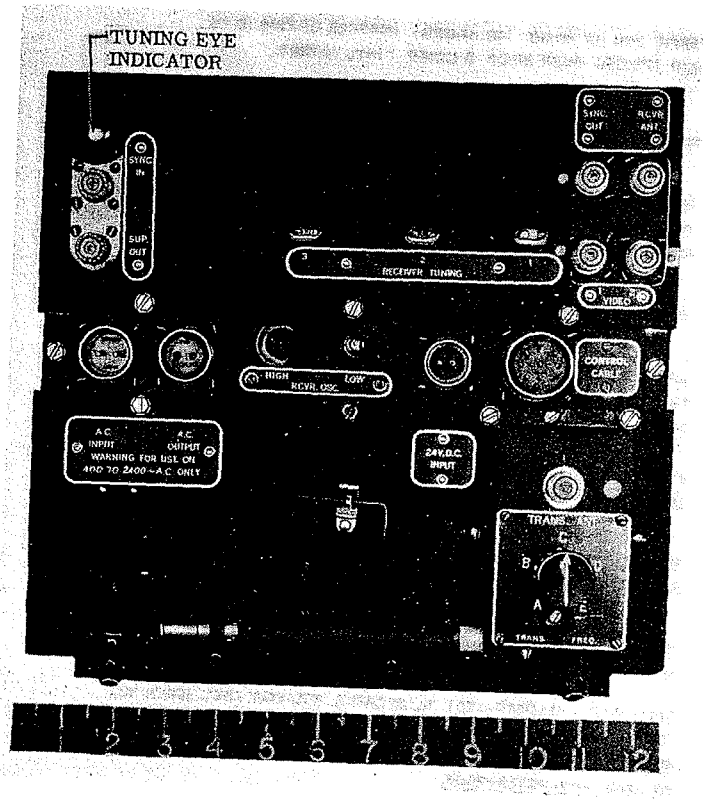


Figure 6-32. Radio Receiver-Transmitter RT-1D/APN-2—Front Panel View

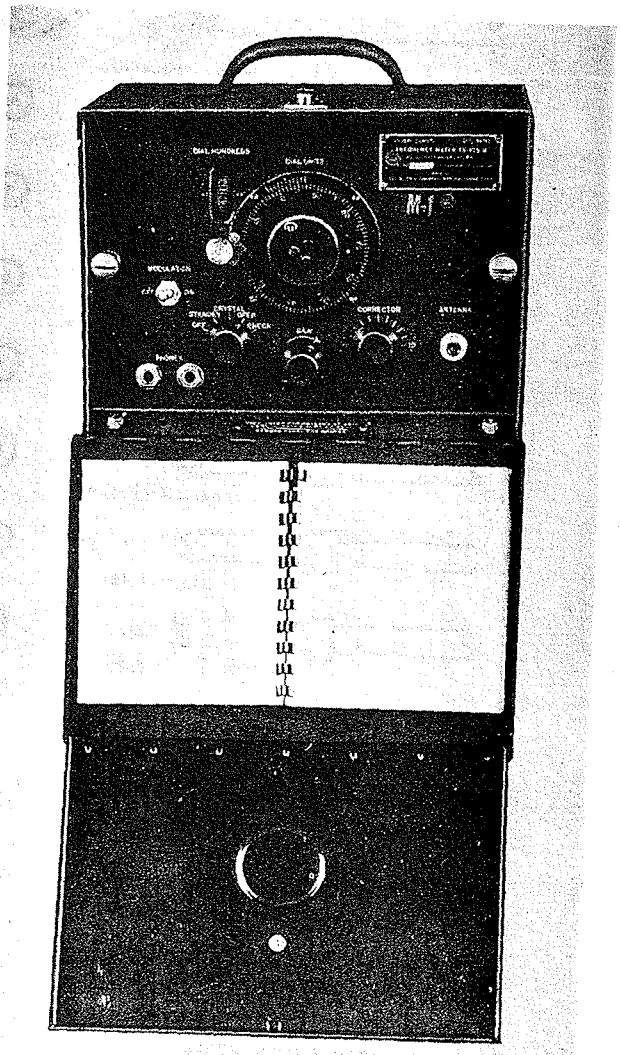
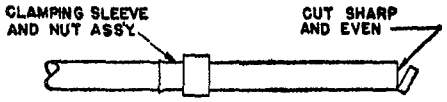
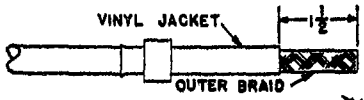
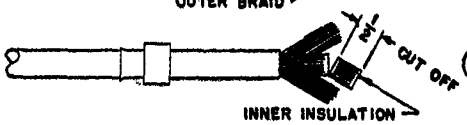
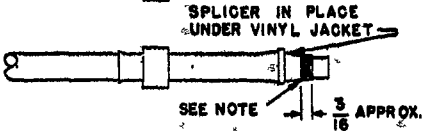
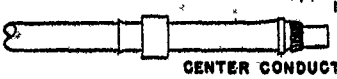
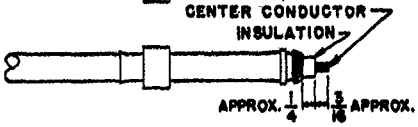
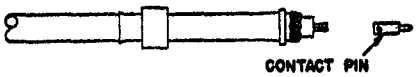
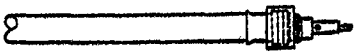
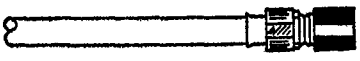
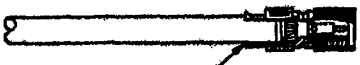


Figure 6-33. Frequency Meter TS-175/U

INSTRUCTIONS FOR ASSEMBLING CONNECTORS

UG-18/U, UG-19/U, UG-20/U, UG-21/U, UG-22/U, UG-23/U, UG-24/U, UG-25/U, UG-26/U.

WITH ARMY-NAVY TYPE RG-5/U, RG-8/U, RG-9/U, RG-10/U CABLE

EQUIPMENT	STEP	OPERATION
	(1)	A-CUT END OF CABLE EVEN. B-SLIDE CLAMPING SLEEVE & NUT ASS'Y. OVER CABLE
	(2)	CUT OFF VINYL JACKET 1 1/2 FROM END OF CABLE EXPOSING BRAID BEING CAREFUL NOT TO NICK BRAID.
	(3)	FAN BRAID OUT CUT OFF INSULATION AND CENTER CONDUCTOR 1/2. (PURPOSE OF THIS IS TO LEAVE SHARP END)
	(4)	TAPER END OF BRAID (AS SHOWN) PURPOSE OF THIS IS TO SLIP SPLICER OVER BRAID & UNDER VINYL JACKET.
	(5)	SLIDE SPLICER OVER TAPERED BRAID & FORCE UNDER OUTER VINYL JACKET.
	(6)	WITH SPLICER IN PLACE TRIM BRAID APPROX. 3/16. NOTE: IF CABLE IS DOUBLE BRAID SHIELDED TRIM OFF OUTER BRAID CLOSE TO SPLICER.
	(7)	FOLD BRAID BACK OVER SPLICER & SMOOTH.
	(8)	A-CUT INNER INSULATION APPROX. 1/4 MEASURING FROM SPLICER. B-REMOVE INNER INSULATION LEAVING 3/16 OF CENTER CONDUCTOR EXPOSED. C-TIN CENTER CONDUCTOR.
	(9)	HOLD CONTACT PIN WITH PLIERS AND INSERT CENTER CONDUCTOR INTO PIN. FILL HOLE WITH SOLDER.
	(10)	REMOVE EXCESS SOLDER. SLIP GASKET OVER SPLICER (AS SHOWN).
	(11)	SLIDE CLAMPING SLEEVE & NUT ASS'Y. AS CLOSE AS POSSIBLE IN PREPARATION TO RECEIVING BODY ASS'Y.
	(12)	BODY ASS'Y. (ILLUSTRATED) SLIDE CABLE INTO BODY ASS'Y. SCREW NUT INTO PLACE WITH A WRENCH. DO NOT TURN BODY WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE CONNECTOR OR JACK NON-WATERPROOF.
	(13)	COMPLETED ASS'Y. SHOWN IN SECTION.

NOTE: IF CABLE IS ARMORED TERMINATE ARMOR AT APPROX. THIS POINT AND FASTEN WITH TAPE OR ANY OTHER SUITABLE MEANS.

Figure 6-34. Coaxial Cable Fabrication Instructions for Use With Plug UG-21/U

SECTION VII

TABLE OF REPLACEABLE PARTS

NOTE

Parts used in AN/APN-2B modification have been added to the end of this table beginning with "Reference Symbol M-27."

1. CONTENT AND ARRANGEMENT OF TABLE.

a. Listings in the Table of Replaceable Parts do not constitute a complete breakdown of the equipment but consist of all electrical parts and such operative mechanical parts, with the exception of structural and minor parts such as standard bolts, screws, nuts, etc., that are subject to loss or failure.

b. Parts are grouped by major assemblies. Under each major assembly they are listed (1) alphabetically according to type and (2) numerically under each type.

2. ORDERING SPARE PARTS.

a. GENERAL.—Each Service using the Table of Replaceable Parts has established certain depots and service groups for the storage and issue of spare parts. The regulations of each Service should be studied to determine the method of requisitioning spare parts and the sources from which they may be obtained. Information in the table pertaining to manufacturers' or contractors' names, types, models, or drawing numbers is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts directly from wholesale or retail stores except under emergency conditions as covered by the existing regulations of the Service concerned.

Note

Parts listed in this table cover equipment manufactured under Order Nos. 5759-WF-43; 272-DAY-44; 431-DAY-44; and 1515-DAY-44.

b. U. S. ARMY PERSONNEL.—The Table of Replaceable Parts is for information *only* and is not to be construed as a list of allowances of maintenance parts or components. Organizations using this equipment will consult applicable AAF Technical Orders of the 00-30 and 00-30A series. Higher maintenance and supply echelons will consult applicable Combat Supply Tables X11A, X11B, and X111.

3. EXPLANATION OF SYMBOLS USED.

a. REFERENCE SYMBOLS (COLUMN ONE).—To identify parts of an equipment referred to in the text, in illustrations, and in the Table of Replaceable Parts, a reference symbol is assigned to each part making up a major assembly of an equipment. Each symbol consists of an alphabetical portion and a numerical portion, separated by a hyphen. (Example C-101.) Reference Symbols for parts for Indicator BC-929-A or BC-929-AZ contain only the numerical portion. The alphabetical portion denotes the type of part, classified in accordance with the following list:

Alphabetical Portion of Reference Symbol	*Type of Part*
A	Structural parts, panels, frames, castings, etc.
B	Motors and prime movers
C	Capacitors of all types
D	Dynamotors
E	Miscellaneous electrical parts, insulators, knobs, brushes, etc.
F	Fuses
G	Generators, exciters, etc.
H	Hardware, screws, bolts, studs, pins, snap-slides, tools, etc.
I	Indicating devices (except meters and thermometers), pilot lamps, etc.
J	Jacks and receptacles (stationary)
K	Contactors, relays, circuit breakers, etc.
L	Inductors, radio-frequency, and audio-frequency
M	Meters of all types, gauges, thermometers, etc.
N	Nameplates, dials, charts, etc.
O	Mechanical parts, bearings, shafts, couplings, gears, ferrules, flexible shafts, housings, etc.
P	Plugs
Q	Diaphragms (microphone, telephone, projector, etc.)
R	Resistors, fixed and variable (potentiometers, etc.)
S	Switches, interlocks, thermostats
T	Transformers, radio-frequency, audio-frequency and power
U	Hydraulic parts
V	Vacuum and gaseous discharge tubes
W	Wires, interconnecting cables, without plugs
X	Sockets
Y	Mechanical oscillators, crystals, magnetostriction tubes, etc.
Z	Impedances, such as traps (wave), etc.
BT	Batteries
CR	Rectifiers (electrochemical, copper-oxide, selenium, crystal, etc., except vacuum or gaseous tubes)
HR	Heaters
HS	Handset (telephone and microphone combination)
HT	Head telephones
HX	Heat exchangers
LS	Loud speakers
MG	Motor generators (single unit)
MI	Microphones (hand or chest type)
TY	Surge eliminators (special discharge resistors)
VR	Voltage regulators (except vacuum or gaseous tubes)

The numerical portion of the reference symbol is assigned as follows: Each part in each of the classifications of parts within a major assembly is assigned a number running consecutively for 99 numbers—from 101 to 199 for the first major assembly listed in the table, from 201 to 299 for the second major assembly, etc. If parts in one or more classifications of parts within a major assembly exceed 99, however, the next hundred series, e.g. 301 to 399, is assigned to that major assembly even though only part of the numbers in that series are used.

The next major assembly listed then begins with the next series, e.g. 401 to 499. The block of numbers assigned to each major assembly is shown in paragraph 5, this section.

Only one reference symbol is assigned to a part, but suffix letters are sometimes added to distinguish between multiple electrical or mechanical characteristics of a part. Example: C-101A, C-101B, and C-101C identify each part of a triple capacitor C-101; K-101A identifies the coil and K-101B the contacts of a relay K-101.

b. CROSS-HATCH SYMBOL (COLUMN TWO). Cross-hatch symbols (#) appearing in column two indicate that corresponding parts are not included in any concurrently procured spare parts group.

4. ABBREVIATIONS.

Abbreviations used in the Table of Replaceable Parts are as follows:

Abbreviation	*Definition*
AC	alternating current
AF	audio frequency
AM	amplitude modulation
amp	amperes
approx	approximately
AWG	American Wire Gauge
AVC	automatic volume control
AWS	American War Standard
C	Centigrade
Coef	coefficient
cps	cycles per second
CW	continuous wave
db	decibel(s)
DC	direct current
dia	diameter
dimen	dimension(s)
DPDT	double pole double throw
DPST	double pole single throw
F	Fahrenheit
ft	foot, feet
FM	frequency modulation
hy	henry(s)
"	inch(es)
ID	inner diameter
IF	intermediate frequency
JAN	joint Army Navy
kc	kilocycle(s)
lg	long
ma	milliampere(s)
max	maximum
mc	megacycle(s)
meg	megohm
min	minimum
mf	microfarad(s)
mmf	micromicrofarad(s)
u sec	microsecond(s)
mh	millihenry
mtd	mounted
mtg	mounting
mts	mounts
OD	outer diameter
%	percent
±	plus or minus
PD	pitch diameter
pri	primary
RF	radio frequency
RMA	Radio Manufacturers' Association
rpm	revolutions per minute
sec	secondary
SPDT	single pole double throw
SPST	single pole single throw
thd	thread(s)
thk	thick
uh	microhenry
UHF	ultra-high-frequency
v	volt(s)
vdcw	DC working volts
VF	video frequency
VHF	very-high frequency
w	watt(s)
wd	wide
ww	wire wound

5. INDEX OF MAJOR ASSEMBLIES.

Major Assembly	*Numhrical Series of Reference Symbols*
Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2	100-199 200-299
Indicator BC-929-(*)	300-399
Radio Control Box ★C-3/APN-2	400-499

6. DECIMAL EQUIVALENTS OF WIRE SIZES OF AWG AND SWG (BRITISH).

Size AWG	*Diameter Inches*	*Size SWG*	*Diameter Inches*
0000	.46000	0000	.4000
000	.40964	000	.3720
00	.36480	00	.3480
0	.32486	0	.3240
1	.28930	1	.3000
2	.25763	2	.2760
3	.22942	3	.2520
4	.20431	4	.2320
5	.18194	5	.2120
6	.16202	6	.1920
7	.14428	7	.1760
8	.12849	8	.1600
9	.11442	9	.1440
10	.10190	10	.1280
11	.09074	11	.1160
12	.08081	12	.1040
13	.07196	13	.0920
14	.06408	14	.0800
15	.05707	15	.0720
16	.05082	16	.0640
17	.04526	17	.0560
18	.04030	18	.0480
19	.03589	19	.0400
20	.03196	20	.0360
21	.02846	21	.0320
22	.02535	22	.0280
23	.02257	23	.0240
24	.02010	24	.0220
25	.01790	25	.0200
26	.01594	26	.0180
27	.01420	27	.0164
28	.01264	28	.0148
29	.01126	29	.0136
30	.01003	30	.0124
31	.008928	31	.0116
32	.007950	32	.0108

Size AWG	Diameter Inches	Size SWG	Diameter Incees
33	.007080	33	.0100
34	.006305	34	.0092
35	.005615	35	.0084
36	.005000	36	.0076
37	.004453	37	.0068
38	.003965	38	.0060
39	.003531	39	.0052
40	.003145	40	.0048

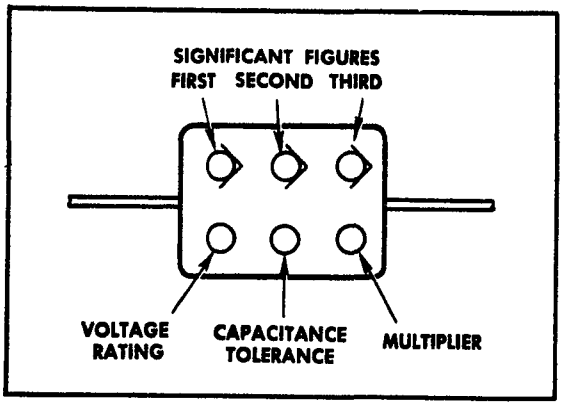
7. LIST OF MANUFACTURERS.

This list contains the names and addresses of manufacturers of the items in the Table of Replaceable Parts. The first column gives the code letters by which the manufacturer may be identified. For example: the manufacturer of a certain item is listed in column five in the Table of Parts as A-3. Referring to the List of Manufacturers, the name listed to the right of A-3 in column two, the producer of that particular item, is found to be Allen-Bradley, Hartford, Conn.

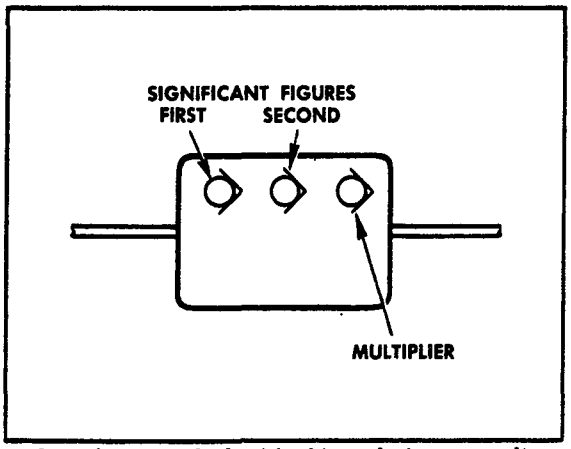
Code No.	Manufacturer and Address
A-1	American Phenolic Corporation, 1830 S. 54th St., Chicago, Illinois
A-2	Aerovox Corporation, New Bedford, Massachusetts
A-3	Allen-Bradley, 133 Sheldon Ave., Hartford, Connecticut
A-39	American Lava Corporation, Kinese Building, Chattanooga, Tennessee
B-4	Bachman Brothers, 1420 E. Erie Ave., Philadelphia, Pa.
B-5	Bellevue Leather Prod., 1205 Race Street, Philadelphia, Pa.
B-17	Bircher Corporation, Los Angeles, California
C-1	Chicago Telephone Supply Company, Elkhart, Indiana
C-2	Cinch Manufacturing Company, 2335 W. Van Buren St., Chicago, Illinois
C-3	Cornell-Dubilier Electric Corporation, 333 Hamilton Blvd., S. Plainsfield, New Jersey
C-4	Clarostat Manufacturing Company, 285 N. 6th Street, Brooklyn, N. Y.
C-6	Cutler-Hammer, 401 N. Broad Street, Philadelphia, Pa.
C-14	C. P. Clare Company, 4719 Sunnyside Avenue, Chicago, Illinois
C-24	Carbide & Chemical Corporation, 30 E. 42nd St., New York, N. Y.
E-1	Erie Resistor Company, 816 W. Erie St., Chicago, Ill.
E-2	Electro Motive Mfg. Co., S. Park & John Streets, Willimentio, Connecticut
E-12	Electric Auto-Lite Company, Bay Mfg. Div., Bay City, Michigan
E-14	G. D. Ellis & Sons, 309-71 3rd St., Philadelphia, Pa.
H-4	Hammerlund Manufacturing Company, 424 W. 33d St., New York, N. Y.
I-1	International Resistor Corporation, 401 N. Broad St., Philadelphia, Pa.
J-1	Jefferson Electric Company, Bellewood, Illinois
J-2	Howard B. Jones, 2300 Wabansia, Chicago, Illinois
K-1	Kurz-Kasch, Incorporated, Dayton, Ohio
K-7	Kings Electric, 372 Classen Ave., Brooklyn, N. Y.
L-9	L & R Manufacturing Company, Tarington, Connecticut
M-1	Micamold Radio Corporation, 1087 Flushing Ave., Brooklyn, N. Y.
M-2	Muter Company, 1255 S. Michigan Ave., Chicago, Ill.
M-12	P. R. Mallory, Liberty Trust Bldg., Broad & Arch Sts., Philadelphia, Pa.
N-2	National Company, 61 Sherman St., Malden, Mass.
O-5	John Oster Company, Genoa, Illinois
P-1	Philco Corporation, C & Tioga St., Philadelphia, Pa.
P-2	Phil. Insulated Wire Company, 200 N. 3rd St., Philadelphia, Pa.
P-4	Pawtucket Screw Company, 143 Hughes Ave., Pawtucket, R. I.
S-3	Stackpole Carbon Company, St. Marys, Pa.
S-4	Spargue Specialties Company, N. Adams, Mass. 501 Maple Ave., Merchantville, N. J.
S-5	Speer Resistor Company, St. Marys, Pa.
S-6	F. W. Sickles, P. O. Box 920, Springfield, Mass.
S-14	Solar Manufacturing Corporation, 599-601 Broadway, New York, N. Y.
S-29	Sillcocks-Miller, S. Orange, New Jersey
S-44	Selector Manufacturing Company, Long Island, N. Y.
U-1	Ucinite Corporation, 459 Watertown St., Newtonville, Mass.
U-5	United Transformer Company, 150 Varick St., New York, N. Y.
W-1	Westinghouse Electric & Mfg. Company, 3001 Walnut St., Philadelphia, Pa.

CAPACITOR COLOR CODES

RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

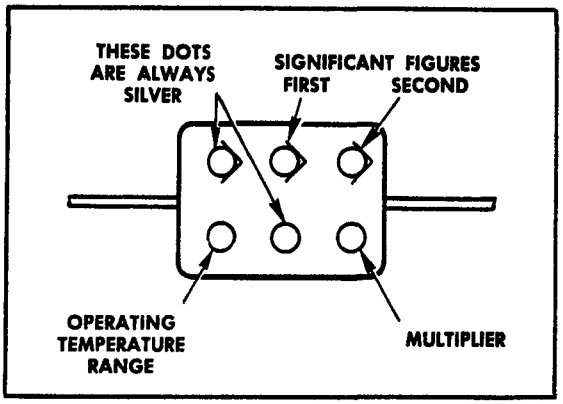


RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts.

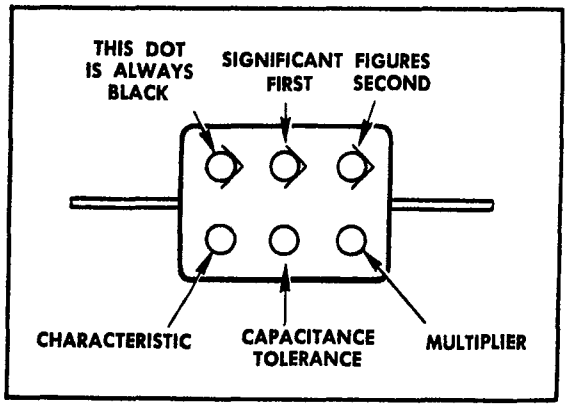
AWS 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



The silver dots serve to identify this marking. The sixth dot shows whether the capacitor has a maximum operating temperature of 167°F (black) or 185°F (brown).

COLOR	SIGNIFICANT FIGURE	MULTIPLIER		VOLTAGE RATING (VOLTS)	CHARACTERISTIC (AWS MICA-DIELECTRIC)
		RMA MICA- AND CERAMIC-DIELECTRIC AWS MICA- AND PAPER-DIELECTRIC	AWS CERAMIC-DIELECTRIC		
BLACK	0	1	1		A
BROWN	1	10	10	100	B
RED	2	100	100	200	C
ORANGE	3	1000	1000	300	D
YELLOW	4	10,000		400	E
GREEN	5	100,000		500	F
BLUE	6	1,000,000		600	G
VIOLET	7	10,000,000		700	
GRAY	8	100,000,000	0.01	800	
WHITE	9	1,000,000,000	0.1	900	
GOLD		0.1		1000	
SILVER		0.01		2000	
NO COLOR				500	

AWS 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



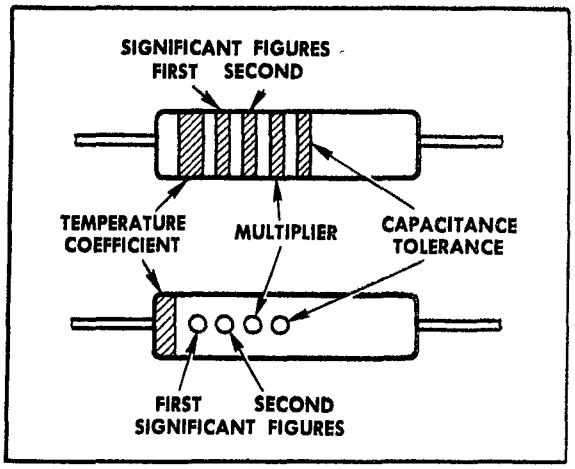
The black dot serves to identify the AWS marking. Capacitors marked with this code are rated at 500 volts, except the following. AWS type CM35 capacitors with capacitances of 6,800, 7,500, and 8,200 micromicrofarads, and AWS type CM40 capacitors with capacitances of 9,100 and 10,000 micromicrofarads are rated at 300 volts.

RMA: *Radio Manufacturers Association*

AWS: *American War Standard (American Standards Association)*

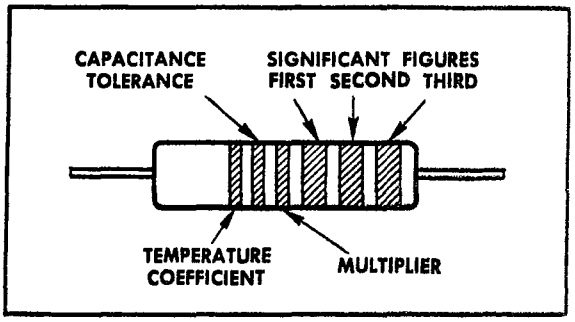
NOTE: These color codes give all capacitances in *micromicrofarads.*

AWS COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



Capacitors marked with this code have a voltage rating of 500 volts.

RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

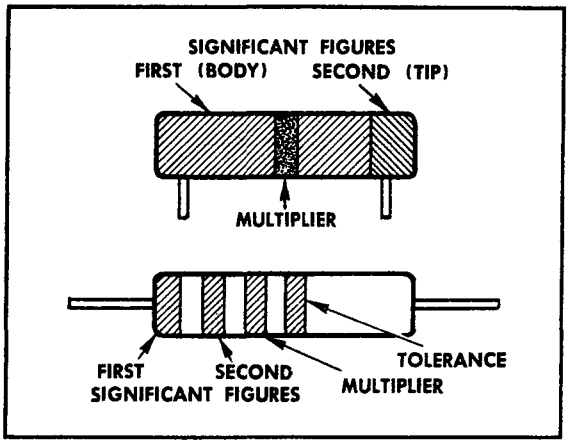


Capacitors marked with this code have a voltage rating of 500 volts.

CAPACITANCE TOLERANCE				TEMPERATURE COEFFICIENT OF CAPACITANCE x10⁻⁶ MMF/MMF/°C
RMA & AWS MICA- AND PAPER-DIELECTRIC (PERCENT)	RMA CERAMIC-DIELECTRIC (PERCENT)	AWS CERAMIC-DIELECTRIC GREATER THAN 10 MMF (PERCENT)	AWS CERAMIC-DIELECTRIC LESS THAN 10 MMF (MMF)	
20	20	20	2.0	0
1	1	1		− 30
2	2	2		− 80
3	3	2.5	0.25	−150
4	4			−220
5	5	5	0.5	−330
6	6			−470
7	7			−750
8	2.5			+ 30
9	10	10	1.0	Not specified
5				
10				
20				TL 13417

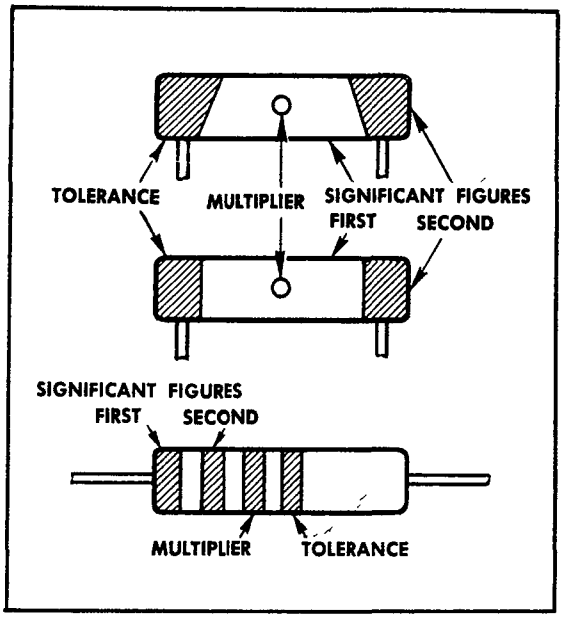
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS



Insulated fixed composition resistors with axial leads are designated by a natural tan background color. Non-insulated fixed composition resistors with axial leads are designated by a black background color.

AWS COLOR CODE FOR FIXED COMPOSITION RESISTORS



The exterior body color of insulated resistors may be any color except black. The usual color is natural tan. The exterior body color of uninsulated resistors with axial leads may be either black or white. The exterior body color of uninsulated resistors with radial leads may be black or it may be the color of the first significant figure of the resistance value.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1000	
YELLOW	4	10,000	
GREEN	5	100,000	
BLUE	6	1,000,000	
VIOLET	7	10,000,000	
GRAY	8	100,000,000	
WHITE	9	1,000,000,000	
GOLD		0.1	5
SILVER		0.01	10
NO COLOR			20

RMA: *Radio Manufacturers Association*
AWS: *American War Standard (American Standards Association)*

TL 13418

TABLE OF REPLACEABLE PARTS

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
(100-199)		RECEIVER SECTION OF RADIO RECEIVER AND TRANSMITTER *RT-1A/APN-2 AND *RT-1A/APN-2Y			
C101-A	3DK8256	CAPACITOR, variable: 0 to 15 mmf; consists of 2 adjustable plates, each 7/8" diameter x 1/16" thick; mounted on brass rod, 15/16" long, threaded 10-32; screw-driver slot on end of rod; one plate and rod mounted on brass support 1 7/16" x 1/2" x 3/8"; other plate and rod mounted on bakelite support 1 7/16" x 1/2" x 1/2"; one plate and rod silver plated, the other nickel plated.	Antenna tuning	P-1 358-3499 358-3501	358-3499 358-3501
C101-B		CAPACITOR, variable: Part of C101-A.	Antenna tuning		
C102-1		CAPACITOR, fixed: Ceramic; 59 mmf ±5%; 500 vdcw; axial leads; negative temperature coefficient 0.00075 mmf/mmf/degree 0; 7/16" long x 7/32" diameter.	Cathode bypass JAN-956 first r-f tube	E-1 N-680	305-1075
C102-2		CAPACITOR, fixed: Ceramic; 50 mmf; same as C102-1.	Filament bypass JAN-956, first r-f tube		
C102-3		CAPACITOR, fixed: Ceramic; 50 mmf; same as C102-1.	Cathode bypass JAN-956, 2nd r-f tube		
C102-4		CAPACITOR, fixed: Ceramic; 50 mmf; same as C102-1.	Filament bypass JAN-956, 2nd r-f tube		
C102-5		CAPACITOR, fixed: Ceramic; 50 mmf; same as C102-1.	Filament bypass JAN-955, oscillator tube		
C102-6 (C122)		CAPACITOR, fixed: Ceramic; 50 mmf +5%, radial leads; overall dimensions 7/16" long x 7/32" diameter; wax-impregnated.	Oscillator feedback capacitor	E-1 N750K	305-1576
C103-1		CAPACITOR, fixed: Ceramic; 25 mmf ±5%; 500 vdcw; radial leads, overall dimensions 1 1/16" long x 7/32" diameter; wax-impregnated.	Plate bypass JAN-956, 1st r-f tube	E-1 NPOL	305-1509
C103-2		CAPACITOR, fixed: Ceramic; 25 mmf; same as C103-1.	Screen bypass JAN-956, 1st r-f tube		
C103-3		CAPACITOR, fixed: Ceramic; 25 mmf; same as C103-1.	Screen bypass JAN-956, 2nd r-f tube		
C103-4		CAPACITOR, fixed: Ceramic; 25 mmf; same as C103-1.	Plate bypass JAN-956, 2nd r-f tube		

C104-1	3D9020-4	CAPACITOR, fixed: Ceramic; 20 mmf ±5%; 500 vdow; radial leads; negative temperature coefficient 0.00075 mmf/mmf/ degree C; 7/16" long x 7/32" diameter; wax-impregnated.	D-C blocking and coupling, 1st r-f to 2nd r-f tube	E-1 E750K	305-1076
C104-2		CAPACITOR, fixed: Ceramic; 20 mmf; same as C104-1.	D-C blocking and coupling, 2nd r-f to mixer tube		
C105-1A	30DK8256.2	CAPACITOR, variable: Consists of two brass, silver-plated tuner plates, 1" long x 7/8" diameter with 3/64" x 1/8" slot in end of 10-32 threaded shaft; one plate with silver-plated support 1 1/4" x 1/2" x 3/8"; other plate with bakelite support 1 1/4" x 1/2" x 1/2".	2nd r-f stage tuning	P-1 358-5207	358-5207
C105-1B		CAPACITOR, variable: Part of C105-1.	2nd r-f stage tuning		358-5208
C105-2A		CAPACITOR, variable: Same as C105-1.	Mixer stage tuning		358-5207
C105-2B		CAPACITOR, variable: Part of C105-2.	Mixer stage tuning		358-5208
C121-33 (C106-1) (C118-1) See change No. 8†	3DKA1-108	CAPACITOR, fixed: Ceramic; 1,000 mmf ±20%; 500 vdcw; axial leads, 5/8" long x .121" diameter.	Cathode bypass, mixer tube	M-2 20K-1200	305-1326
C121-34 (C106-2) (C118-2) See change No. 10†		CAPACITOR, fixed: Ceramic; same as C106-1.	Filament bypass, mixer tube		
C106-3 (New) (C121-31) See Sec. VI, par. 5d(4)		CAPACITOR, fixed: Mica; wax-impregnated; 1,000 mmf ±10%; 500 vdcw; axial leads; overall dimensions 51/64" long x 15/32" wide x 7/32" thick.	Screen grid bypass JAN-956, mixer tube	E-2 503-M	60-20105407
C106-4 (C121-32)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass JAN-956, mixer tube		
C106-5 (C121-1)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Coupling mixer tube to 1st i-f tube		
C106-6 (C121-2)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Cathode bypass, 1st i-f tube		
C106-7 (C121-3)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Screen bypass, 1st i-f tube		
C106-8 (C121-4)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Coupling, 1st i-f tube to 2nd i-f tube		
C106-9 (C121-5)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass, 1st i-f tube		

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
C106-10 (C121-6)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Cathode bypass, 2nd i-f tube		
C106-11 (C121-7)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Screen grid bypass, 2nd i-f tube		
C106-12 (C121-8)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass, 2nd i-f tube		
C106-13 (C121-9)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Coupling, 2nd i-f tube to 3rd i-f tube		
C106-14 (C121-10)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Cathode bypass, 3rd i-f tube		
C106-15 (C121-11)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Screen grid bypass, 3rd i-f tube		
C106-16 (C121-12)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass, 3rd i-f tube		
C106-17 (C121-13)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Coupling, plate 3rd i-f tube to grid 4th i-f tube		
C106-18 (C121-14)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Cathode bypass, 4th i-f tube		
C106-19 (C121-15)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Screen grid bypass, 4th i-f tube		
C106-20 (C121-16)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass, 4th i-f tube		
C121-21 (C121-17)		CAPACITOR, fixed: Mica, 1,000 mmf; same as C106-3.	Coupling, plate 4th i-f tube to grid of 5th i-f tube		
C106-22 (C121-18)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Cathode bypass, 5th i-f tube		
C106-23 (C121-19)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Screen grid bypass, 5th i-f tube		
C106-24 (C121-20)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Plate bypass, 5th i-f tube		

C106-25 (C121-21)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Coupling, plate 5th i-f tube to cathode of detector		
C106-26 (C121-22)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Filament bypass JAN-6H60T, detector		
C106-27 (C121-23)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	B+ bypass for r.f. at osc. plate		
C106-28 (C121-24)	CAPACITOR, fixed: Mica; 1000 mmf; same as C106-3	Gain control bypass at 1st and 2nd r-f and 1st i-f screens		
C106-29 (C120-25)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	R-F bypass for receiver heater circuit		
C106-30 C121-26)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Bypass for receiver B+ circuit		
C106-31 (C121-27)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	R-F filter capacitor for r-f, osc., and i-f filament circuit		
C106-32 (C121-28)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Filament bypass at JAN-6AC7, 3rd i-f tube		
C106-33 (C121-29)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	R-F bypass for B+ at mixer		
C106-34 (C121-30)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C106-3.	Filament bypass for r-f, osc., and i-f tubes		
C107-1	CAPACITOR, fixed: Paper; oil-filled; 3 sections; .1 mf +20% −10% per section; 600 vdcw; hermetically sealed metal case $1\frac{3}{16}$″ long x 1″ wide x $\frac{3}{4}$″ high; two mounting brackets, one on each end of case with .187″ diameter holes, spaced $2\frac{1}{8}$″ apart; 3 terminals on top of case.		C-3 DYRB-6111-8	305-1532
C107-1A	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-1.	Screen bypass 1st v-f tube		
C107-1B	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-1.	Screen bypass 1st v-f tube		
C107-1C	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-1.	Plate bypass 1st v-f tube		
C107-2	CAPACITOR, fixed: Paper; oil-filled; 3x.1 mf; same as C107-1.			
C107-2A	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-2.	Screen bypass sync. amplifier tube		
C107-2B	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-2.	Plate bypass clipper tube		
C107-2C	CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-2.	Plate bypass 2nd section suppressor amplifier		
C107-3	CAPACITOR, fixed: Paper; oil-filled; 3x.1 mf; same as C107-1.			

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
C107-3A		CAPACITOR. fixed: Paper; oil-filled; .1 mf; part of C107-3.	Cathode bypass clipper tube		
C107-3B		CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-3.	Cathode bypass clipper tube		
C107-3C		CAPACITOR, fixed: Paper; oil-filled; .1 mf; part of C107-3.	Cathode bypass JAN-6H6GT tube, limiter section		
C108-1		CAPACITOR, fixed: Paper; wax-impregnated; .1 mf +20% −10%; 400 vdcw; axial leads; 1 7/16" long x 3/4" wide x 3/8" thick.	Coupling capacitor 1st to 2nd video	S-14 DYRB-6111-8	305-1513
C108-2		CAPACITOR, fixed: Paper; .1 mf; same as C108-1.	Coupling capacitor 1st and 2nd section suppressor amplifier		
C109		CAPACITOR, variable: Both rotor and stator plates silver-plated; overall dimensions 1 7/8" long x 1 3/16" square; 2 mounting brackets, one on each side, mounting hardware supplied.	Receiver oscillator HIGH frequency adjustment	P-1 756-2205	756-2205
C110	3DK9012V-2	CAPACITOR, variable: 3 to 12 mmf; ceramic padder type; 2 plates; voltage rating 500 vdcw; flash test 1300 volts; zero temperature coefficient; steatite base 55/64" long x 41/64" wide x 3/8" deep; 2 lugs 9/32" below base; two 0.120" diameter mounting holes, 7/16" between center.	Receiver oscillator LOW tuning adjustment	E-1 TS2A	351 1051
C111	3DKA250-53	CAPACITOR, fixed: Paper; wax-impregnated; .25 mf ±20%; 200 vdcw; axial leads; overall dimensions 1 7/16" long x 3/4" wide x 3/8" thick.	Coupling capacitor to grid of sync amplifier and limiter	M-1 345-20	305-1241
C112-1		CAPACITOR, fixed: Paper; wax-impregnated; .01 mf ±10%; 400 vdcw; axial leads; 1 5/32" long x 5/8" wide x 1/4" thick.	Coupling timing oscillator to clipper	C-3 BP	305-1023
C112-2		CAPACITOR, fixed: Paper; .01 mf; same as C112-1.	Feedback coupling, sync amplifier and suppressor amplifier		
C112-3		CAPACITOR, fixed: Paper; .01 mf; same as C112-1.	Coupling clipper to suppressor amplifier		
C114 See change No. 52†	3DKA3-62	CAPACITOR, fixed: Mica; 3,000 mmf ±5%; 600 vdcw; 13/16" x 13/16" x 21/64".	Timing osc. grid-leak capacitor	E-2 502L	60-20306324

C114 See change No. 52†		CAPACITOR, fixed: Mica; 4,000 mmf ±5%; 500 vdcw: 13/64" x 13/64" x 21/64".	Timing osc. grid-leak capacitor		60-20406324
C115		CAPACITOR, fixed: Paper; oil-filled; 1 mf +20% −10%; 600 vdcw; hermetically sealed metal case 1½" long x ⅞" wide x 1½" high; 2⅛" between mounting holes; 2 terminals, one on each side of case.	Receiver output coupling to VF-1	A-2 630A	305-1342
C116 (Old) See change No. 50†	3DK9500-96	CAPACITOR, fixed; Ceramic; 500 mmf +20%; 500 vdcw; axial leads; dimensions ⅝" long x .121" diameter; bakelite coated.	R-F bypass for suppressor grid of sync amplifier	M-2 20K-1200	305-1325
C116 (C120) See change No. 50†		CAPACITOR, fixed: Ceramic; 100 mmf ±5%; 500 vdcw; axial leads; dimensions 11/16" long x 7/32" diameter.	R-F bypass for suppressor grid of sync amplifier	E-1 N750L	305-1074
C117-1 See change No. 42†		CAPACITOR, fixed: Mica; 2,500 mmf ±5%; 500 vdcw; axial leads; dimensions 53/64" x 53/64" x 3/16"; wax-impregnated.	Filament bypass, JAN-6AC7, 5th i-f tube	E-2 6023	60-20255324
C117-2 See change No. 52†		CAPACITOR, fixed: 2,500 mmf; same as C117-1.	Timing osc. grid-leak capacitor		
C118-1 See change No. 8†	3DKA1-108	CAPACITOR, fixed: Ceramic; 1,000 mmf ±20%; 500 vdcw; radial leads; dimensions ⅝" long x .121" diameter; wax-impregnated.	Cathode bypass, mixer tube	M-2 20K-1200	305-1326
C118-2 See change No. 10†		CAPACITOR, fixed: Ceramic; 1,000 mmf; same as C118-1.	Filament bypass, mixer tube		
C120 (C116)		CAPACITOR, fixed: Ceramic; 100 mmf ±5%; 500 vdcw; axial leads; 11/16" long x 7/32" diameter.	R-F bypass for suppressor grid of sync amplifier	E-1 N750L	305-1074
C121-1 (C106-5) See Sec. VI, par. 5*d*.(5)		CAPACITOR, fixed: Mica; wax-impregnated 1,000 mmf ±10%; 500 vdcw; axial leads; overall dimensions 51/64" long x 15/32" wide x 7/32" thick.	Coupling mixer tube to 1st i-f tube	E-2 503-M	60-20105407
C121-2 (C106-6)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Cathode bypass, 1st i-f tube		
C121-3 (C106-7)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen bypass, 1st i-f tube		
C121-4 (C106-8)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Coupling, 1st i-f tube to 2nd i-f tube		
C121-5 (C106-9)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, 1st i-f tube		

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI

TABLE OF REPLACEABLE PARTS (Continued

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
C121-6 (C106-10)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Cathode bypass, 2nd i-f tube		
C121-7 (C106-11)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen grid bypass, 2nd i-f tube		
C121-8 (C106-12)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, 2nd i-f tube		
C121-9 (C106-13)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Coupling, 2nd i-f tube to 3rd i-f tube		
C121-10 (C106-14)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Cathode bypass, 3rd i-f tube		
C121-11 (C106-15)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen grid bypass, 3rd i-f tube		
C121-12 (C106-16)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, 3rd i-f tube		
C121-13 (C106-17)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Coupling, 3rd i-f tube to 4th i-f tube		
C121-14 (C106-18)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Cathode bypass, 4th i-f tube		
C121-15 (C106-19)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen grid bypass, 4th i-f tube		
C121-16 (C106-20)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, 4th i-f tube		
C121-17 (C106-21)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Coupling, 4th i-f tube to 5th i-f tube		
C121-18 (C106-22)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Cathode bypass, 5th i-f tube		
C121-19 (C106-23)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen grid bypass, 5th i-f tube		
C121-20 (C106-24)		CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, 5th i-f tube		

C121-21 (C106-25)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Coupling, 5th i-f tube to detector tube		
C121-22 (C106-26)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Filament bypass, detector tube		
C121-23 (C106-27)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	B+ bypass for r.f. at osc. plate		
C121-24 (C106-28)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Gain control bypass for 1st and 2nd r-f and 1st i-f screens		
C121-25 (C106-29)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	R-F bypass for receiver heater circuit		
C121-26 (C106-30)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Bypass for receiver B+ circuit		
C121-27 (C106-31)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	R-F filter capacitor for r-f, osc., and i-f heater circuit		
C121-28 (C106-32)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Filament bypass, 3rd i-f tube		
C121-29 (C106-33)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	R-F bypass for B+ at mixer		
C121-30 (C106-34)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Filament bypass for r-f, osc., and i-f tubes		
C121-31 (C106-3)	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Screen-grid bypass, mixer tube		
C121-32 (C106-4) C121-33* C121-34**	CAPACITOR, fixed: Mica; 1,000 mmf; same as C121-1.	Plate bypass, mixer tube		
C122 (C102-6)	CAPACITOR, fixed: Ceramic; 50 mmf ±5%; radial leads; 7/16" long x 7/32" diameter; wax-impregnated.	Oscillator feedback capacitor.	E-1 N750K	305-1576
J101-1	CONNECTOR, coaxial, female: Single contact; flange type, 1" square x 1 1/16" long with 4 mounting holes .125" diameter, centered at 0.79" on corners; 5/8x24 thread on shaft.	Connection to receiver antenna	S-44 Navy *49194 Sig. Corps SO-234	358-2430
J101-2	CONNECTOR, coaxial: Female; same as J101-1.	Video frequency output 1		
J101-3	CONNECTOR, coaxial: Female; same as J101-1.	Video frequency output 2		
J101-4	CONNECTOR, coaxial: Female; same as J101-1.	Sync. input		

*See C-106
**See C-106-2

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y **Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y**

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
J101-5		CONNECTOR, coaxial: Female; same as J101-1.	Suppressor output		
J101-6		CONNECTOR, coaxial: Female; same as J101-1.	Sync. output		
J102 (P101) See change No. 66†	2ZK7118.17	CONNECTOR: Howard Jones type P-308FHT; 3/8" hole in cap; 8 prongs; 1 1/4" x 11/16" x 1".	Power and signal connection between receiver and transmitter chassis	J-2 P-308FHT	257-7115
K101	2XK6750-K1	RELAY: Oscillator; 24 volts; coil resistance 300 ohms; SPST; normally open; 1 form A-18 gauge silver contacts; all fiber parts wax-impregnated; overall dimensions 1 3/16" x 1 1/2" x 5/8"; used in AN/APN-2 only.	Changes oscillator frequency by switching capacitances	C-14 Type K	358-4734
		or			
		RELAY: 12 volts d.c.; 126 ohms d-c resistance; SPST; 18-gauge silver contacts, normally open; two mounting holes, tapped 5-40; used in AN/APN-2Y only.	Changes oscillator frequency by switching in additional capacitance	C-14 Midget type K, or equivalent	452-1154
L101	3CK318-28	COIL, r-f: 4 turns 12-gauge (0.081) solid copper wire, silver-plated; coil 11/16" long x 0.205" diameter, mounted on lugs.	Antenna tuning	S-6 352-1383	352-1383
L102-1	3CK318-26	COIL, r-f: 2 3/4 turns 12-gauge (0.081) solid copper wire, silver-plated; coil 11/16" long x 0.125" diameter.	2nd r-f stage tuning	S-6 352-1384	352-1384
L102-2		COIL, r-d: 2 3/4 turns; same as L102-1.	Mixer tuning		
L103-1	2ZK9642.6	COIL, i-f, and core assembly: 7 turns No. 22 enameled copper wire wound on black bakelite form, grade 120; 1 5/8" long x 5/8" outside diameter; coil form grooved; brass insert.	1st i-f tuning	P-1 358-3518	358-3518
L103-2		COIL, i-f: Same as L103-1.	2nd i-f tuning		
L103-3		COIL, i-f: Same as L103-1.	3rd i-f tuning		
L103-4		COIL, i-f: Same as L103-1.	4th i-f tuning		
L103-5		COIL, i-f: Same as L103-1.	5th i-f tuning		
L104	2ZK9642.7	COIL, i-f, and core assembly: 9 turns No. 22 enameled wire wound on a black bakelite form, grade 120; 1 5/8" long x 5/8" outside diameter, 0.380" inside diameter; coil form grooved; brass insert 7/16" long x 3/8" diameter, inserted 3/16"; insert has two flat sides, tapped 6-32; coil core G-2 iron, 1/2" long x .370" diameter mounted on end of brass rod 1 1/32" long, threaded 6-32.	6th i-f coil, detector input	P-1 358-3517	358-3517

L105‡		COIL, oscillator link: #22 solid tinned copper wire; breakdown of 500 volts, 60 cycles, r.m.s.; insulation resistance 10,000 megohms minimum; maximum outside diameter 0.070″.	Coupling oscillator output to mixer	P-2 25-7355095	25-7355095
L106		COIL & LINK ASSEMBLY, oscillator: Oscillator coil consists of 5 turns #12-gauge (0.081) commercially pure, soft drawn tinned copper wire, 1″ x 0.359″ diameter; link coil (L105) and mounting hardware.	Oscillator tuning and coupling	P-1 756-2216	756-2216
L107	3C318-6	COIL, r-f choke: Double spaced; ceramic spool $^{13}/_{16}$″ x ¼″ with 2 holes $^{11}/_{32}$″ between centers; thickness of wall of spool 0.086″; 22 turns B & S #30 gauge solid copper wire, enameled; 1¼″ axial leads; wax-impregnated.	Oscillator filament choke	S-6 352-1126	352-1126
L108	3CK318-10	COIL, r-f choke: Ceramic coil form 1″ long, $^{5}/_{16}$″ outside diameter, $^{5}/_{32}$″ inside diameter; four 0.046″ diameter holes in each end of form; 20 turns #22 copper enameled wire.	R-F choke in filament lead to r-f and i-f stages	S-6 352-1321	352-1321
P101 See change No. 66	2ZK7118.17	CONNECTOR: Male, 8 pin contacts; Howard Jones type P-308-FHT; ⅜″ hole in cap; overall dimensions 1¼″ x $^{11}/_{16}$″ x 1″.	Provides connections between receiver and transmitter chassis	J-2 P308-FHT	257-7115
R101-1	3RC21AE331K	RESISTOR, fixed: Composition; insulated; 330 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 1st r-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1333340
R101-2		RESISTOR, fixed: 330 ohms ±10%; same as R101-1.	Cathode bias, 2nd r-f tube		
R102-1 See change No- 1†	3Z6610-57	RESISTOR, fixed: Composition; insulated; 10,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load, 1st r-f tube	A-3 EB, RC-20 I-1 BT-½ RC-21	66-3103340
R102-2 See change No. 3†		RESISTOR, fixed: 10,000 ohms ±10%; ½ watt; same as R102-1.	Plate load, 2nd r-f tube		
R102-3 See change No. 11†		RESISTOR, fixed: 10,000 ohms ±10%; ½ watt; same as R102-1.	Plate de-coupling and dropping, mixer tube		
R102-4		RESISTOR, fixed: 10,000 ohms ±10%; ½ watt; same as R102-1.	Voltage dropping plate of suppressor amplifier tube		
R102-5		RESISTOR, fixed: 10,000 ohms ±10%; ½ watt; same as R102-1.	Part of sync input time constant network		

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.
‡Not supplied in Base Spares.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
R102-6 See change No. 2†		RESISTOR, fixed: 10,000 ohms ±10%; ½ watt; same as R102-1.	1st r-f screen resistor		
R103-1	3Z6150-48	RESISTOR, fixed: Composition; insulated; 1500 ohms ±10%; ½ watt; JAN type RC-21; wax-impregnated.	Plate de-coupling and dropping, 1st r-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2153340
R103-2		RESISTOR, fixed: 1,500 ohms; same as R103-1.	Plate de-coupling and dropping, 2nd r-f tube		
R103-3 See change No. 13†		RESISTOR, fixed: 1,500 ohms; same as R103-1.	Plate load, mixer tube		
R103-4		RESISTOR, fixed: 1,500 ohms; same as R103-1.	Plate de-coupling and dropping, 1st v-f amplifier		
R104-1 (R102-6) See change No. 2	3RC31AE683K	RESISTOR, fixed: Composition; insulated; 68,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Voltage dropping, screen grid 1st r-f tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-3684350
R104-2		RESISTOR, fixed: 68,000 ohms; same as R104-1.	Voltage dropping, screen grid of mixer tube		
R105-1	3Z6615-33	RESISTOR, fixed: Composition; insulated; 15,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Voltage dropping, screen grid of 2nd r-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-3153340
R105-2		RESISTOR, fixed: 15,000 ohms; same as R105-1.	Voltage dropping, screen grid of 5th i-f tube		
R105-3		RESISTOR, fixed: 15,000 ohms; same as R105-1.	Part of 1st plate load and voltage divider suppressor amplifier tube		
R105-4		RESISTOR, fixed: 15,000 ohms; same as R105-1.	Part of 1st plate load and voltage divider, suppressor amplifier tube		

R106-1	3Z6047-6	RESISTOR, fixed: Composition; insulated; 470 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, mixer tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1473340
R106-2		RESISTOR, fixed: 470 ohms; same as R106-1.	Voltage dropping, screen grid 1st i-f tube		
R106-3 See change No. 55†		RESISTOR, fixed: 470 ohms; same as R106-1.	Cathode load, timing-osc. tube		
R107-1	3ZK6012-14	RESISTOR, fixed: Composition; insulated; 120 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 1st i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1123340
R107-2		RESISTOR, fixed: 120 ohms; same as R107-1.	Oscillation suppressor resistor at plate of 1st i-f tube		
R107-3		RESISTOR, fixed: 120 ohms; same as R107-1.	Oscillation suppressor resistor at plate of 4th i-f tube		
R108-1	3Z6051-4	RESISTOR, fixed: Composition; insulated; 510 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load 1st i-f tube	A-3 EB, RC-20 I-1, BT-½	66-1513240
R108-2 See change No. 25†		RESISTOR, fixed: 510 ohms; same as R108-1.	Plate load, 2nd i-f tube		
R108-3 See change No. 31†		RESISTOR, fixed: 510 ohms; same as R108-1.	Plate load, 3rd i-f tube		
R108-4 See change No. 37†		RESISTOR, fixed: 510 ohms; same as R108-1.	Plate load, 4th i-f tube		
R109-1	3Z6015-28	RESISTOR, fixed: Composition; insulated; 150 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 2nd i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1153340
R109-2		RESISTOR, fixed: 150 ohms; same as R109-1.	Cathode bias, 3rd i-f tube		

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. r Spec. No.*
R110-1	3ZK6647-23	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Voltage dropping, screen grid 2nd i-f tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-3474340
R110-2		RESISTOR, fixed: 47,000 ohms; same as R110-1.	Voltage dropping, screen grid 3rd i-f tube		
R111-1	3RC31AE332K	RESISTOR, fixed: Composition; insulated; 3,300 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Voltage dropping and decoupling, plate 1st i-f tube	A-3 GB, RC-30 I-1, BT-1, RC-31	66-2334350
R111-2		RESISTOR, fixed: 3,300 ohms; same as R111-1.	Voltage dropping and decoupling, plate 2nd i-f tube		
R111-3		RESISTOR, fixed: 3,300 ohms; same as R111-1.	Voltage dropping and decoupling, plate 3rd i-f tube		
R111-4		RESISTOR, fixed: 3,300 ohms; same as R111-1.	Voltage dropping and decoupling, plate 4th i-f tube		
R111-5 See change No. 45†		RESISTOR, fixed: 3,300 ohms; same as R111-1.	Voltage dropping and decoupling, plate 5th i-f tube		
R112-1	3Z6022-9	RESISTOR, fixed: Composition; insulated; 220 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 4th i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1223340
R112-2		RESISTOR, fixed: 220 ohms; same as R112-1.	Cathode bias, 2nd v-f tube		
R113-1 See change No. 35†		RESISTOR, fixed: Composition; insulated; 22,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Screen divider, syno amplifier and limiter	A-3 GB, RC-30 I-1 BT-1, RC-31	66-3224356
R113-2		RESISTOR, fixed: 22,000 ohms; same as R113-1.	Screen dropping, 4th i-f tube		

R114	3Z6027-1	RESISTOR, fixed: Composition; insulated; 270 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 5th i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1273340
R115	3Z6733-2	RESISTOR, fixed: Composition; insulated; 330,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Limiter cathode voltage divider	A-3 EB, RC-20 I-1 BT-½, RC-21	66-4333340
R116-1	3Z6747-1	RESISTOR, fixed: Composition; insulated; 470,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Limiter cathode voltage divider	A-3 EB, RC-20 I-1 BT-½, RC-21	66-4473340
R116-2		RESISTOR, fixed: 470,000 ohms; same as R116-1.	Grid return, 2nd v-f tube		
R117-1	3Z6622-2	RESISTOR, fixed: Composition; insulated; 22,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Detector plate load	A-3 EB, RC-20 I-1 BT-½, RC-21	66-3223340
R117-2		RESISTOR, fixed: 22,000 ohms; same as R117-1.	Grid return, receiver oscillator tube		
R117-3 See change No. 35†		RESISTOR, fixed: 22,000 ohms; same as R117-1.	Screen dropping, 4th i-f JAN-6AC7 tube		
R118	3Z6722-1	RESISTOR, fixed: Composition; insulated; 220,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Grid return, 1st v-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-4223340
R119 (Old) See change No. 49†	3ZK6625-52	RESISTOR, fixed: Wirewound; 25,000 ohms ±10%; 5 watts; 1 7/32" long x 7/16" diameter; pigtail terminals.	Plate load, 1st v-f tube	S-4 5K	353-1344
R119-1 (New) (R145-1) See change No. 49†	3RC40AE473K	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; 2 watts; axial leads; 1⅜" long x ⅜" diameter; wax-impregnated.	Plate load; 1st v-f tube	S-5 S1-2	66-3475356
R119-2 (New) (R145-2) See change No. 49†		RESISTOR, fixed: 47,000 ohms; same as R119-1.	Plate load, 1st v-f tube		

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
R120-1	3Z4525	RESISTOR, fixed: Composition; insulated; 1,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Grid current limiter, 2nd v-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2103340
R120-2		RESISTOR, fixed: 1,000 ohms; same as R120-1.	First cathode bias, suppressor amplifier tube.		
R121		RESISTOR, fixed: Wirewound; 10,000 ohms; 10 watts; radial leads; 1¾″ long x ½″ diameter.	Cathode load, 2nd v-f tube	I-1 AB	353-1537
R122	3Z6633-2	RESISTOR, fixed: Composition; insulated; 33,000 ohms ±10%; 2 watts; axial leads; JAN type RC-41; wax-impregnated.	Voltage dropping, plate, receiver oscillator tube	S-5, SI-2 RC-40, I-1 BWZ, RC-41	66-3335340
R123-1	3Z4534	RESISTOR, fixed: Composition; insulated; 1 megohm ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Suppressor-grid load, sync amplifier and limiter	A-3 EB, RC-20 I-1 BT-½, RC-21	66-5103340
R123-2		RESISTOR, fixed: 1 megohm; same as R123-1.	Grid return, sync amplifier and limiter		
R123-3		RESISTOR, fixed: 1 megohm; same as R123-1.	1st grid return suppressor amplifier tube		
R123-4		RESISTOR, fixed: 1 megohm; same as R123-1.	2nd grid return suppressor amplifier tube		
R124 (Old) See change No. 51†	3ZK6615-66	RESISTOR, fixed: 15,000 ohms ±5%; ½ watt; carbon; insulated; 7/16″ x 7/32″.	Plate dropping sync amplifier and limiter tube	S-3, MB-½ I-1, BT-½	66-3153240
R124 (Old) See change No. 51†	3RC21BE243J	RESISTOR, fixed: Carbon, insulated; 24,000 ohms ±5%; ½ watt; axial leads; 7/16″ long x 7/32″ diameter; wax-impregnated.	Plate dropping; sync amplifier and limiter tube	S-3, MB-½ I-1, BT-½	66-3243240
R125	3ZK6700-94	RESISTOR, fixed: Composition; insulated; 100,000 ohms ±10%; 2 watts; axial leads; JAN type RC-41; wax-impregnated.	Screen voltage divider; sync amplifier and limiter	S-5, SI-2 RC-41	66-4105356
R126 (Old) See change No. 53†	3ZK6803A6-1	RESISTOR, fixed: Carbon; insulated; 3.6 megohms ±5%; ½ watt; ⅜″ long x 3/16″ diameter; pigtail terminals.	Grid return, timing osc.	S-3, MB-½ I-1, BT-½	66-5363240

R127-1		RESISTOR, fixed: Composition; insulated; 4.7 megohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, clipper tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-5473340
R127-2		RESISTOR, fixed: 4.7 megohms; same as R127-1.	Grid return, clipper tube		
R127-4 (R127-3) See change No. 53†		RESISTOR, fixed: 4.7 megohms; same as R127-1.	Grid return, timing-osc. tube		
R128	3Z4550	RESISTOR, fixed: Composition; insulated; 100,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate dropping, clipper tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-4103340
R129 (Old) See change No. 44†	3Z6068-7	RESISTOR, fixed: Carbon; insulated; 680 ohms ±10%; ½ watt; 7/16" long x 7/32" diameter; pigtail terminals.	Plate load, 5th i-f tube	S-3, MB-½ I-1, BT-½	66-1683340
R129 (Old) (R140-2) See change No. 44†	3RC21BE122J	RESISTOR, fixed: Composition; insulated; 1,200 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Original function: plate load, 5th i-f tube. Present function: mixer plate load resistor.	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2123240
R130	3RC21BE620J	RESISTOR, fixed: Composition; insulated; 62 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, 1st v-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-0623240
R131	3Z6647-1	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load, clipper tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-3473340
R132	3ZK6712-11	RESISTOR, fixed: Composition; insulated; 120,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Screen dropping, 1st v-f tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-4124340
R133 (R141) See change No. 44†	3RC21BE182J	RESISTOR, fixed: Composition; insulated; 1,800 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load, 5th i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2183240

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y **Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y**

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
R134-1 See change No. 45†	3RC31BE682K	RESISTOR, fixed: Composition; insulated; 6,800 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Plate dropping, 5th i-f tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-2684356
R134-2 See change No. 45†		RESISTOR, fixed: 6,800 ohms; same as R134-1.	Plate dropping, 5th i-f tube		
R135-1 See change No. 1†	3RC31BE103K	RESISTOR, fixed: Composition; insulated; 10,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Plate load, 1st r-f tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-3104350
R135-2 See change No. 3†		RESISTOR, fixed: 10,000 ohms; same as R135-1.	Plate load, 2nd r-f tube		
R135-3 See change No. 11†		RESISTOR, fixed: 10,000 ohms; same as R135-1.	Plate dropping, mixer tube		
R136 See change No. 55†	3RC21BE681K	RESISTOR, fixed: Composition; insulated; 680 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode load, timing osc. tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1683340
R137 See change No. 56	3RC21BE822K	RESISTOR, fixed: Carbon; insulated; 8,200 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	1st plate voltage-divider, suppressor amplifier tube	A-3 EB, RC-20 I-1, BT-½	66-2823240
R138 See change No. 57	3RC21BE472K	RESISTOR, fixed: Composition; insulated; 4,700 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode load, suppressor amplifier tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2473340
R139 (Old) See change No. 54	2ZK7269-1000M.1	RESISTOR, variable: 1 megohm ±20%; special D taper; carbon; 315° rotation; 1" long x 1⅛" diameter; ⅜-32 thread on shaft; 3 terminals.	Blocking osc. frequency control	C-1 †35	353-5077

R139 (New) See change No. 54	2ZK7262-2000M	RESISTOR, variable: Carbon; 2 megohms ±20%; special D taper; 315° rotation; 1″ long x 1⅛″ diameter; ⅜-32 thread on shaft; 3 terminals.	Blocking osc. frequency control	C-1 † 35	353-5277
R140 See change No. 51	3ZK6615-66	RESISTOR, fixed: Carbon; 15,000 ohms ±5%; ½ watt; 7/16″ long x 7/32″ diameter.	Plate dropping resistor, sync. amplifier and limiter	S-3, MB-½ I-1, BR-½	66-3153240
R140-2 (R129) See change No. 13	3RC21BE122J	RESISTOR, fixed: Composition; insulated; 1,200 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Mixer plate load resistor	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2123240
R141 (Old) (R147) See Change No. 51†		RESISTOR, fixed: Wirewound; 18,000 ohms ±5%; 10 watts; radial leads; 1¾″ long x 5/16″ diameter.	Plate dropping resistor, sync amplifier and limiter	I-1 Type AB	353-1743
R141 (New) (R133) See change No. 44	3RC21BE182J	RESISTOR, fixed: Composition; insulated; 1,800 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load, 5th i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2183240
R142-1 See change No. 25		RESISTOR, fixed: Composition; insulated; 680 ohms ±5%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Plate load, 2nd i-f tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-1683240
R142-2 See change No. 31†		RESISTOR, fixed: 680 ohms; same as R142-1.	Plate load, 3rd i-f tube		
R142-3 See change No. 37†		RESISTOR, fixed: 680 ohms; same as R142-1.	Plate load, 4th i-f tube		
T101	2ZK9982-4	TRANSFORMER, audio: Primary; 225 turns #36 enameled copper wire; 85-millihenry inductance at 1,000 cycles; secondary 300 turns #36 enameled copper wire, 155-millihenry inductance at 1,000 cycles; steel case 2″ x 1½″ x 2″; four terminals on top of case.	Feedback for timing-osc. and coupling between timing oscillator and sync amplifier and limiter	J-1 467-001-149	352-7088
V-101-1	2J956	TUBE, electron: Acorn type; pentode.	1st r-f amplifier	RCA, JAN-956	354-1347
V-101-2	2J956	TUBE, electron: Acorn type; pentode.	2nd r-f amplifier	RCA, JAN-956	354-1347
V-101-3	2J956	TUBE, electron: Acorn type; pentode.	Mixer	RCA, JAN-956	354-1347
V-102-1	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	1st i-f amplifier	RCA, JAN-6AC7	354-1320

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
V-102-2	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	2nd i-f amplifier	RCA, JAN-6AC7	354-1320
V-102-3	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	3rd i-f amplifier	RCA, JAN-6AC7	354-1320
V-102-4	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	4th i-f amplifier	RCA, JAN-6AC7	354-1320
V-102-5	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	5th i-f amplifier	RCA, JAN-6AC7	354-1320
V-102-6	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	1st v-f amplifier	RCA, JAN-6AC7	354-1320
V-102-7	2J6AC7	TUBE, electron: Metal; sharp cutoff pentode.	Sync amplifier and limiter	RCA, JAN-6AC7	354-1320
V-103	2J6H6GT/G	TUBE, electron: Twin diode.	Detector and limiter	Sylvania, JAN-6H6GT/G	354-1331
V-104	2J6V6GT	TUBE, electron: Beam power output.	2nd v-f amplifier	Sylvania, JAN-6V6GT	354-1308
V-105	2J955	TUBE, electron: Acorn type; triode.	Receiver oscillator	RCA, JAN-955	354-1348
V-106-1	2J6SL7GT	TUBE, electron: Twin triode; high-mu amp.	Timing osc. and clipper	Sylvania, JAN-6SL7GT	354-1307
V-106-3	2J6SL7GT	TUBE, electron: Twin triode; high-mu amp.	Suppression pulse amplifier and cathode-follower output	Sylvania, JAN-6SL7GT	354-1307
X-101-1	2Z8761.1	SOCKET: Electron tube; acorn; $1^{9}/_{16}$" diameter x $^{13}/_{64}$" thick; ceramic ring; inside diameter $^{27}/_{32}$"; two $^{5}/_{32}$" mounting holes; 5 beryllium copper contacts on ceramic ring for connection to tube pins.	Mounting, JAN-956 1st r-f tube	H-4 UHS900	257-6005
X-101-2		SOCKET, electron tube: Acorn; same as X-101-1.	Mounting, JAN-956 2nd r-f tube		
X-101-3		SOCKET, electron tube: Acorn; same as X-101-1.	Mounting, JAN-956 tube, mixer		
X-101-4		SOCKET, electron tube: Acorn; same as X-101-1.	Mounting, JAN-955 oscillator tube		
X-102-1	2Z8650.1	SOCKET, electron tube: Octal; bakelite; phosphor bronze, nickel-plated contacts; riveting plate for mounting; 1.312" between center lines of mounting holes.	Mounting, JAN-6AC7 1st i-f tube	C-2 #6742	257-6041

X-102-2		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6AC7, 2nd i-f tube		
X-102-3		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6AC7, 3rd i-f tube		
X-102-4		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6AC7, 4th i-f tube		
X-102-5		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6AC7, 5th i-f tube		
X-102-6		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6H6GT, detector and limiter		
X-102-7		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6AC7, 1st v-f tube		
X-102-8		SOCKET, electron tube: Octal; same as X-102-1.	Mounting for JAN-6V6-GT, 2nd v-f tube		
X-102-9		SOCKET, electron tube: Octal; same as X-102-1.	Mounting, JAN-6AC7, sync amplifier and limiter tube		
X-102-10		SOCKET, electron tube: Octal; same as X-102-1.	Mounting, JAN-6SL7, timing osc. and clipper tube		
X-102-11		SOCKET, electron tube: Octal; same as X-102-1.	Mounting, JAN-6SL7, suppressor amplifier tube		
200-299		TRANSMITTER SECTION OF RADIO RECEIVER and TRANSMITTER *RT-1A/APN-2 and *AN/APN-2Y			
B201	3HK401-2	BLOWER ASSEMBLY, 24 volts d-c: Assembly consists of motor and fan-blade rotor and housing; motor housed in metal case $2^{31}/_{32}$" long x $1\frac{7}{8}$" diameter; cylindrical fan 1" wide x 2" diameter, housed in black bakelite case; counterclockwise rotation; for *AN/APN-2.	Cooling power supply	P-1 358-5357	358-5357
	or 3HK401-1	BLOWER ASSEMBLY, 12 volts d-c: Assembly consists of motor, fan-blade rotor and housing; motor housed in metal case $2^{31}/_{32}$" long x $1\frac{7}{8}$" diameter; fan is 1" wide x 2" diameter, housed in black bakelite case; counterclockwise rotation. For *AN/APN-2Y.	Cooling power supply	P-1 358-4831	358-4831
C201-1 (C214-1)	3DKA1-104	CAPACITOR, fixed: Paper; bakelite coated; 1,000 mmf $\pm 20\%$; 500 vdcw; axial leads; $\frac{5}{8}$" long x 0.121" diameter.	Filter for blower motor	M-2 20K-1200	305-1326
C201-2 (C214-2)		CAPACITOR, fixed: 1,000 mmf; same as C201-1.	Filter for blower motor		

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
C202	3DB2.6020-4	CAPACITOR, fixed: Paper, oil-filled; 2 mf +20% —10%; 600 vdcw; hermetically sealed metal case 1 7/8" long x 1" wide x 2 7/8" deep; 2 lugs on top of case for mounting; 2 terminals on top.	Filter for JAN-5U4G output	C 3 TJU 6020	305-1155
C203-1	3DB4-43	CAPACITOR, fixed: Electrolytic; 4 mf ±10%; 600 vdcw, hermetically sealed metal case 2 1/2" long x 1 1/2" diameter; positive terminal on top of can; case grounded.	Filter for JAN-5U4G output	C-3 TLA 6040	305-1048
C203-2		CAPACITOR, fixed: 4 mf; same as C203-1.	Filter for JAN-5U4G output		
C204		CAPACITOR, fixed: Paper, oil-filled; 3 sections, each .1 mf ±20% —10%; 600 vdcw; hermetically sealed metal case 1 3/16" long x 1" wide x 3/4" high; 2 mounting brackets, one on each end of case with .187" diameter holes spaced 2 1/8" apart; 3 terminals on top of case.		C-3 DYRB-6111-8	305-1532
C204-AB		CAPACITOR, fixed: Two .1-mf sections in parallel; part of C204.	Filter for stand-by bias		
C204-C		CAPACITOR, fixed: .1 mf; part of C204.	Cathode bypass JAN-6SN7GT modulator tube		
C205		CAPACITOR, fixed: Paper; wax-impregnated; .01 mf ±10%; 400 vdcw; axial leads; 1 5/32" long x 5/8" wide x 1/4" thick.	Modulator input coupling	C-3 BP	305-1023
C206		‡CAPACITOR, variable: Consists of 2 silver-plated plates 1 15/16" diameter x .046" thick; one plate has a brass stud 21/32" long x 7/32" diameter; 15/16" of shaft threaded 8-32, class-2 fit; other plate has a shaft 1 11/16" long x .249" diameter overall; stainless steel; 10-32 thread on one end.	Transmitter frequency control	B-4 358-4540 356-2000	358-4540 356-2000
C207	3DK9050-87	CAPACITOR, fixed: 50 mmf ±10%; 3000 vdcw; bakelite case 1 3/4" long x 5/16" thick; lug on each end for connections; 0.144" hole in end for mounting purposes.	Feedback for transmitter osc. JAN-2C26	C-3 9AFLST	305-1390
C208 (Old) See change No. 64†	3DA50-42	CAPACITOR, fixed: Paper; .05 mf +20% —10%; 600 vdcw; bakelite case 1 7/16" long x 3/4" wide x 3/8" thick; wax-impregnated.	Cathode bypass for transmitter osc. JAN-2C26	M-1 345-22	305-1033
C208 (New) (C212)		CAPACITOR, fixed: Paper; wax-impregnated; .1 mf +20% —10%; 400 vdcw; axial leads; overall dimensions of body 1 7/16" long x 3/4" wide x 3/8" thick.	Cathode bypass for transmitter osc. JAN-2C26	S-14 MPMW4-.01-20	305-1513
C209-1 See change No. 62†	3DK9500-96	CAPACITOR, fixed: Paper; insulated; 500 mmf ±20%; 500 vdcw; axial leads; 0.625" long x 0.121" diameter.	Filament bypass JAN-2C26 tube	M-2 20K-1200	305-1325

C209-2 See change No. 62†		CAPACITOR, fixed: 500 mmf; same as C209-1.	Filament bypass JAN-2C26 tube		
C210		CAPACITOR, fixed: Paper; oil-filled; .1 mf +20% −10%; 3,500 vdcw; hermetically sealed metal case 3 1/8" long x 1 3/8" diameter with one terminal 15/16" high on top of case, mounting hardware supplied.	Filter for rectifier JAN-2X2 output	P-1 756-2057	756-2057
C211 (Old) See change No. 61†		CAPACITOR, fixed: Mica; 200 mmf ±10%; 600 vdcw; 51/64" long x 15/32" wide x 7/32" thick.	Coupling output JAN-2C26 to connector on panel	A-2 1468	60-10206407
C211 (New) (C213) See change No. 61†		CAPACITOR, fixed: Mica; wax-impregnated; 5 mmf ±10%; 500 vdcw; axial leads; overall dimensions 51/64" long x 15/32" wide x 7/32" thick.	Coupling output of JAN-2C26 tube to connector on panel	E-2 603M	60-00055437
C212 (C208)		CAPACITOR, fixed: Paper; .1 mf; same as C208.			
C213 (C211)		CAPACITOR, fixed: Mica; 5 mmf; same as C211.			
C214-1 (C201-1)	3DKA1-104	CAPACITOR, fixed: Paper; 1000 mmf; same as C201-1.			
C214-2 (C201-2)		CAPACITOR, fixed: Paper; 1000 mmf; same as C201-1.			
E290	6ZK8718-9	TRANSMISSION LINE ASSEMBLY—Includes L-204, L-205, C-206, C-207 and C-213.			
J201	2ZK3096-20	CONNECTOR, female: 2 contacts; aluminum alloy shell; 1 5/8" square flange; body 1 11/32" long x 1 1/4" diameter; 1 3/8"-18 thread on one end; 4 mounting holes in flange 1 1/4" apart center to center, .120" diameter.	A-C input to transmitter chassis	A-1 AN-3102-18-3S	358-2926
J202	2Z8799-207	CONNECTOR, male; 2 contacts; aluminum alloy shell; 1 3/8" square flange; body 1 11/32" long x 1" diameter; 1 1/8"-18 thread on one end; 4 mounting holes in flange 1 1/16" apart, .120" diameter.	A-C power output	A-1 AN-3102-18-3P	358-2925
J203	2Z8679.1	CONNECTOR, female: 9 contacts; aluminum alloy shell; 1 5/8" square flange; body 1 11/32" long x 1 1/4" diameter; 1 3/8"-18 thread on one end; 4 mounting holes 1 1/4" apart; .120" diameter.	Connection between transmitter and control box	A-1 AN-3102-22-17S	358-3455
J204	2Z8757.6	CONNECTOR, female: 8 "knife switch" contacts; molded bakelite; phosphor-bronze contacts polarized; dimensions 1 1/8" x 3/4" x 1/2".	Connection between transmitter and receiver chassis	J-2 S304AB	257-7109
J205	2Z8799-239	CONNECTOR female: Single contact; 1 1/16" long; mounted on 1" flange with 0.125" diameter mounting holes centered at 0.79" on corners; 0.620"-diameter socket shaft; 5/8"-24 thread on shaft.	Transmitter output	A-1 Navy type 49194	358-2430

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.
‡Supplied as an assembly (358-4534) in Base Spares.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
L201-1	3C318-6	COIL, r-f choke: 22 turns Brown and Sharpe 30-gauge enameled copper wire; 1.5-microhenry inductance at 1,000 cycles; ceramic coil form 13/16" long x 0.250" outside diameter; coil wax-impregnated.	Plate choke JAN-2C26 tube	S-6 352-1126	352-1126
L201-2		COIL, r-f choke: 1.5 microhenries; same as L201-1.	Grid choke JAN-2C26 tube		
L201-3 See change No. 63†		COIL, r-f choke: 1.5 microhenries; same as L201-1.	Cathode choke JAN-2C26 tube		
L201-4		COIL, r-f choke: 1.5 microhenries; same as L201-1.	Blower filter		
L201-5		COIL, r-f choke: 1.5 microhenries; same as L201-1.	Blower filter		
L202		COIL, filter choke: 2 chokes in one housing; each coil 0.5 henry at 380 ma; resistance 25 ohms; 300 vdcw; hermetically sealed metal case 2 5/8" long x 2 7/16" wide x 4 3/8" high; 4 mounting holes, 7/32" deep 8-32 tap; 1.875" x 1.625" apart center to center; 4 terminals on top of case.		S-26	352-7170
L202-A		COIL, filter choke: .5 henry; part of L202.	Filter for rectifier JAN-5U4 tube		
L202-B		COIL, filter choke: .5 henry; part of L202.	Filter for rectifier JAN-5U4 tube		
L203-1	3CK318-10	COIL, r-f choke: 20 turns #22 enameled wire; ceramic coil form 1" long x 5/16" outside diameter, 5/32" inside diameter; 4 0.046"-diameter holes in each end of form spaced 90° around form.	Filament choke for JAN-2C26 tube	P-1 352-1321	352-1321
L203-2		COIL, r-f choke: same as L203-1.	Filament choke for JAN-2C26 tube		
L204		R-F TUNED LINE, transmitter; plate line; drilled, threaded and tapped; overall dimensions, 4 7/16" long x 3/8" diameter.	Plate r-f tuned line		258-5228
L205		R-F TUNED LINE, transmitter: Grid line; bushing for tuning-capacitor shaft; overall dimensions 5" long x 3/8" diameter, rectangular block at top.	Grid r-f tuned line		358-4837
P201	2ZK3096-22	CONNECTOR, male: 2 contacts; aluminum alloy shell; 1 9/32" square flange; body 29/32" long x 7/8" diameter; 20 threads per inch on one end; 4 mounting holes 120" diameter, 31/32" apart center to center.	D-C input for blower motor	A-1 AN-3102-16S-4P	358-2963

R201 See change No. 59†	3ZK6647-23	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Filter for stand-by bias	A-3 GB, RC-30 I-1 BT-1, RC-31	66-3474340
R202 (Old) See change No. 58†	3Z6801-36	RESISTOR, fixed: Carbon; 1 megohm ±10%; ½ watt; insulated body $^{7}/_{16}$" long x $^{7}/_{32}$" diameter; axial leads.	1st grid return; modulator tube	S-3 MB-½ I-1 BT-½	66-5103340
R202 (New) (R210) See change No. 58†		RESISTOR, fixed: Composition; insulated; 2,200 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Grid return, 1st section JAN-6SN7GT modulator tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2223340
R203	3Z6801-36	RESISTOR, fixed: Composition; insulated; 1,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	1st section cathode bias, JAN-6SN7GT modulator tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2103340
R204	3Z6470-11	RESISTOR, fixed: Composition; insulated; 4,700 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	2nd section cathode bias, JAN-6SN7GT modulator tube	A-3 GB, RC-30 I-1 BT-1, RC-31	66-2474340
R205	3Z6150-48	RESISTOR, fixed: Composition; insulated; 1,500 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Cathode bias, JAN-2C26 transmitter tube	A-3 EB, RC-20 I-1 BT-½, RC-21	66-2153340
R206	3Z6615-23	RESISTOR, fixed: Wirewound; insulated; 15,000 ohms ±20%; 10 watts; axial leads; 1¾" long x ⅜" diameter.	1st & 2nd r-f & 1st i-f screen dropping resistor in series with gain control	I-1 AB	353-1413
R207	3ZK6622-23	RESISTOR, fixed: Composition; insulated; 22,000 ohms ±10%; 2 watts; axial leads; JAN type 41, wax-impregnated.	Filter for rectifier JAN-2X2 tube output	S-3 MB-2, RC-30 I-1 BT-2, RC-31	66-3225340
R208-1		RESISTOR, fixed: Composition; insulated; 1 megohm ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Part of h-v bleeder in JAN-2C26 plate circuit	A-3 GB, RC-30 I-1 BT-1, RC-31	66-5104350

† Chang numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
R208-2		RESISTOR, fixed: 1 megohm; same as R208-1.	Part of h-v bleeder in JAN-2C26 plate circuit		
R208-3		RESISTOR, fixed: 1 megohm; same as R208-1.	Part of h-v bleeder in JAN-2C26 plate circuit		
R208-4		RESISTOR, fixed: 1 megohm; same as R208-1.	Part of h-v bleeder in JAN-2C26 plate circuit		
R208-5		RESISTOR, fixed: 1 megohm; same as R208-1.	Part of h-v bleeder in JAN-2C26 plate circuit		
R209	3ZK6200-43	RESISTOR, fixed: Wirewound; 2,000 ohms; 20 watts; 2″ long x 9/16″ outside diameter, 3/8″ inside diameter; axial leads.	Stand-by bias resistor	I-1 DG	353-1543
R210 (R202)		RESISTOR, fixed: Composition; 2,200 ohms; same as R202.			
T201	2ZK9613.30	TRANSFORMER, power: 400 to 2400 cycles; primary 115 volts with 80-volt tap; two secondary windings; 6 milliamperes at 2500 volts; 135 milliamperes at 300 volts; steel case 3 1/16″ x 3 1/16″ x 4 7/8″; 7 terminals on top of case; 4 10-24 tapped holes in top of case provide mounting.	Supplies high and medium a-c voltage to rectifier tubes	U-5 352-7098	352-7098
J202	2ZK9613-30	TRANSFORMER, filament: 400 to 2400 cycles; primary 115 volts with 80-volt tap; 4 secondaries; 2.5 volts at 1.75 amperes, insulated for 3000 volts; 5 volts at 3 amperes, insulated for 500 volts; 6.5 volts at 1.2 amperes, insulated for 500 volts; metal case 3 1/16″ x 3 1/16″ x 4 7/8″; 11 terminals on top of case; 4th secondary, 6.5 volts at 6.5 amperes, insulated for 500 volts.	Supplies heater and filament a-c voltage for all tubes in receiver and transmitter	U-5 352-7096	352-7096
T203	2ZK9982-3	TRANSFORMER, audio: Primary 225 turns #36 enameled wire, 70 millihenries inductance at 1,000 cycles; secondary 450 turns of #36 enameled wire, 260 millihenries inductance at 1,000 cycles; metal case 2″ long x 1 1/2″ wide x 2″ deep; 4 terminals on top of case.	Coupling transformer for 1st and 2nd sections of JAN-6SN7GT modulator tube	J-1 352-7089	352-7089
V201	2J5U4G	TUBE, electron: High-vacuum, full-wave rectifier.	Low-voltage rectifier	RCA, JAN5U4G	354-1312
V-202	2J6SN7GT	TUBE, electron: Twin triode.	Pulse amplifier and modulator	Sylvania, JAN-6SN7GT	354-1321
V-203	2J2X2	TUBE, electron: High-voltage, high-vacuum, half-wave rectifier.	High-voltage rectifier	Kenrad, JAN-2X2	354-1316

V-204	2J2C26	TUBE, electron: Triode.	Transmitter oscillator	Hytron or Nat'l Union, JAN-2C26	354-1342
	or 2J2C26A	TUBE, electron: Triode.	Transmitter oscillator	Hytron or Nat'l Union, JAN-2C26A	354-1423
X201-1	2Z8650.1	SOCKET, electron tube: Octal; bakelite; phosphor-bronze, nickel-plated contacts; riveting plate for mounting; 1.312″ between center lines of mounting hole.	Mounting for JAN-5U4 rectifier tube	C-2 S742	257-6041
X-201-2		SOCKET, electron tube: Octal; same as X-201-1.	Mounting for JAN-6SN7 modulator tube		
X-201-3		SOCKET, electron tube: Octal; same as X-201-1.	Mounting for JAN-2C26 transmitter oscillator		
X-202	2Z8674.15	SOCKET, electron tube: Bakelite; 4 contacts; riveting plate; overall dimensions $1\frac{7}{16}$″ diameter x $1\frac{5}{8}$″ long.	Mounting for JAN-2X2 rectifier tube	A-1 774-18	257-6042
300-399		INDICATOR BC-929-(*)			
300-1		CONNECTOR, coaxial, female: 1 contact; $1\frac{1}{16}$″ long; mounted on 1″ square flange, with 4 mounting holes .125″ diameter, centered at .79″ on corners; $\frac{5}{8}$-24 thread on shaft.	Connection to right antenna	S-44 Navy, #49194	358-2430
300-2		CONNECTOR, coaxial: Female; same as 300-1.	Connection to left antenna		
300-3		CONNECTOR, coaxial: Female; same as 300-1.	Connection to receiver antenna		
300-4		CONNECTOR, coaxial: Female; same as 300-1.	Connection to video signal		
300-5		CONNECTOR, coaxial: Female; same as 300-1.	Connection for synchronization		
301	2CK1550-929A/A1	MOTOR-SWITCHING ASSEMBLY: 24 vdcw; 2 switches mounted on a motor-shaft assembly and in metal housing 6.848″ long x $2\frac{22}{32}$″ diameter; each switch made of 2 semicircular metal strips separated by a gap at each end, a moving arm rotating 360°, alternately making contact with each strip; 6 connectors provide contact with the 4 metal strips and 2 moving arms. Used only with *AN/APN-2.	Switches right and left antenna and video signals alternately into the circuit	E-12 451-1084	451-1084
	2CK1550-929A/AZ	MOTOR-SWITCHING ASSEMBLY: 12 vdcw; two switches mounted on a motor shaft assembly and in metal housing $6\frac{7}{8}$″ x $2\frac{11}{16}$″ diameter. Used only in *AN/APN-2Y.	Switches right and left antenna and video signals alternately into the circuit	E-12 451-1139	451-1139
301-A		MOTOR-SWITCHING ASSEMBLY: Part of 301.	Left and right antenna switch		
301-B		MOTOR-SWITCHING ASSEMBLY: Part of 301.	Video switch		

*Any issue letter is applicable.

†Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
301-C		MOTOR-SWITCHING ASSEMBLY: Part of 301.	Switch motor		
302-1	3DA10-124	CAPACITOR, fixed: Paper; wax-impregnated; .01 mf +20 −10%; 600 vdcw; axial leads; overall dimensions 1 1/16" x 3/4" x 5/16".	Coupling capacitor, right video	M-1 342-17	305-1255
302-2		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Coupling capacitor, left video		
302-3		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Coupling JAN-6SN7GT trigger tube to grid JAN-6G6G discharge tube		
302-4		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Coupling inverter plate JAN-6SN7GT tube to horizontal plate of JAN-3BP1 tube		
302-5		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Coupling plate of JAN-6SN7GT sweep-amplifier tube to horizontal plate of JAN-3BP1 tube		
302-6 See change No. 73†		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Bypass horizontal centering control		
302-7 See change No. 71†		CAPACITOR, fixed: .01 mf +20% −10%; same as 302-1.	Couples 1st and 2nd section of JAN-6SN7 sweep amplifier and inverter		
302-8§					
303-1	3Z6801-20	RESISTOR, fixed: Composition; insulated; 1 megohm ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Load, 1st section JAN-6H6GTG, horizontal leveler	I-1 BT-½, RC-21	66-5103340
303-2		RESISTOR, fixed: 1 megohm ±10%; same as 303-1.	Load, 2nd section JAN-6H6GTG horizontal leveler		
303-3		RESISTOR, fixed: 1 megohm ±10%; same as 303-1.	Grid return, 1st section JAN-6SN7GT trigger tube		
303-4		RESISTOR, fixed: 1 megohm ±10%; same as 303-1.	Attenuator, grid of JAN-6SN7, sweep inverter		

303-5 See change No. 77†		RESISTOR, fixed: 1 megohm ±10%; same as 303-1.	Shunt resistor for intensity control		
X-304-1	2Z8650.1	SOCKET, tube: Octal; bakelite; phosphor-bronze, nickel-plated contacts; riveting plate for mounting; 1.312″ between center lines of mounting holes.	Mounting for JAN-6H6-GTG horizontal leveler tube	C-2 6742	257-6041
X-304-2		SOCKET, tube: Octal; bakelite; same as 304-1.	Mounting for JAN-6SN-7GT trigger tube		
X-304-3		SOCKET, tube: Octal; bakelite; same as 304-1.	Mounting for JAN-6G6G discharge tube		
X-304-4		SOCKET, tube: Octal; bakelite; same as 304-1.	Mounting for JAN-6SN-7GT sweep-amplifier and inverter tube		
X-304-5		SOCKET, tube: Octal; bakelite; same as 304-1.	Mounting for JAN-6X5GT rectifier tube		
X-304-6		SOCKET, tube: Octal; bakelite; same as 304-1.	Mounting for JAN-6H6GTG vertical leveler tube		
305-1 302-8	3DKA10-125	CAPACITOR, fixed: Paper; .01 mf ±10%; 400 vdcw; axial leads; overall dimensions $1\frac{5}{32}$″ x $\frac{5}{8}$″ x $\frac{1}{4}$″; molded bakelite case.	Plate bypass, 1st section JAN-6H6GTG horizontal-leveler tube	M-1 340-18	305-1023
305-2		CAPACITOR, fixed: .01 mf ±10%; same as 305-1.	Filter in switching-motor circuit		
305-3		CAPACITOR, fixed: .01 mf ±10%; same as 305-1.	Filter in switching-motor circuit		
305-4 See change No. 73†		CAPACITOR, fixed: .01 mf ±10%; same as 305-1.	Plate bypass, 2nd section, JAN-6H6GTG, horizontal-leveler tube		
305-5		CAPACITOR, fixed: .01 mf ±10%; same as 305-1.	Coupling capacitor, grid of inverter section JAN-6SN7		
306-1 See change No. 72†		RESISTOR, fixed: Composition; insulated; 330,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Horizontal-centering divider	I-1 BT-1, RC-31	66-4334350
306-2 See change No. 72†		RESISTOR, fixed: 330,000 ohms ±10%; same as 306-1.	Horizontal-centering divider		

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.
§ See 305-1.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
306-3 (353-1) See change No. 82†		RESISTOR, fixed: 330,000 ohms ±10%; same as 306-1.	Voltage divider for cathode-ray tube		
306-4 (353-2) See change No. 82†		RESISTOR, fixed: 330,000 ohms ±10%; same as 306-1.	Voltage divider for cathode-ray tube		
307-1	2ZK7262-500M.2	RESISTOR, variable: Carbon; 500,000 ohms ±20%; special "D" taper; 315° rotation; case is 1⅛" diameter x ½" deep; shaft for mounting ⅜" long, ⅜-32 thread; 3 terminals on top of case.	Vertical centering, panel control	C-1 #35	353-5079
307-2		RESISTOR, variable: 500,000 ohms ±20%; same as 307-1.	Sweep-duration control, 50-mile range		
307-3		RESISTOR, variable: 500,000 ohms ±20%; same as 307-1.	Horizontal-centering control		
307-4 See change No. 72†		RESISTOR, variable: 500,000 ohms ±20%; same as 307-1.	Horizontal-centering chassis control		
308	2ZK3096-22	CONNECTOR, male: 2 contacts; aluminum shell; 5⅝₄" long; 1⅝₂" square mounting flange with 4 mounting holes, .120" diameter, 1¼" between centers; 1⅜-18 thread.	D-C input to switch motor	A-1 AN-3102-16S-4P	358-2963
309	3ZK9845-11.1	SWITCH, toggle: DPST; 20 amp, 24 volts, nominal rating; metal housing 1⁵⁄₁₆" x ¾" x ²⁵⁄₃₂"; mounting shaft ¹¹⁄₃₂" long, threaded ¹⁵⁄₃₂-32; switch handle ²⁵⁄₃₂" long, with luminous top.	Off-on switch in switching-motor circuit	C-6 8822	452-1100
310	3Z4529	RESISTOR, fixed: Composition; insulated; 10,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Part of voltage divider, grid JAN-6SN7GT trigger tube	I-1 BT-½, RC-21 A-3 EB, RC-20	66-3103340
311	3ZK6668-17	RESISTOR, fixed: Composition; insulated; 68,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Voltage dropping, 1st plate JAN-6SN7GT trigger tube	I-1 BT-1, RC-31 A-3 GB, RC-30	66-3684340
312	3ZK6647-21	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; 2 watts; axial leads; JAN type RC-41; wax-impregnated.	Voltage dropping and part of load divider, 2nd plate JAN-6SN7GT trigger tube	S-5 S1-2, RC-41	66-3475356

313	3Z6610-60	RESISTOR, fixed: Composition; insulated; 10,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Plate load, 2nd plate, JAN-6SN7GT trigger tube	I-1 BT-1, RC-31 A-3 GB, RC-30	66-3104350
314		CAPACITOR, fixed: Mica; 1,500 mmf ±10%; 500 vdcw; axial leads; overall dimensions 59/64" wide x 3/16" thick; wax-impregnated.	Sweep-duration discharge capacitor, trigger circuit	E-2 5026	60-20155414
315-1 See change No. 68†	3ZK6700-95	RESISTOR, fixed: Composition; insulated; 100,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Screen voltage divider, JAN-6G6G, discharge tube	I-1 BT-1, RC-31 A-3 GB, RC-30	66-4104350
315-2		RESISTOR, fixed: 100,000 ohms ±10%; same as 315-1.	Screen voltage divider, JAN-6G6G, discharge tube		
315-3 See change No. 78†		RESISTOR, fixed: 100,000 ohms ±10%; same as 315-1.	Filter for JAN-2X2 rectifier output		
316-1	3Z6700-32	RESISTOR, fixed: Composition; insulated; 100,000 ohms ±10%; 2 watts; axial leads; JAN type RC-41; wax-impregnated.	Part of cathode voltage-divider, 1st section JAN-6SN7GT sweep amplifier	S-5 S1-2, RC-41	66-4105356
316-2		RESISTOR, fixed: 100,000 ohms ±10%; same as 316-1.	Voltage dropping, plate JAN-6SN7GT sweep-amplifier		
316-3		RESISTOR, fixed: 100,000 ohms ±10%; sam as 316-1.	Voltage dropping, plate JAN-6SN7GT sweep-inverter tube		
316-4 See change No. 68†		RESISTOR, fixed: 100,000 ohms ±10%; same as 316-1.	Voltage divider, screen grid JAN-6G6G discharge tube		
317	3D9010-23	CAPACITOR, fixed: Mica; 10 mmf ±10%; 500 vdcw; axial leads; overall dimensions, 51/64" long x 15/32" wide x 7/32" thick; wax-impregnated.	Frequency compensation, grid JAN-6SN7 sweep inverter	E-2 503-M	60-00105417
318-1	3Z6804A7-4	RESISTOR, fixed: Composition; insulated; 4.7 megohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Grid return, JAN-6SN7GT sweep-inverter tube	I-1 BT-½, RC-21 A-3 EB, RC-20	66-5473340
318-2		RESISTOR, fixed: 4.7 megohms ±10%; same as 318-1.	Grid return, JAN-6G6G discharge tube		
318-3		RESISTOR, fixed: 4.7 megohms ±10%; same as 318-1.	Diode load, 2nd section JAN-6H6GTG vertical-leveler tube		

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
318-4		RESISTOR, fixed: 4.7 megohms ±10%; same as 318-1.	Diode load, 1st section JAN-6H6GTG vertical-leveler tube		
319	3Z6682	RESISTOR, fixed: Composition; insulated; 82,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Part of grid-attenuator network JAN-6SN7GT sweep inverter	I-1 BT-½, RC-21 A-3 EB, RC-20	66-3823340
320	3Z9903-10	SWITCH, rotary: 2 sections; 3 positions; bakelite insulation; contact clips and rotor blades on one wafer; mounting shaft ⅜" long, threaded ⅜"-32; metal rod on rotor for operation; oval-shaper wafer, 1⅞" long x 1½" wide; overall switch length 1½".	Range switch	O-1 452-1099	452-1099
320-A		SWITCH, rotary: Part of Ref. 320.	Switching duration controls		
320-B		SWITCH, rotary: Part of Ref. 320.	Switching amplitude controls		
321	3ZK6568-18	RESISTOR, fixed: Composition; insulated; 6,800 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Cathode bias, both sections, JAN-6SN7GT trigger tube	I-1 BT-1, RC-31 A-3 GB, RC-30	66-2684356
322-1	3ZK7262.3	RESISTOR, variable: Carbon; special "D" taper; 1 megohm ±20%; 315° rotation; cover is 1⅛" diameter x ½" deep; shaft for mounting ⅜" long, ⅜-32 thread; 3 terminals.	Sweep-duration control, 100-mile range	C-1 #35	353-5077
322-2		RESISTOR, variable: 1 megohm ±20%; same as 322-1.	Sweep-amplitude control, 100-mile range		
322-3		RESISTOR, variable: 1 megohm ±20%; same as 322-1.	Sweep-amplitude control, 50-mile range		
322-4		RESISTOR, variable: 1 megohm ±20%; same as 322-1.	Sweep-amplitude control, 10-mile range		
323-1	3ZK6747-1	RESISTOR, fixed: Composition; insulated; 470,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Sweep-duration resistor, 100-mile range	I-1 BT-½, RC-21 A-3 EB, RC-20	66-4473340
323-2		RESISTOR, fixed: 470,000 ohms ±10%; same as 323-1.	Sweep-amplitude resistor, 10-mile range		

324-1	3ZK6722-1	RESISTOR, fixed: Composition; insulated; 220,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Sweep-duration resistor, 50-mile range	I-1 BT-½, RC-21	66-4223340
324-2		RESISTOR, fixed: 220,000 ohms ±10%; same as 324-1.	Sweep-amplitude resistor, 100-mile range		
325	3Z6647-1	RESISTOR, fixed: Composition; insulated; 47,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Sweep-duration resistor, 10-mile range	I-1 BT-½, RC-21 A-3 EB, RC-20	66-3473340
326	2ZK7262-100M.1	RESISTOR, variable: Carbon; special "D" taper; 100,000 ohms ±20%; ½ watt; 315° rotation; cover is 1⅛" diameter x ½" deep; shaft for mounting ⅜" long, ⅜-32 thread; 3 terminals on top of metal cover.	Sweep-duration control, 10-mile range	C-1 #35	353-5078
327	3DA50-42	CAPACITOR, fixed: Paper; wax-impregnated; .05 mf +20% −10%; 600 vdcw; axial leads; molded bakelite case, 1 7/16" x ¾" x ⅜".	Sweep-amplitude, 100-mile range	M-1 345-22	305-1033
328-1 See change No. 69†	3ZK6733-12	RESISTOR, fixed: Composition; insulated; 330,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Sweep-amplitude, 50-mile range	I-1 BT-½, RC-21 A-3 EB, RC-20	66-4333340
328-2		RESISTOR, fixed: 330,000 ohms ±10%; same as 328-1.	Cathode-ray tube, 2nd anode voltage divider		
328-3		RESISTOR, fixed: 330,000 ohms ±10%; same as 328-1.	Cathode-ray tube, 2nd anode voltage divider		
329	3ZK6390-9	RESISTOR, fixed: Composition; insulated; 3,900 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Part of cathode voltage divider; JAN-6SN7GT sweep amplifier	I-1 BT-1, RC-31 A-3 GB, RC-30	66-2394340
330	2Z8799-207	CONNECTOR, male: 2 contacts; aluminum shell, 1 11/32" long; 1⅜" square flange with 4 mounting holes .120" diameter each corner. 1 1/16" between centers; threaded 1⅛-18.	A-C input to indicator	A-1 AN-3102-18-3P	358-2925
331	2ZK9613.31	TRANSFORMER, power: Primary winding, 400 to 2400 cycles, 115 volts, tapped 80 volts; 4 secondaries; #1 center tap grounded, winding connected to plates of 6X5GT tube; rectifier output 350 volts at 20 milliamperes. #2, one end of winding grounded; winding tapped at 2.5 volts for 2X2 heater; rectifier output 1500 volts at 1.0 milliamperes. #3, 6.3 volts at 2.5 amperes. #4, 6.3 volts at 0.6 ampere; 2,000 vdcw insulation; metal case 4 3/16" x 3¼" x 4 9/16"; 12 terminals on top of case; 4 mounting holes tapped 8-32, spaced 2.678" x 3.625" between centers.	Furnish power for indicator	U-5 352-7099	352-7099

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
332	3CK318-11	COIL, a-f filter choke: Wound with #31 enameled wire; core 5/8" x 5/8", #26-gauge audio "C" iron; inductance 2 henries; resistance 60 ohms at 65 madcw; operating frequency 400 to 1600 cycles; metal housing 1 15/16" x 1 15/32" x 2 1/4"; 2 terminals on top of case; 4 mounting holes tapped 6-32, spaced 1" x 1.375" apart.	Filter for JAN-6X5GT rectifier	P-1 352-7056	352-7056
333A, 333B See change Nos. 75 and 76†	3DK9002-10	CAPACITOR, fixed: 2 sections of 2 mf +20% −10% each; 600 vdcw; hermetically sealed in metal case, 1 1/2" diameter x 4 7/16" long; case grounded; two connections on top of case for connections to each section; Dykanol-impregnated.	Filter for JAN-6X5 rectifier output	C-1 TLA-6022	305-1305 or 305-1516
334	3DKA20-64	CAPACITOR, fixed: Paper; oil-filled; .02 mf ±20%; 2,500 vdcw; axial leads; hermetically sealed metal case, 1 15/16" long x 53/64" diameter overall.	Unblanking pulse coupling capacitor	S-4 P-10400	305-1397
X-335	2ZK8684-5	SOCKET, tube, female: 14 contacts; overall dimensions, 2.219" diameter x 1 3/8" high; made of Bakelite Corporation #15832 natural-color compound; 2 mounting screws.	Mounting for JAN-3BP1 cathode-ray tube	C-2 9450	257-6068
X-336	2ZK8659-8	SOCKET, tube: 4 contacts; riveting plate; overall dimensions, 1 27/64" diameter x 1 5/8" high; length of riveting plate 2 3/16"; 2 holes, 0.136" diameter for mounting purposes, 1 3/16" between centers.	Mounting for JAN-2X2 rectifier	A-1 77A-4T	257-6042
337		CAPACITOR, fixed: Paper; oil-filled; 2 x .1 mf +20% −10%; 2,500 vdcw; hermetically sealed metal case 1 3/16" x 1 1/16" x 2 1/8"; 4 mounting brackets, containing 9/32" slots for mounting; 2 terminals on top of case.		S-4 P9952	305-1517
337A		CAPACITOR, fixed: .1 mf +20% −10%; part of Ref. 337.	Filter capacitor for JAN-2X2 rectifier		
337B		CAPACITOR, fixed: .1 mf +20% −10%; part of Ref. 337.	Filter for JAN-2X2 rectifier.		
338		CAPACITOR, fixed: Paper; mica-filled; .1 mf +20% −10%; 400 vdcw; axial leads; overall dimensions of bakelite body, 1 7/16" long x 3/4" wide x 3/8" thick.	Filter capacitor, negative high-voltage divider circuit	S-14 MPMW4-.01-20	305-1513
339 See change No. 79†	2ZK7262-500M.3	RESISTOR, variable: Carbon; special "D" taper; 500,000 ohms ±10%; 1/2 watt; 315° rotation; metal housing 1 1/8" diameter x 1/2" deep; mounting shaft 1/4" long, 3/8-32 thread; 3 contacts on top of housing.	Focus control for JAN-3BP1 cathode-ray tube	C-1 #35	353-5081
340	3Z6801A5	RESISTOR, fixed: Composition; insulated; 1.5 megohms ±10%; 1/2 watt; axial leads; JAN type RC-21; wax-impregnated.	Grid return, JAN-3BP1 cathode-ray tube	I-1 BT-1/2, RC-21	66-5153340

341	3DKA10-177	CAPACITOR, fixed: Paper; wax-impregnated; .01 mf ±20%; 1000 vdcw; axial leads; overall dimensions of bakelite molded case, 1 7/16" x 3/4" x 3/8".	Bypass, anode JAN-3BP1 cathode-ray	M-1 345	305-1383
342-1 See change No. 80†	3ZK6801-63	RESISTOR, fixed: Carbon; 1 megohm ±10%; 1 watt; insulated body, 1 1/4" long x 1/4" diameter; axial leads.	High-voltage bleeder	S-3 MB-1	66-5104347
342-2 See change No. 82†		RESISTOR, fixed: 1 megohm ±10%; same as 342-1.	High-voltage bleeder		
342-3 See change No. 82†		RESISTOR, fixed: 1 megohm ±10%; same as 342-1.	High-voltage bleeder		
342-4 See change No. 82†		RESISTOR, fixed: 1 megohm ±10%; same as 342-1.	High-voltage bleeder		
343 See change No. 81†	2ZK7263.4	RESISTOR, variable: Carbon; special "D" taper; 1 megohm ±10%; 1/2 watt; 315° rotation; metal housing, 1 1/8" diameter x 1/2" deep; mounting shaft, 1/4" long threaded 3/8-32; 3 terminals on top of housing.	Intensity control for JAN-3BP1 cathode-ray tube	C-1 #35	353-5122
344	3DKA20-66	CAPACITOR, fixed: Paper; wax-impregnated; .02 mf ±20%; 600 vdcw; axial leads; dimensions of bakelite molded case, 1 7/16" x 3/4" x 3/8".	Sweep amplitude, 50-mile range	M-1 #345	305-1330
345	3DKA3-48	CAPACITOR, fixed: Paper; wax-impregnated; 3,000 mmf ±10%; 600 vdcw; axial leads; dimensions of molded bakelite case, 1 5/32" x 5/8" x 1/4".	Sweep amplitude, 10-mile range	M-1 #340	305-1329
346-1	3C318-6	COIL, r-f choke: 22 turns of B & S 30-gauge enameled copper wire; 1.5 microhenries inductance at 1,000 cycles; axial leads; ceramic coil form, 13/16" long x .250" outside diameter, .078" inside diameter; wax-impregnated.	Blocks r. f. from horizontal centering	S-6 352-1126	352-1126
346-2		COIL, r-f choke: 1.5 microhenries; same as Ref. 346-1.	Blocks r.f. from horizontal centering		
346-3		COIL, r-f choke: 1.5 microhenries; same as 346-1.	Blocks r.f. from vertical centering		
347 See change No. 75†		CAPACITOR, fixed: Paper; oil-filled; 1 mf +20% −15%; 600 vdcw; hermetically sealed metal case, 2 1/2" long x 7/8" wide x 1 1/2" high overall; 2 1/8" between mounting holes; 2 terminals, one on each side of case.	Filter, JAN-6X5GT tube	A-2 603A	305-1342

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
348 See change No. 76†		CAPACITOR, fixed: Electrolytic; 4 mf ±10%; 600 vdcw; hermetically sealed metal case, 4½" long x 1½" diameter; positive terminal on top of case; case grounded.	Filter, JAN-6X5GT tube	C-3 TLA6040	305-1048
349-1 See change No. 67†		COIL, r-f choke: 22 turns of B & S 30-gauge enameled copper wire; 1.5 microhenries inductance at 1,000 cycles; axial leads; ceramic coil form, 13/16" long x .250" diameter; wax-impregnated.	Keeps r.f. out of d-c line	S-6 352-1126	352-1126
349-2 See change No. 67†		COIL, r-f choke: Same as 349-1.	Keeps r.f. out of d-c line		
350 See change No. 72† and text reference		RESISTOR, fixed: Carbon; 150,000 ohms ±10%; 1-watt insulated body, 1¼" long x ¼" diameter; axial leads.	Part of horizontal-centering voltage divider	S-3 MB-1	66-4154347
351 See change No. 78†		RESISTOR, fixed: Composition; insulated; 22,000 ohms ±10%; ½ watt; axial leads; JAN type RC-21; wax-impregnated.	Filter for JAN-2X2 rectifier output	I-1 BT-½, RC-21 A-3 EB, RC-20	66-3223340
352-1 See change No. 77†		RESISTOR, fixed: Composition; insulated; 220,000 ohms ±10%; 1 watt; axial leads; JAN type RC-31; wax-impregnated.	Shunting resistor for intensity control	I-1 BT-1, RC-31 A-3 GB, RC-30	66-4224340
352-2 See change No. 80†		RESISTOR, fixed: 220,000 ohms ±10%; same as 352-1.	Part of negative high-voltage bleeder and divider		
390-1 (304-1)	2J6H6GTG	TUBE, electron: Twin diode.	Horizontal leveler	Sylvania, Signal Corps JAN-6H6GTG	354-1331
391-1 (304-2)	2J6SN7GT	TUBE, electron: Twin triode.	Trigger tube for vertical sweep	Sylvania Signal Corps JAN-6SN7GT	354-1321
392 (304-3)	2J6G6G	TUBE, electron: Pentode.	Discharge tube	RCA, Signal Corps JAN-6G6G	354-1351
391-2 (304-4)	2J6SN7GT	TUBE, electron: Twin triode.	Sweep amplifier and inverter	Sylvania Signal Corps JAN-6SN7GT	354-1321

393 (304-5)	2J6X5GT	TUBE, electron: High-vacuum, full-wave rectifier.	Medium voltage rectifier	RCA, Signal Corps JAN-6X5GT	354-1317
390-2 (304-6)	2J6H6GTG	TUBE, electron: Twin diode.	Vertical leveler	Sylvania, Signal Corps JAN-6H6GTG	354-1331
394 (335)	2J3BP1	TUBE, electron: Electrostatic deflection cathode-ray tube.	Signal indicator	RCA, Nat'l Union, Sylvania, Signal Corps JAN-3BP1	354-1352
395 (336)	2J2X2	TUBE, electron: High-voltage, high-vacuum, half-wave rectifier.	High-voltage rectifier	Kenrad, Signal Corps, JAN-2X2	354-1316
400-499		RADIO CONTROL BOX *C-3/APN-2			
J401	2Z5531.2	JACK, phone: Single contact, closed circuit; fits Signal Corps Plug PL-55; overall dimensions $1^{19}/_{32}$" long x $1\frac{1}{8}$" high; $\frac{3}{8}$-32 thread for mounting.	Connection for hand keying	M-12 A-2-A	358-2623
J402	2ZK3096.28	CONNECTOR, male: 9 contacts; aluminum alloy shell; mounting flange $1\frac{5}{8}$" square; $1^{11}/_{32}$" long overall x $1\frac{1}{4}$" diameter; $1\frac{3}{8}$-18" thread on one end; 4 mounting holes 0.120" diameter $1\frac{1}{4}$" apart, center to center.	For cable connection to transmitter-receiver.	A-1 AN-3102-22-17P	358-3188
R401	2ZK7262-20M.1	RESISTOR, variable: Wirewound; linear taper; 20,000 ohms ±10%; overall dimensions of metal case $1^{9}/_{16}$" diameter x $^{11}/_{16}$" deep; mounting shaft $^{29}/_{32}$" long, $\frac{3}{8}$-32 thread; 3 terminals on top of case.	Gain control	C-1 252	353-5076
S401	3Z9849.8	SWITCH, toggle: SPST; overall dimensions $2\frac{1}{16}$" long x $\frac{7}{8}$" wide x $1\frac{1}{8}$" deep; 2 mounting holes $\frac{5}{16}$" diameter, $1^{13}/_{16}$" apart, center to center; 2 contacts on bottom of case.	"HIGH-LOW" switch	C-6 8201K-3	452-1022
S402	3ZK9849.28	SWITCH, toggle: SPDT; overall dimensions $2\frac{1}{16}$" long x $\frac{3}{4}$" wide x $1\frac{1}{8}$" deep; 2 mounting holes $\frac{5}{16}$" diameter, $1^{13}/_{16}$" apart, center to center; 2 terminals on bottom of case.	"TRANS-KEY" switch	C-6 8208	452-1094
S403	3ZK9845-11.1	SWITCH, toggle: DPST; overall dimensions $1\frac{5}{16}$" long x $\frac{3}{4}$" wide x $1\frac{1}{8}$" deep; mounting shaft $^{15}/_{32}$"-32 thread, 2 hex nuts on shaft; 2 terminals on bottom of case.	"OFF-ON" switch	C-6 8822	452-1100
	2A203-1	ANTENNA *AT-1/APN-2, transmitting: Assembly consists of $12\frac{1}{4}$" rod, phenolic base, neoprene gasket, brass cover, and Plug PL-259.	Transmitter radiator		
	2A203-2	ANTENNA *AT-2/APN-2, receiving: Assembly consists of a streamlined phenolic case supporting a director and a dipole antenna, on a pedestal mounting.	Receiving antenna		

† Change numbers refer to changes listed in TABLE OF MODIFICATIONS in Section VI.
‡ Supplied in Base Spares but not in equipment.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
	2A203-2A	ANTENNA *AT-2A/APN-2, receiving: Same as Antenna *AT-2/APN-2, except modified by supporting wings.	Receiving antenna		
		BOARD, terminal: 4 lugs mounted on bakelite panel, spaced ½" apart; one lug used for mounting and grounding; panel 1 1/16" long x 3/8" wide; wax-impregnated.	For wiring purposes, receiver chassis	C-2 358-3804	358-3804
	2ZK9462-29	BOARD, terminal: 46 lugs mounted on bakelite panel in two rows of 23 each, spaced 3/8" apart; 3 cadmium-plated brackets on panel for mounting, 3 lugs grounded to brackets; panel 8¾" long x 1¾" wide x 3/32" thick; wax-impregnated.	For wiring purposes, indicator chassis	C-2 7494	358-2983
	2ZK9462-28	BOARD, terminal: 14 lugs mounted on bakelite panel in two rows of 7 each, spaced 3/8" apart; 2 end lugs on one row mounted on metal brackets which are used for mounting and grounding; panel 2 5/8" long x 1¾" wide x 3/32" thick; wax-impregnated.	For mounting purposes, indicator chassis	C-2 8923	358-3058
	2ZK9462-27	BOARD, terminal: 6 lugs mounted on bakelite panel, vertically spaced in two rows of three each; panel 2¾" long x 1½" wide; two mounting holes, one on each end of panel, 0.156" diameter; wax-impregnated.	For mounting purposes, power-transmitter chassis	C-2	358-2929
	2Z9402.3	BOARD, terminal: 2 lugs mounted on bakelite panel spaced ½" apart; one lug used for mounting and grounding; panel 7/8" long x 3/8" wide x 3/32" thick; wax-impregnated.	For mounting purposes, power-transmitter chassis	C-2 6421	358-2622
	2ZK9462-25	BOARD, terminal: 8 lugs mounted on bakelite panel spaced ½" apart; 2 lugs used for mounting and grounding; panel 3 7/8" long x 3/8" wide; wax-impregnated.	For wiring purposes, receiver chassis	C-2 6453	358-3196
	2Z9472.8	BOARD, terminal: 8 lugs mounted on bakelite panel ½" apart; 2 lugs used for mounting and grounding; panel 4" long x 3/8" wide; wax-impregnated.	For mounting purposes, receiver chassis and power-transmitter chassis	C-2 T6364	358-1794
	2ZK9462-26	BOARD, terminal: 3 lugs mounted on bakelite panel 3/8" apart; one lug used for mounting and grounding; panel 1 1/8" long x 3/8" wide; wax-impregnated.	For mounting purposes, receiver chassis	C-2 6458	358-3468
	2ZK9462-24	BOARD, terminal: 4 lugs mounted on bakelite panel 3/8" apart; one lug used for mounting and grounding; panel 1½" long x 3/8" wide; wax-impregnated.	For mounting purposes, receiver r-f unit	C-2 EXP 7553	358-2940

2ZK9462-23	BOARD, terminal: 5 lugs mounted on bakelite panel spaced 3/8" apart; center lug used for mounting and grounding; panel 1 7/8" long x 3/8" wide; wax-impregnated.	For wiring purposes: 1 on indicator, 2 on power-transmitter, and 9 on receiver chassis	C-2 1542H	358-1637
	BRUSH, electric contact: Carbon; overall dimensions 1/4" x 1/4" x 1", as manufactured by the Electric Auto-Lite Company #E.W. D-12.	Part of antenna-switch motor	E-12 E.W.D-12	451-1037
	BRUSH, electrical contact: Overall dimensions 19/32" long x 17/64" diameter.	Blower-motor brush	O-5 2054	451-1165
	CAP, electric contact brush: Consists of brass knob 9/32" diameter x 5/64" deep, with slot for replacement 1/32" wide x 1/32" deep; also in assembly is brush tube cover.	Contact brush for blower-motor assembly	P-1 358-8233	358-8233
2Z2636-1	CLAMP, cable: Die-cast aluminum; fits AN fitting size 12; 1 3/16" long; outside diameter 1 3/8", inside diameter 13/16"; adjusted by two 8-32 x 7/8" screws.	Connector on control-box cable	A-1 AN-3057-12	358-2903
2ZK2636-3	CLAMP, cable: Fits AN fitting size 8; 1 1/8" long; outside diameter 1 1/16", inside diameter 5/8"; adjusted by two 5-40 x 3/4" screws, threaded 1-20.	Connector on indicator d-c cable	A-1 AN-3057-8	358-3474
2ZK2636-2	CLAMP, cable: Fits AN fitting size 10; 1 1/8" long; outside diameter 1 3/16"; inside diameter 11/16"; adjusted by two 8-32 x 3/4" screws; threaded 1-20.	Connectors on a-c input and a-c interconnecting cables	A-1 AN-3057-10	358-2321
2ZK2708.9	CLIP, electron tube contact: Standard grid clip for grid and plate connections; 0.015" spring steel, hot-tin-dipped.	Connector for plate and grid of JAN-2C26 tube	C-2 28-3888	28-3888
2Z2712.1	CLIP, electron tube contact: Insulated grid cap, spring clip, porcelain housing; overall dimensions 1 1/8" x 5/8" x 9/16".	Used on JAN-2X2 rectifier tube	N-2 SPP-3	257-4079
2Z2702.1	CLIP, electron tube contact: #14 AS & W music wire, approximately 40° open; accommodates wire up to B & S 18 gauge.	Acorn-tube plate and grid connections	I-2 258-1490	258-1490
	CONNECTOR, female: 2 contacts; aluminum alloy shell, right angle; overall dimensions 1 15/16" long x 15/16" diameter; 1 1/8-18 thread on one end, 1-20 thread on other end.	A-C power connector	A-1 AN-3108-18-3S	358-2945
2Z7226-259	‡CONNECTOR, coaxial, male: Knurled shell.	Coaxial-cable connector	S-44 Navy #49195	358-3124
	‡CONNECTOR, female: 2 contacts; aluminum alloy shell, straight fitting; overall dimensions 1 3/8" long x 1 3/16" diameter, with 7/8-20 thread on end.	D-C supply cable connector	A-1 AN-3108-16S-4S	358-2974
	‡CONNECTOR, male: 2 contacts; aluminum shell, right angle; overall dimensions 1 15/16" long x 15/16" diameter; 1 1/8-18 thread on both ends.	A-C power connector	A-1 AN-3108-18-3P	358-2946

‡Supplied in Base Spares but not in equipment.

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set *AN/APN-2 and *AN/APN-2Y — Major Unit: Radio Receiver and Transmitter *RT-1A/APN-2 and *RT-1A/APN-2Y

Reference Symbol	*Army Stock Number Navy Type Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
		‡CONNECTOR, coaxial female contact: Overall dimensions of right-angle connector 0.509″ x 0.800″, with 0.344″ inside diameter; also in assembly is brass socket 19/32″ long x 1/4″ diameter; necessary hardware supplied.	Motor-switch connector	A-1 Signal Corps #MC-277	358-1381
		‡CONNECTOR, male: 9 contacts; aluminum shell, right angle; 2 11/32″ long x 1 19/32″ diameter, with 1 3/16-18 thread on one end.	Control-cable connector at receiver-transmitter	A-1 AN-3108-22-17P	358-3458
	2ZK3096-27	CONNECTOR, female: 9 contacts; aluminum shell, right angle; 2 11/32″ long x 1 19/32″ diameter, with 1 3/16-18 thread on one end.	Control-cable connector at control box	A-1 AN-3108-22-17S	358-3189
	3H3124-1/H8	HOLDER, motor brush: Electrical contact tube.	Holds brushes on antenna-video switching motor	E-12 EW D-16	451-1036
		IMPELLER, blower: Steel, cadmium-plated; overall dimensions 2″ diameter x 1″ deep with 9/16″ — diameter hole through center; two set screws threaded 8-32 mounted in center hole.	Circulation in blower assembly	L-9 258-8359	258-8359
		KNOB: Black bakelite; overall dimensions 1 1/8″ diameter x 5/8″ deep; 0.250″ diameter shaft; brass insert and two set screws also in assembly.	Knob for "HIGH OSC." tuning capacitor	P-1 358-8773	358-8773
		KNOB: Pointer; black bakelite; overall dimensions 1 1/8″ diameter x 5/8″ deep; two holes tapped 8-32; set screw also in assembly.	Gain-control knob	P-1 358-3523	358-3523
		KNOB, assembly: Consists of black bakelite knob 1 1/8″ diameter x 1″ deep, #18 (.169) drill hole in side for brass insert; mounting hardware also contained in assembly.	Transmitter tuning knob	P-1 756-2217	756-2217
	2ZK5844-3	KNOB: Black bakelite; 1″ diameter x 23/32″ long; grooved edge; 8-32 x 5/16″ set screw inside of knob; recess in back of knob 25/32″ diameter x 3/16″ deep; second recess in 5/8″ diameter x 3/32″ deep; third recess in 3/8″ diameter x 5/16″ deep; brass insert in third recess has inside diameter of 1/4″.	Focus and intensity control knob	P-1 358-3520	358-3520
	2ZK5844-2	KNOB: Black bakelite; 1″ diameter x 23/32″ long; grooved edge; 8-32 x 5/16″ set screw inside of knob; white arrow on front of knob; recess in back of knob 25/32″ diameter x 3/16″ deep; a second recess 5/8″ diameter x 3/32″ deep; third recess 3/8″ diameter x 5/16″ deep, brass insert in third recess has inside diameter of 1/4″.	Range-switch knob	P-1 358-3519	358-3519
	6ZK8718-9	LINE ASSEMBLY, r-f transmission: This is an assembly for spare parts, composed of items L204, L205, C206, and C207, with necessary hardware.	Transmitter tuning	P-1 358-4534	358-4534

	SCALE, nautical-mile: indicator; .020″ thick; green transparent vinylite; $3\frac{11}{32}$″ diameter; 4 mounting holes .156″ diameter; scales calibrated in nautical miles; right scale for 10- and 100-mile range; left scale for 50-mile range.	Range scale for indicator cathode-ray tube	C-24 H4896	257-8147
	SCALE, statute-mile: indicator; .020″ thick; green transparent vinylite; $3\frac{11}{32}$″ diameter; 4 mounting holes .156″ diameter; division lines same as nautical scale, but in addition has two horizontal dash lines at calibration points; right scale for 10- and 100-mile range; left scale for 50-mile range.	Range scale for indicator cathode-ray tube	C-24 H4896	257-8559
	SCREW: Standard 6-32 slotted round-head machine screw, ¼″ long.	Mounting purposes	P-4 2W10611FE26	2W10611FA43
	SCREW: Steel 10-32 special machine screw; ½″ long; black oxidized finish.	Rec.-trans. chassis mounting screws	P-4 258-6295FA4	258-6295FA4
	SCREW: Steel, 10-32 special machine screw ½″ long; cadmium finish.	Rec.-trans. cover mounting screws	P-4 258-6295FA22	258-6295FA22
	‡SHIELD, electron tube: Metal shield made of two sections spot-welded together; one section $5\frac{9}{16}$″ long x $2\frac{11}{32}$″ diameter 0.031 Armco Iron; other section is truncated cone $3\frac{15}{32}$″ on large end, $2\frac{23}{64}$″ on small end, $3\frac{9}{16}$″ long; two L-shaped mounting brackets 3¼″ long x 1″ wide, with ½″ band on one end of mounting foot, all spot-welded, on opposite sides of shield; 3 angle mounting brackets, all spot-welded, on large end of shield for mounting to front panel of indicator.	Shield for JAN-3BP1 cathode-ray tube	E-14 358-2971	358-2971
	SPRING, retainer: Zinc-finished piano wire spring .031″ diameter close wound $1\frac{1}{16}$″ long; also contains a steel tension spring 1⅛″ long with ¼″ dip in center; necessary hardware supplied.	Brush retainer for blower motor	U-1 153024	358-8979
	TOOL, alignment: Assembly consists of bakelite tubing, 4¾″ long x .500″ outside diameter x .370″ inside diameter, through which goes a bakelite rod 6¼″ long x .343″ outside diameter with beveled end; .031″ wide cutout ½″ deep; brass cadmium-plated top, ½″ diameter x ½″ deep, diamond knurled.	Tune transmitter assembly	K-7 358-7370	358-7370
	TUNING UNIT, receiver r-f: This is a complete unit as supplied in Base Spares.	Receiver r-f stages	P-1 756-1831	756-1831
2ZK11117-2	VISOR, leather: Cone-shaped; overall dimensions 7¾″ long x 4″ outside diameter, $3\frac{23}{32}$″ inside diameter; sponge-rubber guard on one end.	Shield for indicator cathode-ray tube	B-5 358-4338	358-4338

‡Supplied in Base Spares but not in equipment.
‡Not furnished in Base Spares.

TABLE OF REPLACEABLE PARTS

Model: Radio Set AN/APN-2B — Major Assembly: Modification of AN/APN-2B

Reference Symbol	*Army Stock Number / Navy Stock Number / British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
M-27		TUBE: Electron-ray (AF Part No. 3300-234505000)	Tuning indicator		
M-28		SOCKET ASSEMBLY: Includes the following: 6 Prong tube socket and shell assembly Wire, black No. 18, stranded Wire, yellow, No. 18, stranded Wire, red, No. 18, stranded Wire, green, No. 18 stranded Resistor, fixed, 1 megohn, ±10%, ½ watt, carbon, axial leads. (AF Part No. 3300-294266000) (AF Part No. 3300-393936000)	Tuning indicator		
M-30		BRACKET: Electron-ray mounting		Tube 6E5	AC Dwgs 45A40799 45A40800 45A40825
M-31		BRACKET: "SYNC IN" and "SUP OUT" terminal			AC Dwg 45B40801
M-32	6Z4891	GROMMET, rubber: 25/32" x 1" mounting hole			
M-34-1	2Z9401.7	TERMINAL, single: Insulated			
M-34-2	2Z9401.7	TERMINAL, single: Insulated			
M-34-3	2Z9401.7	TERMINAL, single: Insulated			
M-34-4	2Z9401.7	TERMINAL, single: Insulated			
M-34-5	2Z9401 7	TERMINAL, single: Insulated			
MC-24		CAPACITOR, fixed: Mica; 1000 micromicrofarad, 5%; axial leads; 11/16" x 1/16" x 3/16" bakelite case; 500 vdcw. (AF Part No. 3300-314933030)	Cathode bypass 1st, 2nd, 3rd, 4th, 5th, i-f		
MC-106-6		CAPACITOR, fixed: Mica; 1000 mmf; same as MC-24			
MC-106-10		CAPACITOR, fixed: Mica; 1000 mmf; same as MC-24			
MC-106-14		CAPACITOR, fixed: Mica; 1000 mmf; same as MC-24			
MC-106-18		CAPACITOR, fixed: Mica; 1000 mmf; same as MC-24			

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set AN/APN-2B — Major Assembly: Modification of AN/APN-2B

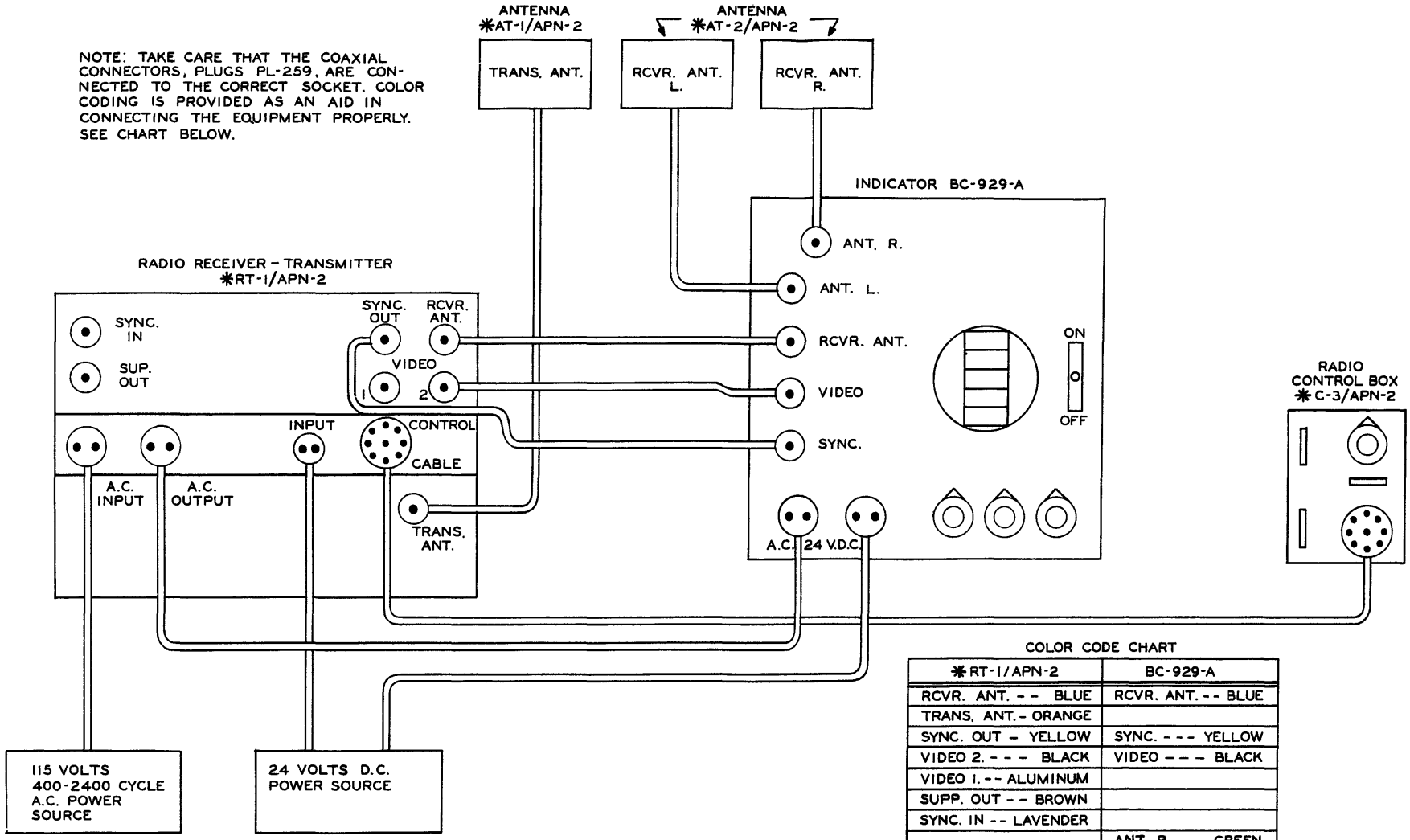
Reference Symbol	*Army Stock Number / Navy Stock Number / British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
MC-106-22		CAPACITOR, fixed: Mica; 1000 mmf; same as MC-24			
ML-26		COIL ASSEMBLY: Bakelite coil form grade 120; 1⅜" long x ⅝" OD; grooved; core is G-2 iron; ½" long x 0.37" diameter mounted on brass rod 1$\frac{7}{32}$" x 6/32" thread; 12 turns No. AWG enamel wire. (AF Part No. 3300-297063425)	Tuned circuit for tuning indicator		
MR-10		RESISTOR, fixed: 400 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-390728600) (AF Part No. 3300-381203320)	Cathode bias, 1st, 2nd, 3rd, 4th, 5th, i-f tube		
MR-11		RESISTOR, fixed: 180 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-381151600)	Cathode degeneration 1st, 2nd, 3rd, 4th, 5th, i-f tube		
MR-12		RESISTOR, fixed: 400 ohm; same as MR-10			
MR-13		RESISTOR, fixed: 180 ohm; same as MR-11			
MR-14		RESISTOR, fixed: 400 ohm; same as MR-10			
MR-15		RESISTOR, fixed: 180 ohm; same as MR-11			
MR-16		RESISTOR, fixed: 400 ohm; same as MR-10			
MR-17		RESISTOR, fixed: 180 ohm; same as MR-11			
MR-18		RESISTOR, fixed: 400 ohm; same as MR-10			
MR-19		RESISTOR, fixed: 180 ohm; same as MR-11			
MR-20		RESISTOR, fixed: 47,000 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-392984000) (AF Part No. 3300-381214480)	Decoupling 2nd detector		
MR-21		RESISTOR, fixed: 5 megohn, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-381214740)	Load, detector for tuning indicator		
MR-23		RESISTOR, fixed: 100,000 ohm, ±10%; ½ watt: carbon; insulated body; axial leads. (AF Part No. 3300-381200260)	Decoupling for tuning indicator		

TABLE OF REPLACEABLE PARTS (Continued)

Model: Radio Set AN/APN-2B — Major Assembly: Modification of AN/APN-2B

Reference Symbol	*Army Stock Number Navy Stock Number British Ref. Number*	*Name of Part and Description*	*Function*	*Mfr. and Desig. or Standard Type*	*Cont. or Govt. Dwg. or Spec. No.*
MR-35		RESITOR, fixed; 75,000 ohm, ±10%; 2 watt; carbon; insulated body; axial leads. (AF Part No. 3300-393267374)	Cathode bias divider 1st i-f		
MR-103-3		RESISTOR, fixed 2000 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-381312500)	Plate load, mixer tube		
MR-105-2		RESISTOR, fixed: 68,000 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-381165320)	Screen dropping 5th i-f		
MR-108-1		RESISTOR, fixed: 3500 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-391762350)	Plate load, 1st, 2nd, 3rd, 4th, 5th, i-f tube		
MR-108-2		RESISTOR, fixed: 3500 ohm; same as MR-108-1			
MR-108-3		RESISTOR, fixed: 3500 ohm; same as MR-108-1			
MR-108-4		RESISTOR, fixed: 3500 ohm; same as MR-108-1			
MR-113-1		RESISTOR, fixed: 68,000 ohm, ±10%; ½ watt; carbon; insulated body; axial leads. (AF Part No. 3300-381165320)	Screen dropping; 4th i-f		
MR-129		RESISTOR, fixed: 3500 ohm; same as MR-108-1			

SECTION VIII
DRAWINGS



COLOR CODE CHART

✱RT-1/APN-2	BC-929-A
RCVR. ANT. - - BLUE	RCVR. ANT. - - BLUE
TRANS. ANT. - ORANGE	
SYNC. OUT - YELLOW	SYNC. - - - YELLOW
VIDEO 2. - - - BLACK	VIDEO - - - BLACK
VIDEO 1. - - ALUMINUM	
SUPP. OUT - - BROWN	
SYNC. IN - - LAVENDER	
	ANT. R. - - GREEN
	ANT. L. - - - - RED

Figure 8-1. Radio Set ★AN/APN-2—Cording Diagram

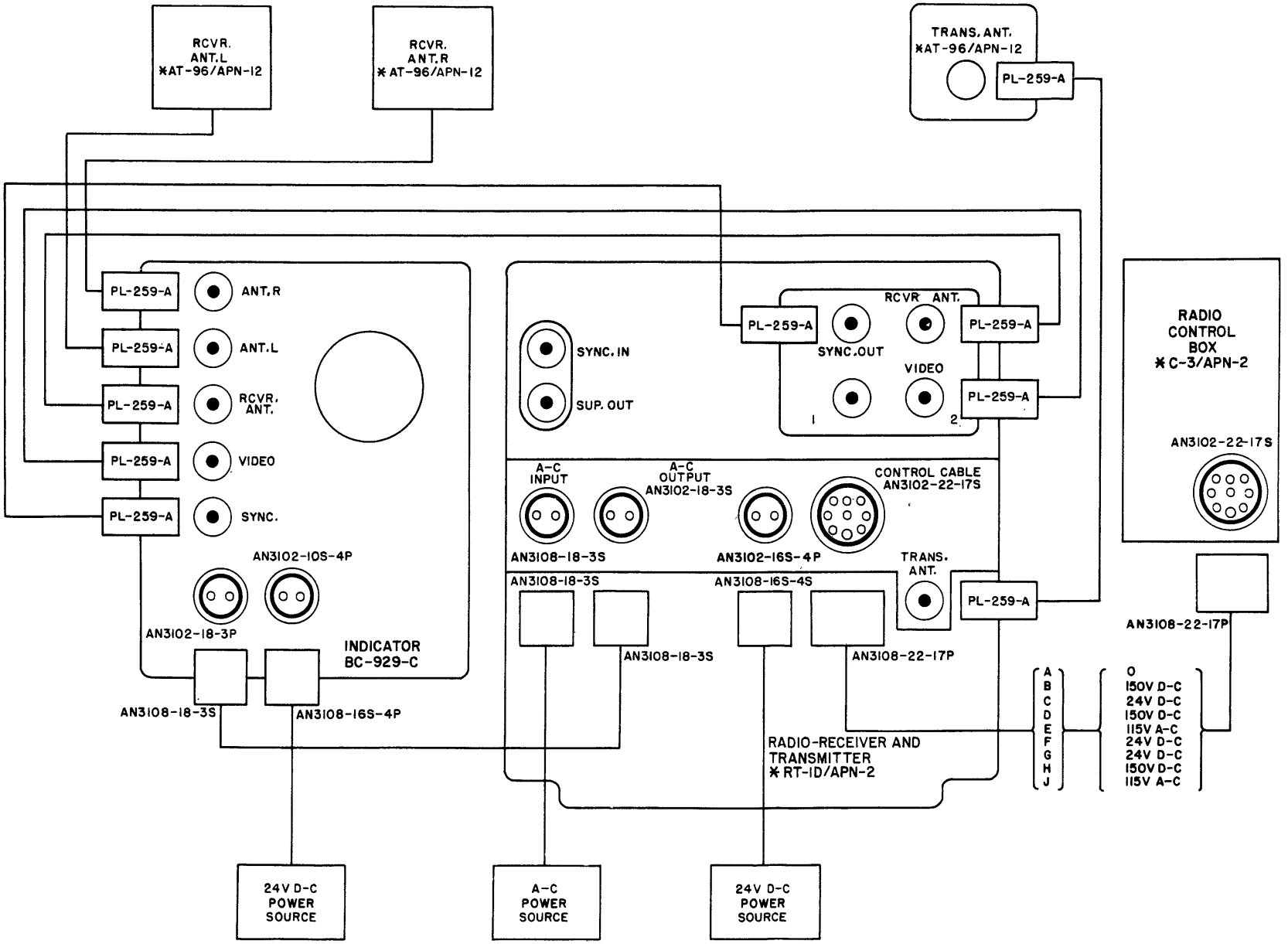


Figure 8-1A. Radio Set AN/APN-2—Cording Diagram

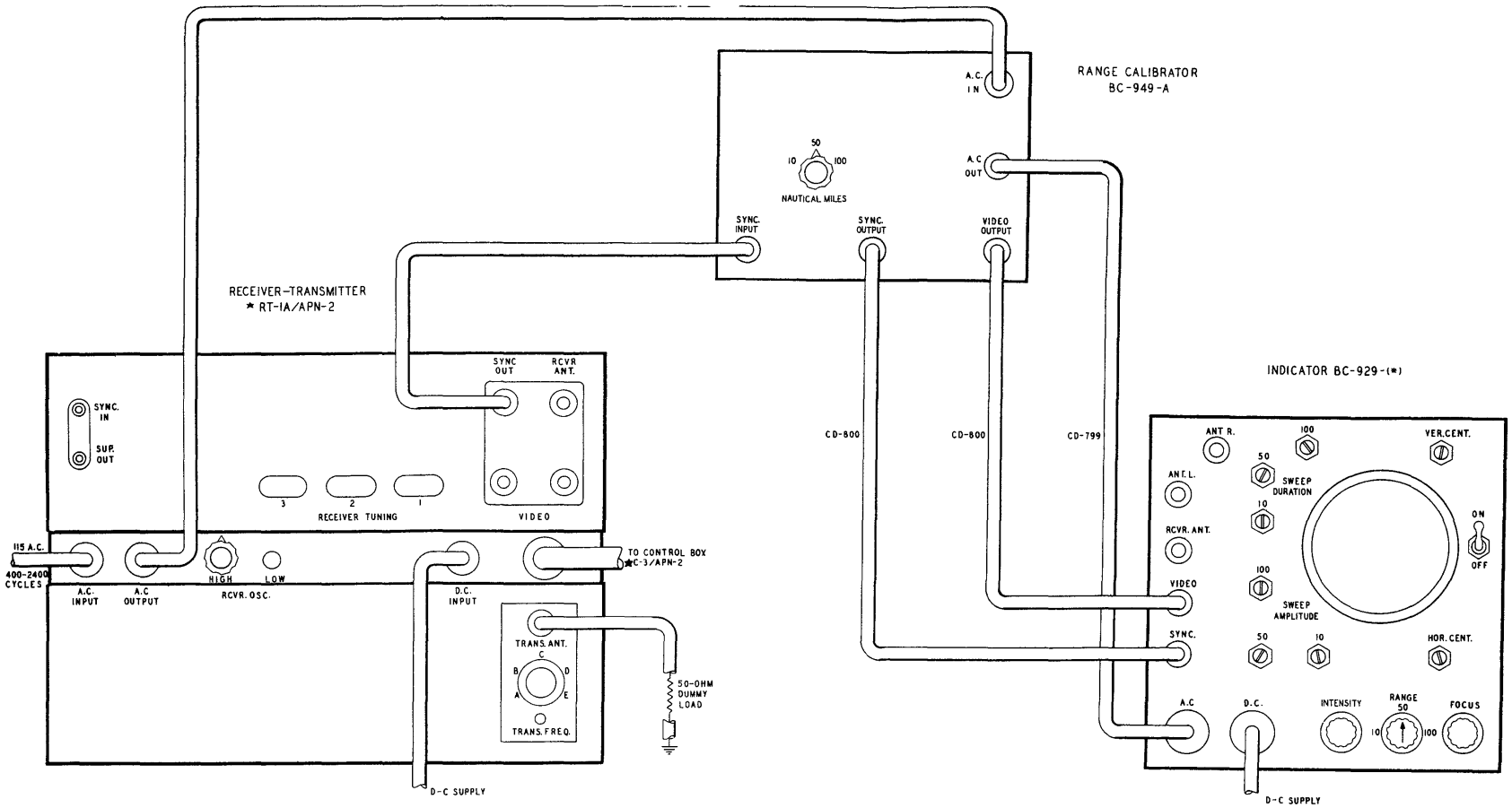


Figure 8-2. Indicator BC-929-A—Calibration, Cording Diagram

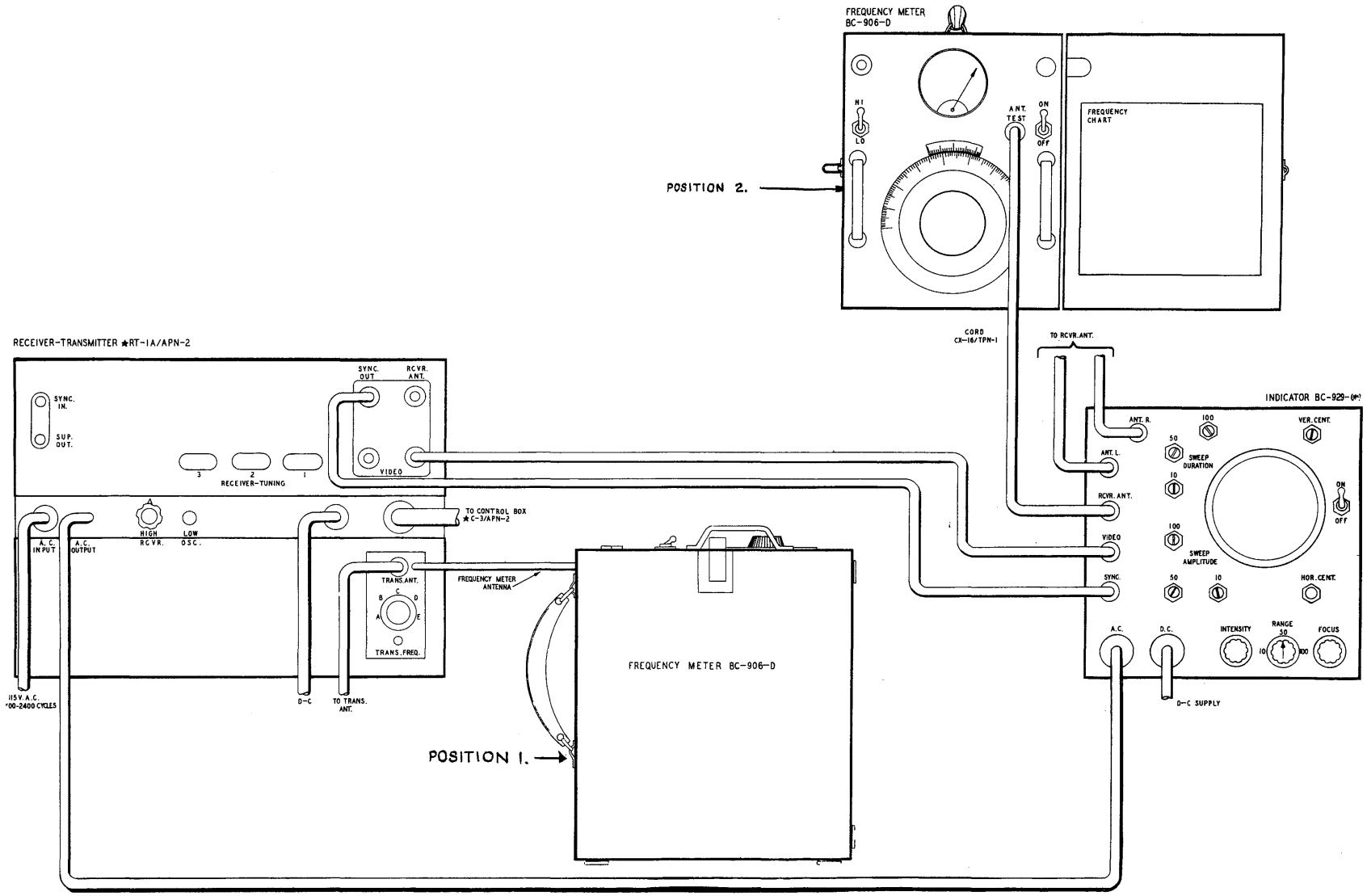


Figure 8-3. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Frequency Check, Cording Diagram (2 Methods)

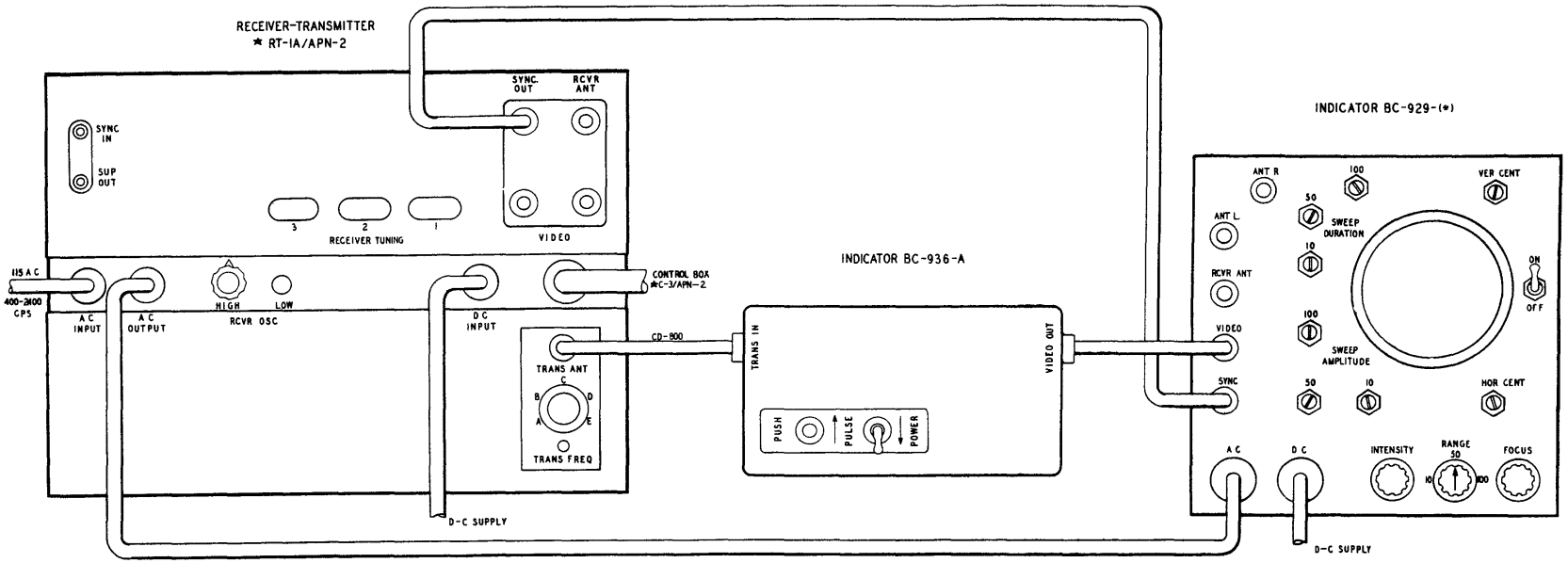


Figure 8-4. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Pulse Width and Power Check, Cording Diagram

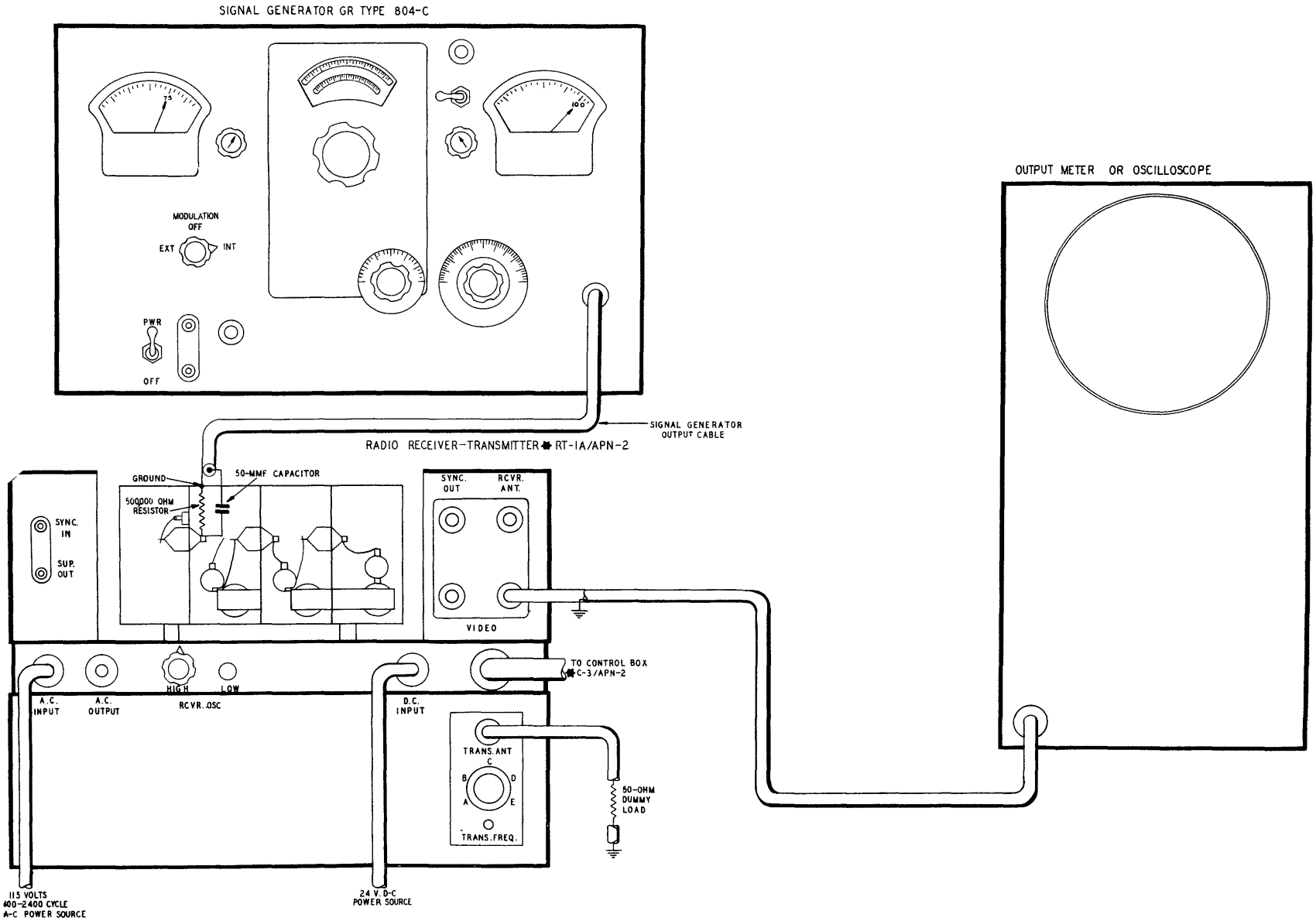


Figure 8-5. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Intermediate Frequency Alignment

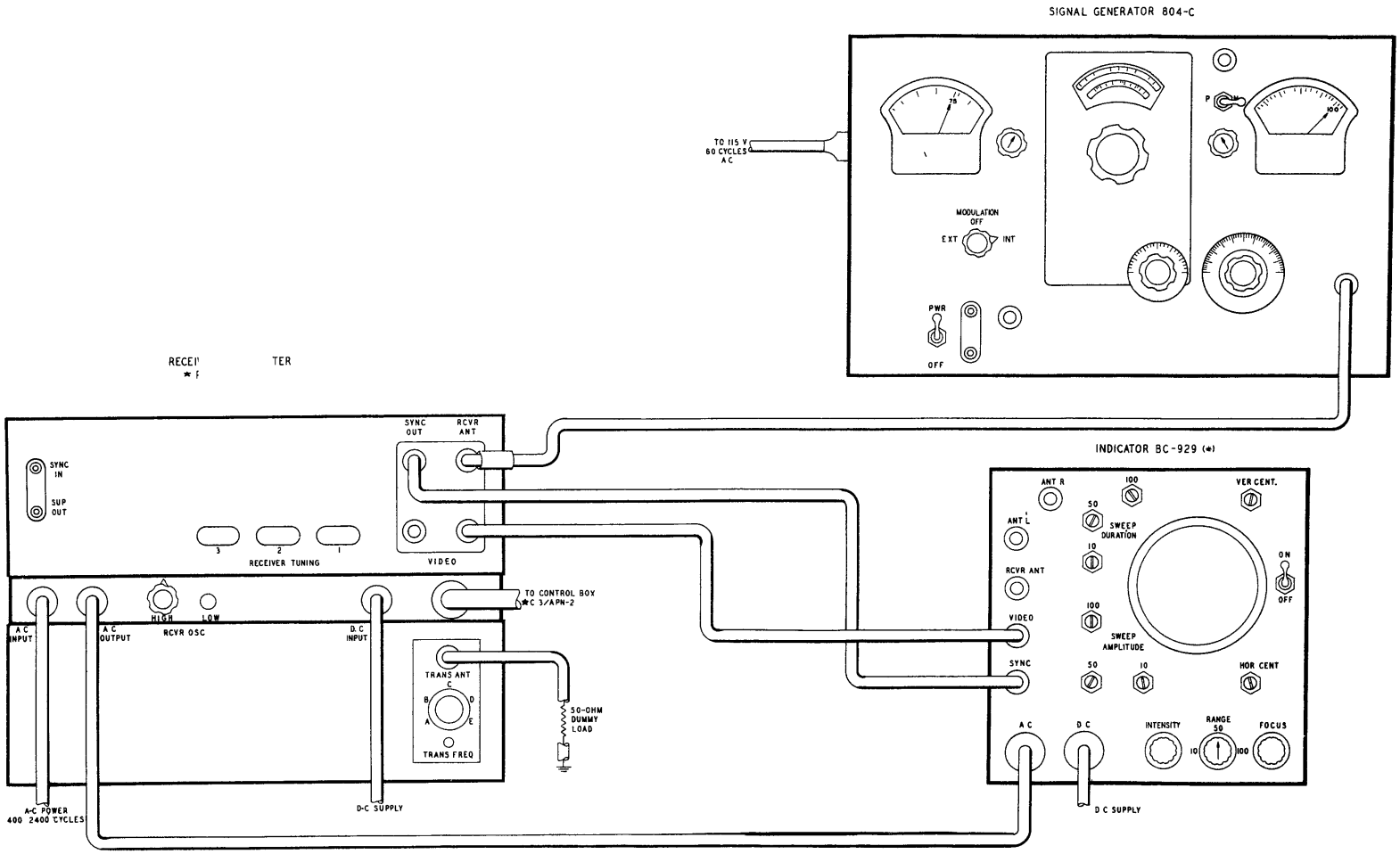


Figure 8-6. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Receiver R-F and Oscillator Alignment

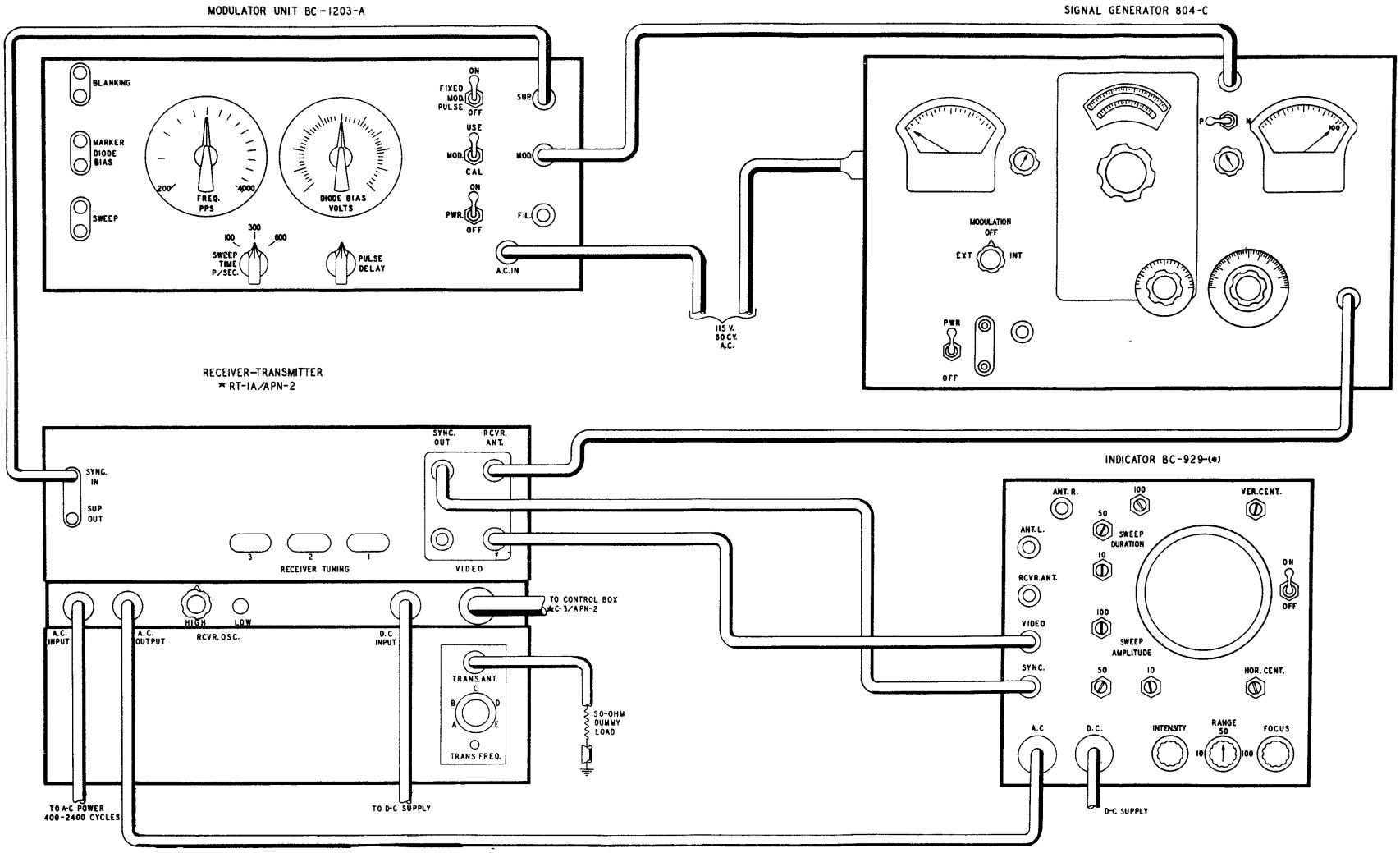


Figure 8-7. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Receiver Sensitivity Measurement Using 100 Percent Pulse Modulation

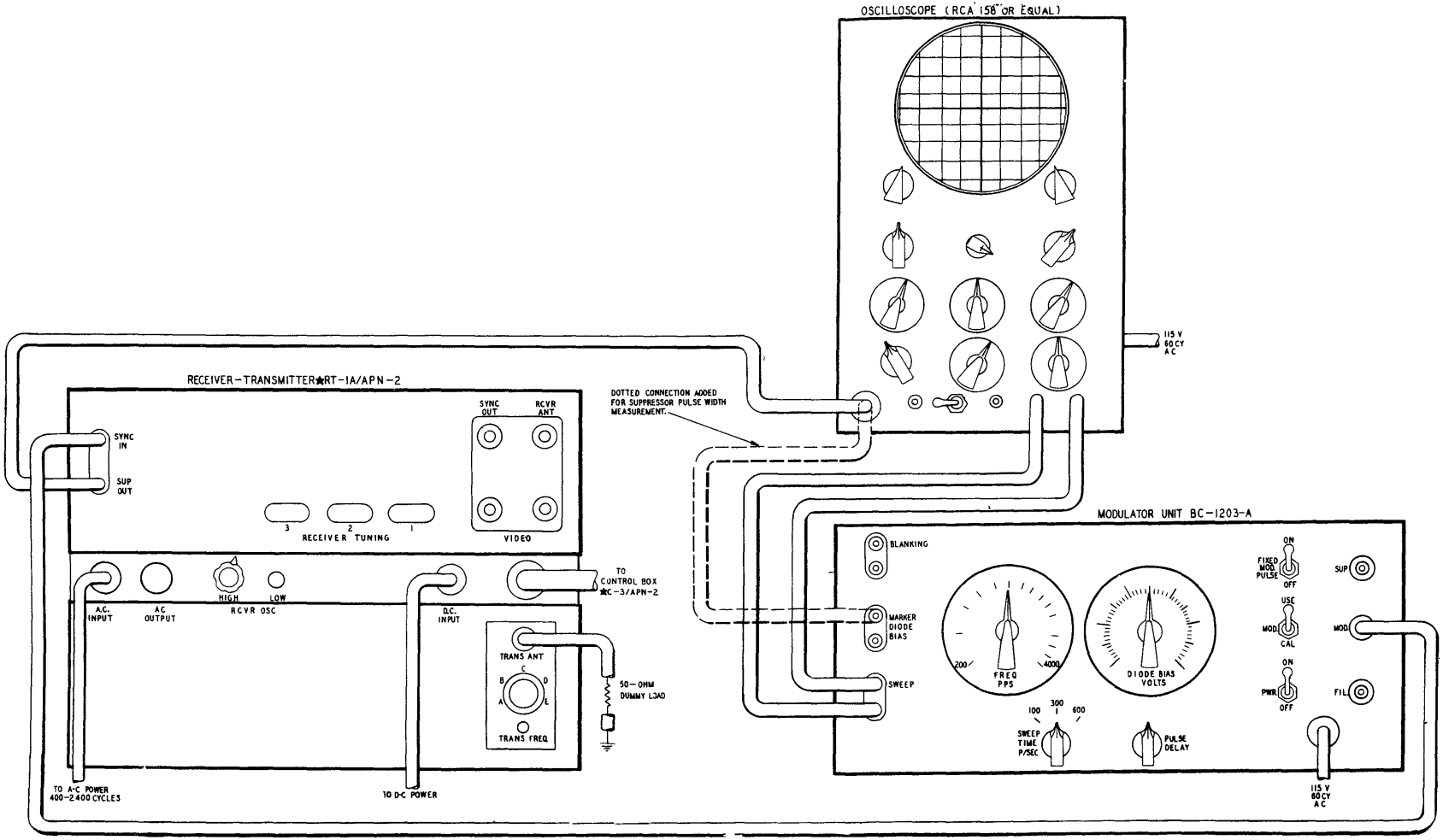


Figure 8-8. Pulse-Generating Section Test, Cording Diagram

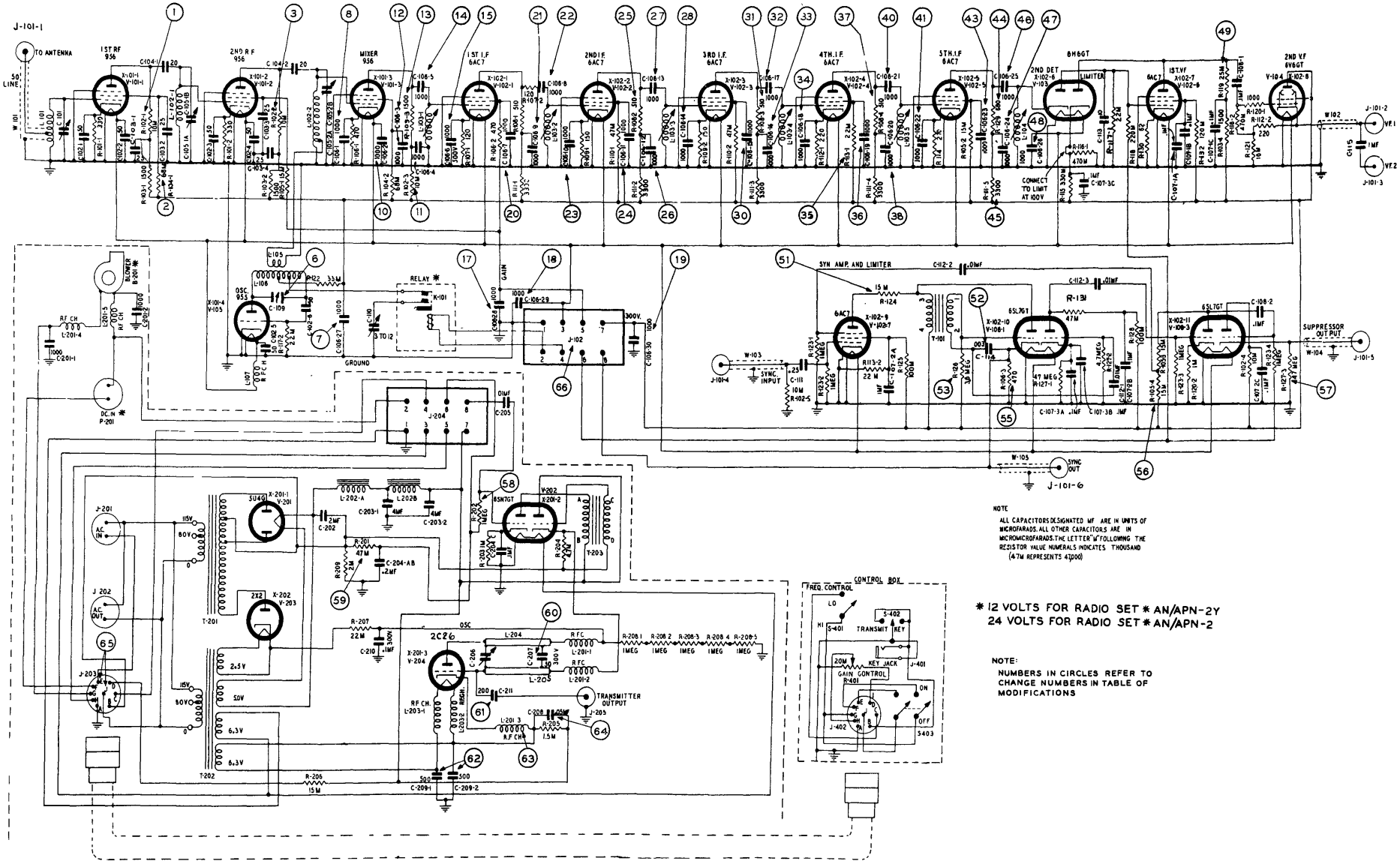


Figure 8-9. Radio Receiver and Transmitter ★RT-1/APN-2—Schematic Diagram of First Production Under Order No. 5759-WF-43

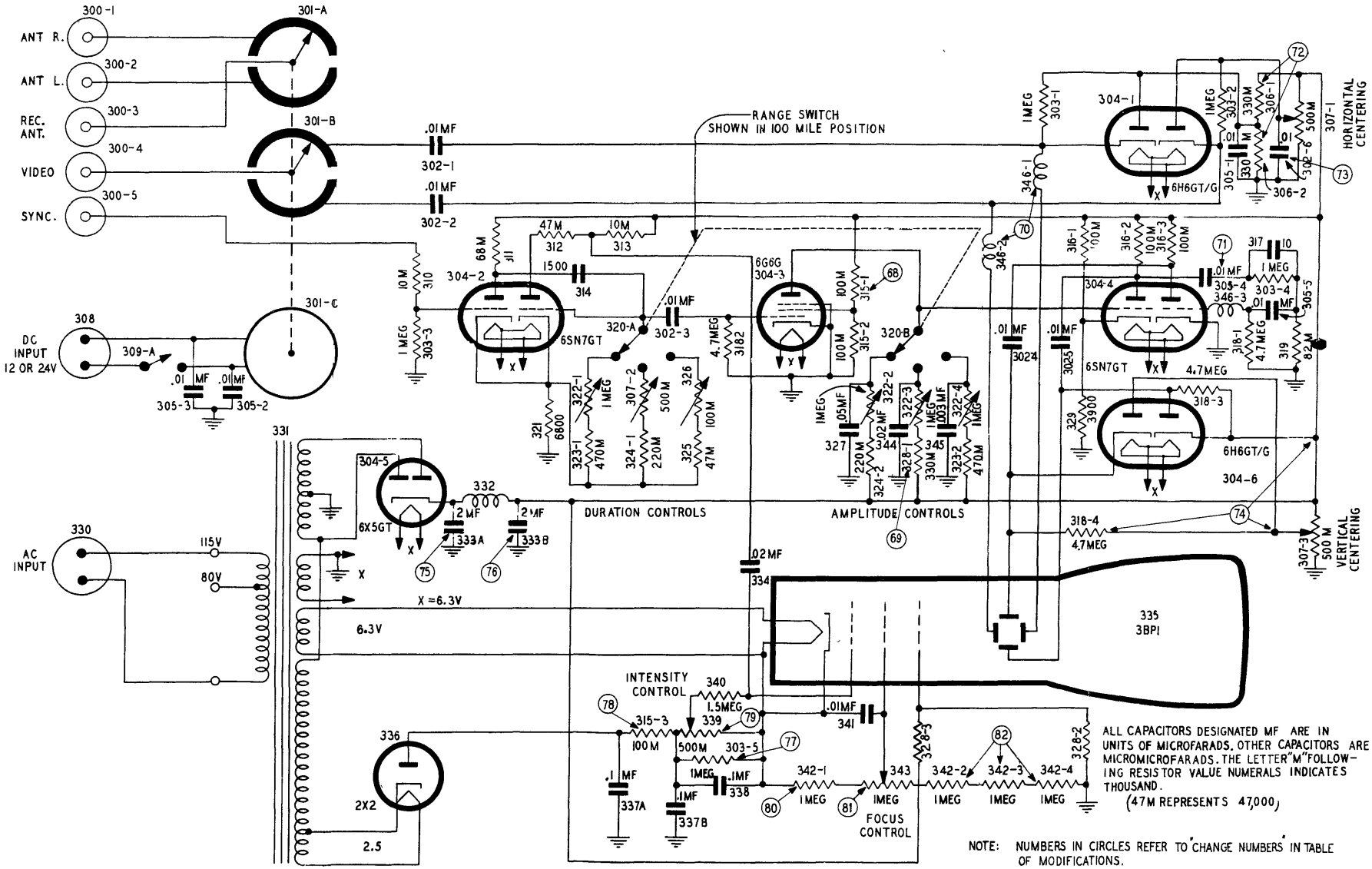
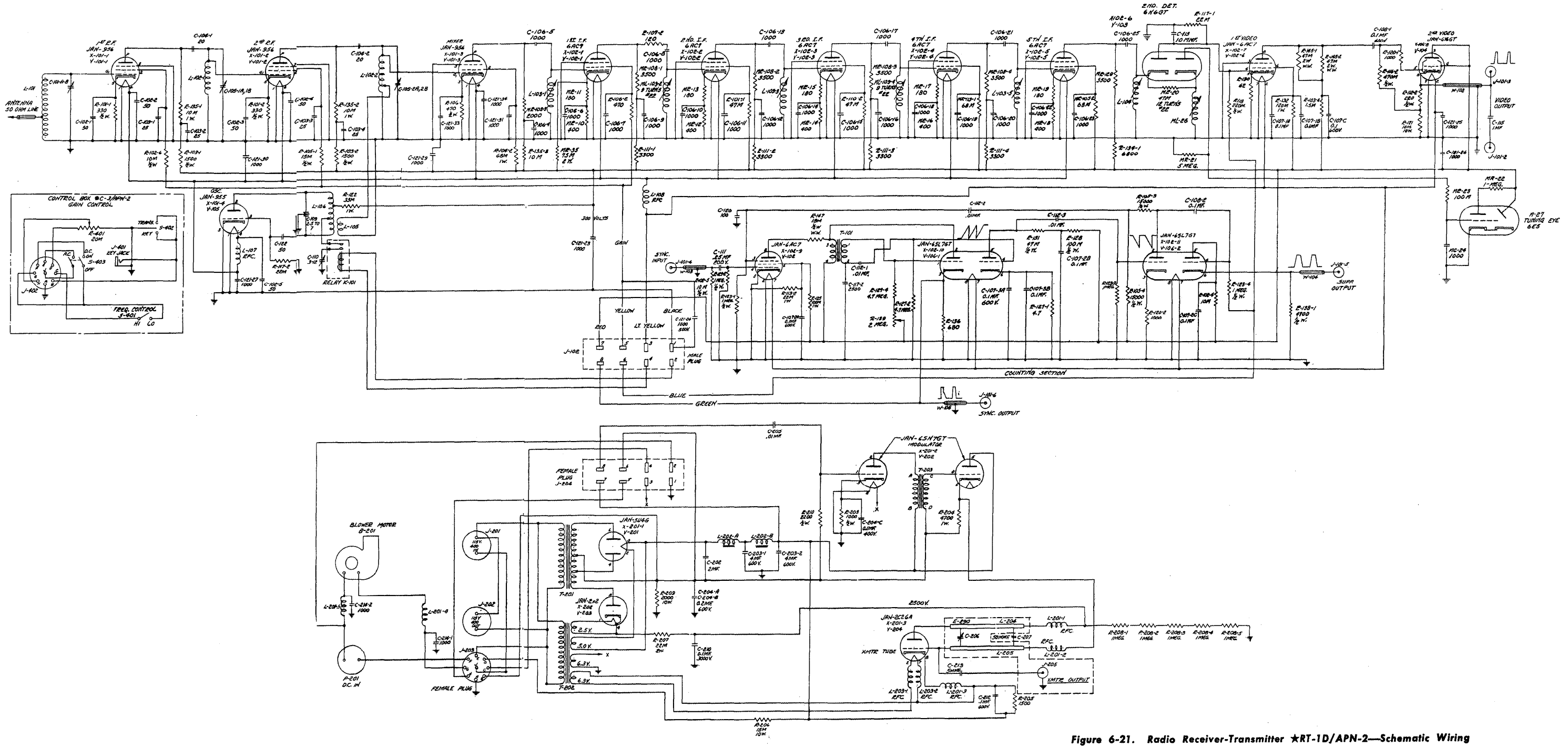


Figure 8-10. Indicator BC-929-(*)—Schematic Diagram of First Production Under Order No. 5759-WF-43

AN 16-30APN2-3



·M-DENOTES 1000

Figure 6-21. Radio Receiver-Transmitter ★RT-1D/APN-2—Schematic Wiring Diagram

Revised 17 July 1951

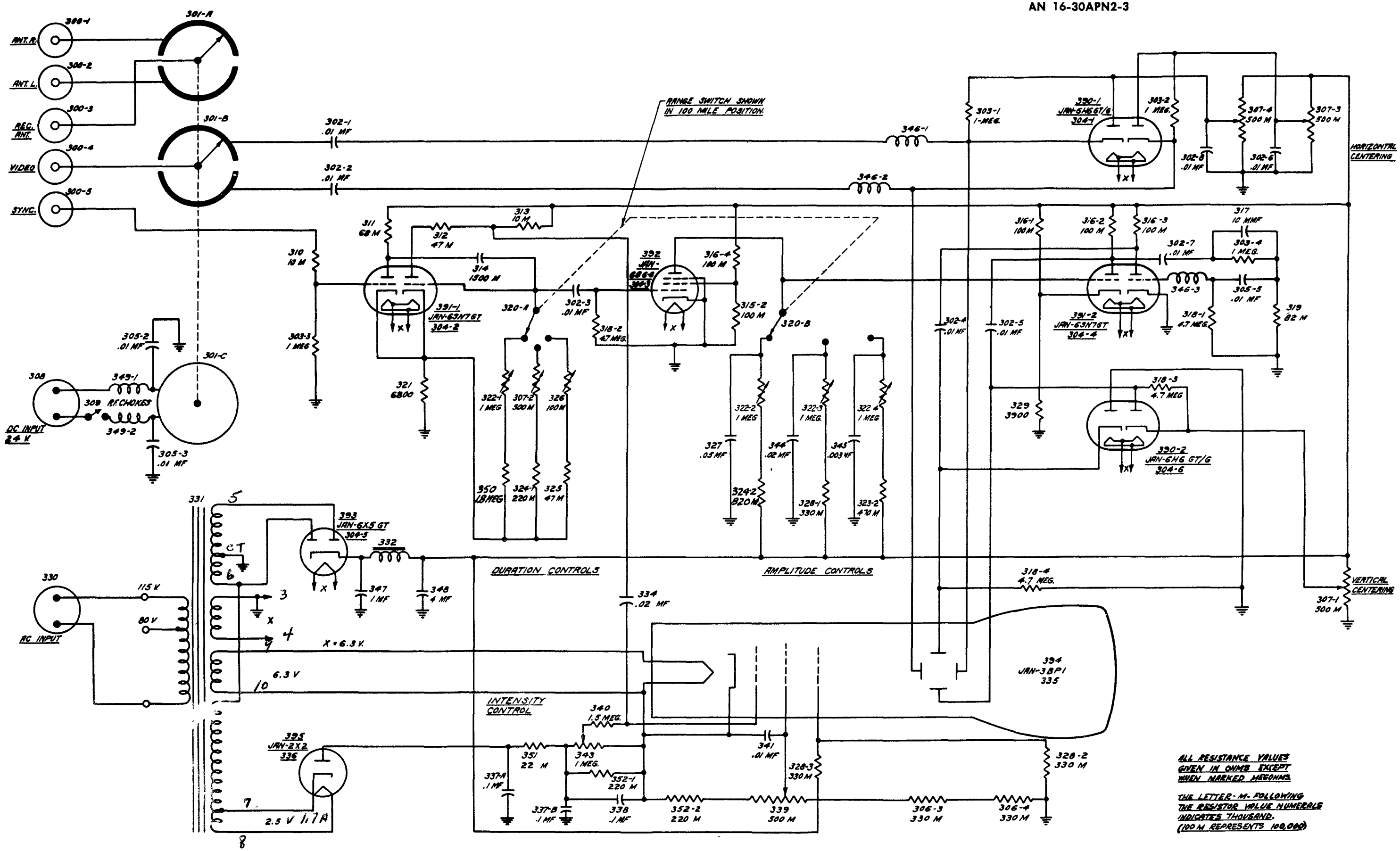


Figure 6-24. Indicator BC-929-C—Schematic Wiring Diagram

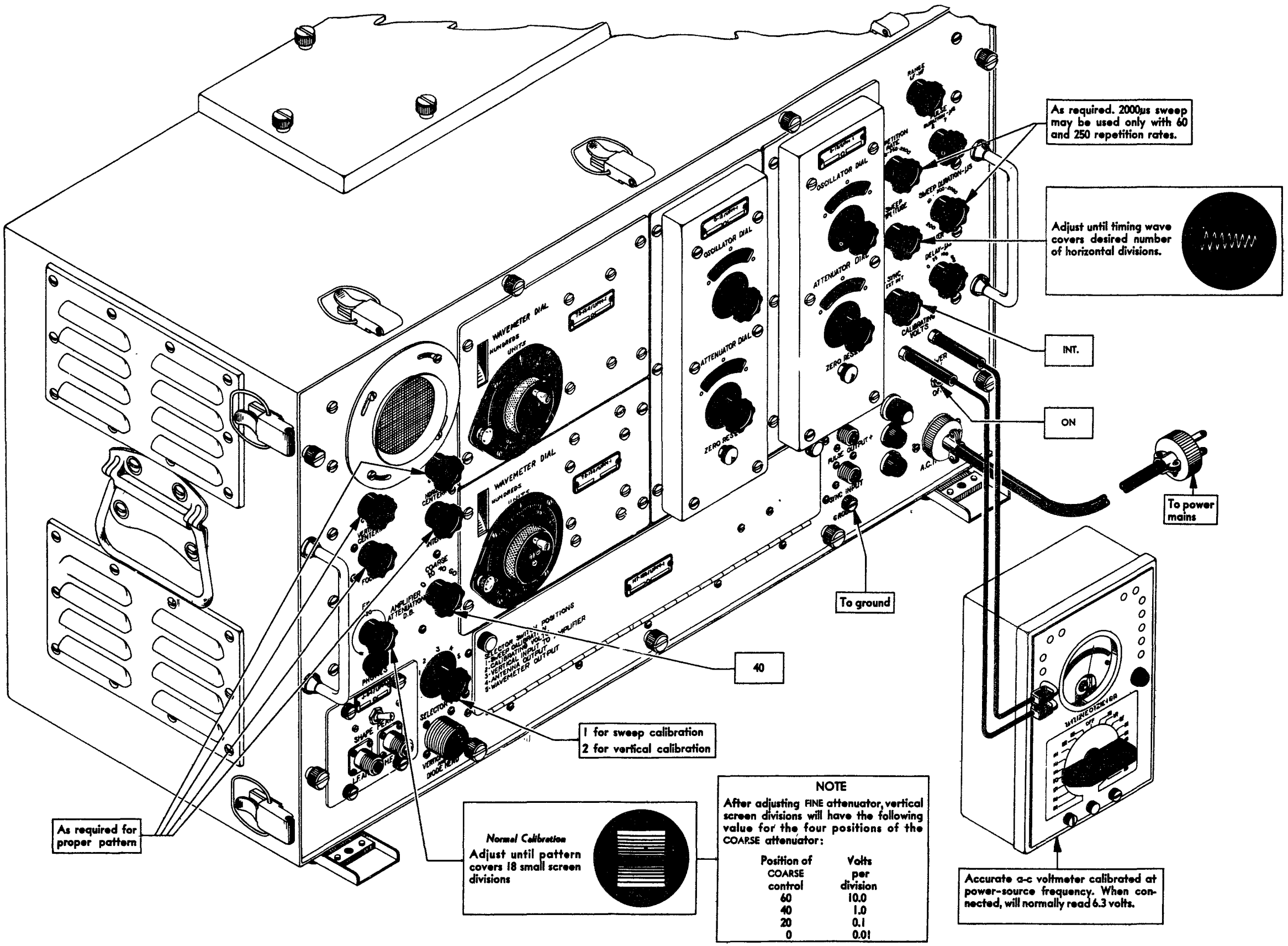


Figure 6-25. Operation Chart—Calibrating Oscilloscope Vertical Input and Sweep (Normal Se

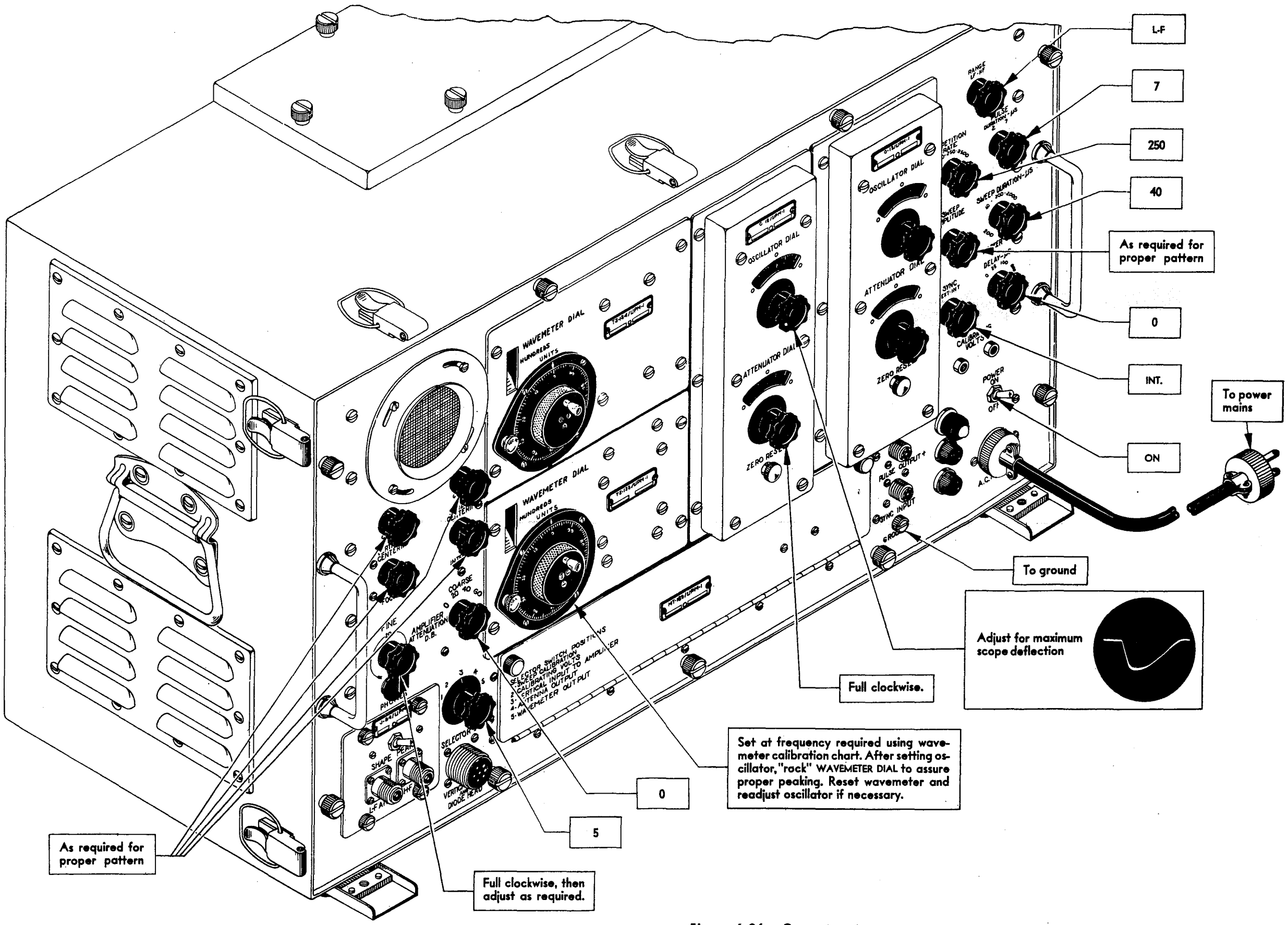


Figure 6-26. Operation Chart—Setting Oscillator O-12/UPM-1 at Spot Frequency

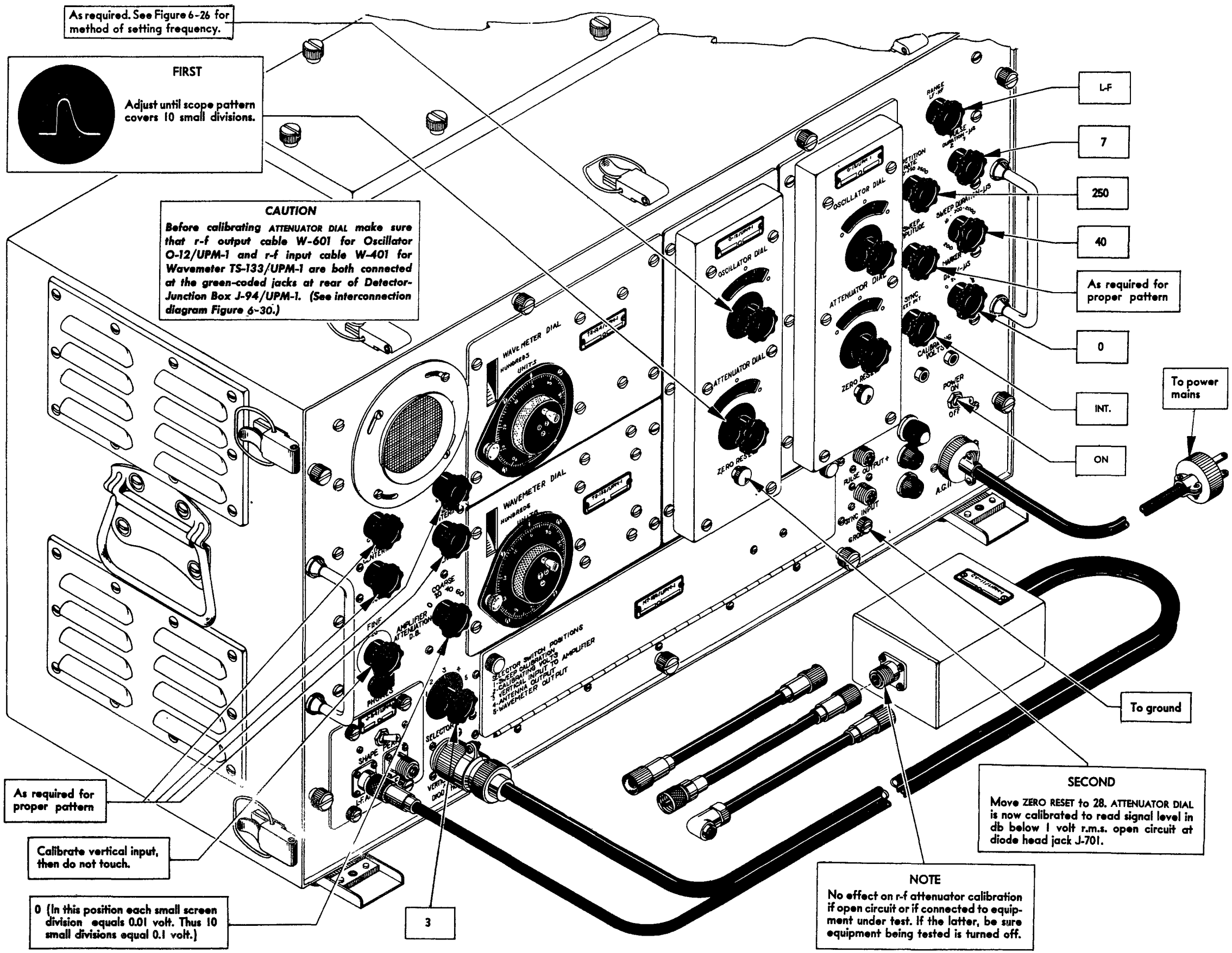


Figure 6-27. Operation Chart—Calibrating R-F Attenuator of Oscillator O-12/UPM-1

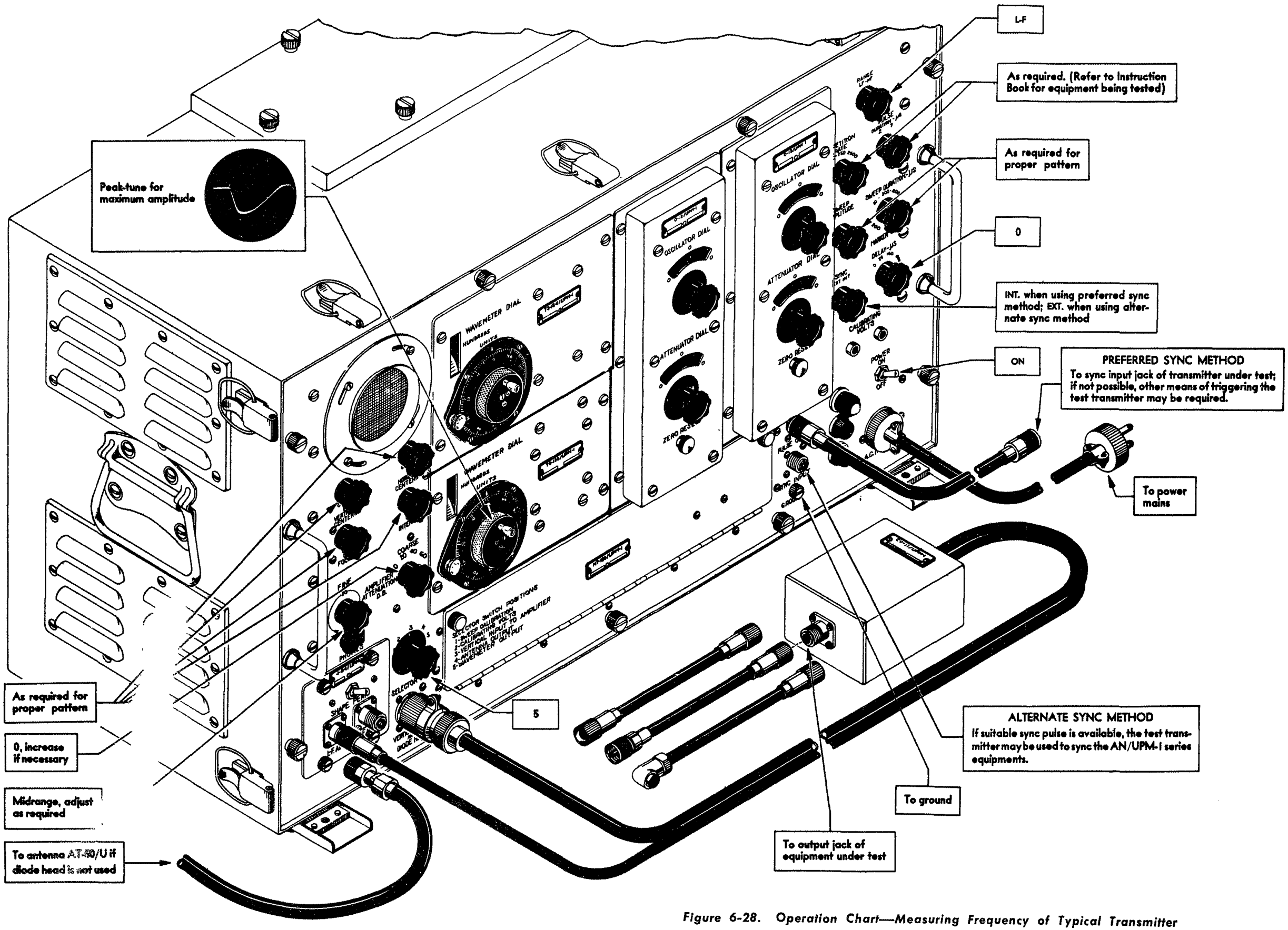


Figure 6-28. Operation Chart—Measuring Frequency of Typical Transmitter ("A" Band)

AN 16-30APN2-3

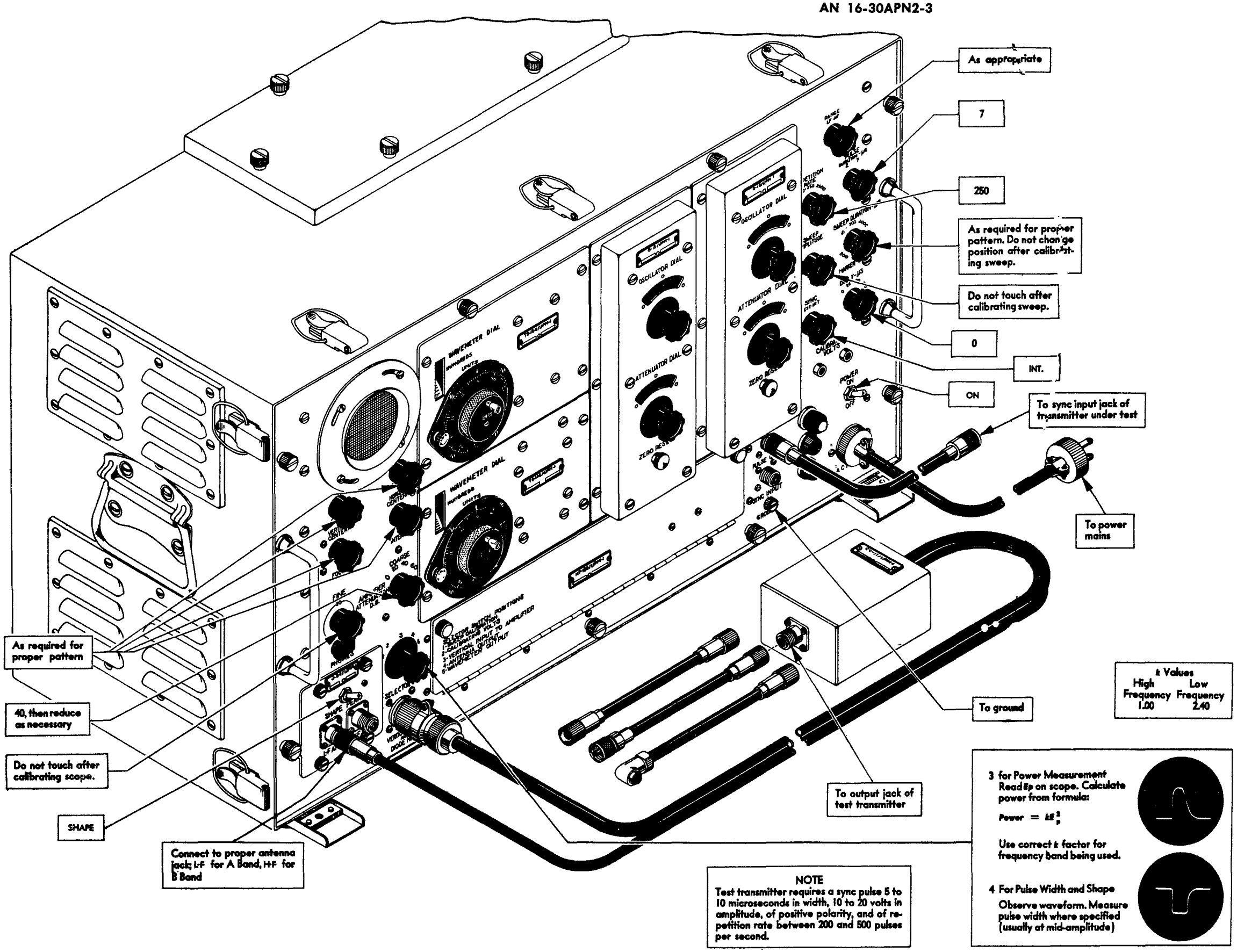
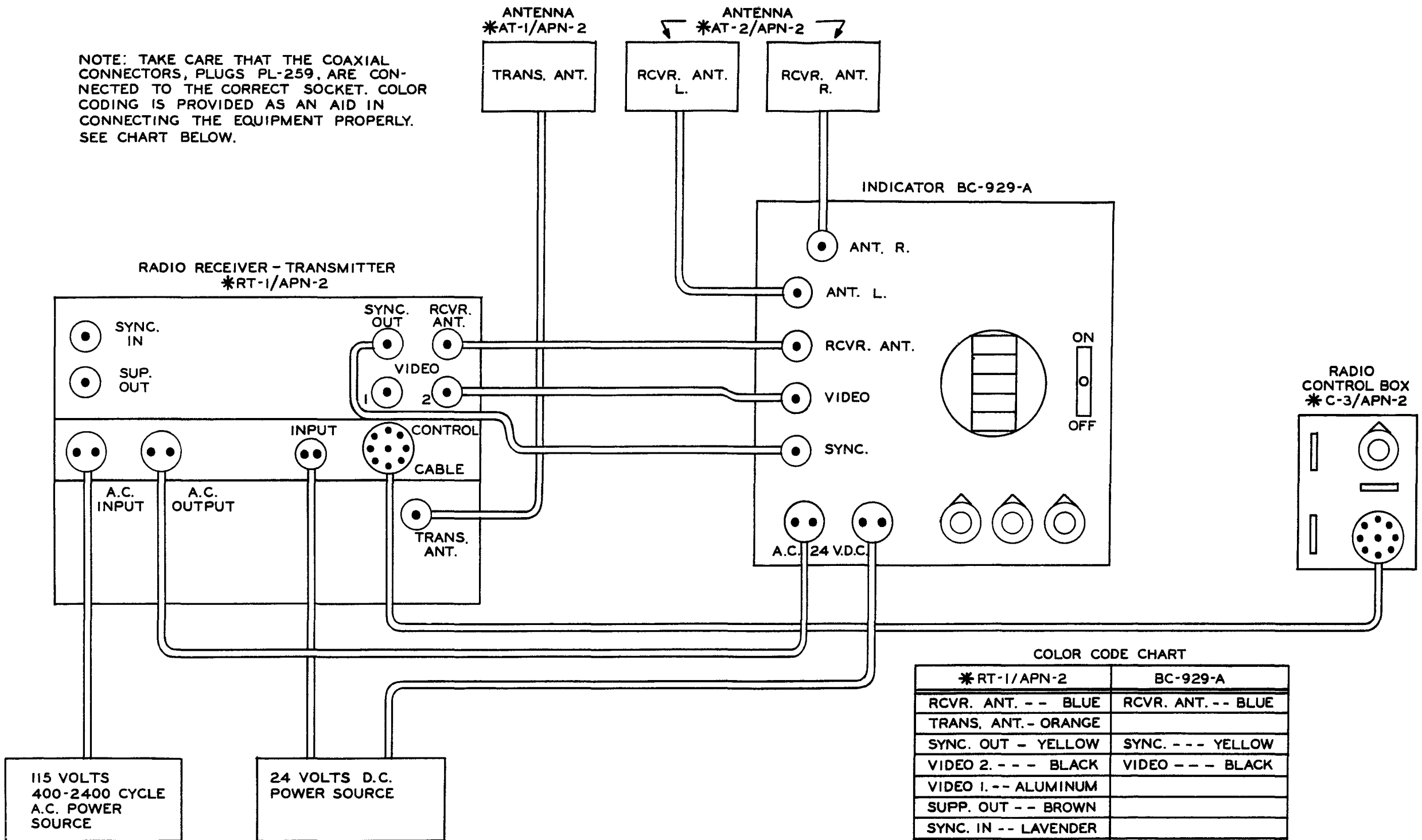


Figure 6-29. Operation Chart—Measuring Power Output and Pulse Width; Observing Waveforms; Triggering a Typical Transmitter

NOTE: TAKE CARE THAT THE COAXIAL CONNECTORS, PLUGS PL-259, ARE CONNECTED TO THE CORRECT SOCKET. COLOR CODING IS PROVIDED AS AN AID IN CONNECTING THE EQUIPMENT PROPERLY. SEE CHART BELOW.



COLOR CODE CHART

✱RT-1/APN-2	BC-929-A
RCVR. ANT. - - BLUE	RCVR. ANT. - - BLUE
TRANS. ANT. - ORANGE	
SYNC. OUT - YELLOW	SYNC. - - - YELLOW
VIDEO 2. - - - BLACK	VIDEO - - - BLACK
VIDEO 1. - - ALUMINUM	
SUPP. OUT - - BROWN	
SYNC. IN - - LAVENDER	
	ANT. R. - - GREEN
	ANT. L. - - - - RED

Figure 8-1. Radio Set ★AN/APN-2—Cording Diagram

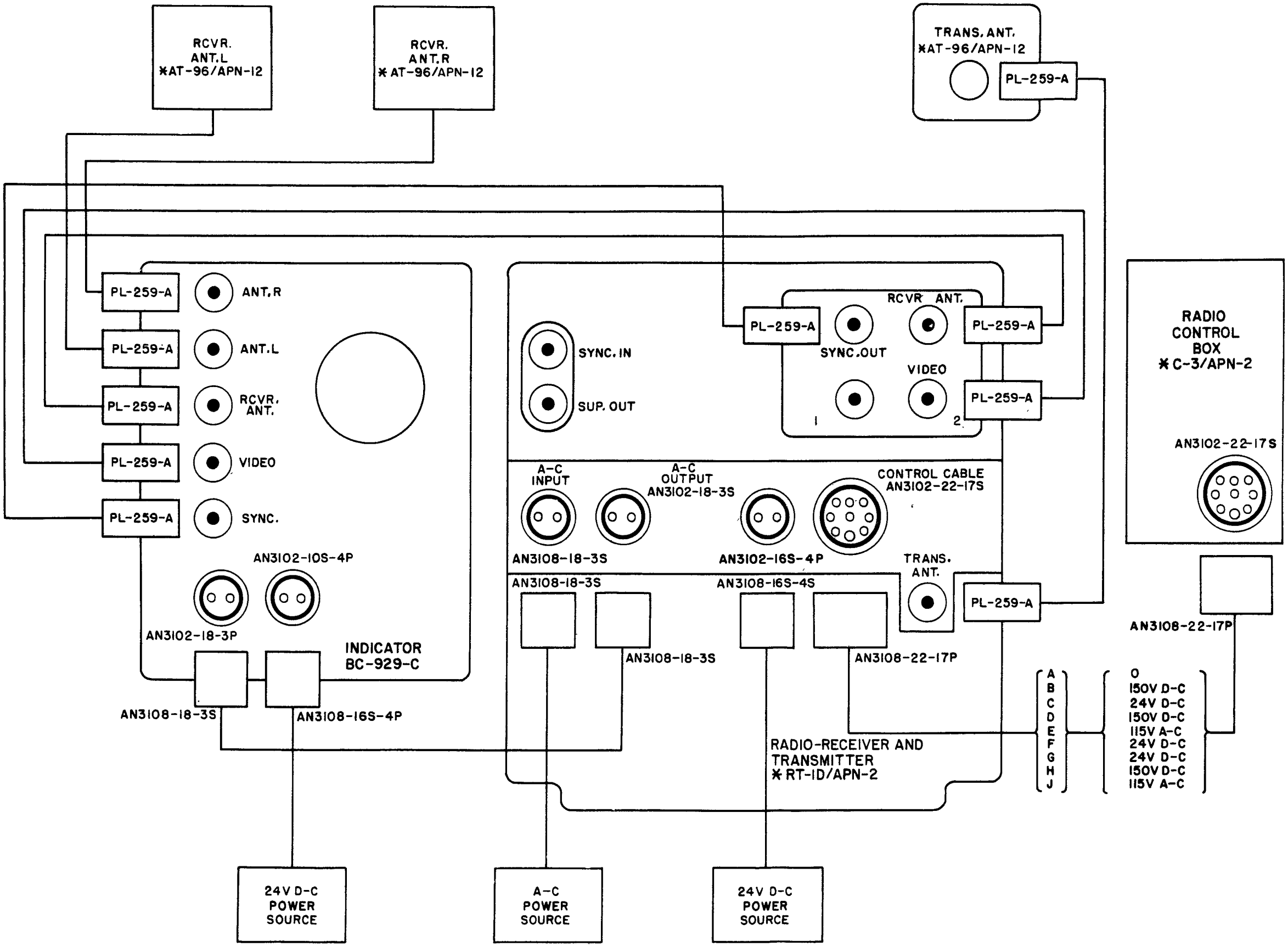


Figure 8-1A. Radio Set AN/APN-2—Cording Diagram

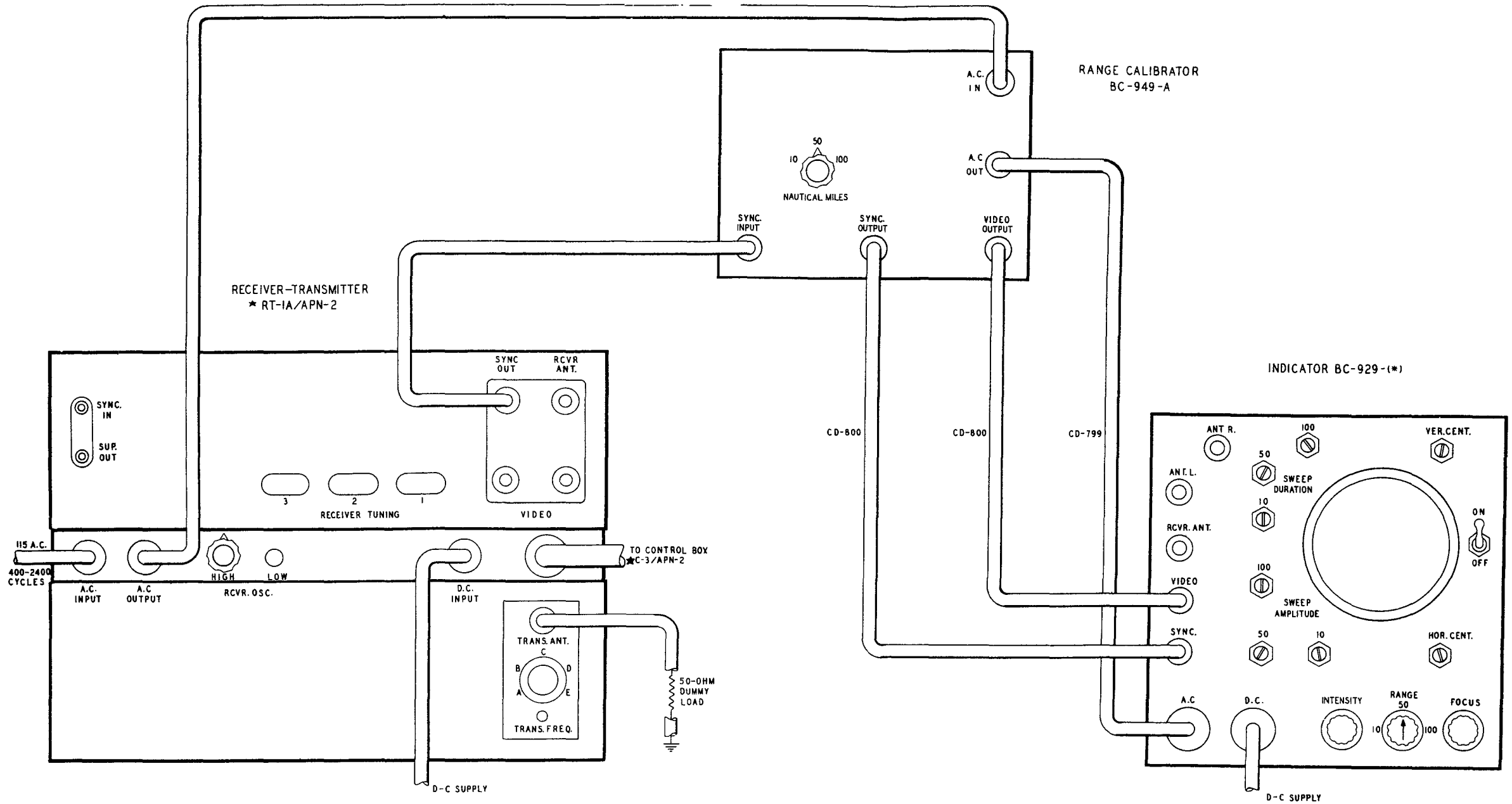


Figure 8-2. Indicator BC-929-A—Calibration, Cording Diagram

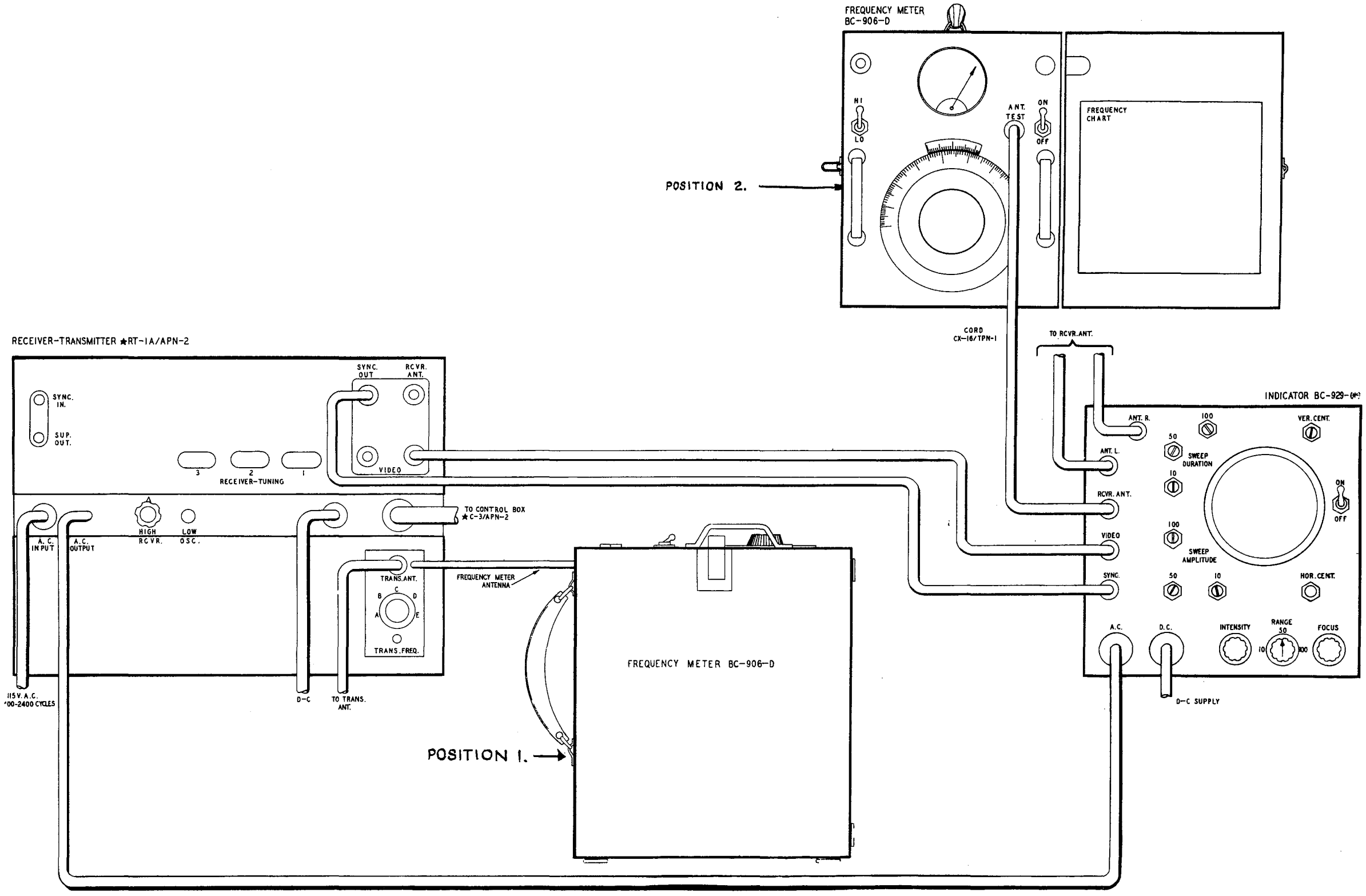


Figure 8-3. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Frequency Check, Cording Diagram (2 Methods)

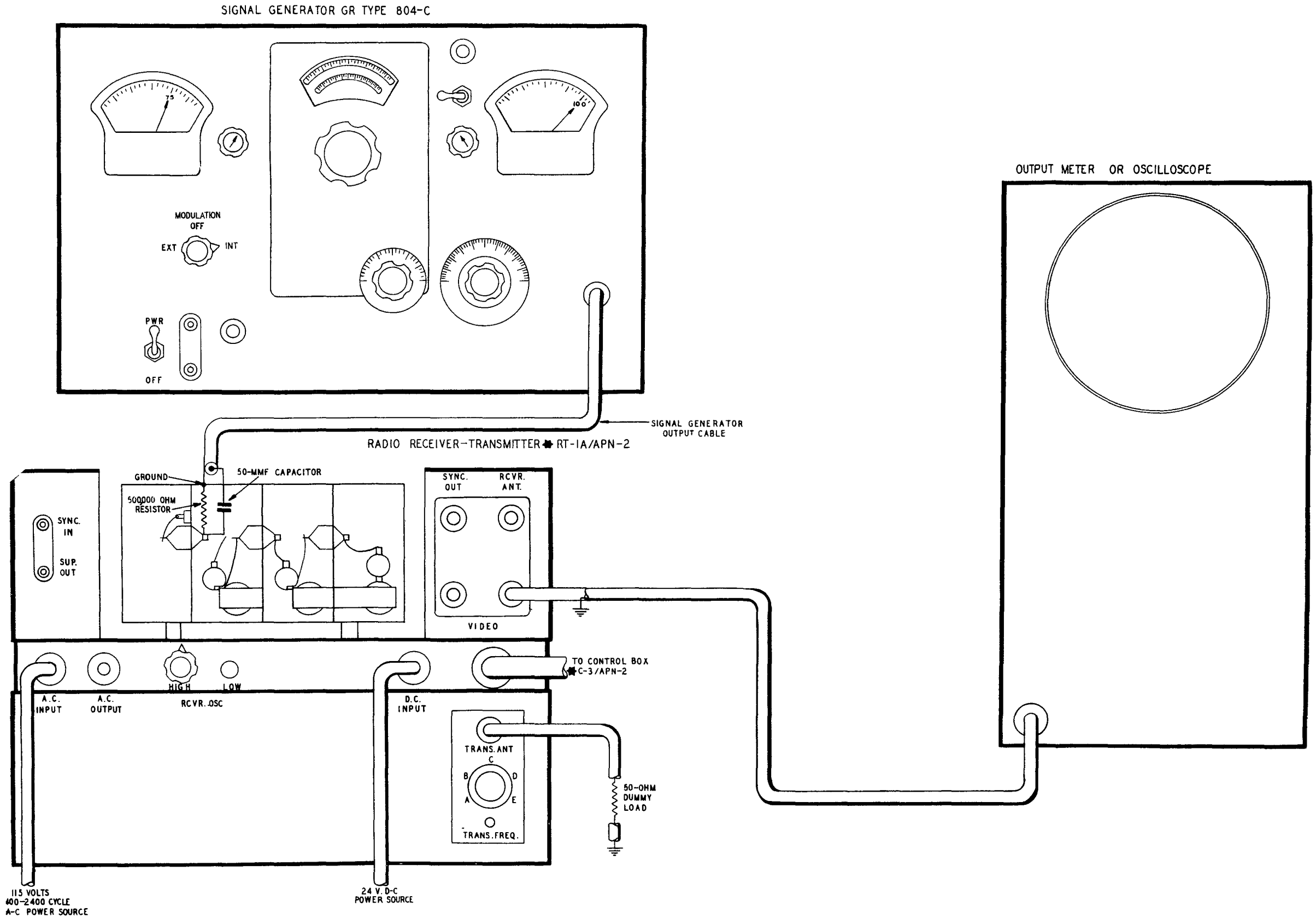


Figure 8-5. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Intermediate Frequency Alignment

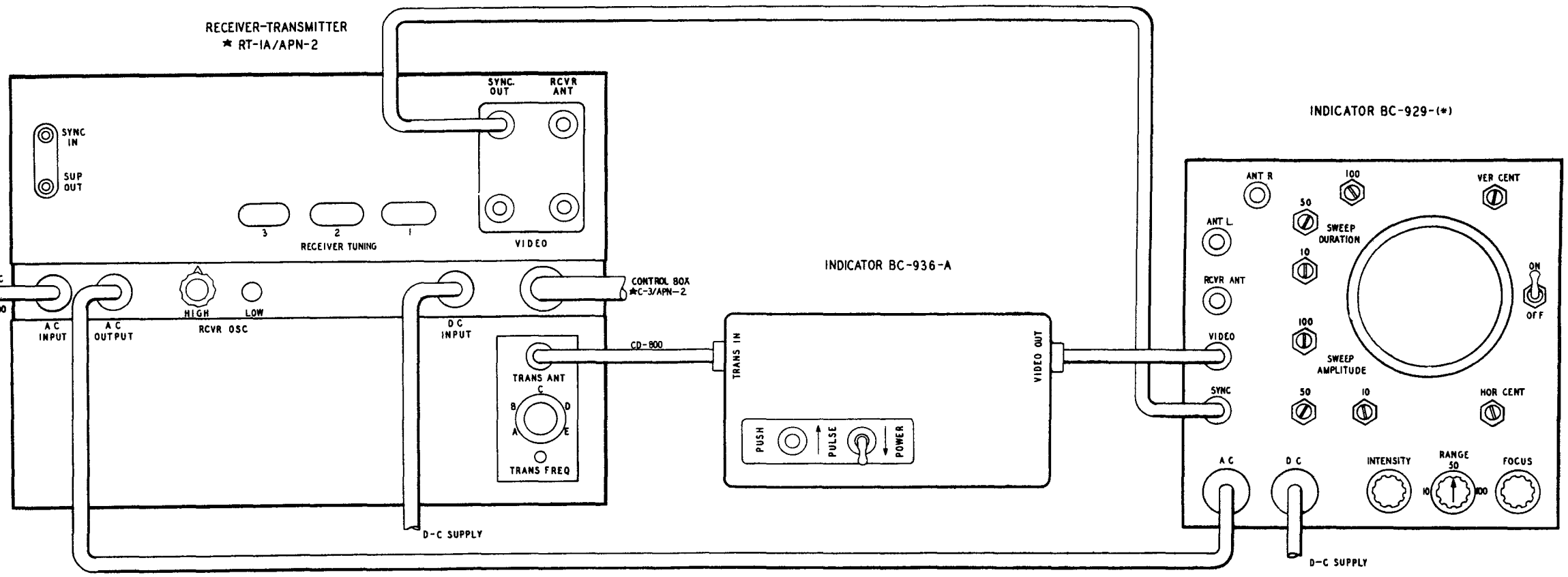


Figure 8-4. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Transmitter Pulse Width and Power Check, Cording Diagram

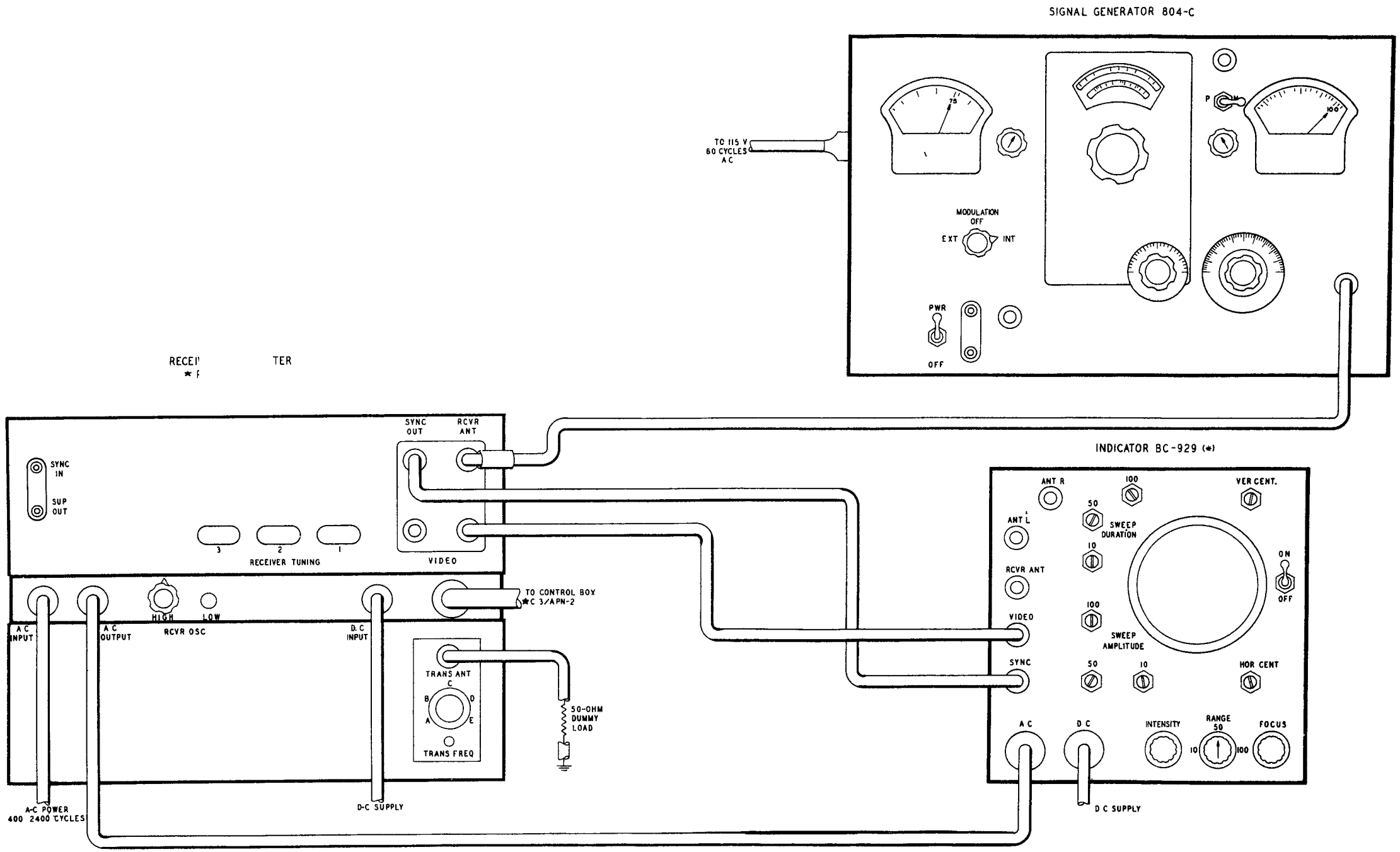


Figure 8-6. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Receiver R-F and Oscillator Alignment

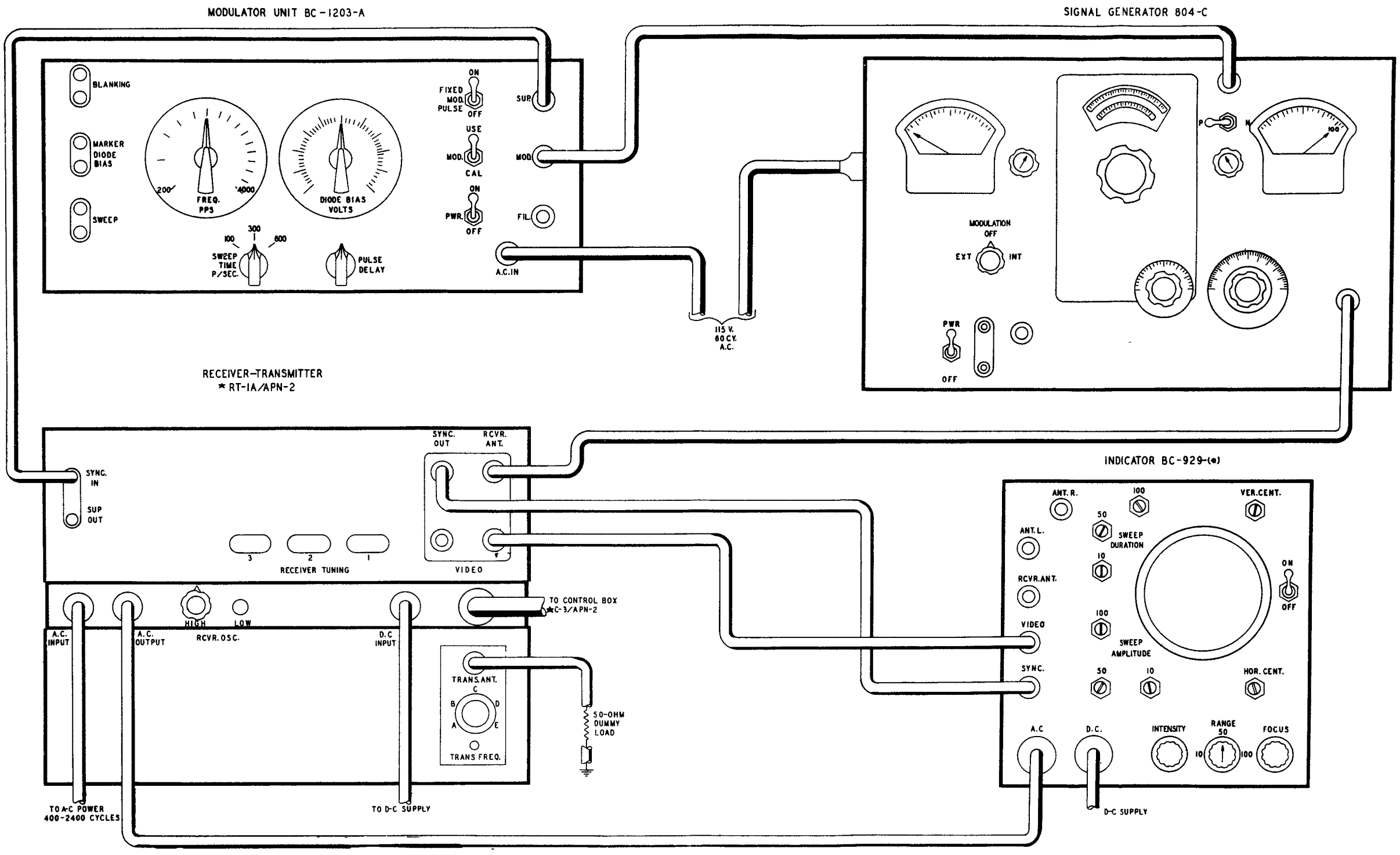


Figure 8-7. Radio Receiver and Transmitter ★RT-1/APN-2 or ★RT-1A/APN-2—Cording Diagram for Receiver Sensitivity Measurement Using 100 Percent Pulse Modulation

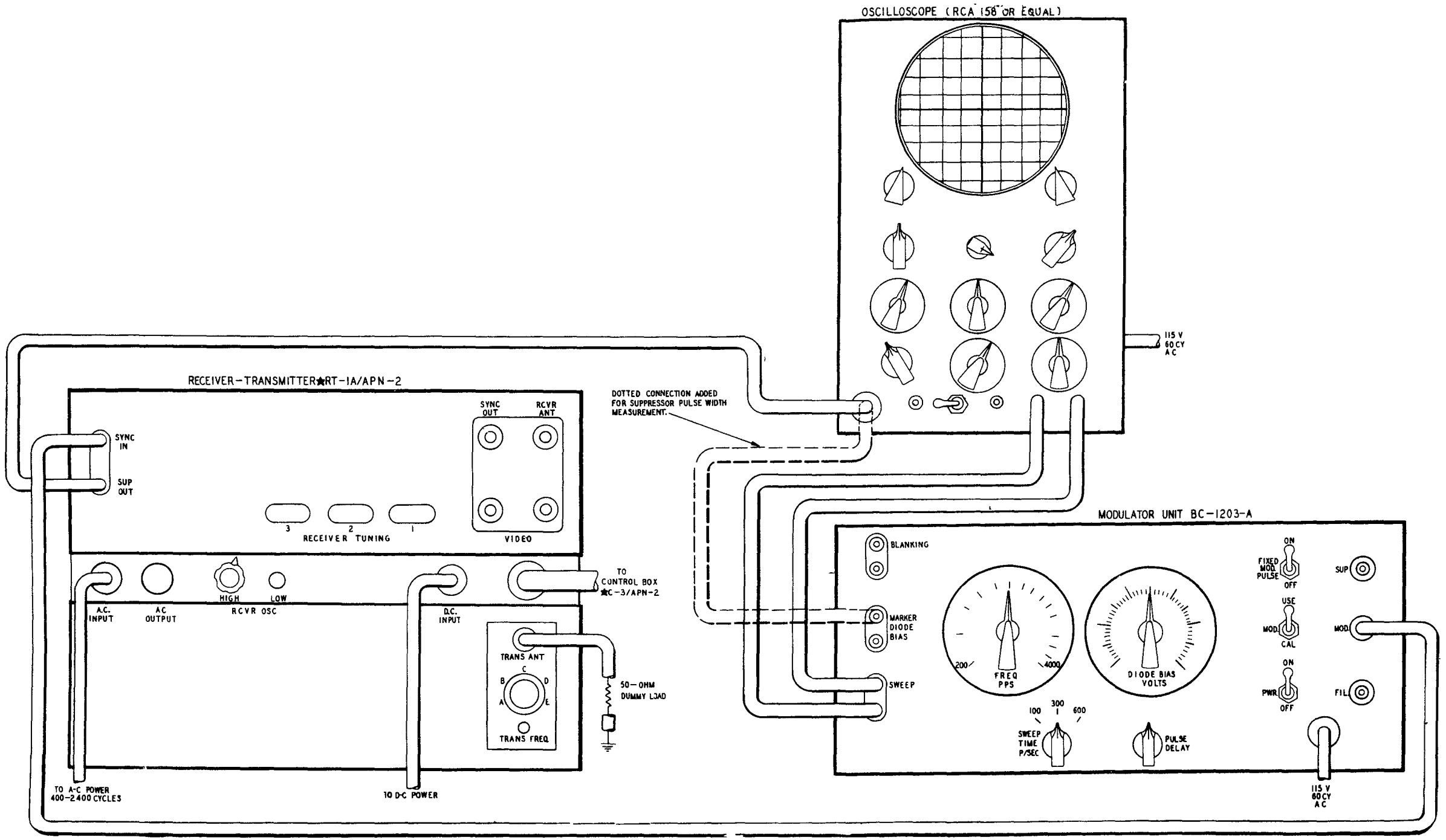
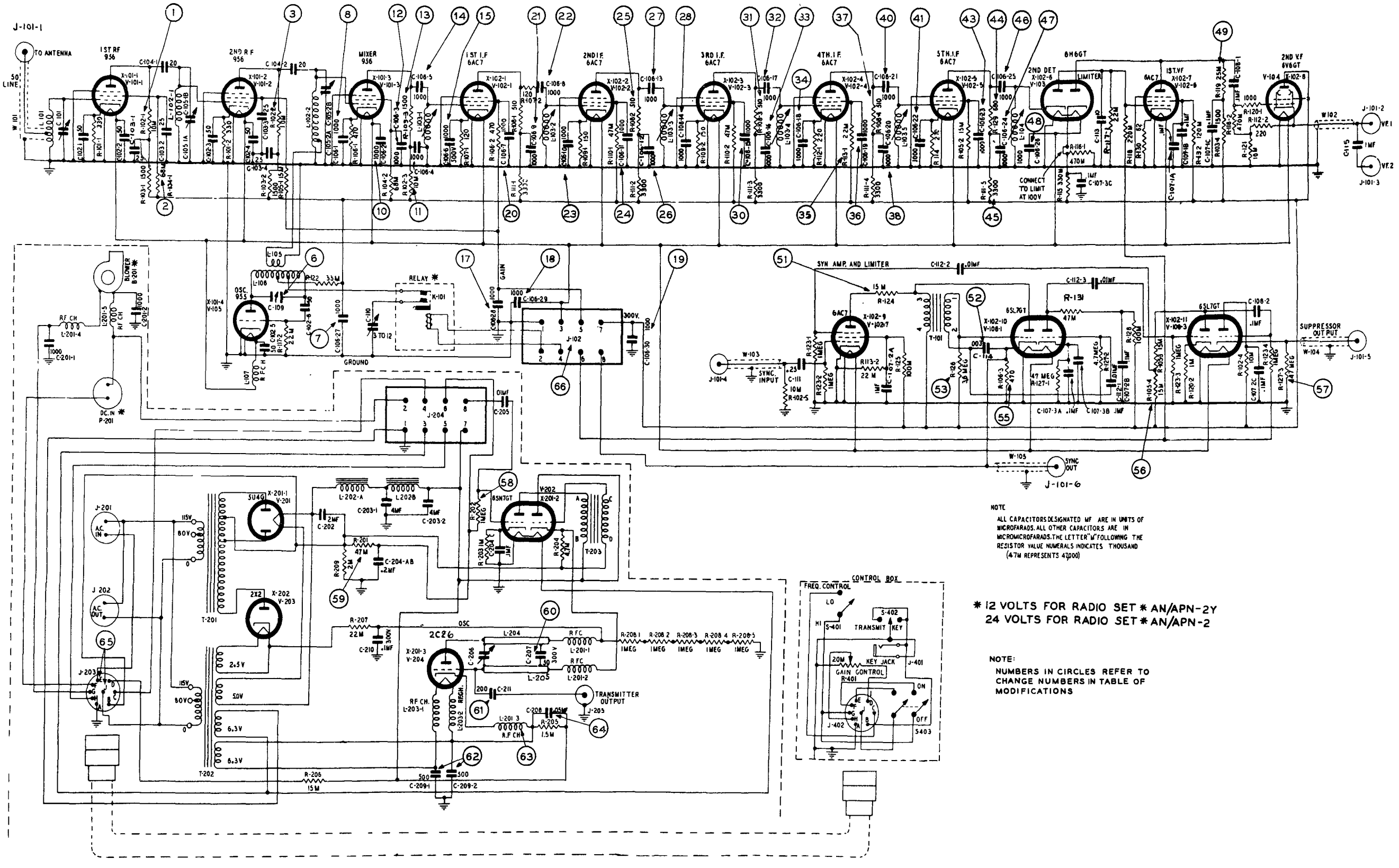


Figure 8-8. Pulse-Generating Section Test, Cording Diagram



* 12 VOLTS FOR RADIO SET * AN/APN-2Y
24 VOLTS FOR RADIO SET * AN/APN-2

NOTE:
NUMBERS IN CIRCLES REFER TO CHANGE NUMBERS IN TABLE OF MODIFICATIONS

NOTE
ALL CAPACITORS DESIGNATED MF ARE IN UNITS OF MICROFARADS. ALL OTHER CAPACITORS ARE IN MICROMICROFARADS. THE LETTER "M" FOLLOWING THE RESISTOR VALUE NUMERALS INDICATES THOUSAND (47M REPRESENTS 47000)

Figure 8-9. Radio Receiver and Transmitter ★RT-1/APN-2—Schematic Diagram of First Production Under Order No. 5759-WF-43

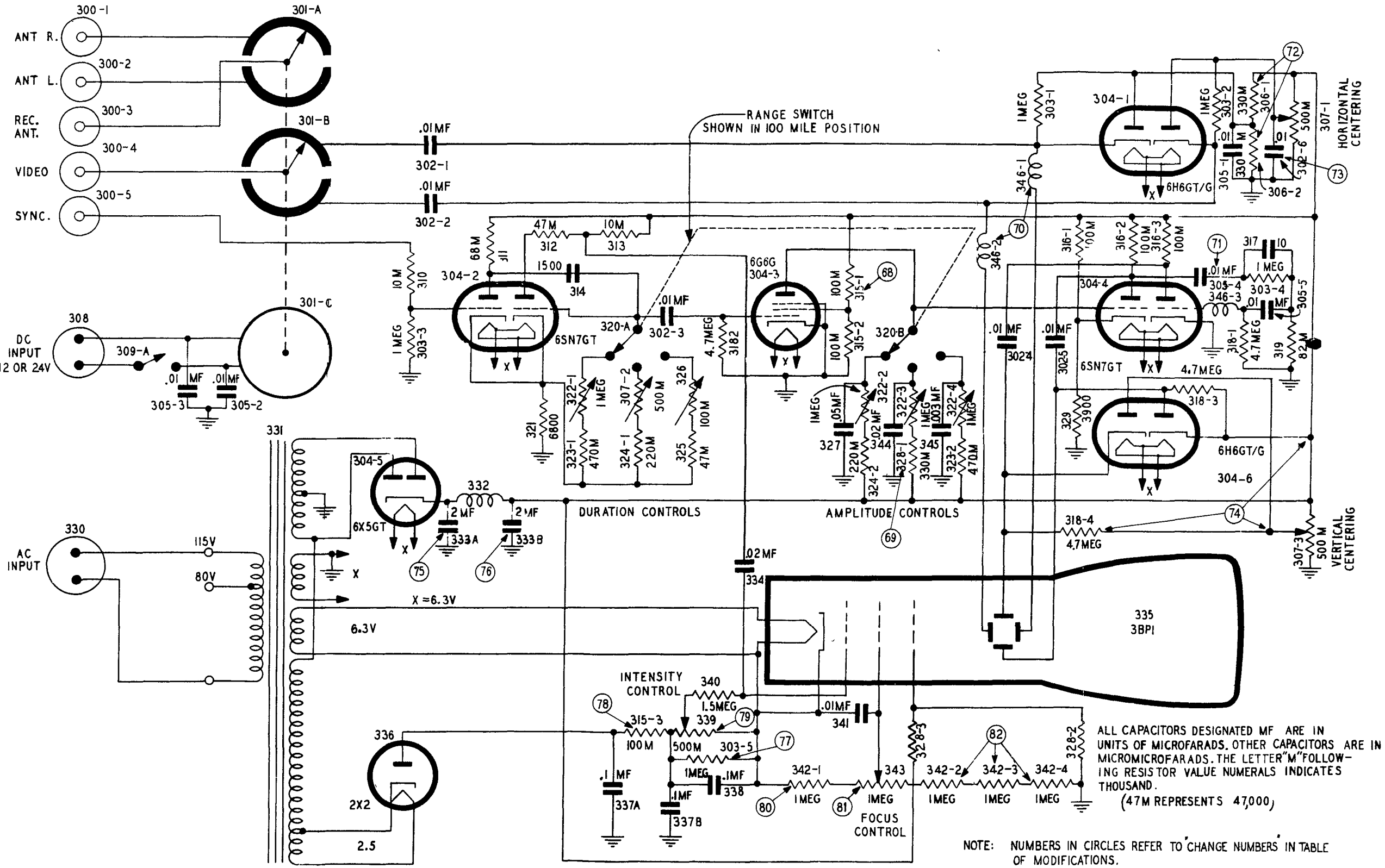


Figure 8-10. Indicator BC-929-(*)—Schematic Diagram of First Production Under Order No. 5759-WF-43