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Colin Hinson
In the village of Blunham, Bedfordshire.

T. O. 12P5-3SCR718-12
(Formerly 16-40SCR718-12)

Handbook
Service Instructions

RADIO SET
SCR-718-C

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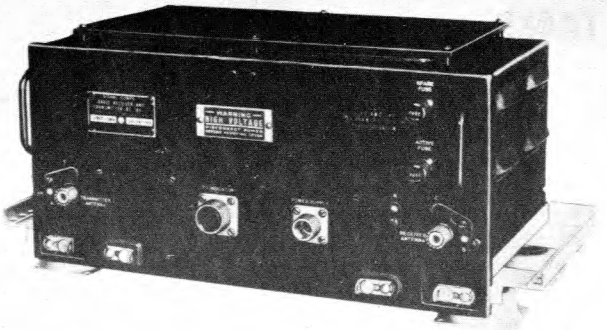
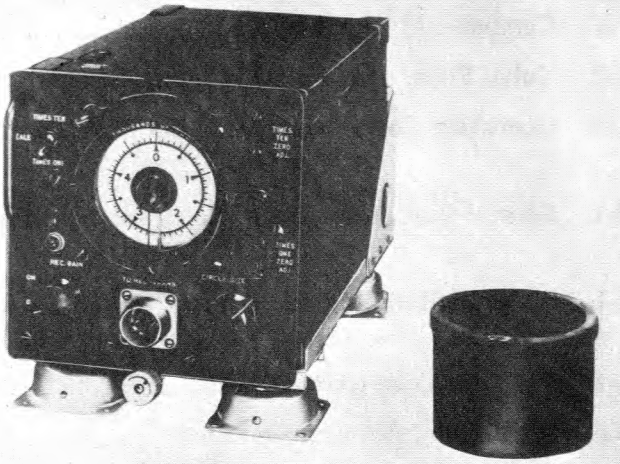


Radio Receiver and Transmitter BC-788-C



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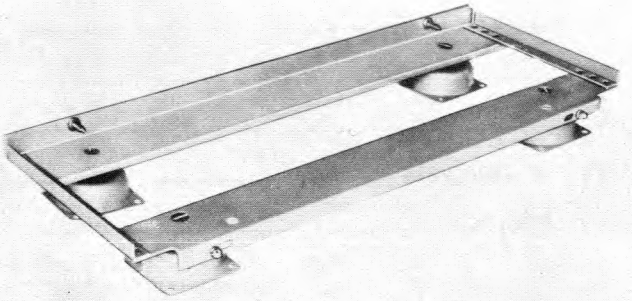

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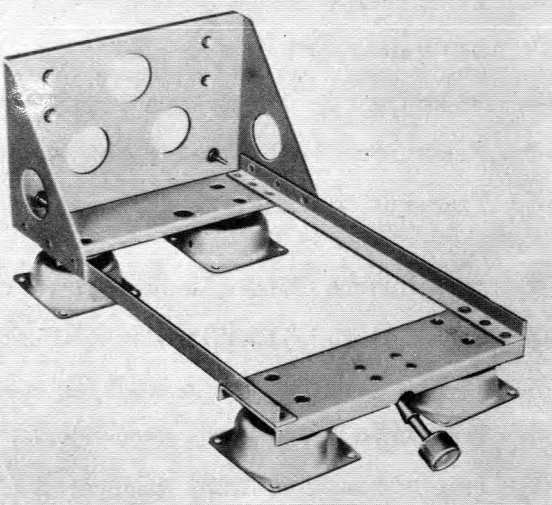
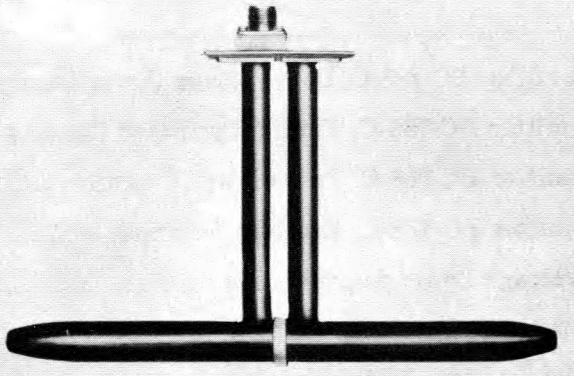


Mounting FT-445-A



Antenna AT-4/ARN-1

Figure 1-1. Radio Set SCR-718-C, Components

SECTION I
DESCRIPTION AND LEADING PARTICULARS

1-1. INTRODUCTION.

1-2. PURPOSE OF HANDBOOK.

1-3. This Handbook of Service Instructions gives a complete description of Radio Set SCR-718-C, and in addition, includes a comprehensive discussion of the theory of operation, methods of preparing the equipment for use, and detailed maintenance procedures.

1-4. SCOPE OF HANDBOOK.

1-5. This handbook is intended for use with Radio Set SCR-718-C. The information included applies to components procured under Air Force Contracts 2157-DAY-DE and 2209-DAY-DE, and under Navy Contracts NXsa-4456 and NXsa 23763. Figure 1-1 shows the components supplied for Radio Set SCR-718-C. The Signal Corps or AN. type designation appears on the name plate of each component; these designations are used throughout this handbook for identification purposes.

1-6. PURPOSE OF EQUIPMENT.

1-7. Radio Set SCR-718-C is an airborne, high-range altimeter. It differs from the barometric altimeter in that it measures the height of the aircraft above the surface of the earth rather than the altitude above sea level. Information supplied by SCR-718-C is an important factor in bombing computations, and is a valuable aid to navigation, especially under conditions of poor visibility.

1-8. GENERAL PRINCIPLES OF OPERATION.

1-9. This equipment uses basic radar principles to make the desired measurement. The key circuits are, therefore, timing, sweep development, transmitting, and receiving. A cathode-ray tube indicator, and two half-wave dipole antennas are employed. The timing oscillator generates an alternating voltage which is amplified and split in phase to obtain two sine-wave sweep voltages with a 90-degree relationship. These voltages are applied to the deflecting plates of a cathode-ray tube to form a circular time base or sweep on the face of the tube. The sweep is concentric with a scale which is calibrated in a clockwise direction from zero to five, and is read in either thousands or ten-thousands of feet, depending upon the selected range.

1-10. The voltage from the timing oscillator also controls pulse forming circuits, which in turn power the u-h-f oscillator in such a way that periodic bursts of u-h-f energy are generated. Thus, the transmitter is synchronized with the sweep and, specifically, emits one u-h-f pulse per complete circular sweep. The transmitting antenna radiates the u-h-f pulses, principally toward the earth.

1-11. The receiving antenna gets some of this energy directly from the transmitting antenna, and some by reflection from the surface of the earth. The difference in time between the direct-path u-h-f pulse and the reflected pulse is related directly to the distance between the aircraft and the earth. The receiver amplifies and detects these pulses and applies them through a video amplifier to the radial electrode of the KRT. Here they appear on the sweep as a reference pip at scale zero, and an echo pip at a point on the scale related to the elevation of the aircraft above the surface of the earth.

1-12. GENERAL ELECTRICAL CHARACTERISTICS.

1-13. POWER REQUIREMENTS.
115 ±10 volts, 400 to 2400 cps
or 80 ±5 volts, 400 to 2400 cps
135 watts

1-14. RECTIFIED VOLTAGES.
+320 volts, approx
−1500 volts, approx

1-15. TRANSMITTER DATA.
Frequency: 440 ±2 mc
Pulse recurrence frequency:
98.35 kc (times-one range)
9.83 kc (times-ten range)
Pulse width: 0.3 μsec, approx
Peak power:
7 watts minimum (times-one range)
5 watts minimum (times-ten range)

1-16. RECEIVER DATA.
Frequency: 440 ±2 mc
Intermediate frequency: 30 mc
I-F amplifier bandwidth: 4 mc

1-17. OPERATING TEMPERATURE RANGE.
High: +55°C (+131°F)
Low: −55°C (−67°F)

1-18. ALTITUDE RANGE OF EQUIPMENT.
Theoretical over-all range: 0 to 50,000 feet
Practical operating range: 50 to 40,000 feet

Note

The actual high-altitude limit of this equipment is 40,000 feet in an unpressurized aircraft, because arcing in the high-voltage detail parts will damage the set at higher altitudes. At the other extreme, overlapping of the reference and altitude pulses on the indicator and the inherent and operational inaccuracies of the set make readings at altitudes below 50 feet undependable.

1-19. ACCURACY OF EQUIPMENT.
Over-all: ±50 ft +0.25 percent of altitude

1-20. EQUIPMENT SUPPLIED.

1-21. TABLE 1-1 gives the type numbers and the numerical series of reference designations for the components supplied with the equipment. Figure 1-1 illustrates these components.

TABLE 1-1

COMPONENTS SUPPLIED

Name of Component	*Type Designation*	*Numerical Series of Reference Designations*
Radio Receiver and Transmitter Mounting Base	BC-788-C MT-14/ARN-1	100—199
Antenna (2 required)	AT-4/ARN-1	300—399
Indicator Mounting Visor (rubber)	I-152-C FT-445-A M-387	200—299

1-22. In addition to the components listed in the foregoing table, the necessary connectors (P401 through P404, P406, P408, and P410); adapters P405, P407, P409, and P411; and fuses required in the operation of the equipment are supplied with the radio set. The coaxial conductor which is part of the interconnecting cable assembly, between the receiver-transmitter and the indicator, as well as the coaxial cable for the antenna transmission lines, are also furnished, in bulk. For details concerning these items, refer to paragraph 3-16.

1-23. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-24. POWER SUPPLY.

1-25. The primary power source is not furnished with the equipment. It is normally an aircraft a-c supply of 115 ±10 volts. However, provision has been made for operation of the radio set on 80 volts, by changing internal connections and fuses. (The fuses required when the altimeter is operated from an 80-volt power source are supplied with the equipment, separately packed.) The power requirements are listed in paragraph 1-13.

1-26. INTERCONNECTING CABLES.

1-27. The length of each cable assembly depends upon the particular installation, and for this reason the interconnecting and power cable assemblies are not supplied with the equipment. They are usually installed by the air-frame manufacturer. For further data and specifications on the conductors required for the interconnecting cables, refer to paragraph 3-16.

1-28. DESCRIPTION OF COMPONENTS.

1-29. GENERAL.

1-30. The SCR-718-C equipment comprises a receiver-transmitter, a transmitting antenna, a receiving antenna, and an indicator. All these components are illustrated in figure 1-1.

1-31. RADIO RECEIVER AND TRANSMITTER BC-788-C.

1-32. This component (figure 1-2) contains transmitter circuits including the timing oscillator, range change relay, pulse forming stages, and u-h-f oscillator. The low-voltage power supply and the following receiver circuits are also mounted on the chassis: local oscillator, mixer, six i-f stages, and detector. Transmitter and receiver u-h-f tuning adjustments, equipment fuses, and connectors are all readily available. BC-788-C is shock-mounted on Mounting Base MT-14/ARN-1 (figure 1-3), which is fastened to a horizontal member of the air frame.

1-33. ANTENNA AT-4/ARN-1.

1-34. Antenna AT-4/ARN-1 is a half-wave dipole (figure 1-4), adapted for attachment to a metal surface on the underside of the wings, fuselage, stabilizers, or any other horizontal metal surface on the underside of the aircraft. The antenna assembly is of such proportions as to place the dipole approximately one-quarter wavelength from the surface on which it is mounted.

1-35. INDICATOR I-152-C.

1-36. The indicator (figure 1-5) houses the KRT, video amplifiers, circle-forming circuits, and high-voltage power supply. All SCR-718-C operating controls are mounted on this component. I-152-C is shock-mounted on Mounting FT-445-A (figure 1-6), which can be fastened to a part of the air frame in a position convenient for viewing. Visor M-387 shields the face of the indicator tube from bright, extraneous light, and thus improves the presentation.

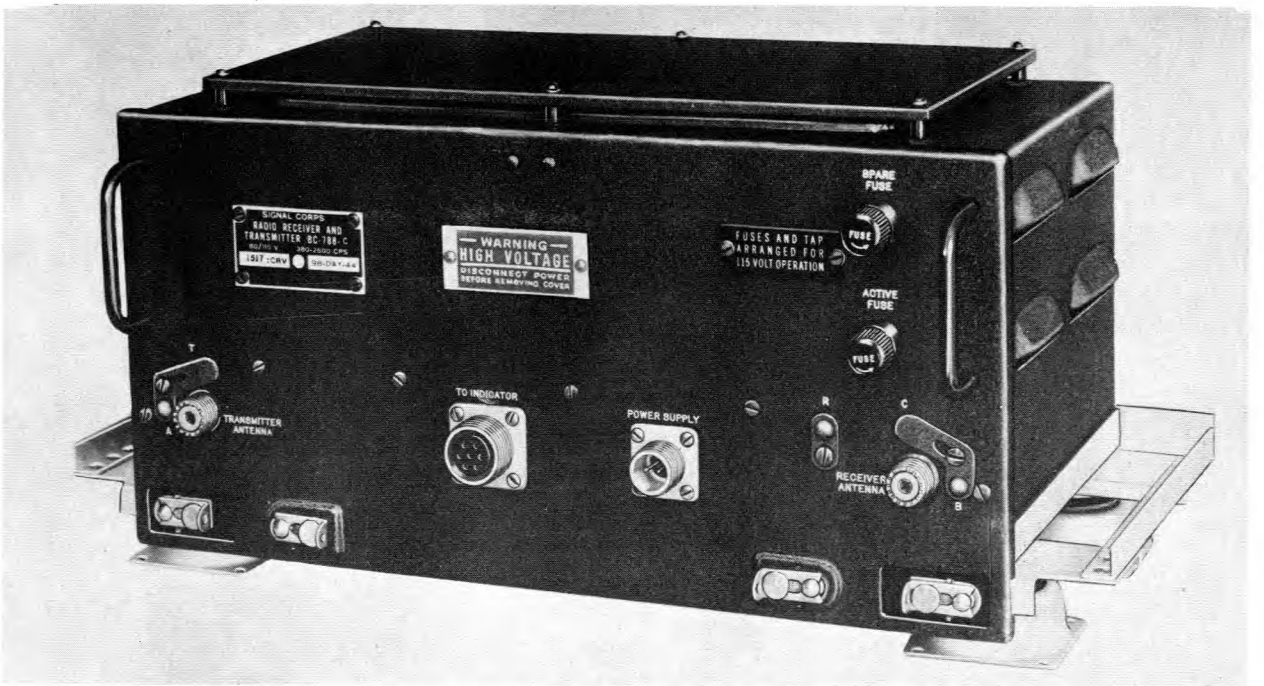


Figure 1-2. Radio Receiver and Transmitter BC-788-C

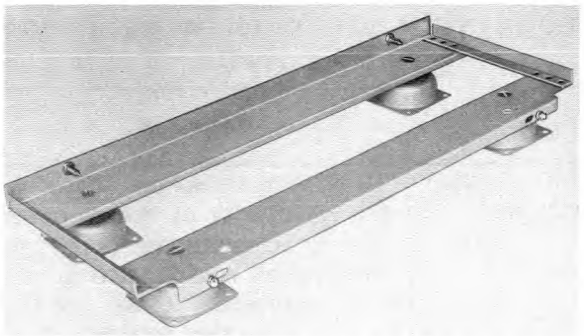


Figure 1-3. Mounting Base MT-14/ARN-1

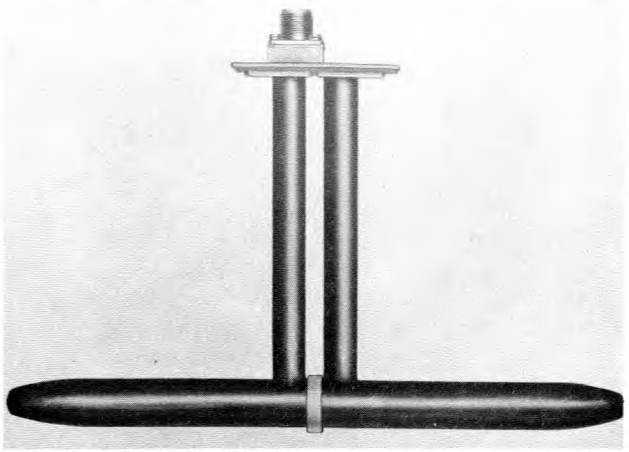


Figure 1-4. Antenna AT-4/ARN-1

1-37. TUBE, FUSE, AND INDICATOR-LAMP COMPLEMENT.

1-38. The tubes, fuses, and indicator lamp used in the SCR-718-C are listed by component in TABLE 1-2.

TABLE 1-2
TUBE, FUSE, AND INDICATOR-LAMP COMPLEMENT

Reference Designation	*Type*	*Function*
Radio Receiver and Transmitter BC-788-C		
V101	JAN 6J6	Mixer
V102	JAN 6J6	Local oscillator
V103	JAN 6AG5	1st i-f amplifier
V104	JAN 6AG5	2nd i-f amplifier
V105	JAN 6AG5	3rd i-f amplifier
V106	JAN 6AG5	4th i-f amplifier
V107	JAN 6AG5	5th i-f amplifier
V108	JAN 6AG5	6th i-f amplifier
V109	JAN 6AG5	Detector
V110	JAN 5Y3 **WGTA**	Low-voltage rectifier
V111	JAN 6AG5	Timing oscillator
V112	JAN 6AG5	Clipper
V113	JAN 6L6	Driver
V114	JAN 6J6	U-H-F oscillator

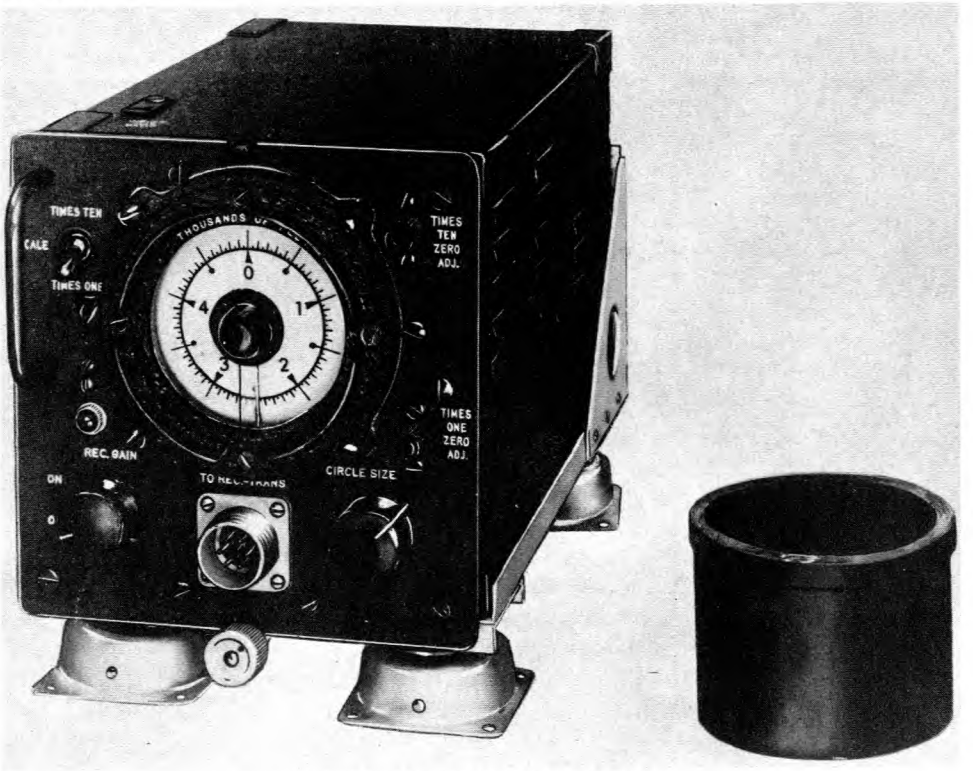


Figure 1-5. Indicator I-152-C

TABLE 1-2 (Continued)

Reference Designation	*Type*	*Function*
Radio Receiver and Transmitter BC-788-C (Cont)		
F101	3AG*, 250V, 1.5 amp	Primary power input protection (115 volts)
F102	3AG*, 250V, 2 amp	Primary power input protection (80 volts)
Indicator I-152-C		
V201	JAN 2X2A	High-voltage rectifier
V202	JAN 6AG5	Video amplifier
V203	JAN 6AG5	Video amplifier
V204	JAN 6AG5	Circle amplifier
V205	JAN 3DP1A+S2	Indicator
I201	319-R**	Indicator lamp

* Not a JAN type.
** Manufacturer's designation.

1-39. LOCATION AND FUNCTIONS OF OPERATING CONTROLS.

1-40. The controls used in the operation of this equipment are located on the front panel of Indicator I-152-C, as shown in figure 1-7. TABLE 1-3 lists the operating controls, and briefly describes their functions.

TABLE 1-3
OPERATING CONTROLS OF RADIO SET SCR-718-C

Control Mark or Name	*Function*
REC. GAIN ON OFF	This potentiometer controls the sensitivity of the receiver, and thus varies the height of the pulses which appear on the indicator. The power switch for the equipment is actuated in the extreme counterclockwise position of this control.

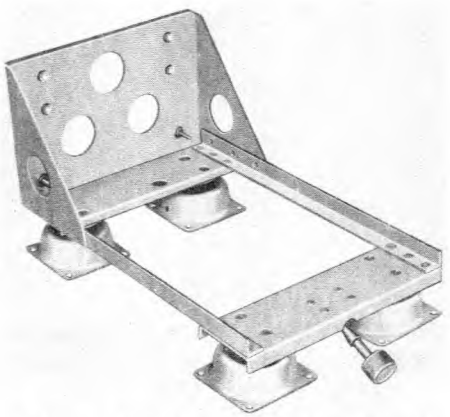


Figure 1-6. Mounting FT-445-A

TABLE 1-3 (Continued)

Control Mark or Name	*Function*
SCALE	This two-position toggle switch changes the range of the equipment. When the switch is thrown to the TIMES ONE position, one complete encirclement of the scale corresponds to 5000 feet of altitude, while in the TIMES TEN position, one complete encirclement represents 50,000 feet.
CIRCLE SIZE	This potentiometer controls the diameter of the circular sweep trace on the screen of the indicator.
TIMES-ONE ZERO ADJ.	This control positions the reference pip along the indicator scale, in the vicinity of zero, on the 5000-foot range (TIMES ONE).
TIMES-TEN ZERO ADJ.	This control positions the reference pip along the indicator scale, in the vicinity of zero, on the 50,000-foot range (TIMES TEN).

1-41. INTERCHANGEABILITY OF COMPONENTS.

1-42. All components of Radio Set SCR-718-A, SCR-718-AM, SCR-718-B, and SCR-718-C are completely interchangeable. However, the following precaution should be observed. When substituting Radio Receiver and Transmitter BC-788-A or BC-788-AM for use with Indicator I-152-B or I-152-C, operation of the equipment is limited to one range, 5000 feet. Therefore, the SCALE switch on the indicator should be thrown to the X1 or TIMES ONE position, and safety-wired to the small bracket mounted below the switch.

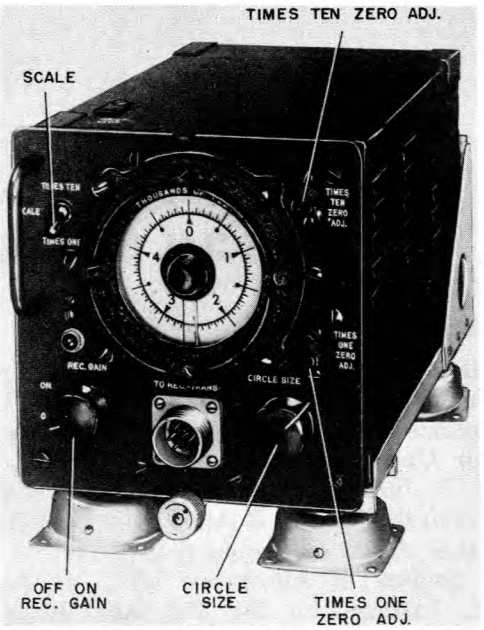


Figure 1-7. Operating Controls

SECTION II
SPECIAL TEST EQUIPMENT AND SPECIAL TOOLS

2-1. GENERAL.

2-2. This section lists and illustrates special test equipment which is supplied specifically for the maintenance of Radio Set SCR-718-C by Organizational or Operational and Field or FASRon activities. A list of general test equipment can be found in the Section R Allowance List, NavAer 00-35QR-5. A list of standard tools can be found in the Section U Allowance List, NavAer 00-35QU-1. Instructions for the fabrication of a bench-test interconnecting cable are included here for use when Test Set TS-23/APN is not available for interconnection purposes.

2-3. SPECIAL TEST EQUIPMENT.

2-4. TABLE 2-1 lists special test equipment which is supplied for the maintenance of Radio Set SCR-718-C. These test equipments are illustrated in figure 2-1.

2-5. SPECIAL TOOLS.

2-6. No special tools are required in the maintenance of SCR-718-C.

2-7. FABRICATION OF BENCH-TEST CABLES.

2-8. Test Set TS-23/APN can be used to interconnect the receiver-transmitter and the indicator of SCR-718-C. In the event that this test set is not available, a bench-test interconnecting cable must be fabricated. In either case, a power cable must be prepared. Fabrication procedures given in paragraph 3-16 are applicable here, provided the length of the cables is limited to test-bench requirements; usually four feet of length is sufficient.

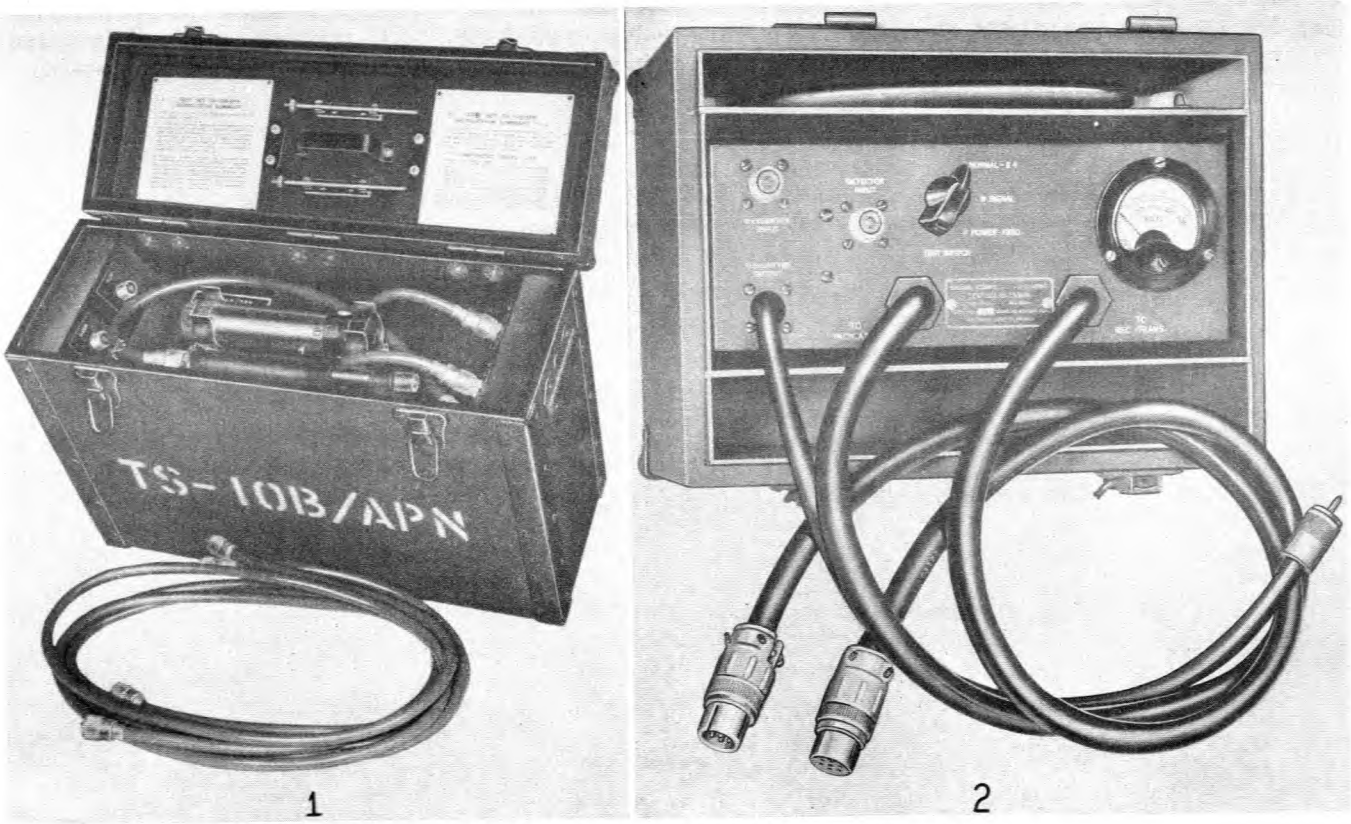


Figure 2-1. Test Sets TS-10B/APN and TS-23/APN

TABLE 2-1
SPECIAL TEST EQUIPMENT REQUIRED FOR MAINTENANCE

Figure and Index No.	*Name*	*Army-Navy Type Designation*	*Alternate*	*Application*
2-1 (1)	Test Set	TS-10B/APN	TS-10C/APN	Used in determining loop sensitivity and sweep calibration, and in adjusting receiver input circuits.
2-1 (2)	Test Set	TS-23/APN	None	Used to meter B+ voltage, observe transmitter pulse shape, and measure transmitter power and frequency.

SECTION III
PREPARATION FOR USE AND RESHIPMENT

3-1. INTRODUCTION.

3-2. This section includes general uncrating instructions, data on preinstallation performance checks and cable fabrication, and general information on repacking the equipment in preparation for reshipment.

Note

The SCR-718-C equipment usually is installed in the aircraft by the contractor prior to delivery. However, the material in this section is intended to cover those contingencies in which the radio set is delivered separately by the contractor for installation by the operating activity, or when the equipment is received from or delivered to other echelons of maintenance.

3-3. UNPACKING.

3-4. When unpacking the equipment, carefully remove each component from the container, and check against the list of equipment supplied, as given in paragraph 1-20, or against the packing list included with the shipment. Carefully examine the equipment to make certain that there is no damage or obvious physical defect. Any discrepancies or exceptions should be reported to the proper authority.

3-5. PREINSTALLATION PERFORMANCE CHECK.

3-6. BENCH-TEST SETUP.

3-7. Set Radio Receiver and Transmitter BC-788-C and Indicator I-152-C on the test bench, within convenient distance of each other and the test equipment. Fabricate all cable assemblies according to the directions given in paragraph 3-16, and connect them to the components.

3-8. VISUAL CHECK.

3-9. Before any electrical check, an inspection more detailed than that made on unpacking should now be completed to ascertain that the set is in good mechanical condition. Proceed as follows:

a. Remove all remaining packing material and dust from equipment, especially from around receptacles; and check for broken connectors, bent prongs, etc.

b. Remove each component from its housing to make certain that there is no packing material or dust which may have entered through louvers or other vents. It is suggested that a long-bristled brush or air jet of low pressure be used to remove dust and dirt from inaccessible places.

c. If tubes are already installed, make sure that none are broken, and that all tubes and tube shields are firmly in place in their respective sockets. Also, see that tube-cap connector on indicator rectifier tube (V201) is making good connection with plate cap.

d. Check to see that crystal unit (Y101) is inserted properly.

e. Operate controls on indicator to check ease of mechanical operation, as follows: rotate REC. GAIN through its entire range, see that ON-OFF switch functions properly at counterclockwise end of excursion; and rotate CIRCLE SIZE through its entire range to see that it turns freely.

CAUTION

All controls and adjusting devices should move through their normal range without requiring excessive effort to manipulate. If undue pressure is required, investigate cause of binding. Adjustable friction devices are provided on controls requiring them.

f. Check mechanical operation of relay in receiver-transmitter by manually depressing plate showing reference designation (K101). Observe movement of contact arms to see that they make proper contact.

g. Make general, over-all inspection, looking for poor or broken solder connections, loose mechanical fasteners, and chafed or frayed insulation, especially where wires pass through chassis holes.

h. Thoroughly clean all dust and dirt from antennas, taking particular care to see that insulator ring at center of dipole is free of any foreign substance, such as grime or paint.

i. Check to see that fuses of correct current rating have been inserted in active and spare

fuse holders on front panel of receiver-transmitter, and that they are of proper type and value for input voltage to be used, as per information given in TABLE 1-2. Make sure that name plate mounted next to fuse posts shows correct information. (In this connection, refer to paragraphs 3-10 and 3-12 for procedure to be used in making necessary changes when using different input voltage.)

3-10. CONNECTION FOR 80-VOLT OPERATION.

3-11. If the equipment is set up for 115-volt operation, and 80-volt operation is desired, proceed as follows:

a. Unsolder yellow lead from terminal 3 of transformer T101 (accessible on underside of transmitter-receiver chassis) and resolder to terminal 2 of transformer T101.

b. Remove 1-½-ampere fuses (F101) from active and spare fuse holders. Replace them with 2-ampere fuses (F102). (Two 2-ampere fuses are supplied with equipment, packed separately.)

c. Remove name plate on front panel of receiver-transmitter which reads FUSES AND TAP ARRANGED FOR 115-VOLT OPERATION, and turn it over, so that it bears the legend FUSES AND TAP ARRANGED FOR 80-VOLT OPERATION.

3-12. CONNECTION FOR 115-VOLT OPERATION.

3-13. If the equipment is set up for 80-volt operation, and 115-volt operation is desired, reverse the procedure in each step of the foregoing paragraph.

3-14. ELECTRICAL CHECK.

3-15. After the equipment has been completely prepared, as in the preceding paragraphs, connect the test equipment, as shown in figure 5-1, and make the performance check according to the instructions in paragraph 6-5.

Note

If Indicator I-152-B or I-152-C is used with Radio Receiver and Transmitter BC-788-A or BC-788-AM, be sure that the scale switch on the indicator is in the X1 or TIMES ONE position, as stated in paragraph 1-42.

3-16. FABRICATION OF CABLE ASSEMBLIES.

3-17. MATERIAL REQUIRED.

3-18. The material required for fabrication of the cable assemblies for aircraft installation is listed in TABLE 3-1.

3-19. GENERAL INSTRUCTIONS.

3-20. The following general instructions apply to the cable-fabrication process:

a. The length of the power, interconnecting, and antenna cables must be such that (1) no strain is placed upon the cables or connectors, (2)

TABLE 3-1

MATERIAL REQUIRED FOR FABRICATION OF CABLE ASSEMBLIES

Quantity	*Description*	*Type No.*	*Supplied*	*Not Supplied*
4	Adapter*	NT 49192	x	
1	Cable clamp	AN 3057-4	x	
2	Cable clamp	AN 3057-8	x	
1	Connector	AN 3106-12S-3S	x	
1	Connector	AN 3106-16S-1P	x	
1	Connector	AN 3108-16S-1S	x	
4	Connector	NT 49190	x	
**	Radio-frequency cable	RG-8/U	x	
**	Radio-frequency cable	RG-59/U or MI-20†	x	
**	Wire, single-conductor, insulated	AN-20		x
**	Wire, single-conductor, shielded	AN-20		x

* For antenna transmission-line connectors, to be used only when necessary.
** Cable or wire length required will depend on installation requirements.
† Manufacturer's number.

sharp bends do not exist, (3) when necessary, drip loops can be provided, and (4) the components are free to move on their shock mounts.

b. When soldering, use only noncorrosive flux or rosin-core solder, and clean off any rosin residue after the joint has set. Avoid using too much solder. Remove any sharp projections formed while soldering, to prevent high-voltage breakdown and possible short circuits.

c. Prepare AN-20 wires for attachment to connectors by removing 1/4-inch of insulation from the end of the wire. Tin the wire for a length of 3/16 inch from the end. Cut insulating tubing of sufficient length to cover wires from terminal to 1/2 inch inside cable clamp, and slip a piece of tubing on each wire.

d. Prepare shielded wire and RG-59/U cable by removing 1/2 inch of braided shield from the end. Tin 1/4 inch of braided shield for bonding purposes. Strip and tin inner conductor as in step c.

e. After the conductors have been soldered to the connectors, and the connectors have been reassembled, the cable assemblies should be subjected to continuity and insulation tests. Each cable should be checked for continuity between the corresponding contacts of the connectors. For the insulation test, use an insulation tester such as an Interstate type G, and check the resistance between each contact and its connector shell, and between each contact and every other contact of each connector. The insulation resistance should be at least 500 megohms.

f. Lace open-wire cabling with No. 6 lacing cord.

3-21. CABLE DETAILS.

3-22. POWER CABLE. Cut conductors to the required length, prepare them for soldering, and assemble them to connector P402, as shown in figure 7-6.

3-23. INTERCONNECTING CABLE. Cut the six conductors to the length required, and assemble them to the connectors and cable clamps, as shown in the assembly diagram, figure 7-6.

3-24. ANTENNA TRANSMISSION CABLES. Cut two lengths of RG-8/U radio-frequency cable as required for transmitting and receiving antenna transmission lines. The total of these two lengths should not exceed fifty feet for any installation. Make certain that the length to which each of the cables is to be cut includes sufficient allowance so that the cable which will normally be used to connect the receiving antenna to the RECEIVER ANTENNA receptacle on the receiver-transmitter is long enough to connect to the TRANSMITTER ANTENNA receptacle, and vice versa, for test purposes.

Note

The transmitter and receiver antenna transmission lines must not be run parallel, and must not be taped or laced together, since signal feed-through will cause an excessively wide transmitter pulse, which is almost impossible to zero accurately, and which makes the indications difficult to read at low altitudes.
When it is necessary to use a right-angle connector to facilitate installation, insert Adapter NT 49192 between the cable plug and the corresponding receptacle. However, this adapter should be used only when absolutely necessary.

3-25. Proceed to assemble the cables as instructed in figure 7-6.

3-26. PREPARATION FOR RESHIPMENT.

3-27. Whenever it is necessary to ship the SCR-718-C equipment, it is important that adequate steps be taken to prevent damage in shipment. The following general precautions should be observed:

a. Make sure that all tubes and plug-in-type items are secured.

b. Wrap all items, or place in sealed cartons to exclude dirt—if possible, use a waterproof inner wrapping.

c. Secure those items which are likely to be jarred loose during shipment, by means of tape or other material.

d. After receiver-transmitter and indicator are placed in shipping crate, use wooden blocks to prevent motion within the container.

e. If receiver-transmitter or indicator is shipped on mounting base, block up the shock mounts to restrict excessive motion within shipping container.

f. Cushion all items to distribute energy of shock.

g. Make sure that no damage is caused by protruding nails or other fastening devices while closing containers.

SECTION IV
THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. This section is divided into two parts in an effort to develop the theory of the SCR-718-C equipment in a logical, understandable manner. First, the general system operation will trace, briefly, the signal path through the entire equipment without regard for the physical arrangement of the various parts. The detailed circuit analysis will then treat, at greater length, the individual circuit theory by component.

4-3. GENERAL SYSTEM OPERATION.

4-4. INTRODUCTION.

4-5. The circuits of Radio Set SCR-718-C may be grouped, for analysis, to fit the basic radar pattern. In general then, all system functions will fall into one of the following classifications: timing, sweep development, indicating, transmitting, antenna, and receiving. The general explanation develops these functions in the order given.

4-6. TIMING AND SWEEP DEVELOPMENT.

4-7. The timing function in this system is handled by one stage, called the timing oscillator. This stage generates a crystal-controlled, 98.35-kc, sine-wave voltage on the times-one range, and a 9.83-kc voltage, essentially sine wave but not crystal controlled, on the times-ten range. Since these frequencies are widely separated, tuned circuits for both frequencies are employed in the following circle amplifier or sweep-development stage. See the block diagram, figure 4-1. The circle-amplifier output transformer is double-tuned. A sine-wave voltage is taken from the primary of the transformer and impressed upon one set of KRT deflecting plates. A second voltage, similar to the first but displaced in phase by 90 degrees, is coupled from the secondary of the transformer to the other pair of deflecting plates. The resulting time base or sweep which appears on the KRT screen is circular in form. At 98.35 kc (times-one range) the electron beam completes a single sweep in 10.17 μsec, which is equivalent to a radar range of 5000 feet. The 9.83-kc frequency (times-ten range) produces a 101.7-μsec sweep equivalent to a range of 50,000 feet. Therefore, the scale on the KRT is calibrated so that these ranges may be read directly.

4-8. TRANSMISSION.

4-9. The sine-wave output of the timing oscillator also controls transmitter-pulse forming circuits. The so-called clipper stage is really a ringing circuit which is excited by either the 98.35-kc or 9.83-kc signal. The low-Q plate tank is tuned to 400 kc, but only the first positive swing has sufficient amplitude to excite the driver stage, another ringing circuit. The 900-kc plate tank in this stage is highly damped, and, again, only the first positive peak excites the u-h-f oscillator. Note that the step up in frequency from stage to stage has no other purpose than to narrow the trigger pulse. The result is a transmitter pulse of 0.3-μsec duration with a recurrence frequency of either 98.35 kc or 9.83 kc. The frequency of transmission is 440 mc.

4-10. This r-f energy is directed principally toward the earth by the half-wave, dipole, transmitting antenna, with the skin of the aircraft acting as a reflector.

4-11. RECEPTION.

4-12. Some energy from the transmitted pulse is picked up directly by the receiving antenna. The energy that strikes the earth is reflected in part to the aircraft, and is likewise picked up by the receiving antenna. The difference in time between the two received pulses is directly related to the distance between the aircraft and the surface of the earth.

4-13. These radio-frequency pulses are mixed, amplified, and detected in a conventional superheterodyne receiver with six stages of intermediate frequency amplification. The detected pulses are amplified by the video stage, and are then impressed upon the radial deflecting electrode of the KRT. Thus, the pulses appear on the sweep, with the direct-path signal or reference pip at scale zero, and the reflected signal at a point on the scale related to the altitude of the aircraft. Receiver gain is controlled at the indicator.

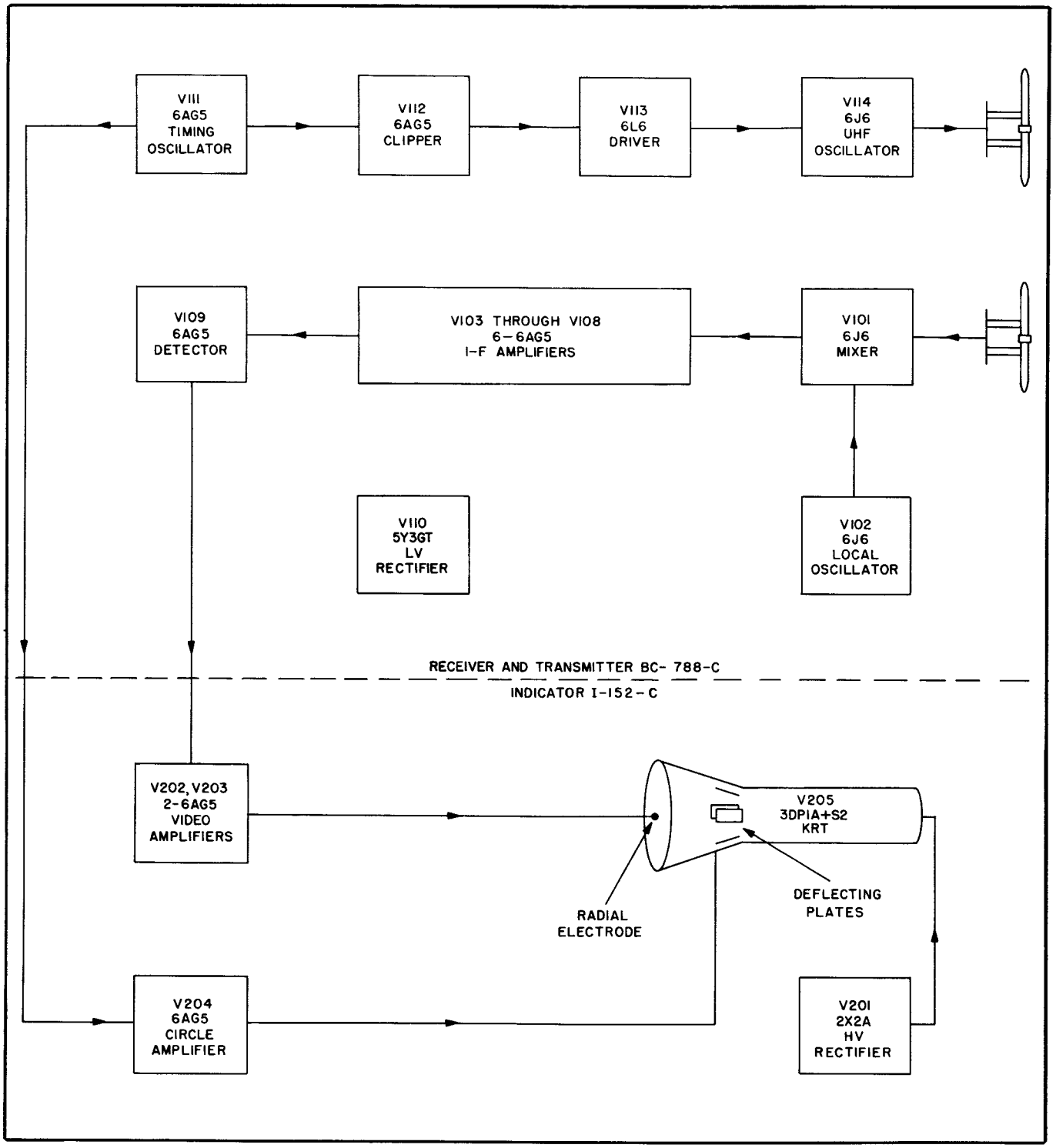


Figure 4-1. Radio Set SCR-718-C, Block Diagram

4-14. RADIO RECEIVER AND TRANSMITTER BC-788-C, DETAILED CIRCUIT ANALYSIS.

4-15. TRANSMITTER.

4-16. The transmitter section of SCR-718-C includes timing oscillator V111, clipper V112, driver V113, and u-h-f oscillator V114. The timing oscillator initiates the action, and therefore synchronizes both sweep and transmitter functions. The clipper and driver employ shock-excited plate-tank circuits designed to shape the transmitter pulse. The u-h-f oscillator must deliver periodic bursts of radio-frequency energy to the transmitting antenna.

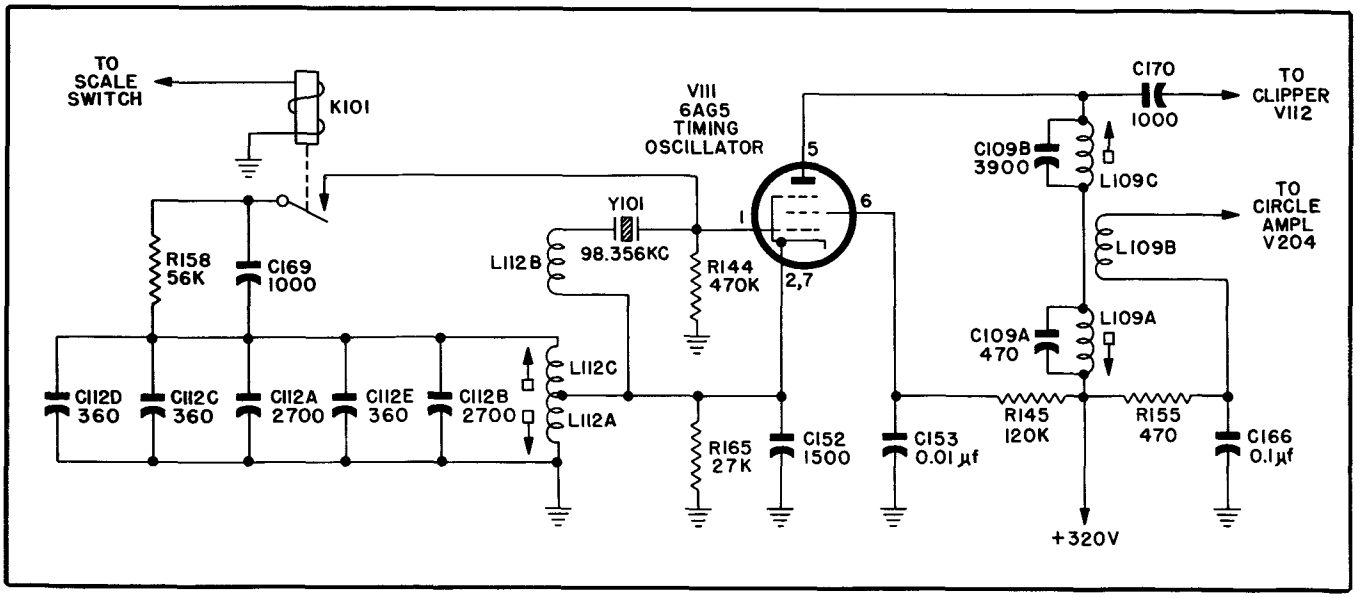


Figure 4-2. Timing Oscillator

4-17. TIMING OSCILLATOR. The timing-oscillator circuit employs a 6AG5 tube as an electron-coupled oscillator. Thus, the circuit is effectively an oscillator and power amplifier combined, and consequently demonstrates good frequency stability despite load or supply-voltage changes.

4-18. On times-one range, relay K101 is not energized, and the oscillator is crystal controlled. (See figure 4-2.) The crystal frequency is 98.356 kc ±0.05 percent, or nominally 98.35 kc, and the waveform is essentially a sine wave. The crystal acts as the tuned-grid circuit, L112A is the oscillator anode coil, and L109A combined with C109A constitute the power-amplifier tank circuit, which is tuned to the base frequency.

4-19. On times-ten range, with relay K101 energized, L112C is the grid coil, L112A the anode coil, and L109C with C109B constitute the power-amplifier tank. The crystal, while still connected, is ineffective at this low frequency.

4-20. A portion of the output of the timing oscillator is inductively coupled to the circle-amplifier input circuit, in the indicator, by way of L109B and shielded interconnecting wire F. Also, C170 couples the oscillator output voltage to the grid of the clipper stage.

4-21. CLIPPER. This circuit, which uses a 6AG5 tube, is essentially a ringing circuit. (See figure 4-3.) It begins a unique pulse-sharpening process

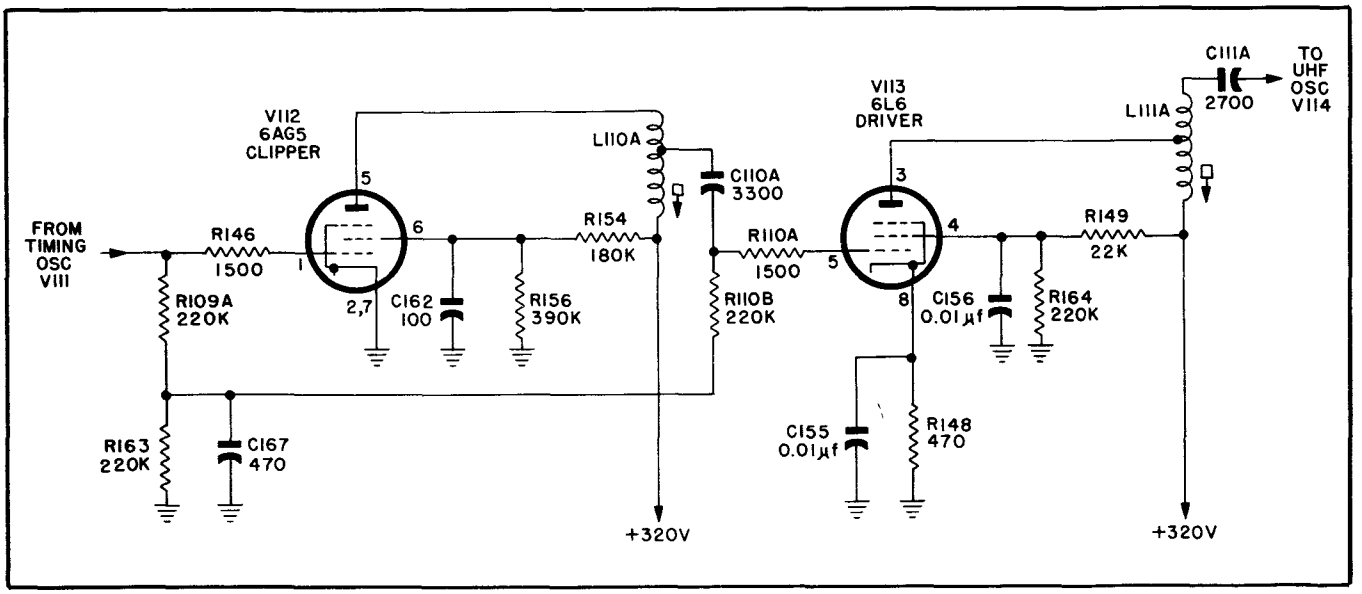


Figure 4-3. Clipper and Driver

by developing a 400-kc damped wave. This frequency is not related harmonically to the timing-oscillator frequency; the 400-kc value is determined solely by coil L110A and its distributed capacitance.

4-22. The cycle of events begins with the tube, V112, biased far beyond cutoff (over ten times the cutoff bias) by grid-leak action of both the clipper and the driver stages. Only the positive peak of the timing-oscillator sine wave, which is approximately 360 volts peak to peak, carries the clipper grid above cutoff; in fact; to a positive value with respect to the grounded cathode. As a result, a single pulse of plate current flows for a portion of each input cycle. This current pulse causes the plate tank to ring at its resonant frequency, which is 400 kc, regardless of the timing-oscillator frequency. The wave is damped by the resistance of the low-Q plate tank. While the voltage viewed at the plate of the clipper is this damped wave, only the peak of the first positive swing is used to excite the following stage; in this way the trigger pulse is reduced in width, and a one-to-one ratio exists between it and either the 98.35-kc or the 9.83-kc timing frequency.

4-23. DRIVER. A 6L6 tube, V113, is employed in this, the modulating stage, which is similar in many ways to the clipper. (See figure 4-3.) Its grid also is biased far beyond cutoff by grid-leak action. Cathode resistor R148 adds little to the cutoff bias, but acts to limit plate current in the event of excitation failure. Since only the first positive swing of the 400-kc input wave train has sufficient amplitude to take the grid above cutoff and into the positive region, one pulse of plate current per timing-oscillator cycle excites the plate-circuit tank, L111A, and its distributed capacitance. This tank is tuned to 900 kc, and the output wave train is heavily damped, so that only the first positive peak has sufficient amplitude to pulse the u-h-f oscillator. Note that clipper and driver stages are biased far beyond cutoff and are driven exceedingly hard, producing output waves that are unrelated in frequency to the input wave. Since only the peak of the first positive voltage swing from each of these stages is used, and since the frequency becomes progressively higher, the trigger pulse becomes progressively narrower. Figure 4-4 illustrates this pulse shaping effect together with the time relationship that exists between the several signals on the times-one range. On times-ten range the frequencies of the clipper, driver, and u-h-f oscillator are unchanged, but the frequency of the timing oscillator is reduced to one-tenth. In other words, the period of the wave is increased by ten, which means that there will be sufficient time between pulses for the clipper and driver waves to be damped completely. The recurrence rate of the transmitter pulse is dependent only on the frequency of the timing oscillator.

4-24. U-H-F OSCILLATOR. A twin-triode, 6J6 tube, V114, is used as a push-pull oscillator, and generates 440-mc signals when pulsed by the driver. (See figure 4-5.) A jumper links the two grids, and this together with the grid inductance and distributed capacitance form the tuned-grid circuit. Plate-circuit tuning is accomplished by using resonant lines with a movable shorting bar. This front-panel adjustment is lettered T. R-F energy is channeled to the antenna by way of a coupling loop which is placed in the vicinity of the resonant lines. The coupling can be varied by means of adjusting screw L129 on the top of the chassis. The antenna circuit is series tuned by C161 whose front-panel adjusting screw is labeled A.

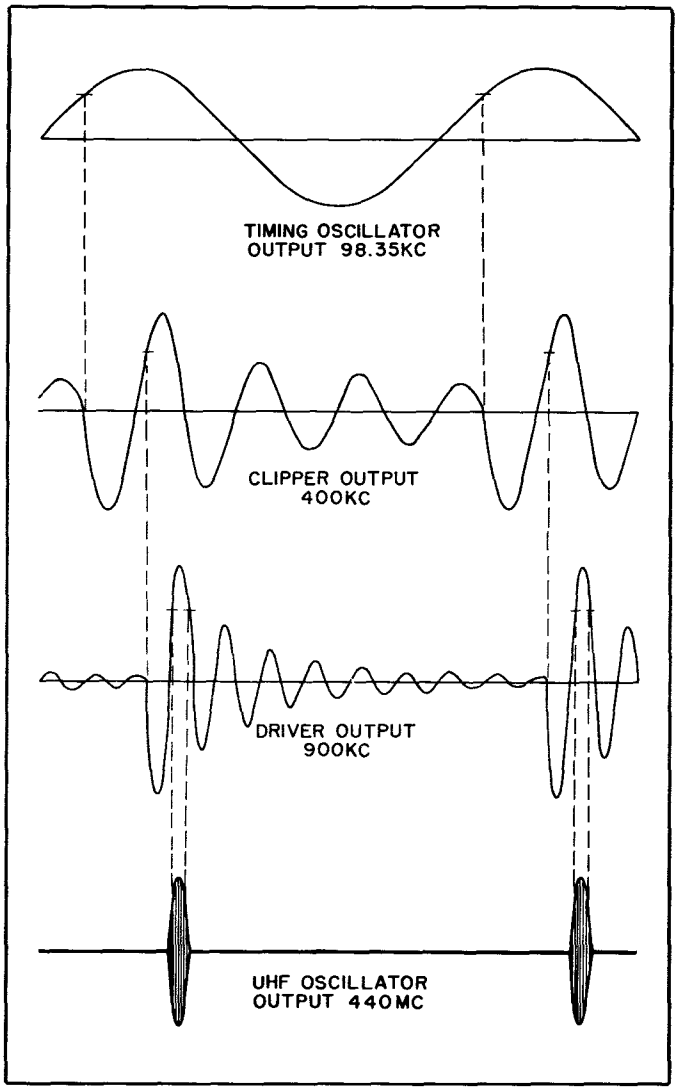


Figure 4-4. Transmitter Waveforms

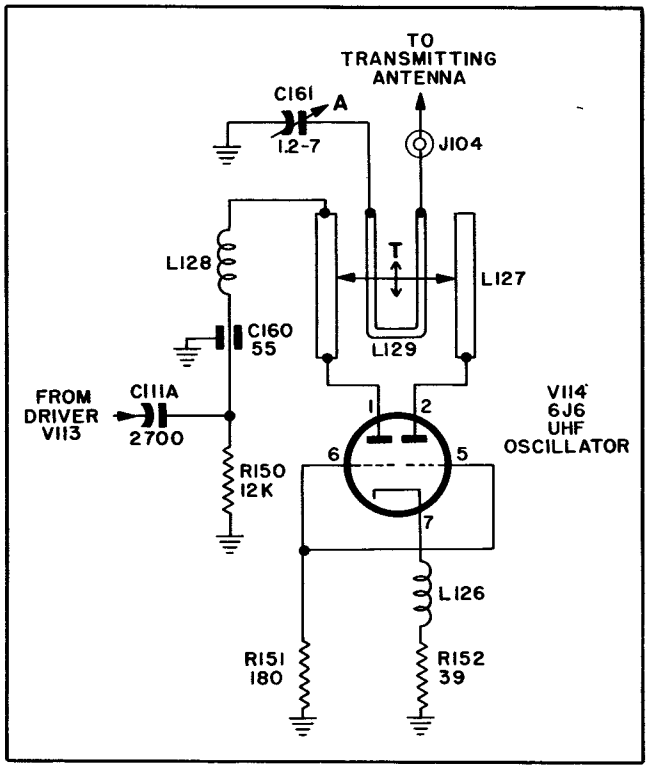


Figure 4-5. U-H-F Oscillator

4-25. The oscillator plates receive no B-supply voltage, but are powered entirely by the positive-going pulse from the driver. In fact, a voltmeter connected from plate to ground will indicate a small negative voltage, brought about by the residual charge on coupling capacitor C111A, which is not completely removed between pulses. Obviously, the driving pulse must have sufficient power to overcome this negative voltage and carry the plates positive before the oscillator will function. The u-h-f oscillator is pulsed for 0.3 μsec at either a 98.35-kc or 9.83-kc rate. The peak power is at least 7 watts on times-one range and at least 5 watts on times-ten range.

4-26. RECEIVER.

4-27. The superheterodyne receiver of SCR-718-C, with the exception of the video amplifier, is housed in Receiver-Transmitter BC-788-C. Included in this component are mixer V101, local oscillator V102, six i-f amplifiers V103 through V108, and detector V109. The individual circuit details are analyzed in the following paragraphs.

4-28. LOCAL OSCILLATOR. The triodes of the 6J6 tube, V102, are parallel-connected in this local-oscillator circuit. (See figure 4-6.) Resonant lines are employed as the tuning element, and frequency adjustment is made by moving the shorting bar with screw R, which is accessible through the front panel. The local oscillator is tuned to 410 mc, and is link-coupled to the mixer by L130.

4-29. MIXER. A second 6J6 tube, V101, is used to mix incoming signals with the local oscillator output. The grids are push-pull connected to resonant lines, which in this circuit have a semifixed shorting bar. Mixer input tuning is accomplished by means of variable capacitor C116, which is adjusted by screw C to 440 mc. The receiver antenna circuit is series tuned by variable capacitor C119, whose adjusting screw is labeled B. The antenna coupling to the mixer can be increased or decreased by turning the screw marked L-131 on the top of the chassis.

4-30. The mixer plates are parallel connected and the 30-mc beat frequency appears in the plate circuit across L102A. From here the signal is coupled to the first i-f amplifier, V103.

4-31. I-F AMPLIFIERS. The six identical i-f stages (V103 through V108) use 6AG5 tubes to amplify the 30-mc beat frequency. Cathode bias is used throughout, and receiver gain is controlled at the indicator by varying the screen-grid voltage of the first two stages. The i-f transformers are designed for an over-all bandwidth of 4 mc. Decoupling networks are provided in the filament and B-supply circuits to prevent regeneration.

4-32. DETECTOR. Another 6AG5 tube, V109, functions as the second detector. (See figure 4-7.) This tube is a pentode with the plate directly by-passed to ground for i-f signals by capacitor C148. The relatively high value of cathode resistor R159 causes the grid bias to limit normal plate current to a low value. Negative-going portions of the i-f signals are therefore cut off, whereas positive variations are faithfully reproduced. Filter network L122, C145, and C146 removes the r-f component, and the resulting pips that constitute the detector output proceed by way of C168 and coaxial cable G of the interconnecting cable to the video amplifier in the indicator.

4-33. LOW-VOLTAGE POWER SUPPLY.

4-34. The 115-volt, a-c input is fused by F101. (See figure 7-1.) Power transformer T101 receives power by way of wires B and C of the interconnecting cable only when switch S201, located in the indicator, is in the ON position. The filament winding of T101 supplies only those tubes located on the same chassis.

4-35. A 5Y3GT, full-wave rectifier V110, supplies B+ voltage to the entire equipment. (See figure 4-8.) Choke L132 and capacitors C149A and C149B filter the rectified voltage, which is then distributed to plate and screen circuits. The indicator receives B+ voltage by way of R155, L109B, and wire F of the interconnecting cable. (See figure 7-5.) It will be remembered that the r-f output of the timing oscillator reaches the indicator by way of this same shielded wire. Coaxial cable G of the interconnecting cable also serves

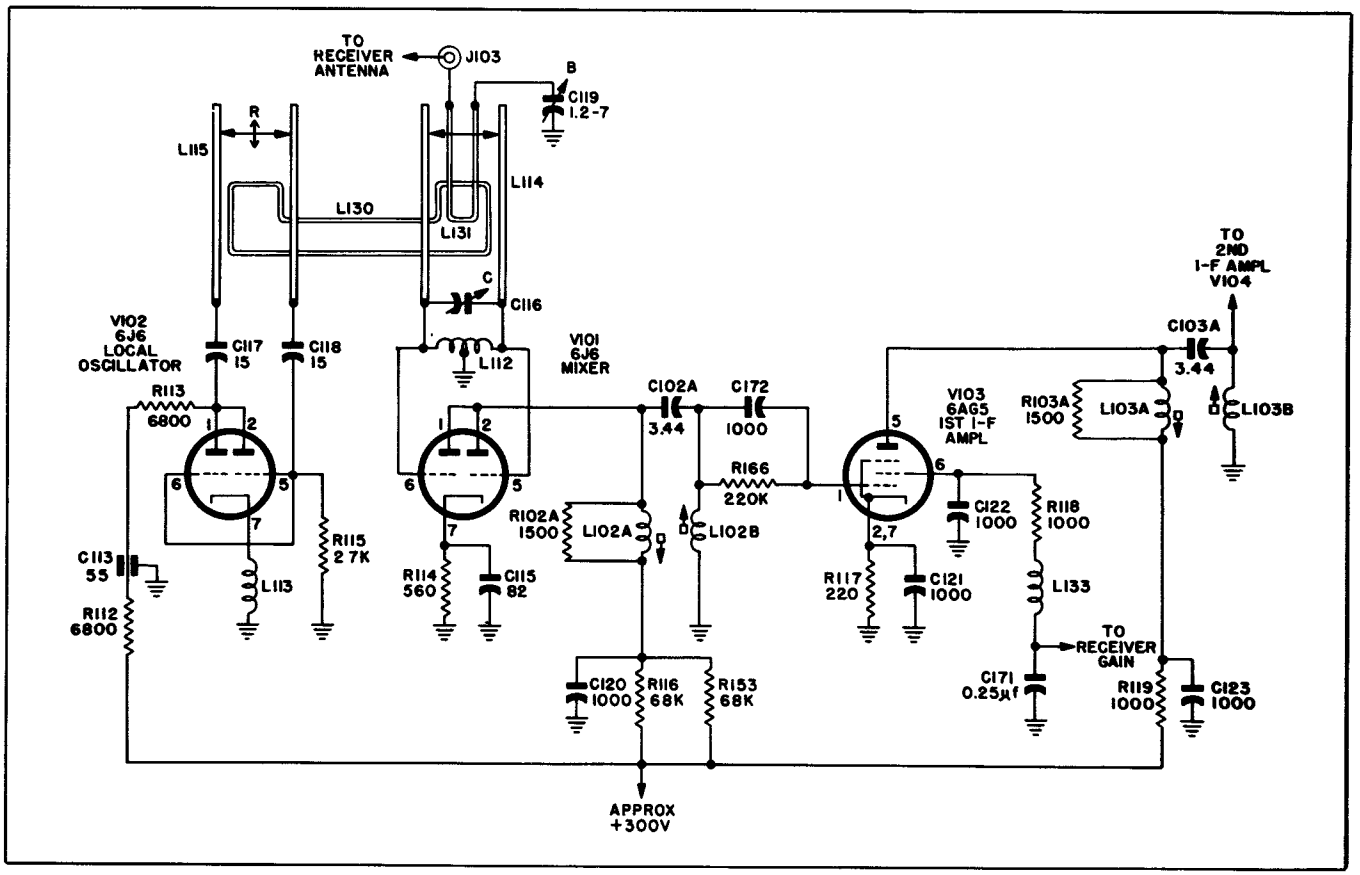


Figure 4-6. Local Oscillator, Mixer, and 1st I-F Amplifier

a dual purpose; in addition to carrying video signals to the indicator, it completes a B+ circuit through R160 and R161 to actuate relay K101 on the times-ten range.

4-36. INDICATOR I-152-C, DETAILED CIRCUIT ANALYSIS.

4-37. INTRODUCTION.

4-38. Indicator I-152-C contains four vacuum tubes and associated circuits in addition to the cathode-ray tube, V205. These tubes are: high-voltage rectifier V201, video amplifiers V202 and V203, and circle amplifier V204. The high-voltage rectifier supplies potentials required by the KRT, which acts as the indicator in this equipment. The circle amplifier increases the voltage of the timing signal that reaches the indicator, and also acts as a phase splitter. Since this voltage is used at the KRT to form a time base, the circle amplifier is considered as a sweep circuit. The video amplifier increases the amplitude of the detector output before this signal is applied to the KRT for presentation. Each of these circuits is examined in detail in the following paragraphs.

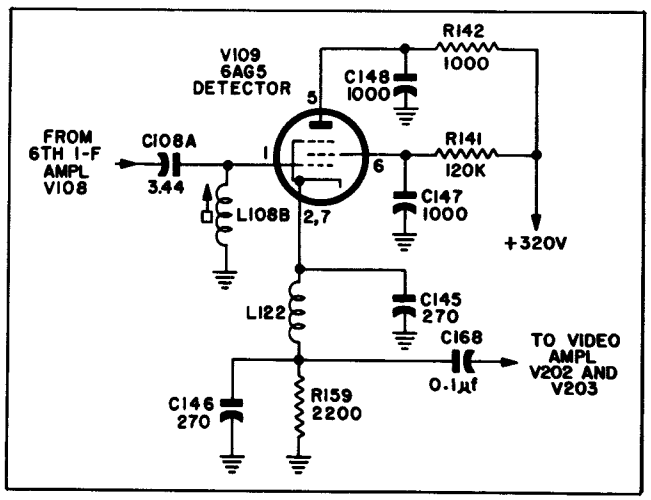


Figure 4-7. Detector

4-39. CIRCLE AMPLIFIER.

4-40. It will be remembered that the timing-oscillator signal and the B-supply voltage reach the indicator in combined form. (See figure 4-9.) Coils L202A and L204A act on this complex voltage, in conjunction with C202A, C213, and C204, as combination filter choke and transformer primary. The coils offer high impedance to the high-frequency component, whereas the capacitors offer low impedance. Therefore, the high-frequency component is filtered from the B voltage, but at the same time it induces voltages in secondaries L202B and L204B.

4-41. If the times-one range is selected, the fre-

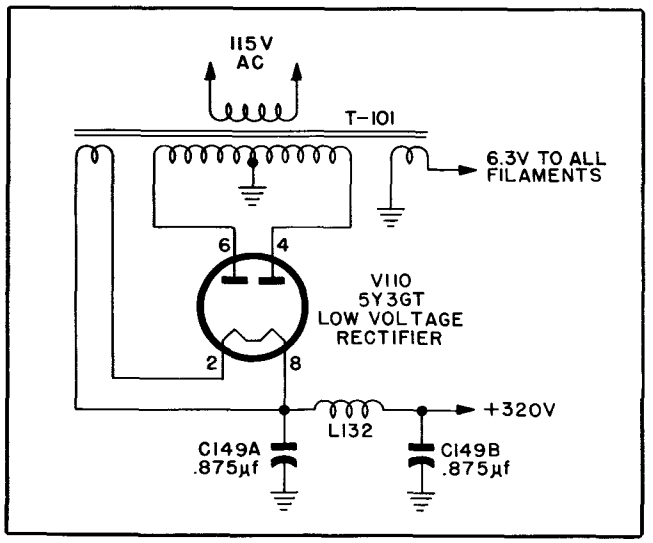


Figure 4-8. Low-Voltage Power Supply

quency of the timing oscillator is 98.35 kc, and a voltage at this frequency appears across the resonant circuit L202B and C205. The signal reaches the grid of the 6AG5 circle amplifier, V204, by way of potentiometers R240 and R213 (the former a screwdriver adjustment, the latter the CIRCLE-SIZE control), and SCALE switch S202. Core slugs in L202B and L204B are provided with knurled knobs so that the start of the sweep may be adjusted to correspond to scale zero. In the plate circuit, the amplified 98.35-kc signal appears across coils L203A and L203C, paralleled by C203D and C203A. The signal also is found across corresponding secondary coils L203B and L203D, which are paralleled by C203B and C203C. The impedance of the remaining tuned primary and tuned secondary is low at this frequency.

4-42. On times-ten range, the frequency of the timing oscillator changes to 9.83 kc, and the voltage appearing across L204B, at this frequency, is connected through S202 to the grid of V204. The CIRCLE SIZE control is effective on this range too. At this frequency, plate-circuit coil L205A and its parallel capacitors present high impedance, and a voltage appears across it and

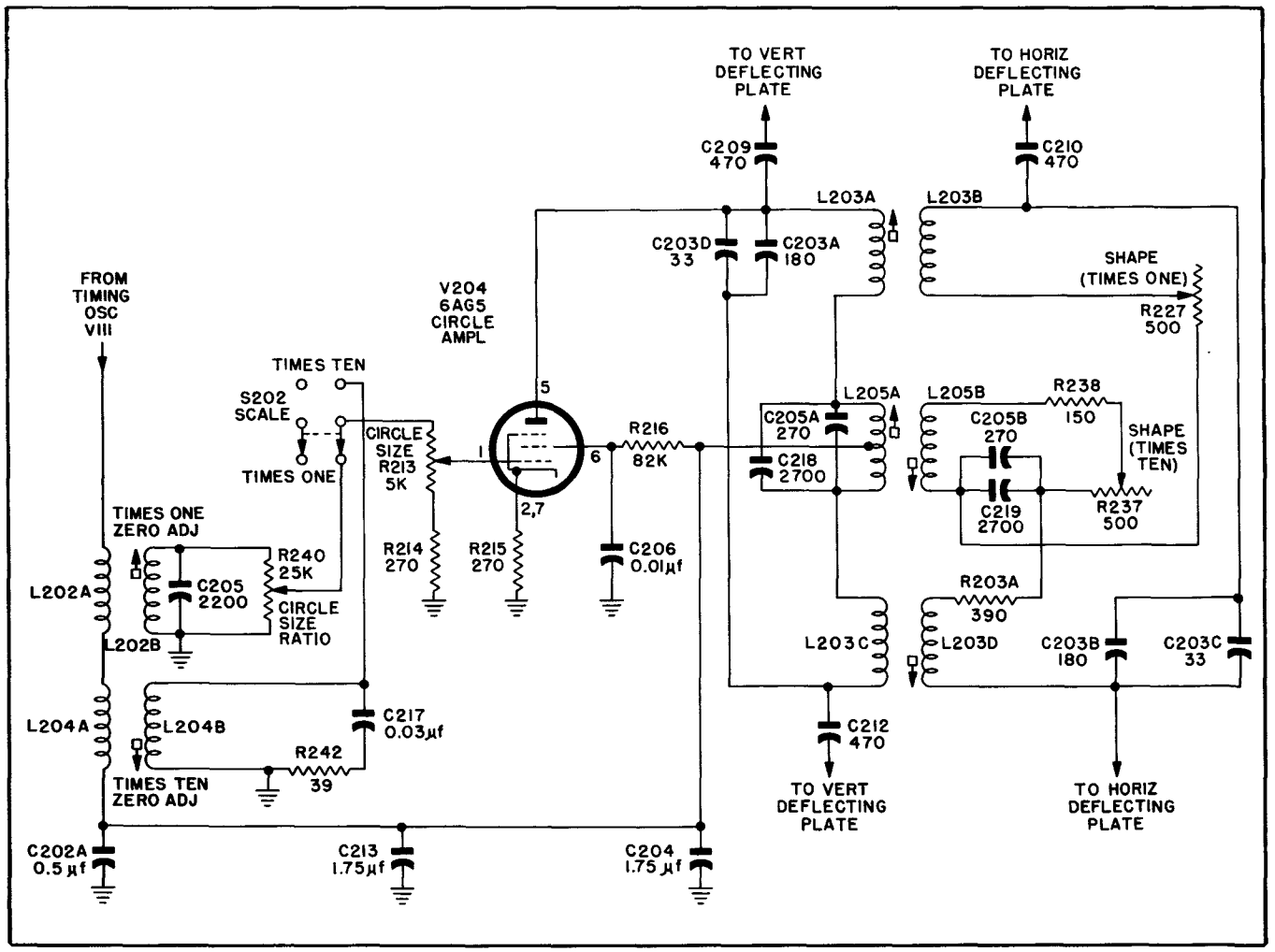


Figure 4-9. Circle Amplifier

the associated secondary resonant circuit. The output circuit of the circle amplifier provides push-pull voltages to the deflecting plates of the KRT; the outer primary terminals of the transformer couple to the vertical plates, the outer secondary terminals couple to the horizontal plates. The voltages across primary and secondary differ by 90 degrees. It is this 90-degree displacement of sine waves that causes the electron beam of the KRT to trace a circular path on the screen, assuming equal horizontal and vertical deflection. The shape controls, R227 and R237, permit the secondary output voltage to be adjusted so that horizontal and vertical deflection may be equalized. Adjustable powdered-iron cores are designed to tune the output-circuit inductances to resonance. The effect of fluctuating line voltage upon circle size is minimized by leaving cathode resistor R215 unby-passed.

4-43. VIDEO AMPLIFIER.

4-44. The output pulses from the detector are coupled from coaxial cable G to the grids of two parallel-connected 6AG5 tubes, V202 and V203. (See figure 4-10.) Peaking coil L204 is placed in the plate circuit to improve the high-frequency response of the amplifier, and thus maintain the steep leading edge of the pulses. The input signal pulses are positive going; the output pulses, coupled to the radial electrode of the KRT, are therefore negative. A negative signal applied to this electrode will cause the electron beam, which is describing a circular path, to be repelled; therefore, the video pips distort portions of the circle toward the outer edge of the tube face. The leading edge of the reference pip, representing time zero, is positioned at scale zero. The position of the echo pip then is related to the altitude of the aircraft.

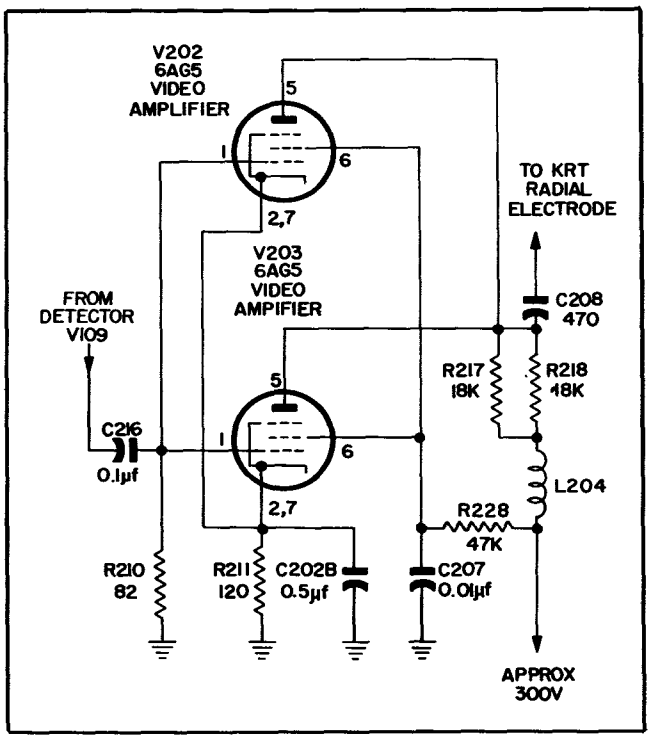


Figure 4-10. Video Amplifier

4-45. CATHODE-RAY TUBE.

4-46. The indicating device in this equipment is a cathode-ray tube, type 3DP1A+S2. It is similar to the common three-inch, electrostatic KRT except for the radial electrode which protrudes through the tube face. This unusual electrode is a rod which extends from the center of the screen toward the electron gun. It functions just as the other four deflecting plates do, and carries the same average potential. (See figure 4-11.) Vertical and horizontal-centering controls R225 and R222 are provided to position the presentation; brilliance and focus controls are provided to control the electron beam.

4-47. HIGH-VOLTAGE POWER SUPPLY.

4-48. Power transformer T201 receives power from leads D and B of the interconnecting cable and power switch S201 (figure 7-1), and supplies all filaments in the indicator and indicator lamp I201. It also supplies high voltage to the 2X2A rectifier, which develops —1500 volts across the voltage divider that includes the brilliance, focus, and centering controls. (See figure 4-11.) Filtering is accomplished by resistor R204 and capacitors C201A and C201B. The highly negative voltage is applied to the cathode of the KRT, therefore, the radial-deflecting electrode on the face of the tube may be operated at a low potential above ground, a desirable safety factor.

4-49. CONTROL CIRCUITS.

4-50. The d-p-d-t SCALE switch, S202, controls two circuits in changing the range from times one to times ten. (See figure 7-5.) In the times-one position, resistor R234 is returned to ground, so that coaxial cable G has a zero-voltage reference and simply carries video signals between components. The circle-amplifier input circuit, also controlled by S202, is described in paragraph 4-40. In the times-ten position, S202 connects B+ from wire F through R235, R236, and R234 to coaxial cable G, to eventually actuate the relay in the receiver-transmitter and thereby change the frequency of the timing oscillator.This places a d-c voltage on coaxial cable G, which must also carry video signals. It is for this reason that coupling capacitors are found at each end of the cable G, to prevent the d-c relay-actuating potential from interfering with the detector and video circuits.

4-51. Receiver gain is controlled by means of a voltage divider (consisting of R229, R230, R232, and receiver gain control R201) which connects

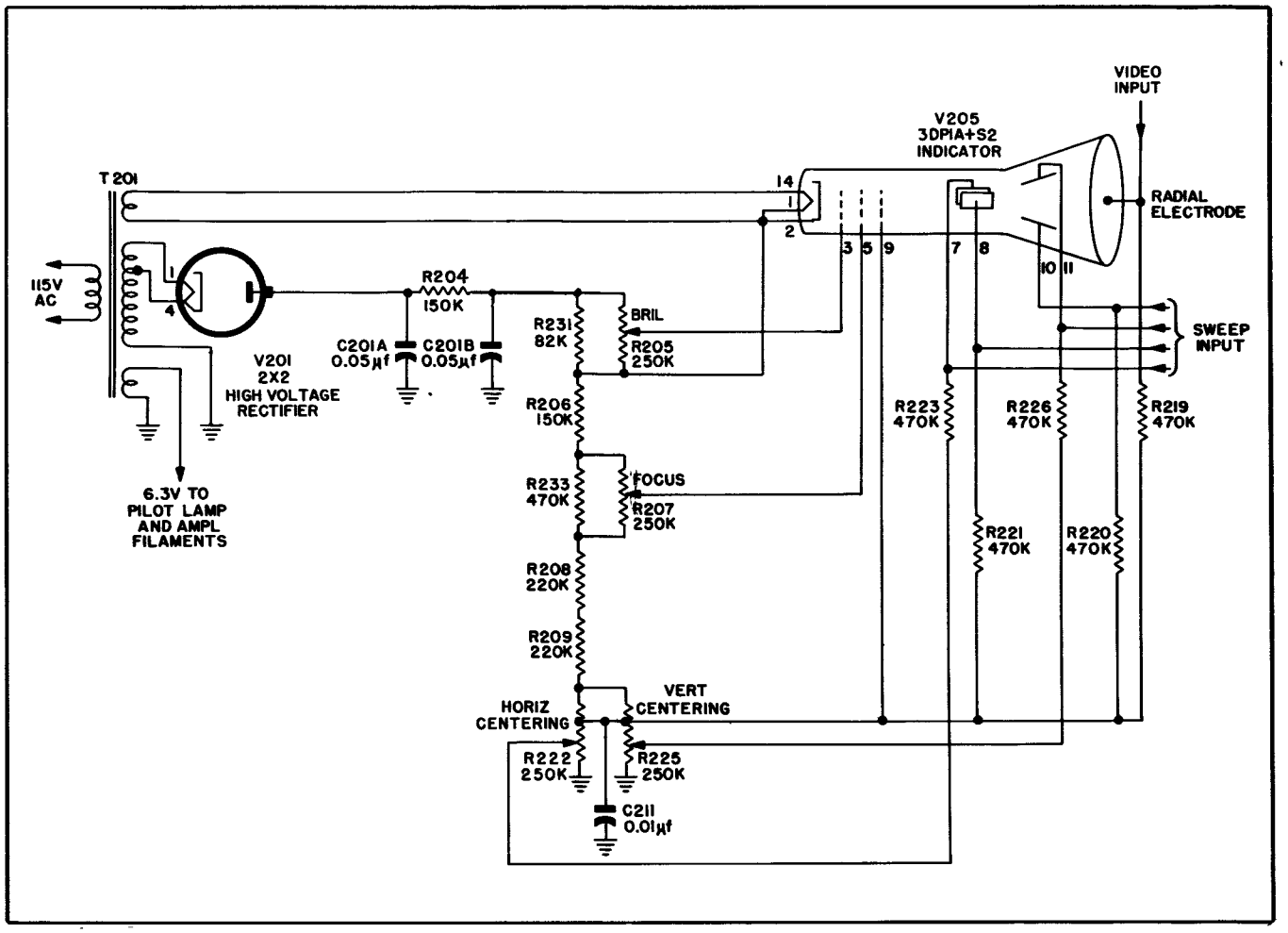


Figure 4-11. High-Voltage Circuits

from B+ to ground. The contact arm of R201 picks off a voltage which is fed over wire A of the interconnecting cable to the screen grids of the first two i-f stages of the receiver.

4-52. ANTENNA AT-4/ARN-1, DETAILED ANALYSIS.

4-53. The SCR-718-C altimeter requires two separate but identical antennas, one for transmitting, and one for receiving. The antennas are half-wave dipoles, mounted on the underside of the aircraft in such a way that direct coupling between the two is minimized. Since the driven element is spaced one-quarter wavelength from the skin of the aircraft, the skin acts as a reflector to increase the gain of the antenna in a vertical direction downward. (See figure 4-12.) The antennas are coupled to the receiver-transmitter by 52-ohm RG-8/U coaxial cable.

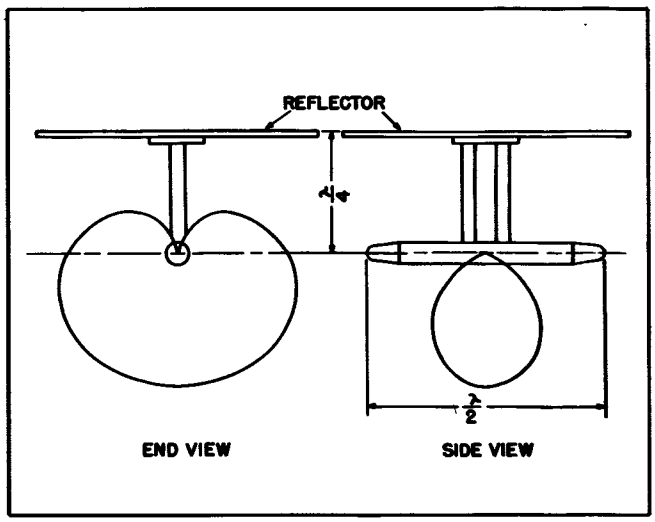


Figure 4-12. Antenna Radiation Pattern

SECTION V
ORGANIZATIONAL AND OPERATIONAL MAINTENANCE

5-1. INTRODUCTION.

5-2. This section provides instructions essential for maintenance of Radio Set SCR-718-C by Organizational and Operational maintenance activities. Before attempting to service and test this equipment, maintenance personnel should be thoroughly familiar with the physical make-up of the equipment and reasonably familiar with its theory of operation.

5-3. Organizational and Operational maintenance of the equipment is based on periodic inspections, to be performed immediately before each flight, after each flight, and at other stated intervals. A preflight check of SCR-718-C should be made, beginning with paragraph 5-21, before the aircraft takes off for each mission. This will ascertain that the equipment is securely fastened and will function properly in flight. The postflight check, beginning with paragraph 5-26, provides for thorough inspection of the equipment in the aircraft following its use in flight. The routine check, which begins with paragraph 5-32 is more detailed than either the preflight or postflight inspection. The routine check should be performed by maintenance personnel whenever deemed necessary by the authority responsible for proper functioning of the equipment.

5-4. Defects disclosed during these inspections can be localized by following the associated trouble references. If circumstances require the use of additional tests or equipment, refer to the system-trouble-analysis tables, paragraph 5-49, which include the necessary procedural steps. The purpose of this trouble-shooting procedure is to quickly determine the portion of the equipment in which the fault exists. After localizing the trouble, maintenance personnel can determine what action, depending upon the time element, should be taken to eliminate it. More detailed trouble-shooting information, whereby the trouble is isolated to a single circuit or part, is given in Section VI of this handbook.

5-5. When attempting to localize trouble in the aircraft, the antenna system and the interconnecting cables are checked first. If these prove normal, it is then necessary to determine whether the receiver-transmitter or the indicator is at fault. Since the components in question are small, lightweight, and easily removed, it is suggested that trouble shooting be expedited by replacing one or the other component to clear the trouble. If spare SCR-718-C equipment is not available, removal of the receiver-transmitter and the indicator to a test bench is recommended; here the routine checks can be followed to isolate the faulty component.

5-6. TEST POINTS.

5-7. A system of test-point identification by symbols is used throughout Sections V, VI, and VII. These symbols quickly point out the location and importance of test points.

5-8. MAJOR TEST POINTS.

5-9. Star-enclosed Arabic numerals, for example ①, ②, are used to designate points for localizing the trouble to an over-all function of the radar equipment, or to a power or voltage-distribution system of the equipment.

5-10. SECONDARY TEST POINTS.

5-11. Encircled capital letters, for example, Ⓐ, Ⓑ, are used to designate test points for isolating the trouble to a group of circuits within a component.

5-12. MINOR TEST POINTS.

5-13. Capital letters followed by Arabic numerals and encircled, for example, Ⓐ①, Ⓐ②, are used to designate test points for isolating the trouble to a specific circuit of a component or assembly.

5-14. Normally, only major and secondary test points are used in Section V. Minor test points, as well as major and secondary test points, are used in Section VI; they also appear in various diagrams in Section VII for reference and identification purposes.

5-15. USE OF TEST EQUIPMENT.

5-16. The testing of SCR-718-C is greatly facilitated by the proper use of applicable test equipment. The following brief information is provided to aid in the use of this test equipment; but for complete information concerning the operation or maintenance of any piece of test equipment, reference should be made to its handbook.

5-17. TEST SETS TS-10B/APN AND TS-10C/APN.

5-18. These test sets can be used in conjunction with SCR-718-C to check loop sensitivity (also known as system performance figure), make transmitter and receiver adjustments, and check the antenna system.

5-19. TEST SET TS-23/APN.

5-20. This test equipment was designed specifically for the SCR-718-C equipment to meter B voltage, to check transmitter power output and frequency, and to present the transmitter-pulse wave shape on the SCR-718-C indicator for observation.

5-21. PREFLIGHT CHECKS.

5-22. VISUAL INSPECTION.

5-23. Make a complete visual inspection of the equipment, giving special attention to the following:

a. Be certain that both components are securely mounted. See that the four slide fasteners on the front of the receiver-transmitter are completely engaged and safety-wired, and that the knurled mounting nut secures the indicator and is safety-wired.

b. See that all cable connectors are firmly seated, and hand-tighten the locking ring on each connector.

c. Make certain that connecting cables and other objects do not interfere with the free movement of the shock-mounted components.

5-24. OPERATIONAL CHECK.

5-25. Check the operation of the equipment by performing each step of TABLE 5-1 in order. If any step reveals an abnormal condition, perform those test or replacements listed in the right-hand column until the trouble is isolated. After the fault is corrected, repeat the step at which the abnormal condition was first observed, then continue with the operational check.

TABLE 5-1
PREFLIGHT OPERATIONAL CHECKS

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
1	SCALE to TIMES ONE. Power switch to ON.	Indicator lamp lights.	Replace fuse F101 and lamp I201. Check primary a-c supply. Check wires B, C, and D of interconnecting cable for continuity, short circuits, or grounds. Replace indicator and/or receiver-transmitter.
2	Hold Indicator ID-98/APN or ID-98A/APN (part of TS-10B/APN or TS-10C/APN) parallel to and approx 6 in. from each antenna.	Test indicator lamp glows when held near the antenna which is transmitting.	Check transmitter function as directed in TABLE 5-4.
3	Rotate CIRCLE SIZE.	Circular sweep appears on KRT approx 20 seconds after power is applied. Adjust CIRCLE SIZE to place circular sweep just outside calibrated circle.	Advance BRIL. Check wires F, E, and A of interconnecting cable for continuity, short circuits, or grounds. Replace indicator and/or receiver-transmitter.
4	Adjust BRIL., FOCUS, VERT. CENTERING and HORIZ. CENTERING, as required.	Bright, sharp, centered circle.	Indicator is defective.

TABLE 5-1 (Continued)

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
5	Advance REC. GAIN.	Reference pip appears on circular sweep. Adjust TIMES ONE ZERO ADJ. to move leading edge of reference pip to zero calibration mark.	Check wires G and A of interconnecting cable for continuity, short circuits or grounds. Check receiver antenna and coaxial cable as directed in TABLE 5-5.
6 Part I	SCALE to TIMES TEN. Adjust TIMES TEN ZERO ADJ. to position reference pip at zero calibration mark.	Narrower reference pip.	Replace indicator and/or receiver-transmitter.
Part II		Circular sweep is reduced in size.	If circle size is abnormal, perform circle-size adjustment as directed in paragraph 5-62. If circle size is still abnormal, or sweep is not circular, indicator is defective.
7	Advance REC. GAIN fully clockwise. After completion of this test, throw SCALE to TIMES ONE.	Grass appears on entire circular sweep.	Replace indicator and/or receiver-transmitter.

5-26. POSTFLIGHT CHECKS.

5-27. VISUAL INSPECTION.

5-28. Make a thorough visual inspection of the equipment, giving particular attention to the following items:

a. See that the antennas are undamaged, securely mounted, and clean.

b. Continue visual inspection as directed in paragraph 5-22.

5-29. PERFORMANCE CHECK.

5-30. Give the equipment a complete performance check, using the following procedure:

a. Check the a-c supply; the reading should be 115 ±10 volts.

b. When, during the following performance checks, the equipment is operating normally, test all cable connections by observing the indicator pattern while gently moving the end of each cable. An erratic pattern will result if cable connections are loose or short-circuiting. In addition, tap the two components to be certain that a normal pattern will not be disturbed by vibration.

c. Perform all steps in TABLES 5-1 and 5-2. Proceed through both charts in numerical order, and follow references in the event of abnormal indication. Once the cause of trouble has been cleared, repeat the step at which the normal indication was first observed, and continue through the chart.

TABLE 5-2
POSTFLIGHT PERFORMANCE CHECKS

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
1	Transpose coaxial cables which connect to receiver-transmitter. Hold indicator ID-98/APN or ID-98A/APN parallel to and approx 6 in. from each antenna.	Test indicator lamp glows when held near antenna normally used to receive.	Receiving antenna and/or associated coaxial cable is defective.

TABLE 5-2 (Continued)

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
2	Connect TS-10B/APN or TS-10C/APN as described in paragraph 5-38 step b. Advance REC. GAIN as required.	Echo pip appears at 350 ± 25-foot mark on KRT.	Replace indicator and/or receiver-transmitter.
3	REC. GAIN fully clockwise. Increase attenuation to reduce echo pulse to height of ¼ inch (the length of the 500-foot marker).	63 db minimum	Perform receiver tuning adjustments as directed in paragraph 5-56. If indication is still abnormal, replace indicator and/or receiver-transmitter.

5-31. Secure the equipment by disconnecting the test set and reconnecting the antennas to the receiver-transmitter. Look for the reference pip on the indicator, then turn the power switch to OFF.

5-32. ROUTINE CHECKS.

5-33. VISUAL INSPECTION.

5-34. Perform a detailed inspection of the entire equipment, giving particular attention to the items that follow:

a. Carefully examine the two antennas for damage, and see that they are securely mounted. Remove any paint or dirt from the porcelain insulators. If possible, inspect and hand-tighten the cable connection at the base of each antenna.

b. Examine all cables for chafing and strain, and see that the cables are properly supported and clamped.

c. Remove all connectors from components, and inspect connectors for cleanliness.

d. Remove the two components from their mounting racks, clean the mounting racks and see that they are securely fastened. Be certain that the fasteners on the mounting racks are undamaged and function normally.

e. Place the components on test bench, and remove the dust covers. Inspect each chassis for obvious signs of trouble, such as accumulated dirt, corrosion or fungus; loose, damaged, or overheated parts; chafed, broken, or burned insulation; and damaged or dirty connectors.

5-35. PRELIMINARY TEST.

5-36. The following tests may be performed before connecting cables to the components:

a. Test fuses, indicator lamp, and all vacuum tubes.

b. Actuate relay K101 by hand to be sure that the armature is free to move, and that the contacts make, wipe, and break correctly.

5-37. GENERAL EQUIPMENT OPERATION.

5-38. Subject the equipment to an over-all operational check as follows:

a. Link receiver-transmitter and indicator using the cables of Test Set TS-23/APN. Turn TEST SWITCH of test set to NORMAL-B+; the altimeter will then operate just as it would with a standard interconnecting cable.

b. Connect Test Set TS-10B/APN or TS-10C/-APN to receiver-transmitter as follows: Connect TRANSMITTER ANTENNA to D-HIGH of test set, using 8-foot cable CA-103 or CG-108/APN. Connect chain end of Attenuator L-101-A to A-LOW. Use the second 8-foot cable to connect other end of attenuator to RECEIVER ANTENNA. Connect 12-inch cable between B-LOW and C-HIGH. Set attenuator at 63. Figure 5-1 illustrates the complete test setup.

WARNING

Operation of this equipment involves high voltages which are dangerous to life. Observe safety precautions at all times. Do not change tubes or make connections or repairs with the power on. Always turn the equipment off first, and remove the a-c input connector. Dangerous potentials may exist in circuits even when the power switch is in the off position. Always discharge and ground circuits before servicing.

c. Proceed with routine operational checks, beginning with step 1 of TABLE 5-3. Continue through the chart in numerical order, following the references in the event of an abnormal indication. After a trouble has been corrected, reconnect cables, repeat the step at which the abnormal indication was first observed, and continue through the chart.

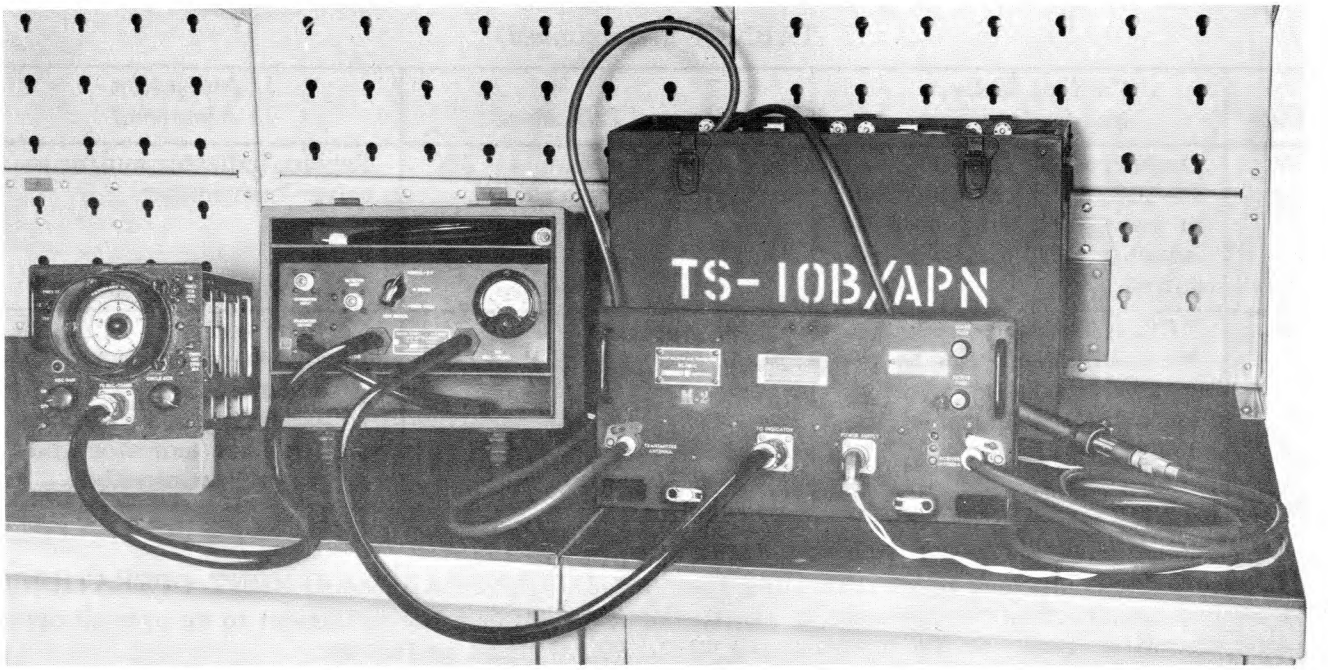


Figure 5-1. Bench-Test Setup, Using Test Sets TS-23/APN and TS-10B/APN

TABLE 5-3
ROUTINE OPERATIONAL CHECKS

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
1	SCALE to TIMES ONE. Power switch to ON.	Indicator lamp and tubes glow.	Check primary a-c supply. Check primary a-c power distribution beginning with step 1 of TABLE 5-6.
2	No change in settings.	320 volts, approx (red line) on TS-23/APN meter.	Check primary a-c supply voltage. It should be 115 ±10 volts. Check 320-volt distribution as directed in TABLE 5-7.
3	Rotate CIRCLE SIZE.	Circular sweep appears on KRT approx 20 seconds after power is applied.	Advance BRIL. Check 98-kc distribution by performing step 1 of TABLE 5-8. If sweep is not circular, perform circle-shape adjustment (times-one range) as directed in paragraph 5-58. If indication is still abnormal, indicator is defective.
4	Adjust CIRCLE SIZE to place circular sweep just outside calibrated circle.	Bright, sharp, centered circle.	Adjust BRIL., FOCUS, VERT. CENTERING and HORIZ. CENTERING. If indication is still abnormal, indicator is defective.
5	Advance REC. GAIN.	Reference pip and echo pip appear on circular sweep.	Check transmitter and receiver functions, beginning with step 1 of TABLE 5-10.

TABLE 5-3 (Continued)

Step	*Control Settings and Instructions*	*Normal Indication*	*If Indication Is Abnormal*
6	Adjust TIMES ONE ZERO ADJ. to move reference pip 200 feet either side of zero.	Size of circle does not change appreciably.	Perform zero adjustment (times-one range) as directed in paragraph 5-60. If indication is still abnormal, indicator is defective.
7 Part I	Return reference pip to zero. SCALE to TIMES TEN.	Relay K101 actuates.	Check relay function as directed in TABLE 5-9.
Part II		Circular sweep is reduced in size.	If circle size is abnormal, perform circle-size adjustment as directed in paragraph 5-62. If sweep is not circular, perform circle-shape adjustment (times-ten range) as directed in paragraph 5-59. If indication is still abnormal, indicator is defective.
Part III		Narrower reference pip.	Receiver-transmitter is defective.
Part IV	Adjust TIMES TEN ZERO ADJ. to move reference pip 1500 feet either side of zero. Return reference pip to zero after performing check.	Size of circle does not change appreciably.	Perform zero adjustment (times-ten range) as directed in paragraph 5-61. If indication is still abnormal, indicator is defective.

5-39. Return SCALE switch to TIMES ONE position, and proceed with operational checks of the equipment.

5-40. Check transmitter frequency as directed in paragraph 5-54. If peaking cannot be achieved by the prescribed adjustments, the receiver-transmitter is defective.

5-41. Check transmitter power output as directed in paragraph 5-55. If the prescribed specifications cannot be met, the receiver-transmitter is defective.

5-42. Check transmitter pulse shape by means of Test Set TS-23/APN, as follows:

a. Turn TEST SWITCH of test set to SIGNAL.

b. Connect cable CD-800 from TRANSMITTER ANTENNA of receiver-transmitter to DETECTOR INPUT of test set.

c. Observe pulse on the indicator. It should be approximately ¼ inch high and 200 feet wide at the base. (See figure 5-2.) If the pulse is abnormal, or if a secondary pulse appears about 500 feet to the right of the main pulse, the receiver-transmitter is defective.

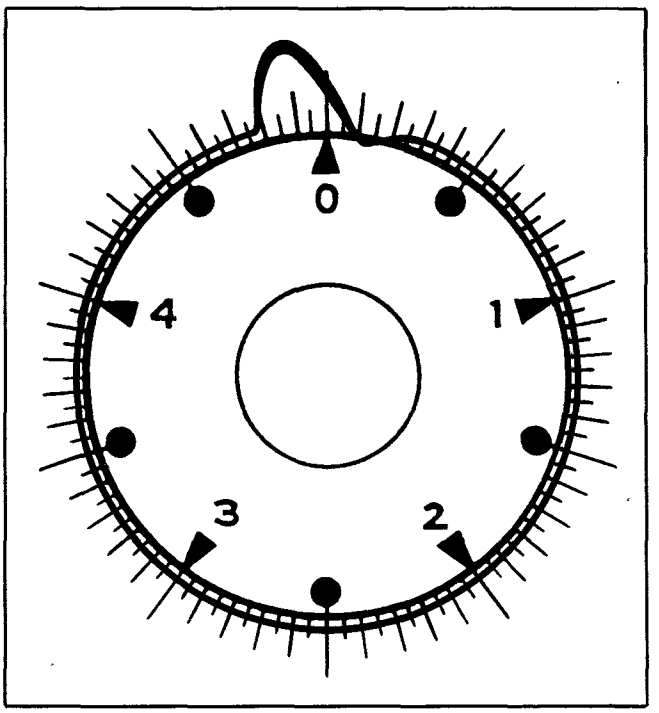


Figure 5-2. Shape of Transmitter Pulse

5-43. Check loop sensitivity of the equipment, utilizing Test Set TS-10B/APN or TS-10C/APN as follows:

a. Advance REC. GAIN fully clockwise.

b. Adjust test-set attenuator to obtain an echo pip ¼ inch high (the length of the 500-foot calibration marker). The attenuator should read at least 63. If it does not, perform receiver tuning adjustments as directed in paragraph 5-56. If the specifications cannot be met, the receiver-transmitter is defective.

5-44. Check sweep calibration by means of Test Set TS-10B/APN or TS-10C/APN as follows: With no change in settings, observe distance between leading edge of reference pulse and leading edge of echo pulse. (See figure 5-3.) This distance should be 350 ±25 feet. If it is not, the receiver-transmitter is defective.

5-45. REASSEMBLY AND FINAL CHECK.

5-46. Check interconnecting cable as directed in paragraph 3-20, step e.

5-47. Reinstall components in the aircraft. Check supply voltage, and perform preflight operational check, beginning with step 1 of TABLE 5-1.

5-48. Secure equipment by turning the power switch to OFF.

5-49. SYSTEM TROUBLE ANALYSIS.

5-50. Step-by-step trouble-analysis procedures, intended to localize trouble to a component are contained in TABLES 5-4 through 5-10. These tables do not constitute a complete test procedure in themselves; they are to be used only when referenced in the preflight, postflight, or routine tables. Accompanying the tables are simplified block diagrams showing the various components with pertinent terminals or contacts, and test points.

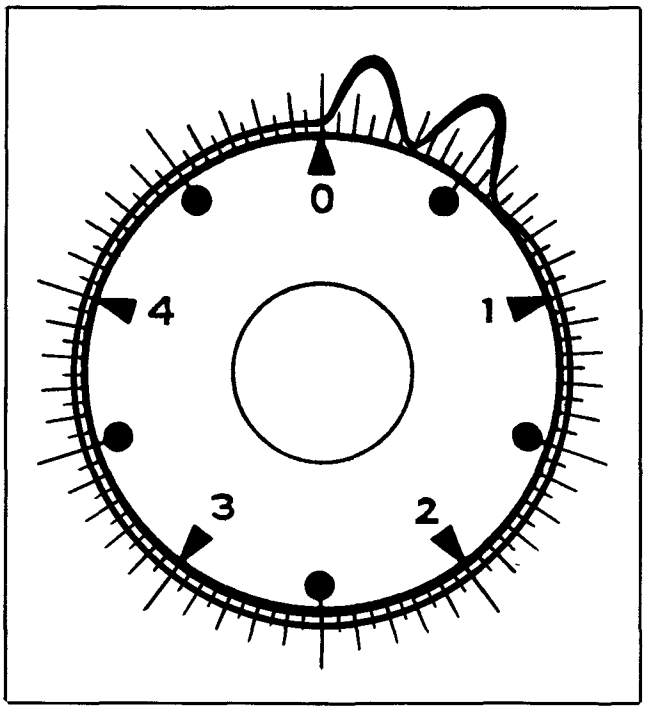


Figure 5-3. Sweep Calibration Pattern

CAUTION

Do not operate the equipment for a period longer than five minutes with the transmitter improperly terminated. Although Antenna AT-4/ARN-1 constitutes a proper termination for the transmitter, its use in the service shop is not recommended because of undesirable radiation. Test Set TS-10B/APN, TS-10C/APN or TS-23/APN is recommended since it provides a nonradiating termination for the transmitter.

TABLE 5-4
TRANSMITTER FUNCTION, SYSTEM TROUBLE ANALYSIS

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	Indicator ID-98/APN or ID-98A/APN	Remove coaxial cable from TRANSMITTER ANTENNA. Connect 6-in. piece of wire to center contact of TRANSMITTER ANTENNA. Hold test indicator parallel to and approx 6 in. from this wire.	Test indicator lamp glows.	Transmitting-antenna and/or associated coaxial cables are defective.	Check wires C, F, and A of interconnecting cable for continuity, short circuits, or ground. Replace indicator and/or receiver-transmitter.

TABLE 5-5
RECEIVER ANTENNA AND COAXIAL CABLE, SYSTEM TROUBLE ANALYSIS

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	Indicator ID-98/APN or ID-98A/APN	Transpose receiver and transmitter coaxial cables. Hold test indicator parallel to and approx 6 in. from the receiving antenna.	Test indicator lamp glows.	Replace indicator and/or receiver-transmitter.	Receiver antenna and/or associated coaxial cable are defective.

TABLE 5-6
PRIMARY A-C POWER DISTRIBUTION, SYSTEM TROUBLE ANALYSIS
(Figure 5-4)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	① Pins B and D of J101	A-C voltmeter (250-volt range)	Remove TS-23/APN cable from receiver-transmitter. Measure voltage at test points.	115±10 volts	Proceed with step 2.	Recheck fuse F101. If indication is still abnormal, receiver-transmitter is defective.
2	Visual check	None	Remove P-402. Jumper B and C of J101. Replace P-402.	Tubes in receiver - transmitter light.	Indicator is defective.	Receiver-transmitter is defective.

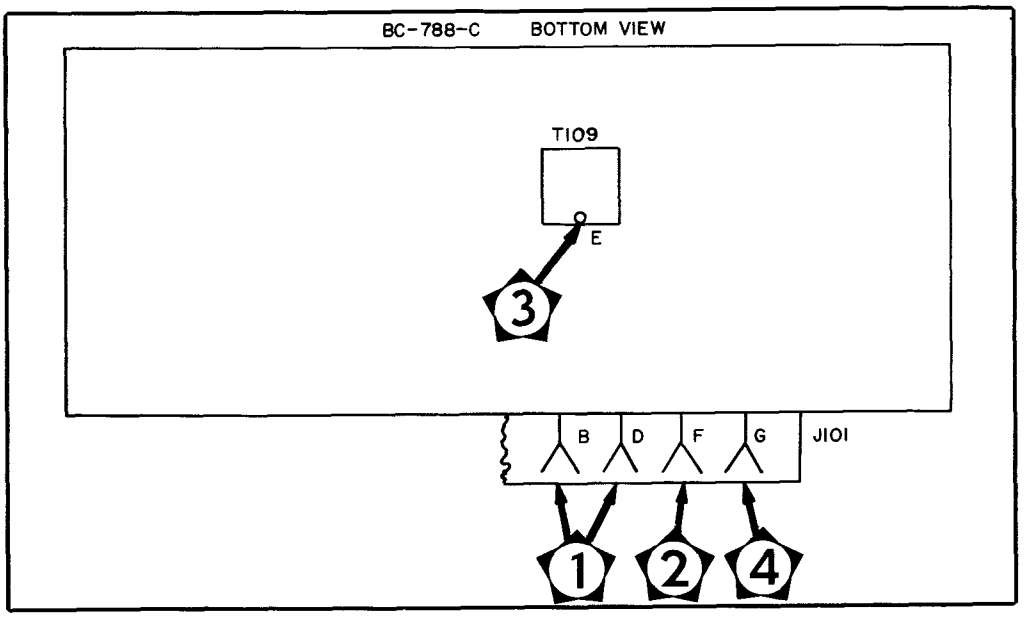


Figure 5-4. Receiver-Transmitter Functions, Block Diagram

TABLE 5-7
320-VOLT DISTRIBUTION, SYSTEM TROUBLE ANALYSIS
(Figure 5-4)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	② Pin F of J101	D-C voltmeter (500-volt range)	Remove P-402 and TS-23/-APN cable from receiver-transmitter. Jumper B and C of J101. Replace P-402, and measure voltage between test point and ground (pin E).	Approx 360-volts	Indicator is defective.	Receiver-transmitter is defective.

TABLE 5-8
98-KC DISTRIBUTION, SYSTEM TROUBLE ANALYSIS
(Figure 5-4)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	③ Term. E T109	Synchroscope, such as TS-239/UP	Examine waveform at test point.	98.35-kc sine-wave	Indicator is defective.	Receiver-transmitter is defective.

TABLE 5-9
RELAY FUNCTION, SYSTEM TROUBLE ANALYSIS
(Figure 5-4)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	④ Pin G of J101	Ohmmeter	Remove P-402 and TS-23/APN from receiver - transmitter. Measure resistance at test point.	14K	Indicator is defective.	Receiver-transmitter is defective.

TABLE 5-10
TRANSMITTER AND RECEIVER FUNCTIONS, SYSTEM TROUBLE ANALYSIS
(Figure 5-5)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	Test Set TS-23/APN; TEST SWITCH to POWER-FREQ.	Remove coaxial cable from TRANSMITTER ANTENNA. Connect coaxial cable CD-800 of TS-23/APN to TRANSMITTER ANTENNA and to DETECTOR INPUT (test set).	Meter of TS-23/APN indicates above blue line.	Proceed with step 2.	Receiver-transmitter is defective.
2	Visual check	Test Set TS-23/APN; TEST SWITCH to SIGNAL.	No change in settings.	Reference pip appears on circular sweep.	Proceed with step 3.	Indicator is defective.
3	(A) Center term. of REC. GAIN (R201)	D-C voltmeter (250-volt range)	Rotate REC. GAIN. Measure voltage at test point.	0 to 110 volts	Receiver-transmitter is defective.	Proceed with step 4.
4	(A) Center term. of REC. GAIN (R201)	Ohmmeter	Remove TS-23/APN cable from indicator. Rotate REC. GAIN. Measure resistance at test point.	0 to 38K	Proceed with step 5.	Indicator is defective.
5	(A) Center term. of R201 (A1) Pin F of J201	Ohmmeter	Rotate REC. GAIN. Measure resistance between test points.	30K to 65K	Receiver-transmitter is defective.	Indicator is defective.

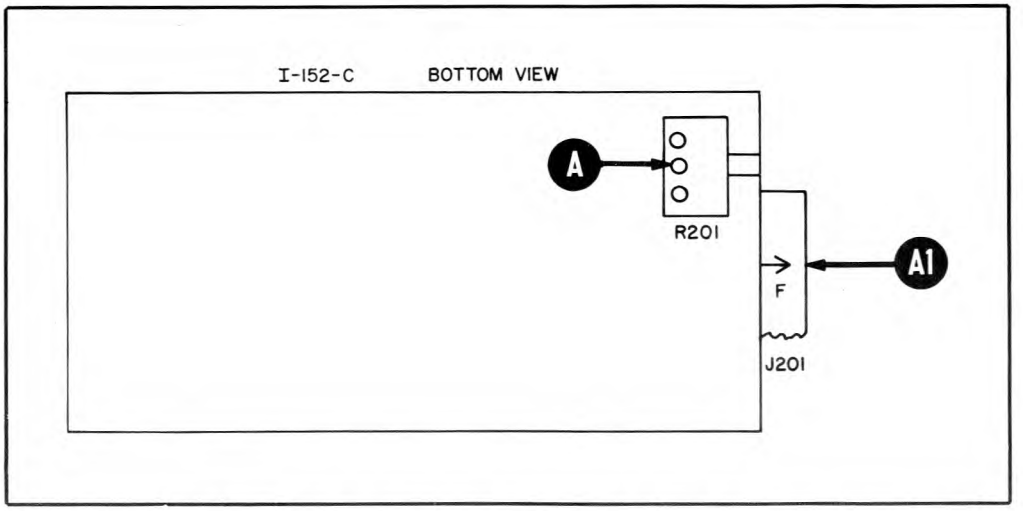


Figure 5-5. Indicator Functions, Block Diagram

5-51. ADJUSTMENTS.

5-52. Adjustment procedures described in the following paragraphs are intended to supplement the postflight and routine checks of this section and the performance checks and trouble isolation procedures of Section VI, and should, therefore, be performed only when directed as a result of an abnormal indication. The equipment is assumed to be operating with test equipment either partially or wholly connected, as the case may be, at that stage of the particular check.

5-53. RADIO RECEIVER AND TRANSMITTER BC-788-C.

5-54. TRANSMITTER FREQUENCY. Using Test Set TS-23/APN, adjust transmitter frequency as follows:

a. Turn TEST SWITCH of TS-23/APN to POWER-FREQ.

b. Connect cable CD-800 from TRANSMITTER ANTENNA of receiver-transmitter to WAVEMETER INPUT of test set.

c. Connect cable CA-101 to DETECTOR INPUT of test set.

d. Move adjustment cover to the side, and adjust control T (figure 5-6) on receiver-trans-

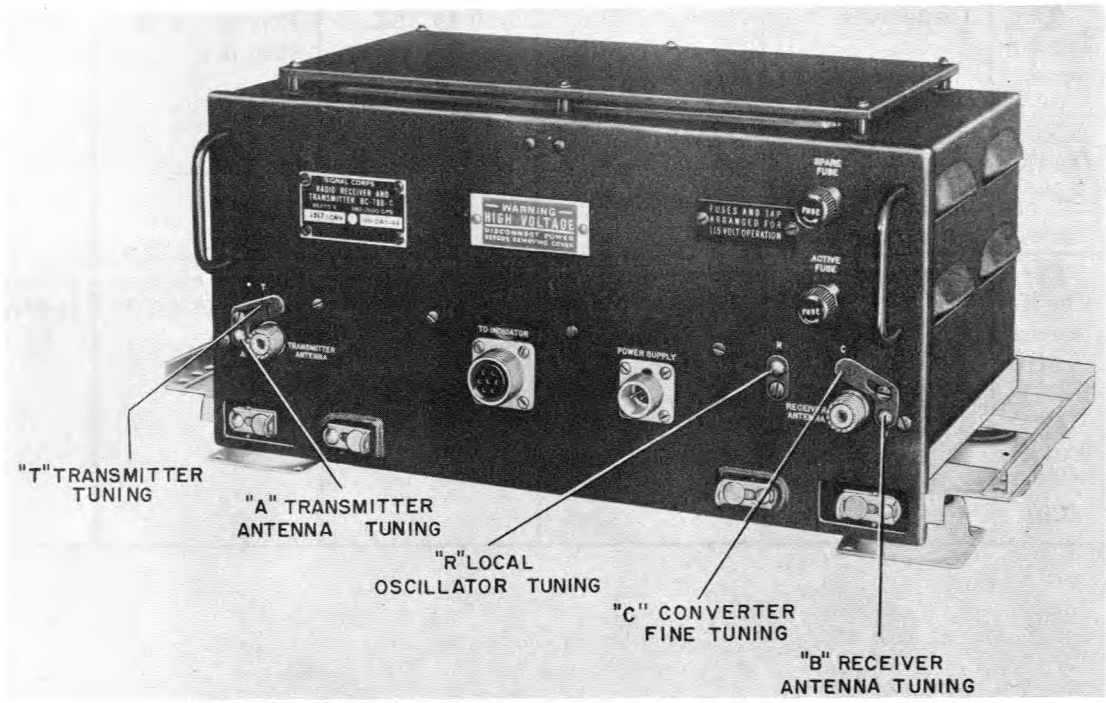


Figure 5-6. Location of Receiver-Transmitter Adjustments

mitter for maximum reading on test-set meter.

e. Remove cable CA-101 from DETECTOR INPUT, and move end of cable CD-800 from WAVEMETER INPUT to DETECTOR INPUT.

f. Adjust screw A of receiver-transmitter for maximum meter reading.

g. Reconnect cables as in b and c, and readjust T for maximum meter indication.

5-55. TRANSMITTER POWER. Test Set TS-23/APN is used to measure and adjust transmitter power. Connections and adjustments are made in the following manner:

a. Turn TEST SWITCH of test set to POWER-FREQ.

b. Connect cable CD-800 from TRANSMITTER ANTENNA of receiver-transmitter to DETECTOR INPUT of test set.

c. Move adjustment cover to the side, and adjust control A on receiver-transmitter for maximum indication on test-set meter. The indication should be on or above the blue line.

5-56. RECEIVER TUNING. This adjustment utilizes Test Set TS-10B/APN or TS-10C/APN; the procedure is as follows:

a. Rotate REC. GAIN to mid-position.

b. Adjust test-set attenuator so that echo pip on indicator is ⅛ inch high.

c. Move adjustment covers to the side, and adjust C, R, and B on receiver-transmitter for maximum echo height.

Note

Do not adjust T. This is a transmitter frequency adjustment which requires the use of Test Set TS-23/APN.

5-57. INDICATOR I-152-C.

5-58. CIRCLE SHAPE (TIMES-ONE RANGE). Perform times-one circle-shape adjustments as follows:

a. Cause sweep to coincide, as much as possible, with the calibrated circle by adjusting CIRCLE SIZE, VERT. CENTERING and HORIZ. CENTERING.

b. Adjust top tuning slug (primary) of T203 for maximum circular or elliptical pattern.

c. Adjust bottom tuning slug (secondary) of T203 until the two axes of the pattern are vertical and horizontal. (See figure 5-7.)

d. Loosen lock nut, and adjust shape control R227 to make vertical and horizontal axes equal.

e. Repeat b, c, and d to achieve a circular trace with minimum distortion.

f. Fasten lock nut of R227.

5-59. CIRCLE SHAPE (TIMES-TEN RANGE). Perform times-ten circle-shape adjustment as follows:

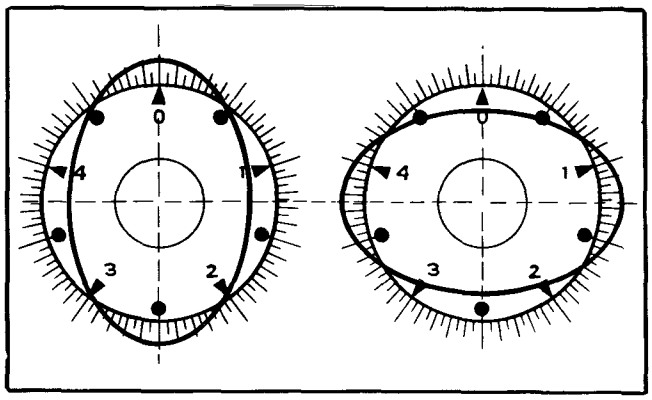


Figure 5-7. Circle Shape Adjustment

a. Adjust top tuning slug of T205 for maximum circular or elliptical pattern.

b. Adjust bottom tuning slug of T205 until the two axes of the pattern are vertical and horizontal. (See figure 5-7.)

c. Loosen lock nut, and adjust shape control R237 to make vertical and horizontal axes equal.

d. Repeat a, b, and c to achieve a circular trace with minimum distortion.

e. Fasten lock nut of R237.

5-60. ZERO ADJUSTMENT (TIMES-ONE RANGE). Perform this adjustment in the following manner: Adjust top tuning slug of T203 so that TIMES ONE ZERO ADJ. moves reference pip 200 feet either side of zero without appreciable change in circle size. Return reference pip to scale zero, using TIMES ONE ZERO ADJ. (See figure 5-8.)

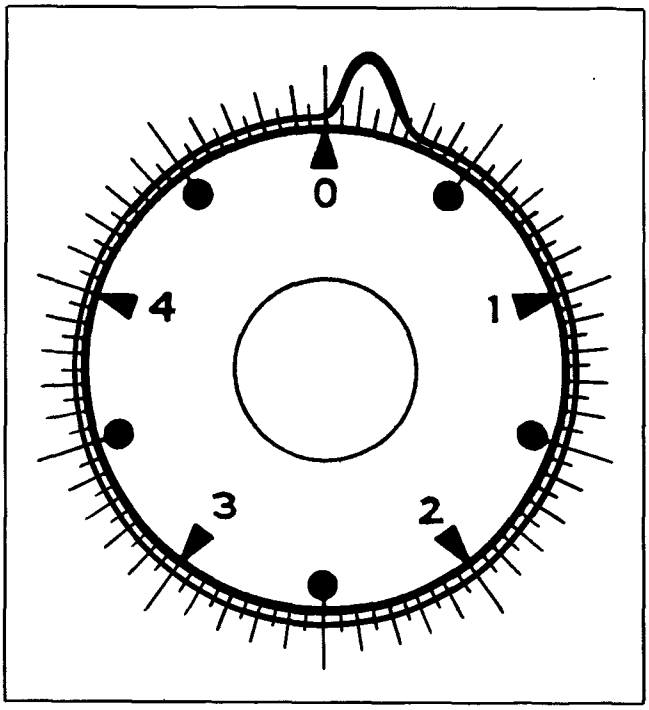


Figure 5-8. Zero Adjustment, Times-One Range

5-61. ZERO ADJUSTMENT (TIMES-TEN RANGE). Perform this adjustment as follows: Adjust top tuning slug of T205 so that TIMES TEN ZERO ADJ. moves reference pip 1500 feet either side of zero without appreciable change in circle size. Return reference pip to scale zero, using TIMES TEN ZERO ADJ. (See figure 5-9.)

5-62. CIRCLE SIZE. Adjust circle size in the following manner:

a. Throw SCALE switch to TIMES TEN.

b. Rotate CIRCLE SIZE to place circular trace inside the calibrated circle.

c. Throw SCALE switch to TIMES ONE.

d. Loosen lock nut on R240, CIRCLE SIZE RATIO, and adjust control to place circular trace just outside the calibrated circle. Refasten lock nut.

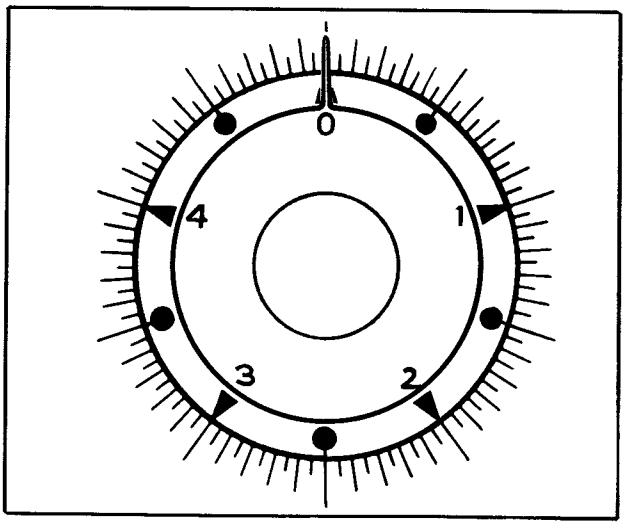


Figure 5-9. Zero Adjustment, Times-Ten Range

SECTION VI
FIELD AND FASRON MAINTENANCE

6-1. INTRODUCTION.

6-2. This section contains instructions for servicing Radio Set SCR-718-C at Field and FASRon maintenance levels. Procedures for checking the various functions of each component are provided, followed by systematic trouble-isolation procedures which begin with a faulty function and lead to the faulty circuit, tube, or part. In addition, adjustments, measurements, and removal information will be found in this section.

6-3. A description of the test points used in this section is given in paragraph 5-6. These test points have been selected on the basis of electrical desirability and physical accessibility.

6-4. It is assumed that a complete SCR-718-C equipment is available and maintained in good operating condition at all times. Whenever a defective or repaired component is to be tested, it is substituted for the component normally used in the bench-test setup described in steps a and b of paragraph 5-38 and shown in figure 5-1.

6-5. PERFORMANCE CHECKS.

6-6. Instructions designed to test each function of each component, the respective normal indications that should be observed, and pertinent reference to adjustments or trouble-isolation procedures are given in paragraphs 6-9 and 6-10. These checks can be used to localize trouble in a faulty component to a particular function, or to ascertain that a repaired or untested component is functioning normally in all respects.

6-7. In those instances where replacement of detail parts alters the tuning of the circuit or associated circuits (a condition normally determined by the performance check following correction of the trouble), reference is made to the appropriate adjustments and measurements, paragraphs 6-16 through 6-30, or adjustments, paragraphs 5-51 through 5-62. Adjustments should not be performed in attempts to clear trouble unless it is definitely established that malfunctioning is the result of misadjustment.

6-8. To check a receiver-transmitter, proceed with the performance checks in TABLE 6-1, performing every step. In the event that a normal indication is not obtained, follow the trouble reference to the related trouble-isolation table. To check an indicator, proceed in the same manner, using TABLE 6-2.

6-9. RADIO RECEIVER, AND TRANSMITTER BC-788-C.

TABLE 6-1
PERFORMANCE CHECKS, RADIO RECEIVER AND TRANSMITTER BC-788-C

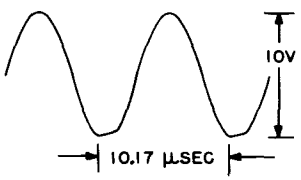
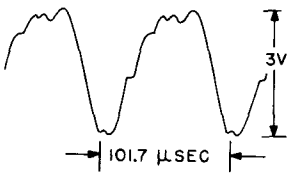
Function	*Test Instructions and Normal Indication*	*Trouble Reference (Tables)*
Low-voltage power supply	With TEST SWITCH on Test Set TS-23/APN at NORMAL-B+, and power switch of SCR-718-C turned to ON, indication on meter of TS-23/APN is on or above red line.	TABLE 6-3, step 1
Timing oscillator, times-one range	Using synchroscope such as TS-239/UP, examine waveform at terminal E of T109. 	TABLE 6-4, step 1

TABLE 6-1 (Continued)

Function	*Test Instruction and Normal Indication*	*Trouble Reference (Tables)*
Timing oscillator, times-ten range	Throw SCALE to TIMES TEN. Examine waveform at terminal E of T109 using synchroscope such as TS-239/UP. 	TABLE 6-4, step 2
Transmitter frequency	SCALE to TIMES ONE. Using Test Set TS-23/APN, test transmitter frequency as instructed in paragraph 5-54.	TABLE 6-5, step 2
Transmitter power output	No change in settings. Test power output as instructed in paragraph 5-55. Meter in TS-23/APN indicates above blue line.	TABLE 6-5, step 2
Transmitter pulse observation	Using Test Set TS-23/APN, with TEST SWITCH at SIGNAL and TRANSMITTER OUTPUT connected to DETECTOR INPUT, observe presentation on indicator. (Adjust CIRCLE SIZE so that circular sweep is at the outer edge of calibrated scale of KRT. See figure 5-8.)	TABLE 6-5, step 4
Receiver sensitivity	Measure loop sensitivity by following procedure given in paragraph 5-43, a reading of 63 db, minimum, should be obtained.	TABLE 6-6, step 1

6-10. INDICATOR I-152-C.

CAUTION

Before connecting indicator to bench-test setup, check resistance from F of J201 to ground (E). The normal resistance is 60,000 ohms. If a reading other than this is obtained, check the associated detail parts and wiring.

TABLE 6-2
PERFORMANCE CHECKS, INDICATOR I-152-C

Function	*Test Instructions and Normal Indication*	*Trouble Reference (Tables)*
A-C input and filament voltage	Indicator lamp lights when power switch is turned to ON.	TABLE 6-7, step 1
High-voltage power supply	D-C voltage at cap of V201 is 1700 ±200 volts, measured with a 20,000 ohms/volt meter on 5000-volt scale.	TABLE 6-7, step 3
Circular sweep, times-one range	Adjust CIRCLE SIZE for circular sweep barely visible outside of the calibrated scale on the face of the KRT. Sweep should be sharp, medium brilliance, properly centered, and exactly circular.	TABLE 6-8, step 1
Circular sweep, times-ten range	SCALE to TIMES TEN Normal indication same as above step except sweep is approximately ¼ inch inside of calibrated scale.	TABLE 6-8, step 4
Video amplifier	SCALE to TIMES ONE Using Test Set TS-23/APN, with TEST SWITCH at SIGNAL and TRANSMITTER OUTPUT connected to DETECTOR INPUT of test set, ob-	TABLE 6-8, step 6, part I

TABLE 6-2 (Continued)

Function	*Test Instruction and Normal Indication*	*Trouble Reference (Tables)*
Video amplifier (Cont.)	serve presentation on indicator. (See figure 5-2.) Height of pulse should be greater than 1/4 inch.	
	Remove V202. Transmitter pulse shrinks to 3/4 former height.	TABLE 6-8, step 6, part II
Zero altitude check, times-one range	Turn TEST SWITCH on TS-23/APN to NORMAL-B+. Replace V202. Advance REC. GAIN until the transmitter pulse appears. The left-hand or leading edge of the pulse should be exactly at zero altitude. (See figure 5-8.)	TABLE 6-8, step 7
Zero altitude check, times-ten range	SCALE to TIMES TEN. Normal indication same as above. (See figure 5-9.)	TABLE 6-8, step 8

6-11. TROUBLE ISOLATION.

6-12. The following tables are planned to be used only when reference is made to them in the tables of performance checks, paragraphs 6-9 and 6-10.

6-13. When referred to a particular trouble-isolation table, proceed as follows:

a. Perform the prescribed step of the table and follow directions until a trouble is localized to a circuit, tube, or detail part.

b. If a tube is involved, replace it first. If trouble is not cleared, make further tests of the circuit with voltmeter and ohmmeter, using voltage and resistance tables, paragraph 6-38.

c. Abnormal voltage or resistance readings should, with the aid of schematic diagrams 7-1 and 7-3, lead the way to the faulty detail parts or wiring.

Note

If connections which are to be unsoldered are tropicalized, this protective coating should be removed before using the soldering iron. For this cleaning purpose, use thinner such as cellulose nitrate dope and lacquer thinner, specification MIL-T-6094, but restrict its use to the contact only.

d. After repairs or replacements are made, and normal indication appears, recheck the function by returning to the performance check in which faulty operation was first detected.

WARNING

Potentials dangerous to life may exist in the equipment even when the power is disconnected. After removing the input power connector, be sure to discharge all capacitors in the circuit under test before attaching test probes, removing tubes, parts, or wires, or making resistance checks.

6-14. RADIO RECEIVER AND TRANSMITTER BC-788-C.

TABLE 6-3

TROUBLE ISOLATION, RADIO RECEIVER AND TRANSMITTER BC-788-C, LOW-VOLTAGE POWER SUPPLY

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	TS-23/APN with TEST SWITCH to NORMAL-B+	Power switch to ON.	Meter in TS-23/APN indicates at red line.	Low-voltage power supply is normal	Replace F101. If indication remains abnormal proceed with step 2.

TABLE 6-3 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
2	⑤ Term. 1 of L132	Ohmmeter	Power switch to OFF. Measure resistance at test point.	45K	Trouble is in L132, V110, T101, and/or associated circuit wiring.	Trouble is in C149 and/or associated detail parts or circuit wiring concerned with 320-volt bus.

TABLE 6-4
TROUBLE ISOLATION, RADIO RECEIVER AND TRANSMITTER BC-788-C, TIMING-OSCILLATOR CIRCUITS

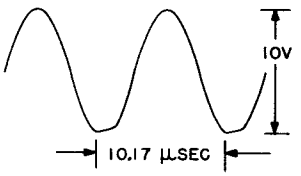
Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	③ Term. E of T109	Synchroscope, such as TS-239/UP	Power switch to ON. SCALE to TIMES ONE. Examine waveform at test point. Perform timing-oscillator adjustment, paragraph 6-17.	 Use internal markers in synchroscope for rough frequency check.	Proceed with step 2.	If there is no indication, or if amplitude is abnormal, trouble is in V111, Y101, T109, and/or associated detail parts. If frequency appears to be abnormal, check to see that contacts of K101 are open. If relay contacts are normal, replace Y101. If indication remains abnormal, trouble is in detail parts of oscillator stage.
2	③ Term. E of T109	Frequency meter, such as LM-15. Synchroscope, such as TS-239/UP	No change in settings. Measure timing-oscillator frequency by following procedure in paragraph 6-19.	98.35 ±0.1 kc	Proceed with step 3.	Trouble is in Y101.

TABLE 6-4 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
3	③ Term. E of T109	Synchroscope, such as TS-239/UP	SCALE to TIMES TEN. Examine waveform at test point. Perform timing-oscillator adjustment, paragraph 6-21.		Timing-oscillator circuits are functioning normally.	If amplitude is abnormal, trouble is in T109, T112, and/or associated detail parts. If frequency stays the same as in step 1, trouble is in K101, T112, and/or associated detail parts.

TABLE 6-5
TROUBLE ISOLATION, RADIO RECEIVER AND TRANSMITTER BC-788-C, TRANSMITTER FUNCTION

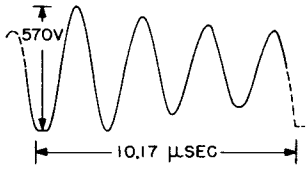
Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1 Part I	Visual check	Test Set TS-23/APN	Power switch to ON. SCALE to TIMES ONE Test the transmitter frequency as instructed in paragraph 5-54.	Maximum meter reading on TS-23/APN meter.	Proceed with part II of this step.	Proceed with step 2.
Part II			No change in settings. Test power output as directed in paragraph 5-55.	Meter in TS-23/APN indicates above blue line.	Proceed with Step 4.	
2	⑧ Pin 5 of V112	Synchroscope, such as TS-239/UP	No change in settings. Examine waveform at test point.	 Recurrent train of damped oscillations, exactly four cycles in duration.	Proceed with step 3.	If timing is abnormal, proceed with clipper adjustment, as directed in paragraph 6-23. If timing can not be normalized, trouble is in T110 and/or

TABLE 6-5 (Continued)

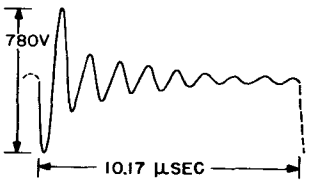
Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
2 (Cont)						associated detail parts. If amplitude is abnormal (low or zero), trouble is in V112, T110, and/or associated detail parts.
3	(B1) Term. of C160	Synchroscope, such as TS-239/UP	No change in settings. Examine waveform at test point.	 Recurrent train of damped oscillations, exactly nine cycles in duration.	Trouble is in V114, T111, and/or associated detail parts.	If timing is abnormal proceed with driver adjustment, paragraph 6-25. If timing can not be normalized, trouble is in T111 and/or associated detail parts. If amplitude is abnormal (low or zero), trouble is in V113, T111, and/or associated detail parts.
		CAUTION Allow the equipment to cool before replacing V114. This will permit V114 to heat normally before it is pulsed.				
4	Visual check	Test Set TS-23/APN, with TEST SWITCH at SIGNAL, and TRANSMITTER OUTPUT connected to DETECTOR INPUT of test set.	Adjust CIRCLE SIZE for circular sweep at outer edge of calibrated scale on indicator.	No spurious transmitter pulses at 550 and 1250 feet following the transmitter pulse. (See figure 5-2.)	Transmitter function is normal.	Perform antenna-coupling adjustment, paragraph 6-27. If indication remains abnormal, perform steps 2 and 3 of this chart to isolate trouble.

TABLE 6-6
TROUBLE ISOLATION, RADIO RECEIVER AND TRANSMITTER BC-788-C, RECEIVER FUNCTION

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual Check	TS-10B/APN or TS-10C/APN	Power switch to ON. Measure loop sensitivity, paragraph 5-43.	63 db, minimum	Receiver function is normal.	If receiver is insensitive, proceed with receiver tuning adjustments, paragraph 5-56. If receiver is still insensitive, check tubes V101 through V109 in a dynamic mutual-conductance tube checker, replacing all weak tubes. If receiver remains insensitive, proceed with step 3. If receiver is dead, check tubes V101 through V109 in a dynamic mutual-conductance tube checker, replacing all defective or weak tubes. If receiver is still dead, proceed with step 2.
2	Ⓒ Pin 6 of V102	D-C Voltmeter (10-volt range)	No change in settings. Measure voltage at test point.	Approx —6 volts	Proceed with step 3.	Trouble is in V102 and/or associated detail parts.
3 Part I	Ⓓ Pin 1 of V109 Ⓓ1 High side of R159	Signal generator such as Measurements Corp Model 80 D-C Voltmeter (250-volt range) Synchroscope, such as TS-	Adjust REC. GAIN for 50 volts on pin 6 of V103. Connect signal generator to Ⓓ Set frequency of signal generator for 30	1 volt, peak-to-peak, 400-cycle signal observed on oscilloscope.	Proceed with part II of this step.	Trouble is in V109, and/or associated detail parts.

TABLE 6-6 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
3 Part I (Cont)		239/UP Remove V102 from its socket.	mc, and output for 100,000 microvolts. Modulate carrier 30 percent at 400 cycles. Connect synchroscope to D1.			
Part II	D2 Pin 1 of V107		Insert a 6000-microvolt signal at test point.	1.5 volts, peak to peak	Proceed with part III of this step.	Trouble is in V107, V108, and/or associated detail parts.
Part III	D3 Pin 1 of V105		Insert a 140-microvolt signal at test point.		Proceed with part IV of this step.	Trouble is in V105, V106, and/or associated detail parts.
Part IV	D4 Pin 1 of V103		Insert a 5-microvolt signal at test point.		Trouble is in V101 and/or associated detail parts.	Trouble is in V103, V104, and/or associated detail parts.

6-15. INDICATOR I-152-C.

TABLE 6-7
TROUBLE ISOLATION, INDICATOR I-152-C, HIGH-VOLTAGE POWER SUPPLY

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	None	Turn power switch to ON.	Indicator lamp lights.	Proceed with step 2.	Replace indicator lamp. If indication remains abnormal, trouble is in S201, T201, and/or associated detail parts or circuit wiring. (Trouble in these circuits may cause fuse F101 in the receiver-transmitter to blow.)

TABLE 6-7 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
2	Ⓔ Cap of V201	D-C voltmeter (5000-volt range)	Measure voltage at test point.	1700 ±100 volts	High-voltage power supply is normal.	Proceed with step 3.
3	Ⓔ Cap of V201	Ohmmeter	Turn power switch to OFF. Measure resistance at test point.	1.1 meg	Trouble is in V201, T201, and/or associated circuit wiring.	If resistance is low, trouble is in C201 and/or associated circuit wiring. If resistance is high, trouble is in voltage-divider resistors from plate of V201 to ground.

TABLE 6-8

TROUBLE ISOLATION, INDICATOR I-152-C, INDICATOR FUNCTION

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
1	Visual check	None	Turn power switch to ON. Adjust CIRCLE SIZE so that circular sweep is barely visible outside of calibrated scale on face of K R T. Adjust brilliance R205, focus R207, vertical centering R225, horizontal centering R222, as required.	Sharp, medium brilliance, properly centered circular sweep.	Proceed with step 4.	If no trace is visible, proceed with step 2. If sweep is not exactly circular, proceed with shape adjustment (times one range), paragraph 5-58. If indication remains abnormal, proceed with step 3.
2	Visual check	None	CIRCLE SIZE maximum counterclockwise. Adjust horizontal centering R222, and brilliance R205 while observing KRT.	Dot or small circle appears, whose position varies as R222 is adjusted.	Proceed with step 3.	Trouble is in V205, and/or associated detail parts or circuit wiring.

TABLE 6-8 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
3	(F) Pin 1 of V204	Synchroscope, such as TS-239/UP	CIRCLE SIZE and circle size ratio R240, turned maximum clockwise. Examine waveform at test point.	98.35-kc sine wave, approx 17 volts, peak to peak.	Trouble is in V204, T203, and/or associated detail parts or circuit wiring.	Trouble is in T202, S202, R240, R213, and/or associated detail parts or circuit wiring.
4	Visual check	None	SCALE to TIMES TEN.	Same as step 1, except sweep is approximately ¼ inch inside of calibrated scale.	Proceed with step 6.	If no trace is visible, proceed with step 5. If presentation is not exactly circular, proceed with circle shape adjustment (times-ten range), paragraph 5-59. If indication remains abnormal, proceed with step 5. If sweep is not properly inside of scale, perform the circle-size adjustment, paragraph 5-62.
5	(F) Pin 1 of V204	Synchroscope, such as TS-239/UP	CIRCLE SIZE to maximum clockwise.	9.8 kc sine wave, approx 12 volts, peak to peak.	Trouble is in T205, and/or associated detail parts or circuit wiring.	Trouble is in S202, T202, R235, R236, and/or associated circuit wiring.
6 Part I	Visual check	Test Set TS-23/APN, with TEST SWITCH at SIGNAL and TRANSMITTER OUTPUT connected to DETECTOR INPUT of test set.	SCALE to TIMES ONE.	See figure 5-2. Height of pulse should be greater than ¼ inch.	Proceed with part II of this step.	Trouble is in V202, V203, and/or associated detail parts or circuit wiring.
Part II			Remove V202.	Transmitter pulse shrinks to 3/4 former height.	Proceed with step 7.	If transmitter pulse disappears, trouble is in V203, and

TABLE 6-8 (Continued)

Step	*Test Point*	*Test Equipment and Instructions*	*Radar Control Settings and Instructions*	*Normal Indication*	*If Indication Is Normal*	*If Indication Is Abnormal*
6 Part II (Cont)						/or associated detail parts. If transmitter pulse does not diminish properly, trouble is in V202, and/or associated parts.
7	Visual check	Turn TEST SWITCH on TS-23/APN to NORMAL-B+	Replace V202. Advance REC. GAIN until the transmitter pulse appears.	See figure 5-9. (Left-hand or leading edge of pulse should be exactly at zero altitude.)	Proceed with step 8.	If no pulse appears, trouble is in R201, R229, R230, R232, and/or associated circuit wiring. If pulse is not on zero, proceed with zero adjustment (times-one range), paragraph 5-60.
8	Visual check	None	SCALE to TIMES TEN.	See figure 5-10. (Left-hand or leading edge of pulse should be exactly at zero altitude.)	The indicator function is normal.	Proceed with zero adjustment (times-ten range), paragraph 5-61.

6-16. ADJUSTMENTS AND MEASUREMENTS.

6-17. TIMING OSCILLATOR ADJUSTMENT (TIMES-ONE RANGE).

6-18. The timing oscillator is first adjusted on the times-one range as follows:

a. Turn power switch to ON, SCALE to TIMES ONE.

b. Set TEST SWITCH of Test Set TS-23/APN at NORMAL-B+ position.

c. Adjust bottom tuning slug of T112 for minimum circle size (circle must increase in size when plug is turned either side of this setting). This setting corresponds to maximum screen voltage at pin 6 of V111.

d. Adjust bottom tuning slug of T109 for maximum circle size.

6-19. TIMING-OSCILLATOR FREQUENCY MEASUREMENT (TIMES-ONE RANGE).

6-20. The frequency of the crystal-controlled output of the timing oscillator can be checked for accuracy by use of a frequency meter such as LM-15 and a synchroscope such as TS-239/UP, as follows:

a. Connect grid 1 of V204 to HORIZONTAL AMPLIFIER INPUT of synchroscope, using shielded wire.

b. Turn SWEEP TIME of synchroscope to SWEEP OFF H. AMP.

c. Calibrate frequency meter in the vicinity of 196 kc. Set R. F. COUPLING at maximum.

d. Connect vertical input of synchroscope to R.F. CPLG. of frequency meter.

e. Obtain a 2:1 Lissajous figure on synchroscope (see figure 6-1) by tuning frequency meter in the vicinity of 196.7 kc. When the pattern is essentially stationary, read the frequency setting of the frequency meter. It should be 196.7 $\pm$0.1 kc.

6-21. TIMING-OSCILLATOR ADJUSTMENT (TIMES-TEN RANGE).

6-22. After performing the adjustment on times-

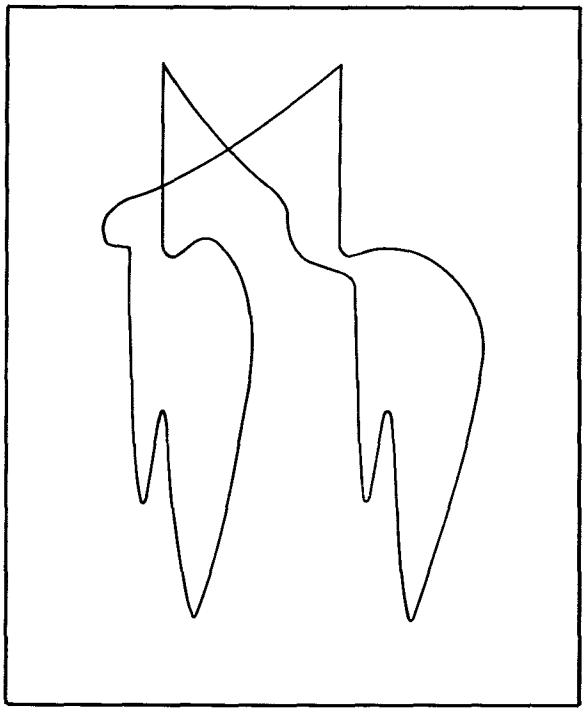


Figure 6-1. 98.35-kc Measurement Pattern

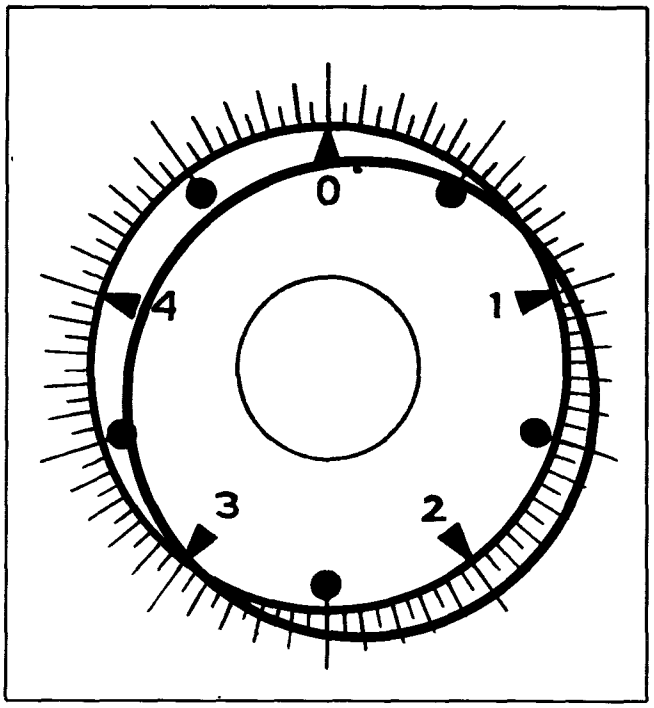


Figure 6-2. Audio-Oscillator Calibration Pattern

one range, proceed as follows:

a. Connect output of an audio oscillator such as HP-200C to the grid (pin 1) of V202. Adjust output of the audio oscillator to broaden circular trace to approximately 3/8 inch.

b. With SCALE still on TIMES ONE, vary audio-oscillator frequency in the vicinity of 98 kc until a 1:1 ratio between audio-oscillator frequency and crystal frequency is observed on the indicator. (See figure 6-2.) This step requires patience, since a small movement of the audio-oscillator dial results in a considerable frequency change. The pattern on the indicator will revolve slowly, for the two frequencies cannot be exactly synchronized.

c. Throw SCALE to TIMES TEN, and adjust top slug of T112 to obtain 10:1 ratio between audio-oscillator and timing-oscillator frequencies. (See figure 6-3 for indicator pattern.) This adjustment is also critical, and again a stationary pattern cannot be achieved. The rotation must be stopped only long enough to count ten peaks.

d. As a frequency check, change the audio-oscillator frequency to 9.83 kc, and obtain a 1:1 ratio pattern on the indicator.

e. If the original frequency of the timing oscillator was far removed from 9.83 kc, the pattern will have changed from a circular to an elliptical shape. Circle-shape adjustments described in paragraphs 5-58 and 5-59 will correct this condition.

f. Remove audio-oscillator connection, and adjust top tuning slug of T109 for maximum circle size.

6-23. CLIPPER ADJUSTMENT.

6-24. Using synchroscope such as TS-239/UP, perform clipper adjustment as follows:

a. Turn SCALE to TIMES ONE.

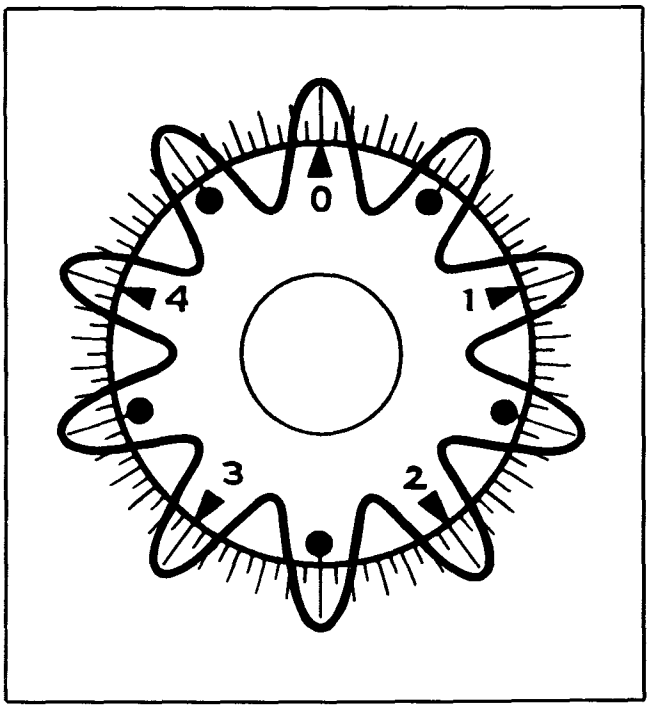


Figure 6-3. 9.83-kc Adjustment Pattern

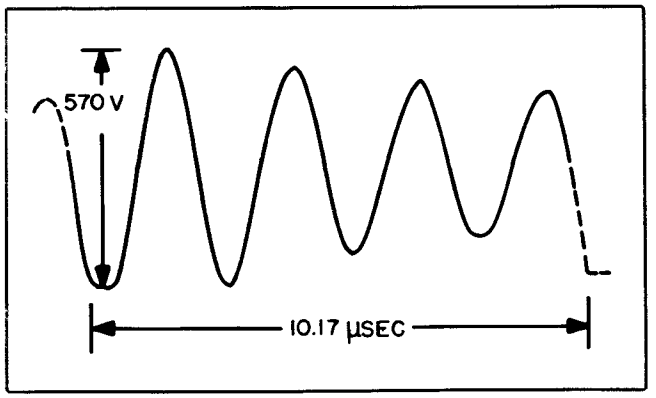


Figure 6-4. Clipper Output Waveform

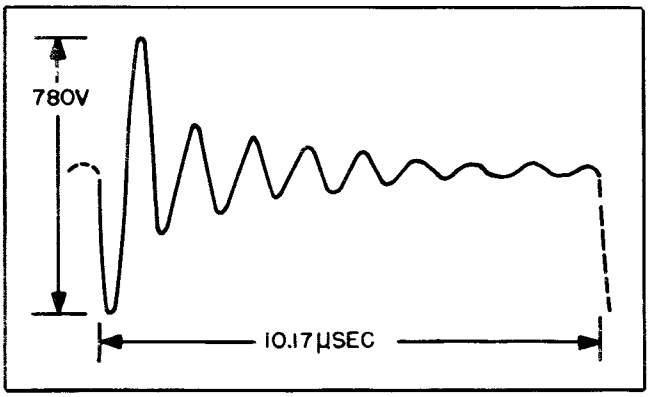


Figure 6-5. Driver Output Waveform

b. Connect probe of synchroscope to plate 5 of V112, and adjust tuning slug of T110 for a damped-wave train having four complete cycles. (See figure 6-4.)

6-25. DRIVER ADJUSTMENT.

6-26. Adjustment of the driver stage is accomplished with the aid of a synchroscope, as follows:

a. With SCALE on TIMES ONE, connect probe of synchroscope across R150.

b. Adjust tuning slug of T111 to obtain nine complete cycles in the damped wave train, as viewed on the synchroscope. (See figure 6-5.)

c. The amplitude of the second positive peak of the wave train should be no greater than 28 percent of the amplitude of the first positive peak.

6-27. ANTENNA COUPLING ADJUSTMENT (TRANSMITTER).

6-28. The antenna coupling loop in the transmitter circuit is positioned as follows:

a. Remove cover from u-h-f oscillator section, and turn L129 adjusting screw on top of the chassis clockwise for relatively loose antenna coupling without bending the loop excessively.

b. Replace cover, and perform transmitter frequency and power adjustments as directed in paragraphs 5-54 and 5-55.

c. Adjust L129 for maximum power as indicated on meter of Test Set TS-23/APN.

d. Repeat transmitter frequency and power adjustments as in step b.

6-29. ANTENNA COUPLING ADJUSTMENT (RECEIVER).

6-30. Position the antenna coupling loop of the receiver as follows:

a. Remove cover from mixer-local-oscillator section, and turn L131 adjusting screw on top of the chassis in a clockwise direction to achieve relatively loose coupling without bending the loop excessively.

b. Replace the cover, and perform receiver tuning adjustments as directed in paragraph 5-56.

c. Adjust L131 for maximum height of the echo pip as viewed on the indicator.

d. Repeat receiver tuning adjustments as in step b.

6-31. OVERHAUL SCHEDULE.

6-32. With normal usage and periodic maintenance, the components of SCR-718-C should function dependably for a period of 500 hours, after which time they should be sent to an overhaul activity. The overhaul activity provides cleaning, refinishing, examinations, tests, inspections, and preventive maintenance beyond the scope of this handbook.

6-33. REMOVAL AND REPLACEMENT OF CATHODE-RAY TUBE.

WARNING

Cathode-ray tubes are potentially dangerous because of their fragile nature and high vacuum. Therefore, extraordinary care should be exercised when handling them. Gloves and safety goggles should be worn when tube removal or insertion is necessary. Since the glass surfaces of cathode-ray tubes must be protected from blows and scratches, the tubes should be placed in a shipping carton or similar container upon removal from the equipment.

6-34. REMOVAL.

6-35. Remove cathode-ray tube 3DP1A+S2 from Indicator I-152-C as follows:

a. Remove interconnecting cable from indicator connector J201.

b. Discharge all high-voltage capacitors.

c. Remove rubber visor from escutcheon casting.

d. Loosen the four round-head screws on escutcheon casting and remove casting from the front panel. The inner rubber gasket may adhere lightly to the face of the KRT.

e. Disconnect the clip from the radial electrode, taking care not to stretch the coiled tension spring.

f. Disengage KRT from its socket, and remove tube from chassis.

6-36. REPLACEMENT.

6-37. A cathode-ray tube is installed in the indicator in the following manner:

a. Loosen the clamp that holds tube socket X205.

b. Insert KRT into its shield on I-152-C chassis so that the zero calibration is uppermost.

c. Observing safety precautions, apply slight pressure against outer edge of tube face, and work socket forward until it completely engages the tube pins.

d. Connect the contact clip to the radial electrode.

e. Clean the tube face and the plastic window which mounts in the escutcheon casting.

f. Remount the escutcheon casting.

g. Turn tube socket to place zero calibration at 12-o'clock position, and press tube socket gently forward to engage tube face and rubber gasket. Tighten tube-socket clamp.

6-38. VOLTAGE AND RESISTANCE MEASUREMENTS.

6-39. The following tables include tube-socket voltage data, tube-socket resistance values, and receptacle-resistance values. Voltages are measured to ground with a 20,000 ohms/volt meter; these readings are dc unless otherwise stated. Resistances are measured in ohms, to ground, with the cables disconnected from the components.

TABLE 6-9
RECEIVER-TRANSMITTER SOCKET VOLTAGES AND RESISTANCES

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V101 JAN 6J6	1	75	200K
	2	75	200K
	3	0	Continuity
	4	6.3, ac	Continuity
	5	0	Continuity
	6	0	Continuity
	7	3.6	560
V102 JAN 6J6	1	145	180K
	2	145	180K

TABLE 6-9 (Continued)

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V102 JAN 6J6 (Cont)	3	6.3, ac	Continuity
	4	0	Continuity
	5	—5	27K
	6	—5	27K
	7	0	Continuity
V103 JAN 6AG5	1	0	220K
	2	0 to 1.5 (see note 1)	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	295	170K
	6	0 to 110 (see note 1)	Infinity
	7	0 to 1.5 (see note 1)	220
V104 JAN 6AG5	1	0	220K
	2	0 to 1.5 (see note 1)	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	295	170K
	6	0 to 110 (see note 1)	Infinity
	7	0 to 1.5 (see note 1)	220
V105 JAN 6AG5	1	0	Continuity
	2	1.9	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	295	170K
	6	150	250K
	7	1.9	220
V106 JAN 6AG5	1	0	Continuity
	2	1.9	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	300	170K
	6	150	250K
	7	1.9	220

TABLE 6-9 (Continued)

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V107 JAN 6AG5	1	0	Continuity
	2	1.9	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	300	170K
	6	150	250K
	7	1.9	220
V108 JAN 6AG5	1	0	Continuity
	2	1.9	220
	3	6.3, ac	Continuity
	4	0	Continuity
	5	305	170K
	6	150	250K
	7	1.9	220
V109 JAN 6AG5	1	0	Continuity
	2	5 to 28 (see note 1)	2200
	3	6.3, ac	Continuity
	4	0	Continuity
	5	310	170K
	6	200 to 250 (see note 1)	280K
	7	5 to 28 (see note 1)	2200
V110 JAN 5Y3GT	2	335	170K
	4	340, ac	27
	6	340, ac	27
	8	335	170K
V111 JAN 6AG5	1	—0.1 (see note 2) —5 (see note 3)	470K
	2	0.2	32
	3	0	Continuity
	4	6.3, ac	Continuity
	5	300	170K
	6	170 (see note 2) 120 (see note 3)	270K
	7	0.2	32

TABLE 6-9 (Continued)

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V112 JAN 6AG5	1	—105 (see note 2) —130 (see note 3)	440K
	2	0	Continuity
	3	6.3, ac	Continuity
	4	0	Continuity
	5	310	170K
	6	140 (see note 2) 165 (see note 3)	200K
	7	0	Continuity
V113 JAN 6L6	1	0	Continuity
	2	0	Continuity
	3	310	170K
	4	260 (see note 2) 280 (see note 3)	160K
	5	—125 (see note 2) —70 (see note 3)	440K
	6	0	Continuity
	7	6.3, ac	Continuity
	8	7 (see note 2) 1 (see note 3)	470K
V114 JAN 6J6	1	—50 (see note 2) —5 (see note 3)	12K
	2	—50 (see note 2) —5 (see note 3)	12K
	3	6.3, ac	Continuity
	4	0	Continuity
	5	—0.3	180K
	6	—0.3	180K
	7	0.25 (see note 2) 0.05 (see note 3)	39

Notes

1. Reading depends upon setting of REC. GAIN.
2. SCALE on TIMES ONE.
3. SCALE on TIMES TEN.

TABLE 6-10
RECEIVER-TRANSMITTER RECEPTACLE RESISTANCES

Receptacle	*Contact*	*Resistance*
J101	A	Infinity
	B	Infinity
	C	Infinity
	D	Infinity
	E	Continuity
	F	170K
	G	13K
J102	A	Infinity
	B	Infinity

TABLE 6-11
INDICATOR SOCKET VOLTAGES AND RESISTANCES

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V201 JAN 2X2A	1	1400, ac	3K
	4	1400, ac	3K
	Cap	—1700	1.1 meg
V202 JAN 6AG5	1	0	82
	2	2	120
	3	0	Continuity
	4	6.3, ac	Continuity
	5	190	70K
	6	155 to 170 (see note 7)	100K
	7	2	120
V203 JAN 6AG5	1	0	82
	2	2	120
	3	0	Continuity
	4	6.3, ac	Continuity
	5	190	70K
	6	155 to 170 (see note 7)	100K
	7	2	120
V204 JAN 6AG5	1	0	270 to 2.5K (see note 1) 270 to 1.3K (see note 2)
	2	2	270
	3	0	Continuity
	4	6.3, ac	Continuity
	5	300	60K
	6	180	150K
	7	2	270

TABLE 6-11 (Continued)

Tube Designation and Type	*Pin*	*Voltage (volts)*	*Resistance*
V205 JAN 3DP 1A+S2	1	—1300	900K
	2	—1300	900K
	3	—1300 to —1500 (see note 3)	900K (see note 3)
	5	—950 to —1200 (see note 4)	600K to 700K (see note 4)
	7	0 to —190 (see note 5)	450K to 550K (see note 5)
	8	—100	530K
	9	—100	60K
	10	—100	530K
	11	0 to —190 (see note 6)	450K to 550K (see note 6)
	14	—1300	900K
	Radial	—100	530K

Notes

1. SCALE on TIMES ONE. Reading depends upon setting of CIRCLE SIZE.
2. SCALE on TIMES TEN. Reading depends upon setting of CIRCLE SIZE.
3. Reading depends upon setting of R205.
4. Reading depends upon setting of R207.
5. Reading depends upon setting of R222.
6. Reading depends upon setting of R225.
7. Reading depends upon setting of REC. GAIN.

TABLE 6-12
INDICATOR RECEPTACLE RESISTANCES

Receptacle	*Contact*	*Resistance*
J201	A	0 to 35K (see note 1)
	B	Infinity
	C	Infinity
	D	Infinity
	E	Continuity
	F	60K
	G	2.2K (see note 2) 90K (see note 3)

Notes

1. Reading depends upon setting of REC. GAIN.
2. SCALE on TIMES ONE.
3. SCALE on TIMES TEN.

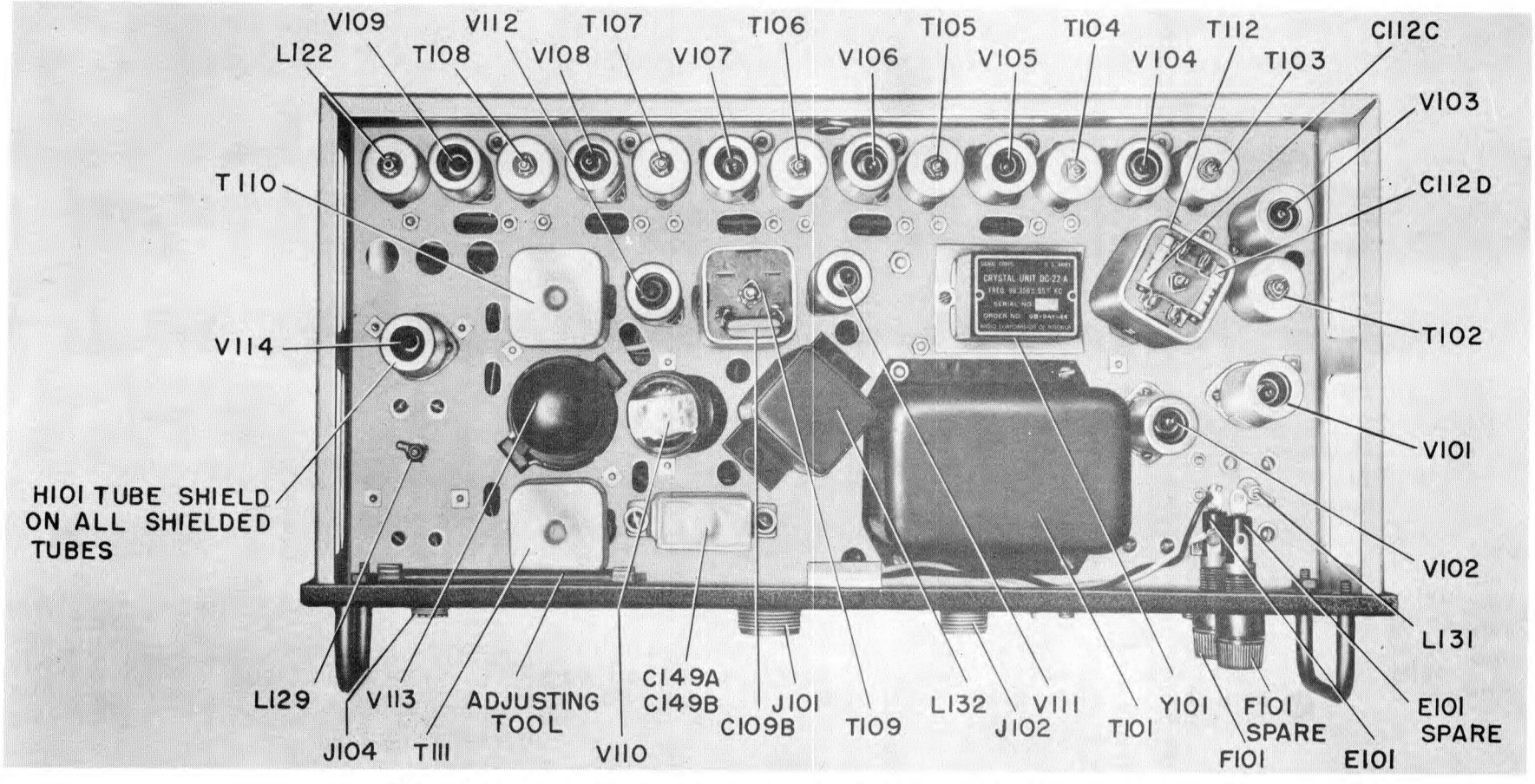


Figure 6-6. Receiver-Transmitter, Top View, Showing Location of Parts

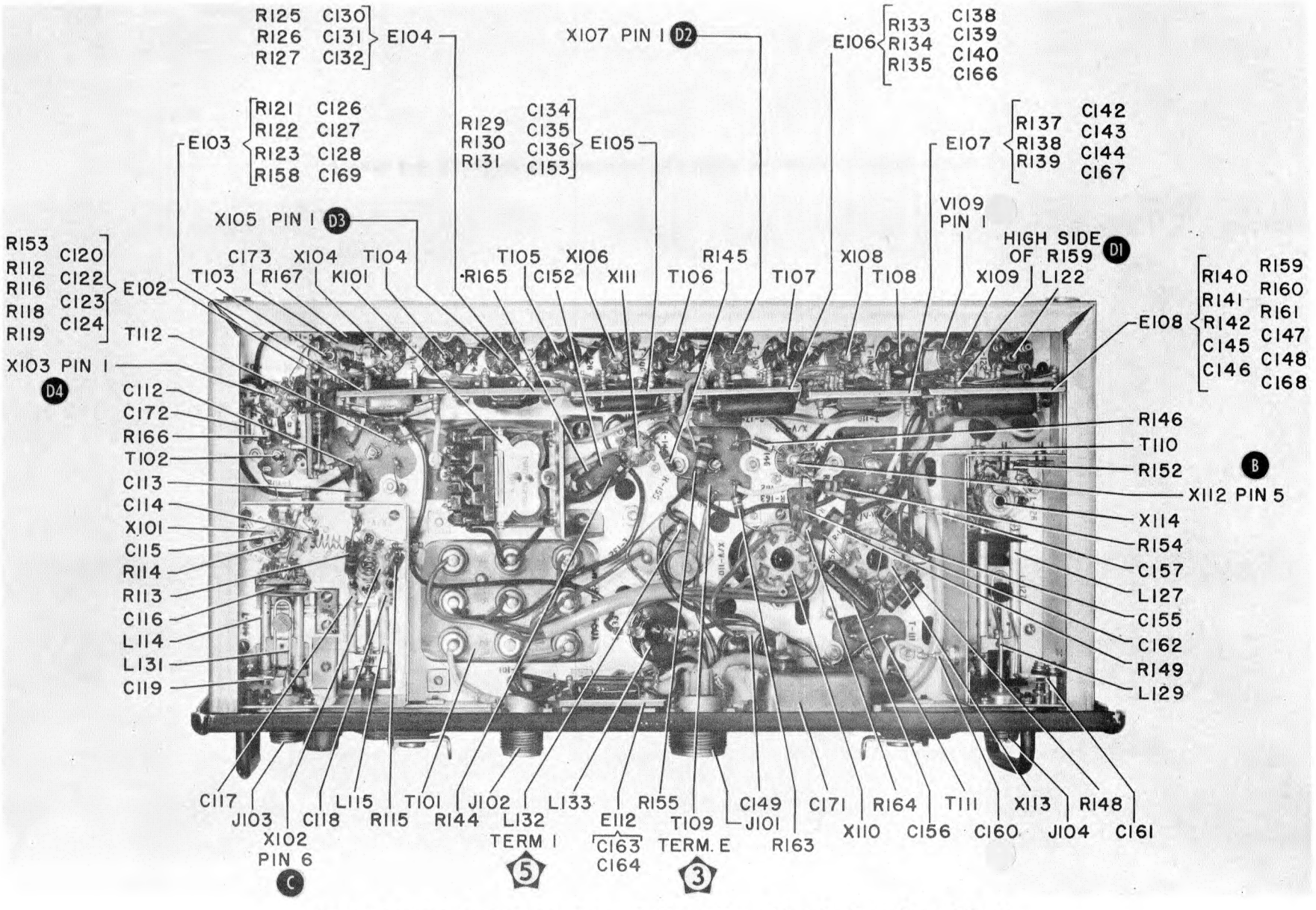


Figure 6-7. Receiver-Transmitter, Bottom View, Showing Location of Parts

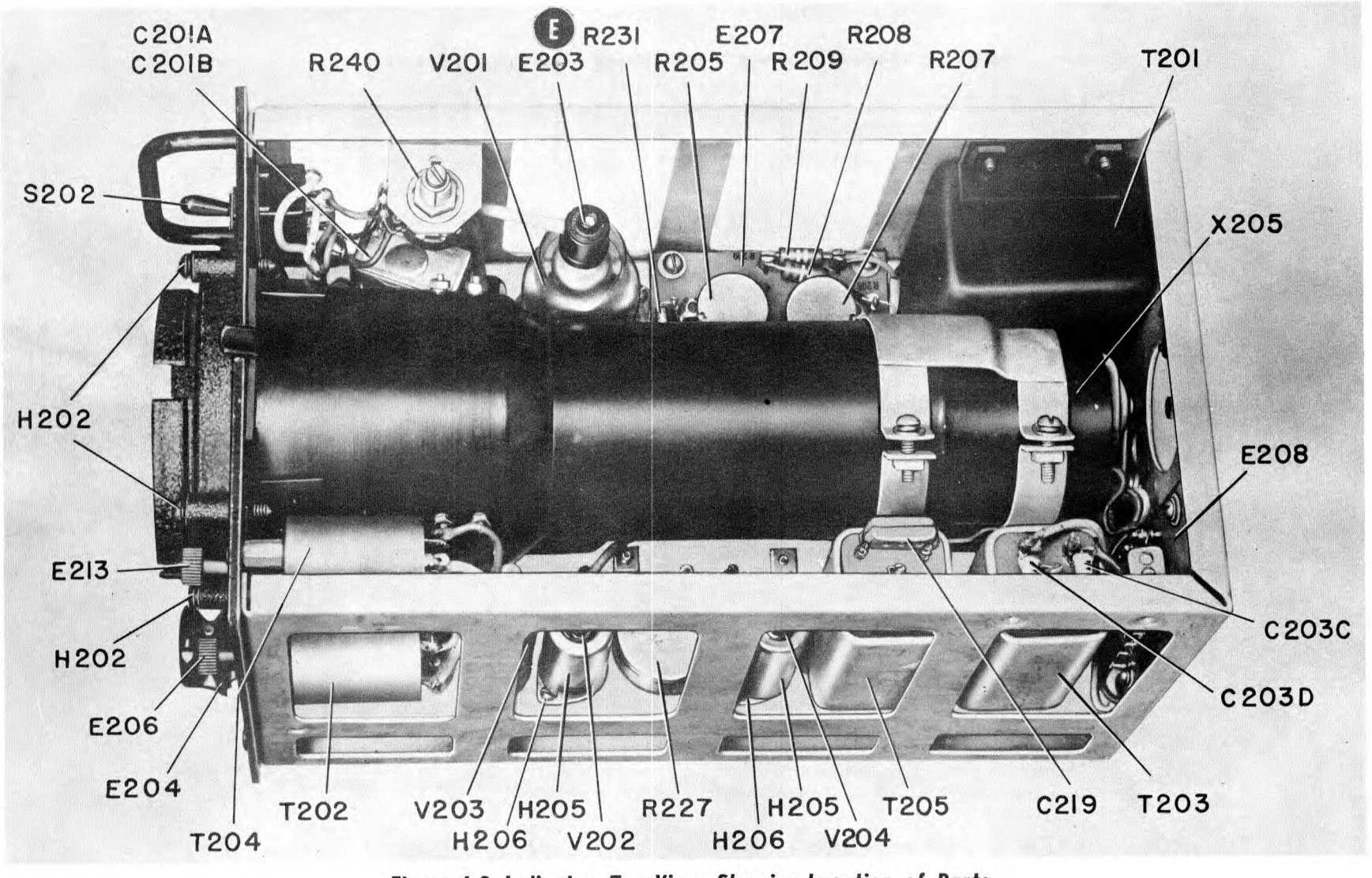


Figure 6-8. Indicator, Top View, Showing Location of Parts

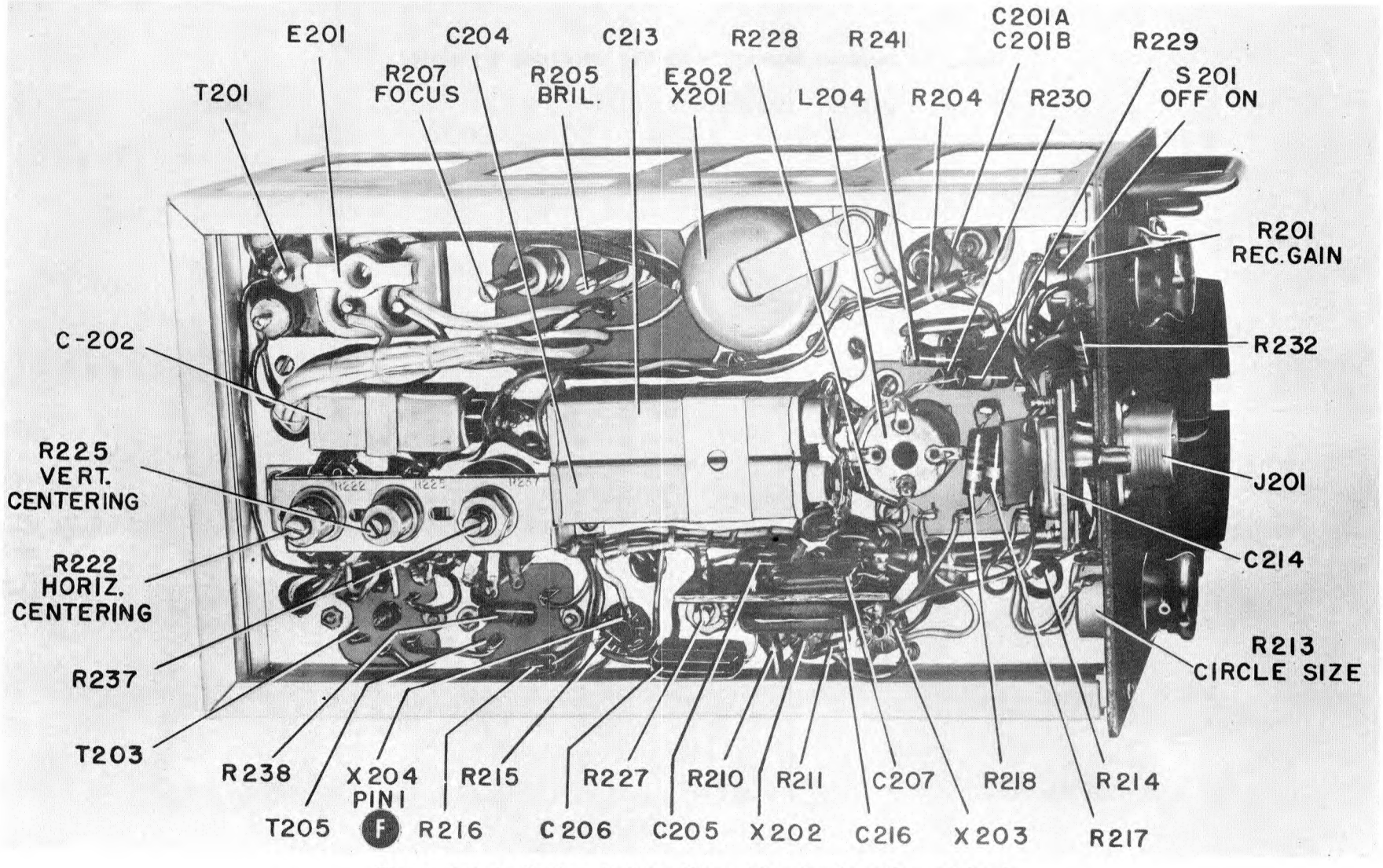


Figure 6-9. Indicator, Bottom View, Showing Location of Parts

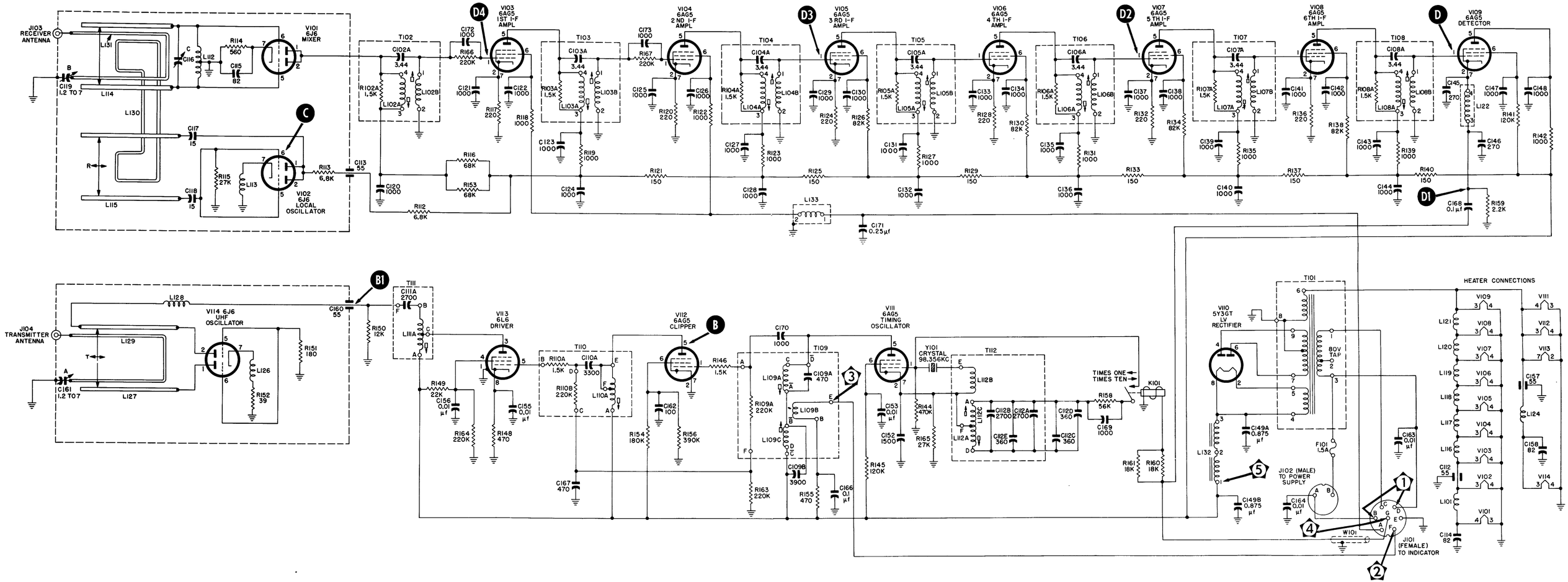
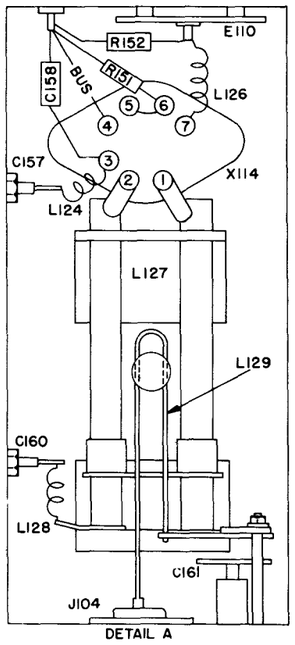
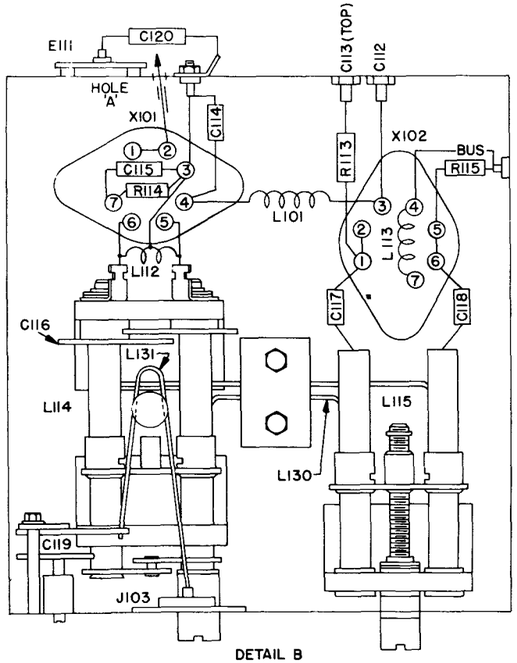


Figure 7-1. Radio Receiver and Transmitter BC-788-C, Schematic Diagram



DETAIL A



DETAIL B

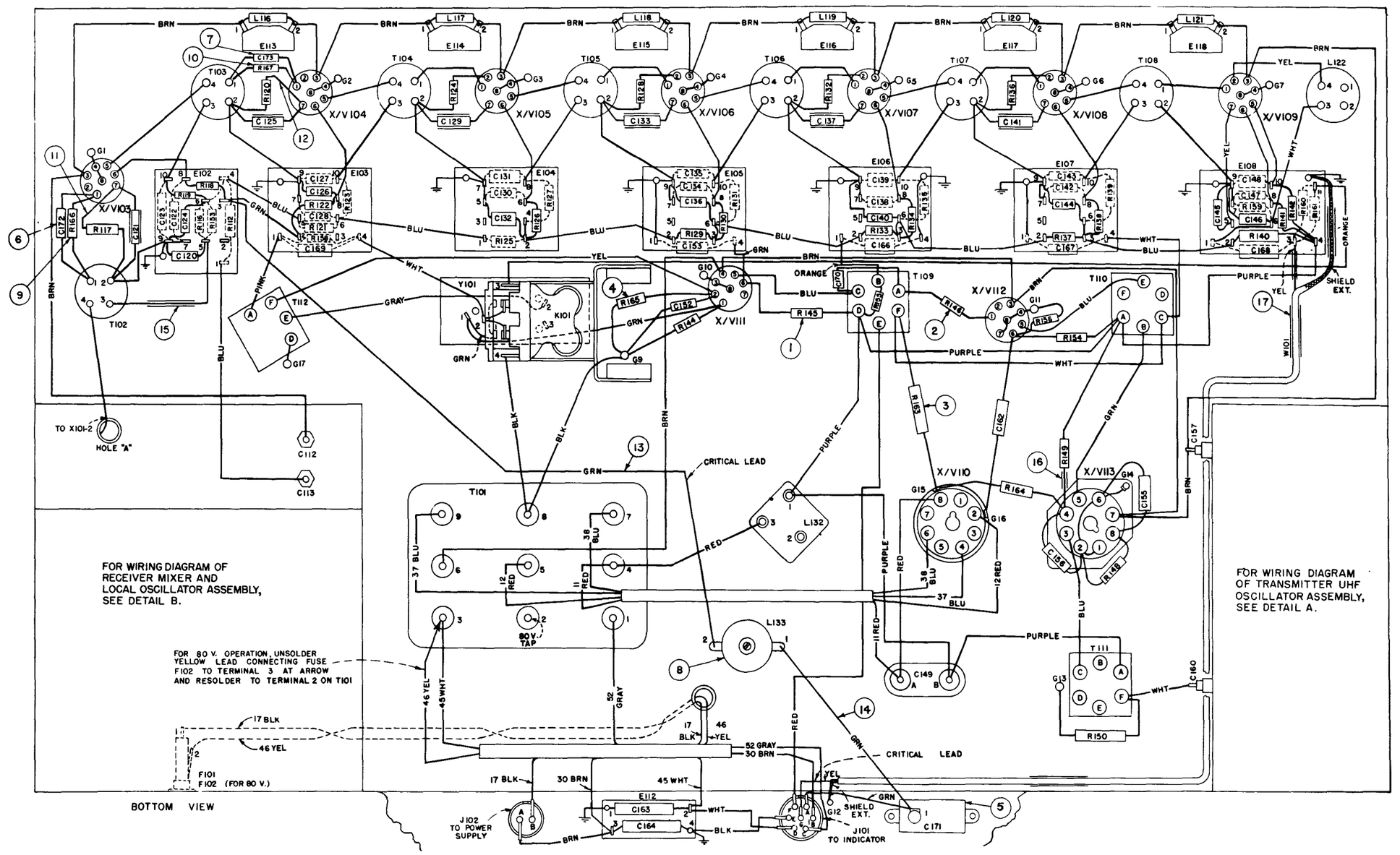


Figure 7-2. Radio Receiver and Transmitter BC-788-C, Wiring Diagram

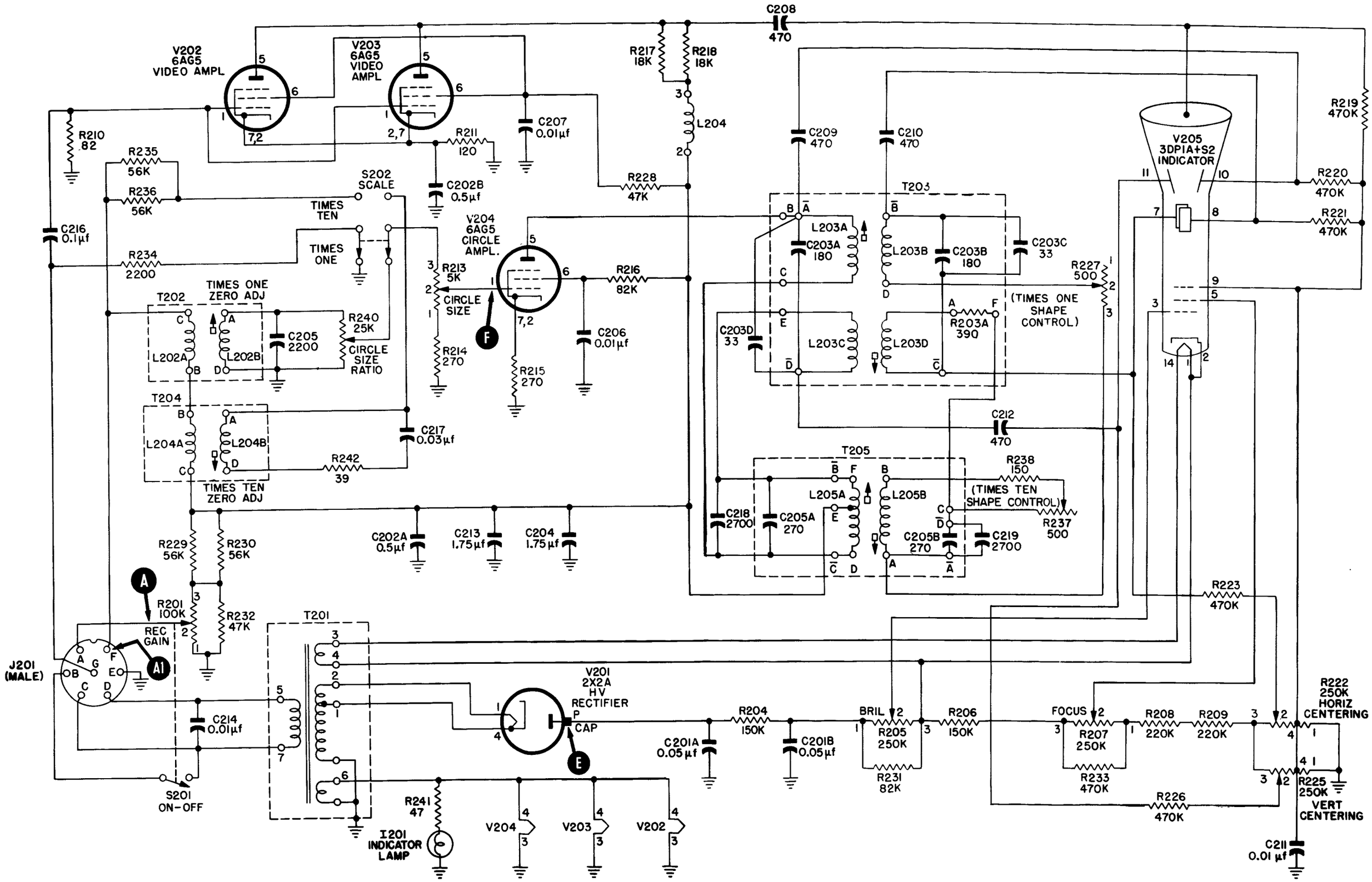
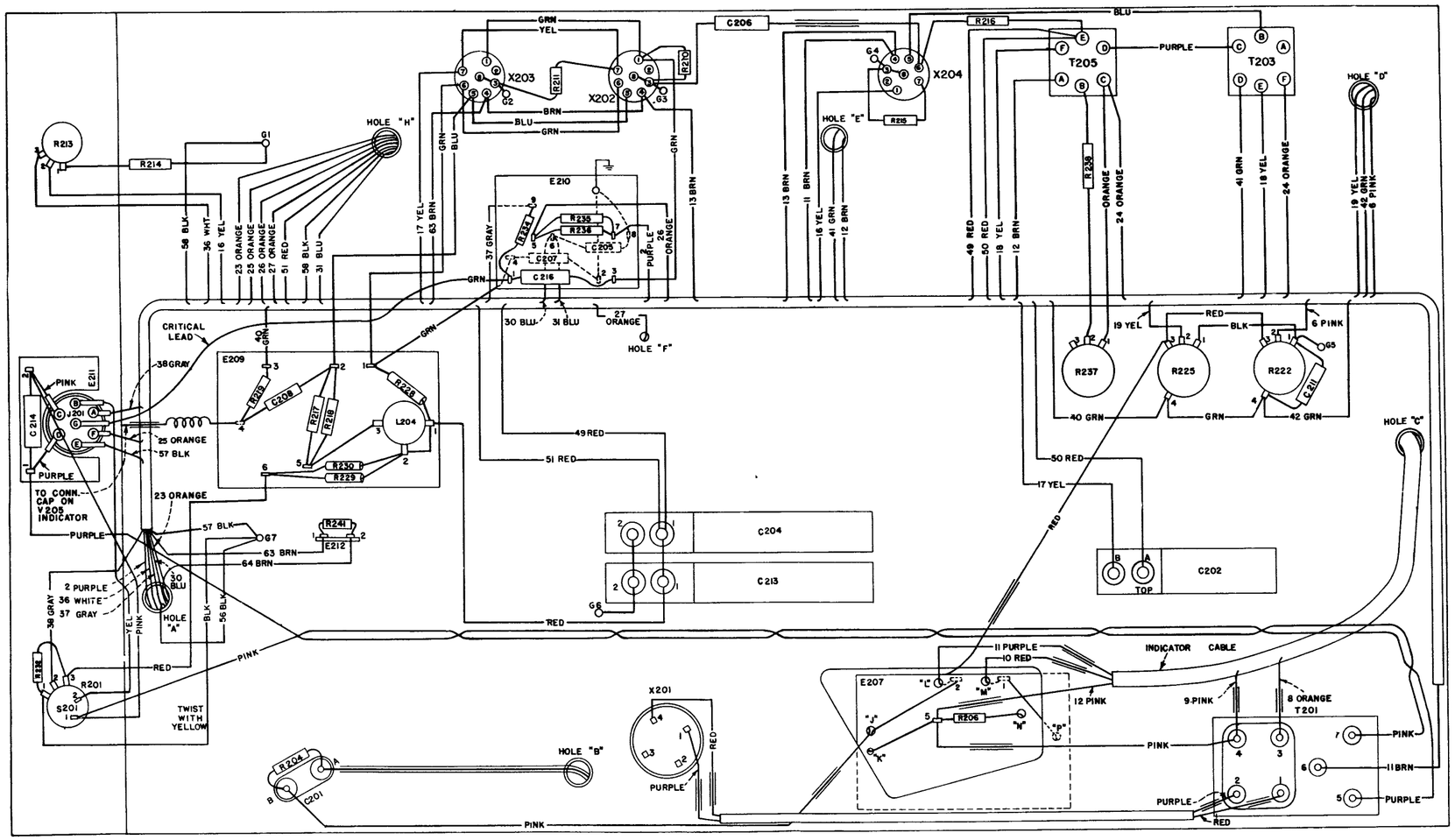


Figure 7-3. Indicator I-152-C, Schematic Diagram



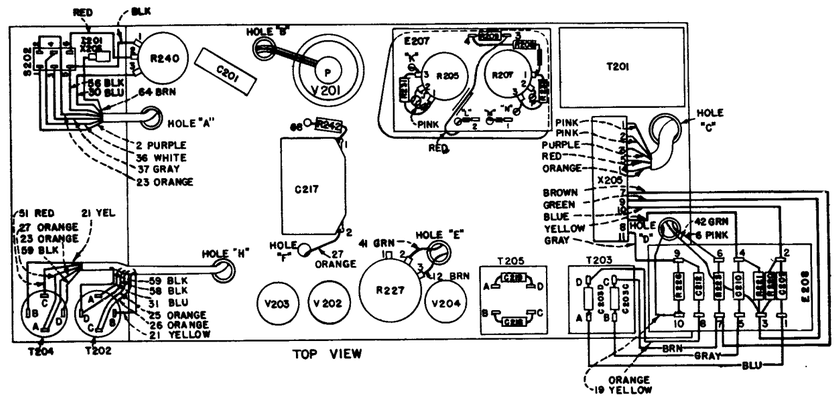


Figure 7-4. Indicator I-152-C, Wiring Diagram

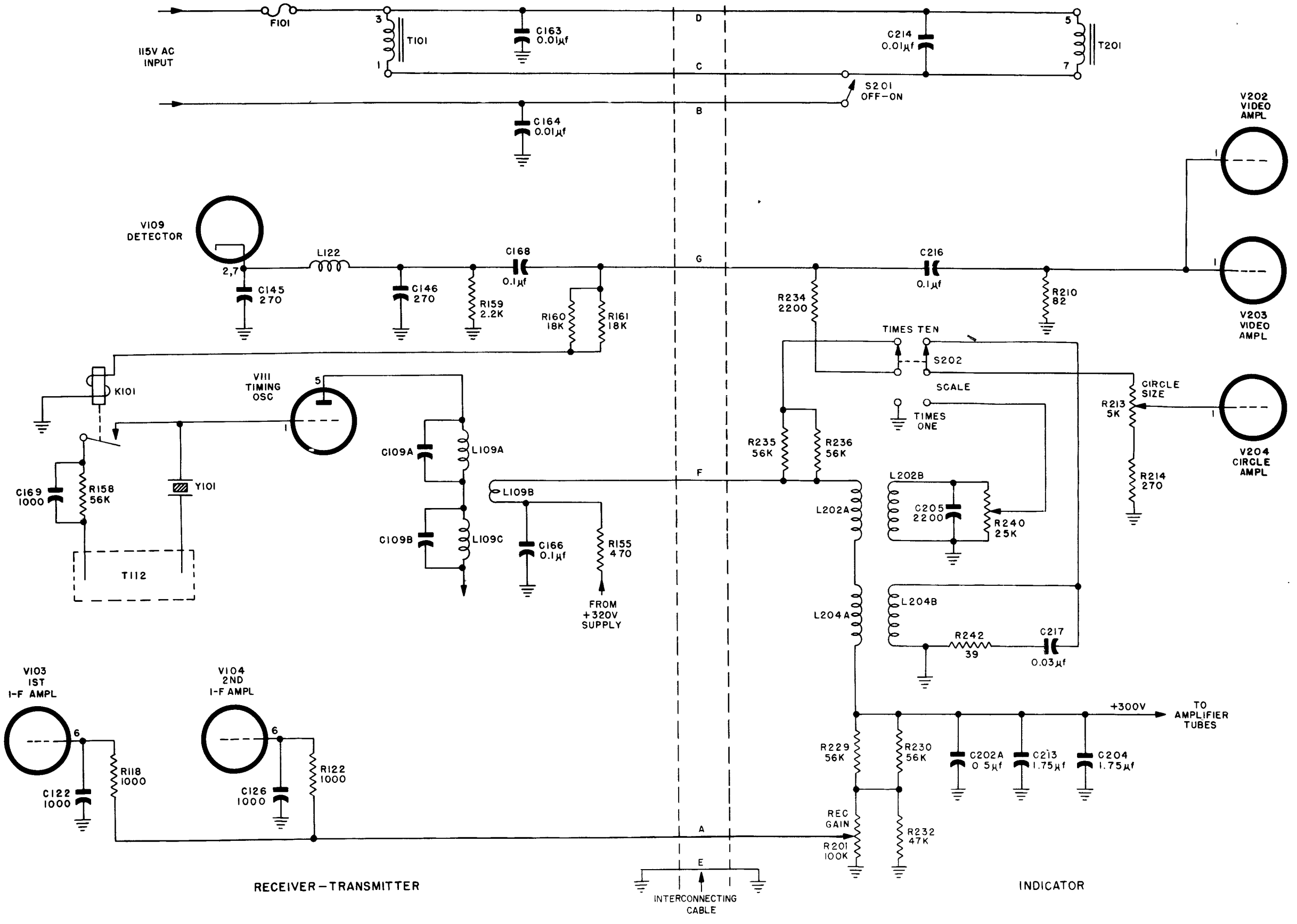
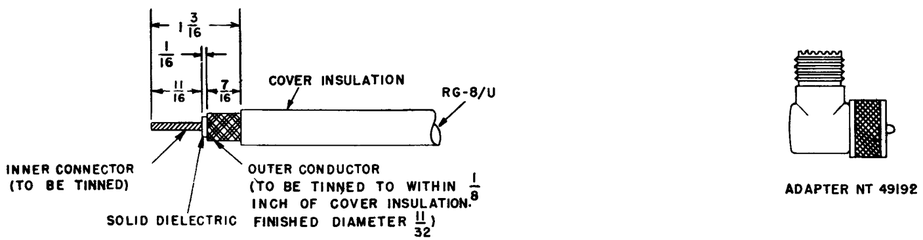


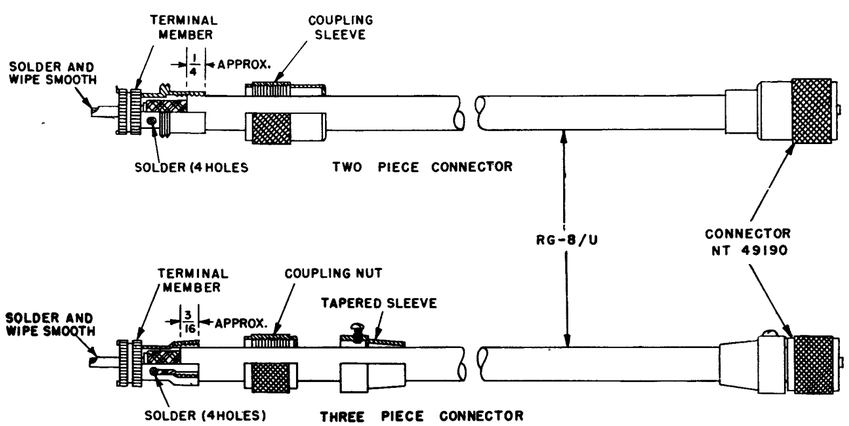
Figure 7-5. Circuits Linked by the Interconnecting Cable, Simplified Schematic Diagram

ANTENNA TRANSMISSION CABLES

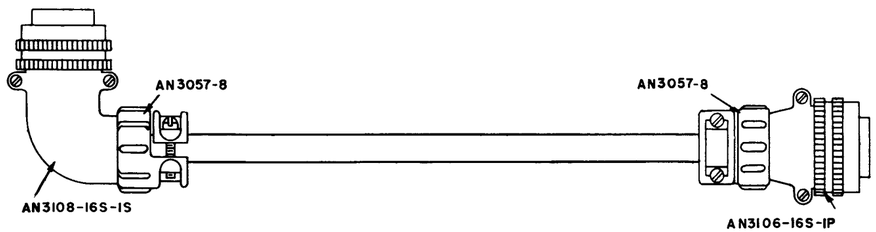


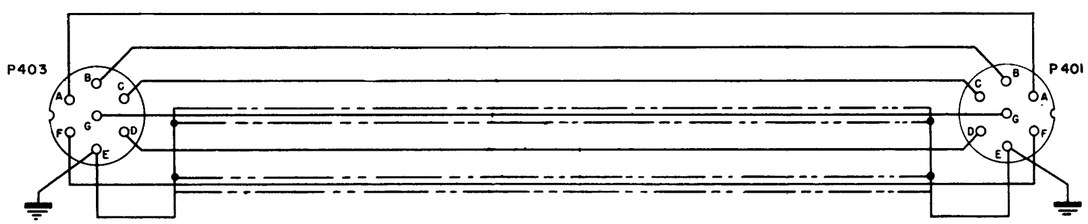
ADAPTER NT 49192

NOTE: MINIMUM BENDING RADIUS OF RG-8/U IS 5 INCHES.



INTERCONNECTING CABLE



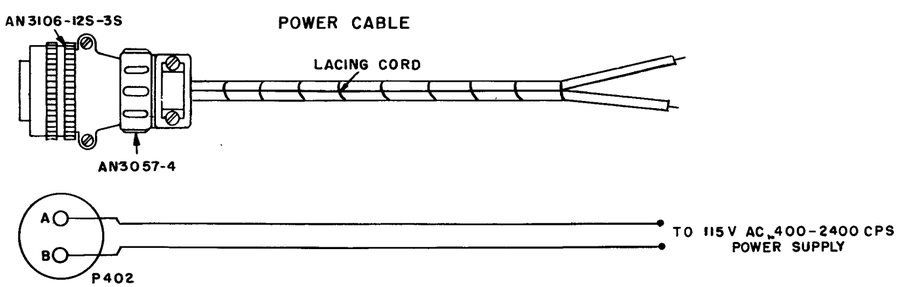


PIN	WIRE TYPE AND SIZE
A	AN 20
B	AN 20
C	AN 20
D	AN 20
E	*
F	AN 20 SHIELDED
G	RG-59/U OR **MI-20

* NOT A SEPARATE CONDUCTOR; USES SHIELD BRAIDS OF CONDUCTORS ON PINS F AND G.

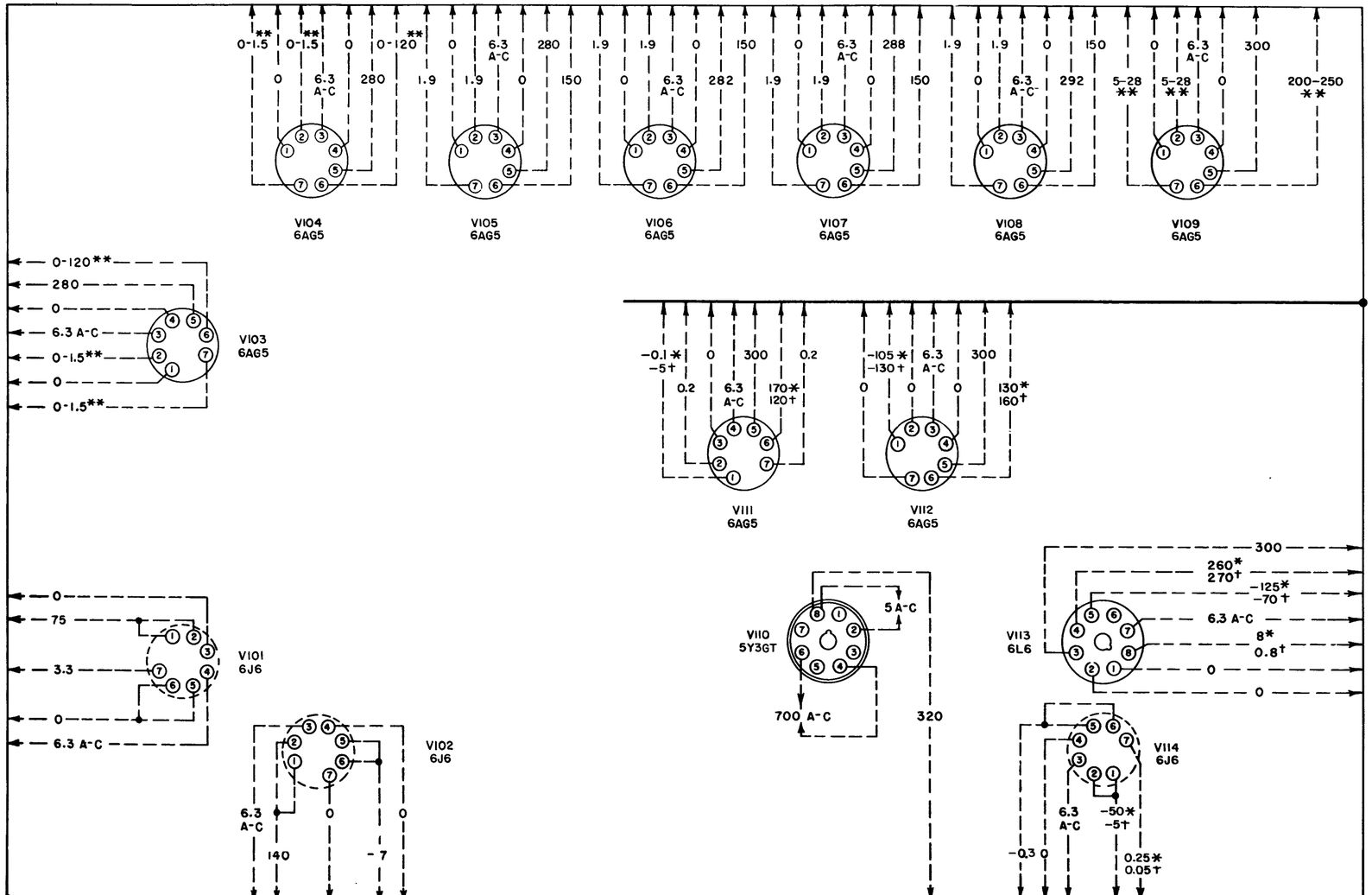
** MANUFACTURER'S TYPE NUMBER.

POWER CABLE



PIN	WIRE TYPE AND SIZE
A	AN 20
B	AN 20

Figure 7-6. Cable Fabrication Drawings



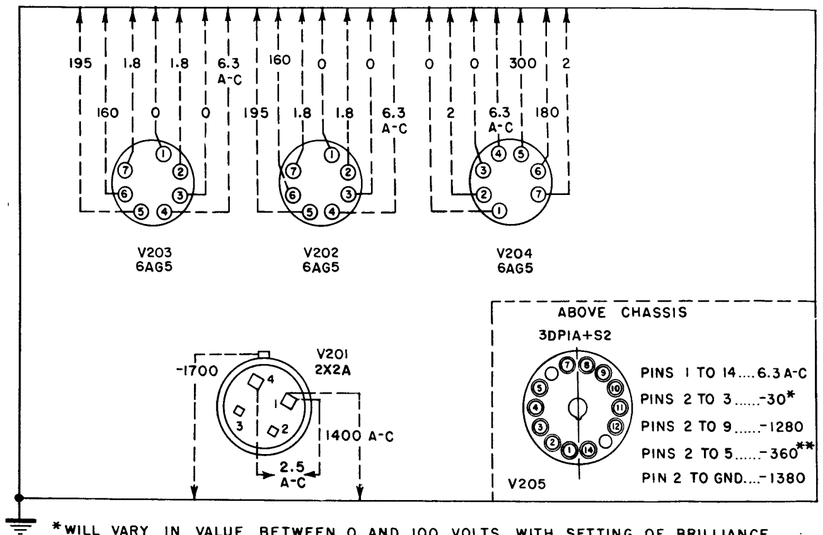
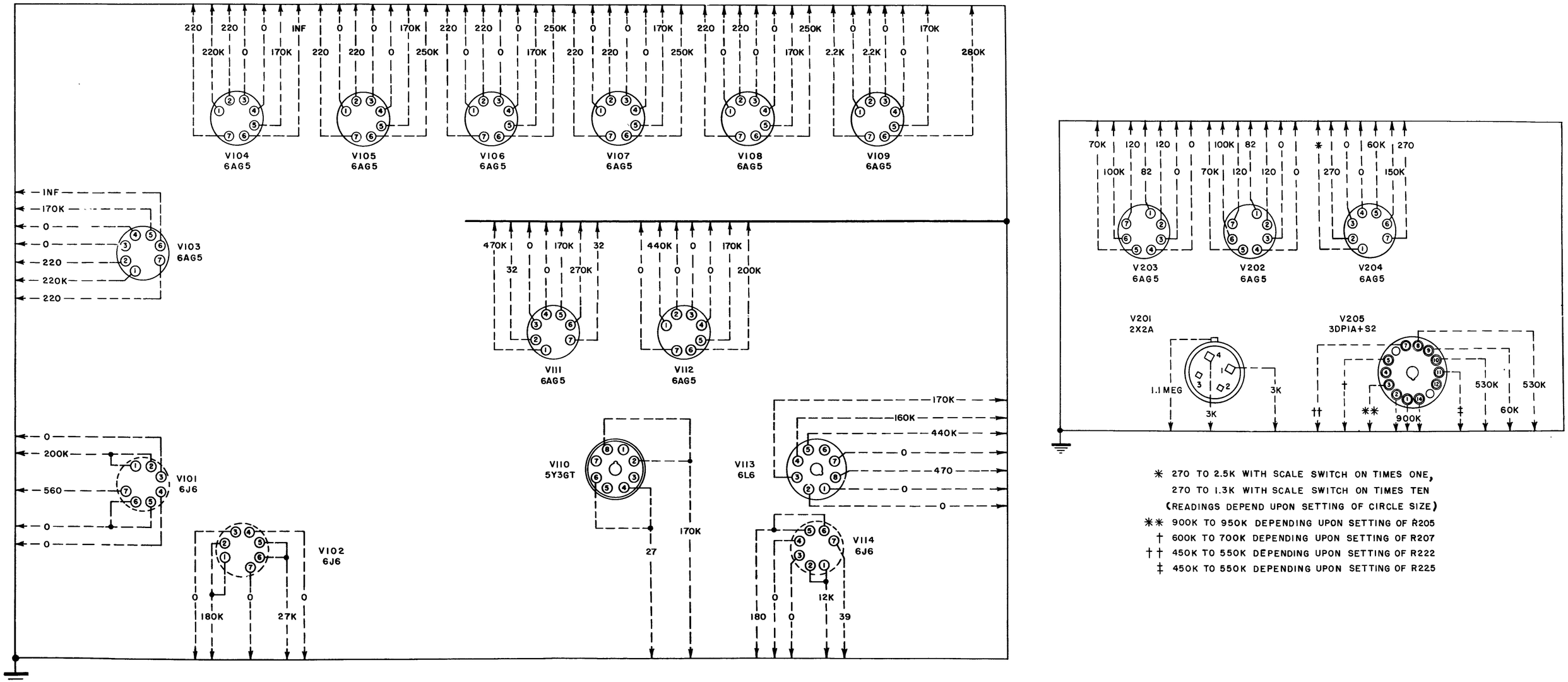


Figure 7-7. Tube-Socket Voltage Diagram



* 270 TO 2.5K WITH SCALE SWITCH ON TIMES ONE,
270 TO 1.3K WITH SCALE SWITCH ON TIMES TEN
(READINGS DEPEND UPON SETTING OF CIRCLE SIZE)

** 900K TO 950K DEPENDING UPON SETTING OF R205

† 600K TO 700K DEPENDING UPON SETTING OF R207

†† 450K TO 550K DEPENDING UPON SETTING OF R222

‡ 450K TO 550K DEPENDING UPON SETTING OF R225

Figure 7-8. Tube-Socket Resistance Diagram

INDEX

INDEX—Continued