INSTRUCTION BOOK

FOR

RADIO COMPASS SCR-246-A

MANUFACTURED BY

FAIRCHILD AVIATION CORPORATION

Cover, iii

~~RESTRICTED~~

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OF

THE CHIEF SIGNAL OFFICER

ORDER NO. 61-NY-40

DATE: AUGUST 7, 1939

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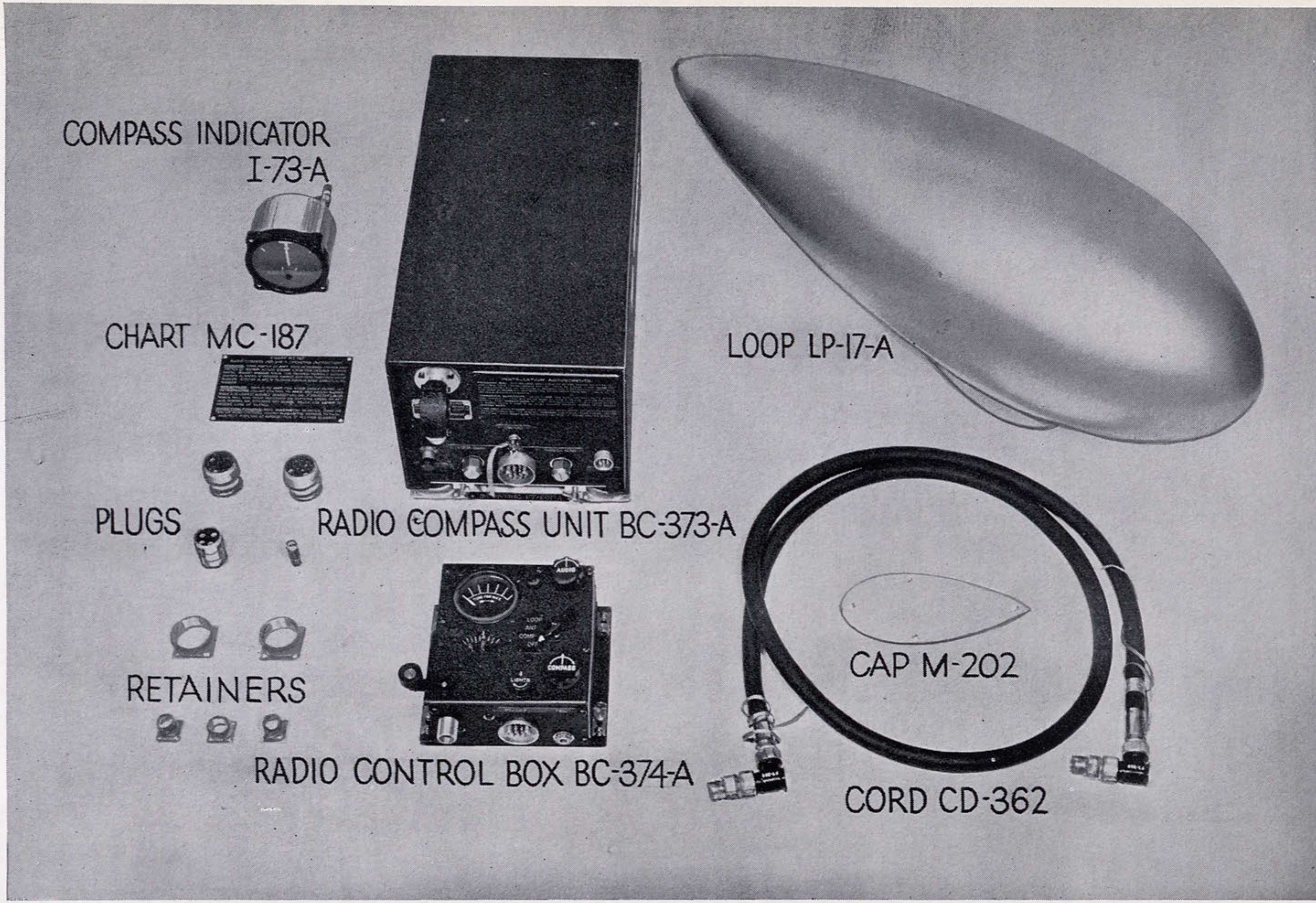


FIG. 1—RADIO COMPASS SCR-246-A, COMPONENTS

I — GENERAL DESCRIPTION OF COMPLETE EQUIPMENT

1. RADIO COMPASS SCR-246-A

a. Purpose and Frequency

Primarily a navigational instrument, Radio Compass SCR-246-A (Fig. 1) was designed for use in U. S. Army aircraft as a radio compass-type homing device. As such it provides visual, unidirectional, right-left indication showing the direction of the radio signal source with respect to the aircraft heading. For this operation both a loop antenna and a non-directional (usually a vertical) antenna are employed. The equipment may also be used as a radio range or weather broadcast receiver providing aural reception of modulated radio signals. In this connection the non-directional antenna is normally required. However, loop reception is provided as an alternative in weather broadcast reception and is possible and advantageous under certain conditions of charged particle (static) interference if the aircraft is maneuvered so that the transmitting station is to the right or left of the line of flight. Operation of the equipment is accomplished remotely by means of a radio control box which may be mounted in any position convenient to the operator. The frequency range, 195 to 420 kilocycles, is covered in a single band. The general mechanical design is such that the rapid removal of major units can be accomplished for inspection or tactical purposes.

b. Typical Installations

The radio compass has been designed for installation in aircraft with built-in connector panels but can be installed in aircraft without connector panels by using the flexible conduit assembly including junction box supplied for laboratory use.

c. Interchangeability of Parts

The individual units comprising the radio compass having the same Signal Corps type numbers are interchangeable, i.e., loops, dynamotors, compass indicators, mountings, etc.

d. Power Supply

Power for Radio Compass SCR-246-A is supplied by the 12 volt aircraft storage battery. The compass when operating under normal conditions draws approximately 70 watts and supplies voltage to the marker beacon receiver through the connecting wiring.

e. Weight

The complete equipment ready to be installed weighs 38.5 pounds. The flexible conduit assembly including junction box or other cables used for interconnection on the aircraft are not included in this weight.

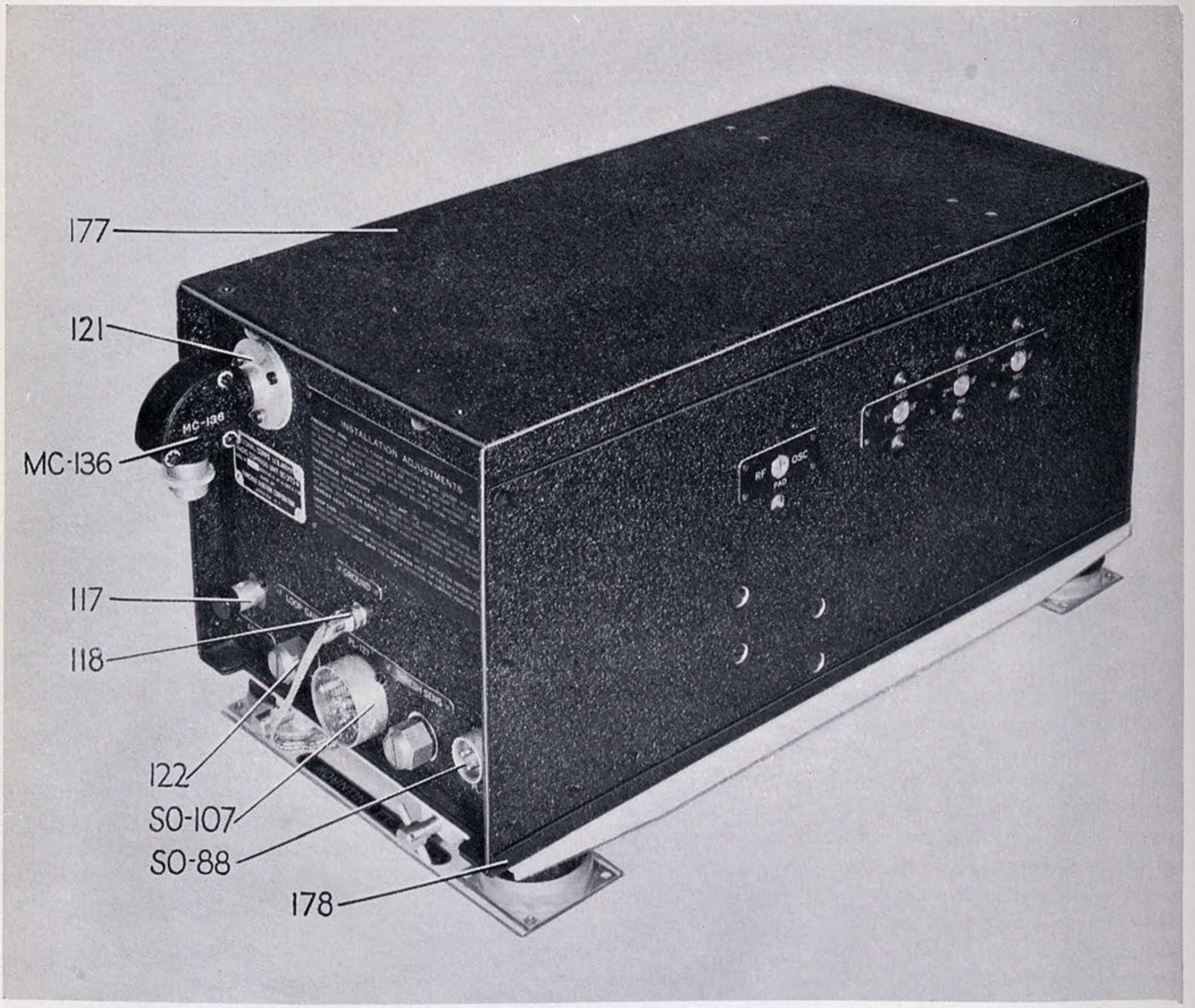


FIG. 2—RADIO COMPASS UNIT BC-373-A

2. DESCRIPTION OF MAIN COMPONENTS

a. Radio Compass Unit BC-373-A

Radio Compass Unit BC-373-A (Fig. 2) contains the compass circuit elements, the superheterodyne receiver elements, and the high voltage power supply. Thirteen all-metal type vacuum tubes are required. A Dynamotor DM-29-A is used for the high voltage supply. The top and bottom covers are removable, allowing access to the radio compass interior for inspection or servicing. The top cover is held by snap-slide fasteners and the bottom cover is held by four fillister head screws. Mounted on the front panel are provisions for the electrical and mechanical coupling to component units, i.e., binding posts for the antenna and ground connections, Socket SO-107 for connection of the electrical circuits to the connector panel, Coupling MC-136 for connection of capacitor Tuning Shaft MC-124, and Socket SO-88 for connection to the loop circuit through Cord CD-362. The use of Coupling MC-136 is optional and will be dependent upon the installation requirements of the aircraft. Also mounted on the front panel are two controls necessary for installation adjustments. These installation adjustments are:

(1) "THRESH SENS" control which adjusts the noise output of the radio compass unit when tuning between stations.

(2) "LOOP GAIN" control which provides the proper ratio of loop signal to antenna signal.

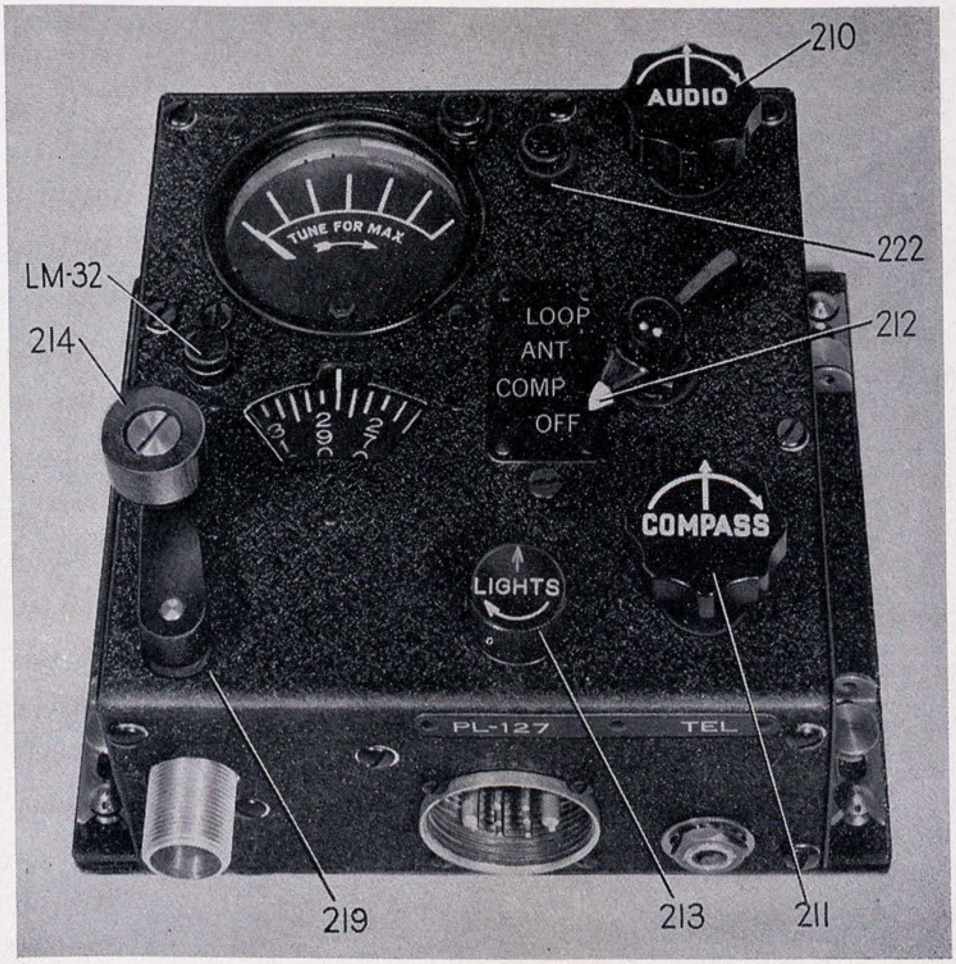


FIG. 3—RADIO CONTROL BOX BC-374-A

b. Radio Control Box BC-374-A

Radio Control Box BC-374-A (Fig. 3) is electrically and mechanically connected to the radio compass unit by means of cables and a flexible tuning shaft. This unit contains Tuning Meter I-74, the frequency dial and tuning crank mechanism, the selector switch, "AUDIO" and "COMPASS" output controls, and "LIGHTS" control.

(1) Tuning Meter I-74

The tuning meter markings are painted with luminous material for visibility during night flying. The function of the tuning meter is to facilitate exact tuning to any received signal. When tuning through a station the meter will deflect toward the right, the maximum deflection indicating proper tuning.

(2) Frequency Dial and Tuning Mechanism

The frequency dial is calibrated in five kilocycle divisions. Resonant frequency is indicated at twenty kilocycle intervals at the high end of the band and at ten kilocycle intervals at the low end. The number appearing under the window index indicates the frequency in kilocycles to which the radio compass is tuned.

(3) Selector Switch, "AUDIO," and "COMPASS" Controls

The selector switch has four positions, namely: "OFF"—"COMP"—"ANT"—"LOOP". When in the "COMP" position the control labelled "COMPASS" adjusts the sensitivity of the compass indicator. The control labelled "AUDIO" governs the signal volume at the headset. In the "ANT" and "LOOP" positions the "COMPASS" control is inoperative, the headset and interphone level being adjusted by the "AUDIO" control.

(4) "LIGHTS" Control

Lighting of the tuning meter and frequency dial is provided by instrument Lamps LM-32. The brilliance is adjusted by the control marked "LIGHTS." One spare lamp is contained in a receptacle on the panel adjacent to the tuning meter.

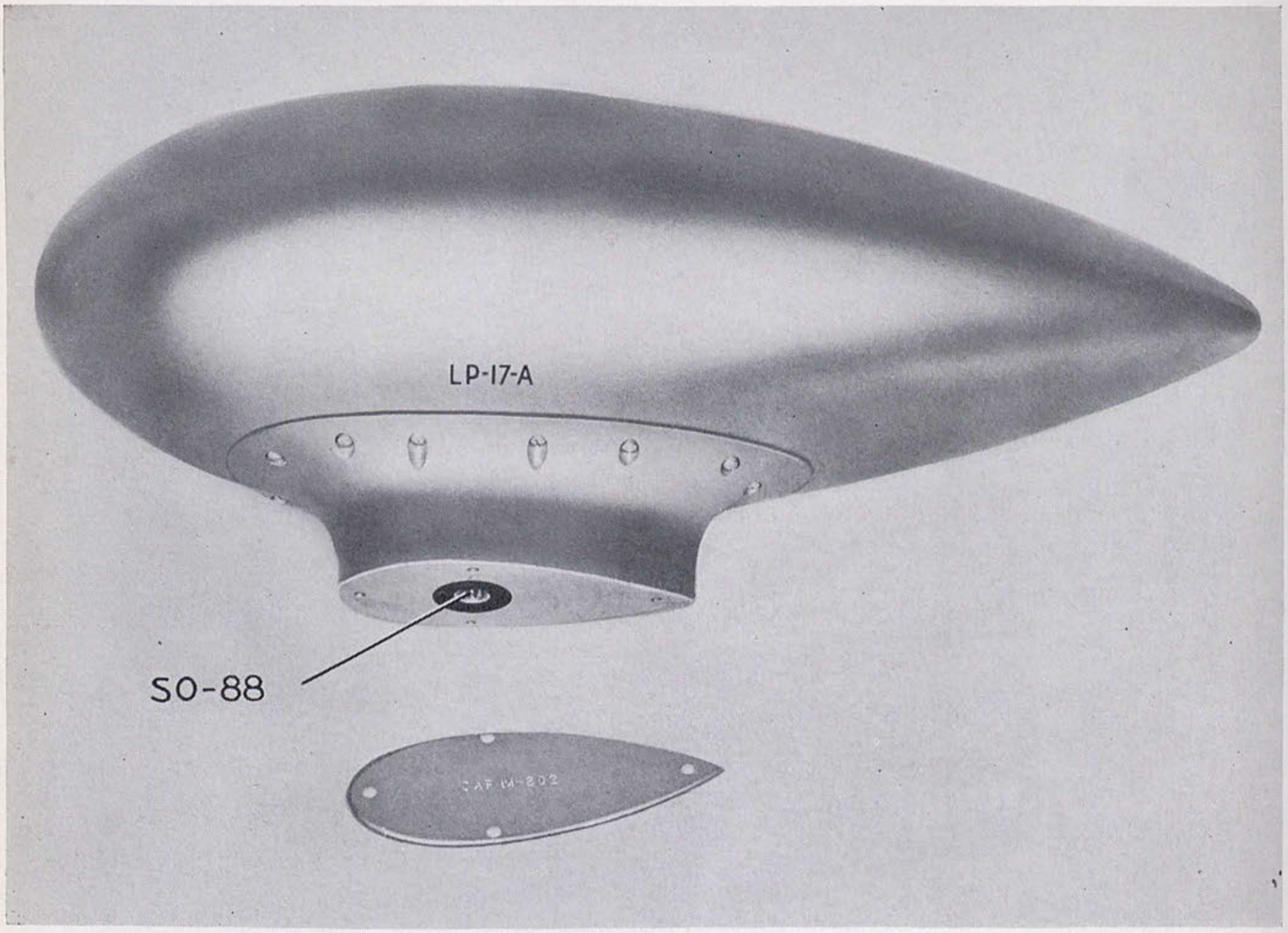


FIG. 4—LOOP LP-17-A AND CAP M-202

c. Loop LP-17-A, Includes Housing and Mounting

Loop LP-17-A consists of a fixed position, low impedance, shielded loop winding enclosed in a streamlined housing. Both loop and housing are supported by a metal neck casting which is designed for bolting to the outside of the aircraft skin structure. The 4 pin connector Socket SO-88 for the Cord CD-362, which electrically connects the loop to the radio compass unit, is recessed into the bottom of the neck casting. Removal of the side plug in the neck casting permits access to the clamping and adjusting screw by means of which the loop may be rotated five degrees in either direction to correct for slight mechanical errors in the installation alignment of the loop assembly. (Fig. 4 and Fig. 26.)

d. Cap M-202 (for loop mounting hole)

Cap M-202 is a flat plate designed to cover the opening in the aircraft skin structure after the removal of the loop. Four holes are provided for mounting to the aircraft. (Fig. 4.)

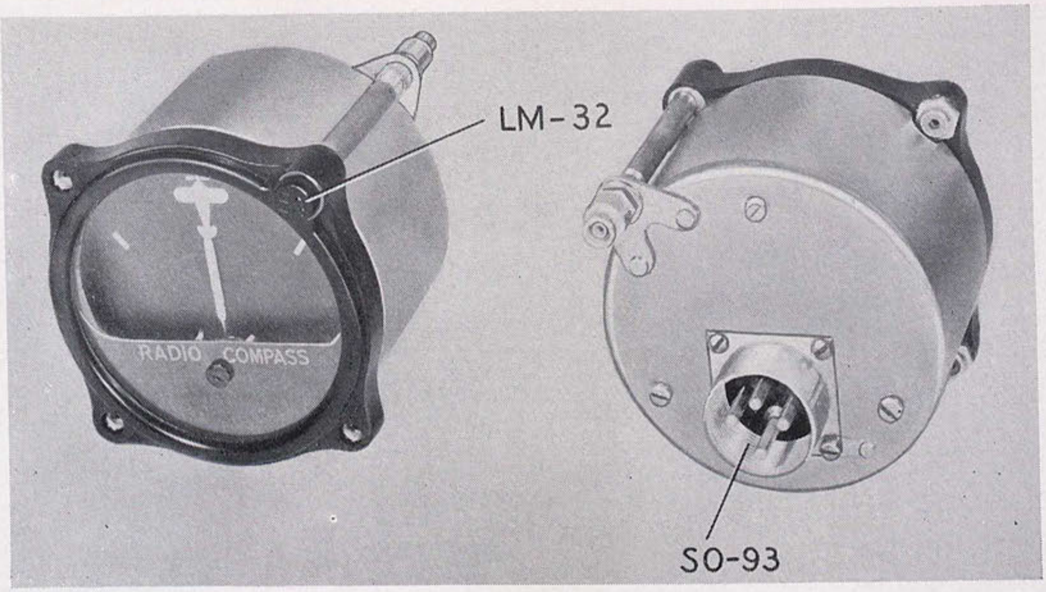


FIG. 5—COMPASS INDICATOR I-73-A

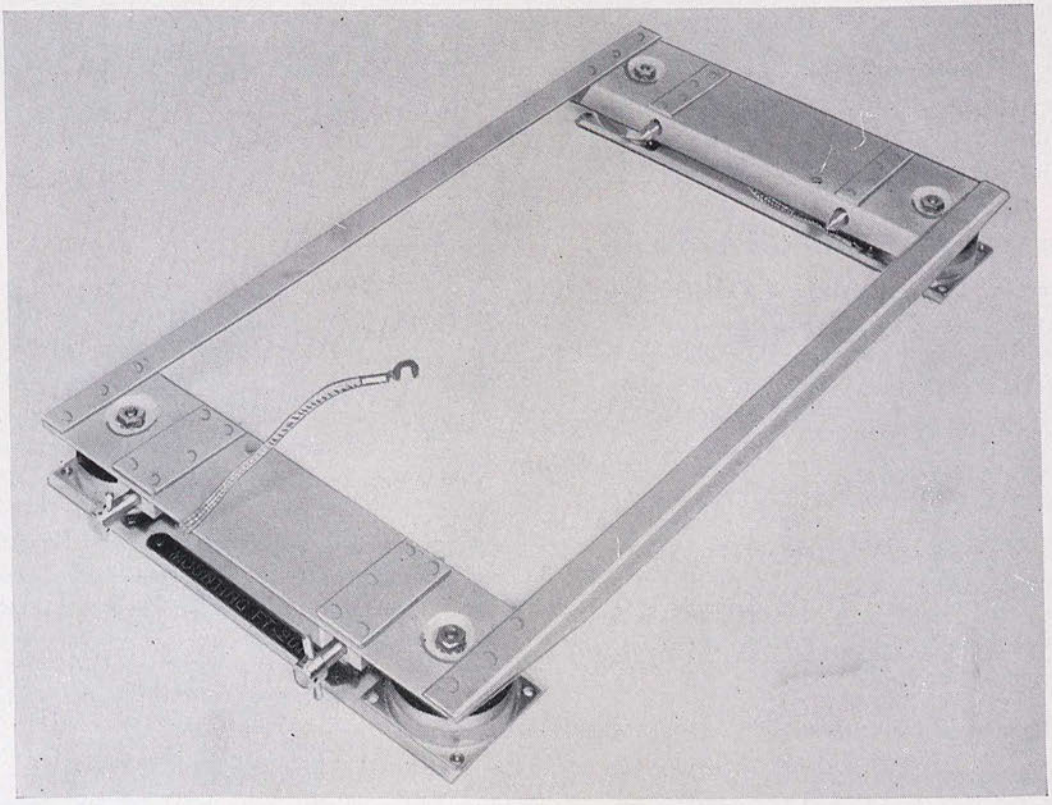


FIG. 6—MOUNTING FT-207-A

e. Compass Indicator I-73-A

Compass Indicator I-73-A is designed for mounting on instrument panels that are shock insulated. The movement is of the iron core dynamometer type and the pointer deflection is proportional to the current flowing in the moving coil. It has luminous markings and rim lighting for visibility during night flying. Sockets are provided on the rear for quick disconnection of electrical circuits. (Fig. 5.)

f. Mounting FT-207-A (for radio compass unit)

Mounting FT-207-A is of the shock insulation type and is designed to be rigidly attached to the aircraft structure and carry the radio compass unit. This mounting is designed for quickly attaching or detaching the radio compass unit by manipulation of two thumb screws. (Fig. 6.)

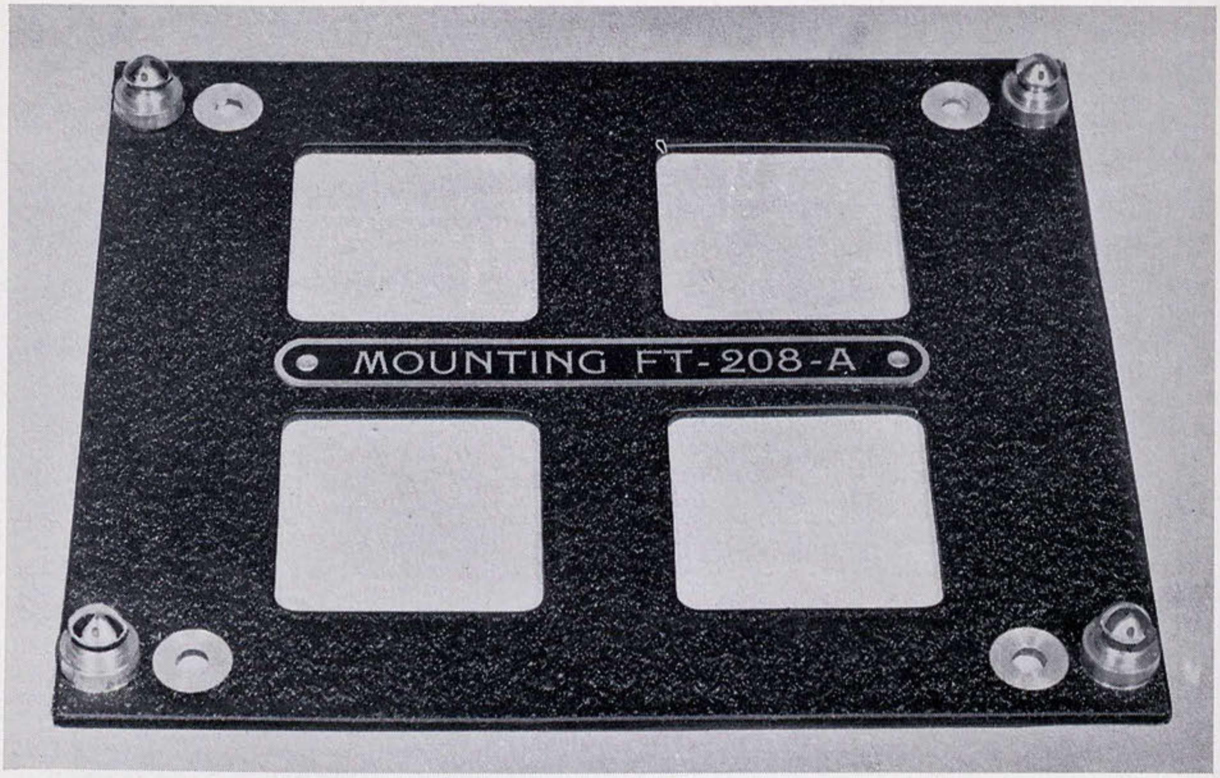


FIG. 7—MOUNTING FT-208-A

g. Mounting FT-208-A (for radio control box)

Mounting FT-208-A consists of a flat rectangular plate carrying snap slide studs mounted in the four corners. It has been designed to be rigidly attached to the aircraft structure. The radio control box is secured to the mounting by means of snap-slides. (Fig. 7.)

h. Cord CD-362

Cord CD-362 is a shielded neoprene coated conduit containing a two conductor, low impedance line terminating in Plug PL-108 at each end. It is designed to electrically connect Loop LP-17-A and Radio Compass Unit BC-373-A. (Fig. 8.)

i. Set of Retainers for Plugs and Tuning Shaft

The retainers are threaded receptacles, to be mounted near the radio control box and radio compass unit, into which the electrical plugs and tuning shaft are secured, when the radio compass unit and/or radio control box are removed from the aircraft. (Fig. 8.)

j. Chart MC-187

Chart MC-187 contains instructions outlining operating procedure for the use of Radio Compass SCR-246-A. It is to be mounted on the aircraft structure in the proximity of the radio control box. (Fig. 8.)

k. Plugs

Four different Signal Corps plugs are used as part of Radio Compass SCR-246-A; two Plugs PL-108 are used and furnished as part of Cord CD-362 (Fig. 8); one Plug PL-127 is used for coupling cables from the connector panel to the radio compass unit and another for coupling cables from the connector panel to the radio control box; one Plug PL-113 is used for coupling cables from the connector panel to the compass indicator; and one Plug PL-117 is used for coupling a cable from the aircraft lighting circuit to the lighting circuit of the compass indicator.

l. Flexible Conduit Assembly, Includes Junction Box

The flexible conduit assembly including the junction box was primarily intended for use in laboratory testing but if desired may be installed in an aircraft. It contains all necessary cables and plugs to interconnect the various units and operate the equipment. Provision has been made to supply the marker beacon receiving equipment with low voltage power and filtered high voltage power. In addition the phone output circuit is brought out through the junction box to the connector panel of the command set. The junction box contains two Fuses FU-28 of 15 ampere rating, one in the positive low voltage power supply circuit and one spare. (Fig. 9.)

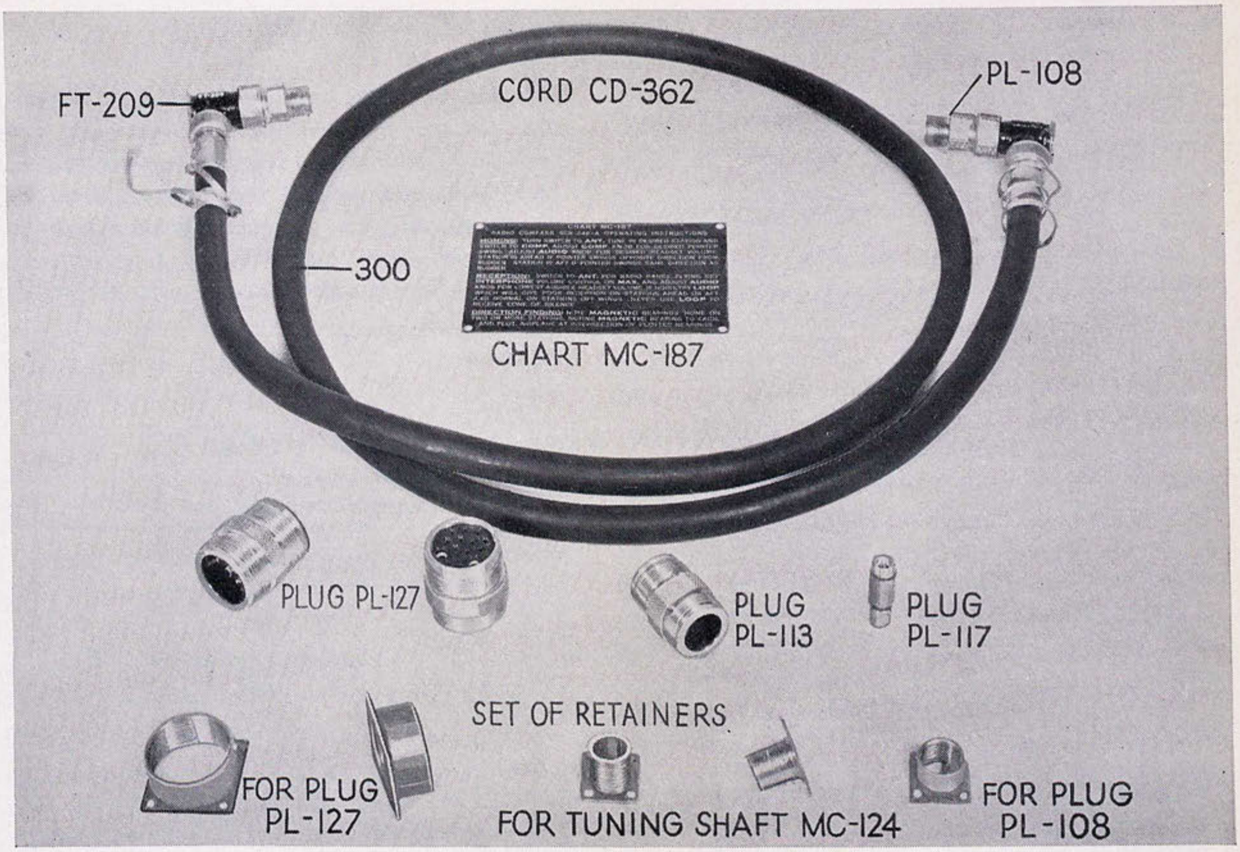


FIG. 8—CORD CD-362, CHART MC-187, SET OF RETAINERS AND PLUGS

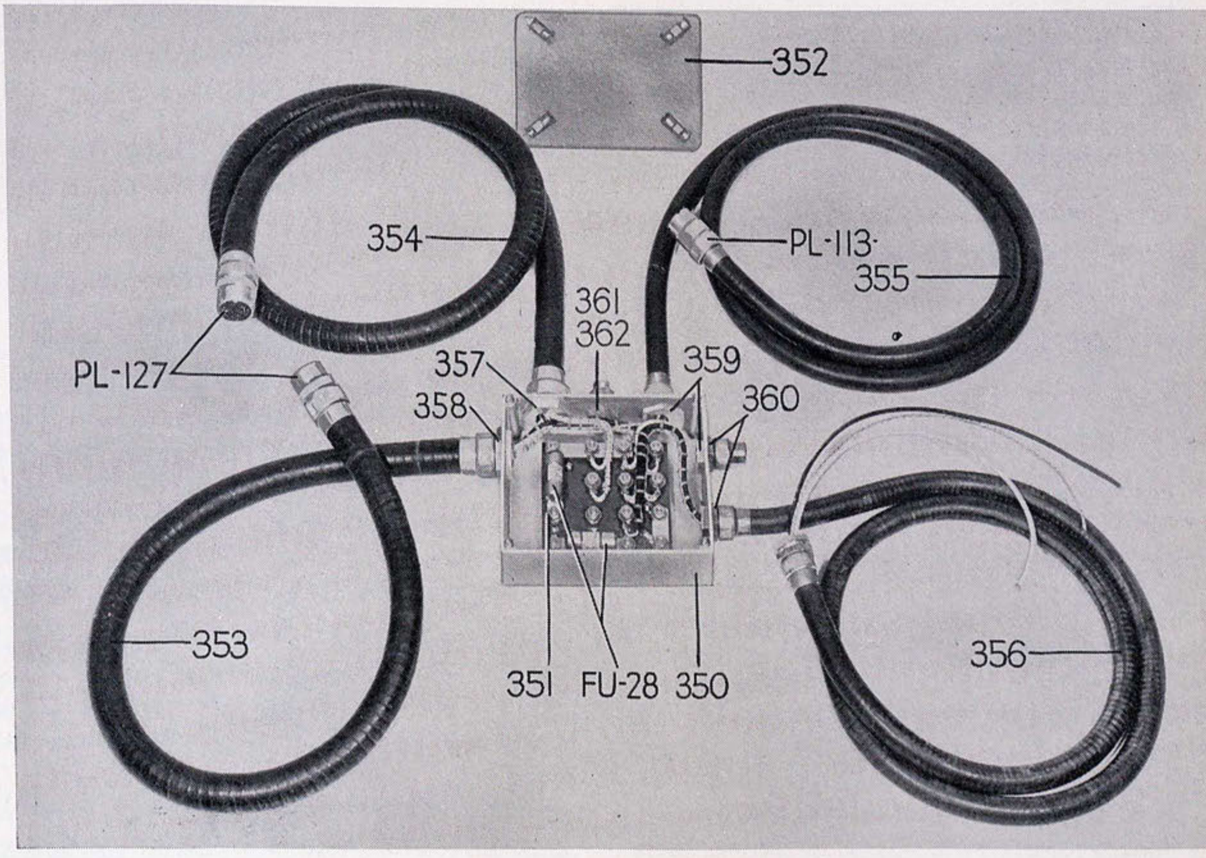


FIG. 9—FLEXIBLE CONDUIT ASSEMBLY INCLUDES JUNCTION BOX

m. Accessories

The radio compass has been designed to be used in conjunction with the following standard Signal Corps parts, although these are not supplied under Order No. 61-NY-40:

(1) Headset HS-18 or HS-23 (electrically interchangeable).

(2) Cord CD-307 or CD-307-A (headset extension).

(3) Tuning Shaft MC-124 (for variable tuning capacitor).

The length of the tuning shaft will be governed by the distance between the installed radio compass unit and radio control box in the aircraft. In addition to the components listed above, there will be required a suitable vertical antenna, a 12 to 14 volt d-c power source, and standard Air Corps conduit and couplings for installations using rigid and flexible conduit.

3. TABULATION OF COMPONENTS, WEIGHTS, AND SIZES

Description	Overall Dimensions In Inches	Weight
1 Cap M-202	6-3/4 x 3 x 1/8	.17 lbs.
1 Chart MC-187	5 x 3-1/4 x 1/32	.04 lbs.
1 Compass Indicator I-73-A	3-1/4 x 3-1/4 x 3-17/32	1.50 lbs.
1 Cord CD-362	72 long	1.36 lbs.
1 Flexible Conduit Assembly including junction box		9.62 lbs.
1 Loop LP-17-A	25-9/16 x 11-3/32 x 9	6.22 lbs.
1 Plug PL-117 (instrument lighting)	1/2 dia. x 1-3/8 long	.02 lbs.
2 Plug PL-127 (at radio compass unit and radio control box to junction box)	1-1/4 dia. x 1-1/2 long	.25 lbs.
1 Plug PL-113 (at compass indicator to junction box)	1-1/16 dia. x 1-1/2 long	.09 lbs.
1 Radio Compass Unit BC-373-A, includes:	15-5/8 x 8 x 8	26.1 lbs.
1 Mounting FT-207-A		
1 Dynamotor DM-29-A		
9 Tube Shield MC-202		
1 Coupling MC-136		
1 Radio Control Box BC-374-A, includes:	5-3/4 x 5-1/8 x 3-23/32	2.78 lbs.
1 Mounting FT-208-A		
3 Lamp LM-32 (2 in use, 1 mounted spare)		
1 Set Screw Wrench No. 6		
1 Set of Retainers for plugs and tuning shaft:		
2 for Plug PL-127	1-3/8 x 1-3/8 x 5/8	.03 lbs.
2 for Tuning Shaft MC-124	7/8 x 7/8 x 11/16	.008 lbs.
1 for Plug PL-108	7/8 x 7/8 x 1/2	.015 lbs.
1 Set of Vacuum Tubes		1.18 lbs.
2 Tube VT-65		
4 Tube VT-86		
1 Tube VT-87		
2 Tube VT-91		
2 Tube VT-93		
2 Tube VT-107		

II — EMPLOYMENT

4. INSTALLATION

a. Bonding and Shielding

To make possible the most efficient operation of the radio compass it will be necessary to satisfactorily bond and shield all electrical circuits in the aircraft, i.e., lighting, ignition, battery, etc. The requirements for bonding and shielding as contained in Air Corps Technical Orders and the Handbook of Instructions for Airplane Designers should be carefully followed in making the radio compass installation.

b. Antenna Requirements

The vertical or non-directional antenna to be used with this radio compass should have the following characteristics:

(1) An effective height of 0.05 meter to 0.25 meter.

(2) A capacitance of 40 to 100 mmfd.

(3) A resistance of 1 to 10 ohms.

Satisfactory operation may be obtained with other antennas, however, but the above data indicates the range of characteristics encountered in ordinary aircraft installations. A short well-insulated lead-in is desirable and should be provided in accordance with the installation limitations of the aircraft. The free end section of this lead at the radio compass unit must have sufficient slack to allow for the maximum possible motion of the radio compass unit on its shock mounting without causing tension on the lead-in wire. Connection to the radio compass unit is provided on the front panel by the binding post marked "ANT".

c. Ground Connection

A length of tinned copper bonding braid is attached to the front base plate of the radio compass unit mounting; the ground connection is made by inserting the bonding braid terminal beneath the wing nut provided on the "GROUND" binding post on the radio compass unit panel. This wing nut should be tightened hand tight.

5. INSTALLATION OF COMPONENTS

Before proceeding with the installation of Radio Compass SCR-246-A in an aircraft, follow the instructions in Par. 6 *a* outlining tests to be made before installation.

a. Loop LP-17-A, includes housing and mounting

Overall and outline dimensions of Loop LP-17-A are shown in Fig. 44. This unit should be mounted along the fore and aft axis of the aircraft in either the upright position above the fuselage or in the inverted position below the fuselage, at a point where the aircraft structure is sufficiently strong to support the weight of the loop and mounting and also withstand the aerodynamic drag on the housing. When the aircraft is in flying position the loop center line should be truly vertical. The location of the loop can be determined only after giving full consideration to the space available, length of Cord CD-362, location of the radio compass unit and other factors that would affect the location of the loop. A strong metal mounting plate attached to the aircraft structure must be provided to support the loop and must be drilled in accordance with dimensions given in Fig. 44. The two holes along the long axis of the loop neck casting are to be located in the line of the projected fore and aft axis of the aircraft. Upon completion of the installation and with the equipment adjusted according to **Par. 6 *b* (2)** *(e)* all external screw head holes are to be filled with Permatex No. 1 sealing compound, or equal, in order to waterproof and streamline the equipment to the best degree.

b. Radio Compass Unit BC-373-A, includes Mounting FT-207-A

The radio compass unit with its mounting should be installed where the unit will have the necessary clearance for free movement during periods of shock and vibration, installation and removal accessibility and clearance to connect the coupling cables and tuning shaft.

Figs. 42 and 45 show all necessary overall and mounting dimensions needed to install the radio compass unit. The selected mounting surface must be securely attached to the aircraft structure and drilled in accordance with dimensions given in Fig. 42. Provision has been made in Mounting FT-207-A for the removal of the front and rear pairs of mounting feet in order to gain access to the lower mounting plate. This is accomplished by removing the four nuts and lockwashers on the top and withdrawing the mounting framework from the shock absorbing feet. The mounting feet may now be secured to the aircraft mounting surface without difficulty. Replace the mounting frame, being certain that all studs are properly seated in their respective holes before tightening the nuts. The radio compass unit can now be placed on the mounting and the cone screws tightened hand tight. Provision for the safety wiring of these screws and the cover snap slides have been made.

c. Radio Control Box BC-374-A, includes Mounting FT-208-A

The radio control box should be located so the panel is within easy reach and sight of the operator and so that coupling may be made by the connection of the electrical cables and mechanical tuning shaft to the bottom of the radio control box. Care should be taken to insure access to all controls and "TEL" jack, and that all controls can be manipulated without physical interference from neighboring units. Outline and mounting dimensions for this unit are contained in Figs. 43 and 46. A strong metal mounting plate must be provided for the radio control box mounting and should be securely attached to the metal aircraft structure. Information for the drilling of this plate is contained in Fig. 46 and four No. 8 machine screws will be required. After the radio control box is in place on its mounting it will be necessary to safety wire the snap slides and studs.

d. Cord CD-362

This cord is fitted at each end with a Plug PL-108 and is used to connect the loop to the radio compass unit. If the cord is too long, the slack may be coiled in any convenient place. DO NOT SHORTEN OR ALTER THE OVERALL LENGTH OF THIS CORD IN ANY WAY. Bonding braid is provided at each end of Cord CD-362 and should be connected electrically to the metallic aircraft structure. It is advisable mechanically to secure the cord to the aircraft structure at a number of places along the run in order to minimize the effects of vibration or shock. (Fig. 48.)

e. Compass Indicator I-73-A

Compass Indicator I-73-A is to be mounted in a standard 3¼" meter hole on the instrument panel. It should be located at a point where the visibility will be unaffected during normal flight operation. Proper clearance and accessibility from the rear for the coupling cables must be considered when a suitable location is being sought. Shock mounting must be provided for installations where the instrument panel is not shock mounted. The electrical coupling to the indicator from the connector panel is through Socket SO-93 located on the rear side of the indicator; the instrument lighting socket (also on the rear of the indicator) furnishes connection to the aircraft lighting circuit through Plug PL-117. Outline and mounting dimensions are contained in Fig. 47.

f. Plugs and Cables

The most satisfactory installation is obtained by running the interconnecting wires through rigid conduit in the aircraft. Shielded cables should be used in installations that are not provided with rigid conduit or other means to prevent pick up of external noise. In installations using rigid conduit, flexible shielded conduit must be used in connecting any shock insulated unit or where connection is made with pin type removable plugs. Care should be taken to allow enough slack in the conduit or cables to take care of movement of the radio compass unit during periods of shock or vibration. The following procedure should be used in assembling the plugs to the free ends of the conduit after the interconnecting wiring has been inserted according to Fig. 41.

(1) With the spring retainer removed, withdraw the plug body from the shell and remove pin jacks.

(2) Strip and tin the wires for a ⅜" length.

(3) Run all cables through the metal plug shell.

(4) Slip a ⅜" length of spaghetti tubing onto each cable, leaving the tinned end exposed (use XTE-30 extruded tubing as made by the Irvington Varnish and Insulator Co. of Irvington, N. J., or equivalent).

(5) Tin the cups of the pin jacks, being careful not to spill solder into the pin receptacles.

(6) Solder the pin jacks to the wires, using sufficient solder to fill the cups. Test each pin jack to be sure the joint is secure.

(7) Reassemble the plug body in the metal shell, making sure that each pin jack is in its proper place in the plug body and that the spaghetti tubing is pushed down over the soldered joint.

g. Flexible Conduit Assembly, includes Junction Box

The flexible conduit assembly is primarily used for laboratory testing, but may be installed in an aircraft if desired. The junction box has not been provided with mounting holes but these may be spotted in the clear bottom area and drilled through. All drilling chips must be removed to guard against shorting of the terminals. The cables should be drawn through the aircraft and connected to the components as shown in Fig. 35, making sure that all coupling nuts and plugs are screwed up hand tight to preclude the possibility of an interrupted ground return through the conduit. A suitable thread lubricant should be used on all plug and socket threaded connections to prevent seizing. Figs. 41 and 49 show size and wiring of components.

h. Power Supply

After all other connections are made and with the selector switch in the "OFF" position the radio compass should be connected to the aircraft storage battery as shown in Fig. 41.

i. Tuning Shaft MC-124

One length of Tuning Shaft MC-124 is to be used between the radio control box and the radio compass unit. It should be installed as straight as possible, with maximum radius on all bends. The more securely the shaft is fastened to points along the run the less chance there will be for backlash in the tuning system. Coupling MC-136 should be used at the radio control box when necessary to eliminate sharp bends in the flexible shaft. When attaching Coupling MC-136 care must be taken to avoid jamming of the coupling on the threaded portions of the radio control box. The jam nut provided on Coupling MC-136 must be screwed on the spline coupling of the radio control box, and Coupling MC-136 then turned on until the mating splines are well meshed and the coupling is in the required position. The jam nut is then backed down to set the assembly in position. To align the variable capacitor with the frequency dial in the radio control box after the flexible shaft is in place, proceed as follows:

(1) Connect the shaft between the radio control box and the radio compass unit. (Fig. 35.)

(2) Rotate the tuning crank so the frequency dial moves toward the low frequency end until the mechanical stop in the radio compass unit terminates the movement.

(3) Uncouple the tuning shaft at the radio control box.

(4) Rotate the tuning crank until the "ALIGN" mark on the frequency dial appears under the index in the window.

(5) Recouple the tuning shaft and rotate the tuning crank approximately five turns in the direction for higher frequency indication.

(6) Rotate the frequency dial toward the low frequency end until a sudden resistance to the movement is apparent. At this point the "ALIGN" mark on the frequency dial should be under the index on the window.

(7) If No. **(6)** does not indicate proper alignment, repeat Nos. **(1)** to **(6)** until the required result is obtained.

6. PREPARATION FOR USE

In order to reduce installation and operational difficulties to a minimum the equipment should be subjected to the following tests and adjustments before and after installation in the aircraft.

a. Tests before Installation

(1) The equipment should be set up and connected as in Fig. 10 and checked as follows:

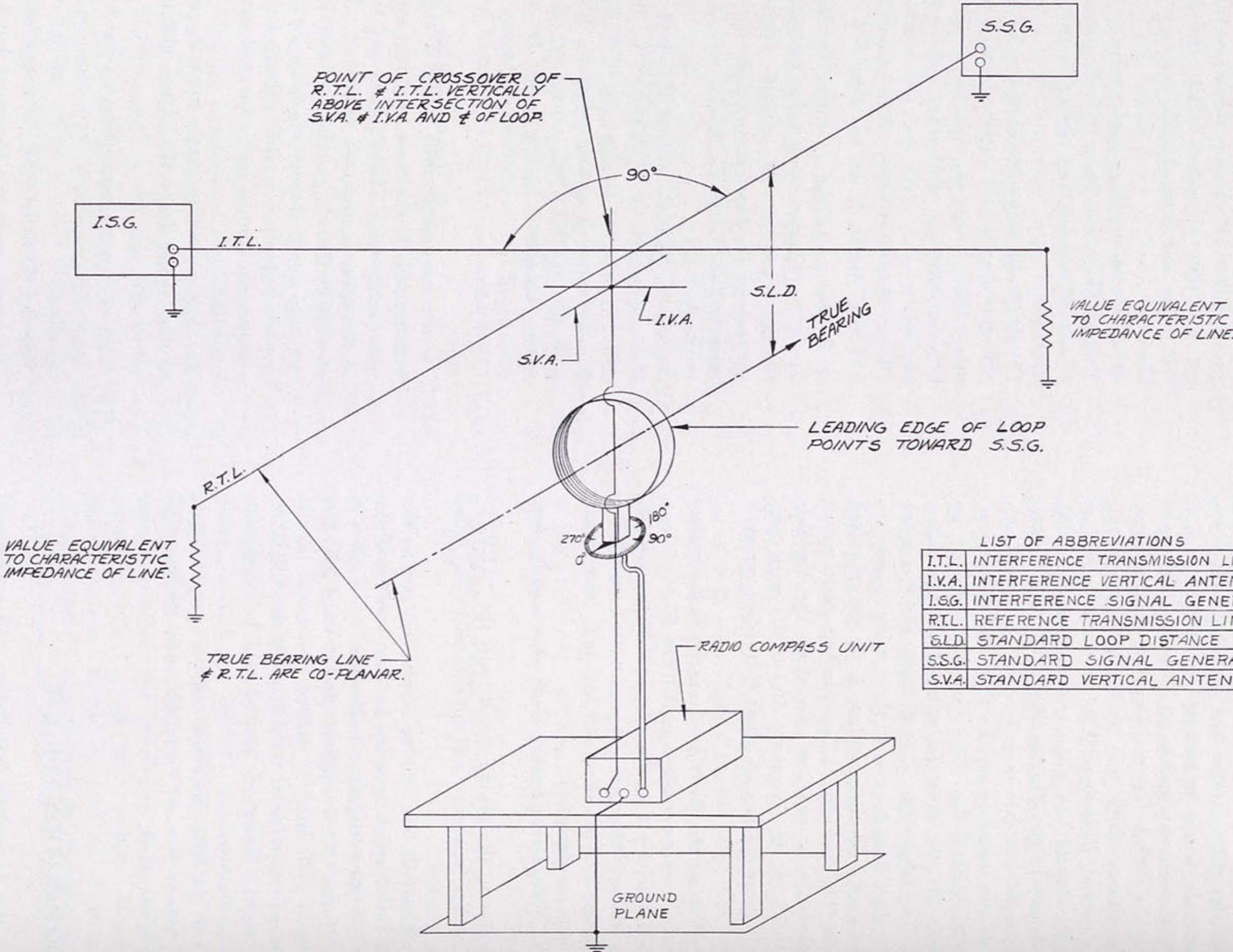
- *(a)* Test all tubes in a reliable tube tester and replace any proving defective.
- *(b)* Be sure that all vacuum tubes are fully inserted in their respective sockets and that all grid clips and tube shields are securely in place.
- *(c)* Check dynamotor for safety wiring.
- *(d)* Test all lamps and fuses including spares.
- *(e)* Check all controls and tuning shaft for free operation.
- *(f)* Check all coupling nuts for tightness.
- *(g)* See that the battery supply voltage on terminal No. 8 in the junction box (Fig. 41) is between +11 and +15 volts with respect to ground.
- *(h)* Check that frequency dial stops at the "ALIGN" point. If not see **Par. 5 *i*.**

(2) With the equipment operating in the same test set-up as in **(1)** above proceed as follows:

- *(a)* Check reception of several frequencies throughout the band and operate the equipment in the "COMP," "ANT," and "LOOP" positions.
- *(b)* Switch to "COMP." Swing the loop to the right or left of the "ON-COURSE" position and note the degrees loop rotation required to produce full scale indicator deflection with the "COMPASS" control set at maximum. This should be less than 5° for a signal strength of 1000 microvolts per meter.
- *(c)* Check lamps and "LIGHTS" control for operation.
- *(d)* Jar the component units to see if any noise is generated. If clicks or increased noise appear, a thorough investigation and removal of the cause is required. Improper soldering of wires to the plugs and noisy vacuum tubes are the usual sources of noise. If unsatisfactory operation is still present substitute components known to be in good operating condition.
- *(e)* See that the tuning meter operates properly as the signal from the signal generator is tuned in.

(3) With the equipment operating on "COMP" in the same test set-up as in **(1)** above, make the following tests:

- *(a)* Note the "ON-COURSE" bearings for several frequencies over the frequency band. These should check within 1° of the true bearing of the test set-up.
- *(b)* Compass performance should be in accord-



LIST OF ABBREVIATIONS

I.T.L.	INTERFERENCE TRANSMISSION LINE
I.V.A.	INTERFERENCE VERTICAL ANTENNA
I.S.G.	INTERFERENCE SIGNAL GENERATOR
R.T.L.	REFERENCE TRANSMISSION LINE
S.L.D.	STANDARD LOOP DISTANCE
S.S.G.	STANDARD SIGNAL GENERATOR
S.V.A.	STANDARD VERTICAL ANTENNA

Fig. 10—Radio Compass SCR-246-A, Test Set-Up

ance with the values shown in **Par. 18 *l*, *Normal Performance Characteristics.***

(c) Reciprocal bearings should check "ON-COURSE" bearings by ±1° but be 180° removed.

b. Tests and Adjustments after Installation

(1) After the equipment has been installed in accordance with **Par. 5** and the radio compass is ready to be put in service, it should be subjected to the following:

(a) Check battery voltage and polarity. The voltage at the fuse terminals should be between +11 and +15 volts regardless of engine speed.

(b) Check vacuum tubes to be sure that they are fully seated in their respective sockets and that all grid clips and tube shields are making positive contact.

(c) Check loop for ruggedness of mounting and for waterproofing of screw head holes with Permatex No. 1 sealing compound or equal.

(d) Check dial "ALIGN" mark with stops in the radio compass unit.

(e) Check all coupling nuts and plugs for tightness.

(f) Check to see that the radio compass mounting is securely fastened to the aircraft and that free movement of the radio compass unit on its shock mounting is permitted.

(g) Inspect Cord CD-362 for bonding and tightness of plugs.

(h) Check "ANT" and "GROUND" connections.

(i) Check instrument lights and "LIGHTS" control for operation.

(j) Check receiver and compass operation.

(k) Jar the radio compass unit and check for noise.

(l) Check safety wiring of the radio compass unit and control box.

(m) Switch the radio compass on and off to see that the magnetic compass is not permanently deflected.

(n) Check to see that operation of other radio equipment in the aircraft does not affect compass or receiver operation. Also that compass operation does not affect other equipment.

(o) Check tuning meter action as transmitting station is tuned in.

(2) Operational adjustments necessary to complete the installation checks should be performed with the aircraft removed to a location distant from buildings, fences, railroads, power lines, etc.; proceed as follows:

(a) Head the aircraft toward a transmitting station of known frequency, within the frequency range, and known direction. Turn the selector switch to "COMP" and tune in this known station. Swing the nose of the aircraft about 15° to the left of the station. The compass indicator needle should swing to the right. This is the correct directional sensing for the radio compass. This sensing will be reversed if the loop and vertical antennas are so located as to be on opposite sides of the fuselage, or if the leads to either the field or the moving coil of the compass indicator are reversed. Correction of this sensing can be accomplished by reversing the leads to the moving coil of the compass indicator at terminals 7 and 11 in the junction box (if used) or the equivalent wires in the aircraft connector panel.

(b) Set the "AUDIO" control at maximum and the selector switch to "ANT." Tune through the band with engines stopped and not the noise level. Repeat with engines running at various speeds. If a considerable increase in noise is noted with the engines running at any speed the aircraft shielding and bonding and the battery circuit filtering should be improved.

(c) The "LOOP GAIN" control adjustment provides the proper ratio of loop signal to antenna signal. This adjustment should be made with the aircraft in flight if the loop or antenna is mounted on the underside of the fuselage, as the proximity to the ground affects the pickup of the signal. Proceed as follows:

(1) Operate the radio compass with the selector switch in the "COMP" position.

(2) Tune in a signal at approximately 350 kilocycles, setting the "AUDIO" control to a comfortable headset level.

(3) Rotate the aircraft for maximum compass indicator deflection while adjusting the "COMPASS" control for half scale compass indicator deflection.

(4) Adjust "LOOP GAIN" control for maximum compass indicator deflection while varying the "COMPASS" control to keep the compass indicator needle from going off scale.

NOTE: This adjustment is made by inserting a screw driver blade in the slotted adjustment cover slug stamped "PUSH." Depress and rotate the slug until it is evident that the concealed projection on the underside of the slug has centered itself in the control adjustment slot. The slug now governs the movement of the "LOOP GAIN" control.

(d) The "THRESH SENS" control adjusts the noise output of the radio compass unit when tuning between stations. This adjustment should not be made until the interference from the ignition, generators, etc., has been reduced to a minimum. Proceed as follows:

(1) Operate the radio compass with the selector switch in the "ANT" position.

(2) Turn the "AUDIO" control clockwise to maximum.

(3) Tune the radio compass to a point near 400 kilocycles where no signal is received.

(4) With the aircraft engines running adjust the "THRESH SENS" control so that the electrical noise from the engines is not objectionable.

(5) Tune in several distant stations to be certain adequate sensitivity remains; if not, advance "THRESH SENS" until required sensitivity is obtained.

NOTE: This adjustment is made by inserting a screw driver blade in the slotted adjustment cover slug stamped "PUSH." Depress and rotate the slug until it is evident that the concealed projection on the underside of the slug has centered itself in the control adjustment slot. The slug now governs the movement of the "THRESH SENS" control.

(e) If the long axis of the loop housing is exactly parallel to the projected fore and aft axis of the aircraft, an "ON-COURSE" bearing should be obtained when the nose of the aircraft is headed toward the transmitting station that is being received with the radio compass operating in the "COMP" position. Due to slight mechanical errors in the installation, the orientation of the loop may not be exactly correct. An adjustment allowing a maximum of five degrees rotation either way from the zero position has been provided in the loop neck casting. The plug over the adjustment screw may be removed by withdrawing the two screws recessed in its surface and turning the plug 90° with a wide bladed screw driver inserted in the slot provided. This will expose the raised portion of the plug containing a finger groove by which the plug can be grasped and withdrawn. The hex head screw uncovered serves both as a locking and as a loop rotating means. When loosened, it may be slid forward or backward and will rotate the loop with it as it is threaded directly into the bearing portion of the loop shaft. An azimuth scale graduated at zero, 2½ and 5 degrees each way with respect to a reference mark on the loop neck casting moves with the screw and loop to provide accurate setting. As the accuracy of this radio compass depends greatly on the accuracy of alignment of the axis of the loop, the following alignment procedure should be followed:

(1) Select a test spot at least 200 feet and preferably one half mile distant from power lines, hills, railroads, fences and other large electrically conductive objects which may distort the radio field.

(2) Determine the exact geographical bearing of a high powered, clear channel radio station located about fifty miles away. The accuracy of this bearing should be checked against compensated magnetic bearings.

(3) Lay out a line on the apron or ramp which if extended would pass through the radio station.

(4) Drop plumb bobs from the center of the nose and tail of the aircraft and move the aircraft over the line in flying position with the nose headed toward the station until the plumb bobs center on the line.

(5) Tune in the signal on the installed radio compass with the equipment functioning in the "COMP" position.

(6) Adjust the loop until an "ON-COURSE" bearing is obtained.

(7) These settings should be checked by flying the aircraft directly toward the station noting the compass indicator and magnetic bearing and subsequently resetting the loop if necessary.

7. OPERATION

a. Homing Compass Operation

The function of the radio compass as a homing device is to indicate visually when the aircraft heading should be altered to the left or to the right in order to approach or pass over a transmitter located along the line of flight. A small conventionalized figure of an aircraft in the center of the compass indicator is used to indicate "ON-COURSE" flight. This may be visualized as actually representing the aircraft. The needle of the indicator may be considered as pointing in the general direction of the transmitting station. To use the radio compass for homing proceed as follows:

(1) Switch to "COMP" position.

(2) Tune for greatest deflection of tuning meter.

(3) Adjust "AUDIO" control for comfortable headset level.

(4) Listen carefully for station identification to be sure proper station is being received.

(5) Turn "COMPASS" control until the compass indicator needle deflects. If the needle deflection is to the left when right rudder is applied and to the right when left rudder is applied, the station to which the radio compass is tuned is ahead of the aircraft. Reversed deflections indicate that the station is to the rear of the aircraft. When the station is ahead of the aircraft, the compass indicator needle deflection will be to the right if the station is to the right of the aircraft heading; and to the left if the station is to the left of the aircraft heading.

(6) Turn the aircraft in the direction indicated by the compass indicator needle and continue turning until an "ON-COURSE" or center position is attained. The aircraft is now headed toward the radio station.

(7) In case the compass indicator needle shows a center position when the station is tuned in, advance the "COMPASS" control and turn the aircraft to one side until a marked deflection is secured. Observe deflection and turn the aircraft in the direction of the pointer deflection until an "ON-COURSE" indication is secured. This precaution is necessary because an "ON-COURSE" indication may be secured when heading either toward or away from a station. No error will result, however, if the aircraft is always turned in the direction indicated by the needle.

b. Radio Range Operation

Aural reception of radio range ("A" and "N") signals is possible by proceeding as follows:

(1) Switch to "ANT" position.

(2) Tune for greatest deflection of tuning meter.

(3) Adjust "AUDIO" control for minimum usable signal.

(4) Listen carefully for station identification to be sure proper station is being received.

(5) When the aircraft is directly on the beam of the radio range a continuous or monotone signal is heard. As the course is altered to the right or left the monotone signal disappears and either the "A" or "N" signal becomes predominant dependent upon which quadrant is being entered. The radio range beam or equi-signal zone is approximately 3 degrees in width.

c. Communication Reception

Radio Compass SCR-246-A, when not being used for navigational purposes, can be used as an ordinary communications receiver by proceeding as follows:

(1) **Normal Conditions.**

(a) Switch to "ANT" position.

(b) Increase "AUDIO" control until moderately strong background noise is heard.

(c) Tune in desired station, setting to maximum deflection of tuning meter.

(d) Positively identify station.

(e) Adjust "AUDIO" control to comfortable headset level.

(2) **Charged Partical Interference (Static Conditions).**

(a) Switch to "LOOP" position.

(b) Proceed as under **Normal Conditions** above to secure station desired.

(c) Note—Signals arriving from either side of the line of flight will be received best and those from fore and aft weekly or not at all.

d. Direction Finding Operation

(1) Operate as in **Par. 7 *a. Homing Compass Operation*,** maneuvering the aircraft for "ON-COURSE" heading to the station whose bearing is desired.

(2) Note the magnetic heading of the aircraft. Correct this for magnetic compass error.

(3) Plot this bearing by drawing a line from the station through the outer (large) figures on the compass rose around the station, using navigation charts.

(4) The aircraft position is along this line.

(5) Repeat for two other stations which are at least 25 degrees removed from first station and from each other, and plot.

(6) The aircraft position is in or near the small triangle formed by the intersections of these three lines.

e. Precautions During Operation

(1) Do not use the "COMP" position for reception of "A" "N" signals, since the automatic volume control in this position will broaden the apparent course width.

(2) For aural reception of "A" "N" signals in "ANT" position, reduce the "AUDIO" control to the lowest usable headset level.

(3) Do not use "LOOP" operation to determine the cone of silence.

(4) For compass operation fly the aircraft with the indicator pointer "ON-COURSE" or fluctuating slightly left and right of "ON-COURSE." The compass indicator pointer deflection bears no relation

to the number of degrees off course. Flying the aircraft with the indicator pointer at fixed deflection will result in a spiral course.

(**5**) Do not operate with the "COMPASS" control on maximum as the radio compass will be very sensitive to the yawing of the aircraft. Reduce the "COMPASS" control until 15 degrees loop deviation from the "ON-COURSE" will produce full scale deflection.

(**6**) Do not disturb any internal adjustments.

(**7**) Night effect, a result of reflection of waves from the sky, is present during darkness and is especially noticeable at sunrise and sunset. It is recognized by a fluctuation in bearings and its effects may be reduced by increasing the aircraft altitude thereby increasing the strength of the direct wave; by taking an average of the fluctuations; or by selecting a station operating on a lower frequency.

(**8**) When close to a station, accurate bearings cannot be taken with the aircraft in a steep bank. This is especially applicable to the reception of signals from instrument landing trucks.

(**9**) When determining the aircraft position by using the radio compass as a radio direction finder never depend upon two stations; at least three stations should be used to plot the "FIX."

(**10**) Do not depend upon the tuning meter to gauge distance.

(**11**) When in the vicinity of air mass fronts it is advisable, for reduction of noise during reception, to cross these fronts at right angles.

III — DETAILED FUNCTIONING OF PARTS

8. GENERAL THEORY OF RADIO COMPASS OPERATION

The primary function of Radio Compass SCR-246-A is to guide the aircraft toward a transmitting station of known location or to provide bearings to known transmitting stations as an aid to navigation. In addition to its use as a radio compass it may also be used as a radio communication receiver. While the equipment is being used as a radio compass the pilot can also hear the station's identification signal, weather reports, and other flight information. When the pilot wishes to fly the aircraft toward a transmitting station, that is, to use the equipment as a homing radio compass, the selector switch is rotated to "COMP" operation and the desired station is tuned in. A fixed loop antenna, mounted with its plane perpendicular to the axis of the aircraft fuselage, provides the directional characteristics. With the headset volume adjusted and the indicator response set to the desired level, the aircraft is turned until the compass indicator points to the center or "ON-COURSE" position.

The compass indicator will remain at the center or "ON-COURSE" position as long as the aircraft is headed directly toward or directly away from the transmitter. The behavior of the indicator will determine whether the transmitter is ahead of or to the rear of the aircraft. If the transmitting station being received lies ahead of the aircraft and the aircraft is turned in the direction indicated by the compass indicator, the indicator pointer will return to the center or "ON-COURSE" position. Conversely if the transmitting station being received lies to the rear of the aircraft and the aircraft is turned in the direction indicated by the compass indicator, the indicator pointer deflection will increase.

If the transmitter is ahead and the aircraft is turned from the "ON-COURSE" heading, the compass indicator will deviate from the center or "ON-COURSE" indication. That is, when there is any departure from the "ON-COURSE" heading the pilot can visualize the transmitter as being located on the side indicated by the pointer and turning the aircraft in that direction will bring the aircraft back "ON-COURSE" and the indicator back to center. The indicator does not measure the course deviation in degrees. However, the indication is proportional to the deviation, and shows upon which side of the line of flight the transmitter is located and remains in the center only when the transmitter is in line with the axis of the aircraft, either fore or aft. The sensitivity of the compass indicator is adjustable to the particular conditions under which it is called upon to function.

In order to determine a position when a fixed loop is employed, a transmitting station is tuned in and the aircraft headed toward the station. When the radio compass indicator points center the bearing of the transmitter can be read on the magnetic compass or directional gyro. By taking bearings on several transmitters located in different directions the position of the aircraft can be charted.

As shown in the block diagram, Fig. 11, and the schematic diagram, Fig. 36, the radio compass equipment consists of a loop antenna, a loop input and amplifier, a 90 degree phase shifter, a balanced

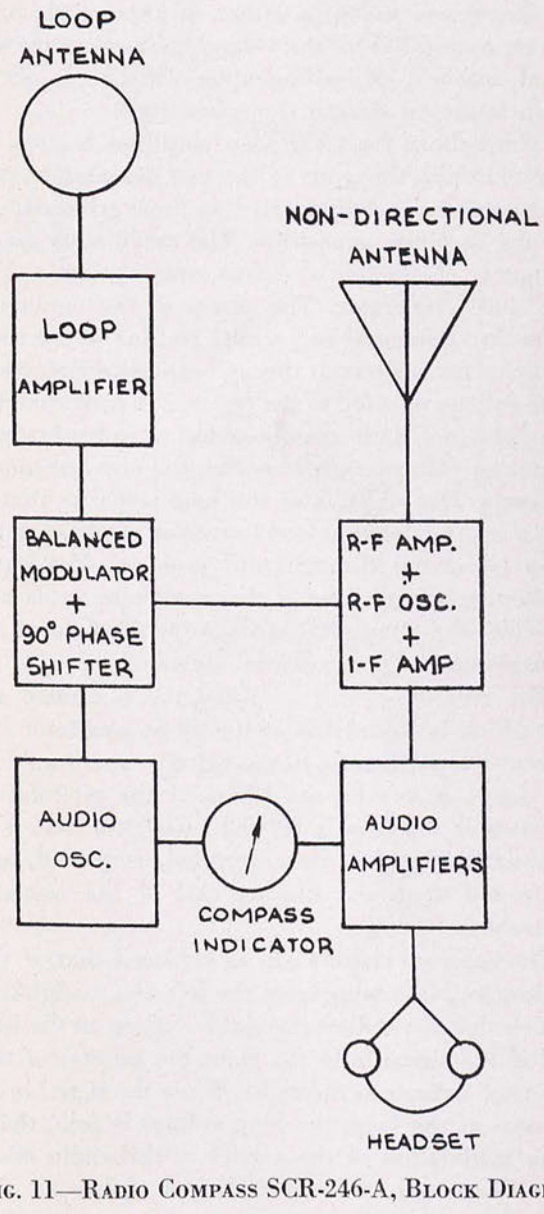


Fig. 11—Radio Compass SCR-246-A, Block Diagram

modulator, an audio oscillator, a non-directional antenna, a sensitive and selective receiver, and compass indicator and telephone output circuits.

The vertical antenna is non-directional, that is, equally sensitive to radio signals from any direction. The voltage induced in a vertical antenna is in phase with the flux of the radio wave.

The loop antenna is directional in that the voltage induced in the loop is maximum when the line from the transmitting station to the aircraft lies in the plane of the loop and minimum when the plane of the loop is perpendicular to the direction of travel of the radio wave from the transmitter. The resultant of the voltage induced in the loop is 90 degrees out of phase with the voltage induced in the vertical antenna and changes abruptly 180 degrees as the loop is rotated through the position of zero pick-up.

The voltage from the loop is amplified and shifted 90 degrees so that it is either in phase with, or in phase opposition to, the voltage induced in the vertical antenna, depending upon which side of the loop is turned toward the transmitter.

The voltage from the loop amplifier is then impressed upon the grids of the two modulator tubes. The secondary windings feeding these grids are connected in phase opposition. The modulators are alternately conductive at a frequency determined by the audio oscillator. The plates of the modulator tubes are connected in parallel and fed to the radio compass mixing circuit through capacitor Ref. No. 3. The voltage thus fed to the receiver circuits from the loop channel is alternately added to and subtracted from the voltage contributed by the non-directional antenna. The addition of the loop signal to that of the non-directional antenna reverses in phase as the loop is rotated through null position. The audio oscillator besides driving the modulator grids also provides the alternating current for the field of the dynamometer type compass indicator.

The receiver circuit amplifies the combined signal which is modulated at the audio oscillator frequency proportionally to the voltage contributed by the loop; moreover, the phase of the modulation reverses as the loop is rotated through a null. The modulated signal is then detected, amplified, and impressed upon the moving coil of the compass indicator.

The compass circuits are so arranged that, if the radio signal is coming from the left, the modulation is such that the indicator pointer deflects to the left, and if the signal is to the right the pointer of the indicator deflects to the right. When the signal is on the axis of the loop, the loop voltage is zero, there is no modulation of the carrier at the audio oscillator frequency and the indicator shows no deflection.

The operation of the various compass circuit elements can be most easily followed by referring to Fig. 12. The voltage induced in the loop by a radio wave from the transmitter is coupled to the loop amplifier Tube VT-86 through the loop transformer, Ref. No. 85. The parallel combination of the primary windings of the modulator transformer, Ref. No. 86, and capacitor, Ref. No. 12-1, in the plate circuit of the tube has a capacitive reactance at the signal frequency so that the phase of the signal voltage is shifted 90 degrees when impressed upon the grids of the modulator Tubes VT-91. Fig. 13 shows the phase of the voltage induced in the loop for reception from either side and also the result of shifting the phase of the voltage 90 degrees. The field coil in the dynamometer type compass indicator is tuned to resonance at 46 cycles per second and serves as part of the parallel tuned circuit of the audio oscillator Tube VT-65. Since the compass indicator has an alternating magnetic field of 46 cycles per second, current in the moving coil at the same frequency and phase will produce a deflection of the pointer to one side of center. If the phase of the current in the moving coil is reversed the indicator deflection will also reverse. Voltage from the audio oscillator Tube VT-65 is impressed on the grid circuits of the modulator Tubes VT-91 in phase opposition through resistors, Ref. Nos. 40-2, 40-6, 47-1, and 47-2 and through the secondaries of modulation transformer, Ref. No. 86. Due to their characteristics and the magnitude of the audio voltage impressed upon the grids, the modulator tubes function as electronic switches, permitting the loop voltage to pass first one tube and then the other. Since r-f voltage on the two grids is in phase opposition (180 degrees apart because of the phasing of the two secondary windings with respect to the two paralleled primaries) the voltage fed from the common plate loading resistor, through capacitor, Ref. No. 3, to the receiver circuits, is added to the voltage from the non-directional antenna when one modulator tube is conductive and subtracted when the other is functioning. The received signal is thus locally modulated at the audio oscillator frequency proportionally to the voltage induced in the loop. The signal is then amplified and the local modulation is detected and amplified to provide the 46 cycle energy for the moving coil of the compass indicator. The phase of the voltage induced in the loop and the phase of the local modulation reverse as the loop is rotated through a null. This, in turn, reverses the phase of the current in the moving coil of the compass indicator and changes the deflection of the pointer from one side to the other.

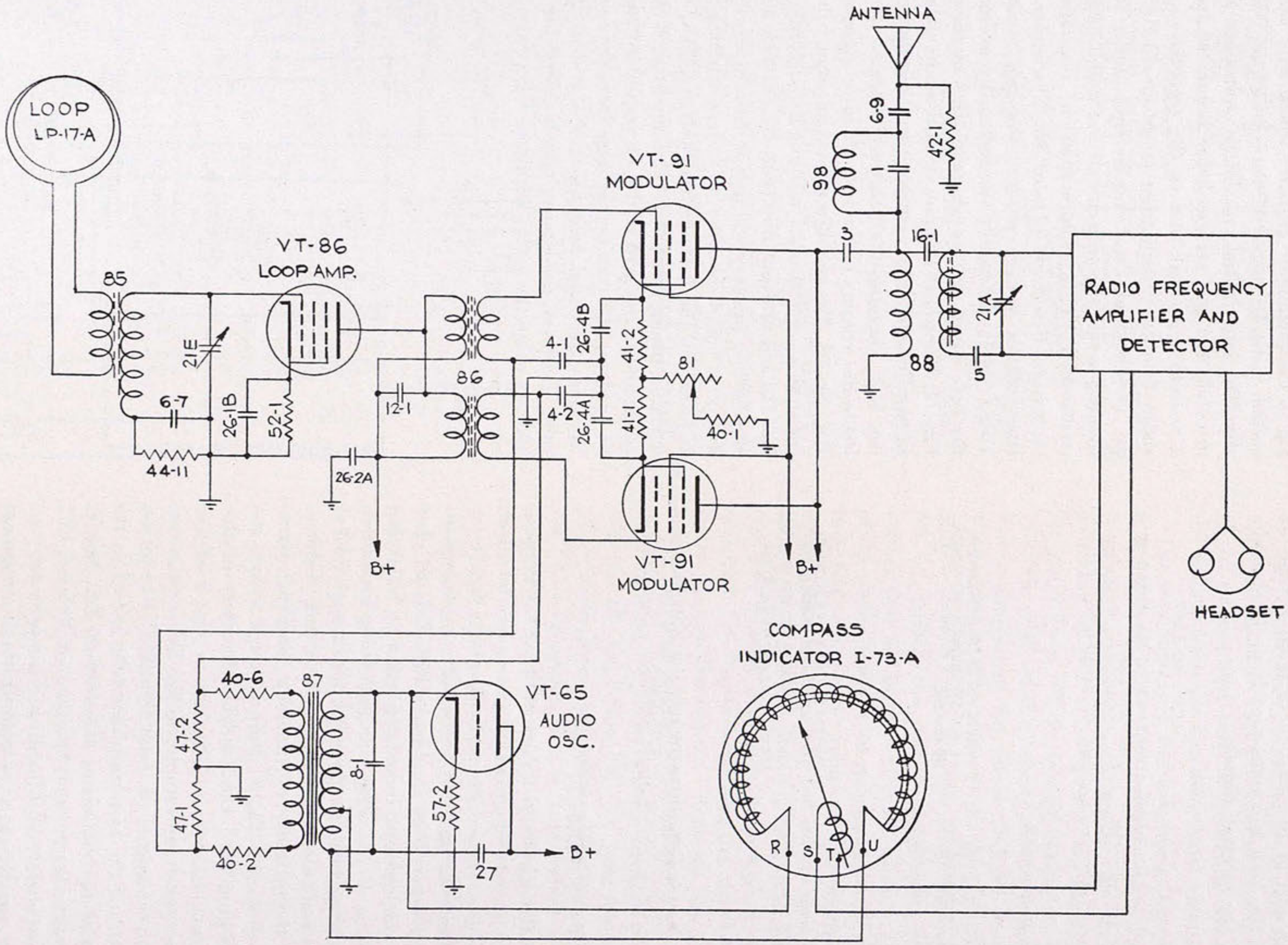


Fig. 12—Radio Compass SCR-246-A, Simplified Circuit

The phase of the voltages acting in the modulator circuit for reception from the right and left are shown in Fig. 13. When the transmitter is located along the axis of the loop there is no voltage induced in the loop and consequently no local modulation of the received signal.

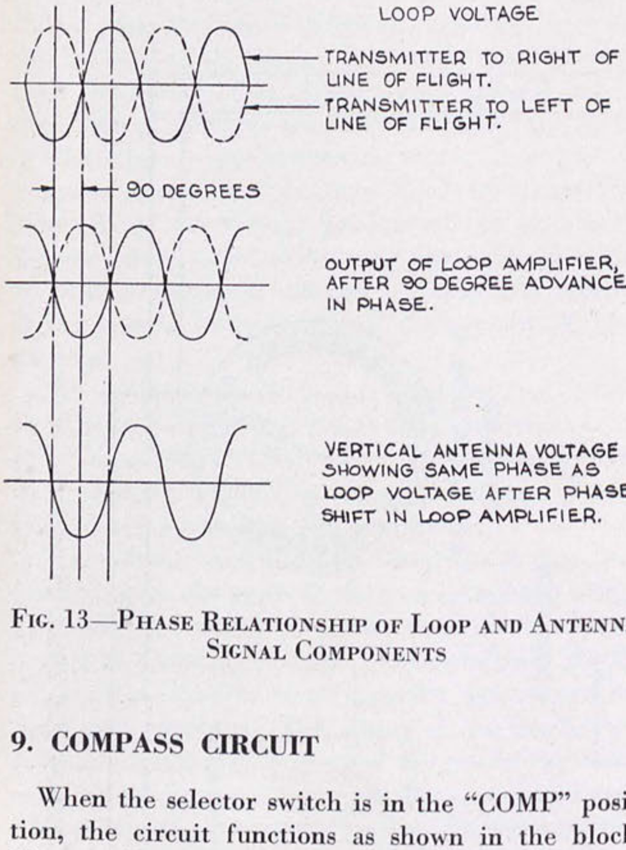


Fig. 13—Phase Relationship of Loop and Antenna Signal Components

9. COMPASS CIRCUIT

When the selector switch is in the "COMP" position, the circuit functions as shown in the block diagram, Fig. 11, and schematic diagram, Fig. 36. A detailed discussion of the theory of compass operation is given in **Par. 8.** Loop LP-17-A is an electrically shielded low impedance winding consisting of 14 turns of litz wire, one end being grounded. Both winding leads are brought out through Socket SO-88 in the base of the loop neck casting. Connection to the primary of the loop matching transformer, Ref. No. 85, is made through a low impedance line, Cord CD-362. The secondary of this transformer is resonated by section No. 5 of the variable tuning capacitor, Ref. No. 21E, and is connected to the grid of the loop amplifier Tube VT-86. The plate of the loop amplifier tube is tied to the primary of the modulator transformer, Ref. No. 86. This winding is resonated by capacitor, Ref. No. 12-1, to approximately 90 kilocycles. This presents a capacitive reactance to any signal within the frequency band of the equipment. As the plate resistance of the loop amplifier Tube VT-86 is high compared to the reactance of its load, Ref. Nos. 86 and 12-1, the voltage across the capacitive reactance, Ref. No. 12-1, is effectively changed 90° in its phase relation to the voltage on the grid of the tube.

The primary of the modulation transformer, Ref. No. 86, is inductively coupled to the two secondary windings connected in phase opposition thus applying to the modulator grids, to which they are connected, radio frequency voltages which are vectorially 180° apart. These modulator tubes are biased to cutoff, the grid returns being connected back to a resistance network and to the secondary of the audio frequency oscillation transformer, Ref. No. 87. The field of the Compass Indicator I-73-A is shunted across the primary of the audio oscillator transformer. This combination is resonated by capacitors, Ref. Nos. 8-1 and 8-3. The audio oscillator output voltage renders the two modulator Tubes VT-91 alternately conductive by overcoming the bias cutoff voltage on each tube in turn. See Fig. 14. The plates of these two tubes are connected in parallel and have a common load resistance, Ref. No. 44-2. The resulting voltage is capacitively coupled to the primary of the antenna input transformer, Ref. No. 88. The non-directional antenna voltage is fed to this same primary winding through relay Ref. No. 110 and i-f shunt trap, Ref. No. 98. The antenna transformer primary winding is capacitively and inductively coupled to the secondary winding which is tuned by the first section, Ref. No. 21A, of the variable tuning capacitor. The tuned secondary is connected to the grid of the r-f amplifier Tube VT-86 applying the resultant voltage from the loop and the non-directional antenna to the grid of this r-f tube. However, the loop voltage is changed in phase 180° at twice the audio oscillator frequency by ac-

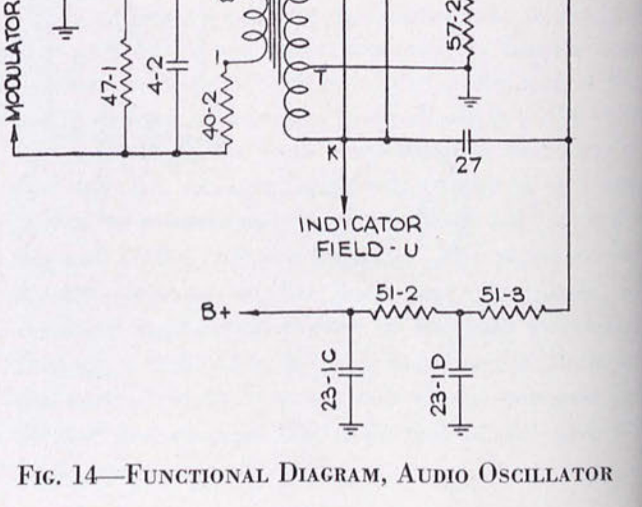


Fig. 14—Functional Diagram, Audio Oscillator

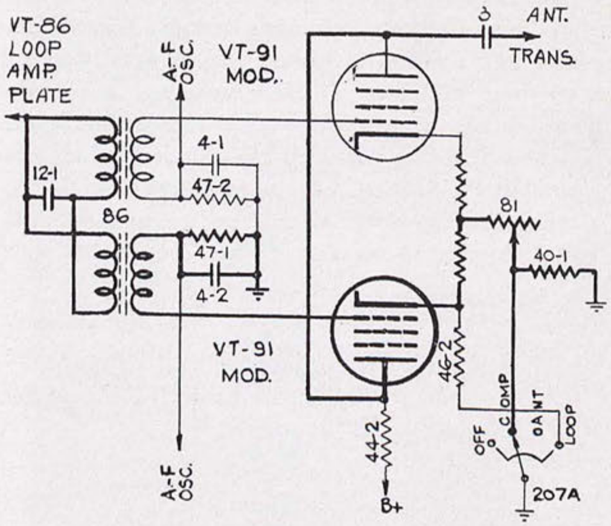


FIG. 15—FUNCTIONAL DIAGRAM, LOOP GAIN CONTROL AND BALANCED MODULATORS

tion of the push pull modulator Tubes VT-91 (Fig. 15). It is therefore alternately added to and subtracted from the antenna voltage in the primary of the antenna input transformer, Ref. No. 88. In this manner a signal is applied to the grid of the r-f amplifier Tube VT-86 which is modulated at the audio

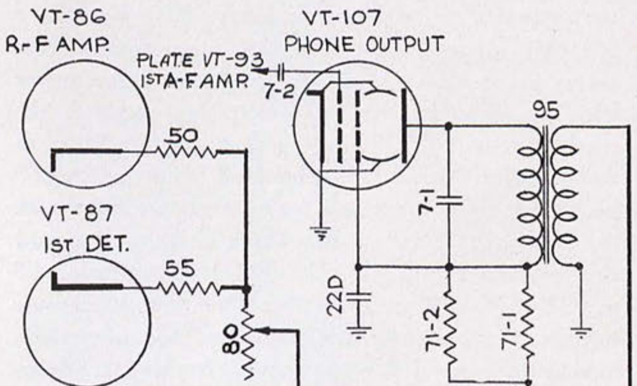


FIG. 16—FUNCTIONAL DIAGRAM, "AUDIO" AND "THRESH SENS" CONTROLS

oscillator frequency. The level of this signal is dependent upon the effective height of the non-directional antenna. The "LOOP GAIN" control, Ref. No. 81, is provided to allow adjustment of the modulator tube gain so that the loop voltage at the grid of the r-f amplifier tube is approximately equal to the voltage from the non-directional antenna.

The combined loop and antenna voltage is amplified and detected by the receiver circuits. The audio frequency component containing the signal and switching frequency is impressed on the grid of the 1st audio Tube VT-93 through capacitor, Ref. No. 11-2. The plate of this tube is resistively and capacitively coupled to the phone and compass output Tubes VT-107. Coupling to the grid of the phone output Tube VT-107 through small capacitor, Ref. No. 7-2, reduces the amount of switching frequency voltage that will be present in the headset. The plate of the phone output tube is bypassed through capacitor, Ref. No. 7-1, to remove r-f from the output circuit. The secondary of the phone output transformer, Ref. No. 96, connects to "TEL" jack, Ref. No. 208, through a constant impedance potentiometer, Ref. No. 204, for adjusting the signal level appearing across the headset. Refer to Fig. 16.

The compass output Tube VT-107 grid receives the switching frequency voltage through capacitor, Ref. No. 28. Capacitor, Ref. No. 24A, resonates the plate circuit of the compass output transformer, Ref. No. 94, to 46 cycles. This is for purposes of proper phasing and to attenuate all but the switching voltage. The compass output transformer secondary is connected to the moving coil of the compass indicator through a constant impedance potentiometer, Ref. No. 205, wherein power to the moving coil is controlled to allow setting convenient pointer sensitivities. Refer to Fig. 17.

When operating the equipment with the selector switch in the "COMP" position the cathode section of the "AUDIO" control, Ref. No. 204C, is shorted out by switch section, Ref. No. 207B, so that the two amplifier tubes have only normal amplifier bias and therefore operate at full gain. The AVC action has the only control on the gain. Under these conditions resistors, Ref. No. 204A and Ref. No. 204B, are connected in the secondary circuit of the phone output transformer, Ref. No. 95, as an "L" type attenuator. The main function of this resistor control is to regulate the signal across the headset when using the equipment for reception of signals from a simultaneous type radio range station. Refer to Fig. 16.

A dual potentiometer or two section "L" type attenuator network, Ref. No. 205, is interposed between the secondary of compass output transformer, Ref. No. 94, and moving coil terminals of the compass indicator. Since the sensitivity or pointer de-

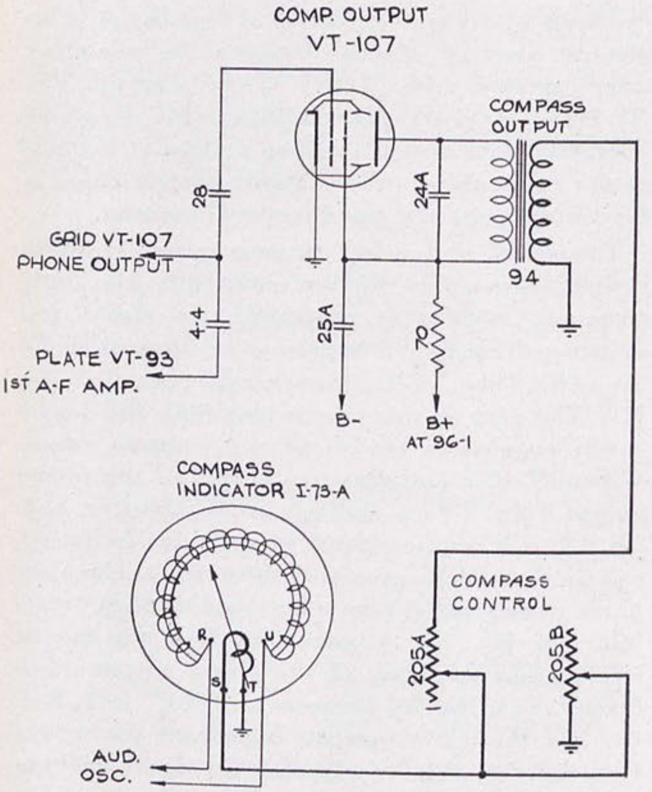


FIG. 17—FUNCTIONAL DIAGRAM, "COMPASS" CONTROL

flection of this meter is proportional to the current flowing in the moving coil, the control is connected to provide adjustment of this current, thereby giving a continuously variable degree of control up to the limits of available voltage delivered by the compass output Tube VT-107. Refer to Fig. 17.

10. RECEIVER CIRCUIT

The receiver circuit is of the super-heterodyne type and consists of two stages of tuned radio frequency amplification (including the first detector), a radio frequency oscillator, two stages of intermediate frequency amplification, a second detector and audio amplifier, an automatic volume control amplifier and rectifier, a phone output amplifier and a compass indicator output amplifier. A complement of 13 vacuum tubes is required for Radio Compass SCR-246-A and all are used in Radio Compass Unit BC-373-A. Tubes may be replaced by removing the top cover of the radio compass unit. The following vacuum tubes are required:

Tubes

VT-86 Loop R-F Amplifier
VT-91 Modulator No. 1 and Loop R-F Amplifier
VT-91 Modulator No. 2
VT-65 Audio Oscillator
VT-86 R-F Amplifier
VT-87 1st Detector
VT-65 R-F Oscillator
VT-86 1st I-F Amplifier
VT-86 2nd I-F Amplifier
VT-93 AVC Amplifier and Rectifier
VT-93 2nd Det. and 1st Audio Amplifier
VT-107 Compass Output
VT-107 Phone Output

The Characteristics of the Vacuum Tubes appear in the table below:

Between the non-directional antenna and the antenna input transformer primary, Ref. No. 88, a blocking capacitor, Ref. No. 6-9, is connected. This serves to prevent damage to the input transformer winding should direct current be applied directly to the "ANT" binding post. A 500,000 ohm resistor, Ref. No. 42-1, is connected from the "ANT" post to ground to act as a leak for static charges on the antenna. Between the blocking capacitor and the antenna relay, Ref. No. 110, a shunt-tuned i-f trap, Ref. No. 98, is connected. This trap attenuates signals at or near the intermediate frequency while having no appreciable attenuation for signals whose

Tube	VT-65	VT-86	VT-87**	VT-91	VT-93	VT-107
Heater V.	6.3	6.3	6.3	6.3	6.3	6.3
Heater Amp.	0.3	0.3	0.3	0.3	0.3	0.45
Esg. V.	—	100.0	100.	100.	125.	250.†
Ep. V.	250.0	250.0	250.	250.*	250.*	250.*
Ecg. V.	-8.0	-3.0	-3.0	-3.0	-3.0	-12.5
Ip. Ma.	8.0	7.0	2.4	2.0	10.0	45.
Isg. Ma.	—	1.7	7.1	0.5	2.3	4.5
Emg.			-10, +12‡			
Mu.	20.0	1160	....	1500	800.	218
Rp. Ohms	10,000	800,000	§1.0 (meg.)	1.5 (meg.)	600,000	52,000
Gm. Micromhos	2000	1450	375	1225	1325	4100

* Maximum Plate Volts
** Mixer Operation
† Maximum Screen Volts
‡ Peak Oscillator Voltage Applied to Mixer Grid
§ Greater than

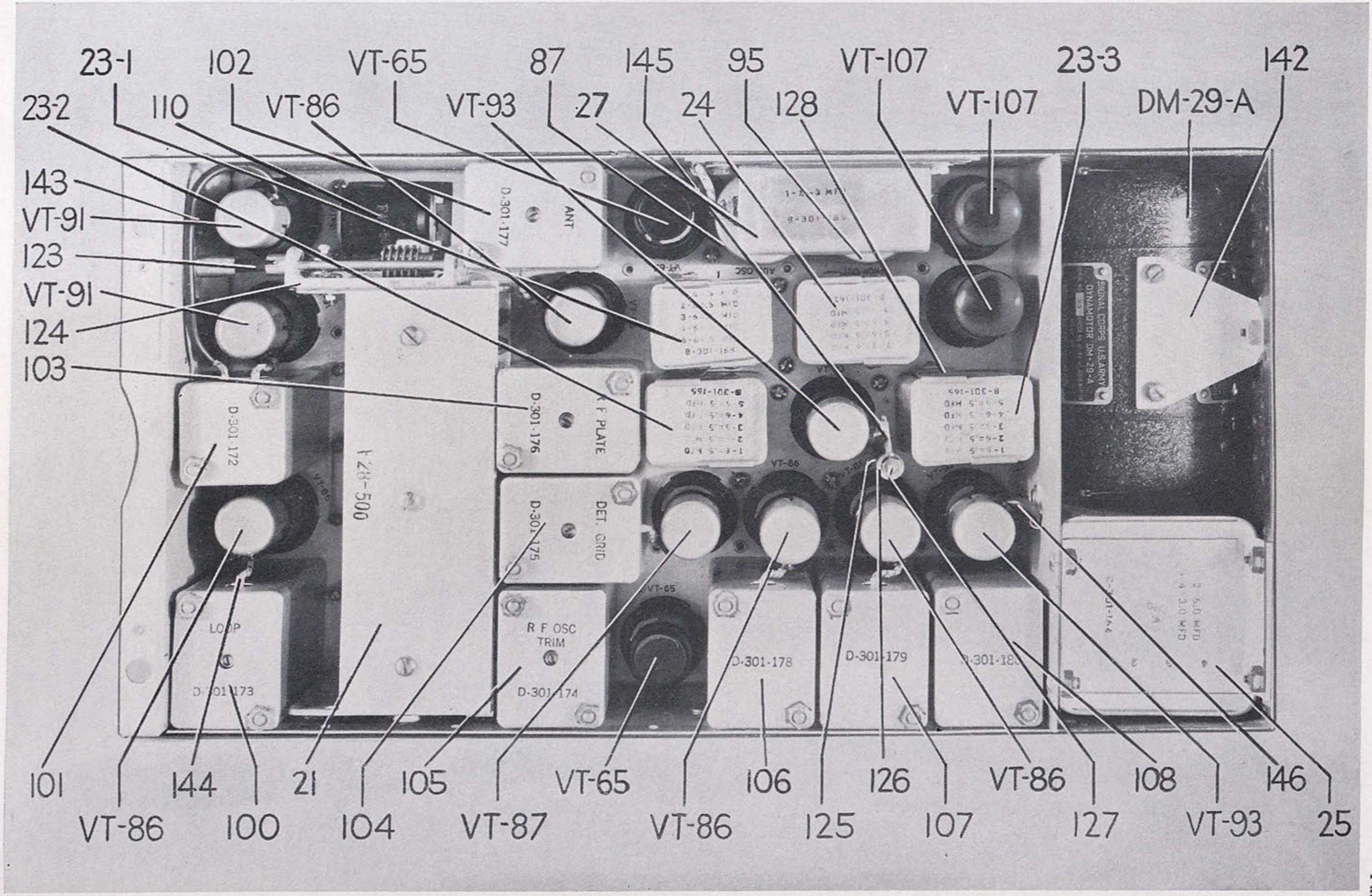


Fig. 18—Radio Compass Unit BC-373-A, Top View

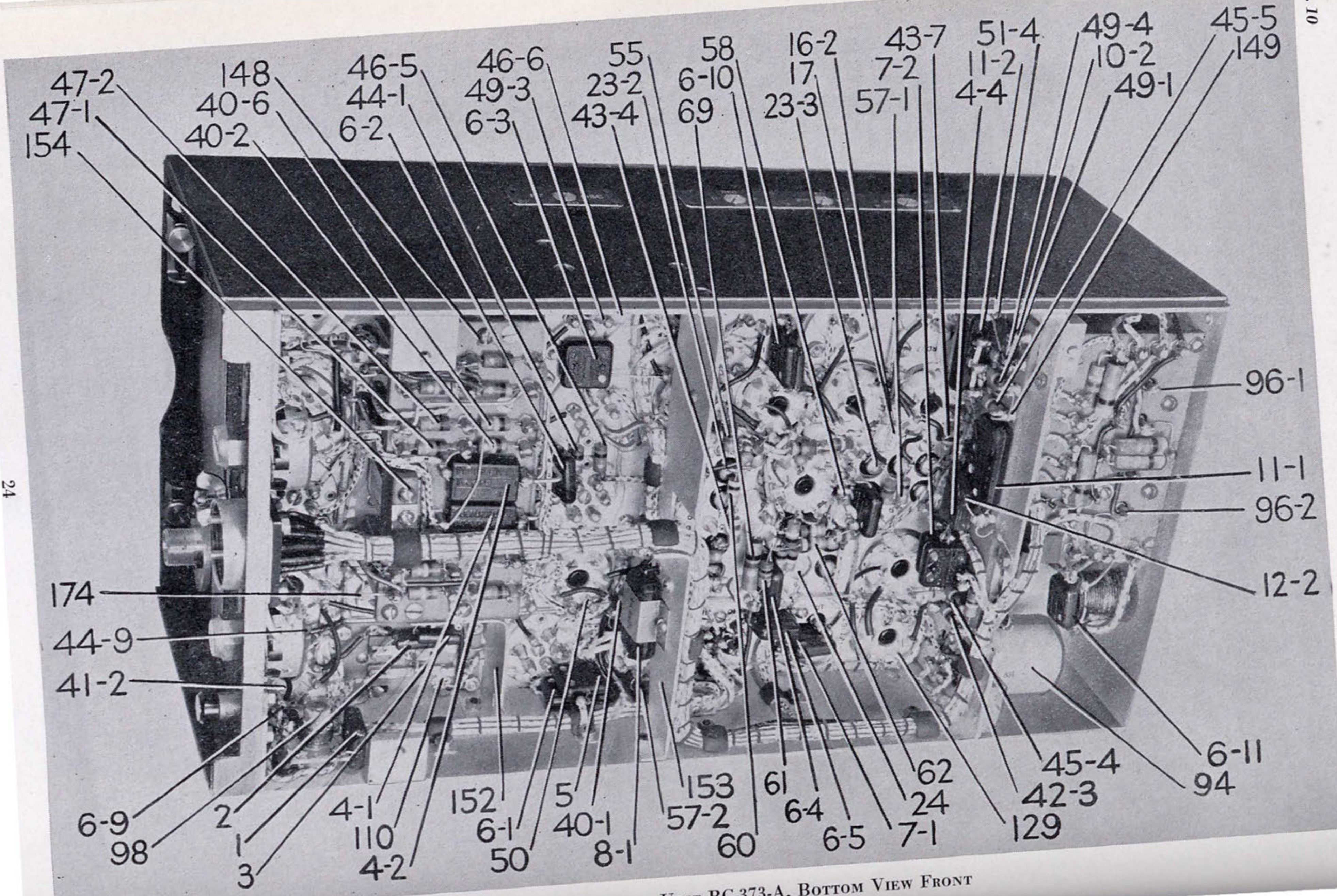


Fig. 19—Radio Compass Unit BC-373-A, Bottom View Front

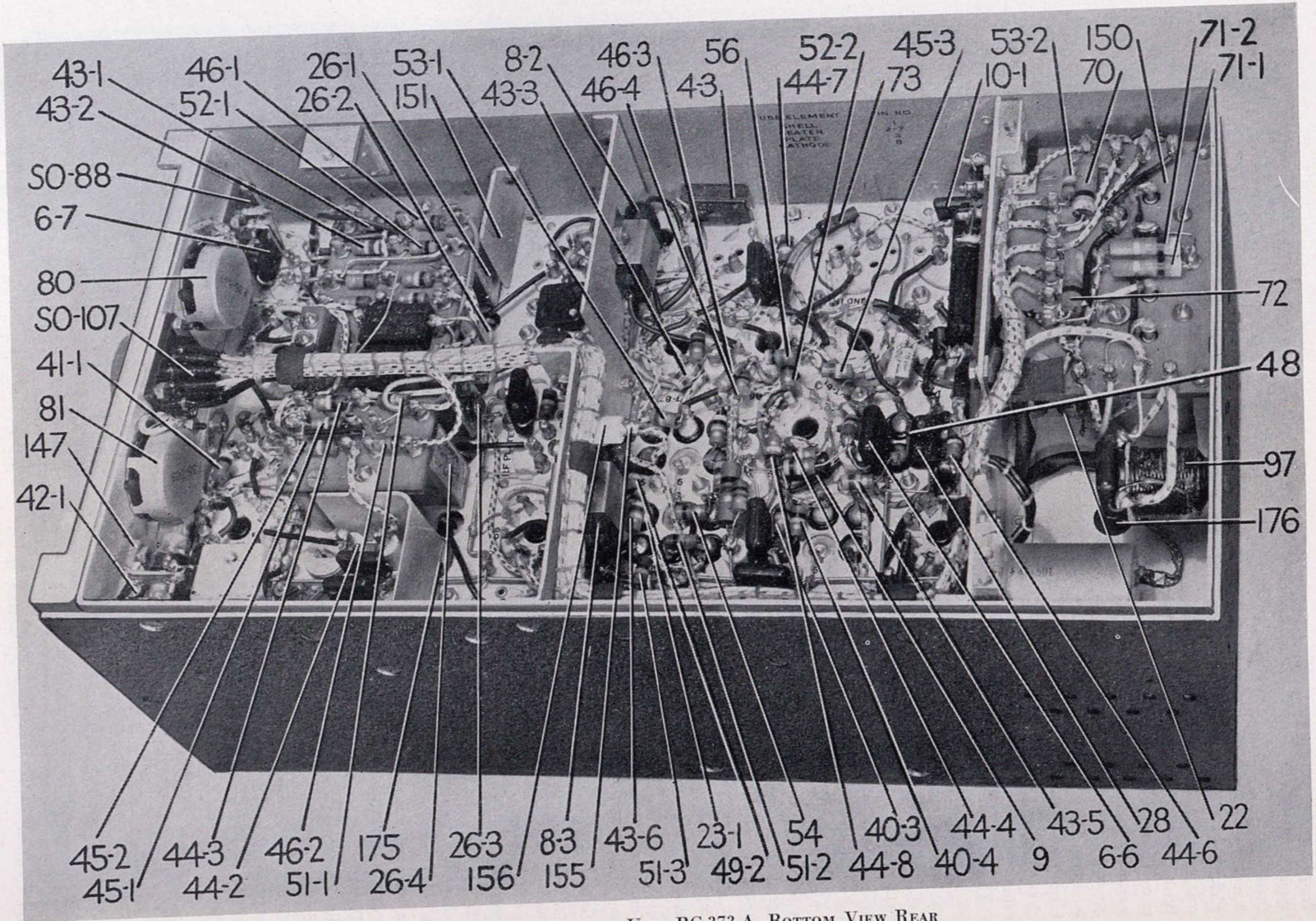


Fig. 20—Radio Compass Unit BC-373-A, Bottom View Rear

frequency is within the tuning range of the equipment. This trap is connected to a relay which performs several functions. When operating with the selector switch on "COMP" and "ANT" a signal picked up on the antenna is fed directly through the relay contacts to the primary of the antenna transformer, Ref. No. 88. When in "LOOP" position, the non-directional antenna is disconnected from the antenna transformer primary, Ref. No. 88, and grounded. At the same time a capacitor, Ref. No. 2, is shunted across the primary of this same transformer so that the alignment and tracking of this circuit is not affected when the normal antenna capacity is removed.

The primary of the antenna transformer, Ref. No. 88, is coupled to the secondary inductively by the transformer winding and capacitively by capacitor, Ref. No. 16-1. The secondary is resonated by the first section of the gang capacitor, Ref. No. 21A. The grid of the r-f amplifier Tube VT-86 is connected to the secondary of this transformer.

The plate of the r-f amplifier Tube VT-86 is fed to the r-f plate transformer, Ref. No. 89, which is tuned by the second section of the variable tuning capacitor, Ref. No. 21B, and coupled to the detector grid transformer, Ref. No. 90, through a small coupling winding which is part of the secondary circuit. This secondary is tuned by the third section of the variable tuning capacitor, Ref. No. 21C, and is connected to the control grid of the first detector or converter Tube VT-87.

The injection grid of the first detector is excited by the output of a triode oscillator Tube VT-65 which is tuned 112.5 kilocycles above the desired signal by the fourth section of the variable tuning capacitor, Ref. No. 21D. The plate circuit primary, Ref. No. 92-1, of this detector is tuned to 112.5 kilocycles by capacitors, Ref. Nos. 13-6 and 14-6, and the alignment is obtained by varying the position of the iron core to give the exact value of inductance necessary to resonate the shunt circuit.

The first i-f transformer primary, Ref. No. 92-1, is inductively coupled to a similarly constructed secondary, Ref. No. 92-2, which is connected to the control grid of the first i-f amplifier Tube VT-86. The plate of this amplifier tube feeds to the primary of the second i-f transformer, Ref. No. 92-3. The secondary of the second i-f transformer, Ref. No. 92-4, is connected to the control grid of the second i-f amplifier Tube VT-86. The plate of this tube feeds to the primary of a third i-f transformer, Ref. No. 92-5, which is inductively coupled to the secondary, Ref. No. 93. This secondary is connected as a full wave rectifier feeding the two diode plates of the second detector Tube VT-93.

The rectified audio frequency appearing at the

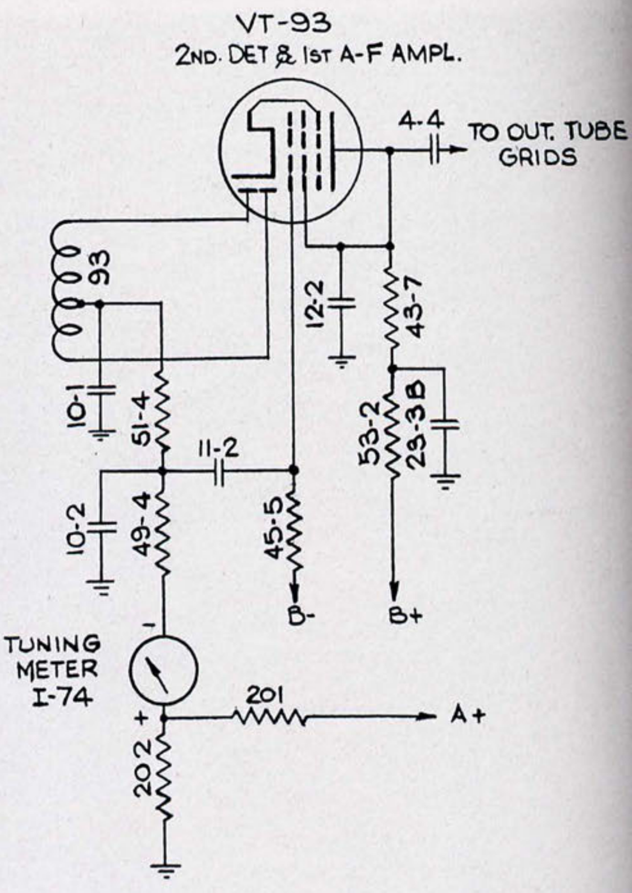


FIG. 21—FUNCTIONAL DIAGRAM, TUNING METER

junction point between the diode load resistors, Ref. Nos. 49-4 and 51-4, is fed to the grid of the triode section through capacitor, Ref. No. 11-2. Refer to Fig. 21. The Tuning Meter I-74 is connected to the low end of the signal diode load resistor, Ref. No. 49-4, and to the junction point of the resistor network, Ref. Nos. 201 and 202. When an r-f signal is applied to the diode plates of the second detector Tube VT-93, some diode current will flow through resistors, Ref. Nos. 49-4 and 202, and the tuning meter. This current, especially at low levels, will be proportional to the incoming r-f signal, will reach a maximum when the r-f input circuits are tuned to exact resonance with the transmitted signal and will decrease on each side of resonance. The normal "no signal" position of the pointer on the tuning meter is to the left side, so that when resonance is reached the pointer will be at its maximum right swing, the needle deflection depending on the field strength of the incoming signal.

The voltage to be rectified and used for automatic volume control is taken from the plate circuit of the second i-f amplifier Tube VT-86 through capacitor network, Ref. Nos. 16-2 and 17. See Fig. No. 23. This voltage is amplified by the pentode section of the AVC amplifier Tube VT-93 and rectified by its

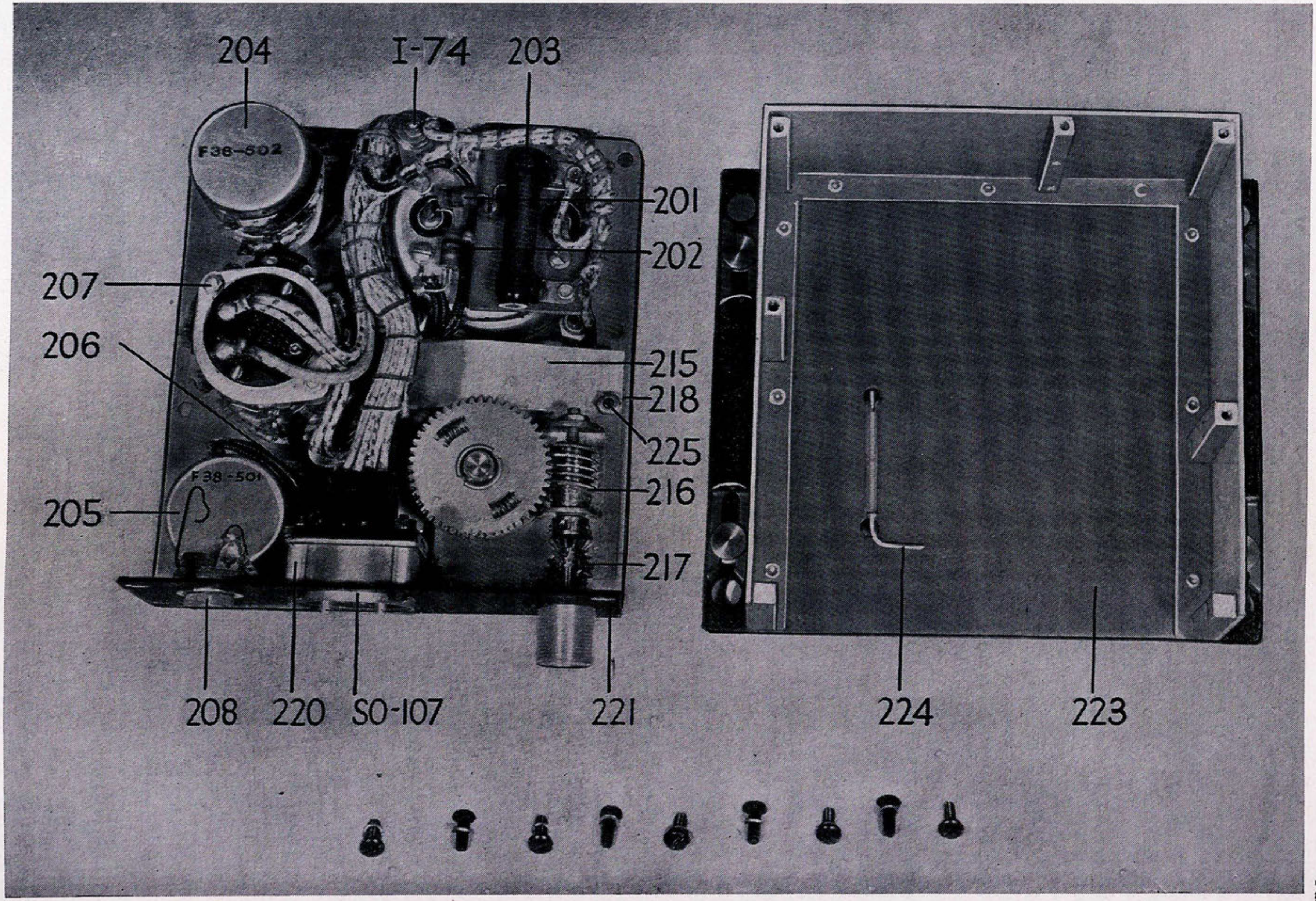


Fig. 22—Radio Control Box BC-374-A, With Cover Removed

diode section. The cathode circuit is so biased that the AVC action is delayed until 50 milliwatts output is obtained in the headset. For extremely high input voltages the AVC action will hold the output to such a level that no circuit in the various amplifiers will be overloaded. The voltage appearing across resistors, Ref. Nos. 62 and 58, to ground is the effective AVC voltage. This is further filtered by resistors, Ref. Nos. 61 and 69 and by capacitors, Ref. Nos. 6-4, 6-5, and 6-10 to remove the audio frequency components. This voltage is applied to the grid returns of the r-f amplifier Tube VT-86, first detector Tube VT-87, and the first i-f amplifier Tube VT-86. Partial AVC from resistors, Ref. Nos. 58 and 62 and capacitor, Ref. No. 6-6, is applied to the first audio Tube VT-93 to assist in reducing the signal appearing across the headset. The operation of this circuit is shown in Fig. 23. The greater the strength of the received signal, the greater will be the voltage built up across the AVC load resistors, Ref. Nos. 62 and 58, by the rectified carrier. Since the control grids of the preceding tubes are connected to the negative end of these resistors, their negative bias will be increased by a strong carrier and the tubes will operate at reduced gain on such signals. Conversely on weak signals the bias introduced by the AVC will be smaller, allowing the tubes to operate at higher gain. This action tends to maintain the signal appearing across the headset at a nearly constant level in spite of variations in the level of the incoming signal.

The plate circuit of the first audio Tube VT-93 is resistively and capacitively coupled to the grid of the phone output Tube VT-107. The plate of the output tube is directly connected to the primary of the phone output transformer, Ref. No. 95. The secondary of this transformer feeds the headset jack, Ref. No. 208. Refer to Fig. 16.

The "AUDIO" control, Ref. No. 204, consists of a three section variable resistor. When the equipment is operating as a communication, aural null or radio range receiver, with the selector switch in the "LOOP" or "ANT" position the third or cathode section, Ref. No. 204C, is used. This resistor, Ref. No. 204C, is in the combined cathode circuits of the r-f amplifier Tube VT-86 and the first detector Tube VT-87. Counter clock-wise rotation of this control increases the resistance and clock-wise rotation decreases the resistance. This change in resistance varies the effective bias that controls the amplification of the two amplifiers thus controlling, to any desired level, the signal across the headset.

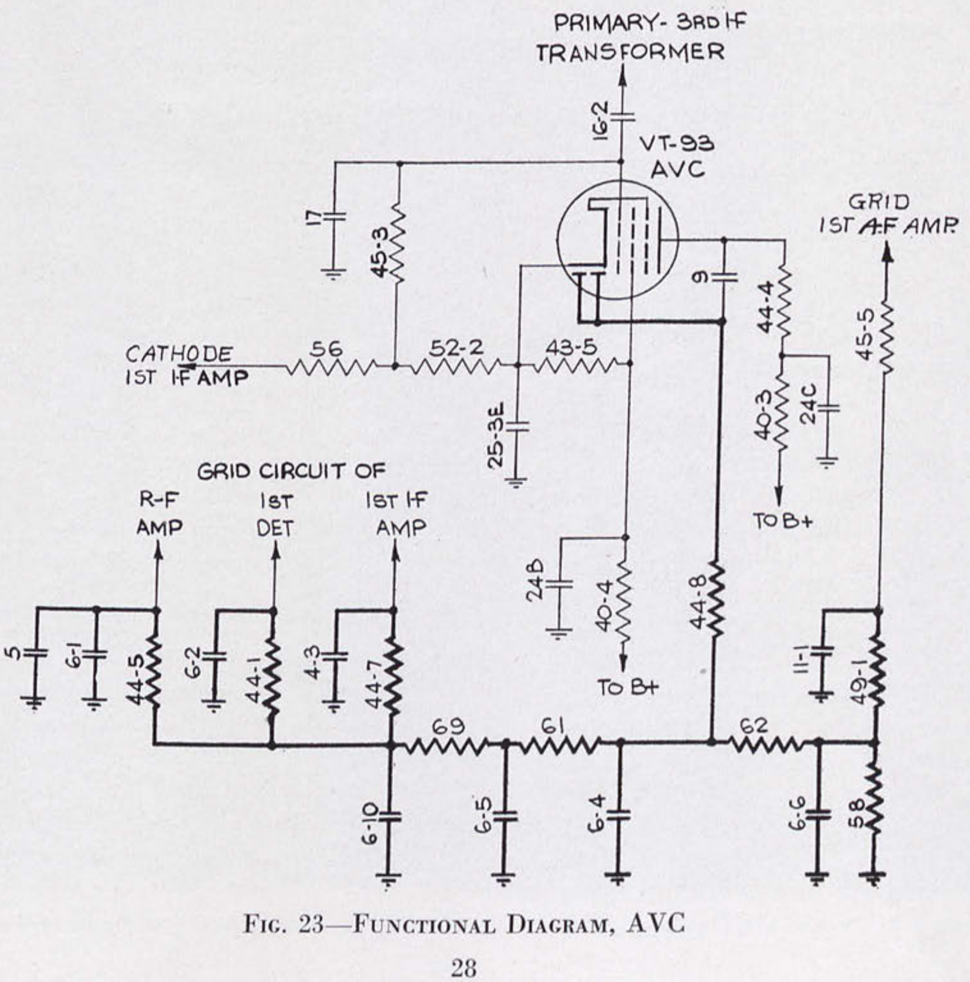


Fig. 23—Functional Diagram, AVC

IV — MAINTENANCE

11. OPERATIONAL INSPECTION OF RADIO COMPASS EQUIPMENT

At regular intervals the Radio Compass, SCR-246-A should be inspected in the aircraft. These intervals should be about 10 hours of operational time apart, or weekly if operation is infrequent.

This inspection should proceed as follows:

(a) Check safety wiring of the radio compass unit and the radio control box.

(b) Check active instrument lights and spares and replace any spares that may be missing or burned out.

(c) Check fuse and supply a new spare if spare has been used.

(d) Check rigidity of loop mounting to aircraft.

(e) Inspect all plugs and mechanical couplings. Tighten if necessary.

(f) Check to see that loop adjustment is correct and that loop setting screw is securely fastened.

(g) Note increase in noise with motors running. If this increase is excessive, check for loose connections, faulty components, or imperfect ignition shielding.

(h) Operate equipment as a compass and check bearings of several stations throughout the band against known bearings.

NOTE: The above test *(h)* should take place at a location at least 200 feet distant from power lines, hills, or large electrically conductive objects.

12. GENERAL INSPECTION AND OVERHAUL OF RADIO COMPASS SCR-246-A

Remove Radio Compass Unit BC-373-A, Radio Control Box BC-374-A, Loop LP-17-A, Cord CD-362, and Compass Indicator I-73-A from the aircraft and return them to the Signal Corps Radio Repair Section at the proper Air Depot. Only Signal Corps Radio Repair Sections at Air Depots are authorized to make the following inspection or to disassemble, adjust, or repair the above named units except, when necessary, certain limited repairs can be made at Signal Corps Radio Repair Shops. This inspection should be conducted as follows:

a. General—Applicable to All Units

(1) Inspect all screws and nuts for tightness.

(2) Remove all dirt, dust, loose solder, metal particles, etc.

(3) Clean all component parts thoroughly and touch up scratched paint.

(4) Remove all traces of corrosion.

(5) Inspect wiring and soldering of joints. If more than two strands are broken at a soldered joint, cut off lead and resolder. If wires seem to be breaking due to vibration, clamp a soldering lug to the lead and resolder.

(6) Clean all pins and receptacles of coupling plugs and sockets if necessary.

(7) Check oil-filled capacitors for leakage.

b. Radio Compass Unit BC-373-A

(1) Inspect as indicated in **Par. 12** *a.*

(2) Check all tubes. Replace those tubes whose characteristics are not within normal recommended limits and those that show loose internal elements when vibrated or jarred during tests.

(3) Dynamotor DM-29-A should be inspected after 1000 hours of operation or twice a year, whichever period is shorter. Disassemble the dynamotor as described in **Par. 13** *c* and proceed as follows:

(a) Examine the brushes to see if they have worn properly and are free of hard spots. Spotted brushes can be located by inspecting the commutator for grooves. If such spots are apparent, the brush should be replaced.

(b) Remove the bearings from the armature and clean them thoroughly with clean naphtha or carbon-tetrachloride. Check balls and housings to be sure they are free from pits or chips.

(c) Relubricate with Air Corps Grease, Soft Grade, or white vaseline lubricant.

(d) After prolonged operation, small grooves may appear in the commutating surfaces due to the continuous action of the brushes. This is a normal condition but if it becomes serious the commutators may be sanded with grade 3/0 sandpaper or finer while spinning in a lathe on centers. DO NOT USE EMERY CLOTH on the commutators because the abrasive is metallic and may cause short circuits in the commutator should it become imbedded in the slots between the segments. After sanding, the commutators should be polished with canvas or crocus cloth.

(e) If the commutators become seriously worn or scored, as they may, after long continuous duty, it will be necessary to reface them. They should be turned in a lathe on centers at about 500 r.p.m. and a cut .010-.012 inch deep should be taken with a tool bit sharply ground for copper turning. For this depth of cut it will not be necessary to undercut the

mica insulation between the commutator segments. However, for deeper cuts the mica insulation should be undercut enough to prevent its coming in contact with the brushes. After undercutting of the insulation the commutator surfaces should be polished with canvas or crocus cloth. A small brush, such as a tooth brush, should be used to remove any foreign material that tends to remain between the commutator bars.

(f) When reassembling the dynamotor, follow instructions contained in **Par. 13 *c*.**

(4) The tuning mechanism attached to the variable capacitor should be cleaned of all old lubricant, dirt, dust, and metallic particles and re-lubricated with Air Corps Grease, Soft Grade, or white vaseline lubricant.

(5) The tuning capacitor should be cleaned of all dirt, dust, and metallic chips, being careful not to bend the plates. Do not lubricate or blow out with compressed air.

c. Radio Control Box BC-374-A

(1) Inspect as indicated in **Par. 12 *a*.**

(2) Clean and lubricate frequency dial drive mechanism. Lubricant used should be Air Corps Grease, Soft Grade, or white vaseline lubricant.

(3) Visually inspect Tuning Meter I-74. DO NOT OPEN CASE. If in need of servicing, it should be replaced by a serviceable one. The repair of meters should only be attempted by authorized personnel designated by the Chief Signal Officer.

d. Loop LP-17-A

(1) Inspect as indicated in **Par. 12 *a*.**

(2) Clean off all old grease and relubricate with Air Corps Grease, Soft Grade, or white vaseline lubricant.

(3) Inspect loop winding to be sure it is securely cemented to its supporting blocks, and re-cement with Glyptal No. 1276 cement, or equal, any portion of winding that may be loose.

e. Compass Indicator I-73-A

(1) Inspect visually. DO NOT OPEN CASE.

(2) Replace any faulty indicators. The repair of meters should be attempted only by authorized personnel designated by the Chief Signal Officer.

f. Cord CD-362

(1) Inspect as in **Par. 12 *a*.**

(2) Check to see that the insulation on the wires at the ferrules has not been cut through.

g. Wiring

(1) Inspect as in **Par. 12 *a*.**

(2) Check all wire insulation for abrasion or breaks and replace if necessary.

h. Performance Tests

Reassemble the equipment and measure the performance according to **Par. 18.** Vibrate the equipment and note additional noise generated. If equipment is noisy or fails to meet performance requirements, re-examine the equipment until the trouble has been discovered. Perform tests in accordance with **Par. 15, TEST PROCEDURE.**

13. DISASSEMBLY OF UNITS

a. Radio Compass Unit BC-373-A

To gain access to the radio compass interior, it is necessary to:

(1) Cut safety wires retaining top cover and move snap slides toward the panel center. The top cover assembly, Ref. No. 177, may now be raised, slid toward the rear and then withdrawn in any direction.

(2) The bottom cover assembly, Ref. No. 178, may be removed by unscrewing the four No. 10-32 fillister head screws located in the two bottom crossbars.

b. Removal of Dynamotor DM-29-A from Chassis:

(1) Unsolder the three leads from the terminal board, Ref. No. 150, and remove the two No. 8-32 round head dynamotor mounting screws.

(2) On the top side remove the No. 6-32 binding head screw that connects bracket, Ref. No. 142, to chassis.

c. Dynamotor DM-29-A Disassembly

(1) Cut the safety wires and remove screws and enclosing covers. See Fig. 24.

(2) Remove brush holder screw caps, Ref. No. 139, and brushes, Ref. Nos. 132 and 133.

(3) Remove the tie rods, Ref. No. 140, by unscrewing the acorn nuts.

(4) The bearing bracket assemblies, Ref. Nos. 135 and 136, should then be removed.

(5) Withdraw the armature, Ref. No. 130, from the dynamotor.

(6) Remove the screws securing the pole pieces to the frame cylinder and slide out the field coils, Ref. No. 137, and the pole pieces, Ref. No. 141.

(7) To remove the bearings, Ref. No. 131, from the armature, a bearing puller should be used. However, in an emergency they may be pried off

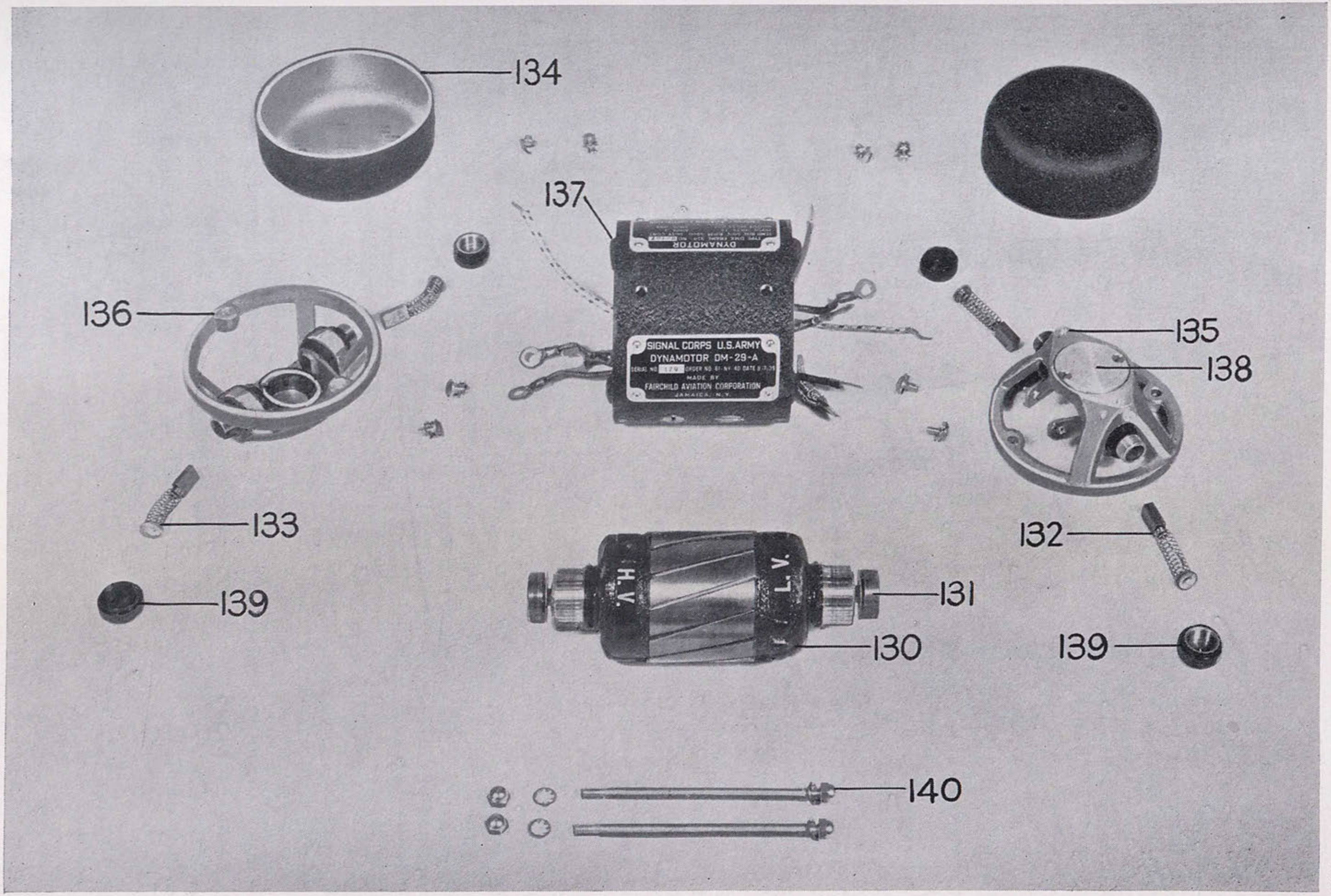


Fig. 24—Dynamotor DM-29-A, Showing Components

with a screw driver if extreme caution is used in protecting the commutators.

(8) To reassemble, reverse the above procedure. The commutator with the wide segments should be assembled into the L-V bearing bracket. Before replacing brushes, spin the armature over by hand to make sure it rotates freely and does not strike the pole pieces or field coils. In replacing the brackets it is important, for commutating reasons, to get them back in their original position. They are located by dowels, when the unit is assembled at the factory and, in reassembling, the dowel holes in the brackets and frame must line up.

d. Variable Tuning Capacitor, Ref. No. 21

This unit is removed as follows:

(1) Remove flexible shaft adapter, Ref. No. 121, by unscrewing the three screws, nuts, and lockwashers that hold it in place.

(2) Withdraw coupling, Ref. No. 123.

(3) Unsolder the bonding braid connections on the chassis top side.

(4) Unsolder wiring on the bottom side.

(5) With a pair of long nose pliers squeeze the two legs of the mounting forks together until the slotted washers, Ref. No. 173, can be removed from the barbs on the mounting forks.

(6) Remove capacitor.

(7) To reassemble reverse the above procedure, taking care to get the slotted washers, Ref. No. 174, over both the mounting fork barbs.

e. Phone Output and Audio Frequency Oscillator Transformers, Ref. Nos. 95 and 87

(1) Unsolder the leads connected to the transformer terminals on the underside of the chassis.

(2) Unsolder the leads to the capacitor, Ref. No. 27, on side wall located above the two transformers.

(3) Remove the capacitor by unscrewing the two binding head screws attaching it to the chassis sidewall.

(4) Unscrew the transformer mounting screws and withdraw the transformers.

f. Compass Output Transformer, Ref. No. 94

(1) Unsolder the leads connected to the terminals extending through the bracket and remove the two screws holding it to the bracket.

(2) Remove transformer.

g. Audio Chokes, Ref. Nos. 96-1, 96-2 and Filter Capacitor, Ref. No. 22

(1) Unsolder cable connections to terminal board, Ref. No. 150.

(2) Unsolder connections to terminal board from Capacitor, Ref. No. 25.

(3) Unsolder connections to R-F Choke, Ref. No. 97, and Dynamotor DM-29-A.

(4) Remove ground bonding braid terminal by loosening the dynamotor mounting screw which clamps it to the chassis.

(5) Remove four screws securing the terminal board to the chassis.

(6) Unsolder connections to the chokes, Ref. Nos. 96-1 and 96-2, and Capacitor, Ref. No. 22.

(7) Remove chokes and capacitor by unscrewing the screws which hold them in place.

h. I-F and R-F Transformer Assemblies

Any I-F or R-F Transformer Assembly may be removed as follows:

(1) Unsolder connecting leads on underside of chassis.

(2) Pull out grid lead plug if used.

(3) Remove two nuts and lockwashers securing the unit to the chassis.

(4) Remove transformer.

i. Disassembly of Ant., Loop, Det. Grid, Modulator, or R-F Plate Transformer Assemblies

(1) Unsolder connections to coil terminal board.

(2) Using thinner remove all traces of cement from speed nut and top cross bar.

(3) Remove speed nut and withdraw top cross bar. If on a particular unit the trimmer interferes with the removal of the speed nut and cross bar remove the top plate after unscrewing the three corner stud nuts.

(4) Remove the bottom coil mounting screw and withdraw the coil assembly.

j. Disassembly of R-F Oscillator or any I-F Transformer Assembly

(1) Unsolder connections to coil terminals.

(2) Remove two screws securing coil assembly to the frame.

(3) Withdraw the coil assembly.

NOTE: Complete I-F Transformer Assemblies have been furnished for replacement purposes.

k. Capacitors Ref. No. 26

To remove any one of the four capacitors, Ref. No. 26, proceed as follows:

(1) Remove shield, Ref. No. 152.

(2) Unsolder external connections to terminal board, Ref. No. 148.

(3) Remove screw holding the main cable clamp to the cable support, Ref. No. 154.

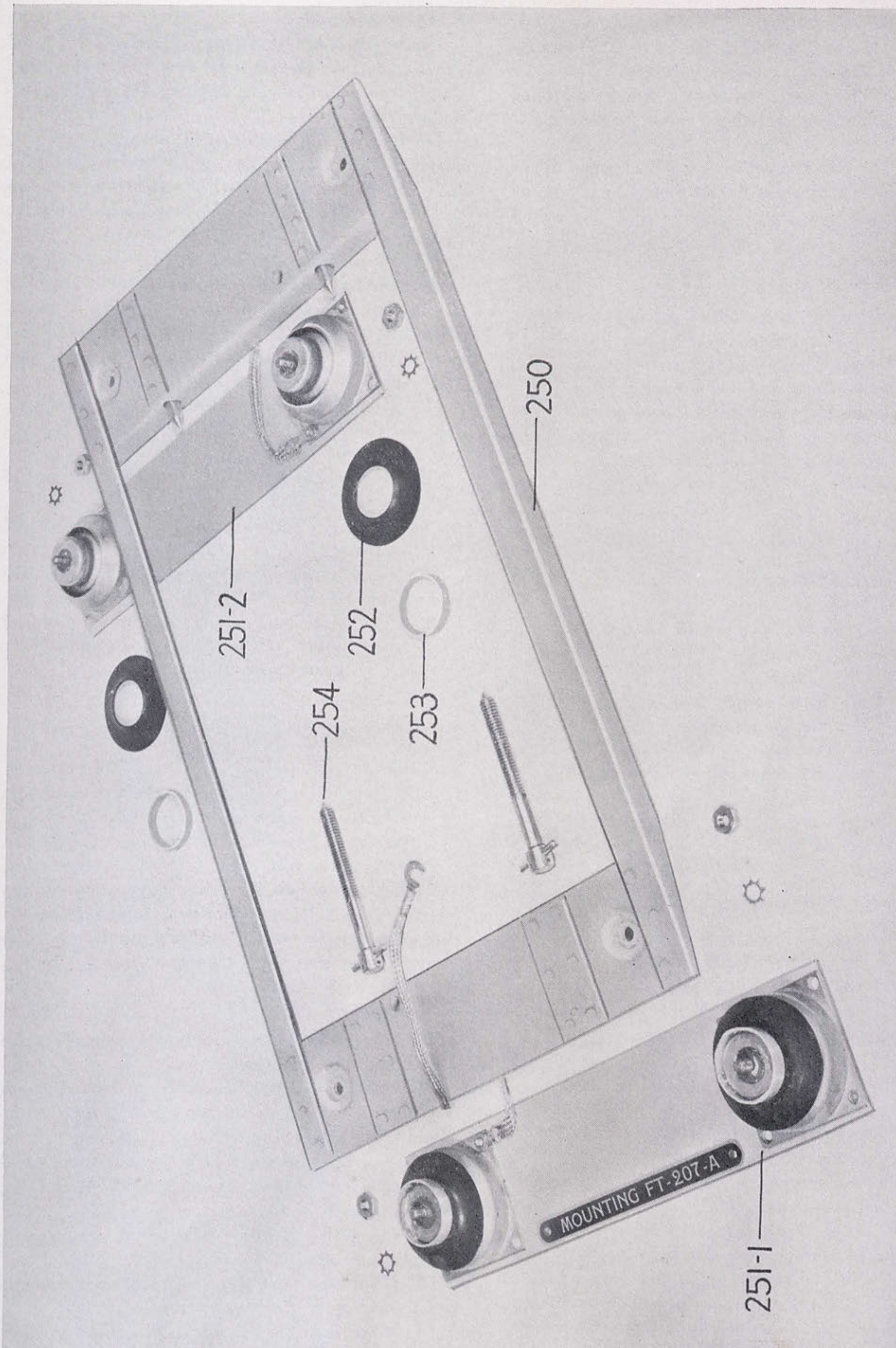


FIG. 25—MOUNTING FT-207-A, DISASSEMBLED

(4) Remove four screws securing the Socket SO-107 in place and fold back the cable to allow sufficient clearance to remove terminal board.

(5) Unscrew and remove the five round head screws securing the terminal board to the chassis studs.

(6) Any one of the four capacitors may now be removed by taking out the nuts and screws holding them in place.

l. Radio Control Box BC-374-A

To gain access to the radio control box interior:

(1) Remove the five black binding head screws located along the top and side edges of the control box panel. (Meter and dial surface.)

(2) Remove the four black binding head screws located along the side edges of the bottom of the panel. (Socket and phone jack surface.)

(3) Withdraw the panel assembly.

m. "LIGHTS" Control, Ref. No. 206

The "LIGHTS" control may be removed as follows:

(1) Unscrew and remove the four fillister head screws holding the Socket SO-107 to the control box panel.

(2) Fold back socket and cable until the "LIGHTS" control is accessible.

(3) Unsolder the leads to the "LIGHTS" control.

(4) Loosen set screws and remove knob, Ref. No. 213.

(5) Remove the control by withdrawing the panel nut and lockwasher.

n. Tuning Drive Mechanism, Ref. No. 216

(1) Loosen set screw in gear, Ref. No. 217, and withdraw Crank, Ref. No. 214, felt washer, Ref. No. 219, and gear.

(2) Remove two binding head screws, nuts and lockwashers and withdraw dial and gearing.

o. Mounting FT-207-A

(1) Remove the four hex nuts located in the depressed sections of the mounting frame and withdraw the mounting feet, Ref. No. 251, as shown on Fig. 25.

(2) The dust cap spacers may now be picked off or pried off with a screw driver.

(3) To replace the dust caps and spacers Glyptal No. 1276 cement, or equal, should be used being careful not to get cement on the faces of the metal retainers in the vicinity of the threaded studs.

p. Loop Assembly

The loop assembly consisting of Ref. Nos. 402 and 403, Fig. 26, may be removed from the housing, Ref. No. 400, and neck casting, Ref. No. 401, by proceeding as follows:

(1) Remove the thirteen fillister head screws securing the housing, Ref. No. 400, to the neck casting, Ref. No. 401, and separate the two parts by rotating the housing 90° from its original position on the casting.

NOTE: Some difficulty may be experienced in separating the housing and neck since cement was used in the assembly of the two parts. A knife blade inserted in the seam of the housing and neck, and pulled along the junction will break the seal and allow the units to separate.

(2) Remove the adjustment cover plug, Ref. No. 404 and gasket, Ref. No. 407, by withdrawing the two fillister head screws.

(3) Unscrew the hex head zero index screw and with it the index, Ref. No. 405.

(4) The loop assembly may now be removed from the casting.

(5) When reassembling the casting, Ref. No. 401, to the housing, Ref. No. 400, coat the mating surfaces with "Best-Test" rubber cement as made by The Union Rubber and Asbestos Co., Trenton, N. J., or equal. This insures a waterproof joint.

14. TROUBLE LOCATION AND REMEDY

a. General

In locating the source of unsatisfactory operation the procedure outlined graphically in Fig. 27 will facilitate rapid location of the source of difficulty.

When trouble has been found and remedied, check the equipment for proper operation. If unsatisfactory results are obtained, follow from the beginning the procedure outlined in the chart to locate further sources of trouble.

b. Preliminary Checks

Before removing the equipment from the aircraft make the following checks:

(1) Make sure that all controls on the radio control box are set to the proper position for the desired mode of operation.

(2) Ascertain that the fuse in the connector panel or junction box (if used) is not burned out and that the battery voltage is normal.

(3) Check that the loop is installed satisfactorily and all connections are made.

(4) Make sure that the non-directional antenna and lead in are not open or grounded.

(5) Make continuity test as discussed in **Par. 16 c.**

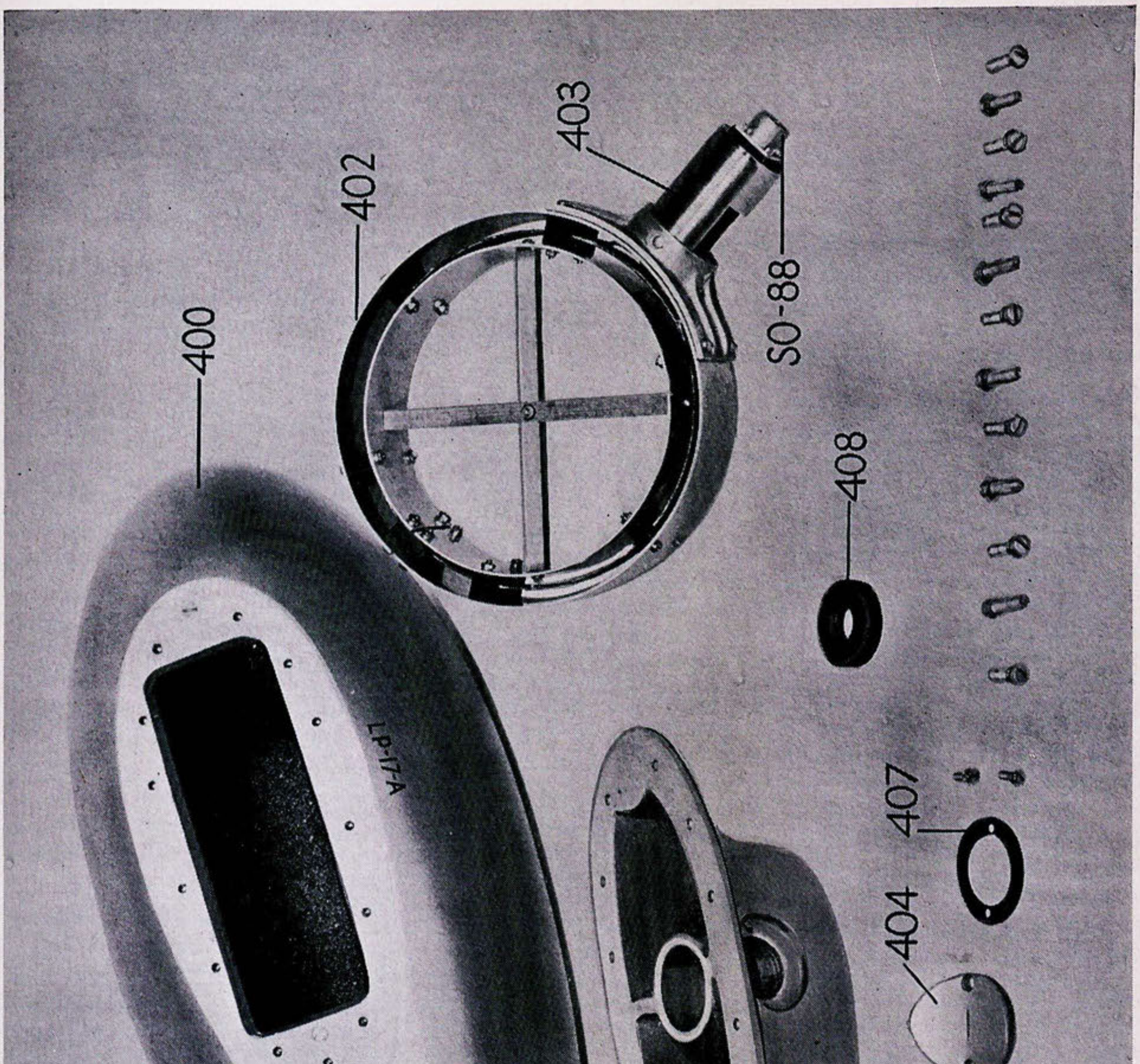


FIG. 26—LOOP LP-17-A, DISASSEMBLED

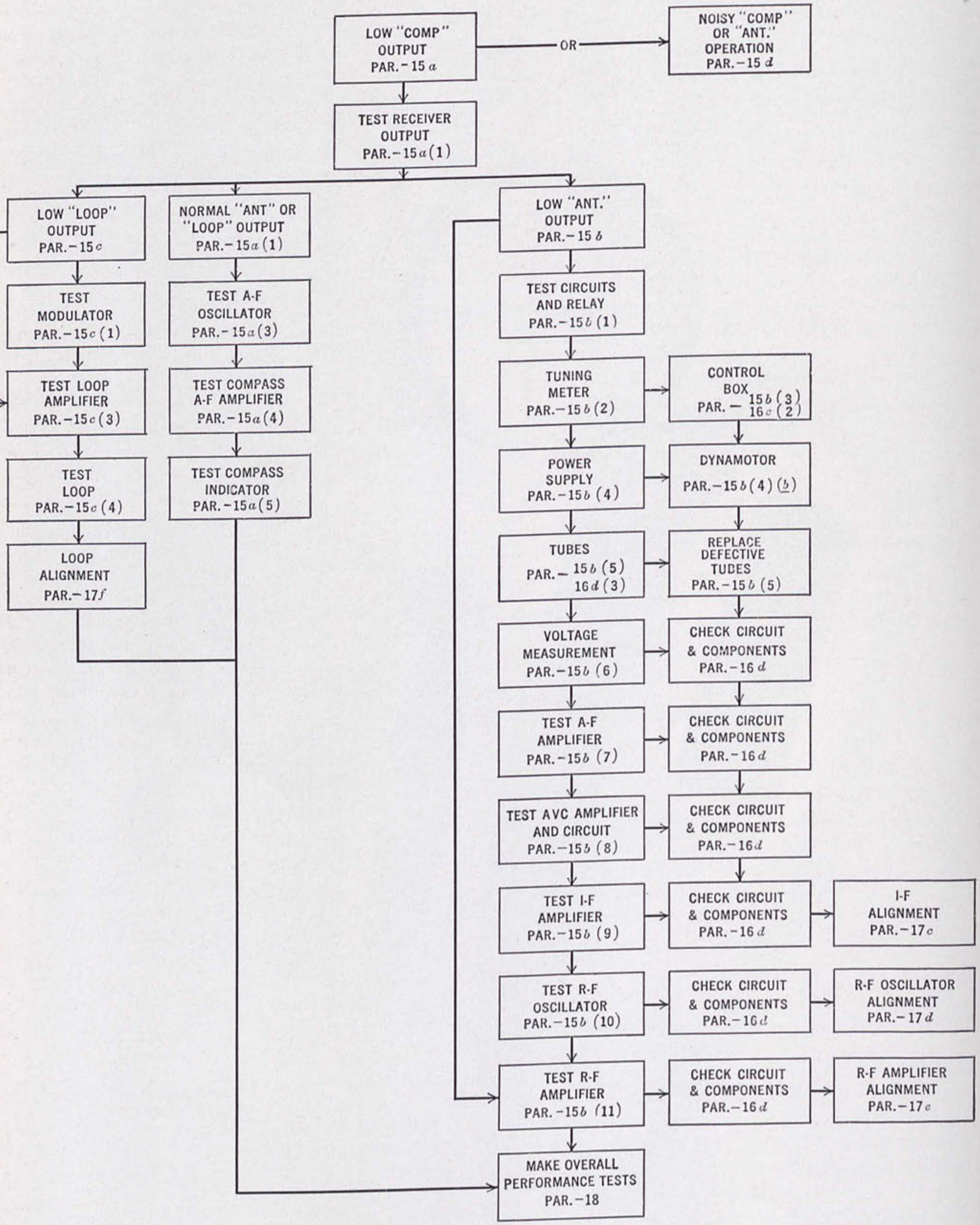


Fig. 27—Trouble Location and Remedy Chart

15. TEST PROCEDURE

a. Low "COMP" Output

(1) Test receiver output—operate the radio compass with the selector switch in the "ANT" position. Tune to signals over the band and if performance is satisfactory switch to "LOOP." Repeat this procedure over the entire tuning range noting the apparent sensitivity. If satisfactory operation is found in both of these positions the trouble must be in the associated compass circuits. Proceed as outlined in **Par. 15 *a*.**

(2) If, however, the "LOOP" operation is unsatisfactory proceed as outlined in **Par. 15 *c*.**

(3) Test Audio Frequency Oscillator—With a vacuum tube voltmeter measure the a-c voltage from terminals 1 and 2 on the audio frequency oscillator transformer, Ref. No. 87, to ground. It should measure approximately 6.5 volts. If a cathode ray oscillograph is available it would be advisable to check the shape of the audio oscillator wave at this point. A nearly perfect sinusoidal wave should be noted. A frequency check of the audio oscillator may also be advisable and can easily be made at this time if a calibrated audio oscillator is available. This should be 46 ± 1 cycles. If satisfactory operation is obtained continue investigation to locate the defect elsewhere, either in the modulator transformer, Ref. No. 86, or in the compass output amplifier circuit or in the attenuator network, Ref. No. 205.

(4) Test Compass Audio Frequency Amplifier—Test compass output Tube VT-107 for emission and characteristics. Operate the equipment in the "COMP" position and measure the tube socket voltages, which should approximate those in the chart in **Par. 16 *b*.** If a considerable variation from the tabulated values is noted, check the wiring and components of the circuits associated with the tube elements. Disconnect the compass indicator from the circuit by removing Plug PL-113 from the rear of the indicator. Set "COMPASS control to full maximum clock-wise position and apply an audio oscillator signal of 3.5 volts at 46 cycles between ground and the junction point of capacitors, Ref. Nos. 28 and 4-4. Connect the output meter between ground and terminal "S" on Plug PL-113. The voltage should be 10 volts, measured on the output meter, part of Test Set I-56-A. If no voltage is present at this point check components in compass output circuit for opens, shorts, and grounds. Replace any defective components.

(5) Test Compass Indicator—Check indicator and the associated cables for opens, shorts, grounds, poor contacts, etc.

(6) Check the two modulator Tubes VT-91 for emission and characteristics and replace if below normal limits. The voltage when read with a vacuum tube voltmeter from either Tube VT-91 top grid to ground should be about .92 volts at 46 cycles.

b. Low "ANT" Output

(1) When both signal and noise output are low or absent check all cable connections, power supply connections, fuses in connector panel or junction box, etc. Check antenna relay, Ref. No. 110, for operation and also for making and breaking of contacts.

(2) Tuning Meter I-74—With the selector switch in the "ANT" position and the "AUDIO" control fully clock-wise the tuning meter should show a slight right deflection after about a fifteen second warm up. If a signal is applied to the antenna and the set is tuned to resonance at this signal frequency a definite right deflection should be noted, the deflection depending upon the signal strength applied to the antenna. If no deflection is noted the connection to resistor, Ref. No. 49-4, should be removed and the resistor grounded at its junction with the wire from terminal "K" (Socket SO-107). If the signal is heard in the headset the meter should be removed and checked for open winding, shorts, grounds, etc. If resistor, Ref. No. 202, is open or defective the meter would be inoperative at normal signal levels as this would increase the amount of delay voltage beyond usable values. If after the above checks the equipment does not function properly proceed with further checks as follows:

(3) Remove the radio control box panel and examine the contacts on the selector switch, Ref. No. 207. Make continuity check from Socket SO-107 and check for continuity on all linking cables in the equipment.

(4) Power Supply—Failure of the primary power source may normally be detected by failure of the instrument lights. The supply voltage (approximately 13.0 volts) should appear between ground (black leads or bare bus bars) and the dynamotor r-f filter choke, Ref. No. 97. If no voltage appears at this point, check the Fuse FU-28. Check on-off switch contacts for continuity. (Ref. No. 207C).

(a) If the supply voltage is normal, approximately 208 volts should appear on the "HV" terminal of Ref. No. 150. If this voltage is unreasonably low check for short circuits in the wiring or components associated with or connected to the high voltage supply.

(b) Lack of dynamotor output voltage, if the primary supply voltage is normal, indicates a defective dynamotor. To definitely determine if the trouble is within the dynamotor disconnect the red lead from the dynamotor

to the "HV" terminal on Ref. No. 150. The voltage from this lead to ground should be approximately 260 volts.

(5) Test all tubes for emission and other characteristics according to **Par. 16 *d* (3)**. Any tubes having characteristics not within the prescribed limits should be replaced.

(6) Voltage measurements — Socket voltages should be measured with the selector switch in the "COMP" position and compared to those in the chart in **Par. 16 *b*.** If any considerable variations from the typical values are noted, check all resistors, capacitors, and wiring in circuits associated with the suspected tube element.

(7) Audio Frequency Amplifier Test — A loud click or whistle should be heard in the headset if the grid of the second detector Tube VT-93 is touched when the radio compass is operating in "ANT" position. If no sound is heard measure the tube socket voltages of the phone output Tube VT-107 and the second detector Tube VT-93 and compare the readings with those in **Par. 16 *b*.** If any considerable variation is noted, check the wiring and components in the circuits associated with the tube elements. Apply a 400 cycle signal from an audio oscillator to the grid of the phone output Tube VT-107 (pin 5 on tube socket) and measure the input required for 50 milliwatts output. If this stage is functioning properly it should be possible to obtain this output with an applied audio voltage of 1.85 volts. Likewise a voltage of .3 volts applied to the grid of the first audio Tube VT-93 should give an output of 50 milliwatts. For both the above tests the voltage from the audio source to the grids of the tubes should be applied through a .1 mfd. capacitor. If the reading on the phone output grid is normal and the input to the grid of the first audio tube is high, apply the audio voltage to the plate of the tube. The input at this point for standard output should be 2.2 volts. If the required voltage is considerably higher, thoroughly check capacitors, Ref. Nos. 4-4 and 7-2, for open circuits. If the voltage to the grid of the phone output tube is higher than normal, check the phone output transformer, Ref. No. 95, and replace if necessary.

(8) AVC Tests—Extreme insensitivity of the radio compass unit may be caused by failure of capacitors, Ref. Nos. 17, 9, 6-4, 6-2, 6-1, or 6-7. The last four listed capacitors are AVC by-pass or padder capacitors and if defective, the r-f circuit resistance is increased by the amount of the associated decoupling resistance, which effectively renders the stage inoperative. If the AVC is inoperative for all signal levels, after checking the AVC amplifier Tube VT-93 characteristics, capacitor, Ref. No. 16-2, should be checked for open circuit. Check circuit and characteristics of the 1st i-f amplifier Tube VT-86.

(9) Intermediate Frequency Tests—Apply a 112.5 kilocycle signal, 30% modulated at 400 cycles, through the standard artificial antenna to the grid of the second i-f amplifier Tube VT-86 with the "AUDIO" control at maximum. Measure the input voltage required to produce 50 milliwatts output. If this stage is functioning properly a signal strength of 190,000 microvolts will be required. If a stronger signal is required readjust the iron cores, Ref. No. 93 and Ref. No. 92-5, for maximum output to determine that the low sensitivity is not due to misalignment of the 3rd i-f transformer. If satisfactory alignment cannot be reached remove 3rd i-f transformer, Ref. No. 108, and check components for opens, shorts, etc. If this 3rd i-f sensitivity is satisfactory but the sensitivity is low at the grid of the 1st i-f Tube VT-86, connect the signal generator to this point and apply a 112.5 kilocycle signal, 30% modulated at 400 cycles, through the standard artificial antenna. With the "AUDIO" and "THRESH SENS" controls set to maximum, a signal strength of 4800 microvolts should be required for standard output of 50 milliwatts. Adjust iron core screws, Ref. Nos. 92-3 and 92-4, to determine that low sensitivity is not due to misalignment. If satisfactory alignment cannot be reached, remove this transformer, Ref. No. 107 and check for open circuits, shorts, grounds, etc. If sensitivity is found to be satisfactory at this point but is low at the grid of the 1st detector Tube VT-87, connect the signal generator to this point and apply the signal as in the preceding paragraph. The input should be approximately 300 microvolts for standard output of 50 milliwatts. The r-f oscillator must be functioning while making this measurement. To determine if the r-f oscillator is functioning properly, note the input required for 50 milliwatts output. Ground the grid of the r-f oscillator Tube VT-65 (tube terminal 4) and note that a lower microvolt input is required for standard 50 milliwatts output than is required with the oscillator functioning. An audible click will also be noticed when this grid is grounded or ungrounded, if the oscillator is functioning properly. If the input to the grid of the 1st detector Tube VT-87 is considerably higher than 300 microvolts adjust the alignment screws, Ref. Nos. 92-1 and 92-2, to determine that the low sensitivity is not being caused by misalignment. If satisfactory alignment cannot be reached, remove the 1st i-f transformer, Ref. No. 106, and check its components for opens, shorts, grounds, etc.

(10) R-F Oscillator Tests — Check tube socket voltages on r-f oscillator Tube VT-65 and compare with data in **Par. 16 *b*.** Check tube emission and characteristics. Connect signal generator to top grid of first detector Tube VT-87 and apply a signal at

400 kilocycles, 30% modulated at 400 cycles. Set "AUDIO" and "THRESH SENS" controls at maximum. Plug output meter in "TEL" jack, Ref. No. 208. Retune signal generator for maximum output or adjust trimmer capacitor, Ref. No. 19-1, for maximum output, if frequency dial calibration deviates considerably from the signal generator setting. Standard output of 50 milliwatts should be obtained with approximately 325 microvolts input from signal generator. If resonance cannot be obtained, or if the sensitivity is high, remove the oscillator transformer assembly, Ref. No. 105, and check components for open circuits, shorts, and grounds.

(11) R-F Amplifier Tests—If after completion of the tests outlined in **Par. 10** above, and socket voltage check as in **Par. 16 *b*** the equipment does not function properly, a stage-by-stage check should be made.

With the radio compass unit tuned to 400 kilocycles and with the signal generator connected to the grid of the r-f amplifier Tube VT-86 through the standard artificial antenna, apply a 400 kilocycle signal, 30% modulated at 400 cycles. With "AUDIO" and "THRESH SENS" controls set to maximum check microvolt input for standard output of 50 milliwatts. The input required should be approximately 11 microvolts. If the proper sensitivity to the grid of the r-f amplifier Tube VT-86 cannot be measured, realign the capacitor, Ref. No. 19-3, on the r-f plate coil and capacitor, Ref. No. 20-1, on the detector grid coil for maximum output. If resonance cannot be reached after the trimmer capacitors are realigned remove the coil assemblies, Ref. Nos. 103 and 104, and check components for opens, shorts, and grounds and replace components found defective.

If the r-f amplifier stage is functioning properly apply a 5 microvolt signal to the "ANT" post on the front panel of the radio compass unit and, if 50 milliwatts is not obtainable on the output meter in "TEL" jack, check alignment of trimmer capacitor, Ref. No. 20-2, in antenna transformer assembly, Ref. No. 102. If resonance cannot be reached on the capacitor, remove assembly and check components for opens, shorts, and grounds. Also check antenna relay, Ref. No. 110, for operation and for continuity of circuit through its contacts. Check i-f rejection trap coil, Ref. No. 98, and capacitors, Ref. Nos. 1 and 6-9, for open circuits, shorts, and grounds and replace components found defective.

c. Low "LOOP" Output

Operate the radio compass with the selector switch in the "LOOP" position. Tune in stations or signals from signal generator over the tuning band, noting apparent sensitivity. If the equipment is inoperative over the entire band (but functions on "ANT" operation) set up equipment on test bench and measure tube socket voltages and compare with tabulated data in **Par. 16 *b*** for loop amplifier Tube VT-86. Check operation of antenna relay, Ref. No. 110. Check tube socket voltages on the two modulator Tubes VT-91 and compare with data in **Par. 16 *b*.** Also check capacitor, Ref. No. 3, for open circuit. If sensitivity still appears low, set up equipment with loop under transmission line as illustrated in Fig. 10. If sensitivity on "LOOP" operation is lower than 100 microvolts per meter [with 4:1 signal to noise ratio (power) as described in **Par. 17 *e***] adjust trimmer capacitor, Ref. No. 19-2, on loop transformer, Ref. No. 100, to determine that loss of sensitivity is not due to misalignment. If correct alignment cannot be reached remove the loop transformer assembly, Ref. No. 100, and examine components for open circuits, shorts, and grounds. Also check Loop LP-17-A, Cord CD-362, and contact pins in Socket SO-88 and Plug PL-108 on loop cable. If equipment still appears to have low sensitivity, a further check to isolate the component causing a loss of gain, may be made as described in the following paragraphs.

(1) Rotate selector switch to "ANT" position and apply a 400 kilocycle signal from the signal generator using standard artificial antenna, to the "ANT" post on the front of the radio compass unit. Tune radio compass to resonance; set input from signal generator at 45 microvolts and reduce "AUDIO" control so that an output of 50 milliwatts is obtained on an output meter in "TEL" jack, Ref. No. 208. Rotate selector switch to "LOOP" position and connect the signal generator to top grid of No. 1 modulator Tube VT-91 (tube nearest modulator transformer, Ref. No. 101) through artificial antenna. Do not change setting or adjustment of any controls. Measure sensitivity or microvolt input required to give 50 milliwatts output at "TEL" jack. This should be approximately 7.5 microvolts. If results are unsatisfactory, check tube emission, tube socket voltage, and operation of antenna relay, also coupling capacitor, Ref. No. 3, for open or short circuit. Connect signal generator to top grid of No. 2 modulator Tube VT-91. While this tube is normally biased to cut off, some signal can be fed through and will be approximately 50,000 microvolts for 50 milliwatt output at "TEL" jack. If unsatisfactory, check tube emission and characteristics, socket voltages, and wiring to socket.

(2) If the checks to the above two points are satisfactory, connect the signal generator to grid of loop r-f amplifier Tube VT-86 through artificial antenna and set signal generator output for approximately 45 microvolts. This should give standard output on meter in "TEL" jack, Ref. No. 208. Do not change setting of any controls or adjustments. If a satisfactory reading is not obtainable check tube characteristics and compare to those in **Par. 10** and check socket voltages and compare to those given in **Par. 16 *b*.** This checks the primary windings and one half of the secondary winding of modulator transformer, Ref. No. 101, and No. 1 modulator Tube VT-91 (one nearest modulator transformer assembly, Ref. No. 101). At this time reverse the connections from modulator transformer, Ref. No. 101, to the two top grids of the two modulator Tubes VT-91. This is done by interchanging the top grid leads from the socket connections in the top side of modulator transformer assembly, Ref. No. 101. The microvolt input for 50 milliwatt output on meter in "TEL" jack, Ref. No. 208, should be the same as for above condition, 45 microvolts; any appreciable change should be investigated by removing transformer assembly, Ref. No. 101, and checking components for open circuits, shorts, grounds, etc.

(3) If all conditions are satisfactory at this point but no signal can be received when using equipment set up as under Fig. 10, a further check may be made on the loop transformer, Ref. No. 100, by applying a signal from the signal generator through the artificial antenna to pin No. 4 on Socket SO-88, after removing Cord CD-362, without changing any control or adjustment setting. Apply a signal of approximately 90 microvolts. This should give an output of 50 milliwatts on the meter plugged in "TEL" jack. Readjust trimmer, Ref. No. 19-2, for maximum output. An input of 20 microvolts should then give standard output of 50 milliwatts on output meter. If not, remove loop transformer, Ref. No. 100, and check components for open circuits, shorts, and grounds. This test misaligns the loop trimmer, Ref. No. 19-2, which must be realigned in accordance with **Par. 17 *f*.**

(4) Check continuity of winding in Loop LP-17-A, by checking resistance between pin No. 2 and No. 4. These are made accessible by removing Plug PL-108 from Socket SO-88 at the front of the radio compass unit. If it is found necessary to remove or replace the loop transformer assembly, Ref. No. 100, or to make any major adjustment in the setting of trimmer capacitor, Ref. No. 19-2, it will be necessary to completely realign this stage as described in **Par. 17 *f*.**

d. Noisy "COMP" or "ANT" Operation

To locate the cause of noisy operation check the following components:

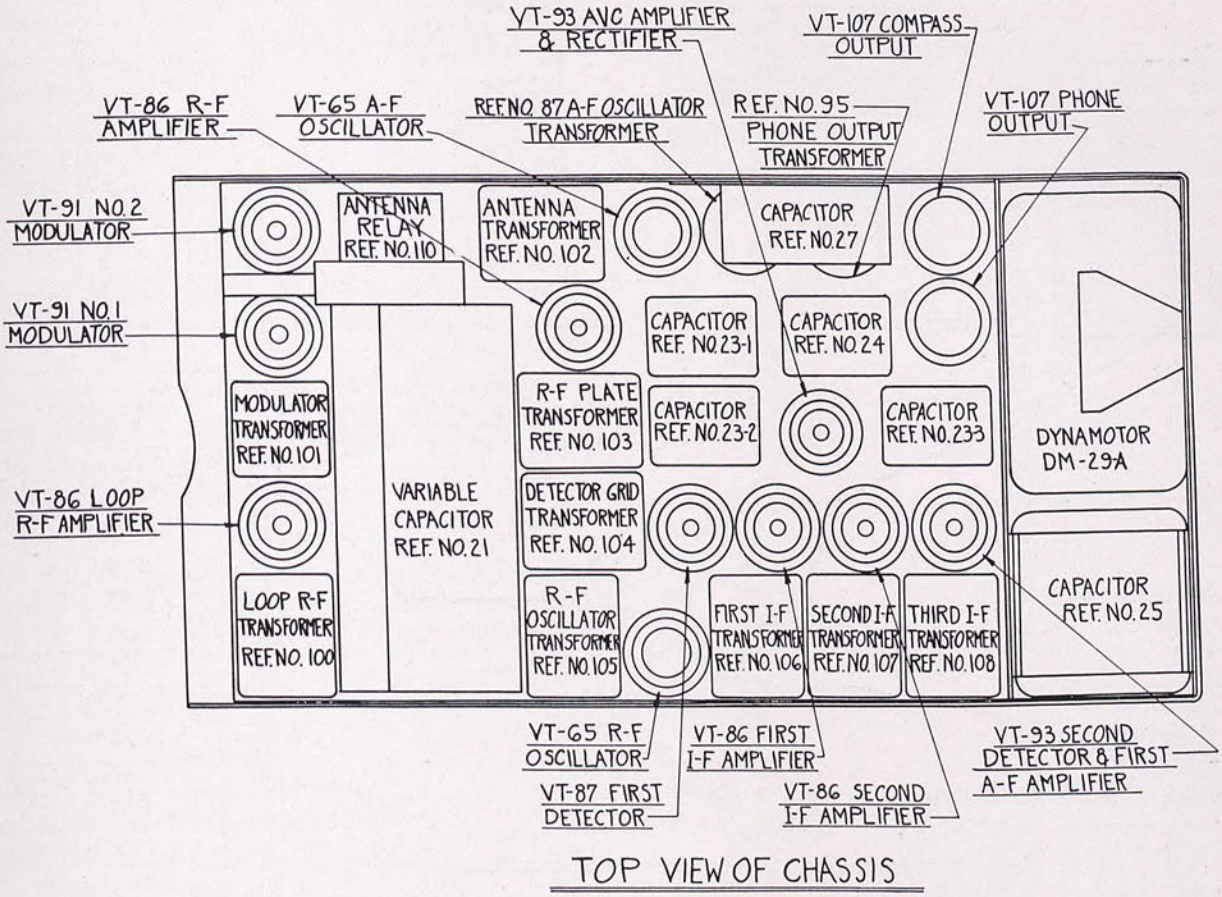
Check	For
Vacuum Tubes	Microphonic or defective units.
Dynamotor	Worm or arcing brushes.
Loop	Dirty or flattened pins, open or short between terminals.
Cable Plugs	Poor contacts.
Switches	Poor contacts.
Antenna Relay	Poor contacts, inoperation, open coil.
Variable Capacitors	Dirt between plates, shorting plates.
Power Source	Loose or corroded contacts.
Circuits	Loose wires, defective capacitors, resistors and other components.

16. TYPICAL OVERALL VOLTAGE MEASUREMENTS

a. Typical Circuit Voltages

The following voltages are based on an average production run of radio compass units and should check within ±10% of readings made on any normal radio compass unit. The measurements should be made on a Weston Model 665, Type 2, Selective Analyzer using the 250 volt scale for plate, B+ and dynamotor output voltages and the 25 volt scale for primary supply voltages. Operate the equipment with selector switch in "COMP" position and all other controls set in the maximum clock-wise position.

Circuit	Ref. No.	Term.	Voltage
Supply Voltage	SO-107	D	13.1
Input to Filter	97	Bat. Side	13.1
Input to Dynamotor	97	Dyn. Side	12.75
Dynamotor Output	150	+HV	208
Input to Filter Choke	96-1	2	208
Output of Filter Choke	96-1	1	200
B+ Side of Phone Transformer	95	B	177
Plate Side of Phone Transformer	95	P	163
B+ Side of Compass Transformer	94	B	156
Plate Side of Compass Transformer	94	P	135
B+ Side of 2nd and 3rd I-F Primaries	107	1	190
Plate Side of 2nd I-F	107	6	189
Plate Side of 3rd I-F	108	1	189



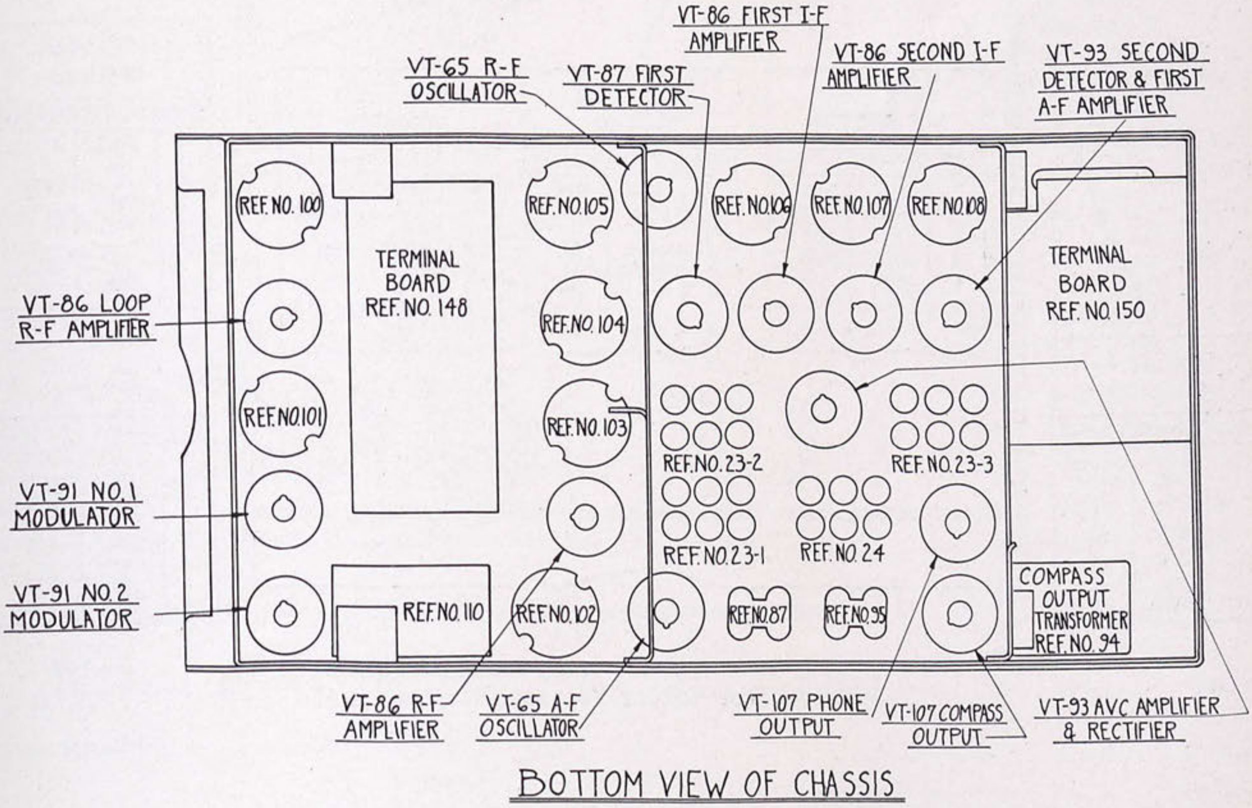
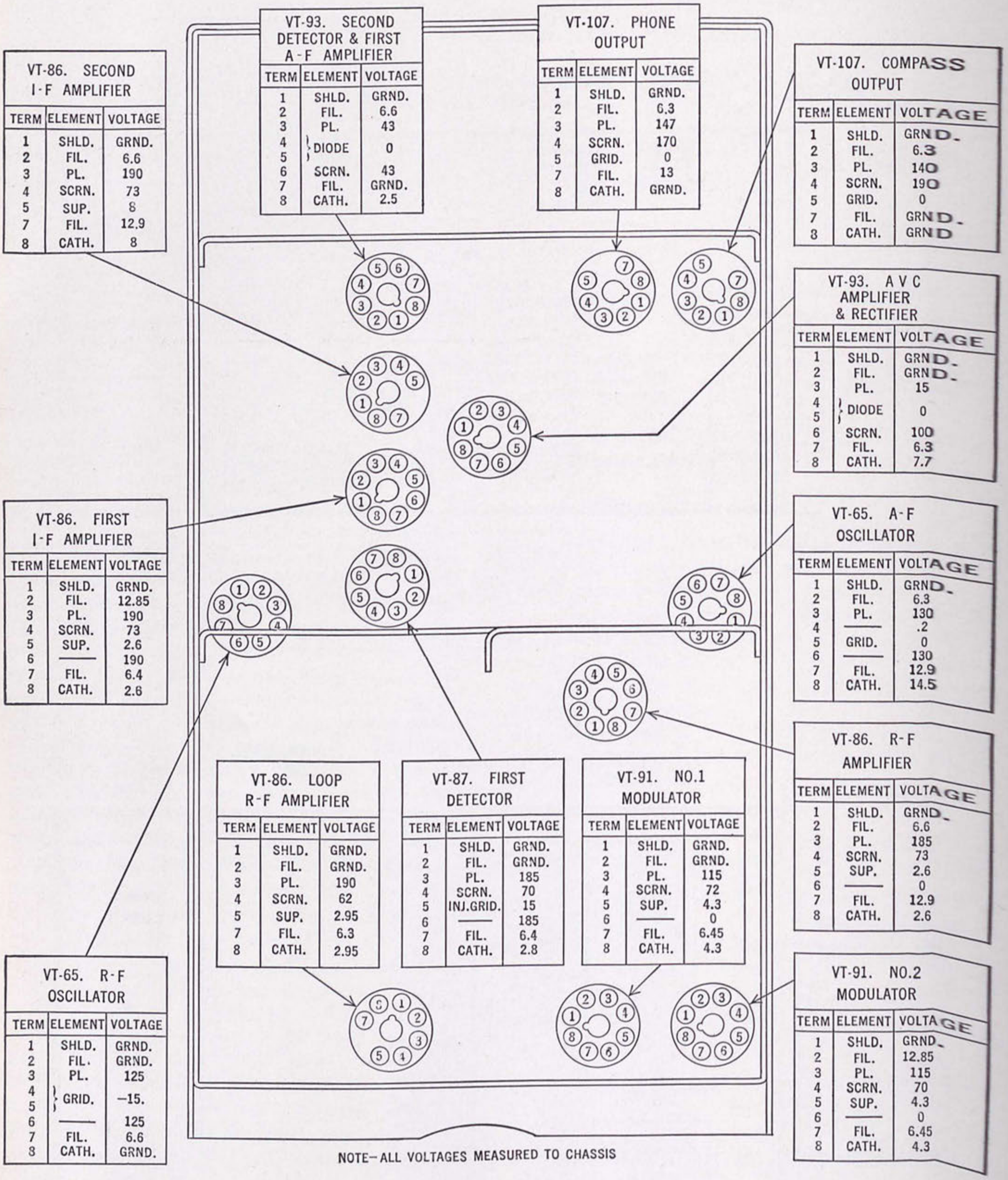


Fig. 28—Chassis Layout, Top and Bottom Views



VT-86. SECOND I-F AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.6
3	PL.	190
4	SCRN.	73
5	SUP.	8
7	FIL.	12.9
8	CATH.	8

VT-93. SECOND DETECTOR & FIRST A-F AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.6
3	PL.	43
4, 5	DIODE	0
6	SCRN.	43
7	FIL.	GRND.
8	CATH.	2.5

VT-107. PHONE OUTPUT

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.3
3	PL.	147
4	SCRN.	170
5	GRID.	0
7	FIL.	13
8	CATH.	GRND.

VT-107. COMPASS OUTPUT

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.3
3	PL.	140
4	SCRN.	190
5	GRID.	0
7	FIL.	GRND.
8	CATH.	GRND

VT-93. A V C AMPLIFIER & RECTIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	GRND.
3	PL.	15
4, 5	DIODE	0
6	SCRN.	100
7	FIL.	6.3
8	CATH.	7.7

VT-86. FIRST I-F AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	12.85
3	PL.	190
4	SCRN.	73
5	SUP.	2.6
6	——	190
7	FIL.	6.4
8	CATH.	2.6

VT-65. A-F OSCILLATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.3
3	PL.	130
4	——	.2
5	GRID.	0
6	——	130
7	FIL.	12.9
8	CATH.	14.5

VT-86. R-F AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	6.6
3	PL.	185
4	SCRN.	73
5	SUP.	2.6
6	——	0
7	FIL.	12.9
8	CATH.	2.6

VT-86. LOOP R-F AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	GRND.
3	PL.	190
4	SCRN.	62
5	SUP.	2.95
7	FIL.	6.3
8	CATH.	2.95

VT-87. FIRST DETECTOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	GRND.
3	PL.	185
4	SCRN.	70
5	INJ.GRID.	15
6	——	185
7	FIL.	6.4
8	CATH.	2.8

VT-91. NO.1 MODULATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	GRND.
3	PL.	115
4	SCRN.	72
5	SUP.	4.3
6	——	0
7	FIL.	6.45
8	CATH.	4.3

VT-65. R-F OSCILLATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	GRND.
3	PL.	125
4, 5	GRID.	−15.
6	——	125
7	FIL.	6.6
8	CATH.	GRND.

VT-91. NO.2 MODULATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	FIL.	12.85
3	PL.	115
4	SCRN.	70
5	SUP.	4.3
6	——	0
7	FIL.	6.45
8	CATH.	4.3

NOTE—ALL VOLTAGES MEASURED TO CHASSIS

Fig. 29—Tube Socket Voltage Diagram

Circuit	Ref. No.	Term.	Voltage
B+ Side of 1st I-F Primary	106	1	194
Plate Side of 1st I-F Primary	106	6	193
B+ to R-F Plate Trans.	103	5	192
Plate Side of R-F Plate Trans.	103	1	191
B+ to R-F Osc.	105	1	200
Plate Side of R-F Osc.	105	4	175
B+ to Modulator Primary	101	2	194
Plate Side of Modulator	101	3	193
B+ to Marker Beacon Receiver	SO-107	U	199

The following Measurements require a Vacuum Tube Voltmeter.

Circuit	Ref. No.	Term.	Voltage
Input to Modulator No. 1	101	5	1.37
Input to Modulator No. 2	101	4	1.35
Input from Audio Osc.	87	1	6.6
Input from Audio Osc.	87	2	6.55
AVC Diode Voltage†	VT-93	4 *C	.45
		*A	.0185
		*L	.0165

* C—"COMP."
* A—"ANT."
* L—"LOOP"
† "AUDIO" control at minimum.

b. Typical Vacuum Tube Socket Voltages

See Fig. 29. Battery voltage 14 volts. Equipment operating on "COMP" with the "THRESH SENS," "LOOP GAIN," and "AUDIO" controls fully clockwise. All voltages should be measured to the chassis unless otherwise stated and should check within 10% of those tabulated. Measurements should be made with the Weston Model 665, Type 2, Selective Analyzer. Plate and screen voltages should be measured on the 250 volt scale. Heater and cathode voltages should be measured on the 10 volt scale. Heater voltages should be measured between terminals 2 and 7.

Tube	Socket Term.	Element	Voltage
VT-65	3	Plate	110
Loop Amplifier	4	Screen	60
	8	Cathode	2.76
	2-7	Heater	6.6

Tube	Socket Term.	Element	Voltage
VT-91	3	Plate	87
Modulator No. 1	4	Screen	74
	8	Cathode	3.9
	2-7	Heater	6.65
VT-91	3	Plate	87
Modulator No. 2	4	Screen	73
	8	Cathode	4.1
	2-7	Heater	6.8
VT-65	3	Plate	110
Audio Oscillator	8	Cathode	10.7*
	2-7	Heater	6.9
VT-86	3	Plate	200
R-F Amplifier	4	Screen	79
	8	Cathode	2.8
	2-7	Heater	6.6
VT-87	3	Plate	200
First Detector	4	Screen	72
	8	Cathode	2.7
	2-7	Heater	6.85
VT-65	3	Plate	160
R-F Oscillator	8	Cathode	—
	2-7	Heater	7.0
VT-86	3	Plate	197
First I-F Amplifier	4	Screen	77
	8	Cathode	2.5
	2-7	Heater	6.75
VT-86	3	Plate	196
Second I-F Amplifier	4	Screen	74
	8	Cathode	4.5*
	2-7	Heater	6.85
VT-93	3	Plate	46
Second Detector	6	Screen	46
	8	Cathode	1.8
	2-7	Heater	6.65
VT-93	3	Plate	11.9*
AVC	6	Screen	106
	8	Cathode	7.7
	2-7	Heater	6.75
VT-107	3	Plate	144
Compass Output	4	Screen	167
	8	Cathode	—
	2-7	Heater	6.85
VT-107	3	Plate	168
Phone Output	4	Screen	184
	8	Cathode	—
	2-7	Heater	6.85

* Read on 25 volt scale, oscillator operating.

NOTE: When vacuum tube socket voltages are found to vary appreciably from the typical values given in the above table, the trouble can usually be located as below:

(1) Heater voltage high—Heater burned out in tube measured. See Fig. 36.

(2) Heater voltage low—Dirty contacts on switch, Ref. No. 207C.

(3) Plate voltage high—Shorted decoupling resistors. Open screen or cathode circuit.

(4) Plate voltage low—Ground on plate lead. Defective plate coupling capacitor.

(5) Screen voltage high—Shorted screen dropping resistor.

(6) Screen Voltage low—Defective screen bypass capacitor or resistor.

(7) Cathode Voltage high—Open cathode resistor.

(8) Cathode Voltage low—Defective cathode bypass capacitor or resistor.

c. Continuity Test of Radio Compass SCR-246-A

(1) Radio Compass Unit BC-373-A—Set controls as follows:

"LOOP GAIN" control to maximum clockwise.

"THRESH SENS" control to maximum clockwise.

Using Weston Model 665, Type 2, Selective Analyzer, the following readings are typical for normal equipment. Readings are from terminal listed to ground binding post unless otherwise stated. (See Fig. 36 and Fig. 38.)

SO-107 Terminal Number	Operate, Test, and Return to Original Setting	Ohmmeter Scale Used	Resistance Ohms	Probable Cause of Incorrect Reading
D		Direct	0.55	Open, short, or ground, Ref. No. 110, DM-29-A. Open or ground in vacuum tube series, filament connections or Ref. No. 22C defective.
E		Rx100	730	Open, short, or ground, secondary winding, Ref. No. 94.
F		Rx100	1100	Open, short, or ground in secondary winding, Ref. No. 95.
G	"THRESH SENS"	Rx1000	59,500	Defective—Ref. Nos. 80, 26-3B, 8-2, 50, 55, 23-1B.
H		Rx100	795	Defective—Ref. Nos. 87, 8-1, 8-3, 27.
J		Rx100	920	Defective—Ref. Nos. 27, 87, 8-1, 8-3.
K		Rx1000	Open	Defective—Ref. Nos. 49-4, 51-4, 10-2, 11-2, 10-1, 108.
M		Direct	0	
N		Rx1000	Open	
R		Rx10	76.5	Defective—Ref. No. 110.
S		Rx1000	23,400	Defective—Ref. Nos. 46-2, 45-1, 26-4A.
T		Direct	0	
U		Rx100	685	Defective—Ref. Nos. 46-4, 23-2B, 107, 108.
V	"LOOP GAIN"	Rx1000	18,400	Defective—Ref. Nos. 40-1, 81, 41-1, 41-2, 26-4.

SO-88 Terminal Number	Operate, Test, and Return to Original Setting	Ohmmeter Scale Used	Resistance Ohms	Probable Cause of Incorrect Reading
2		Direct	0	
4		Direct	.25	Defective—Ref. No. 85.

(2) Radio Control Box BC-374-A

Set controls as follows: "AUDIO," "COMPASS," and "LIGHTS" controls to maximum clockwise position. Selector switch to "COMP" position.

SO-107 Terminal Number	Sel. Sw. Position	Operate, Test, and Return to Original Setting	Ohmmeter Scale Used	Resistance Ohms	Probable Cause of Incorrect Reading
D	All	"LIGHTS"	Direct	25	Defective—Ref. Nos. 201, 202, 203, 206, LM-32 Sockets, 207C
E	All	"COMPASS" Max.	Rx1000	Open	Defective—Ref. Nos.205A, 205B
		"COMPASS" Min.	Rx1000	2000	
F	"OFF", "ANT", and "LOOP"		Rx1000	Open	Defective—Ref. Nos. 207B, 204A, 204B
	"COMP"	"AUDIO" Max.	Rx1000	Open	Defective—Ref. Nos. 204A, 204B, 208
		"AUDIO" Min.	Direct	10	
G	"OFF", "ANT", and "LOOP"	"AUDIO" Max.	Direct	20	Defective—Ref. Nos. 207B, 204C
		"AUDIO" Min.	Rx1000	10,000	
	"COMP"		Direct	0	Defective—Ref. No. 204C
H	"OFF", "ANT", and "LOOP"		Rx1000	Open	Defective—Ref. Nos. 208, 204A, 204B, 207B
	"COMP"	"AUDIO" Max.	Rx1000	Open	Defective—Ref. Nos. 208, 204A, 204B
		"AUDIO" Min.	Rx1000	4000	
J	All	"COMPASS" Max.	Rx1000	Open	Defective—Ref. No. 205
		"COMPASS" Min.	Direct	10	
M	"OFF" and "COMP"		Rx1000	Open	Defective—Ref. No. 207B
	"ANT" and "LOOP"		Direct	0	Defective—Ref. No. 207B
N	"OFF" and "COMP"		Rx1000	Open	Defective—Ref. No. 207B
	"ANT" and "LOOP"		Direct	0	Defective—Ref. No. 207B
R	"OFF", "COMP", and "ANT"		Rx1000	Open	Defective—Ref. No. 207A
	"LOOP"		Direct	0	Defective—Ref. No. 207A
S	"OFF", "COMP", and "ANT"		Rx1000	Open	Defective—Ref. No. 207A
	"LOOP"		Direct	0	Defective—Ref. No. 207A
T	"OFF"		Rx1000	Open	Defective—Ref. No. 207C
	"COMP", "ANT", and "LOOP"		Direct	25	Defective—Ref. Nos. 201, 202, 203, 206, LM-32 Sockets
U	All		Direct	0	
V	"OFF", "ANT", and "LOOP"		Rx1000	Open	Defective—Ref. No. 207A
	"COMP"		Direct	0	Defective—Ref. No. 207A

(3) Compass Indicator I-73-A

Remove Plug PL-113

SO-93 Terminal Number	Ohmmeter Scale Used	Resistance Ohms	Probable Cause of Incorrect Reading
S to T	Rx100	2275	Defective Moving Coil, Open, Short, or Ground.
R to U	Rx100	2650	Defective Field Coil, Open, Short, or Ground.
R-S-T-U to Case	Rx1000	Open	Grounded Windings or Connections.

d. Circuit Analysis Using Test Set I-56-A

(1) General: Before attempting to use Test Set I-56-A, the instructions outlining its use and operation should be carefully studied in the first five paragraphs of Detailed Tests on Radio Sets, Section III of the Instruction Book for Test Set I-56-A.

(2) Cable Tests: If poor or erratic operation of the radio compass unit is noted, first, a continuity check on all plugs and connecting cables should be made in accordance with **Par. 2** of the above reference.

(3) Tube Testing: If all cable connections seem to be in good condition, the tubes should be tested on the Model 685 Tube Checker in accordance with **Par. 3** of the above reference and the following Chart.

Tube	Comm. Equiv.	Fil. Selector	Tube Selector	"IN" Position
VT-65	6C5	6	40	BD
VT-86	6K7	6	40	BCDE
VT-87	6L7	6	43	BCDE
VT-91	6J7	6	41	BCDE
VT-93	6B8	6	35	*BEF
			0	C and D
VT-107	6V6	6	45	BCD

* Pentode Position.

(4) Voltage, Current, and Resistance Measurements: If the trouble has not been located after performing the preceding tests, voltage, current, and resistance measurements should be made, using the Weston Model 665 Selective Analyzer and Model 666 Socket Selector Unit. When measuring tubes with top grids use .1 mfd to .5 mfd capacitor from grid to ground to prevent spurious oscillations. Set up the analyzer and socket selector block as indicated under **Pars. 4** and **5** of Section III of the Instruction Book for Test Set I-56-A. The voltage, current, and resistance values should check within 10% of those given in chart shown on Page 47 providing the following rules are observed:

Test Set I-56-A—Place Model 666, Type 1B Socket Selector Block in pin jacks above the meter in

CIRCUIT ANALYSIS USING TEST SET I-56-A

Tube Type	VT-86		VT-87		VT-93		VT-91		VT-65		VT-107	
	Block Term. No.	Conn. to Anal. Jacks	Block Term. No.	Conn. to Anal. Jacks	Block Term. No.	Conn. to Anal. Jacks	Block Term. No.	Conn. to Anal. Jacks	Block Term. No.	Conn. to Anal. Jacks	Block Term. No.	Conn. to Anal. Jacks
Plate Volts	3 Gnd.	250V –V	3 Gnd.	250V –V	3 Gnd.	50V –V	3 Gnd.	500V –V	3 Gnd.	250V –V	3 Gnd.	250V –V
Plate Current	3 out 3 ins	5Ma –Ma	3 out 3 ins	2–5Ma –Ma	3 out 3 ins	2.5Ma –Ma	3 out 3 ins	1Ma –Ma	3 out 3 ins	10Ma –Ma	3 out 3 ins	25Ma –Ma
Screen Volts	4 Gnd.	250V –V	4 Gnd.	250V –V	2nd Det. 6 Gnd. AVC 6 Gnd.	 50V –V 250V –V	4 Gnd.	500V –V			4 Gnd.	250V –V
Screen Current	4 out 4 ins	2–5Ma –Ma	4 out 4 ins	5Ma –Ma	2nd Det. 6 out 6 ins AVC 6 out 6 ins	 1Ma –Ma 5Ma –Ma	3 out 3 ins	1Ma –Ma			4 out 4 ins	2.5Ma –Ma
Cathode Volts	8 Gnd.	5V –V	8 Gnd.	5V –V	8 Gnd.	10V –V	8 Gnd.	25V –V	8 Gnd.	25V –V		

Analyzer Model 665. Keep "AC-DC" toggle switch on "DC." Place other toggle switch on "VOLTS-MA" position. Connect jumper between ground on the socket selector block and radio compass unit ground binding post. Ground tube shell through lead attached to socket selector block. Connect short jumper cables between analyzer and socket selector block as indicated in the chart on Page 46. Select the proper meter scale and read scale accurately. Make all voltage measurements using outer pin jacks on socket selector block.

Insertion of a cable pin in the inside jack produces an open circuit to provide for current measurements. Resistance measurements are made from the proper terminal on the socket selector block through the meter to ground. Resistance measurements are always made with power disconnected and the "VOLTS-MA-OHMS" toggle switch in the "OHMS" position.

Set up the radio compass without the vertical or loop antennas connected.

Warm up for ten minutes.

Set "LOOP GAIN" control to maximum clockwise position.

Set "THRESH SENS" control to maximum clockwise position.

Set "AUDIO," "COMPASS," and "LIGHTS" controls to maximum clockwise position.

Set tuning mechanism to low frequency end. Battery—14 volts.

CIRCUIT ANALYSIS USING TEST SET I-56-A

Tube Function	Tube		Plate			Screen			Fil. Volts	Control Grid Ohms	Cathode	
			Volts	Ma	Ohms	Volts	Ma	Ohms			Volts	Ohms
Loop Ampl.	† COMP	VT–86	200	3.0	1775	60	.74	40M	6.6	107M	2.76	635
	ANT		203	3.1	1775	61	.75	40M	6.6	107M	2.8	635
	LOOP		200	3.0	1775	60	.74	40M	6.6	107M	2.76	635
Mod. No.1	COMP	VT–91	88	.23	122M	74	.06	56M	6.65	4700	3.9	4200
	ANT		122	0	122M	81	0	56M	6.65	4700	14.9	22M
	LOOP		50	.92	122M	69	.25	56M	6.65	4700	2.5	1000
Mod. No. 2 Sidewall	COMP	VT–91	88	.22	116M	73	.055	55M	6.8	4750	4.1	4100
	ANT		122	0	116M	82	0	55M	6.8	4750	14.9	22M
	LOOP		50	0	116M	67	0	55M	6.8	4750	5.2	8200
Aud. Osc.	COMP	VT–65	88	6.2	22M	—	—	—	6.9	820	12.8	2050
	ANT		151	2.7	22M	—	—	—	6.9	820	5.2	2050
	LOOP		138	2.6	22M	—	—	—	6.9	820	5.2	2050
R-F Amp.	VT–86		200	4.7	1725	79	1.2	31M	6.6	1 Meg.	2.8	450
First Det.	VT–87		200	.84	1750	72	3.6	21M	6.85	1 Meg.*	2.7	580
R-F Osc.	VT–65		74	5.6	23M	—	—	—	7.0	50M	0	—
First I-F	VT–86		197	4.5	1775	77	1.18	28M	6.75	1 Meg.	2.5	200
Sec. I-F	VT–86		196	2.25	1775	74	.55	28.5M	6.85	62	4.0	1550
Sec. Det.	VT–93		46	1.14	110M	46	.29	100M	6.65	600M	1.8	2000
AVC	VT–93		11.9	1.6	125M	106	3.4	17M	6.75	250.5M	7.7	1100
Comp. Out.	VT–107		144	10.2	6800	167	.75	4650	6.85	600M	—	—
Phone Out.	VT–107		168	14.8	2950	184	1.4	2000	6.75	400M	—	—

* First Det. Inj. Grid Res. 49.5M Ohms.
† Selector Switch Position.

e. Inductance and Transformer Data

Ref. No.	Description	Part of Ref. No.	Winding Term. No.	Ind.	Tol.	"Q"	Mutual Ind.	D.C. Res. Ohms
LP-17-A	Loop	LP-17-A	2 to 4	50 uh	±5%			.165
85	Loop R-F Trans.	100	Prim. 2 to 1	6.5 uh	±5%		75 uh	.265
			Sec. 4 to 3	2.05 mh	±1%	230	85 uh	7.25
86	Mod. Trans.	101	Prim. 3 to 2	6.65 mh	±1%	21†		37.3
		No. 1 Mod. Sec.	Top Grid to 5	.765 mh	±1%	Prim. & Sec.	1.475	24.2
		No. 2 Mod. Sec.	Top Grid to 4	.785 mh	±1%	20†	1.495	25.4
87	A-F Osc. Trans.		Prim. G to T (Tap K)	65. h	±10%			1800
			Sec. 1 to 2	3.85 h	±10%			540
88	Antenna Trans.	102	Prim. 3 to 2	11.3 mh	±5%	200*		106.4
			Sec. 4 to 1	1.945 mh	±1%		35 uh	6.8
89	R-F Plate Trans.	103	Prim. #Red to Blue	2.0 mh	±1%	240*		6.97
			3 to 5	.405 mh				2.0
			6 to 4	4.0 uh	±1%			.381
90	Det. Grid Trans.	104	Sec. 3 to 6	1.9 mh	±1%	240*		6.56
91	R-F Osc. Trans.	105	Sec. 4 to 6	1.125 mh	±1%			6.25
			Prim. #2 to Blue	1.86 uh	±5%			9.25
92–1	1st I-F Trans. Prim.	106	Prim. 6 to 1	6.275 mh	±1%	160kc 57‡	175 uh	55.0
92–2	1st I-F Trans. Sec.	106	Sec. Top Grid to 4	6.3 mh	±1%	57‡		55.0
92–5	3rd I-F Trans. Prim.	108	Prim. 6 to 3	6.15 mh	±1%	57‡	125 uh	55.0
93	3rd I-F Trans. Sec.	108	Sec. 5 to 6 (Cen. Tap to 4)	6.3 mh	±1%	57‡		55.0

e. *Inductance and Transformer Data (continued)*

Ref. No.	Description	Part of Ref. No.	Winding Term. No.	Ind.	Tol.	"Q"	Mutual Ind.	D.C. Res. Ohms
92–3	2nd I-F Trans. Prim.	107	Prim. 6 to 1	6.275 mh	±1%	57‡	175 uh	55.0
92–4	2nd I-F Trans. Sec.	107	Sec. Top Grid to 4	6.275 mh	±1%	57‡		55.0
94	Compass Out. Trans.		Prim. P to B	10. h	±10%			2225
			Sec. G to C	3.55 h	±10%			775
95	Phone Out. Trans.		Prim. P to B	8.3 h	±10%			940
			Sec. F to G	5.65 h	±10%			1100
96–1	+B Filter A-F Circuits		1 to 2	2.85 h	±10%			260
96–2	+B Filter R-F Circuits		1 to 2	2.85 h	±10%			260
97	R-F Choke +A Circuit			65. uh	±5%			.120
I-73-A	Compass Indicator Field		R to U	31. h	±3.5%			2650
	Compass Ind. Moving Coil		S to T	.178 h	±10%			2275
98	I-F Trap Coil		#(Wh. to Blk.)	2.12 mh	±1%	78§		24.5

NOTE —Inductance measured on General Radio 1000 cycle inductance bridge.
* Denotes Q measured on Q-meter (of coil only, removed from the frame assembly) at 200 kc.
‡ Denotes Q measured on Q-meter (of coil only [iron core removed] removed from the frame assembly) at 160 kc.
† Denotes Q measured on Q-meter of coils on bracket (removed from the frame) at 70 kc.
§ Denotes Q measured on Q-meter at 112.5 kc.
# Denotes coil terminal on coil form.

17. CIRCUIT ALIGNMENT PROCEDURE

Radio Compass SCR-246-A has been carefully aligned and adjusted by the manufacturer and thoroughly inspected before shipment. The design of the circuits is such that their alignment should be maintained over a long period of time. Before any adjustments are undertaken it should be ascertained that the difficulty is not caused by normal deteriorating influences, such as worn out vacuum tubes, blown fuses, improper operating voltages, broken cords, etc. Any questionable performance characteristics should be measured in accordance with **Par. 18** before and after adjustment. All alignment adjustments are accessible from the top and top right side of the chassis. See Fig. 30. These adjustments are:

Alignment Frequency	Loop Ref. No.	Antenna Ref. No.	R-F Plate Ref. No.	Detector Grid Ref. No.	R-F Osc. Ref. No.	1st I-F Ref. No.	2nd I-F Ref. No.	3rd I-F Ref. No.
400 kc.					19–1			
200 kc.	19–2	20–2	19–3	20–1	91			
112.5 kc.						Pri. 92–1 Sec. 92–2	Pri. 92–3 Sec. 92–4	Pri. 92–5 Sec. 93

a. Standard Alignment Conditions

(1) Radio control box settings.

(a) Switch to "ANT."

(b) "COMPASS," "AUDIO" and "LIGHTS" controls to maximum clockwise position.

(c) A 4000 ohm output meter plugged into the "TEL" jack (this meter is part of Test Set I-56-A).

(2) Radio compass unit settings.

"THRESH SENS" and "LOOP GAIN" controls set to maximum clockwise position.

(3) Signal generator settings.

All signal generator settings are with 30% modulation at 400 cycles.

(4) Artificial antenna.

The artificial antenna consists of an 18″ length of single conductor, shielded, insulated cable of good electrical characteristics, a 50 mmfd capacitor and a 500,000 ohm resistor. The arrangement is such as to feed the signal along the line through the 50 mmfd capacitor to the top grid of the tube. The 500,000 ohm resistor is placed in series with the lead to the tube grid. The cable shield should be grounded to the signal generator at one end and to the radio compass unit at the other. This may be made up in the form of a cable with suitable grid and shield clips at the free end to facilitate its application to any tube.

b. Average Stage-by-Stage Sensitivity

The following required microvolt input, is for a standard output of 50 milliwatts, 4 to 1 signal to noise ratio (power), using a standard artificial antenna.

Point of Applied Voltage	Microvolts Input	Freq.
Grid, 2nd I-F Amp. Tube VT-86	190,000	112.5 kc.
Grid, 1st I-F Amp. Tube VT-86	4,800	112.5 kc.
Grid, 1st Detector Tube VT-87	300	112.5 kc.
Grid, 1st Detector Tube VT-87	325	400 kc.
Grid, R-F Amp. Tube VT-86	11.0	400 kc.
"ANT" Binding Post	4.0	400 kc.
*Reference Transmission Line	75†	400 kc.

* Selector switch in "LOOP" position. Set up as shown in Fig. 10. Field strength to loop in microvolts per meter, equals the signal generator output to the reference transmission line, divided by the transmission line factor.

† Microvolts per meter.

All measurements made at 400 kilocycles, 30% modulated at 400 cycles. Selector switch on "ANT" position for all conditions except as noted.

Output measured on output meter (part of Test Set I-56-A) in "TEL" jack, Ref. No. 208.

c. Intermediate-Frequency Amplifier Alignment

(1) Third I-F Stage Alignment.

(a) Set frequency dial to 200 kilocycles.

(b) Apply a 112.5 kilocycle signal to the top grid of the 2nd i-f amplifier Tube VT-86, using the standard artificial antenna. The signal generator should be set to deliver approximately 250,000 microvolts output.

(c) Rotate adjusting screws, Ref. Nos. 92-5 and 93, for maximum output, reducing the signal generator output as the adjusting screws are rotated to keep the output at approximately 50 milliwatts. The input to this stage should be approximately 190,000 microvolts for 50 milliwatts output after the adjustment has been made.

(2) Second I-F Stage Alignment.

(a) Maintain all conditions as for 3rd i-f alignment as above in **Par. 17 *c* (1)** *(a)*.

(b) Connect the standard artificial antenna to the top grid of the 1st i-f amplifier Tube VT-86 and deliver a signal of 112.5 kilocycles to this grid. A signal strength of approximately 10,000 microvolts may be required to get appreciable output.

(c) Adjust Ref. Nos. 92-3 and 92-4 for maximum output, reducing the signal generator output as required to keep the audio output at 50 milliwatts. The input to this stage when properly aligned should be approximately 4800 microvolts for 50 milliwatts output.

(3) First I-F Stage Alignment.

(a) Maintain all conditions as for 2nd i-f alignment in **Par. 17 *c* (2)** *(a)* above, shifting the artificial antenna connection to the top grid of the 1st detector Tube VT-87.

(b) The signal generator setting should remain at 112.5 kilocycles with a strength of 500-1000 microvolts as required.

(c) Adjust Ref. Nos. 92-1 and 92-2 for maximum output, reducing the input voltage required to keep the output at approximately 50 milliwatts. When properly aligned, the input required for 50 milliwatts output should be approximately 300 microvolts.

NOTE: The sensitivity as given in **Par. 17 *c* (3)** *(c)* above is measured with the r-f oscillator functioning as this is quite necessary for accurate measurement.

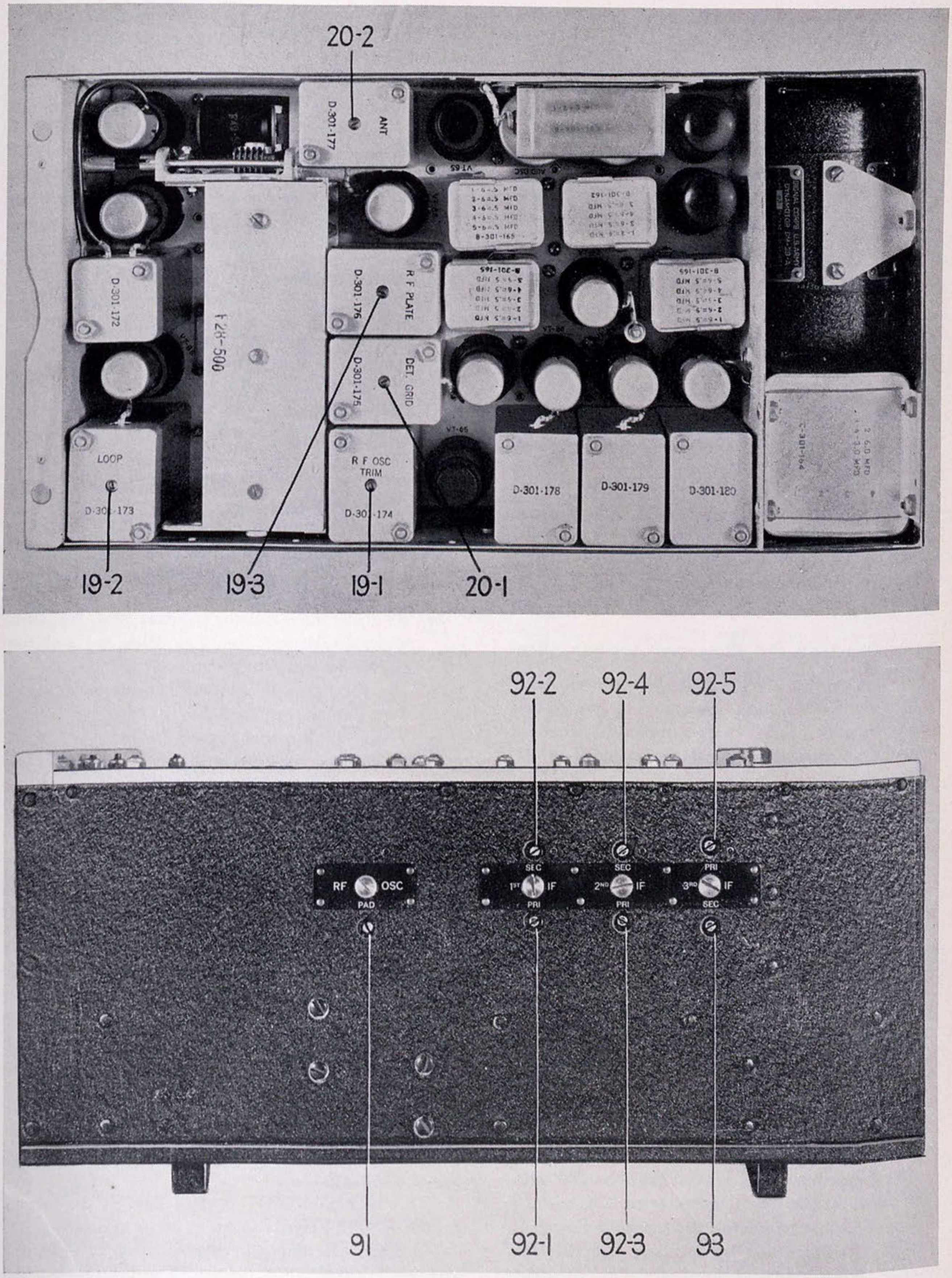


FIG. 30—CIRCUIT ALIGNMENT ADJUSTMENTS

d. R-F Oscillator Alignment

(1) Tune radio compass unit to 400 kilocycles after checking the align point on the radio control box frequency dial.

(2) Connect the artificial antenna to the top grid of the 1st detector Tube VT-87, and apply a 400 kilocycle signal of approximately 1000 microvolts.

(3) Adjust trimmer, Ref. No. 19-1, for maximum output, reducing the signal generator output as necessary to maintain approximately 50 milliwatts output. The signal strength required for this stage should be approximately 325 microvolts for 50 milliwatts output.

(4) Tune the radio compass unit to 200 kilocycles and apply a 200 kilocycle signal. The sensitivity for 50 milliwatts output at this frequency should be approximately the same as in **Par. 17 *b* (3)** above. The frequency dial calibration at this point should be within ± 3 kilocycles. Should the calibration be off at this point it may be brought within the limits by rotating the oscillator padding screw, Ref. No. 91, until the required result is obtained.

(5) Recheck the 400 kilocycle alignment point as in **Par. 17 *b* (3)** above after making this initial frequency dial adjustment.

e. Detector Grid, R-F Plate, and Antenna Alignment

(1) Connect the signal generator to the grid of the r-f amplifier Tube VT-86 through the standard artificial antenna. Tune the radio compass to 400 kilocycles and apply a 400 kilocycle signal at a level of 50 microvolts. This signal strength may be necessary to get an appreciable signal through the amplifiers.

(2) Adjust trimmer, Ref. No. 20-1, for maximum output reducing the input as required to maintain the output at approximately 50 milliwatts.

(3) Adjust trimmer, Ref. No. 19-3, for maximum output reducing the input voltage as necessary to keep approximately 50 milliwatts output. The input required to secure this output should be approximately 11 microvolts.

(4) Connect the artificial antenna to the "ANT" post using only the 50 mmfd capacitor. Apply a signal of 5 microvolts and adjust trimmer, Ref. No. 20-2, to maximum output, reducing the "AUDIO" control so as not to exceed 50 milliwatt output.

(5) Tune the radio compass unit to 200 kilocycles and set the signal generator to deliver a 200 kilocycle signal at 5 microvolts. A required input in excess of 5 microvolts for standard 50 milliwatts output indicates misalignment of the r-f oscillator circuit with respect to the previously adjusted r-f circuits. This condition may be improved as follows:

(a) Maintain conditions in **Par. 17 *d* (5)** above but increase input to approximately 10 microvolts.

(b) Reduce the "AUDIO" control so that the output is not more than 50 milliwatts. Note exact output.

(c) Rotate adjusting screw, Ref. No. 91, about one-eighth turn clockwise and at the same time retune the signal generator slightly for maximum output. Note if there is an increase or decrease in output meter reading. If an increase is noted continue turning the adjustment screw in the same direction while retuning the signal generator for maximum output. If a decrease is noted the direction of rotation should be reversed. The correct position of the iron adjustment slug, so that the r-f oscillator has the proper relation to the other r-f circuits, will be at a point where further rotation in either direction of the adjustment screw no longer results in an increase in output.

(d) Retune the radio compass unit to 400 kilocycles and retune the signal generator to deliver a 400 kilocycle signal, at a signal strength of 5 microvolts.

(e) Readjust the oscillator trimmer, Ref. No. 19-1, and readjust Ref. Nos. 20-1, 19-3, and 20-2 for maximum output.

(f) Repeat the 200 kilocycle adjustment as in **Par.** *(c)* above.

(g) These adjustments should be repeated until no further improvement can be gained. This repetition of adjustments is necessitated by the inherent characteristics of the r-f oscillator and should be carefully followed to insure best alignment over the entire band.

f. Loop Alignment

Set up the equipment as illustrated in Fig. 10. Turn the loop parallel to the transmission line and set the selector switch to the "LOOP" position.

(1) Tune the radio compass unit to 400 kilocycles and adjust the signal generator to the same frequency and for an input of approximately 100 microvolts per meter at the loop.

(2) Adjust trimmer capacitor, Ref. No. 19-2, for maximum output on the output meter in "TEL" jack, Ref. No. 208, or for maximum swing of the Tuning Meter I-73-A.

(3) Adjust "AUDIO" control for 50 milliwatts output with 4:1 signal to noise ratio (power).

(4) Reduce signal generator output as required after setting "AUDIO" control. The input required for standard output should be approximately 75 microvolts per meter at the center of the loop.

18. OVERALL PERFORMANCE TESTS

a. General

If at any time the operation of the equipment is questionable, its performance should be measured in accordance with this paragraph. After making any major repairs or adjustments, the performance should be measured to insure that they have been properly made.

b. Standard Test Conditions

For these tests the following conditions should be maintained unless otherwise stated:

(1) Signal to noise ratio—4 to 1 in power, or 2 to 1 in voltage. The noise output is 12.5 milliwatts when standard output is 50 milliwatts or 7 volts where standard output is 14.1 volts.

(2) Standard output—50 milliwatts or 14.1 volts (signal and noise). This output is measured at the "TEL" jack, Ref. No. 208, in the radio control box using output meter, part of Test Set I-56-A. When operating with the selector switch in the "ANT" position adjust the "AUDIO" control for standard signal-to-noise ratio. When operating in the "COMP" position, adjust "AUDIO" control for maximum output.

(3) Artificial antenna.

For "ANT" operation: 50 mmfd and 500,000 ohm resistor. See **Par. 17 *a* (4)**.

For "COMP" operation: 50 mmfd and 1/4 meter effective height.

(4) Standard modulation—30% at 400 cycles.

(5) Warm-up period—10 minutes.

(6) Low voltage supply—14 volts.

c. Sensitivity—"ANT" Operation

Set "THRESH SENS" control at maximum. Apply a 400 kilocycle standard modulated signal to the "ANT" post. Set input at approximately 5 microvolts. Tune the radio compass unit carefully to resonance. Cut off modulation, leaving carrier on. Set "AUDIO" control to obtain 12.5 milliwatts average noise output. Restore modulation and reset microvolt input for 50 milliwatt output. Repeat until 50 milliwatts output is obtained with the modulation on and 12.5 milliwatts noise with the modulation off. Repeat the above procedure with the equipment tuned to 300 kilocycles and 200 kilocycles. Record results on a form similar to that shown in **Par. 18 *l*.**

d. Noise Level

Operate the equipment in the "ANT" position with the "AUDIO" control on maximum and with the "THRESH SENS" control fully clockwise. Connect the "ANT" binding post to ground through the artificial antenna. Care should be taken to shield the radio compass unit and the artificial antenna against pickup. Tune the equipment throughout the frequency range. Record the maximum noise at the various frequencies as shown in **Par. 18 *l*.** Minimum noise level can be measured by operating on "ANT" and adjusting the "AUDIO" control to minimum. Levels greater than .05 milliwatts indicate probable trouble in either the dynamotor filtering or in the second detector and audio amplifier circuits.

e. Intermediate Frequency Rejection Ratio

Operate the radio compass unit with the selector switch in the "ANT" position and measure the sensitivity to the "ANT" binding post at the desired test frequency. Set the signal generator to deliver 112.5 kilocycles (or nearest point for maximum output) and increase attenuator output until 50 milliwatts "AUDIO" output is obtained. The ratio of the attenuator setting at 112.5 kilocycles, to that at the desired test frequency is the intermediate-frequency rejection ratio. Record results on a form similar to that contained in **Par. 18 *l*.**

NOTE: Harmonics of the signal will appear in the frequency range of the equipment at 225 and 337.5 kilocycles. To avoid spurious responses select frequencies in the vicinity of 200, 300, and 400 kilocycles.

f. Image Rejection Ratio

Measure the sensitivity at the "ANT" post with the equipment functioning in the "ANT" position at the desired test frequency, and again with the signal generator tuned to 225 kilocycles above the test frequency, increasing the attenuator setting to give 50 milliwatts output. Do not disturb the tuning of the equipment or the setting of any controls. Vary the signal generator setting to give maximum response and readjust the attenuator setting for 50 milliwatts output. The ratio of the attenuator setting at 225 kilocycles above the test frequency to that at the desired test frequency is the image rejection ratio. Record results on a form similar to that contained in **Par. 18 *l*.**

g. A V C Action

Operate the equipment with the selector switch in the "ANT" position and with the "AUDIO" control maximum clockwise. Apply signals at test frequencies 30% modulated at 400 cycles according to **Par. 18 *l*** through the 50 mmfd artificial antenna to "ANT" binding post and record milliwatts output against microvolts input.

h. Selectivity—"ANT"

Measure the sensitivity of the equipment with the selector switch in the "ANT" position at test frequencies shown on chart **Par. 18 *l*.** Increase the signal generator attenuator so that output is 10, 100, 1,000, and 10,000 times the resonant frequency sensitivity measured. For each increase in input, vary the signal generator frequency above and below the resonant point and record results on a form similar to **Par. 18 *l*.** The selectivity or band width of this equipment is practically the same at 400, 300, and 200 kilocycles.

i. Sensitivity—"LOOP"

Mount loop beneath reference transmission line as in Fig. 10 and operate the radio compass unit with the selector switch in the "LOOP" position. Tune in signals at frequencies specified in **Par. 18 *l*** and rotate loop for maximum pickup. Adjust the "AUDIO" control for signal to noise ratio of 4 to 1 (power) as in "ANT" sensitivity measurement **Par. 17 *c*.** Record microvolts per meter field strength at the center of loop for standard output on a form similar to that shown in **Par. 18 *l*.**

j. "COMPASS" Sensitivity, Uniformity, and Accuracy

Mount loop beneath the reference transmission line as in Fig. 10. Operate on "COMP" using the 50 mmfd 1/4 meter artificial antenna connected to "ANT" binding post. Adjust the "COMPASS" control until 15° loop rotation produces full scale indicator deflection with an input of 1000 microvolts per meter at 300 kilocycles to the center of the loop. Without changing the position of the "COMPASS" control, record the degrees loop rotation necessary to produce zero and full scale left and right indicator needle deflections for 50, 100, 1000, and 10,000 microvolts per meter input at test frequencies according to **Par. 18 *l*.**

k. Input for Full Scale Indicator Deflection

This test requires a well shielded test room. Set up the radio compass according to Fig. 10 and rotate the loop to 90° with the "COMPASS" control set to maximum clockwise position. Record the signal strength (microvolts per meter) at the center of the loop required for full scale indicator deflection on a chart similar to **Par. 18 *l*.**

l. Normal Performance Characteristics, Radio Compass SCR-246-A

Test Point			L		LM		M		MH		H	
Test Freq.	Kc		200		250		300		350		400	
"ANT" Sens.	uv		3.9		3.7		3.3		3.2		3.0	
Noise Level	mw		12.2		25.0		18.0		7.5		13.0	
I-F Rej. Ratio			200M		250M		325M		375M		565M	
Image Rej. Ratio			Greater than 500M						325M		215M	
"LOOP" Sens.	uv/m		76		83		77		77		77	
Compass Sensitivity Uniformity Accuracy	100 uv/m	O	0		0		0		0		0	
		R L	12.0 14.0		15.5 13.0		16.0 16.0		21.0 21.0		22.5 20.0	
	1000 uv/m	O	0		0		0		0		0	
		R L	12.0 12.0		15.0 13.5		16.0 15.0		20.0 17.5		22.5 20.0	
	100M uv/m	O	0		0		0		0		0	
		R L	12.5 10.5		15.0 12.5		15.0 12.5		18.0 15.5		20.0 17.5	
AVC Action Test Freq. 400 Kc Mod. 30%	uv		2.5	5.0	10	100	1000	10M	100M	500M	1 Volt	2 Volts
	mw		41	86	95	116	138	169	233	371	576	841
"ANT" Selectivity			10 X HI	10 X LO	100 X HI	100 X LO	1000 X HI	1000 X LO	10000 X HI	10000 X LO		
Test Freq. 400 Kc Mod. 30%	Kc		2.1	3.1	2.9	3.4	3.3	3.7	3.6	4.0		

m. Minimum Performance Characteristics, Radio Compass SCR-246-A

Test Point			L		LM		M		MH		H	
Test Freq.	Kc		200		250		300		350		400	
"ANT" Sens.	uv		Not Worse Than 10 uv									
Noise Level	mw		Not Worse Than 50 mw									
I-F Rej. Ratio			Not Less Than 100,000 to 1									
Image Rej. Ratio			Not Less Than 100,000 to 1									
"LOOP" Sens.	uv/m		Not Worse Than 100 uv/m									
Compass Sensitivity Uniformity Accuracy	100 uv/m	O	Not More Than ± 1 Degree									
		R L	Not More Than 30 Degrees Loop Rotation									
	1000 uv/m	O	Not More Than ± 1 Degree									
		R L	Not More Than 30 Degrees Loop Rotation									
	100M uv/m	O	Not More Than ± 1 Degree									
		R L	Not More Than 30 Degrees Loop Rotation									
AVC Action Test Freq. 400 Kc Mod. 30%	uv		2.5	5.0	10	100	1000	10M	100M	500M	1 Volt	2 Volt
	mw		#	50 ±10	95 ±45	116 ±50	138 ± 50	169 ± 50	233 ± 50	371 ± 75	576 ±100	841 ±150
"ANT" Selectivity			10 X HI	10 X LO	100 X HI	100 X LO	1000 X HI	1000 X LO	10000 X HI	10000 X LO		
Test Freq. 400 Kc Mod. 30%	Kc		4.5	4.5	4.7	4.8	6.5	6.5	8.5	8.5		

Due to the great effect of small variations in sensitivity, AVC limits are not properly applicable in this range of input signal strength.

V—SUPPLEMENTARY DATA AND LIST OF REPLACEABLE PARTS

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
			RADIO COMPASS UNIT BC-373-A (Assembly Drawing No. E301-1)		
1		Capacitor	Cornell Dubilier Type 1WS .001 mfd. mica	I-F Trap resonator	F26-501-1
2		Capacitor	Cornell Dubilier Type 5 WS 75 mmfd. mica	Antenna compensating	F26-500-6
3		Capacitor	Cornell Dubilier Type 5 WS 50 mmfd. mica	Modulator coupling	F26-500-5
4		Capacitor	Cornell Dubilier Type 3 WS .01 mfd. mica		F26-502-1
			Ref. No. 4-1	R-F bypass—Mod. Sec.	
			Ref. No. 4-2	R-F bypass—Mod. Sec.	
			Ref. No. 4-3	AVC filter—1st I-F	
			Ref. No. 4-4	Plate coupling—2nd Det.	
5		Capacitor	Cornell Dubilier Type 1 WS .0065 mfd. mica	AVC filter—Antenna Sec.	F26-501-10
6		Capacitor	Cornell Dubilier Type 1 WS .01 mfd. mica		F26-501-8
			Ref. No. 6-1	AVC filter—Antenna Sec.	
			Ref. No. 6-2	AVC filter—Detector Grid	
			Ref. No. 6-3	Plate bypass—R-F Oscillator	
			Ref. No. 6-4	AVC input filter bypass	
			Ref. No. 6-5	AVC line center bypass	
			Ref. No. 6-6	AVC line bypass	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
6 (cont'd)		Capacitor	Ref. No. 6-7	Series padder—Loop Sec.	
			Ref. No. 6-8	R-F Plate pad and blocking	
			Ref. No. 6-9	Antenna blocking	
			Ref. No. 6-10	AVC line bypass	
			Ref. No. 6-11	L-V Dynamotor R-F filter	
7		Capacitor	Cornell Dubilier Type 1 WS .002 mfd. mica		F26-501-5
			Ref. No. 7-1	R-F bypass—Phone Output Transf. Primary	
			Ref. No. 7-2	Grid coupling—Phone Output	
8		Capacitor	Micamold Type 345 .14 mfd.		F26-503-2
			Ref. No. 8-1	Resonator—Audio Osc. Transf. Pri.	
			Ref. No. 8-2	Cathode bypass—1st Det.	
			Ref. No. 8-3	Resonator—Audio Osc. Transf. Pri.	
9		Capacitor	Cornell Dubilier Type 5 WS 100 mmfd. mica	AVC Diode coupling	F26-500-7
10		Capacitor	Cornell Dubilier Type 5 WS 250 mmfd. mica		F26-500-10
			Ref. No. 10-1	R-F bypass—3rd I-F Sec.	
			Ref. No. 10-2	I-F filter bypass	
11		Capacitor	Micamold Type 345 .1 mfd.		F26-503-1
			Ref. No. 11-1	AVC bypass—1st Audio Grid	
			Ref. No. 11-2	Coupling-1st Audio Grid	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
12		Capacitor	Cornell Dubilier Type 5 WS 500 mmfd. mica		F26-500-14
			Ref. No. 12-1	Resonator—Modulator Pri.	
			Ref. No. 12-2	R-F bypass—1st Audio Plate	
13		Capacitor	Cornell Dubilier Type 5 RS 250 mmfd. mica		F26-504-10
			Ref. No. 13-1	Resonator—3rd I-F Pri.	
			Ref. No. 13-2	Resonator—3rd I-F Sec.	
			Ref. No. 13-3	Resonator—2nd I-F Sec.	
			Ref. No. 13-4	Resonator—2nd I-F Pri.	
			Ref. No. 13-5	Resonator—1st I-F Sec.	
			Ref. No. 13-6	Resonator—1st I-F Pri.	
			Ref. No. 13-7	Grid coupling—R-F Osc.	
14		Capacitor	50 mmfd. Erie Ceramicon		F29-1-4
			Ref. No. 14-1	Temp. comp.—3rd I-F Pri.	
			Ref. No. 14-2	Temp. comp.—3rd I-F Sec.	
			Ref. No. 14-3	Temp. comp.—2nd I-F Sec.	
			Ref. No. 14-4	Temp. comp.—2nd I-F Pri.	
			Ref. No. 14-5	Temp. comp.—1st I-F Sec.	
			Ref. No. 14-6	Temp. comp.—1st I-F Pri.	
15		Capacitor	25 mmfd. Erie Ceramicon		F29-1-3
			Ref. No. 15-1	Temp. comp.—R-F Osc. Sec.	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
15 (cont'd.)		Capacitor	Ref. No. 15-2	Temp. comp.—Detector Grid	
			Ref. No. 15-3	Temp. comp.—R-F Plate	
			Ref. No. 15-4	Temp. comp.—Loop Sec.	
			Ref. No. 15-5	Temp. comp.—Ant. Sec.	
			Ref. No. 15-6	Resonator—Ant. Pri.	
16		Capacitor	10 mmfd. Erie Ceramicon		F29-1-2
			Ref. No. 16-1	Coupling—Ant. Pri. and Sec.	
			Ref. No. 16-2	I-F coup.—AVC Grid	
17		Capacitor	15 mmfd. Erie Ceramicon	I-F coup.—AVC Grid	F29-1-5
18		Capacitor	Cornell Dubilier Type 1 RS 700 mmfd. mica	Series padder—R-F Osc. Sec.	F26-505-9
19		Capacitor	Trimmer 25 mmfd.		F28-501-2
			Ref. No. 19-1	Trimmer—R-F Osc.	
			Ref. No. 19-2	Trimmer—Loop	
			Ref. No. 19-3	Trimmer—R-F Plate	
20		Capacitor	Trimmer 25 mmfd.		F28-501-1
			Ref. No. 20-1	Trimmer—Det. Grid	
			Ref. No. 20-2	Trimmer—Antenna	
21		Capacitor	Variable Capacitor		F28-500
			Ref. No. 21A 321 mmfd. section	Antenna tuning	
			Ref. No. 21B 321 mmfd. section	R-F Plate tuning	
			Ref. No. 21C 321 mmfd. section	Detector Grid tuning	
			Ref. No. 21D 321 mmfd. section	R-F Osc. tuning	
			Ref. No. 21E 321 mmfd. section	Loop tuning	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
22		Capacitor	Four Section Paper		B301-166
			Ref. No. 22A 1 mfd. section	H-V filter	
			Ref. No. 22B .5 mfd. section	Bias filter—Audio and Comp. Output Grids	
			Ref. No. 22C .5 mfd. section	L-V filter	
			Ref. No. 22D .5 mfd. section	Audio filter—Phone Output Trans. Pri.	
23-1		Capacitor	Five Section Paper		B301-165
			Ref. No. 23-1A .5 mfd. section	R-F Screen bypass	
			Ref. No. 23-1B .5 mfd. section	R-F Cathode bypass	
			Ref. No. 23-1C .5 mfd. section	H-V filter—Audio Osc.	
			Ref. No. 23-1D .5 mfd. section	H-V filter—Audio Osc.	
			Ref. No. 23-1E .5 mfd. section	Cathode bypass—1st I-F	
23-2		Capacitor	Five Section Paper		B301-165
			Ref. No. 23-2A .5 mfd. section	Screen bypass—1st and 2nd I-F	
			Ref. No. 23-2B .5 mfd. section	Plate bypass—1st and 2nd I-F	
			Ref. No. 23-2C .5 mfd section	Plate bypass—1st Det.	
			Ref. No. 23-2D .5 mfd. section	Screen bypass—1st Det.	
			Ref. No. 23-2E .5 mfd. section	R-F Plate bypass	
23-3		Capacitor	Five Section Paper		B301-165
			Ref. No. 23-3A .5 mfd. section	Bias filter—Comp. and Phone Output Grids	
			Ref. No. 23-3B .5 mfd. section	Plate filter—1st Audio	
			Ref. No. 23-3C .5 mfd. section	Cathode bypass—1st Audio	
			Ref. No. 23-3D .5 mfd. section	Cathode bypass—2nd I-F	
			Ref. No. 23-3E .5 mfd. section	Cathode bypass—AVC	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No
24		Capacitor	Four Section Paper		B301-162
			Ref. No. 24A .4 mfd. section	Resonator—Comp. Output Transf. Pri.	
			Ref. No. 24B .5 mfd. section	Screen bypass— AVC	
			Ref. No. 24C .5 mfd. section	Plate filter— AVC	
			Ref. No. 24D .5 mfd. section	H-V filter— R-F stages	
25		Capacitor	Two Section Paper		C301-164
			Ref. No. 25A 3 mfd. section	Plate bypass— Comp. Output	
			Ref. No. 25B 6 mfd. section	H-V filter— Audio Stages	
26-1		Capacitor	Two Section Paper		B301-163
			Ref. No. 26-1A .45 mfd. section	Screen bypass— Loop Amplifier	
			Ref. No. 26-1B .45 mfd. section	Cathode bypass— Loop Amplifier	
26-2		Capacitor	Two Section Paper		B301-163
			Ref. No. 26-2A .45 mfd. section	Plate bypass— Loop Amplifier	
			Ref. No. 26-2B .45 mfd. section	Screen bypass— Modulators	
26-3		Capacitor	Two Section Paper		B301-163
			Ref. No. 26-3A .45 mfd. section	Plate bypass— Modulators	
			Ref. No. 26-3B .45 mfd. section	Cathode decoupling— R-F Amp. and 1st Det.	
26-4		Capacitor	Two Section Paper		B301-163
			Ref. No. 26-4A .45 mfd. section	Cathode bypass— Modulators	
			Ref. No. 26-4B .45 mfd. section	Cathode bypass— Modulators	
27		Capacitor	3 mfd. Paper	Audio Oscillator feedback	B301-189
28		Capacitor	Cornell Dubilier Type 1 WS .005 mfd.	Grid coup.— Comp. Output	F26-501-7
40		Resistor	Stack. ½ watt 20,000 ohms insulated ±5%		F62B-203-5

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
40 (cont'd.)		Resistor	Ref. No. 40-1	Shunt resistor—"LOOP GAIN" control	
			Ref. No. 40-2	Voltage divider—Audio Osc. Transf. Sec.	
			Ref. No. 40-3	Plate filter—AVC	
			Ref. No. 40-4	Screen bleeder—AVC	
			Ref. No. 40-5	Plate filter—R-F Osc.	
			Ref. No. 40-6	Voltage divider—Audio Osc. Transf. Sec.	
41		Resistor	Stack. ½ watt 4000 ohms insulated ±5%		F62B-402-5
			Ref. No. 41-1	Cathode bias—Modulator	
			Ref. No. 41-2	Cathode bias—Modulator	
42		Resistor	Stack. ½ watt 500,000 ohms insulated ±5%		F62B-504-5
			Ref. No. 42-1	Static leak—Antenna	
			Ref. No. 42-2	Compensating—Det. Grid	
			Ref. No. 42-3	Grid Resistor—Comp. Output	
43		Resistor	Stack. ½ watt 75,000 ohms insulated ±5%		F62B-753-5
			Ref. No. 43-1	Screen voltage divider—Loop Amp.	
			Ref. No. 43-2	Screen voltage divider—Loop Amp.	
			Ref. No. 43-3	Screen voltage divider—1st Det.	
			Ref. No. 43-4	Screen voltage divider—1st I-F	
			Ref. No. 43-5	Screen voltage divider—AVC	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
43 (cont'd.)		Resistor	Ref. No. 43-6	Screen voltage divider—R-F Amplifier	
			Ref. No. 43-7	Plate load—1st Audio	
44		Resistor	Stack. ½ watt 100,000 ohms insulated ±5%		F62B-104-5
			Ref. No. 44-1	AVC filter—1st Det.	
			Ref. No. 44-2	Plate load—Modulator	
			Ref. No. 44-3	Screen bleeder—Modulator	
			Ref. No. 44-4	Plate load—AVC	
			Ref. No. 44-5	AVC filter—R-F Amp. Grid	
			Ref. No. 44-6	Bias filter—Comp. and Phone Output Grids	
			Ref. No. 44-7	AVC filter—1st I-F	
			Ref. No. 44-8	Diode load—AVC	
			Ref. No. 44-9	Screen voltage divider—Modulators	
			Ref. No. 44-10	Compensating—2nd I-F Sec.	
			Ref. No. 44-11	Grid Leak—Loop	
45		Resistor	Stack. ½ watt 250,000 ohms insulated ±5%		F62B-254-5
			Ref. No. 45-1	Cathode bleeder—No. 1 Modulator	
			Ref. No. 45-2	Cathode bleeder—No. 2 Modulator	
			Ref. No. 45-3	Grid leak—AVC	
			Ref. No. 45-4	Grid leak—Phone Output	
			Ref. No. 45-5	Grid leak—1st Audio	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
45 (cont'd.)		Resistor	Ref. No. 45-6	Compensating—2nd I-F Primary	
			Ref. No. 45-7	Compensating—1st I-F Secondary	
			Ref. No. 45-8	Compensating—1st I-F Primary	
46		Res'stor	Stack. ½ watt 1000 ohms insulated ±5%		F62B-102-5
			Ref. No. 46-1	Plate filter—Loop Amp.	
			Ref. No. 46-2	Cathode shunt—No. 1 Modulator	
			Ref. No. 46-3	Plate filter—1st Det.	
			Ref. No. 46-4	Plate filter—1st and 2nd I-F	
			Ref. No. 46-5	Plate filter—R-F Amp.	
			Ref. No. 46-6	Plate compensator—R-F Osc.	
47		Resistor	Stack. ½ watt 5000 ohms insulated ±5%		F62B-502-5
			Ref. No. 47-1	Voltage divider—Audio Osc. Transf. Sec.	
			Ref. No. 47-2	Voltage divider—Audio Osc. Transf. Sec.	
48		Resistor	Stack. ½ watt 1500 ohms insulated ±5%	Cathode bias—2nd I-F Amp.	F62B-152-5
49		Resistor	Stack. ½ watt 50,000 ohms insulated ±5%		F62B-503-5
			Ref. No. 49-1	Decoupling—1st Audio Grid	
			Ref. No. 49-2	Voltage divider—R-F Screen	
			Ref. No. 49-3	Grid leak—R-F Osc.	
			Ref. No. 49-4	Audio Diode load	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
50		Resistor	Stack. ½ watt 400 ohms insulated ±5%	Cathode bias—R-F Amp.	F62B-401-5
51		Resistor	Stack. ½ watt 10,000 ohms insulated ±5%		F62B-103-5
			Ref. No. 51-1	Plate filter—Modulator	
			Ref. No. 51-2	Plate filter—Audio Osc.	
			Ref. No. 51-3	Plate filter—Audio Osc.	
			Ref. No. 51-4	Audio Diode load	
52		Resistor	Stack. ½ watt 600 ohms insulated ±5%		F62B-601-5
			Ref. No. 52-1	Cathode bias—Loop Amp.	
			Ref. No. 52-2	Cathode bias divider—AVC	
53		Resistor	Stack. ½ watt 25,000 ohms insulated ±5%		F62B-253-5
			Ref. No. 53-1	Screen voltage divider—1st Det.	
			Ref. No. 53-2	H-V filter—1st Audio Plate	
54		Resistor	Stack. ½ watt 200 ohms insulated ±5%	Cathode bias—1st I-F	F62B-201-5
55		Resistor	Stack. ½ watt 500 ohms insulated ±5%	Cathode bias—1st Det.	F62B-501-5
56		Resistor	Stack. ½ watt 300 ohms insulated ±5%	Voltage divider—AVC cathode	F62B-301-5
57		Resistor	Stack. ½ watt 2000 ohms insulated ±5%		F62B-202-5
			Ref. No. 57-1	Cathode bias—1st Audio	
			Ref. No. 57-2	Cathode bias—Audio Osc.	

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
58		Resistor	Stack. ½ watt 300,000 ohms insulated ±5%	Voltage divider—AVC Diode load	F62B-304-5
59		Resistor	Stack. ½ watt 200,000 ohms insulated ±5%	Compensator—3rd I-F Primary	F62B-204-5
60		Resistor	Stack. ½ watt 40,000 ohms insulated ±5%	Screen voltage divider—1st I-F	F62B-403-5
61		Resistor	Stack. ½ watt 1,000,000 ohms insulated ±5%	Filter—AVC line	F62B-105-5
62		Resistor	Stack. ½ watt 700,000 ohms insulated ±5%	Voltage divider—AVC Diode load	F62B-704-5
63		Resistor	Stack. ½ watt 350,000 ohms insulated ±5%	Compensator—R-F Amp. Plate	F62B-354-5
69		Resistor	Stack. 1 watt 2,000,000 ohms insulated ±5%	Filter—AVC line	F62C-205-5
70		Resistor	Stack. 1 watt 4000 ohms insulated ±5%	Plate filter—Compass Output	F62C-402-5
71		Resistor	Stack. 1 watt 3000 ohms insulated ±5%		F62C-302-5
			Ref. No. 71-1	Plate filter—Phone Output	
			Ref. No. 71-2	Plate filter—Phone Output	
72		Resistor	Stack. 1 watt 200 ohms insulated ±5%	Bias resistor—Phone and Compass Output	F62C-201-5
73		Resistor	Clar. 3 watts 21 ohms Flex. ±5%	Heater dropping—AVC	B301-218
80		Variable Resistor	2500 ohms Threshold Control	"THRESH SENS" Control	F36-504
81		Variable Resistor	6000 ohms—Loop Gain Control	"LOOP GAIN" Control	F36-503
85		Loop Transf.	Part of Ref. No. 100		B301-58

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
86		Mod. Transf.	Part of Ref. No. 101		B301-74
87		A-F Osc.	Special		F43-500
88		Ant. Transf. Coils	Part of Ref. No. 102		B301-66
89		R-F Plate Transf.	Part of Ref. No. 103		B301-70
90		Det. Grid Coil	Part of Ref. No. 104		B301-73
91		R-F Osc. Transf.	Part of Ref. No. 105		B301-68
92		I-F Coils	(Ref. No. 92-1 Primary) (Ref. No. 92-2 Secondary) Both part of Ref. No.106 (Ref. No. 92-3 Primary) (Ref. No. 92-4 Secondary) Both part of Ref. No. 107 (Ref. No. 92-5 Primary) Part of Ref. No. 108		B301-75
93		3rd I-F Sec. Coil	Secondary Part of Ref. No. 108		B301-76
94		Comp. Output Transf.	Special		F43-501
95		Phone Output Transf.	Special		F43-502
96		A-F Choke	Special Ref. No. 96-1 Ref. No. 96-2		F43-503
97		R-F Choke	Special		F54-511
98		I-F Rej. Coil Assy.	I-F Trap		B301-245
100		Loop Transf. Assembly	Includes 85, 19-2, 15-4, 44-11, 161, 162-1, 165, 119, 120		D301-173
101		Mod. Transf. Assembly	Includes 86, 12-1, 160, 163, 166, 119, 179		D301-172
102		Ant. Transf. Assembly	Includes 88, 20-2, 15-5, 15-6, 16-1, 44-12, 157-1, 164, 167, 119, 120		D301-177
103		R-F Plate Transf.	Includes 89, 19-3, 15-3, 6-8, 63, 157-5, 168, 119, 120		D301-176

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
104		Det. Grid Transf. Assembly	Includes 90, 20-1, 15-2, 42-2, 157-2, 162-2, 169, 119, 120		D301-175
105		R-F Osc. Transf. Assembly	Includes 91, 19-1, 15-1, 18, 13-7, 40-5, 157-3, 170, 119, 120		D301-174
106		1st I-F Transf. Assembly	Includes 92-1, 92-2, 14-6, 14-5, 13-5, 13-6, 45-7, 45-8, 159, 162-3, 171, 119, 120		D301-178
107		2nd I-F Transf. Assembly	Includes 92-3, 92-4, 14-3, 14-4, 13-3, 13-4, 44-10, 45-6, 158, 162-4, 172, 119, 120		D301-179
108		3rd I-F Transf. Assembly	Includes 92-5, 93, 14-1, 14-2, 13-1, 13-2, 59, 157-4, 173, 119, 120		D301-18
110		Relay	D. P. D. T. Coil 79 ohms D-C Res.	Ant. switching	F49-500
117		Binding Post	Push Type with locating pin	Antenna	B301-183
118		Binding Post	Wing Nut Type	Ground	
119		Coil Frame Stud—Long	Brass—Wh. N. P.	For R-F and I-F Transf. Assems.	B301-6
120		Coil Frame Stud—Short	Brass—Wh. N.P.	For R-F and I-F Transf. Assems.	B301-161
121		Tuning Shaft Adapter Assy.		For attaching Tuning Shaft MC-124	B301-149
122		Adj. Cover	Spring Slug type stamped "PUSH"	For "LOOP GAIN" and "THRESH SENS" controls	B301-124
123		Coup. Shaft Assembly		For Vari. Cap. drive	B301-152
124		Capacitor Stop Mechanism		For Vari. Cap. drive	R.C.C. No. 2-19-10
125		Spacer		For Tube VT-93 Grid stud	B301-112
126		Insulator	Alsimag 196	For Tube VT-93 Grid stud	B301-113
127		Stud	Brass Cad. Plate	For Tube VT-93 Grid	B301-111
128		Strap	Capacitor Mtg.	For 23-1, 23-2, 23-3, 24	B301-100
129		Socket	Amphenol Octal Ceramic	For Vacuum Tubes	F34-602

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
130		Armature Assembly	With bearings	For Dynamotor DM-29-A	B301-230
131		Ball Bearing	Part of Ref. No. 130	For Dynamotor DM-29-A	B301-229
132		Brush Assy.	(Low Voltage) Positive (Low Voltage) Negative	For Dynamotor DM-29-A	B301-227
133		Brush Assy.	(High Voltage) Positive (High Voltage) Negative	For Dynamotor DM-29-A	B301-228
134		Enclosing Cover	Aluminum	For Dynamotor DM-29-A	C.E. No. 19964-1
135		Low Voltage Bearing Bracket	With brush holders	For Dynamotor DM-29-A	C.E.Nos. 26201 23610-1-X
136		High Voltage Bearing Bracket	With brush holders	For Dynamotor DM-29-A	C.E. Nos. 26201 23610-2-X
137		Field Coils		For Dynamotor DM-29-A	C.E. No. 21668-WS7082
138		Cover Plate	For 135, 136	For Dynamotor DM-29-A	C.E. No. 26207
139		Brush Holder Screw Cap	For 132, 133	For Dynamotor DM-29-A	C.E. No. 23607-2
140		Tie Rod	Steel	For Dynamotor DM-29-A	C.E. No. 17042-310
141		Dynamotor Pole Pieces	Steel	For Dynamotor DM-29-A	C.E. No. 21667
142		Dynamotor Brkt. Assy.	Alum. (with insert)		B301-160
143		Grid Lead Assy.		For Tube VT-91	B301-207
144		Grid Lead Assy.		For Tubes VT-91, VT-86, VT-87	B301-206
145		Grid Lead Assy.		For Tube VT-93	B301-220
146		Grid Lead Assy.		For Tube VT-93	B301-205
147		Ant. Term. Board	Bakelite		B301-96

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
148		Loop Term. Board	Under Chassis 25 Lug		B301-101
149		Audio Term. Board	Under Chassis 17 Lug		B301-98
150		Dyn. Filter Board	Under Chassis 16 Lug		B301-102
151		Small Shield	Aluminum		B301-198
152		Large Shield	Aluminum		B301-196
153		Bracket Assy.	Alum. with Eyelets		B301-203
154		Cable Support Assembly	Bakelite		B301-105
155		Terminal	Brass Cad. Pl.	Standoff	F38-506
156		Insulator	Alsimag 196	Standoff	B301-199
157		Coil Bottom Assembly			B301-33-1
			Ref. No. 157-1 Part of Ref. No. 102 Ref. No. 157-2 Part of Ref. No. 104 Ref. No. 157-3 Part of Ref. No. 105 Ref. No. 157-4 Part of Ref. No. 108 Ref. No. 157-5 Part of Ref. No. 103		
158		Coil Bottom Assembly	Part of Ref. No. 107		B301-33-3
159		Coil Bottom Assembly	Part of Ref. No. 106		B301-33-2
160		Coil Bottom Assembly	Part of Ref. No. 101		B301-34
161		Coil Bottom Assembly	Part of Ref. No. 100		B301-33-4
162		Grid Brkt. Assembly			B301-44
			Ref. No. 162-1 Part of Ref. No. 100 Ref. No. 162-2 Part of Ref. No. 104 Ref. No. 162-3 Part of Ref. No. 106 Ref. No. 162-4 Part of Ref. No. 107		

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
163		Top Plate Assembly	Part of Ref. No. 101		B301-46
164		Grid Bracket Assembly	Part of Ref. No. 102		B301-43
165		Can	Part of Ref. No. 100	Loop shield	B301-56-2
166		Can	Part of Ref. No. 101	Mod. shield	B301-16
167		Can	Part of Ref. No. 102	Ant. shield	B301-57
168		Can	Part of Ref. No. 103	R-F Plate shield	B301-54
169		Can	Part of Ref. No. 104	Det. Grid shield	B301-56-1
170		Can	Part of Ref. No. 105	R-F Osc. shield	B301-48
171		Can	Part of Ref. No. 106	1st I-F shield	B301-15-1
172		Can	Part of Ref. No. 107	2nd I-F shield	B301-15-2
173		Can	Part of Ref. No. 108	3rd I-F shield	B301-47
174		Var. Capacitor Mtg. Washer	Steel Cad. Pl.	For Ref. No. 21	F48-81
175		Var. Capacitor Mtg. Grommet	Gum Rubber	For Ref. No. 21	F51-12
176		Gasket	Neoprene	For Dynamotor DM-29-A	F48-501
177		Top Cover Assy.	Alum. with Snapslide Studs		D301-3
178		Bottom Cover Assembly	Aluminum		D301-4
179		Nut—Special	Aluminum	For Ref. No. 101	B301-211
DM-29-A		Dynamotor DM-29-A		H-V Power Supply	D301-2
MC-136		Coupling MC-136	Right Angle Swivel	For Flex. Tuning Shaft	Breeze No. F124-1-10
MC-202		Tube Shield MC-202	For metal tubes	For Tubes VT-86, VT-87, VT-91, VT-93	B301-155
SO-107		Socket SO-107	14 Conductor	For Junction Box Cable	F34-550

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
SO-88		Socket SO-88	4 Conductor	For Cord CD-362	F34-552
VT-65		Tube VT-65	Metal	R-F Osc. Audio Osc.	F61-521
VT-86		Tube VT-86	Metal	Loop R-F Ampl. Ant. R-F Ampl. 1st I-F, 2nd I-F	F61-503
VT-87		Tube VT-87	Metal	1st Det.	F61-504
VT-91		Tube VT-91	Metal	Mod. No. 1, Mod. No. 2	F61-502
VT-93		Tube VT-93	Metal	2nd Det. & 1st Aud., AVC Ampl. & Rect.	F61-501
VT-107		Tube VT-107	Metal	Comp. Output, Phone Output	F61-541
		RADIO CONTROL BOX BC-374-A (Assembly Drawing No. D303-13)			
201		Resistor	Stack. ½ watt 600 ohms ±5%	Voltage divider	F62B-601-5
202		Resistor	Stack. ½ watt 100 ohms ±5%	Voltage divider	F62B-101-5
203		Resistor	25 ohms 10 watts with Term. Bd.	Pilot Light dropping	B303-33
204		Variable Resistor	3 Section "AUDIO" Control	Phone Vol. Control	F36-502
			Ref. No. 204-A 4000 ohm section		
			Ref. No. 204-B 8000 ohm section		
			Ref. No. 204-C 10,000 ohm section		
205		Variable Resistor	2 section "COMPASS" Control	Compass sensitivity Control	F36-501
			Ref. No. 205-A 2000 ohm section		
			Ref. No. 205-B 4000 ohm "L" pad		
206		Variable Resistor	2 watt 50 ohms Wire wound	"LIGHTS" Control	F36-500

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
207		Switch	6 pole 4 position with A-C switch	Selector Switch	F40-500
			Ref. No. 207-A Panel Wafer		
			Ref. No. 207-B Rear Wafer		
			Ref. No. 207-C On-Off Wafer	Power Switch	
208		Phone Jack	Single Spring	For Plug PL-55	F34-600
210		Knob	Marked "AUDIO"	For "AUDIO" Control	F30-500-1
211		Knob	Marked "COMPASS"	For "COMPASS" Control	F30-500
212		Knob	Alum. Die Casting	For Selector Switch	F30-501
213		Knob	Marked "LIGHTS"	For "LIGHTS" Control	F30-502
214		Crank Assy.	With shaft	For tuning mechanism	B303-14
215		Light Reflector	Alum. with insert		B303-31
216		Dial and Gearing Assy.	Worm driven dial scale		B303-5
217		Miter Gear	½ P.D.		F58-504
218		Spacer	Alum. Tubing	To space dial from panel	F36-504
219		Washer	Felt		B303-35
220		Spacers	Alum. Tubing	For Socket SO-107	F56-502
221		Panel Assy.	With dial scale index and pilot lamp socket		C303-12
222		Spare lamp holder	Aluminum	For Lamp LM-32	B303-11
223		Box Assembly	With four snap slides		D303-6
224		Set Screw Wrench	Allen #6	Part of Ref. No. 223	B303-22
225		Screw	Blank Head	For dial gearing	B303-34
I-74		Tuning Meter I-74	Weston Model 606 Modified	To facilitate tuning	F32-500
LM-32		Lamp LM-32	3V Instrument	For meter and scale Illum.	F35-500
SO-107		Socket SO-107	14 Conductor	For Junction Box Cable	F34-550

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
		MOUNTING FT-207-A (Assembly Dwg. No. E302-1)			
250		Mounting Frame	Dural with steel rear points		D302-11
251		Ret. and feet Assembly	Ref. No. 251-1, front Ref. No. 251-2, rear		C302-10
252		Dust Cap	Neoprene		B302-22
253		Dust Cap Spacer	Alum. Tubing		B302-23
254		Release Screw	Steel		B302-20
		CORD CD-362 (Assembly Drawing C312-1)			
300		Flexible Conduit	3/8 I.D. Neoprene coated shielding conduit		B312-2
FT-209		Conduit Elbow FT-209	Alum. with coupling nut		F70-2
PL-108		Plug PL-108	4 Conductor		F34-502
		FLEXIBLE CONDUIT ASSEMBLY INCLUDING JUNCTION BOX (Assembly Drawing No. D313-6)			
350		Junction Box	Alum. casting with latch studs		C313-14
351		Term. Bd. Assembly	Bakelite		C313-2
352		Cover	Alum. with latches		C313-13
353		Radio Compass Unit Cable	3/4 I.D. Neoprene coated shielding conduit		D313-7-3
354		Radio Control Box Cable	3/4 I.D. Neoprene coated shielding conduit		D313-7-4
355		Indicator Cable	1/2 I.D. Neoprene coated shielding conduit		D313-7-1
356		Command Rec. Cable	1/2 I.D. Neoprene coated shielding conduit		D313-7-2
357		Connector	Aluminum	For 3/4 conduit	F18-505
358		Locknut	Aluminum	For 3/4 conduit	F19-505

19. REFERENCE LIST AND TABLE OF REPLACEABLE PARTS (Continued)

Ref. No.	Stock No.	Name of Part	Description	Function	F. A. C. Dwg. No.
359		Connector	Aluminum	For ½ conduit	F18-503
360		Locknut	Aluminum	For ½ conduit	F19-503
361		Connector	Aluminum	For ⅜ conduit	F18-502
362		Locknut	Aluminum	For ⅜ conduit	F19-502
FU-28		Fuse FU-28	Buss. 15 Amp.		F31-500
PL-113		Plug PL-113	4 Conductor		F34-501
PL-127		Plug PL 127	14 Conductor		F34-500
		LOOP LP-17-A (Assembly Drawing No. E305-21)			
400		Housing	Zeppelin Type	To streamline loop	C305-28
401		Neck Casting	Aluminum		E305-12
402		Loop Assy.	Winding and Shields		D305-6
403		Loop Shaft Assembly			B305-14
404		Cover Plug	Aluminum		C305-27
405		Zero Index	Alum. Bronze Casting		B305-19
406		Screw	¼-28 x 1″ Hex. Hd. Steel		F52-503
407		Gasket	Neoprene	For Ref. No. 404	F45-500
408		Gasket	Neoprene	For Socket SO-88	F45-501
SO-88		Socket SO-88	4 Conductor	For Cord CD-362	F34-552
		COMPASS INDICATOR I-73-A (Assembly Drawing No. F32-501)			
LM-32		Lamp LM-32	3V Instrument	For meter illumination	F35-500
SO-93		Socket SO-93	4 Conductor	For Junction Box Cable	F34-551

20. NOTES TO TABLE OF REPLACEABLE PARTS

In order to readily identify electrical and mechanical parts making up the Radio Compass SCR-246-A, a system of reference numbers, to be used for items not assigned Signal Corps type numbers, has been devised. These reference numbers have been assigned to all normally replaceable parts. Parts are normally replaceable if they are not permanently assembled by riveting, cementing, etc., and can be disassembled without the use of special tools. This system of reference numbers definitely associates the various replaceable parts with respect to their function and location in the units as well as on the diagrams and photographs. The reference numbers have been assigned in groups to the various units, i.e.: Ref. No. 1 through 199 to the Radio Compass Unit BC-373-A; 200 through 249 to the Radio Control Box BC-374-A; 250 through 299 to Mounting FT-207-A; 300 through 349 to Cord CD-362;

350 through 399 to the Flexible Conduit Assembly, including Junction Box; and 400 through 450 to Loop LP-17-A. If a unit or part has been assigned a Signal Corps type number, such as Dynamotor DM-29-A, Conduit Elbow FT-209, Plug PL-108, etc., these numbers serve as the reference number for the particular part. Should there be a duplication of parts in the same component unit, the basic reference number assigned to these parts is exactly the same; however, it is followed by a dash and another number which serves to show:

(1) The physical and electrical position in the equipment.

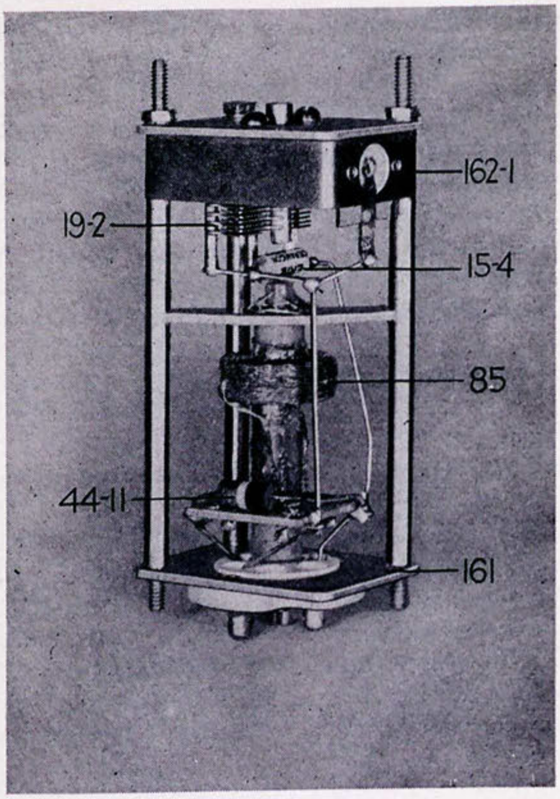
(2) The function in the equipment.

(3) The location on diagrams and photographs.

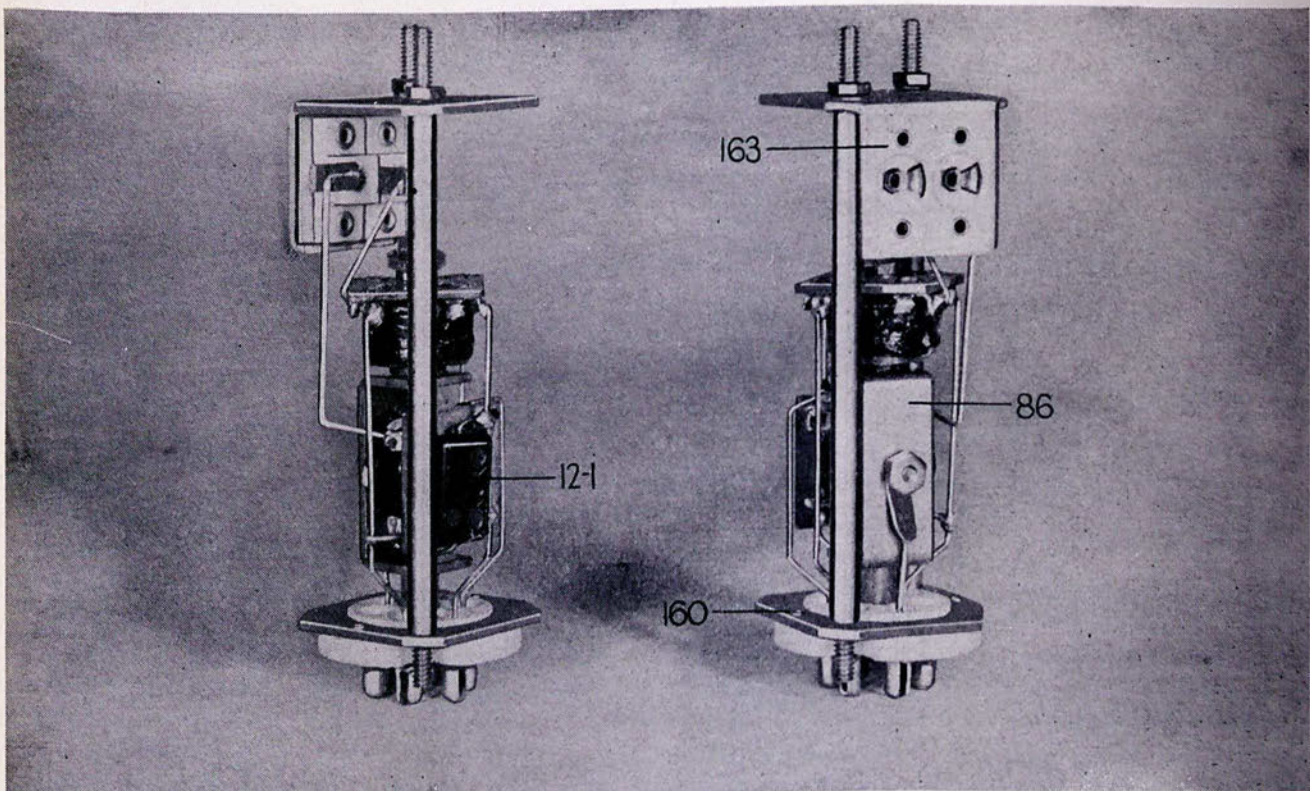
Thus, the parts whose Ref. Nos. are 42-1, 42-2, 42-3 are identical and interchangeable, each having a different function at varying locations. When two or more units are enclosed in a single case or frame and are inseparable, the reference numbers assigned to them have an additional suffix letter, signifying that the units are individual yet inseparable and become 22A, 22B, and 22C. The letters signify that basic Ref. No. 22 consists of three individual inseparable components in the same frame or enclosure. When two or more identical multiple parts are used in the same unit, the reference number for the first becomes 22-1A, 22-1B, 22-1C, and for the others, 22-2A, 22-2B, 22-2C, etc. All units having the same basic reference number are thus identical and interchangeable, the dash numbers signifying varying functions at different locations and that reference numbers containing letters (other than Signal Corps type numbers) are elements of multiple units.

The following abbreviations have been used to indicate manufacturers of various parts.

Stack.	Stackpole Carbon Co.	St. Marys, Pa.
Buss.	Bussman Mfg. Co.	Chicago, Illinois
C.D.	Cornell Dubilier Corp.	So. Plainfield, N. J.
C.E.	Continental Elec. Co.	Newark, N. J.
Cinch	Cinch Mfg. Co.	Chicago, Illinois
Clar.	Clarostat Mfg. Co.	Brooklyn, N. Y.
Micamold	Micamold Radio Corp.	Brooklyn, N. Y.
R. C. C.	Radio Condenser Co.	Camden, N. J.
Weston	Weston Elec. Inst. Co.	Newark, N. J.

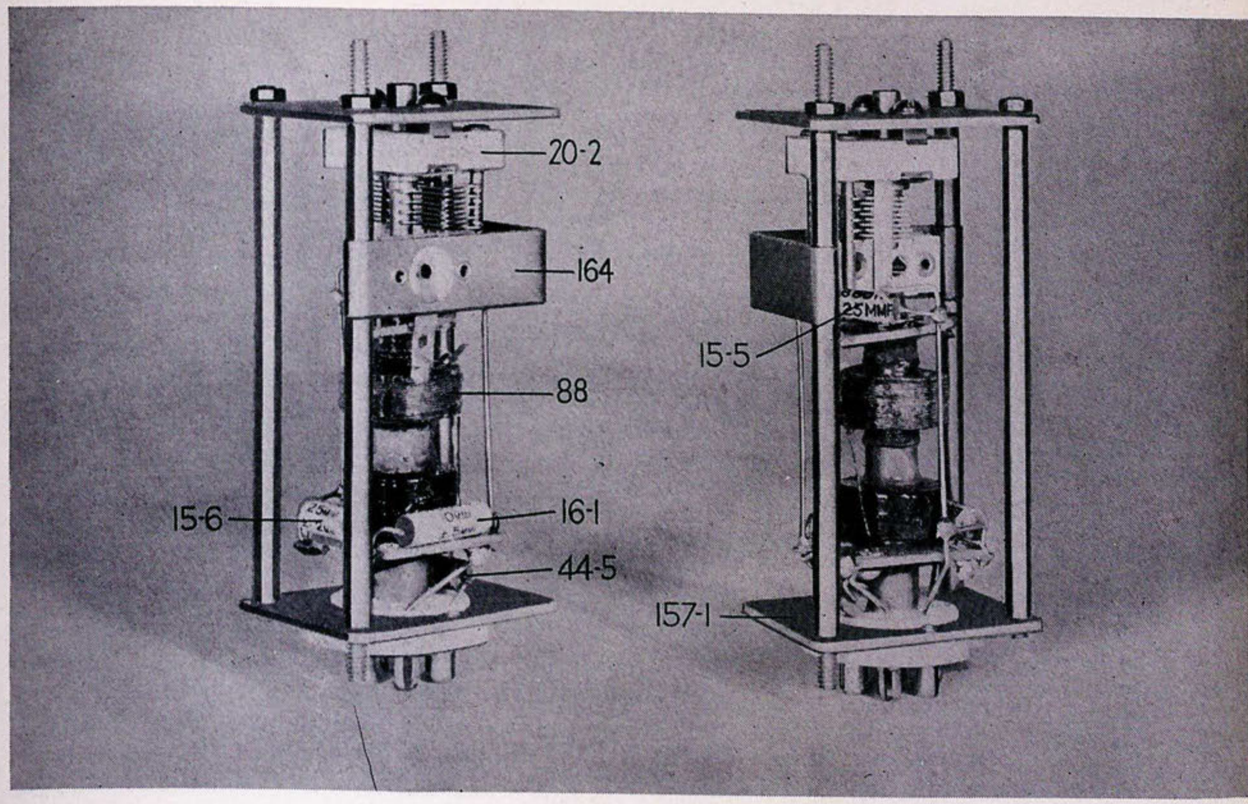


Loop Transformer, Ref. No. 100

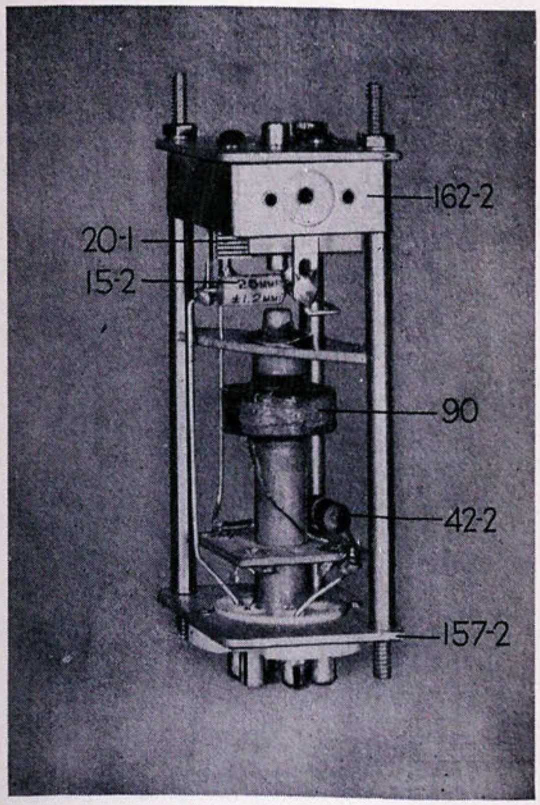


Modulator Transformer, Ref. No. 101

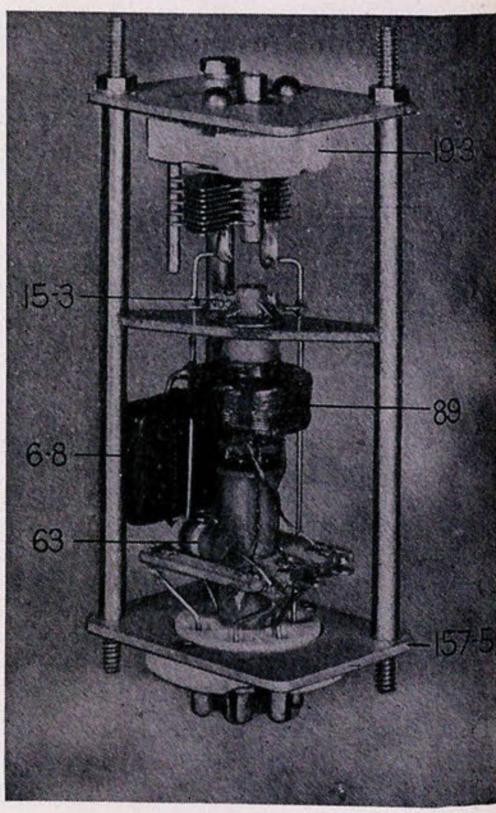
FIG. 31—LOOP AND MODULATOR TRANSFORMERS



Antenna Transformer, Ref. No. 102

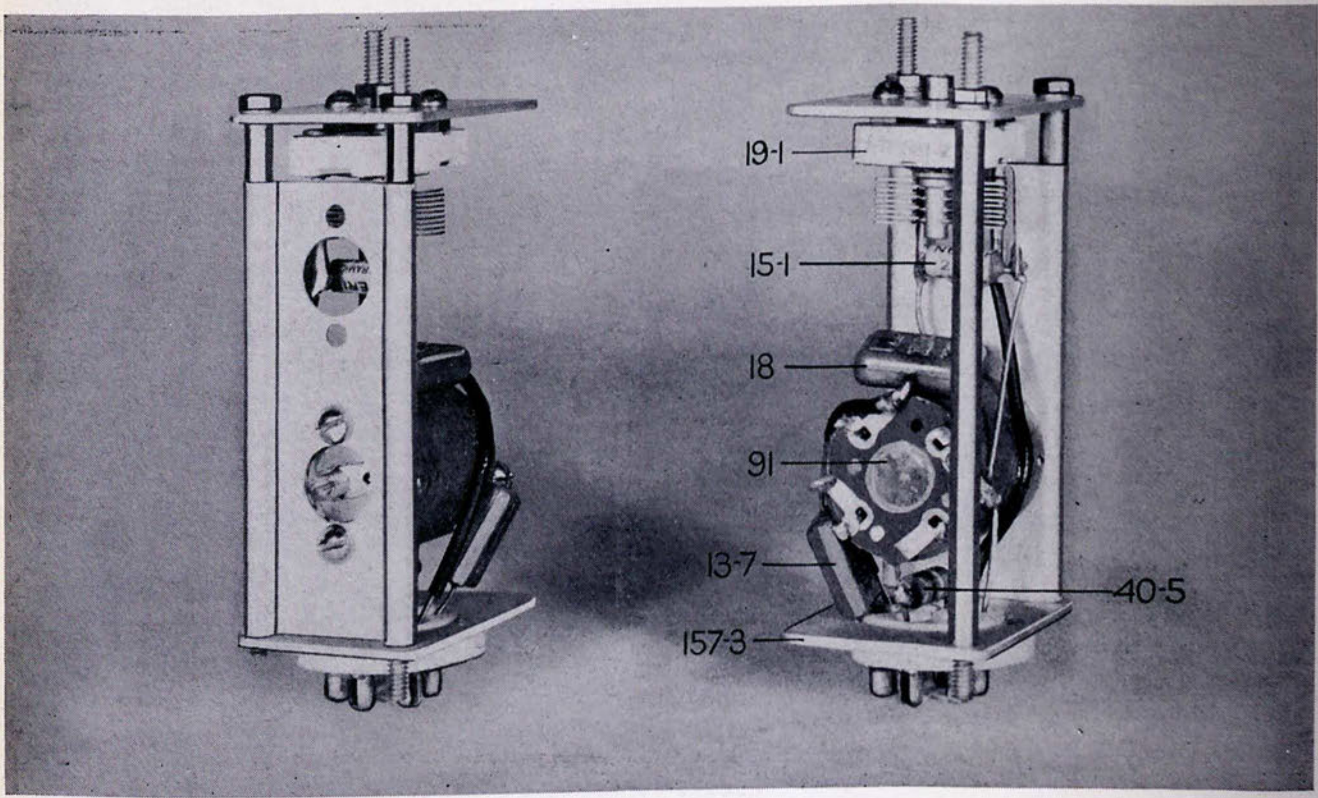


Detector Grid Transformer, Ref. No. 104

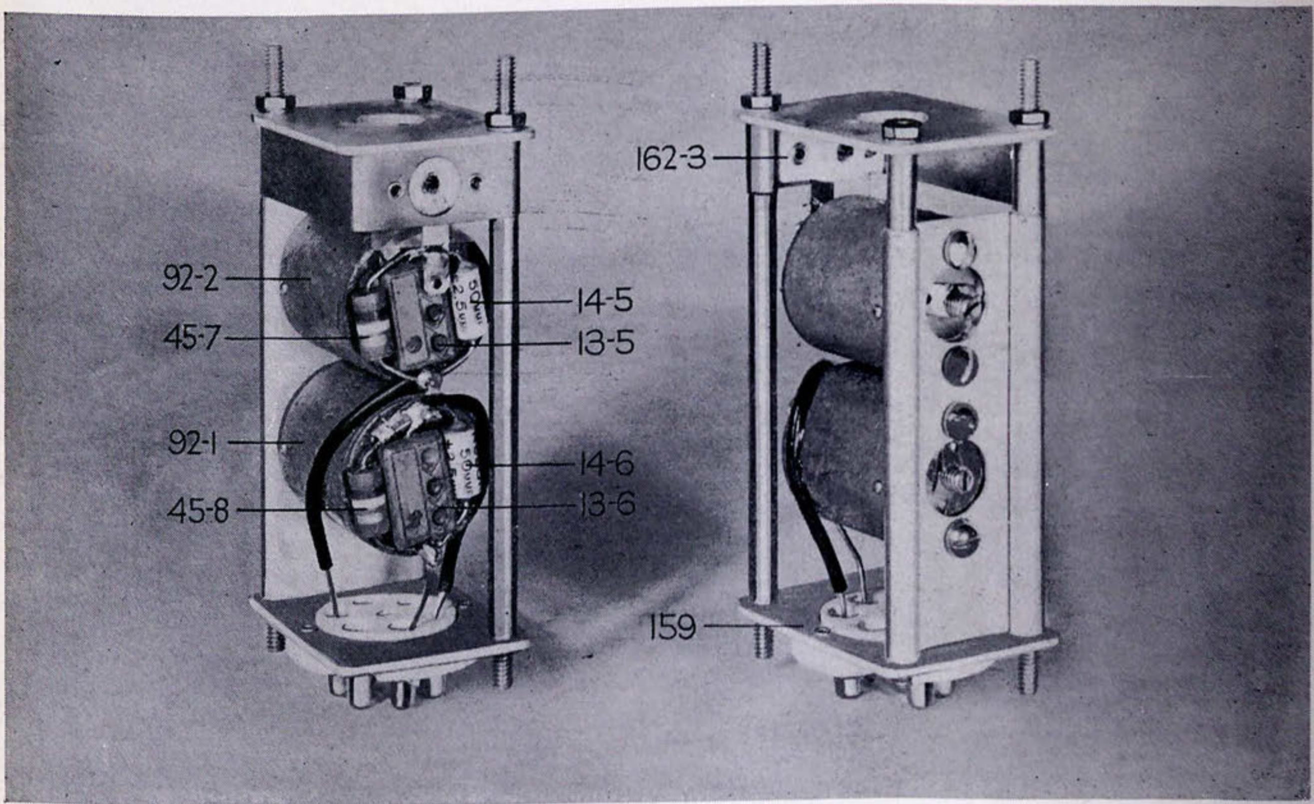


R-F Plate Transformer, Ref. No. 103

FIG. 32—ANTENNA, DETECTOR GRID AND R-F PLATE TRANSFORMERS

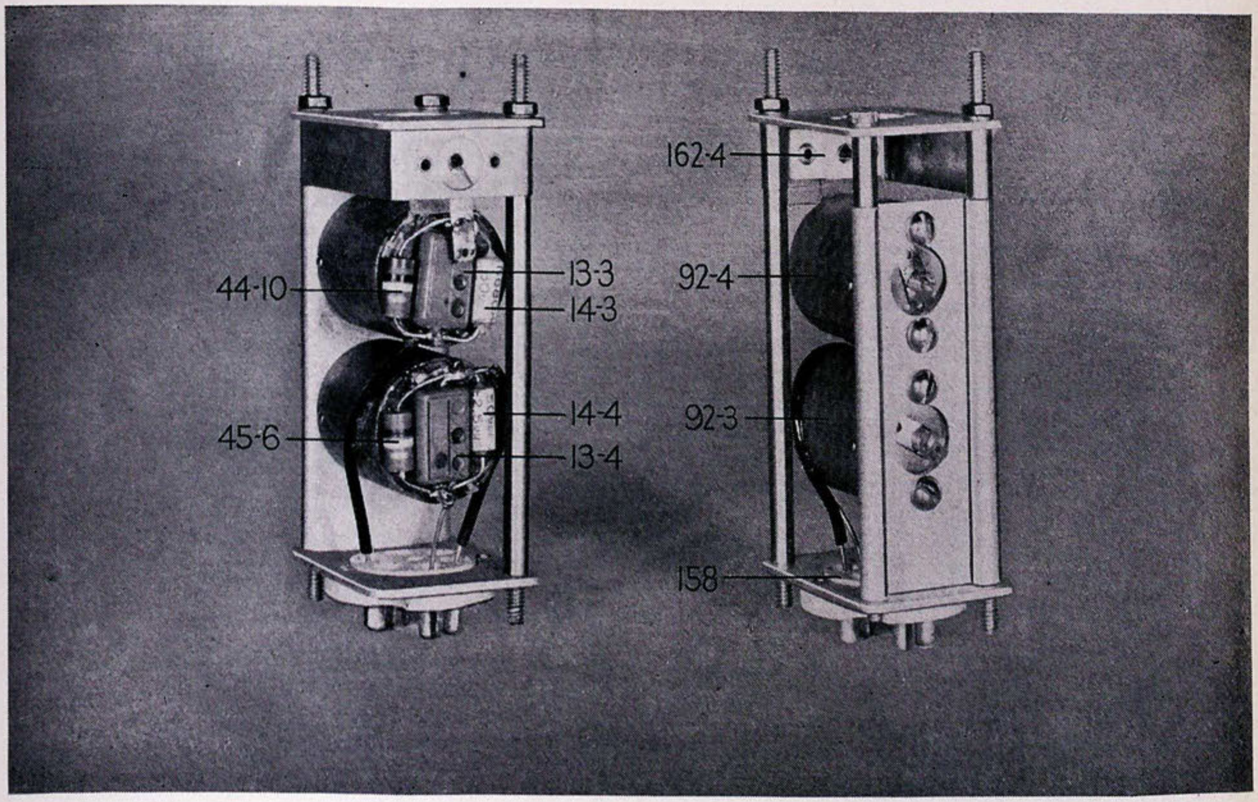


R-F Oscillator Transformer, Ref. No. 105

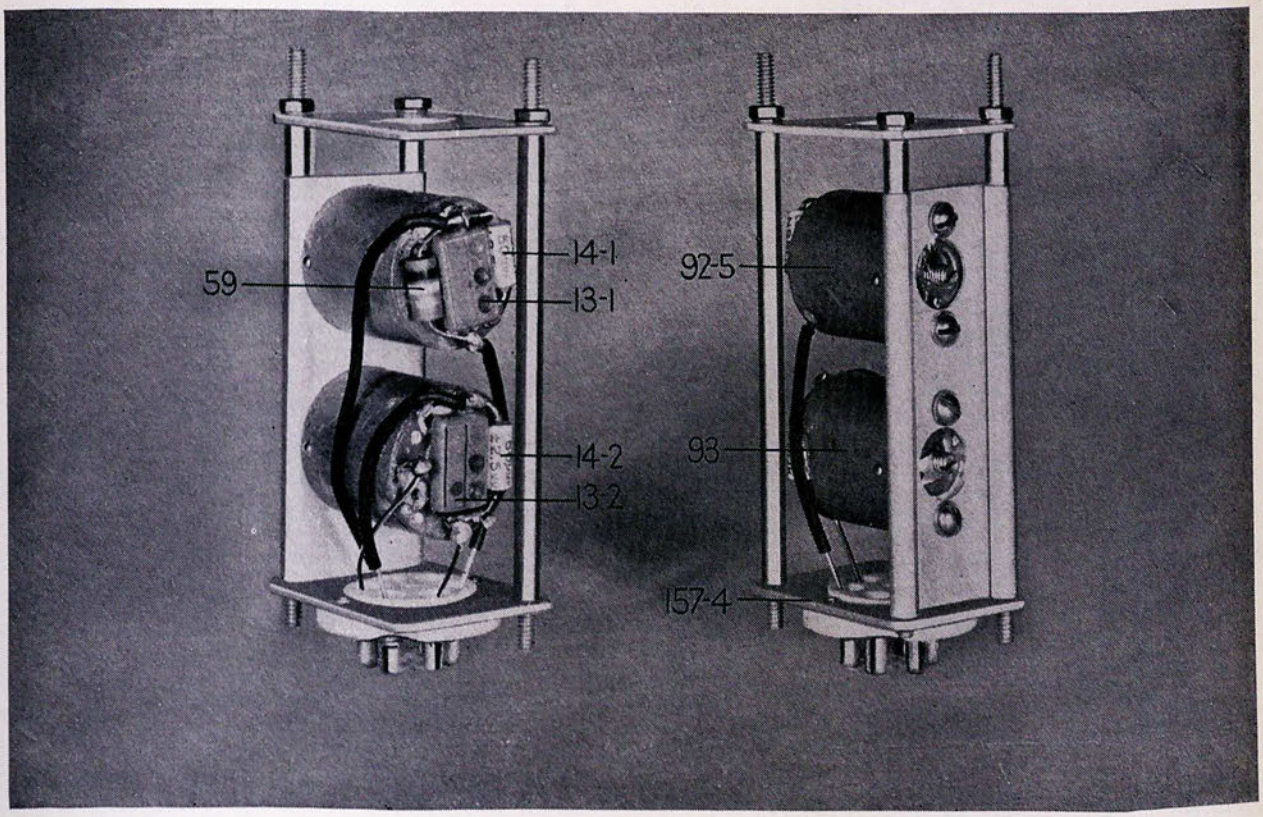


First I-F Transformer, Ref. No. 106

Fig. 33—R-F Oscillator and First I-F Transformers



Second I-F Transformer, Ref. No. 107



Third I-F Transformer, Ref. No. 108

FIG. 34—SECOND AND THIRD I-F TRANSFORMERS

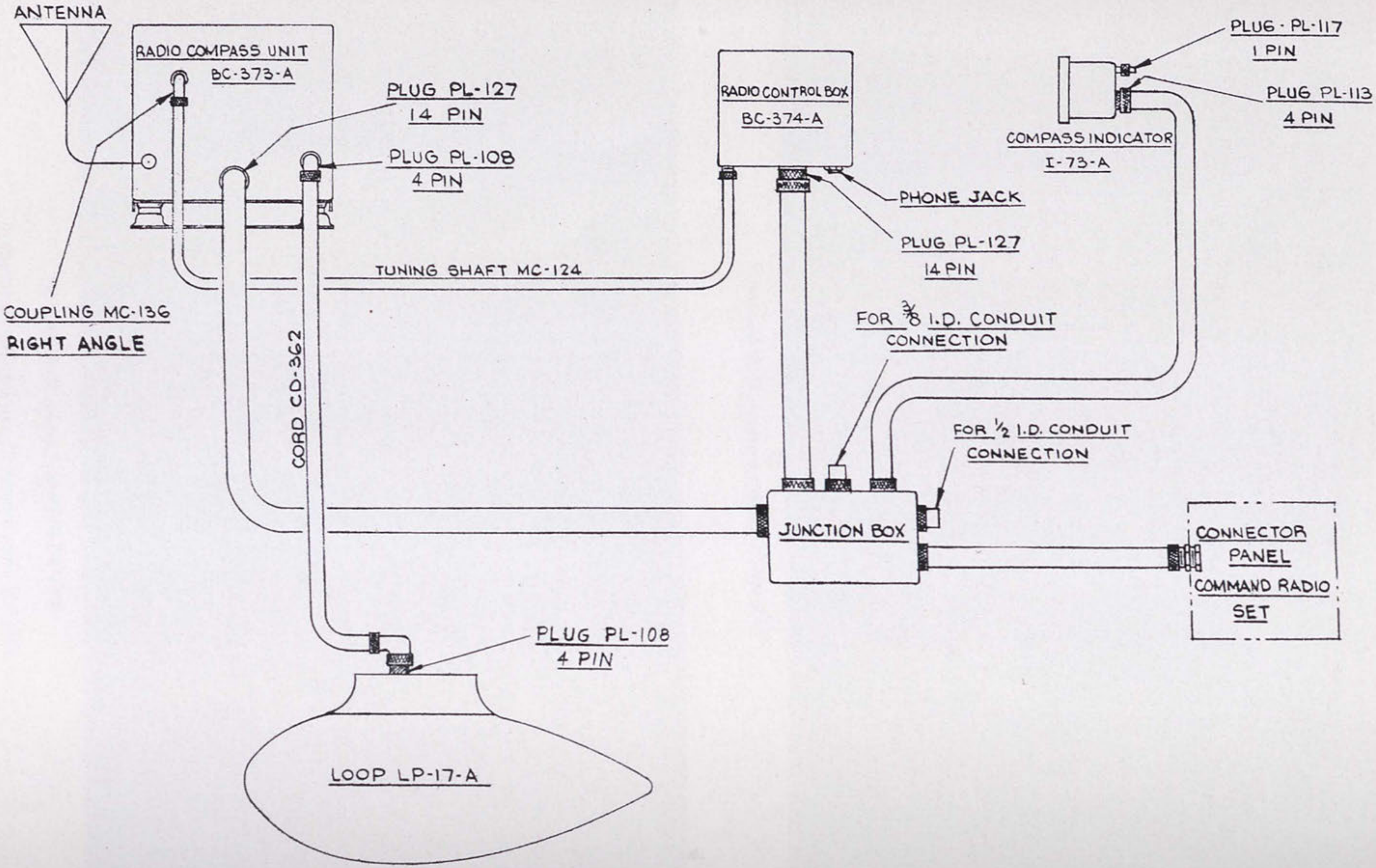


FIG. 35—RADIO COMPASS SCR-246-A, TYPICAL CORDING DIAGRAM

TABLE OF REPLACEABLE ELECTRICAL PARTS

Capacitors

Ref. No.	Capacity
1	.001 mfd
2	75 mmfd
3	50 mmfd
4	.01 mfd
5	.0065 mfd
6	.01 mfd
7	.002 mfd
8	.14 mfd
9	100 mmfd
10	250 mmfd
11	.1 mfd
12	500 mmfd
13	250 mmfd
14	50 mmfd
15	25 mmfd
16	10 mmfd
17	15 mmfd
18	700 mmfd
19	25 mmfd
20	25 mmfd
21	321 mmfd
22A	.1 mfd
22B	.5 mfd
22C	.5 mfd
22D	.5 mfd
23	.5 mfd
24A	.4 mfd
24B	.5 mfd
24C	.5 mfd
24D	.5 mfd
25A	3.0 mfd
25B	6.0 mfd
26	.45 mfd
27	3.0 mfd
28	.005 mfd

Resistors

Ref. No.	Res. in Ohms
40	20,000
41	4,000
42	500,000
43	75,000
44	100,000
45	250,000
46	1,000
47	5,000
48	1,500
49	50,000
50	400
51	10,000
52	600
53	25,000
54	200
55	500
56	300
57	2,000
58	300,000
59	200,000
60	40,000
61	1,000,000
62	700,000
63	350,000
69	2,000,000
70	4,000
71	3,000
72	200
73	21
80	2,500
81	6,000
201	600
202	100
203	25
204A	4,000
204B	8,000
204C	10,000
205A	2,000
205B	4,000
206	50

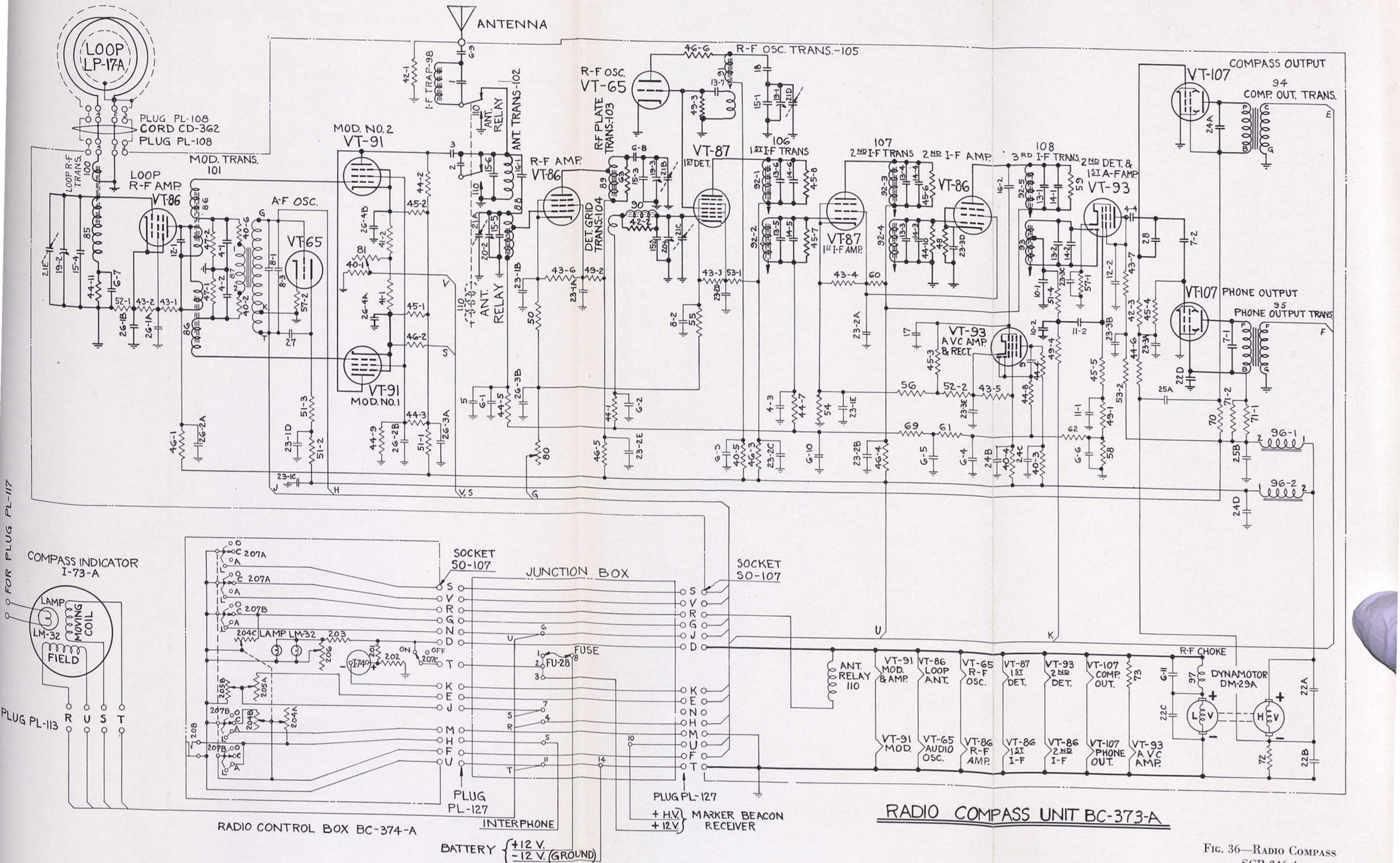


Fig. 36—Radio Compass SCR-246-A, Schematic Wiring Diagram

TABLE OF REPLACEABLE ELECTRICAL PARTS

Capacitors

Ref. No.	Capacity
1	.001 mfd
2	75 mmfd
3	50 mmfd
4	.01 mfd
5	.0065 mfd
6	.01 mfd
7	.002 mfd
8	.14 mfd
9	100 mmfd
10	250 mmfd
11	.1 mfd
12	500 mmfd
13	250 mmfd
14	50 mmfd
15	25 mmfd
16	10 mmfd
17	15 mmfd
18	700 mmfd
19	25 mmfd
20	25 mmfd
21	321 mmfd
22A	.1 mfd
22B	.5 mfd
22C	.5 mfd
22D	.5 mfd
23	.5 mfd
24A	.4 mfd
24B	.5 mfd
24C	.5 mfd
24D	.5 mfd
25A	3.0 mfd
25B	6.0 mfd
26	.45 mfd
27	3.0 mfd
28	.005 mfd

Resistors

Ref. No.	Res. in Ohms
40	20,000
41	4,000
42	500,000
43	75,000
44	100,000
45	250,000
46	1,000
47	5,000
48	1,500
49	50,000
50	400
51	10,000
52	600
53	25,000
54	200
55	500
56	300
57	2,000
58	300,000
59	200,000
60	40,000
61	1,000,000
62	700,000
63	350,000
69	2,000,000
70	4,000
71	3,000
72	200
73	21
80	2,500
81	6,000
201	600
202	100
203	25
204A	4,000
204B	8,000
204C	10,000
205A	2,000
205B	4,000
206	50

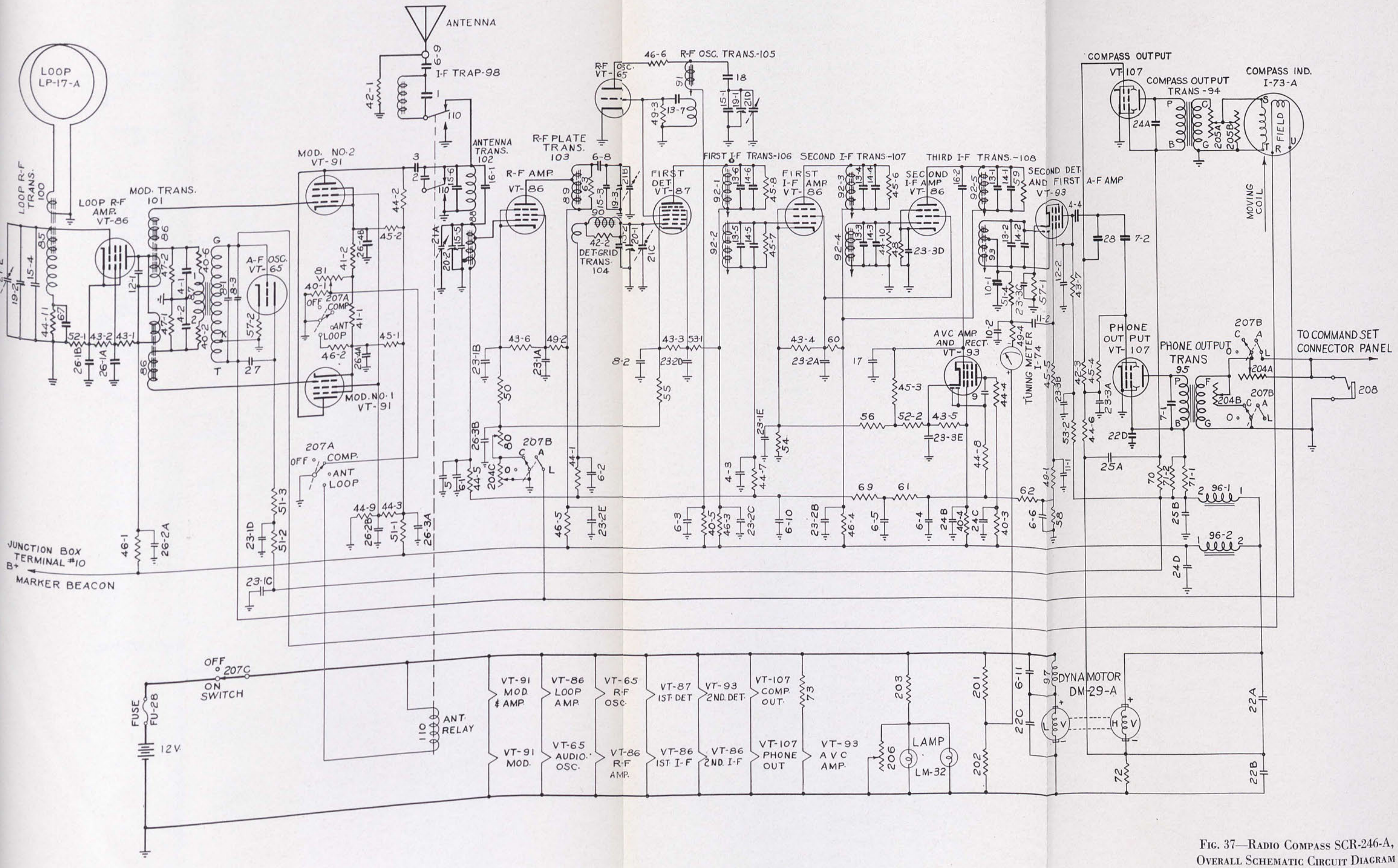
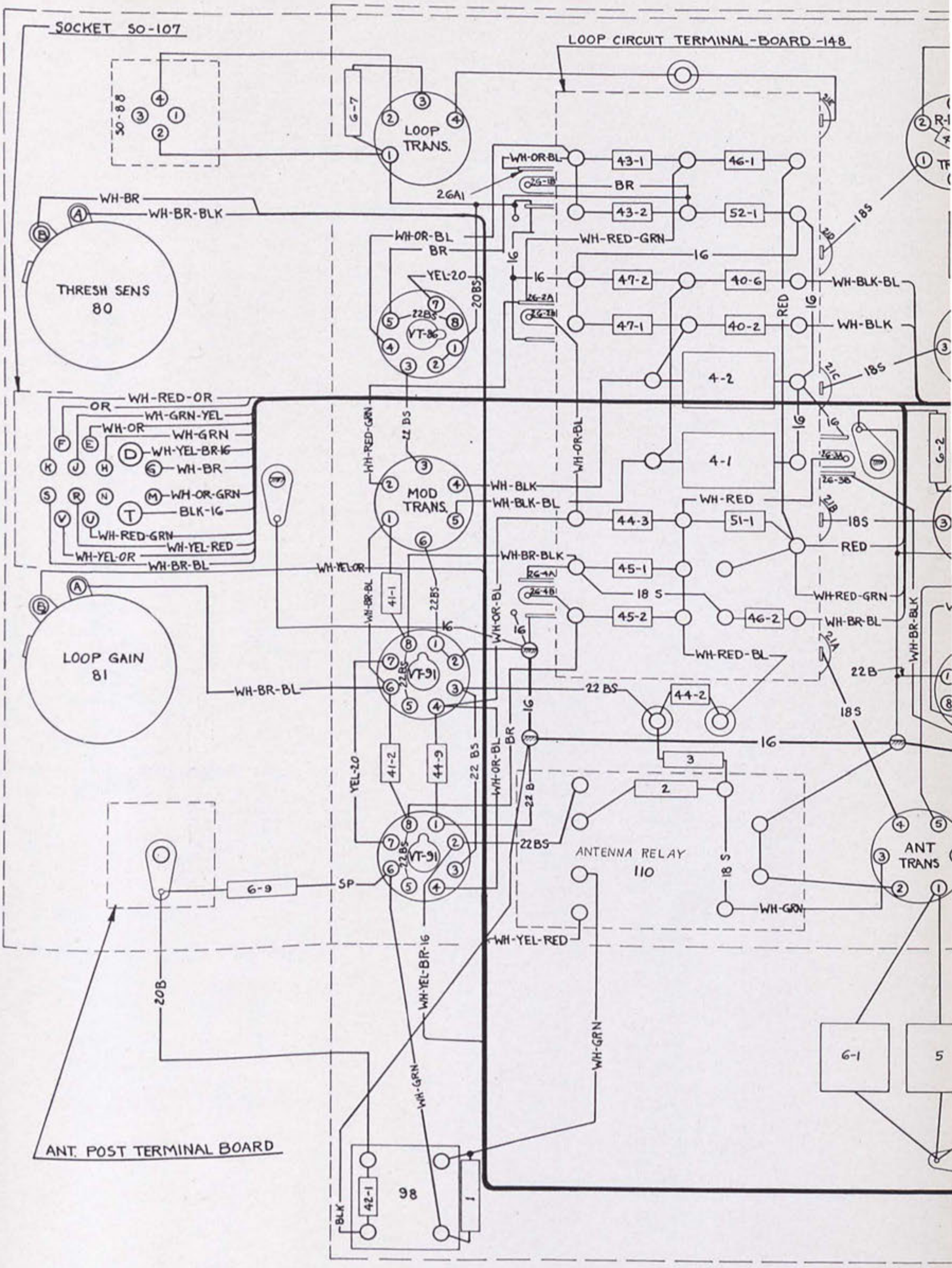
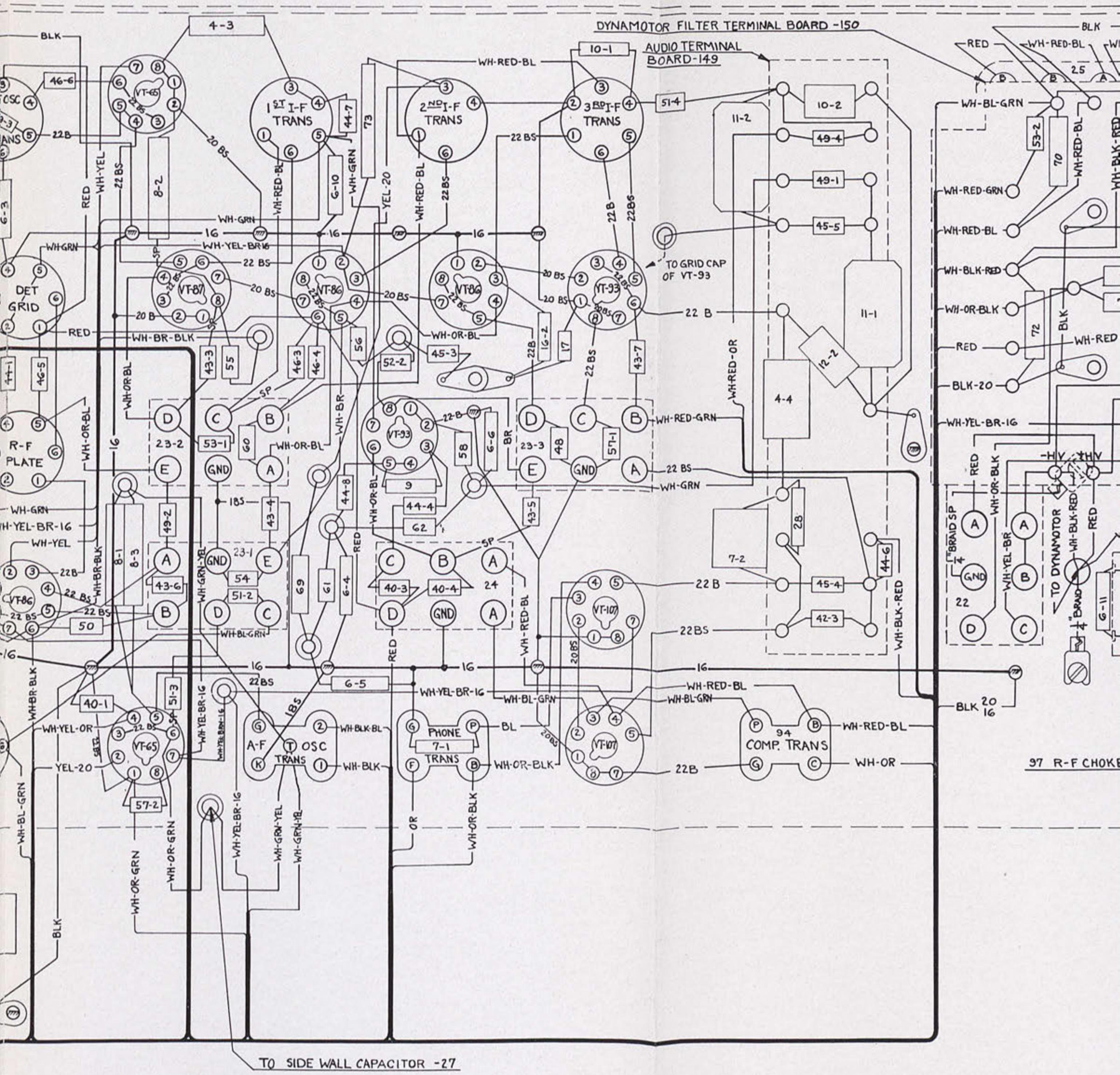


Fig. 37—Radio Compass SCR-246-A, Overall Schematic Circuit Diagram



COLOR ABBREVIATIONS	
COLOR	ABBR.
WHITE	WH
BLACK	BLK
BROWN	BR
RED	RED
ORANGE	OR
YELLOW	YEL
GREEN	GRN
BLUE	BL

SYMBOL	
14	*1
18 S	*1
22 B	*2
22 BS	*2
20 B	*2
20 BS	*2
SP	L

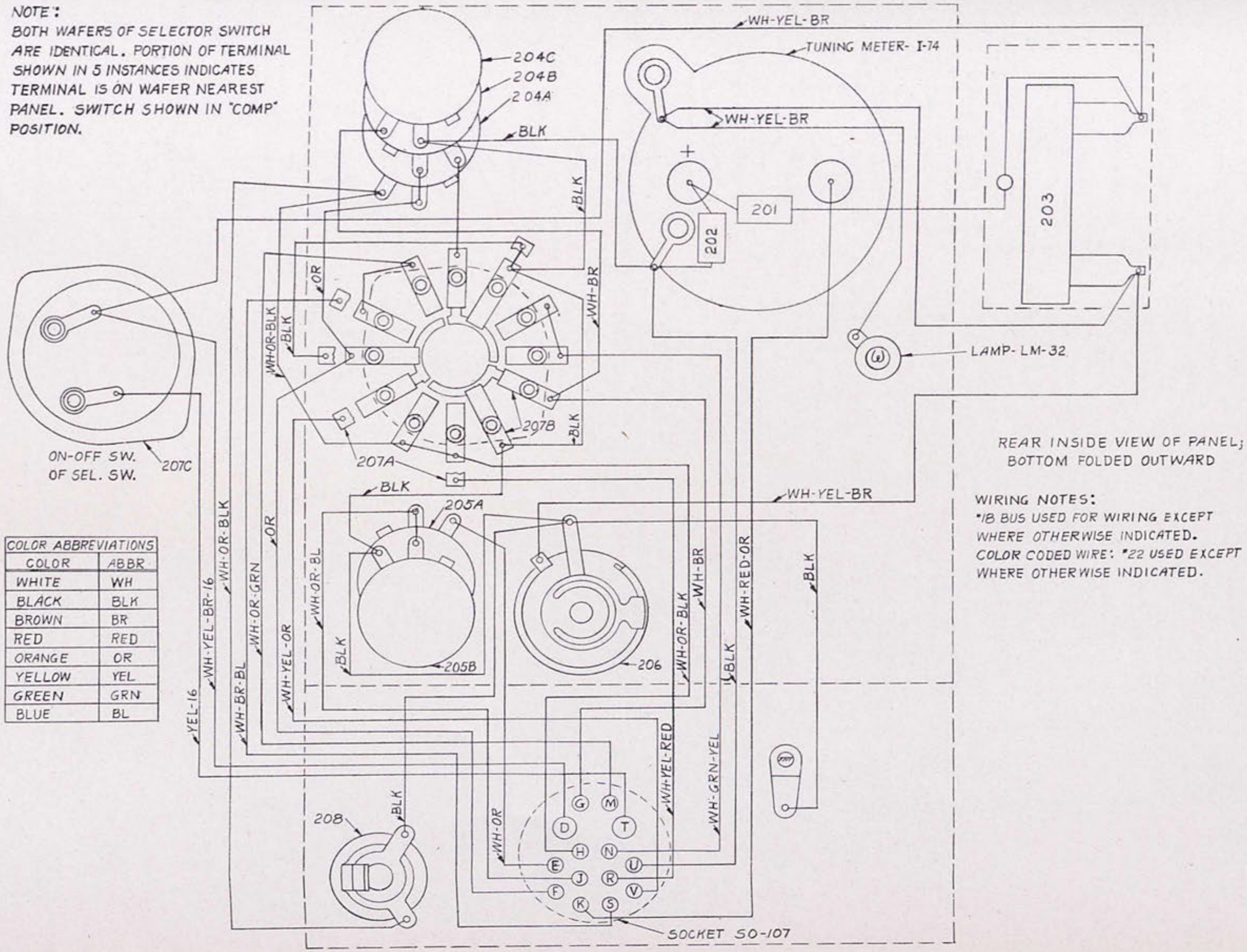


MATERIAL
4 BUS
8 BUS COVERED WITH INSULATED SLEEVING
2 BRAID
2 BRAID COVERED WITH INSULATED SLEEVING
BRAID
BRAID COVERED WITH INSULATED SLEEVING
EAD COVERED WITH INSULATED SLEEVING

#18 BUS USED FOR WIRING EXCEPT WHERE OTHERWISE INDICATED.
COLOR CODED WIRE: #22 USED EXCEPT WHERE OTHERWISE INDICATED

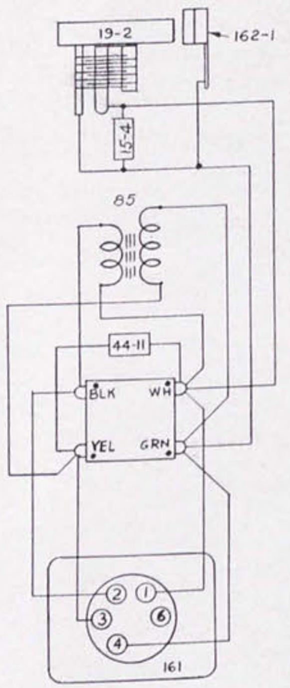
BOTTOM VIEW SHOWN WITH FRONT, ONE SIDE, AUDIO TERMINAL BOARD, AND DYNAMOTOR CONDENSER BLOCK FOLDED OUT.

FIG. 38—RAD
UNIT BC
PRACTICAL WI

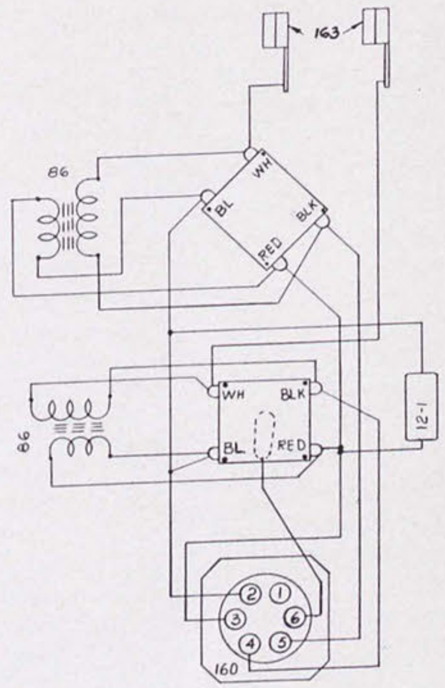


COLOR ABBREVIATIONS	
COLOR	ABBR
WHITE	WH
BLACK	BLK
BROWN	BR
RED	RED
ORANGE	OR
YELLOW	YEL
GREEN	GRN
BLUE	BL

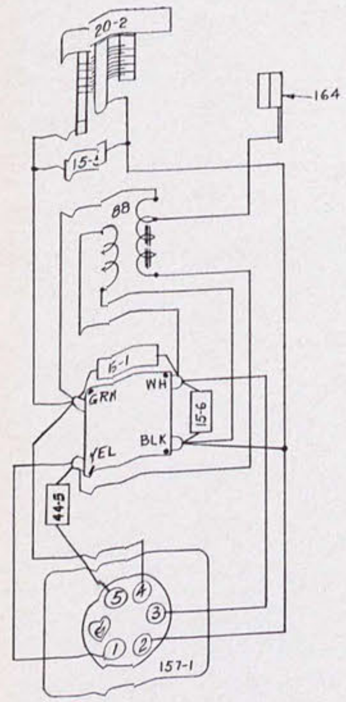
Fig. 39—Radio Control Box BC-374-A, Practical Wiring Diagram



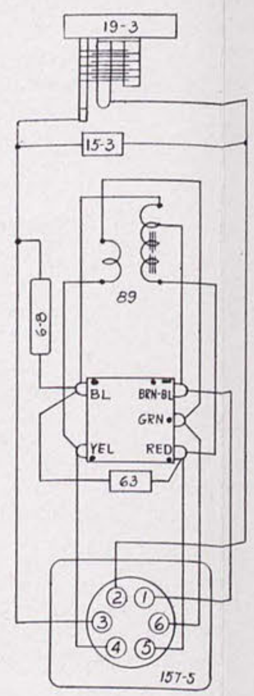
100
LOOP TRANSFORMER ASSEMBLY



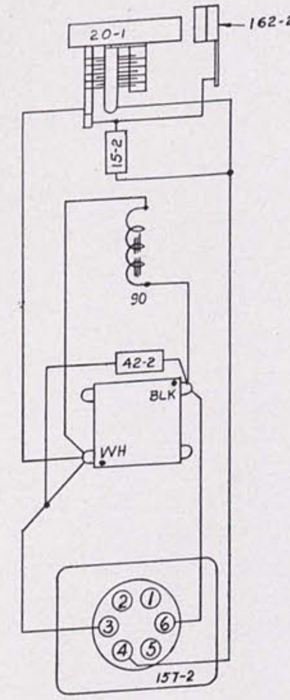
101
MODULATOR TRANSFORMER ASSEMBLY



102
ANTENNA TRANSFORMER ASSEMBLY

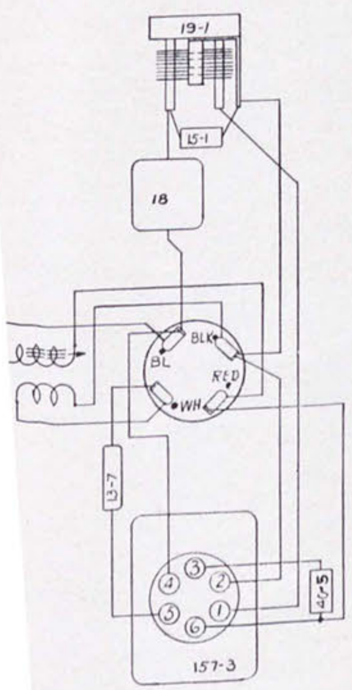


103
R-F PLATE TRANSFORMER ASSEMBLY

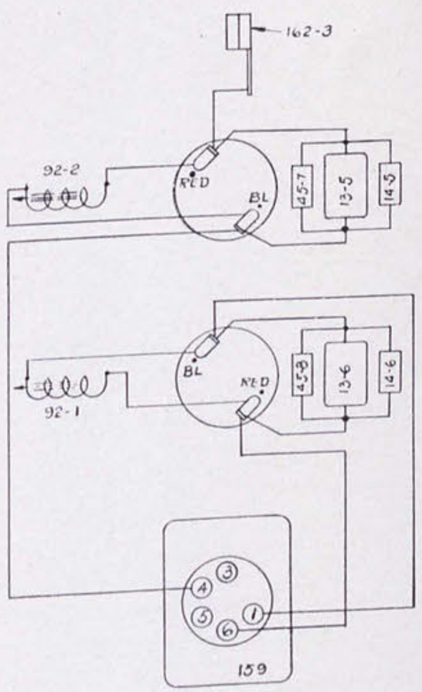


104
DETECTOR GRID TRANSFORMER ASSEMBLY

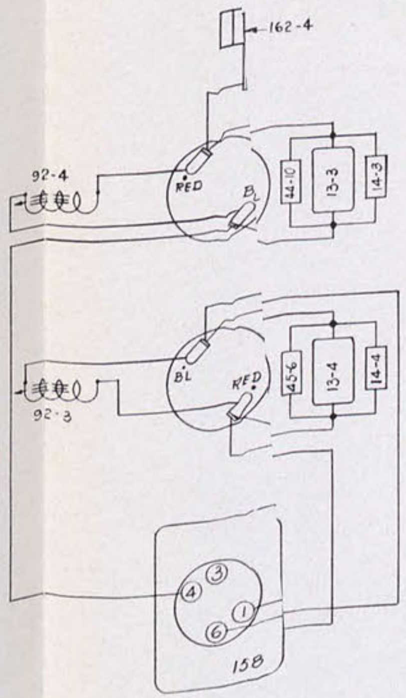
NOTE DIAGRAMS SHOW TOP VIEWS OF TRANSFORMER ASSEMBLIES TERMINAL BOARDS.



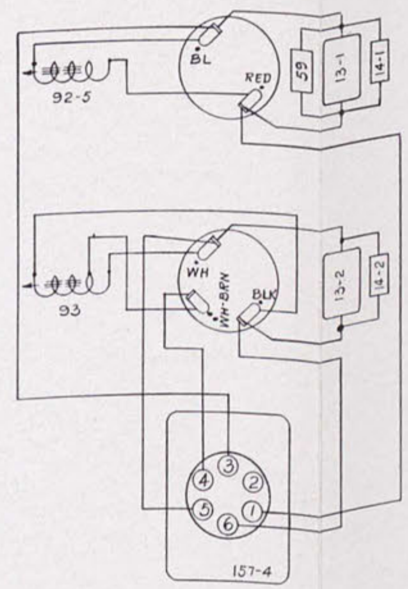
105
-F OSCILLATOR TRANSFORMER ASSEMBLY



106
1ST I-F TRANSFORMER ASSEMBLY

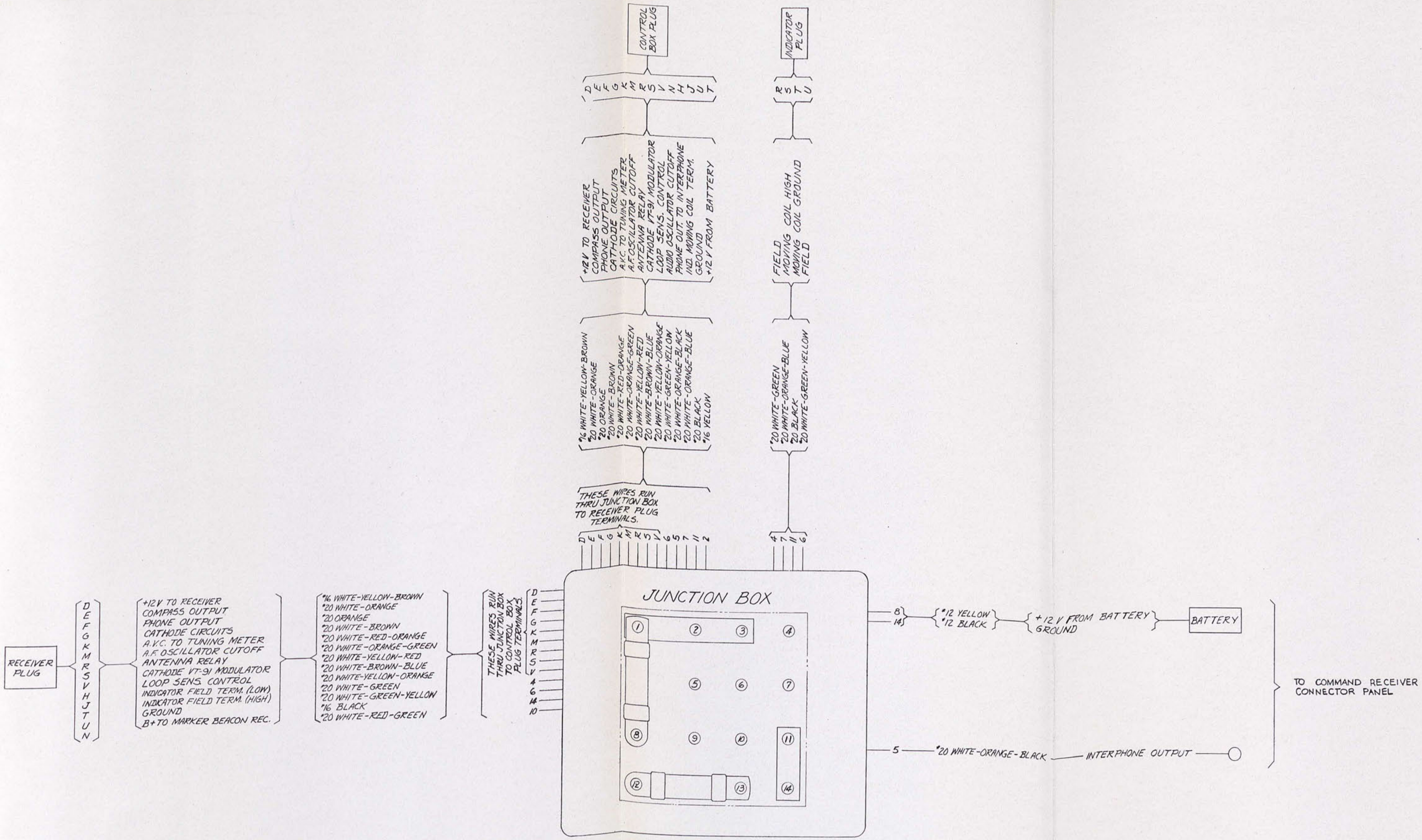


107
2ND I-F TRANSFORMER ASSEMBLY



108
3RD I-F TRANSFORMER ASSEMBLY

FIG. 40—TRANSFORMERS, PRACTICAL WIRING DIAGRAMS



FOR CONDUIT REFER TO FIGURE 49

Fig. 41—Flexible Conduit Assembly, Includes Junction Box, Wiring Diagram

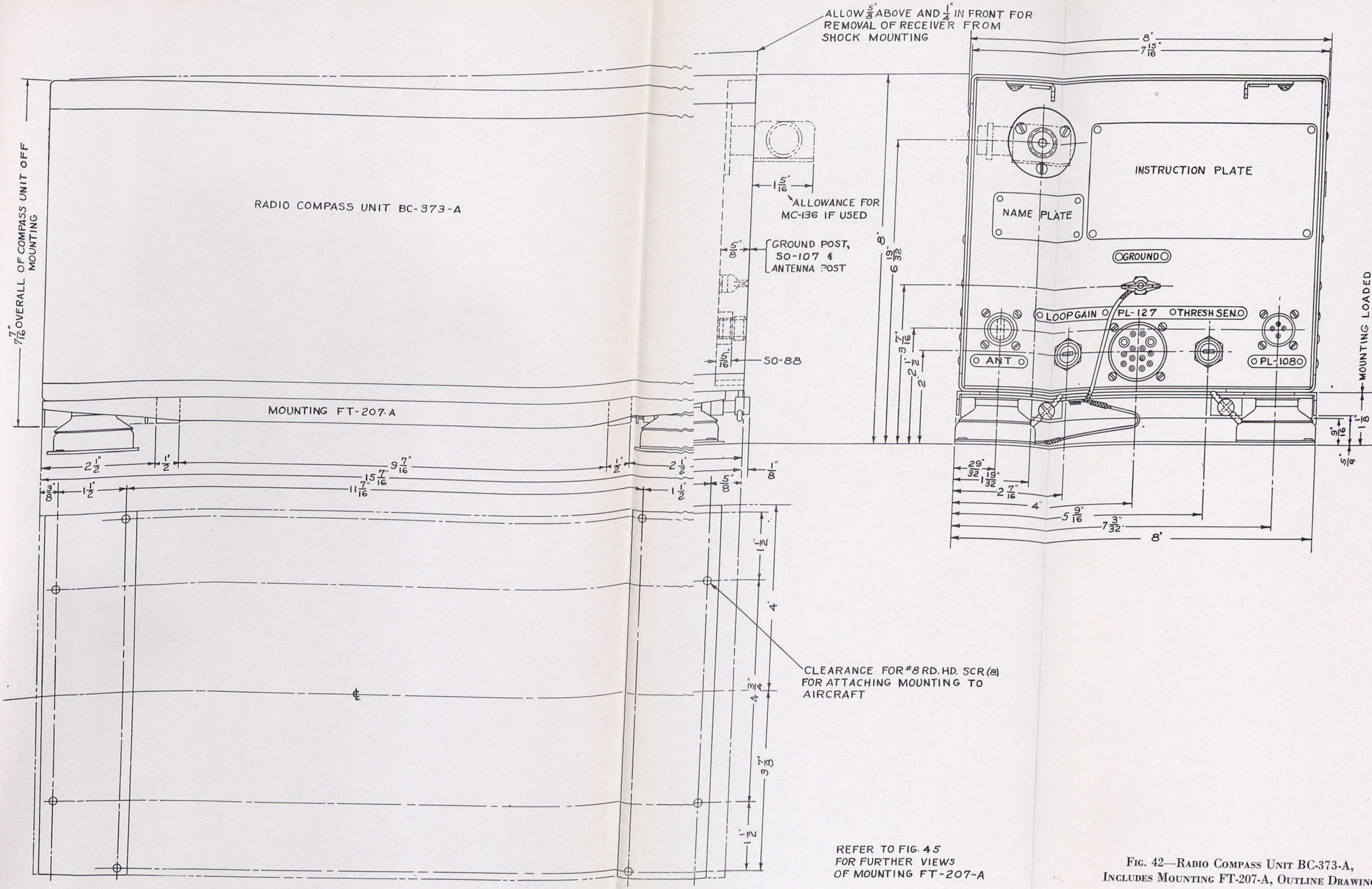


FIG. 42—RADIO COMPASS UNIT BC-373-A, INCLUDES MOUNTING FT-207-A, OUTLINE DRAWING

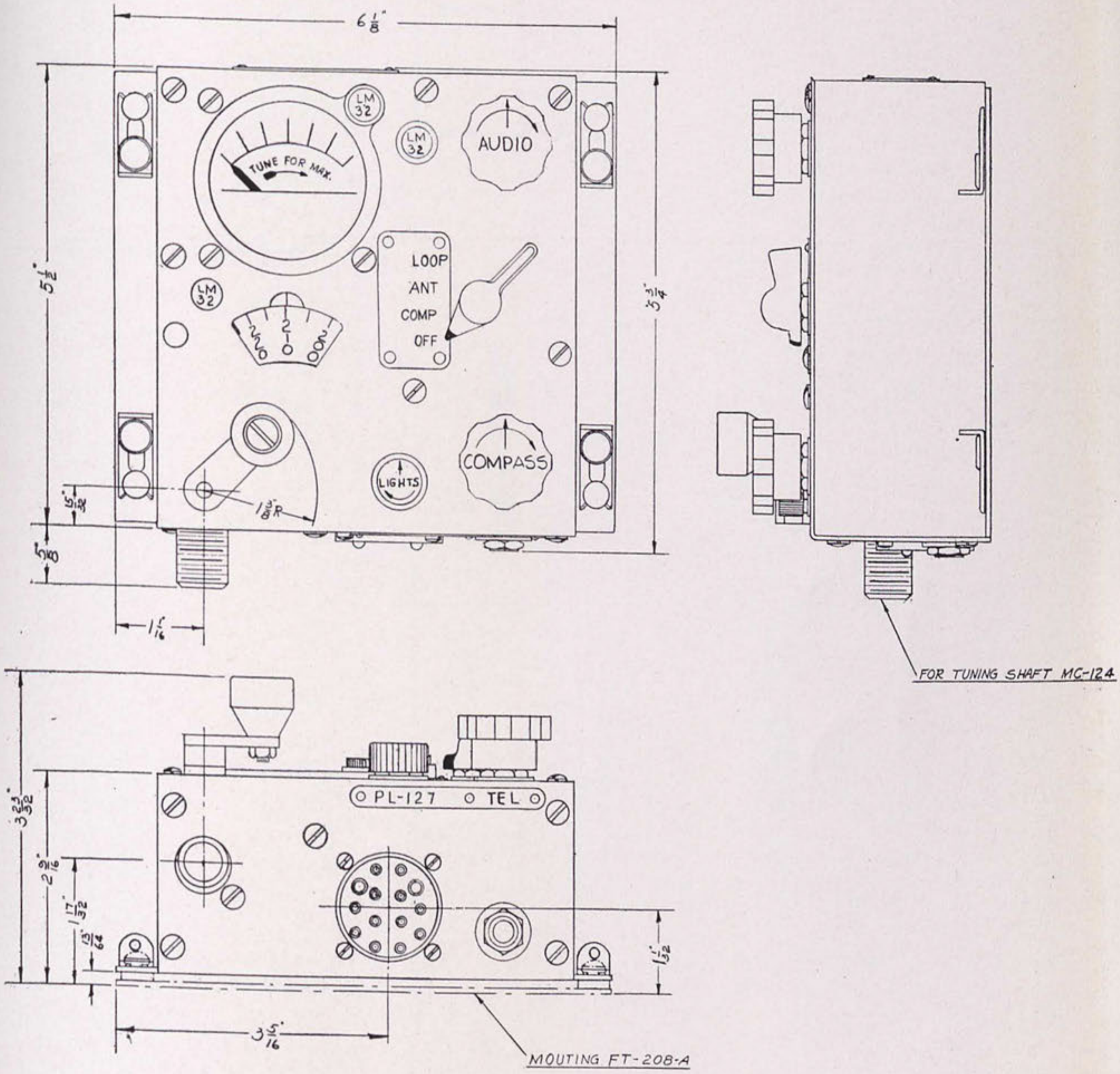


Fig. 43—Radio Control Box BC-374-A, Less Mounting FT-208-A, Outline Drawing

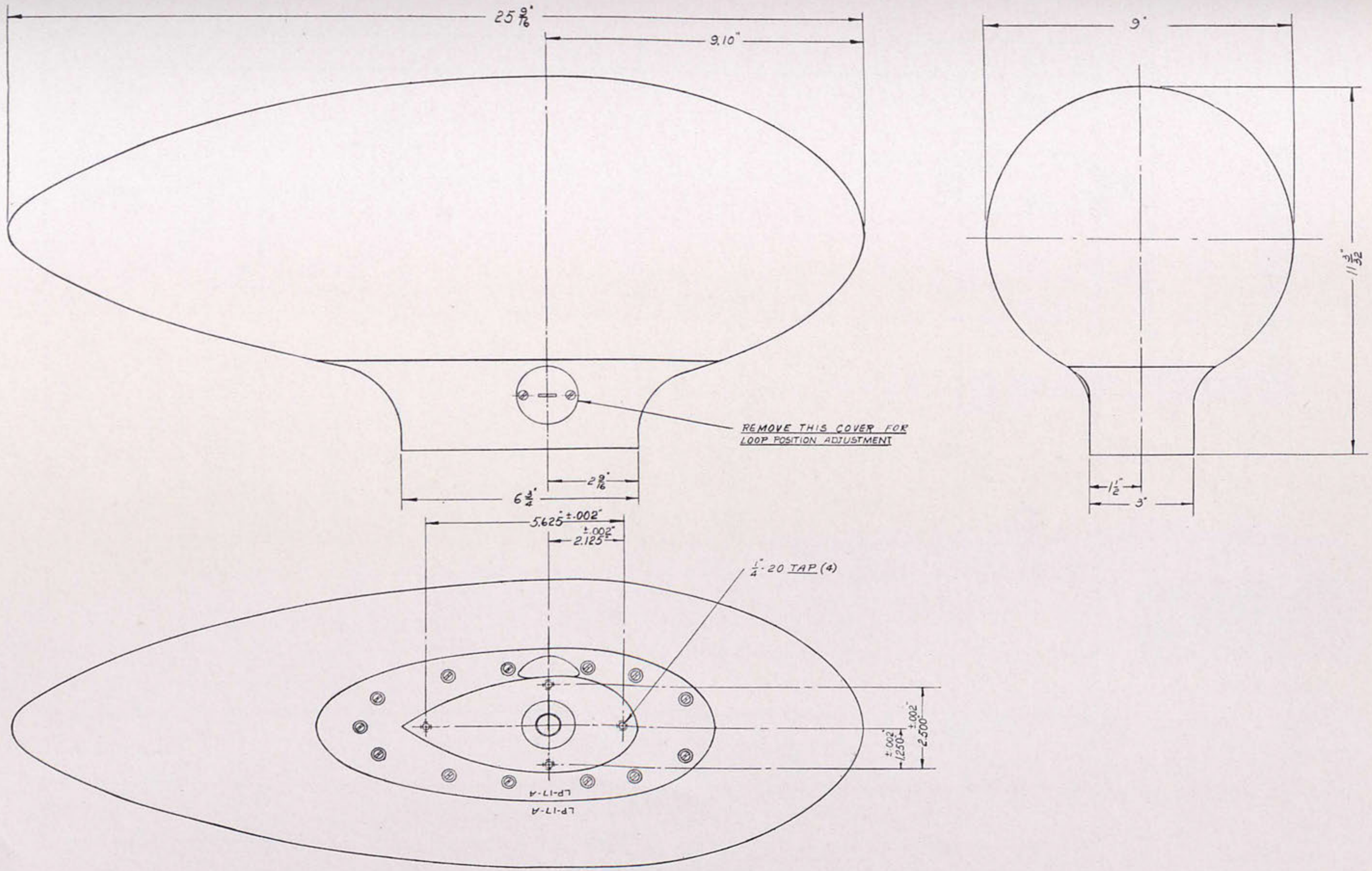


Fig. 44—Loop LP-17-A, Includes Housing and Mounting, Outline Drawing

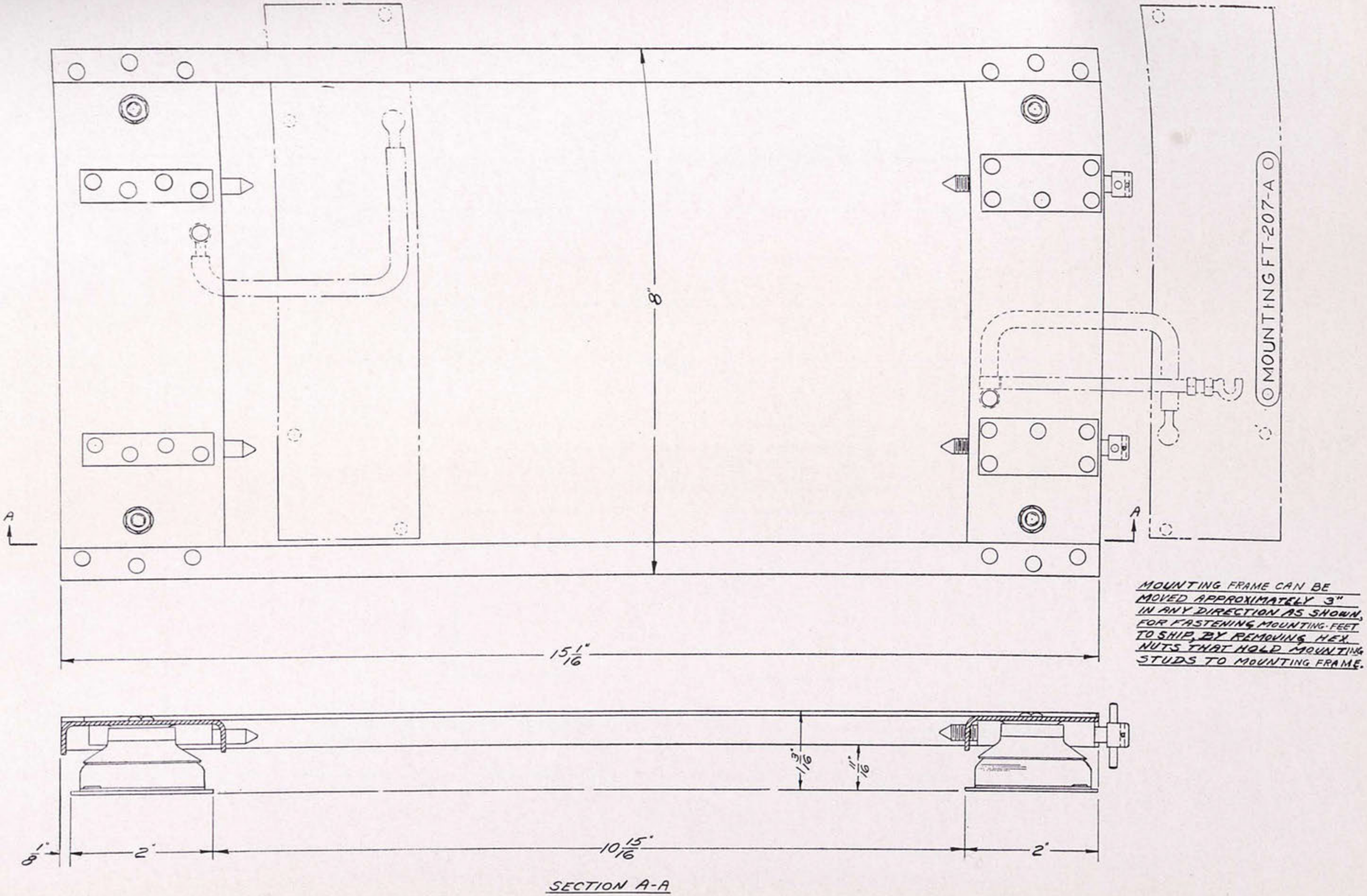


Fig. 45—Mounting FT-207-A (for Radio Compass Unit) Outline Drawing

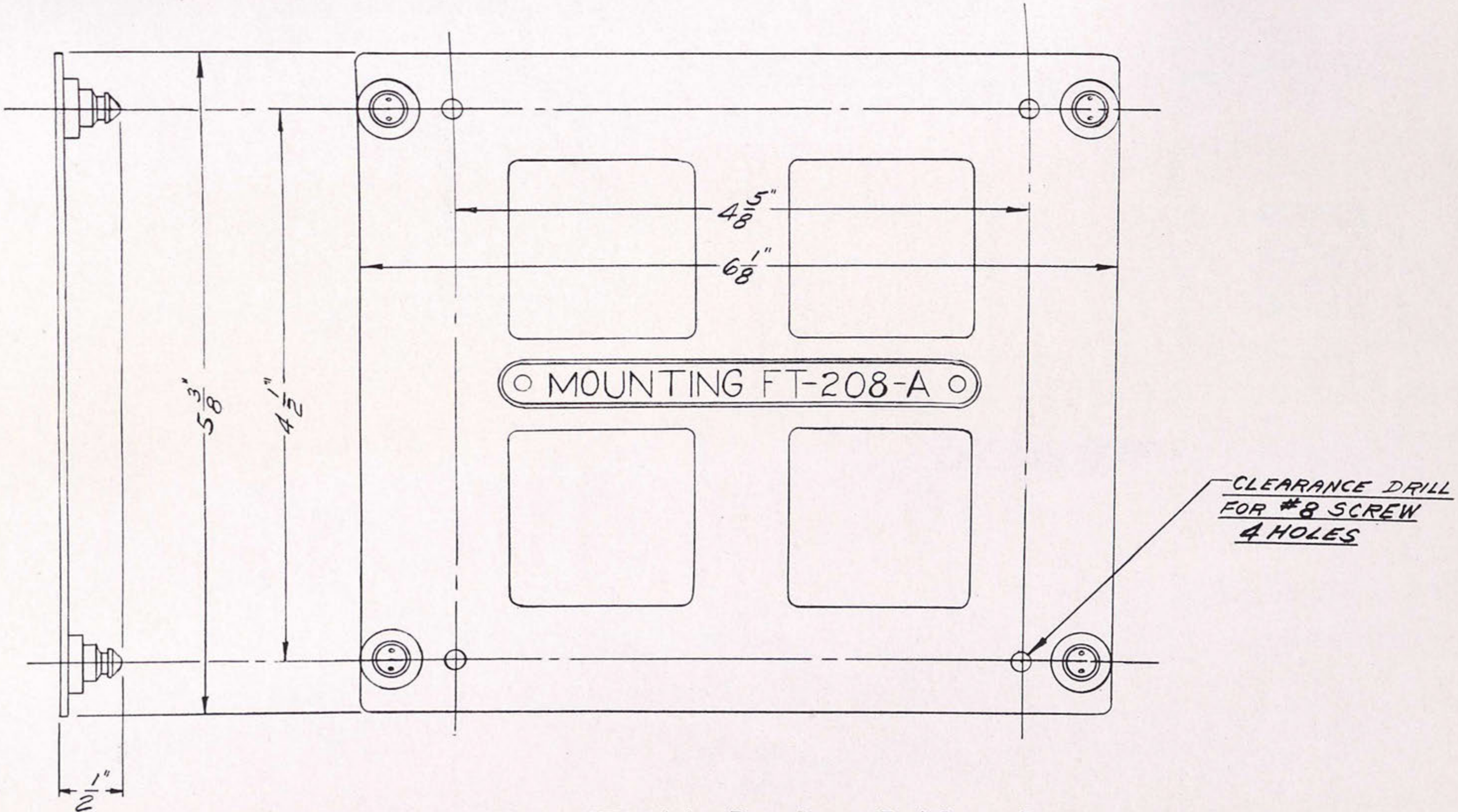


Fig. 46—Mounting FT-208-A (for Radio Control Box) Outline Drawing

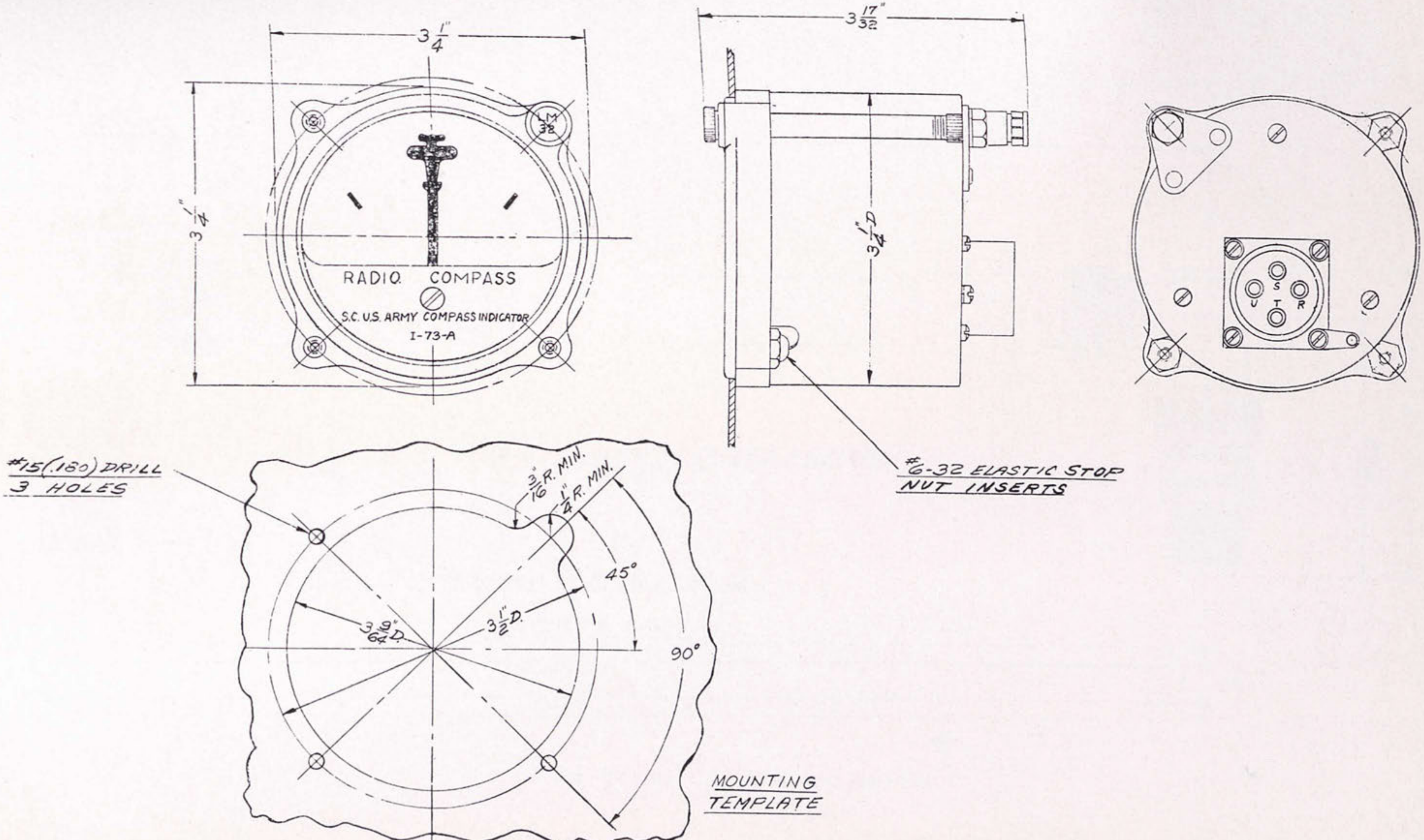


Fig. 47—Compass Indicator I-73-A, Outline Drawing

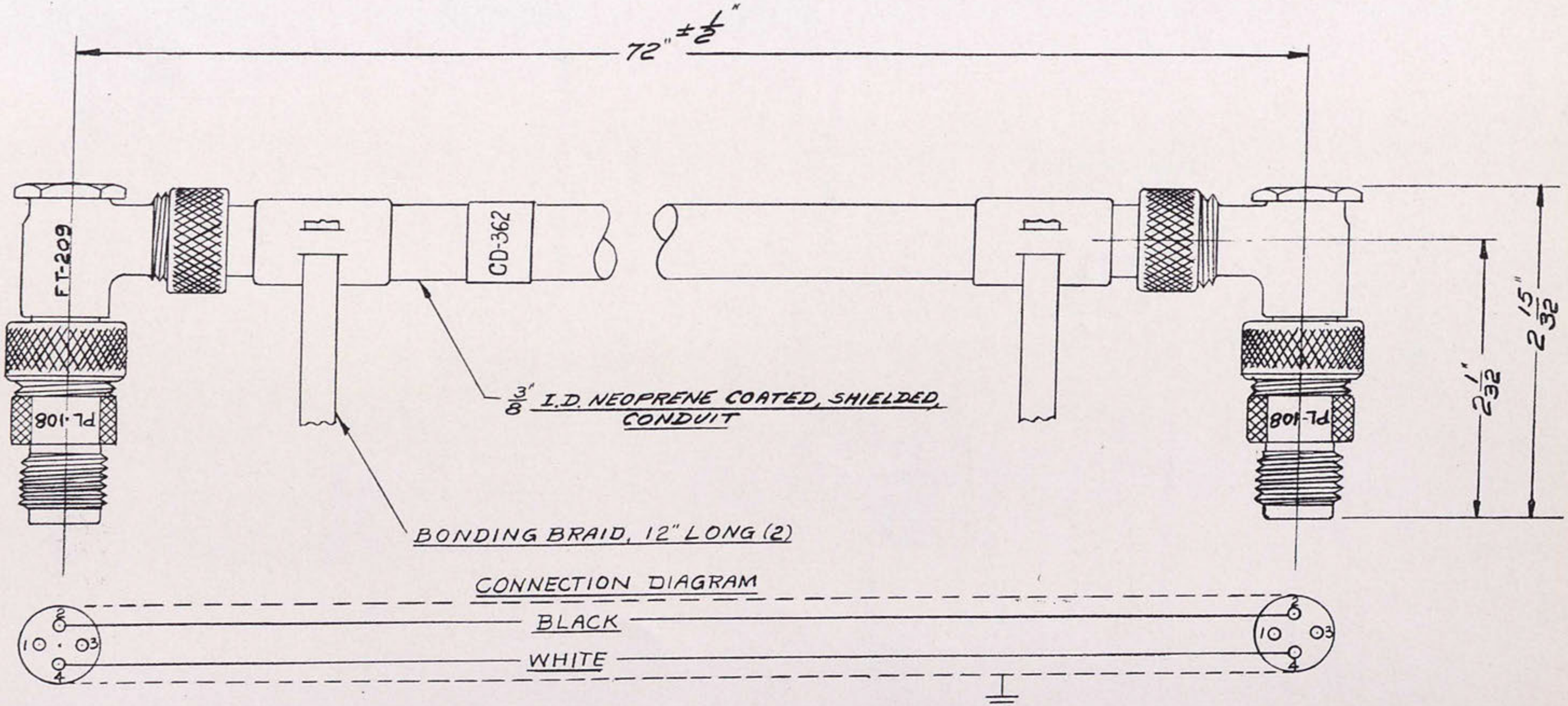


Fig. 48—Cord CD-362, Outline Drawing