INSTRUCTION BOOK

FOR

RADIO COMPASS SCR-263-A

Manufactured By

BENDIX RADIO CORPORATION

Baltimore, Maryland, U. S. A.

PRO PATRIA VIGILANS

RESTRICTED

PUBLISHED BY AUTHORITY

OF

THE CHIEF SIGNAL OFFICER

ORDER No. 1658-NY-41

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TABLE OF CONTENTS

SECTION I, DESCRIPTION OF RADIO COMPASS SCR-263-A

SECTION II, EMPLOYMENT

TABLE OF CONTENTS—*Continued*

SECTION III, DETAILED FUNCTIONING OF PARTS

SECTION IV, MAINTENANCE

TABLE OF CONTENTS—*Continued*

TABLE OF CONTENTS—*Continued*

LIST OF ILLUSTRATIONS

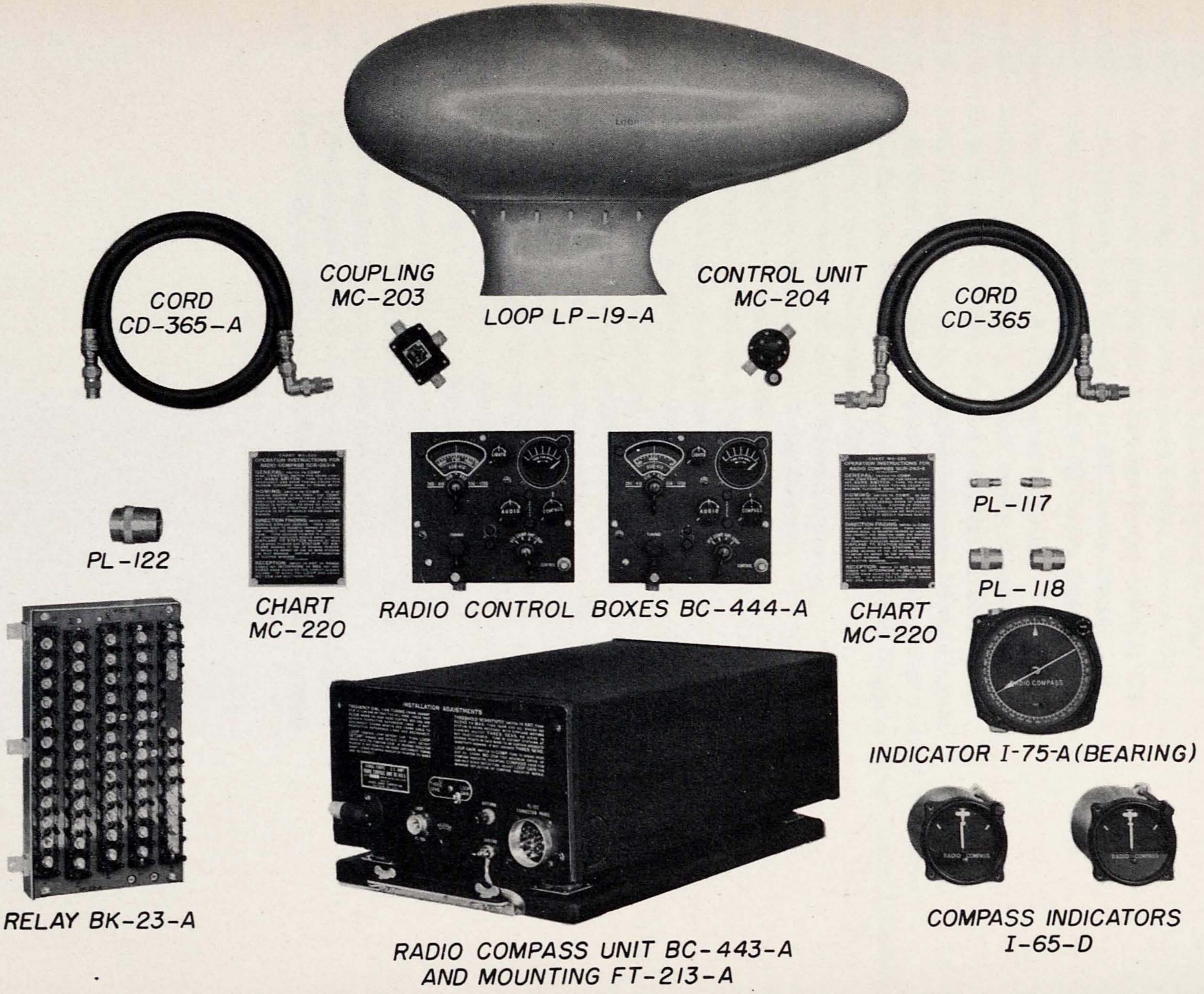

Figure 1 — Radio Compass SCR-263-A, Components

INSTRUCTION BOOK
for
RADIO COMPASS SCR-263-A

SECTION I

DESCRIPTION OF RADIO COMPASS SCR-263-A

1. GENERAL

Radio Compass SCR-263-A is intended primarily for use in U. S. Army aircraft and may be remotely controlled from either of two positions. However, installations may be made using only one control position, paragraph 9*c* (11). While the tuning may be accomplished from either of the remote positions, only that position having control may switch bands and functions. The frequency range of the equipment is 200 to 1750 kcs, which is covered in three bands calibrated in kilocycles, as follows: band 1—200 to 410 kcs, band 2—410 to 850 kcs, and band 3—850 to 1750 kcs. Only the frequency band in use is visible on the tuning dial. When used in conjunction with the required additional equipment, Radio Compass SCR-263-A is a complete operable equipment capable of providing:

(a) Visual, unidirectional, right-left indication of the direction of arrival of radio frequency energy with respect to the plane of the loop and simultaneous "On Course" aural reception of modulated radio frequency energy.

(b) Aural reception of modulated radio frequency energy, using a non-directional antenna.

(c) Aural reception of modulated radio frequency energy, using a loop antenna.

(d) Aural-null indications of the direction of arrival of modulated radio frequency energy, using a loop antenna.

2. COMPONENTS, DIMENSIONS AND WEIGHTS

The following components are required for a Radio Compass SCR-263-A installation in aircraft which are provided with a built-in junction box or connector panel:

Quantity	Description	Overall Size in Inches (Including Projections)	Weight Lbs
1	**Radio Compass Unit BC-443-A, includes: 1 Mounting FT-213-A 1 Dynamotor DM-30 1 Setscrew Wrench, Allen No. 6 6 Tube Shields MC-202	$19\frac{13}{16}''$ x 12″ x $7\frac{7}{8}''$*	42.00*
1	Set of Vacuum Tubes consisting of: 1 Tube VT-66 6 Tubes VT-86 1 Tube VT-87 1 Tube VT-93 1 Tube VT-94 1 Tube VT-96 1 Tube VT-105		1.09
2	※Radio Control Box BC-444-A, includes: 5 Lamps LM-32 (3 in use, 2 mounted spares) 1 Setscrew Wrench, Allen No. 6 1 Control Box Base	$7\frac{1}{2}''$ x $7\frac{1}{2}''$ x $3\frac{15}{16}''$	4.00 ea.
1	Loop LP-19-A, includes housing and mounting	$25\frac{3}{8}''$ x 9″ x $13\frac{1}{2}''$	7.06

DESCRIPTION OF RADIO COMPASS SCR-263-A

Quantity	Description	Overall Size in Inches (Including Projections)	Weight Lbs
1	Cord CD-365, includes: 2 Plugs PL-108 2 Conduit Elbows FT-184 1 Flexible Conduit Ass'y. (Note: Cord CD-365-A includes only one Conduit Elbow FT-184. Cord CD-365-B, which has no conduit elbows, may be used in lieu of Cord CD-365 or Cord CD-365-A.)	72″ long, $\frac{1}{2}$″ diameter	1.62
2	※Compass Indicator I-65-D each includes: 1 Lamp LM-32	$3\frac{1}{4}$″ x $3\frac{1}{4}$″ x $4\frac{9}{32}$″	1.6 ea.
1	※Coupling MC-203 (Coupling tuning shaft from both radio control boxes to radio compass unit)	$3\frac{3}{4}$″ x $2\frac{7}{16}$″ x $1\frac{19}{64}$″	0.34
1	Control Unit MC-204 (For rotating bearing indicator and loop)	3″ x 2″ x $3\frac{1}{32}$″ (Rotation requires $3\frac{1}{4}$″ diameter)	0.34
1	Indicator I-75-A (Bearing), includes: 1 Setscrew Wrench, Allen No. 6	$5\frac{1}{8}$″ x $5\frac{1}{8}$″ x $2\frac{11}{16}$″	1.87
1	※Relay BK-23-A (Switching from one radio control box to the other)	11″ x 7″ x 3″	5.94
2	※Plug PL-117 (Instrument lighting at compass indicator from connector panel)	$\frac{7}{16}$″ diam. x $1\frac{7}{16}$″ long	0.022 ea.
1	※Plug PL-122 (Compass Unit to connector panel)	$1\frac{23}{32}$″ diam. x $2\frac{1}{8}$″ long	0.2
2	※Plug PL-118 (1 for each compass indicator to connector panel)	$1\frac{3}{32}$″ diam. x $1\frac{15}{32}$″ long	0.06 ea.
2	※Chart MC-220	$6\frac{7}{16}$″ x $4\frac{1}{2}$″ x $\frac{3}{64}$″	0.11

NOTES: *When less Mounting FT-213-A size is $19\frac{13}{16}$″ x 12″ x $7\frac{25}{32}$″ and weight is 41 lbs.

**Requires but does not include one set of vacuum tubes.

※See paragraph 9*c* (11) regarding single control installations.

All component parts of this equipment having the same type numbers are interchangeable, viz., radio compass units, loops, loop cords, indicators, and control boxes.

3. ADDITIONAL EQUIPMENT REQUIRED

In addition to the components listed above, there will be required one or two headsets with suitable plug, a suitable non-directional antenna, a 24 to 28 volt DC power source, suitable interconnecting wiring, and five tuning shafts of required length.

4. TOTAL WEIGHT

Radio Compass SCR-263-A complete and ready for service, including 2 Compass Indicators I-65-D, 2 Plugs PL-117, 2 Plugs PL-118, and 2 Charts MC-220, but not including tuning shafts and wiring, weighs 71.864 pounds.

5. POWER CONSUMPTION

All power required for the operation of this equipment is obtained from the aircraft's storage battery. The requirements are:

24 to 28 Volts, 2.65 to 3.0 Amperes.

6. INSTALLATION MATERIAL

Certain Air Corps stock items are required for different installations. For quantities and sizes of such materials and fittings, refer to the Air Corps installation drawings applicable to the particular type of aircraft.

DESCRIPTION OF RADIO COMPASS SCR-263-A

7. DESCRIPTION OF PRINCIPAL COMPONENTS

a. Radio Compass Unit BC-443-A

Radio Compass Unit BC-443-A includes a cabinet, chassis, and Mounting FT-213-A. See Figure 2. The chassis contains Dynamotor DM-30, a No. 6 Allen setscrew wrench, and 6 Tube Shields MC-202. This unit requires, but does not include, one set of vacuum tubes. The radio compass unit contains the compass circuit elements, the superheterodyne receiver circuit elements, and the high voltage power supply. Mounting FT-213-A consists of an aluminum base plate with two Dzus fasteners for holding the cabinet sub-base.

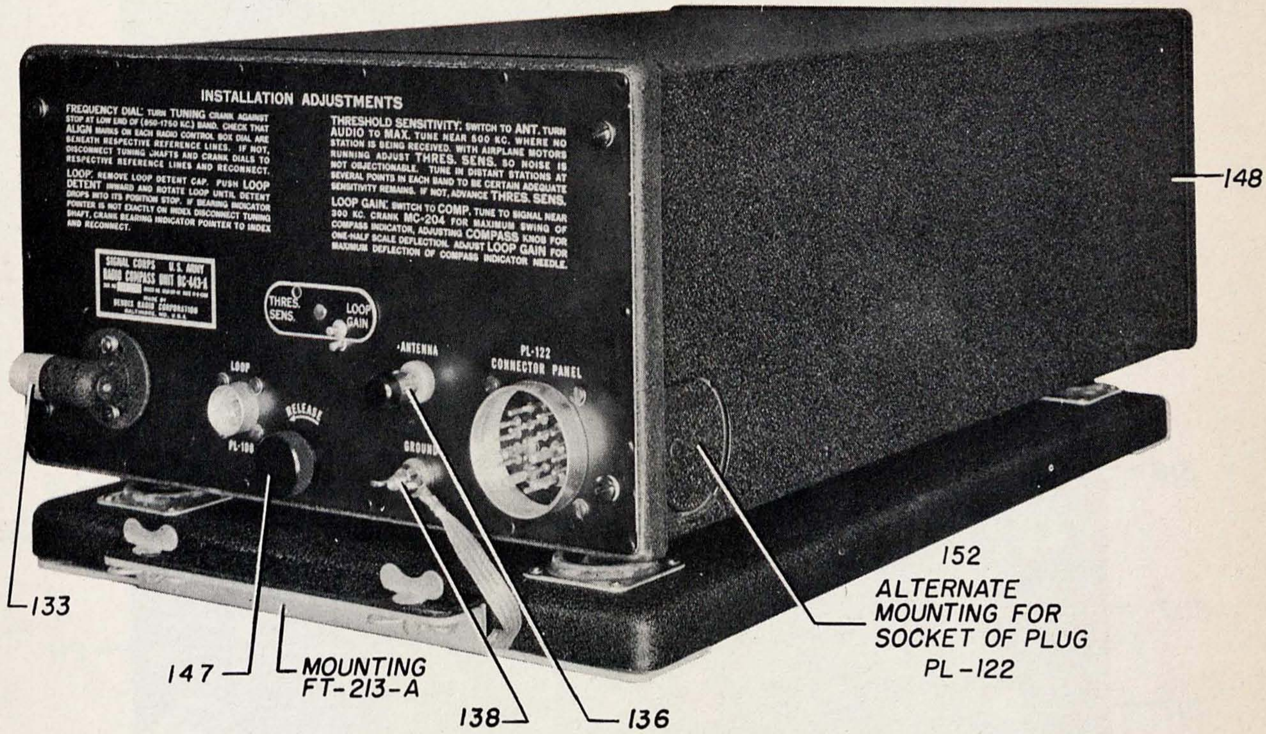

FIGURE 2 — RADIO COMPASS UNIT BC-443-A, FRONT RIGHT OBLIQUE VIEW

b. Radio Control Box BC-444-A

One or two radio control boxes are a part of each Radio Compass SCR-263-A, thus providing one or two remotely located control positions. Each box provides complete control of the equipment, selection of the controlling position being determined by either operator. Each Radio Control Box BC-444-A includes 5 Lamps LM-32 (3 in use and 2 mounted spares), 1 No. 6 Allen setscrew wrench, and 1 control box base. These boxes are built in two sections and are constructed for mounting in a rigid conduit system (see Figure 23). Each control box contains a tuning crank and illuminated dial, a band selector switch, "OFF-COMP.-ANT.-LOOP" switch, control switch, pilot light, an illuminated tuning meter, and light intensity, audio volume, and compass sensitivity controls. When only one control box is installed the control switch is inactive.

c. Loop LP-19-A

Loop LP-19-A consists of an 8-turn coil with center tap, shielded electrostatically and enclosed in a zeppelin type housing. Electrical connection to the loop is made through terminals 2, 3, and 4 of the socket for Plug PL-108 in the base of the housing, and rotation of the loop is accomplished by means of tuning shaft fittings on the base.

d. Indicator I-75-A (Bearing)

Essentially, Indicator I-75-A (Bearing) consists of a double-ended tuning shaft drive to which is connected, through an appropriate gear and cam drive, a pointer which moves over the bearing scale. The cam automatically applies the radio compass deviation correction, and a knob-controlled movable scale is provided to set the magnetic heading of the aircraft and compensate for East or West variation.

DESCRIPTION OF RADIO COMPASS SCR-263-A

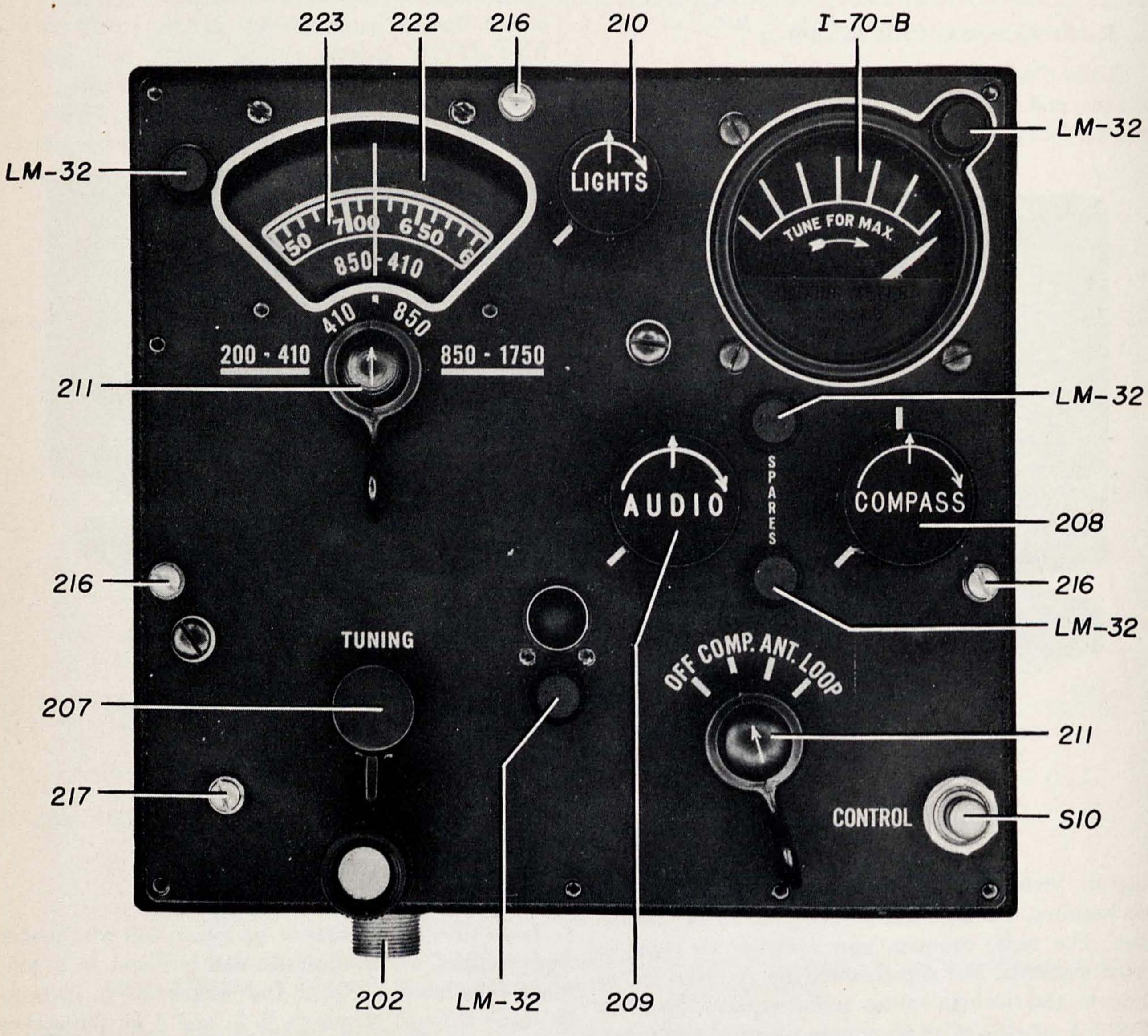

FIGURE 3 — RADIO CONTROL BOX BC-444-A, FRONT VIEW

e. Compass Indicator I-65-D

One or two Compass Indicators I-65-D are used with Radio Compass SCR-263-A, (one for each operating position). They are provided with rim lighting, and the dials are marked with a small conventionalized figure of an airplane to indicate "On Course" flight. The movement is of the iron-core dynamometer type, with the field coil acting as the plate circuit inductance for the audio oscillator.

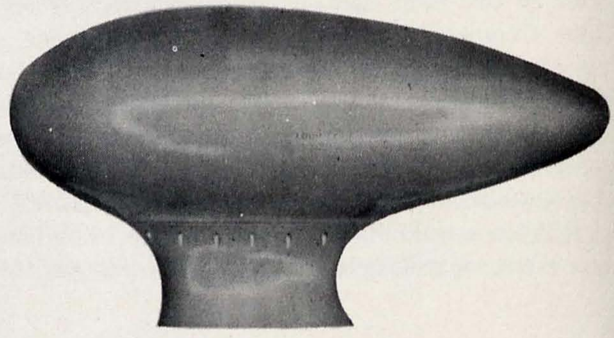

FIGURE 4 — LOOP LP-19-A

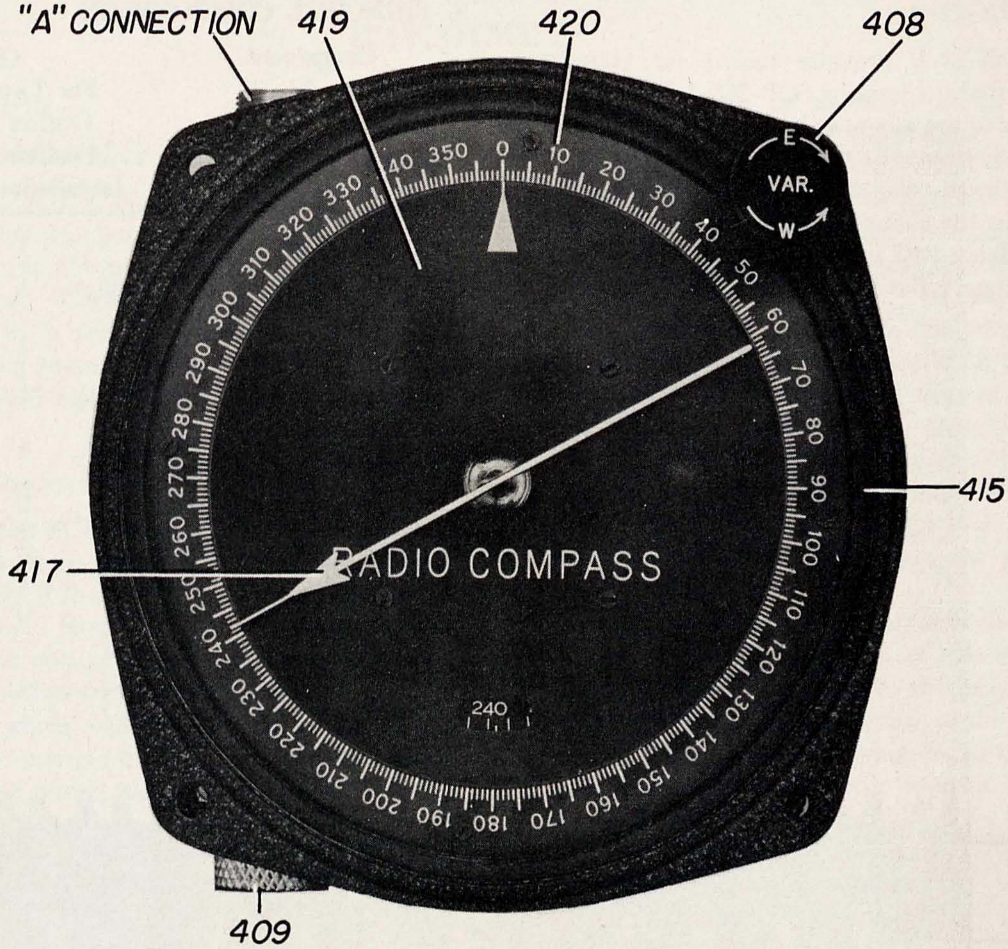

FIGURE 5 — INDICATOR I-75-A (BEARING), FRONT VIEW

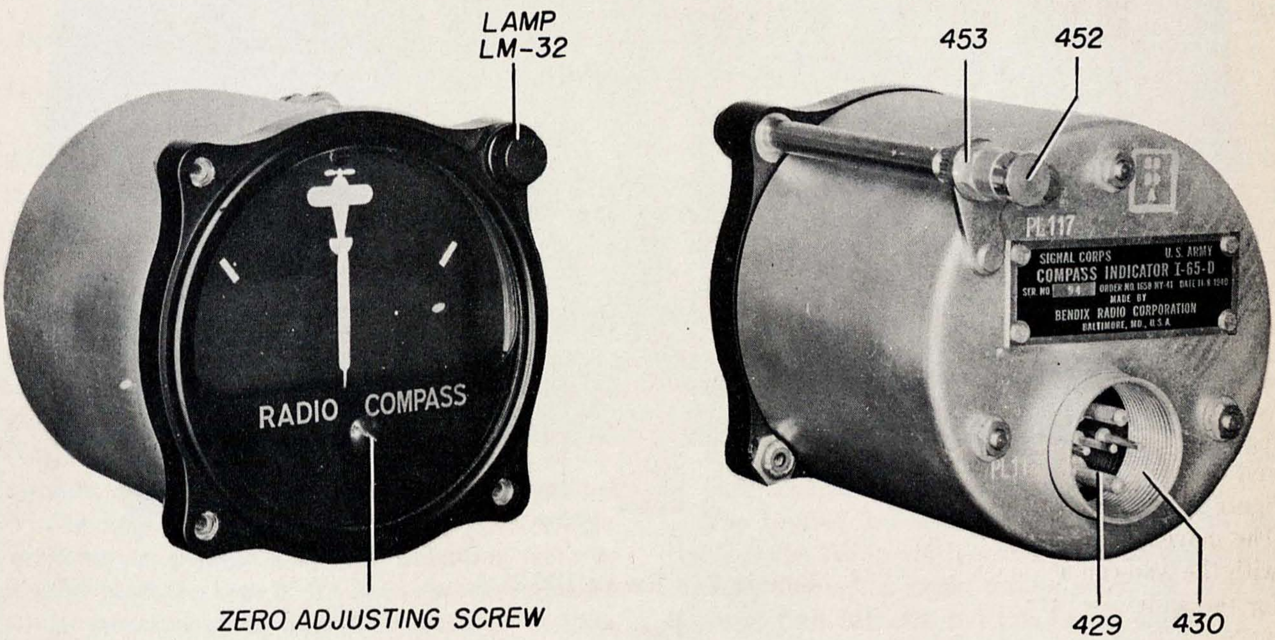

FIGURE 6 — COMPASS INDICATOR I-65-D

DESCRIPTION OF RADIO COMPASS SCR-263-A

f. Relay BK-23-A

Relay BK-23-A provides means for transferring control of Radio Compass SCR-263-A from one radio control box to the other, and means for electrical interconnection between the various units. It is a solenoid-operated, eleven-pole, double-throw type, designed for mounting in the connector box in the aircraft conduit system. Relay RE7 is a part of this unit and controls the low voltage input to the equipment.

8. PRINCIPAL COMPONENTS

Component	Quantity For Two Control Position Installations	Quantity For Single Control Position Installations
Compass Indicator I-65-D	2	1
Control Unit MC-204	1	1
Cord CD-365 or Cord CD-365-A (loop connecting)	1	1
Coupling MC-203	1	0
Indicator I-75-A (Bearing)	1	1
Loop LP-19-A (includes housing and mounting)	1	1
Radio Compass Unit BC-443-A, includes Mounting FT-213-A	1	1
Radio Control Box BC-444-A	2	1
Relay BK-23-A	1	0
Chart MC-220	2	1
Set of Tubes	1	1
Relay RE7	0	1

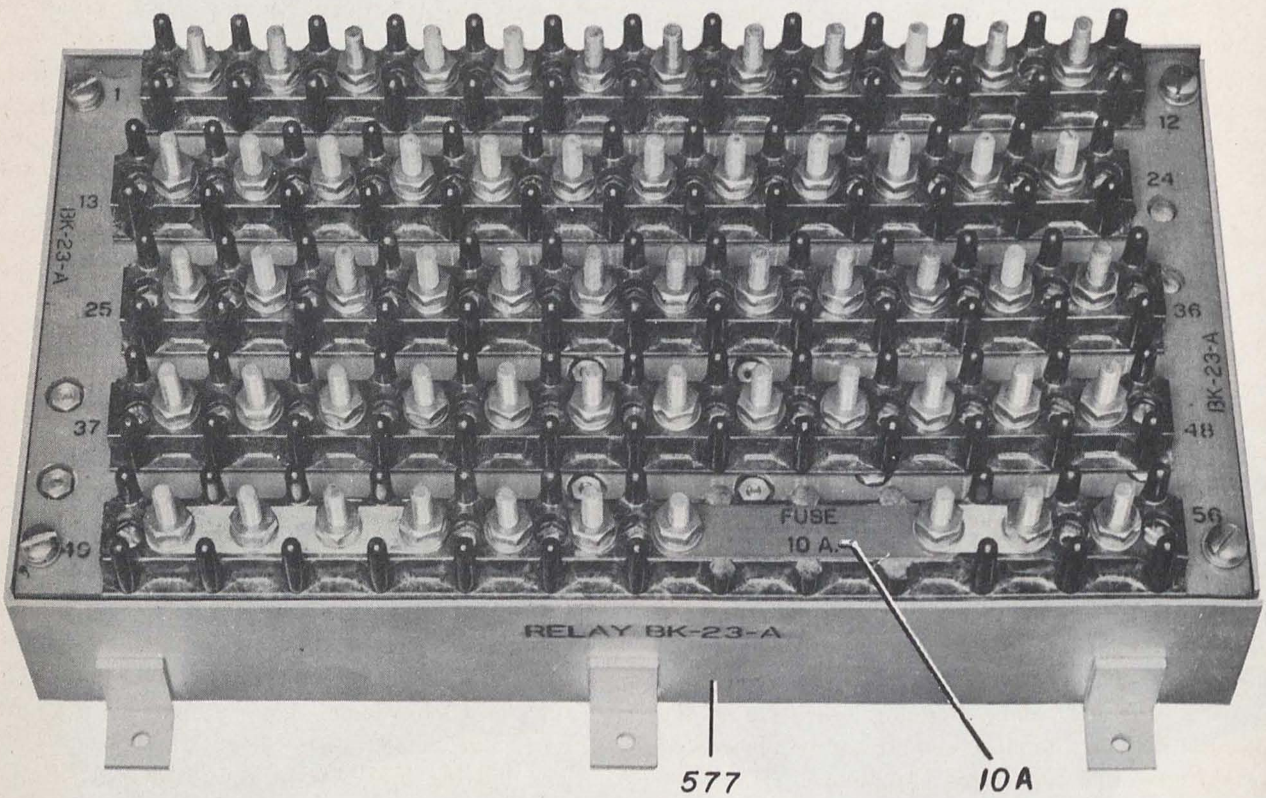

FIGURE 7 — RELAY BK-23-A

SECTION II
EMPLOYMENT

9. INSTALLATION

a. Bonding and Shielding

Satisfactory operation of radio receiving equipment in aircraft will depend upon the efficiency of the shielding and bonding of the ignition, generator, and other electrical systems. The requirements for shielding and bonding set forth in Air Corps Technical Orders and the Handbook of Instructions for Airplane Designers should be complied with in making any radio compass installation.

b. Antenna Requirements

Radio Compass SCR-263-A is designed to provide optimum performance with a non-directional antenna of approximately 0.25-meter effective height and 50-mmf capacitance. However, the non-directional antenna size is not critical and satisfactory operation is possible over a rather wide range of sizes.

On aircraft which will accommodate any one of several types of antenna installation, it is desired that the type be used which most nearly meets the above requirements, and has the largest ratio of vertical to horizontal length. Vertical rod antennas and T-type wire antennas supported by stub masts have been found satisfactory. No antenna or lead-in should be placed within three feet of the loop. Care should be taken in installing the lead-in to keep its capacitance as low as possible.

c. Installation of Components

(1) Loop LP-19-A

Loop LP-19-A should be located on the fore-and-aft center line of the fuselage in a position as far as practicable from sources of engine interference, metal masses, and conductors. To determine the actual location of the loop, consideration must be given to the following: The space available for both the loop and its base and housing, structural requirements, length of Cord CD-365, the location of the compass unit, and other factors incident to the normal use of the aircraft.

Areas affecting safety in flight, operation of the aircraft, and maintenance should not be obstructed by the loop and associated equipment. It will be necessary to provide a suitable mounting plate no smaller than the base of the loop, securely attached to the structure of the aircraft, to support the loop. The loop should not be mounted on the primary structure of the aircraft on installations where the loop is mounted below the aircraft since, when landing with wheels retracted, the aircraft might be damaged beyond repair. This plate must have clearance holes for loop cord, detent cap, and tuning shaft fittings (see Figure 59). In locating the mounting holes (see Figure 59), the fore and aft holes should be approximately parallel to the center line of the fuselage. The broad nose of the loop housing must face forward. The assembly of the mounting to the support should be such as to prevent water, oil, dirt, etc., from entering the fuselage. The loop base is fastened to the ship with four $\frac{1}{4}$-28 bolts, which must not project into the loop base more than $\frac{7}{16}$ inch.

Plug PL-108 on Cord CD-365 is connected into the socket provided on the bottom of the loop base. The tuning shaft is connected to the proper tuning shaft fitting provided on the bottom of the loop base in accordance with the following paragraph. The two tuning shaft fittings provide opposite loop rotation and the fitting used should be selected very carefully and checked. If the wrong fitting is used, the direction of loop rotation will be incorrect. After the correct fitting has been determined, the tuning shaft should have a permanent tag attached bearing the correct fitting letter, either A or B. This is very important for replacement and maintenance purposes. The tag may be a thin metal band $\frac{1}{2}$ inch wide.

(*a*) Direction of Rotation

Because of the flexibility of this equipment, various combinations of loop and bearing indicator rotation may occur. These are dependent on which tuning shaft fitting is used on the bearing indicator, which tuning shaft fitting is used on the loop, and whether the loop is mounted on the top or the bottom of the aircraft.

The loop tuning shaft connection only should be made in accordance with the following table. All other tuning shaft connections may be made in the most convenient manner possible for the particular installation involved.

The bearing indicator fitting referred to in the table is the fitting which connects to the loop, either directly through a single tuning shaft, or through Control Unit MC-204 and two tuning shafts.

EMPLOYMENT

Loop Location On Aircraft	Bearing Indicator Fitting	Use Loop Tuning Shaft Fitting
Top	A	B
Bottom	A	A
Top	B	A
Bottom	B	B

(2) Indicator I-75-A (Bearing), Control Unit MC-204, and Tuning Shaft

Indicator I-75-A (Bearing) should be mounted so that the entire bearing scale is visible to the operator. It should be mounted close enough to enable the operator to set up heading and magnetic variations by turning the "VAR." knob in one corner of the bearing indicator. Provision is made for mounting the bearing indicator on a flat surface or flush on a panel. If it is decided to mount it on a panel, a ⅜-inch hole in one corner will be necessary for the "VAR." knob and a 5-inch hole to expose the face of the instrument. Three holes are provided for panel mounting and four for surface mounting. See outline drawing in Figure 60 for mounting dimensions. The face of the instrument is arranged so that it can be rotated in 90° steps to allow mounting in any one of four positions. To change its position, remove the snap ring and the glass and the four small screws holding the face inside of the scale, being careful not to scratch the scale. Rotate the face to the desired position without raising it to hit the pointer, and replace the four screws. Before final tightening, check the "VAR." knob for freedom of rotation. Replace the glass and snap ring. In this fashion the tuning shaft fitting can be installed in either corner at any one of the four sides of the Indicator I-75-A (Bearing). This allows convenient tuning shaft entrance.

The Control Unit MC-204 should be mounted within convenient reach of the operator so that it can be cranked easily. By separating the bearing indicator and the control crank in this manner, a more convenient installation can be made for the operator. Control Unit MC-204 should be mounted so that when the crank is turned clockwise, the bearing indicator pointer rotates clockwise. The direction of rotation can be reversed by turning the control unit 180° on its mounting. Convenience to the operator is the only other consideration when mounting the control unit.

In addition to the necessity for making proper connection for correct direction of rotation, it is necessary that the pointer of the bearing indicator be properly aligned with the loop. After connecting the tuning shafts to Loop LP-19-A, Control Unit MC-204, and Indicator I-75-A (Bearing), depress the detent located adjacent to the tuning shaft fittings on the base of the loop and rotate the loop slowly by means of the crank on Control Unit MC-204 until the detent drops into its slot, which stops further rotation of the loop. To gain access to the detent plunger, remove the small threaded plug in the bottom of the loop base. When the detent plunger has dropped into its slot on the loop shaft gear, the loop is within ±3° of its proper zero position with respect to the fore-and-aft axis of the aircraft. Now remove the tuning shaft connection to the loop, and rotate the control unit crank until zero on the inner dial on the face of the bearing indicator is aligned accurately with the zero index. The main pointer should also be at the zero index if there has been no correction applied to the compensator adjusting screws. Now reconnect the tuning shaft to the control unit. This completes the installation of Loop LP-19-A, Indicator I-75-A (Bearing), and Control Unit MC-204, with interconnecting tuning shafts. For accurate alignment of the bearing indicator pointer, see paragraph 10*b* (4).

(3) Radio Compass Unit BC-443-A, Including Mounting FT-213-A

Radio Compass Unit BC-443-A (includes Mounting FT-213-A) should be so installed that sufficient clearance is allowed on all sides for free action of the shock absorbers, for adjustment of "THRES. SENS." and "LOOP GAIN" controls, and for removal of the unit from the mounting. Provision is incorporated in the radio compass unit for changing the location of socket 142 and 143 from the front panel to the right side of the chassis. This operation is effected by removing the four screws which secure the socket and the four holding the socket-hole cover plate 152, and interchanging the positions of these items. Care should be taken not to break the wires connected to the socket or to damage the terminals. Mounting FT-213-A should be secured to the principal structure of the aircraft by six No. 10 screws. Mounting dimensions are shown on Figures 56 and 57. The mounting should be bonded to the metallic frame work of the aircraft, and the ground braid on the mounting must be fastened to the ground post on the radio compass unit.

(4) Radio Control Box BC-444-A and Chart MC-220

Each Radio Control Box BC-444-A should be located where the panel will be easily visible and the controls accessible to the operator. Consideration must be given to providing clearance for connection of the tuning shaft and the cable or conduit to the connector panel.

No mounting holes are provided in the base of the control box since the requirements will vary with individual installations (see Figure 58). In drilling such holes, care must be taken not to damage the wiring in the base and to clean out carefully all metal chips to avoid the possibility of short circuits or fouled gears.

The panel of Radio Control Box BC-444-A plugs into its mounting base. (Figure 23.) The plug release screw 217 at the lower left corner near the tuning crank must be tightened first, after which the three captive mounting screws (216) may be tightened. When removing Radio Control Box BC-444-A, the plug release screw at the left of the tuning crank must not be loosened until the captive mounting screws have been fully released.

Chart MC-220 should be mounted near each radio control box so as to be easily read by day or night.

(5) Compass Indicator I-65-D

Compass Indicator I-65-D is designed for standard 3-$\frac{1}{4}$ inch instrument panel mounting. Space for the pilot's compass indicator is normally available on the instrument panel near the other flight instruments. The navigator's compass indicator should be located where it will be easily visible to the observer. Mounting dimensions for the compass indicators are shown in Figure 62. Clearance must be allowed for the installation of the connecting cables. It will not be necessary to shockmount the compass indicators if the panel on which they are mounted is provided with shock absorbers. For other installations, shockmounting must be provided. The lighting cable, which is terminated in Plug PL-117, should be connected to the 3-volt instrument lighting system. If such a system is not available, a 120-ohm, 5-watt resistor must be connected in series with the 28-volt DC supply and the lighting cable to each compass indicator. When only one compass indicator is used, it will be necessary to connect a 35,000-ohm, $\frac{1}{2}$-watt resistor in parallel with a 0.1-mfd capacitor between terminals 39 and 41 on the terminal board of Relay BK-23-A or between terminals 14 and 16 on the connector panel on single remote control installations. The addition of this resistance is necessary to maintain the audio oscillator output voltage at its proper value. Connection to the light circuit (Plug PL-117) may be omitted in aircraft which are equipped with fluorescent lighting.

(6) Tuning Shaft and Coupling MC-203

The tuning shaft should be run in a straight line, avoiding as many bends as is practicable. Where bends are necessary, the radius of bend should be as large as is practicable, and in no case less than 6 inches. The shaft must be held firmly in place to prevent movement and must be well bonded.

Coupling MC-203 (used only when two control boxes are installed) must be mounted with four No. 8 screws on a solid surface between the Radio Compass Unit BC-443-A and the two Radio Control Boxes BC-444-A. Connect a tuning shaft between the center fitting of the coupling unit and the right angle drive 133 on the front panel of the radio compass unit. This right angle drive may be rotated to any one of eight positions by removing the screws which hold it to the panel; further adjustment by means of slotted holes permits a movement of 20 degrees from any one of these eight positions. Next connect the other two tuning shafts to the two end fittings of the coupling unit. Temporarily connect one of these shafts into a radio control box and rotate the tuning crank in a counterclockwise direction until the stop is reached. This stop is mounted on the gang capacitor and establishes the maximum capacitance end of capacitor rotation. Disconnect the tuning shaft from the radio control box and rotate the dial on each of the radio control boxes to the alignment mark which appears at the low frequency end of the 850–1750 kcs band. Connect the tuning shafts to the radio control boxes.

(7) Relay BK-23-A

NOTE: Relay BK-23-A is not used with single control installations (see paragraph 9c (11)).

Relay BK-23-A is provided with six mounting lugs by which the relay unit is to be securely mounted into the connector panel provided in the aircraft wiring system. It should be centrally located on the connector panel to allow sufficient clearance on all sides for wiring. The cables to the relay terminals should be arranged and bound in place so that they enter the relay from one side. The relay panel screws may then be removed and the relay panel folded outward to expose the internal parts for inspection without disconnecting any cable. In mounting the relay, the six mounting lugs should be adjusted to an even tension in order to keep the relay base from warping and thus causing the contact mechanism to bind. After installation, a 28-volt external supply should be used to check the operation of the relay. Mounting is provided on the terminal panel for an Air Corps 10-ampere fuse.

EMPLOYMENT

(8) Cord CD-365 or Cord CD-365-A

Cord CD-365 or Cord CD-365-A connects Radio Compass Unit BC-443-A to Loop LP-19-A, through its terminal Plugs PL-108. *Do not alter the length of this cord.* If it is too long, the excess may be coiled wherever convenient. If it is too short, a request for a longer cord should be forwarded through the proper channels.

(9) Plugs and Wiring

Plugs and wiring should be in accordance with applicable installation drawings for the particular aircraft. Refer to the Handbook of Instructions for Airplane Designers and to the applicable drawings. The wires should be bundled and taped or wrapped with cord for about 2 inches back from the plug. This prevents abrasion of the insulation by the ferrule.

In soldering wires to the plug terminals, the following method should be employed:

(*a*) Disassemble the plug by removing the spring retainer ring and withdrawing the plug body from the shell. Remove the slotted bakelite disk, and withdraw the terminals from the plug body.

(*b*) Remove the insulation on the individual wires for a distance of $\frac{3}{8}$-inch and tin the ends of the wires.

(*c*) Run all wires through the metal shell of the plug.

(*d*) Slip a $\frac{3}{8}$-inch length of spaghetti tubing over each wire, leaving the tinned ends clear.

(*e*) Tin the cups of the terminals, being careful not to spill solder into the pin receptacle.

(*f*) Solder the terminals to the wire, using sufficient solder to fill the cups. Test each terminal to be sure that the joint is secure.

(*g*) Reassemble the plug body in the metal shell, making sure that each terminal is in its proper place in the plug body and that the spaghetti tubing is pushed down over the soldered joint. The plug retaining ring should fit snugly around the groove in the plug shell. If it is bent away from the groove, the ring may cause grounds on the socket pins.

(10) Cooperation with Other Equipments

(*a*) Marker Beacon Receiving Equipment

Provision has been made to supply 28 and 220 volts DC for operation of the above equipment. (See Figure 49.)

(*b*) Interphone

The audio output of Radio Compass SCR-263-A may be connected to the input of the interphone at the connector panel on Relay BK-23-A (see Figure 49).

The interphone input should be connected between terminal 22 and ground terminal 49. Removal of the headset plug at the control box having control connects the input of the interphone to the audio output of the radio compass and allows control of the interphone volume by means of the "AUDIO" knob at the radio control box having control.

When a low impedance interphone system is used, a matching transformer C-289 should be inserted at the connector panel between terminals 22 and 49, as shown in Figure 49 or, in the case of single remote control installations, between terminals 10 and 21, as shown in Figure 51. The top or secondary of the matching transformer C-289, which connects to the interphone, may be connected to any of the unused terminals or the connector panel.

(11) Single Remote Control Installations

(*a*) In installations in which only one control box is used, the quantities of components listed under paragraphs 2 and 3 should be modified as follows:

Quantity	Description
1	Radio Control Box BC-443-A, includes: 5 Lamps LM-32 1 Setscrew Wrench, Allen No. 6 1 Control Box Base
1	Compass Indicator I-65-D, includes: 1 Lamp LM-32
0	Coupling MC-203
0	Relay BK-23-A
1	Plug PL-117 (Instrument lighting at Compass Indicator, from Connector Panel)
1	Plug PL-118 (Compass Indicator to Connector Panel)
1	Chart MC-220
3	Tuning Shafts

The following components must be added:

Quantity	Description
1	Resistor, 35,000 ohm, ½ watt
1	Capacitor, .1 mfd, 400 volts
1	Relay RE7 (On-Off switching)
1	Fuse, Air Corps 10-ampere

(*b*) Figure 50 shows a cording diagram of a single remote control installation. Figure 51 shows a schematic circuit diagram of the wiring between the remote control box, compass indicator, and Plug PL-122 for a single remote installation.

(*c*) Since Relay BK-23-A is not used with the single control installation, the terminal board which is a part of it will not be available. Therefore, it will be necessary to make some provision in a connector panel for the required number of terminals.

(*d*) Relay RE7 (On-Off switching) is a part of Relay BK-23-A assembly in normal dual control installations. The function of Relay RE7 is the same in either case.

(*e*) It will be necessary to mount an Air Corps 10-ampere fuse in the primary circuit as shown in Figure 7. This fuse is mounted on the terminal board of Relay BK-23-A in normal dual control installations but must be added on the connector panel in single control installations.

(*f*) Make certain that the proper changes have been made per paragraph 9*c* (5) so that the single Compass Indicator I-65-D will perform properly. The 35,000-ohm resistor and the .1-mfd capacitor should be added to terminals 14 and 16 as shown in Figure 51.

10. PREPARATION FOR USE

a. Test Before Installation in Aircraft

Considerable time and trouble will be saved if the components of Radio Compass SCR-263-A to be installed in aircraft are interconnected as shown in Figure 47 or Figure 50 and tested before installation. If standard transmission line test set-up, Figure 8, is available, the performance of the equipment should be measured in accordance with paragraph 33. If the test set-up above is not available, the components should be properly interconnected and tested as fol-

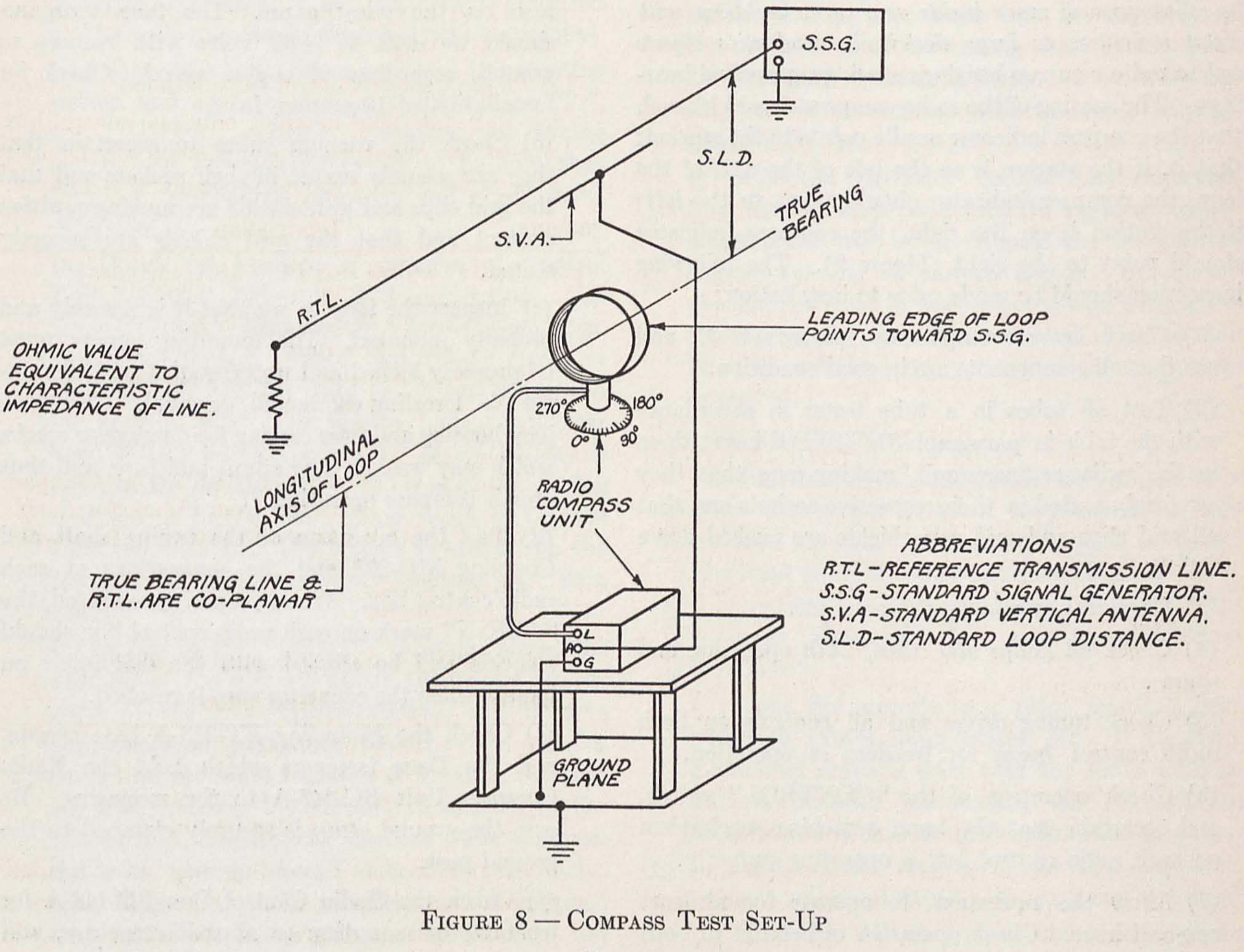

FIGURE 8 — COMPASS TEST SET-UP

EMPLOYMENT

lows, using a non-directional antenna with an approximate effective height of 0.25 meter:

Tune in several radio stations in each band. On each station, operate the equipment on the "COMP.", "ANT.", and "LOOP" positions. When operating the equipment on the "COMP." position, swing the loop right and left and note the degree loop rotation from the null point required for full-scale compass indicator deflection with the "COMPASS" control set fully clockwise. This rotation should be 5 degrees or less for a signal of approximately 1000 microvolts per meter. Note the "On Course" and "Reciprocal" bearings. The "On Course" bearing should check geographical bearings within 1 degree. From a knowledge of the distance, power, and direction of the station, a rough check may be obtained of the performance of the equipment. These tests should be made in an isolated position free from electrical interference, and at least 200 feet distant from large electrically conductive objects, such as buildings, hills, power lines, railroads, etc. *Sensing or bearing accuracy checks cannot be relied upon if made inside or close to buildings with metal structures or large electrically conductive objects* unless radio compass bearings check geographical bearings. The sensing of the radio compass should be such that the compass indicator needle points to the station; that is, if the station is to the left of the axis of the loop, the compass indicator should point to the left; if the station is on the right, the compass indicator should point to the right (Figure 9). The following inspection should be made prior to installation:

(1) Check list of components (paragraph 2), and see that all components are in good condition.

(2) Test all tubes in a tube tester in accordance with the table in paragraph 31*d* (3) and insert them in the radio compass unit, making sure that they are firmly seated in their respective sockets and that all grid clips and grid cap shields are pushed down tightly.

(3) Check safety wiring of dynamotor.

(4) Check all lamps and fuses, both operating and spares.

(5) Check tuning drives and all controls on both radio control boxes for freedom of operation.

(6) Check operation of the "CONTROL" switch, and ascertain that the band switching mechanism on each radio control box is operating properly.

(7) Allow the equipment to operate for at least one-half hour. Check operation of headset in both headset jacks. Vibrate or jar the equipment. Any clicks or increase in noise will require a thorough investigation and removal of the cause. Improper soldering of wires to the plugs and noisy vacuum tubes are the most common sources of trouble.

(8) If the equipment does not seem to be operating satisfactorily, the interconnecting leads and vacuum tubes should be rechecked and equipment known to be in good condition substituted for the faulty component. If the faulty component is a Signal Corps item, it should be returned to the Signal Corps Repair Section at the appropriate Air Depot for repair or replacement.

b. Adjustments After Installation

After the radio compass has been installed in the aircraft, the following tests and adjustments should be made before placing the equipment in service:

(1) Initial Checks

(*a*) Before turning on the radio compass, check the battery voltage and polarity at both sides of the fuse on the relay panel. The fuse terminals should be +24 to +30 volts with respect to ground, regardless of engine speed. Check for installation of 10-ampere fuse.

(*b*) Check the vacuum tubes to ascertain that they are securely seated in their sockets and that the grid clips and grid shields are making positive contact and that the grid shields are securely seated.

(*c*) Inspect the loop to see that it is securely and properly mounted. The mounting screws must be properly locked and waterproofed with Permatex No. 1 sealing compound, or equal. Check the loop housing and base casting for damage or cracks which may weaken it or admit moisture, and thus impair compass operation.

(*d*) Test the operation of the tuning shaft and Coupling MC-203 and the connections at each radio control box. When properly connected, the "ALIGN" mark on each radio control box should coincide and be aligned with the dial index on band 3 when the capacitor stop is reached.

(*e*) Check the Mounting FT-213-A base screws, and the Dzus fasteners which hold the Radio Compass Unit BC-443-A to the mounting. Be sure the ground strap is securely clamped to the ground post.

(*f*) Check the Radio Control Box BC-444-A for tightness of mounting to aircraft structure, and check mounting screws on panel for tightness.

(*g*) Check the non-directional antenna. See that the connections are properly and securely made.

(*h*) Be sure that Cord CD-365 or Cord CD-365-A is secured and that ground braids at each end of the cord are bonded to the structure of the aircraft. Check the tightness of Plugs PL-108 and the ferrule couplings on the plugs.

(*i*) Check for presence and operation of instrument lights. Also check light controls.

(*j*) Using a Headset HS-18 or HS-23, check loop, antenna, and compass operation and compass indicator response on all three bands. Jar the Radio Compass Unit BC-443-A to check for possible sources of noise.

(*k*) Switch Radio Compass SCR-263-A on and off, and note whether or not the magnetic compass is affected.

(*l*) Check for effects of other radio equipment in the aircraft upon the communicational and navigational performance of the radio compass. Also, determine the extent of any interference produced by the radio compass in the other radio equipment.

(*m*) Tune the radio compass to a transmitting station and operate on the "COMP.", "ANT.", and "LOOP" positions. Examine the tuning meters and compass indicators to be sure that they are functioning properly, and check aural reception.

(*n*) Check for freedom of rotation of Control Unit MC-204, Indicator I-75-A (Bearing), and Loop LP-19-A. Remove the "Zero Detent" cap, press the plunger inward and rotate crank of Control Unit MC-204 until the detent drops into the position slot. The bearing indicator pointer head should be on the index. If the pointer is not exactly on the index, disconnect the tuning shaft going to the loop, rotate crank of Control Unit MC-204 until the pointer is exactly on the index point, and reconnect. Replace the "Zero Detent" cap.

(*o*) Switch to the "COMP." position, swing the heading of the aircraft about 15 degrees to the right of the transmitting station, and observe the Compass Indicators I-65-D. The needles should deflect toward the left of the dial. Repeat the test, heading the aircraft 15 degrees to the left of the transmitting station. The compass indicator needles should deflect to the right. (See Figure 9.) The sensing may be reversed from the above if the compass indicators are not properly connected at the relay panel or if either the loop or the antenna is mounted on the top of the aircraft and the other beneath. If both loop and antenna are mounted on either the top or the bottom of the fuselage, the sense will be correct if all connections are made in accordance with Figure 49. If they are mounted on opposite sides, the sense should be corrected by reversing the field leads 3 and 5 to both Compass Indicators I-65-D at terminals 39 and 41 on Relay BK-23-A in the connection box. The wires in Cord CD-365 or Cord CD-365-A should never be disturbed.

(*p*) To check the sensing of the pointer on the Indicator I-75-A (Bearing), head the aircraft directly toward the transmitting station again. Turn the "VAR." knob until zero is opposite the index mark. Now rotate the crank on Control Unit MC-204 until the bearing is 15 degrees. The Compass Indicator I-65-D needle should deflect to the left. Set the bearing to 345 degrees. The compass indicator needle should be deflected to the right. If the sense of the bearing indicator pointer is not in accordance with the above, check the connections of the tuning shaft at the Loop LP-19-A and bearing indicator to be sure that they are in accordance with the table in paragraph 9*c* (1) (*a*).

(*q*) With the "AUDIO" control fully clockwise, tune through each band with the engines stopped, and note the noise level. Repeat the test with the engines running at various speeds. If any appreciable increase in noise is noted with the engines running at any speed, the aircraft shielding and bonding and the battery circuit filtering must be improved.

(2) "LOOP GAIN" Adjustment

The function of the "LOOP GAIN" control is to provide the proper ratio of loop signal to non-directional antenna signal. The control is located on the front panel of Radio Compass Unit BC-443-A, and access to it is obtained through a hole in the front panel (Figure 2). The adjustment procedure is as follows:

(*a*) Take the aircraft to a place removed from buildings, power lines, fences, etc. If the non-directional antenna used with the radio compass unit is installed underneath the aircraft, the adjustments should be made while the aircraft is in flight, as the pick-up of the non-directional antenna will be affected by its proximity to ground.

(*b*) Turn the "LOOP GAIN" control at about the midpoint of its range of rotation, and set the

EMPLOYMENT

"OFF-COMP.-ANT.-LOOP" switch at the "COMP." position.

(*c*) Tune in a strong signal and rotate the loop until an "On Course" indication is obtained on the Compass Indicator I-65-D.

(*d*) Rotate the loop 90°, and turn the "COMPASS" control knob until less than full-scale deflection is obtained.

(*e*) Turn the "LOOP-GAIN" control slowly in a clockwise direction until further clockwise adjustment no longer results in increased indicator deflection, readjusting the "COMPASS" control if necessary to prevent off-scale deflection.

(3) Threshold Sensitivity Adjustment

The purpose of the "THRES. SENS." control is to reduce the noise output of the Radio Compass Unit BC-443-A when tuning between stations. The control is located on the front of the compass unit, access to it being obtained through a hole in the front panel. Adjustment should not be undertaken until the interference from the aircraft ignition, generating, and electrical systems has been reduced to the lowest possible level. The adjustment procedure is as follows:

(*a*) Set the "OFF-COMP.-ANT.-LOOP" switch to the "ANT." position, and the "AUDIO" control fully clockwise.

(*b*) Turn the "THRES. SENS." control to its maximum clockwise position.

(*c*) Set the band selector switch on the 410-850 kcs band, and tune the radio compass unit to a point near the middle of the band where no station is being received.

(*d*) With the aircraft motors operating at normal cruising speed, turn the "THRES. SENS." control counterclockwise until the noise received in the headset is of appreciable, but not objectionable, loudness.

(*e*) Tune the radio compass unit throughout its frequency range to ascertain that the sensitivity at all points of the frequency spectrum. It may be necessary to tolerate a somewhat higher noise level on the lower frequencies in order to obtain proper sensitivity on the higher frequencies.

(4) Indicator I-75-A (Bearing) Adjustment and Connection to Loop LP-19-A

NOTE: WHENEVER INDICATOR I-75-A (BEARING) IS USED PRIOR TO ADJUSTMENT OF THE RADIO COMPASS DEVIATION COMPENSATORS (PARAGRAPH 10*b* (6)), THE BEARING POINTER READING SHOULD COINCIDE WITH THE INNER DIAL READING AT EACH 15° POINT. IF IT DOES NOT, THE RADIO COMPASS DEVIATION COMPENSATORS SHOULD BE ADJUSTED ACCORDINGLY, USING THE METHOD OF PARAGRAPH 10*b* (6).

(*a*) The loop must be set in each installation so that an "On Course" indication is obtained when the transmitting station is directly ahead of the aircraft and the pointer on Indicator I-75-A (Bearing) is set to zero index. If the Loop LP-19-A is set and connected to Indicator I-75-A (Bearing) in accordance with instructions in paragraph 9*c* (2), the zero setting will be accurate within 3 degrees, but it should be checked and accurately set to ±0.5 degree by heading the aircraft accurately toward a transmitting station. Tune the radio compass to this transmitting station and set the "COMPASS" control fully clockwise.

(*b*) Now rotate the loop until the Compass Indicator I-65-D needle is accurately centered on its "On Course" position. If the bearing indicator reads other than zero, remove the tuning shaft at the loop side of the Control Unit MC-204, and, without moving the loop, rotate the control unit crank until the bearing reading is exactly zero, and reconnect the tuning shaft.

(*c*) In order to provide an exact method of locating this zero position of the loop at later times, an adjustment has been provided on the loop detent. To set this detent, leave the loop on its bearing zero as determined above, and by means of a small tool formed from #9 wire, pull out on the detent plunger, located on the bottom of the loop base under the tapped plug cover adjacent to the shaft fittings, and rotate it one tooth at a time, each time pushing inward on it to determine if it drops into the loop alignment slot. When the position of the detent plunger is found that allows it to be pushed inward about 3/8 inch, the adjustment is complete. If the Indicator I-75-A (Bearing) or Loop LP-19-A tuning shafts are removed at any time for any reason, it will be necessary to recheck the loop bearing zero as follows:

(*1*) While holding the loop detent plunger tightly inward against its spring, slowly rotate the loop until the detent is felt to drop into its alignment position.

(2) Disconnect the loop tuning shaft.

(3) Rotate the control unit crank until the bearing indicator pointer is at the zero index.

(4) Reconnect the loop tuning shaft to the control unit.

(d) To obtain good bearing accuracy throughout the entire azimuth circle, it is important that the loop "On Course" position be determined and corrected to within ±0.5 degree. The determination of loop "On Course" position can be made either in the air or on the ground, the method used depending on such factors as the type of airplane, the radio compass loop position (above or below fuselage), the available personnel, and the ground facilities. Two methods applicable for original determination of the loop position or for final flight checking are as follows:

(1) Select a road or series of landmarks lying in a direct line to a radio transmitting antenna. Fly along this reference line and rotate the loop off zero by the amount necessary to center the compass indicator. Record this information so that the Indicator I-75-A (Bearing) can be reconnected to read zero degrees for this loop position.

(2) The second method is for those airplanes having a drift meter. "Home" on a nearby radio station with Indicator I-75-A (Bearing) at zero, and, by using the vertical scanning feature of the drift meter, bring into view the transmitting antenna at a distance of one or two miles before it is reached. Record the drift meter horizontal azimuth reading for the zero center reading of the compass indicator. The observation is made before reaching the antenna to avoid any error which may be caused by the "cone of silence." The drift meter will show the number of degrees which the loop must be moved in a corrective direction to obtain accurate positioning with respect to the airplane.

(e) Determination of the correct loop position may be accomplished on the ground as follows: At a selected test location (either a compass rose, ramp, or other convenient place), where there are no conditions likely to distort a radio field, determine the exact geographical line to a radio station providing a noise and interference free signal at some frequency between 200 and 1000 kcs. Check this azimuth line by taking a radio bearing on the radio station, using a bench set-up of the radio compass at the test location. If the radio bearing reads within ±1.5° of the azimuth line, no appreciable distortion exists. If the deviation is more than ±1.5°, another station or location should be selected. Drop plumb bobs from the center of the nose and tail of the aircraft and move the aircraft over the line (in flying position if practicable), with the nose headed toward the radio station, until the plumb bobs center on the line. Adjust the bearing zero, as described above, so that the bearing reading is exactly zero when the Compass Indicator I-65-D needle is at its "On Course" position. This setting should be checked in flight, especially if the loop is mounted beneath the aircraft.

(5) Radio Compass Deviation Calibration

It will be necessary to check the direction of radio bearings every 15 degrees from the fore-and-aft axis of the aircraft in order to determine and compensate for deviations caused by distortion of the radio field pattern due to wings, engines, propellers, antennas, and other parts of the aircraft.

The calibration may be made on the ground for installations in which the loop is on top the airplane; however, for installations with the loop beneath the fuselage, the use of a flight method is necessary if accuracy is to be obtained. Since ground methods require more time and more personnel and do not obviate the necessity for checking in the air, they will not be discussed in detail. Calibration data may be obtained in flight by the following method:

(a) Select a medium or high powered radio station between 25 and 100 miles distant from the locale at which the test is to be conducted. The radio station selected should not be in a congested channel where high powered adjacent channel signals can, by slight mis-tuning, cause bearing errors. The station should normally provide good bearings with little or no fluctuation of the compass indicator needle.

(b) Select a day when the wind is less than eight miles per hour in order to avoid excessive drift angles, and when the air is smooth in order to avoid errors in reading the bearing angles. Do not make the calibration within one hour of sunrise or sunset or when wide fluctuations of bearings are noted.

(c) At some time prior to take-off, rotate Indicator I-75-A (Bearing) to see that there is no correction set up on the instrument. Turn the pointer of Indicator I-75-A (Bearing) by means of Control

EMPLOYMENT

Unit MC-204 to successive 15-degree positions of the inner dial scale (as seen through the small window beneath the word "RADIO COMPASS"), and see that the indicated bearings correspond to these inner dial readings. The outer dial zero should be at the index mark, and care should be taken not to move the "VAR." knob during this check.

(*d*) Select a landmark or series of landmarks (such as a road, railroad tracks, section lines, etc.) which will provide a direct line toward the radio station. Since power lines or railroads on or adjacent to the landmark can distort the radio path, a check should be made to determine whether or not distortion is present. This can be done by crossing the power line at various angles while maintaining fixed courses by means of the directional gyro. If the bearing changes rapidly as the line is approached, distortion is present and should be eliminated by flying at a greater elevation, or by selecting a new reference landmark.

(*e*) With the aircaraft in level flight, fly along this reference line at an altitude low enough to avoid parallax error. If the airplane has a drift meter installed, it can be used to insure that the direction of flight is parallel to, or directly over, the reference line. Set the directional gyro to zero, and rotate the loop to obtain "On Course" indication on the compass indicator. When passing over some predetermined point or intersecting line to the reference, record simultaneously the bearing indicator reading and the directional gyro reading. Also record the drift meter reading if a drift meter is being used. The above readings, if the previous setting and the line of flight have been maintained, should be zero. This maneuver, as well as those discussed in the following paragraphs are indicated by Figure 66. In practice, it will be found practicable to have the co-pilot use Figure 66 to direct the pilot and to maintain the airplane's location at all times with respect to the flight pattern shown.

(*f*) Turn the aircraft to the left, and then swing back to the right, crossing the reference line at an angle of 15 degrees by the directional gyro. The pilot should be instructed to swing far enough out on these maneuvers to regain level flight some distance before the reference line is reached. Readings should be made only during conditions of level flight. Have the pilot inform the radio compass operator at the instant the airplane crosses the reference line. Record the radio compass bearing for that instant in the indicated place in column 3 on Figure 67. For those installations having a drift meter, greater accuracy can be obtained since the drift meter observer can determine the exact moment of crossing the reference and can read the heading at that exact flight position.

(*g*) Repeat the above procedure throughout Step I of Figure 66, recording the data in the third column of Figure 67; return on the reference line as shown in Step II. The directional gyro should be reset each time a new step is begun.

(*h*) Repeat the above procedure until the entire flight pattern of Figure 66 has been flown.

(*i*) During the above procedure, care must be taken to avoid parallax in reading the instruments, and to set the directional gyro accurately. One or two check runs should be made if best accuacy is to be obtained.

(*j*) Calibration data obtained for a particular type of airplane is usable without modification for all airplanes of that type, if the location of the loop and other antennas is the same. Since all airplanes of the same type may not have the same radio installations, an accurate diagram with antenna dimensions and exact loop location will add to the usefulness of the recorded data (Figure 69).

NOTE: Since radio compass deviation changes to some extent with frequency, calibration data should be taken at several frequencies to insure greatest accuracy in use. The readings used to set up the radio compass deviation compensators on the Indicator I-75-A (Bearing) should be those obtained at some frequency between 200 kcs and 800 kcs, since in that frequency range the radio wave characteristics are better suited to radio compass use. Under service conditions, and with the bearing indicator properly compensated, the overall radio compass deviation should not exceed three degrees except at points of large rate of change of error between 15-degree rhumb lines or sectors.

(6) Adjustment of Radio Compass Deviation Compensators in Indicator I-75-A (Bearing)

After the radio compass deviation has been determined in accordance with paragraph 10*b* (5), it may be compensated in Indicator I-75-A (Bearing) so that correct bearings may be read directly from the bearing pointer (see Figures 5 and 29). Although the corrections can be compensated by direct reference to the observed data, it is more practicable, because of the design of the bearing indicator compensator, to plot the data and interpolate on the curve, thereby obtaining values which apply to the location of the cam roller at the adjustment screw positions throughout the sequence of adjustment.

(*a*) Determination of Correction Data

(*1*) Plot the observed bearings from column 3, Figure 67, against the corresponding plane to radio station bearings of column 2, using the chart of Figure 68. An example is shown in Figure 69 and 70. Lay a straight edge parallel to the diagonal dotted lines (Note #1, Figure 70) and through the degree point on the vertical scale which corresponds to the desired figure in column 3 of Figure 67, and draw a fine line. The point at which this line intersects the solid line (corresponding to the figures listed in column 2 of Figure 67) is the plot point. For example, the indicated bearing for a true bearing of 15° (column 2, Figure 69) is 7° (column 3). Lay a straight edge parallel to the dotted lines and through the 7° vertical graduation, and draw a fine line (Note #1, Figure 70). This line intersects the solid line which passes through the 15° graduation. This intersection is one point on the deviation curve. Repeat the above for each of the 24 fifteen-degree positions, and then draw a smooth curve between the plotted points, to form the deviation curve.

(*2*) In order to determine the proper sequence in which the adjusting screws should be set, it is first necessary to know the desired quadrature position of the reference mark face plate required for the particular airplane installation. This may be determined by observation. Rotate the "VAR." knob until the zero-degree point is aligned with the desired new position of the reference mark. The degree point (90, 180 or 270 degrees) which falls at the original position of the reference mark on the face plate should be noted and entered at the top of column 4, (see Figure 60 for original position of the reference mark as shipped from the factory). Since a definite sequence of adjustment must be followed as indicated in paragraph 10*b* (6) (*b*) (*5*) below, adjustment of the compensators *must* progress both clockwise and counterclockwise from the *original* zero position using the data as applicable for that position and referred to the above outer scale values as set by the "VAR." knob. This is necessary because the cam strip is anchored at that point and the open ends are 180 degrees from that position.

(*3*) The remainder of the figures in column 4, Figure 67, may then be entered in their proper order, starting with the first figure as determined above. The remaining 15-degree points should be entered by proceeding first 15 degrees to one side of the first figure and then 15 degrees to the other side of the first figure, etc. In this manner the 15-degree points in column 4 will be arranged in the proper order for adjusting the compensators.

(*4*) The next step is to determine the values for column 5, Figure 67 from the curve of paragraph 10*b* (6) (*a*) (*1*). For the correction points, draw fine lines parallel to the solid lines from the intersections of the dotted lines (for each particular 15-degree position of column 4) and the plotted curve, to the graduated vertical line. (See Notes #2 and #3, Figure 70). In column 5, record values for the points of intersection (see Note #4, Figure 70), as read on the graduated vertical line, beside the 15° dotted line values in column 4. For example, it is desired to determine the corrected pointer bearing for the loop position of 60° (column 4, Figure 67). Lay the straight edge parallel to the solid line through the intersection of the dotted 60-degree line and the deviation curve (see Note #2, Figure 70). This fine line intersects the graduated vertical line at 73°. This bearing value is recorded in column 5. Similarly a bearing of 105° from column 4 gives a bearing of 100° for column 5.

(*b*) Adjustment of the Compensator Screws of Indicator I-75-A (Bearing)

(*1*) Prior to removing the bearing indicator from the airplane, rotate the pointer to zero index, and uncouple the tuning shaft from its fitting.

(*2*) Unscrew the bearing indicator from its mounting, and take it to a bench or table. Remove the four screws located on the underside, and remove the bottom cover plate. This exposes the adjustment screws.

(*3*) With the reference mark in the *original* zero position, rotate the azimuth scale by means of the "VAR." knob until the degree-setting recorded at the head of column 4, Figure 67, is in line with the reference mark. If the setting recorded at the head of column 4, Figure 67, is 90, 180, or 270 degrees, the reference mark face-plate should be removed and turned to the new quadrature position determined in paragraph 10*b*(6)(*a*)(*2*). To move the plate, remove the snap ring and cover glass, then take out the four small retaining screws on the instrument face. With the "VAR." knob still set as outlined above, rotate the plate until the reference mark is aligned with zero degrees on the azimuth scale. Replace the screws, being careful to centrally locate the plate so that it does not rub the outer scale when that scale is rotated by the "VAR." knob.

(*4*) Set the inner dial (viewed through the small window of the instrument face below "RADIO COMPASS") to the degree marking which corresponds to that at the head of column 4, and, using the wrench located in the bottom of the bearing indicator, adjust the compensator screw corresponding to the particular 15-degree setting of column 4, until the pointer reads the correct value as indicated in column 5, Figure 67. At all times care must be taken to maintain the zero of the outer dial at the *new* setting of the reference mark.

(*5*) The above procedure should be followed for each of the 24 compensating screw positions taken in the order listed in column 4, Figure 67 (i.e.—working alternately clockwise and counter-clockwise from the starting position). The adjustment of the compensator screws must progress through alternate clockwise and counter-clockwise 15-degree positions from the *original* reference mark position because the cam strip is anchored at the position of the original reference mark and the open ends are 180 degrees from that position. Since the data in columns 4 and 5, Figure 67, has been compiled with reference to the *new* position of the reference mark face plate, the corrections can now be applied in accordance with the above adjustment procedure.

(*6*) If large errors are to be corrected, or the rate of change of error per 15-degree sector is rapid, it may be more accurate to set up from 1/3 to 1/2 the required correction for all screws; then repeat the entire process once or twice until all screws have been satisfactorily adjusted.

(*7*) Replace the setscrew wrench, and reassemble the bearing indicator.

(*8*) Check the entire applied correction to ascertain that the compensation is correctly set-up.

(*9*) Rotate the pointer to the index mark, and mount the bearing indicator in place in the airplane.

(*10*) Reconnect the tuning shaft to the proper bearing indicator spline.

(*c*) Flight Check

(*1*) Fly all, or selected portions, of the original course and record the data as per paragraph 10*b* (5).

(*2*) The bearing indicator pointer readings, with the bearing scale zero set on the index, should agree with the figures of column 2, Figure 67, within ±3 degrees for each 15-degree interval directional gyro heading.

(7) Recommended Preliminary Instruction

To obtain a practical knowledge of the above method of plotting the deviation curve and adjusting the compensators, it is recommended that the instructions of paragraph 10*b* (6) be used in conjunction with Figures 69 and 70 to set up a sample Indicator 1-75-A (Bearing).

11. OPERATION

a. General

(1) Set the radio control box switch to "COMP." or "ANT." position.

(2) Push the "CONTROL" switch to operate green light. The green light identifies the radio control box in control.

(3) Rotate the band switch to the frequency band in which operation is desired.

(4) Turn the "TUNING" crank to the desired station frequency in kilocycles and rotate back and forth through resonance to determine the exact setting of the dial for maximum clockwise deflection of the tuning meter. Listen for identification to be sure the correct station is being received.

b. Homing Compass Operation

The function of Radio Compass SCR-263-A as a homing device is to indicate visually when the aircraft's heading should be altered to the left or to the right in order to approach or pass over a transmitting station located at the destination or along the line of flight. A small conventionalized figure of an airplane in the upper center of the compass indicator dial is used to indicate "On Course" flight. If this figure is thought of as representing the actual aircraft, then the needle of the compass indicator may be considered as pointing in the general direction of the transmitting station. (See Figure 9.)

EMPLOYMENT

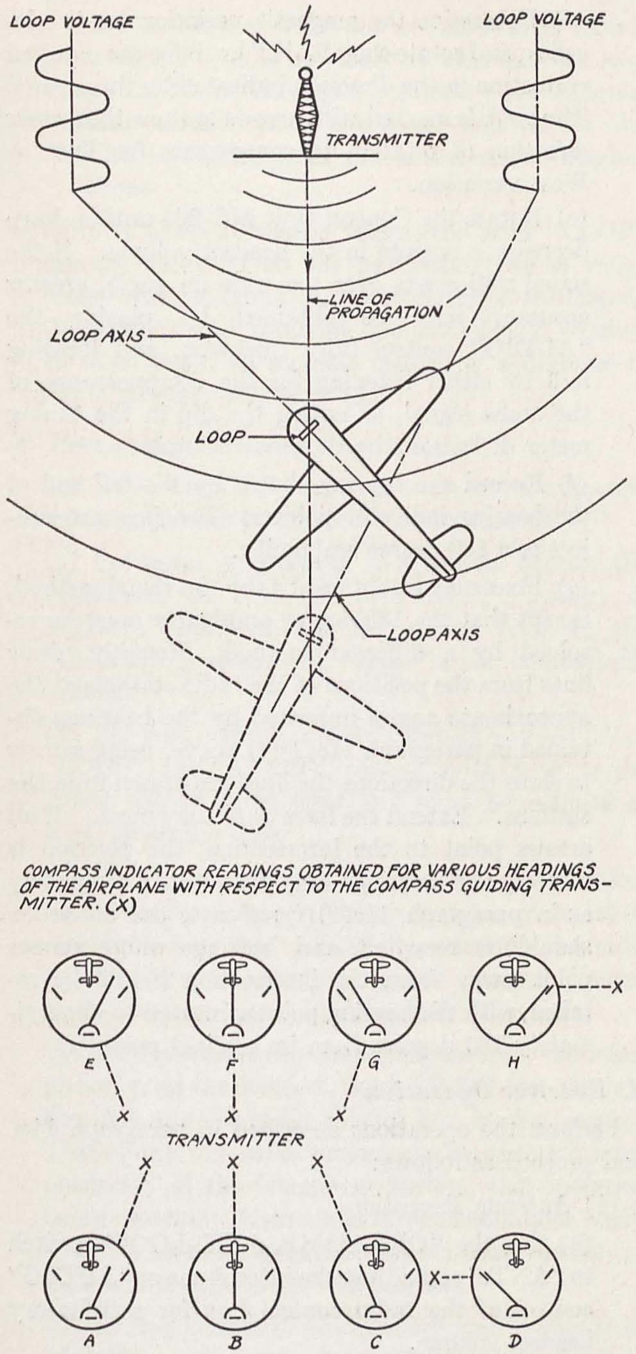

FIGURE 9 — FUNCTIONAL DIAGRAM, LOOP PICK-UP AND COMPASS INDICATOR DEFLECTION

For homing operation, perform the operations of paragraph 11*a*, and proceed as follows:

(1) Turn the loop rotating crank of Control Unit MC-204 until the bearing indicator pointer head is on the index.

(2) Switch to "COMP."

(3) Set the "AUDIO" or interphone control to the desired headset level.

(4) Set the "COMPASS" control near the vertical mark for best compass indicator sensitivity.

(5) Apply rudder in the direction shown by the compass indicator needle. When the compass indicator needle is centered, the aircraft is headed toward the radio station.

(6) In the event that the indicator pointer shows "On Course" flight when the station is first tuned in, turn the aircraft to either side until a marked deflection is obtained on the compass indicator. Observe the deflection and turn the aircraft to the side to which the pointer deflects, continuing the turn until an "On Course" indication is obtained. This precaution is necessary since "On Course" indication may be obtained both heading toward and away from a station. No errors will result, however, if the aircraft is always turned in the direction indicated by the pointer.

(7) Since in "COMP." operation the equipment has an excellent automatic volume control action, it is not practical to home on a radio range course and fly it aurally at the same time.

(8) Radio compass homing operation is such that the aircraft will ultimately arrive over the radio station antenna, regardless of probable drift due to cross wind. However, the flight path will be a curved line, and coordination with ground fixes or landing fields along the route will be either difficult or impossible. Consequently, it is often expedient to fly a straight line course by off-setting the loop sufficiently to compensate for wind drift. To do this, determine the wind drift either with the drift sight or by noting the change in magnetic compass reading over a period of time while homing with the radio compass. A *decreasing* magnetic bearing indicates a wind from the *left*; while an *increasing* magnetic bearing indicates a wind from the *right*. By trial and error, find the correct down-wind loop position as shown by that bearing indicator pointer setting which provides the minimum rate of change of magnetic compass reading.

c. *Direction Finding*

(1) Visual Method

(*a*) Switch to "COMP.", push "CONTROL" switch to obtain green light, and tune in desired station as in paragraphs 11*a*(3) and 11*a*(4).

(*b*) Prior to making fix determinations, the stations to be used should be located on the map, tuned in, identified, and the dial reading logged. This avoids delay and error at the time of obtaining the fix.

(c) For best accuracy, several bearings should be taken in rapid succession, thereby eliminating error caused by the distance traveled between bearing observations.

(d) Adjust the "AUDIO" control or interphone control for desired headset level.

(e) Using the "VAR." knob on the bearing indicator, set the bearing scale so that the numerical value of the aircraft's magnetic heading is at the index mark.

(f) Determine the magnetic variation for the locality, and rotate the "VAR." knob for the required correction in the direction indicated by the arrows. The knob is marked with arrows to show the proper direction of rotation to compensate for East or West variation.

(g) Turn the loop rotating crank of Control Unit MC-204 until the compass indicator needle is at the center position. Turn the crank for clockwise rotation of the bearing indicator pointer. If the compass indicator needle moves left, the correct bearing is being taken. If the compass indicator needle moves right, rotate the bearing indicator pointer 180 degrees.

(h) Turn the crank to center the compass indicator needle, and record the bearing shown by the tail end of the bearing indicator pointer.

(i) To obtain a fix, take bearings on two or more stations 30 degrees or more apart, and plot them on a map. The intersection of the plotted lines is the position of the aircraft at the time of observation.

(j) After the compensation has been established in Indicator I-75-A in accordance with paragraphs 10b(5) and 10b(6), the radio compass deviation correction is accomplished automatically and need not be considered when taking bearings.

(2) Aural-Null Method

(a) Switch to "LOOP", push "CONTROL" switch to obtain green light, and tune in desired station as in paragraph 11a(3) and 11a(4). When listening for station identification, it may be necessary to rotate the loop to a maximum signal position to obtain a good intelligible signal.

(b) Adjust "AUDIO" or interphone control for desired headset level.

(c) Using the "VAR." knob on Indicator I-75-A (Bearing), set the bearing scale so that the numerical value of the aircraft's magnetic heading is at the index mark.

(d) Determine the magnetic variation for the locality, and rotate the "VAR." knob for the required correction in the direction indicated by the arrows. The knob is marked with arrows to show the proper direction of rotation to compensate for East or West variation.

(e) Rotate the Control Unit MC-204 until a sharp decrease is noticed in the headset volume. If the signal null exists over too wide an angle, greater accuracy may be obtained by placing the "AUDIO" control fully clockwise, and locating null by either listening for the disappearance of the audio signal, or noting the dip in the tuning meter deflection.

(f) Record the bearing shown by the tail end of the bearing indicator pointer. Bearings are subject to a 180-degree ambiguity.

(g) Fixes may be obtained as by the visual method, except that the 180-degree ambiguity must be resolved by a different method. Roughly, draw lines from the positions of the radio stations at the approximate angles indicated by the bearings obtained in paragraph 11c(2)(f) above, using arrows to show the directions the lines are drawn from the stations. Extend the lines until they meet. If all arrows point to the intersection, the position is correct, and bearings may be plotted accurately as in paragraph 11c(1)(i); if not, the entire fix should be repeated, and bearings whose arrows point away from the intersection should be retaken, with the bearing pointer rotated to approximately 180 degrees from its original position.

d. Receiver Operation

Perform the operations described in paragraph 11a, and proceed as follows:

(1) Antenna Reception

(a) Set the "OFF-COMP.-ANT.-LOOP" switch to "ANT." and adjust the interphone or "AUDIO" control of the radio control box for satisfactory headset volume.

(b) For the best definition of radio range signals (between 200 and 420 kcs), set the interphone volume control fully clockwise, and adjust the "AUDIO" control for the lowest usable headset volume.

(2) Loop Reception

(a) If reception on "ANT." is noisy, switch to "LOOP", and turn the loop rotating crank of Control Unit MC-204 for maximum signal. Adjust the interphone or "AUDIO" control for desired headset volume.

EMPLOYMENT

(*b*) For the best definition of radio range signals on "LOOP", it is necessary to maintain the loop near the 90- or 270-degree position. Set the interphone control fully clockwise, and adjust the "AUDIO" control for the lowest usable headset volume.

NOTE: Cone of silence indications with "LOOP" operation depend on the particular type of range transmitting antenna and the mounting of the loop on the aircraft and therefore are not always reliable. In some cases, an increase instead of a decrease in signal strength will be noted.

e. Precautions During Operation

(1) When only the pilot is present, set the bearing indicator pointer to zero index before take-off.

(2) For aural reception of A-N signals, operate the equipment on "ANT." or "LOOP" instead of "COMP." since the action of the AVC in the "COMP." position will cause broad course indications.

(3) For best definition of A-N signals on "ANT." or "LOOP", the "AUDIO" control must be set to the lowest usable audio level and must be reduced as A-N signals increase.

(4) For aural reception of A-N signals on interphone, the interphone volume control must be set on maximum and the "AUDIO" control on the radio control box used to reduce headset volume. Failure to do this may cause broad course indications.

(5) To disconnect the radio compass from the interphone, plug the headset Cord CD-307 directly into the jack on the radio control box having control. This allows the radio compass to be operated independently of the interphone system, this operation being especially desirable in those installations which have the radio compass and another radio receiver on the same interphone switch position.

(6) During periods of precipitation static, operate on "LOOP", and, for best reception, rotate the loop until a maximum signal is obtained.

(7) When determining direction on "LOOP" by aural-null method, there is a 180-degree ambiguity, and the direction of the station may be 180 degrees from the null obtained. The broadness of the null depends on the strength of the signal. Strong fields produce very sharp nulls, sometimes as small as one-tenth (0.1) degree. Vary the "AUDIO" control until null is of satisfactory width. The tuning meter may be used as a visual null indicator.

(8) Loop Operation

(*a*) If the loop should be in null position when flying on a radio range course, the signal may fade in and out and possibly be mistaken for a cone of silence.

(*b*) Cone of silence indications are not reliable on loop-type radio range stations when the radio compass is operating on "LOOP". The signal may increase in volume to a strong surge when directly over the station instead of indicating a silent zone.

(9) Select radio stations providing stable bearings. Tune equipment carefully. If an interfering signal is heard in the headset, it is probably causing an error in bearing. To check, tune a few kilocycles either side of maximum. A change in bearing with tuning indicates an interfering signal. The compass indicator needle must be held on course during this test and any change in bearing noted on the directional gyro. If it is not considered desirable to change the course of the aircraft, the loop can be rotated to recenter the compass indicator, and the deviation caused by the interfering signal may be read on the bearing indicator. If station interference exists, select another station, or proceed by other means of navigation until closer to the desired station. Care must be exercised when taking bearings on stations broadcasting the same program as they may be mistaken for each other. Avoid taking bearings on synchronized stations unless close to the desired station. If the radio station stops transmitting or fades, especially a station operating in a network, bearings might be taken on other stations of the same frequency, thus causing errors.

(10) Check dial calibrations against actual station frequencies. If the calibration is wrong, report the defect.

(11) Fly the aircraft with the compass indicator needle "On Course", or fluctuating slightly equally to left and right of "On Course". The compass indicator needle deflection bears no fixed relation to the degrees "Off Course". Flying the aircraft with the compass indicator needle at a fixed deflection will result in a curved course.

(12) Do not operate with "COMPASS" control fully clockwise as the radio compass will be very sensitive to the least yawing of the airplane. Reduce "COMPASS" output control until 15-degree loop rotation produces a full-scale deflection.

(13) Do not depend on the tuning meter as a distance meter.

EMPLOYMENT

(14) Do not disturb any internal adjustments.

(15) Night effect, or reflection of the radio wave from the sky, is always present. It may be recognized by a fluctuation in bearings. The remedy is to increase altitude, thereby increasing the strength of the direct wave; take an average of the fluctuations; or select a much lower frequency station. Night effect is worst at sunrise and sunset. It is present on stations at frequencies of 1750 kcs at distances greater than 20 miles. As the frequency decreases, the distance of the usable direct wave increases, until at 200 kcs the distance will be about 200 miles. Satisfactory bearings, however, will often be obtained at much greater distances than stated above.

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

(17) Only head-on bearings are entirely dependable. If side bearings are taken, keep the wings horizontal.

(18) Do not depend on two stations for a fix of location; at least three station bearings should be used. In general, a set of stations with bearings spaced at approximately equal intervals throughout 360 degrees will give best accuracy.

(19) This equipment should provide compass bearings during conditions of moderate precipitation static which interrupt normal reception. On occasions where severe precipitation static is present, especially when discharges occur from parts of the aircraft surfaces, it will be necessary to operate on "LOOP" position. In this position, satisfactory reception and aural-null direction finding will be possible most of the time. The type of precipitation static existing in air mass fronts at different temperatures can be avoided by crossing the air mass front at right angles and then proceeding on the desired course instead of flying along the air mass front.

(20) Erroneous or fluctuating bearings in some instances are produced by reflection of radio waves from the surface of mountains. This is called "mountain effect", and is known to exist under certain circumstances in the vicinity of Pittsburgh and Salt Lake City. Because of this effect bearings taken when flying over mountainous terrain should not be relied on implicitly.

(21) An additional effect, not unlike "mountain effect" has been observed to a limited extent when the radio wave travels through a "cold front". Bearings taken under these conditions should be checked by other navigational means whenever possible.

SECTION III

DETAILED FUNCTIONING OF PARTS

12. GENERAL THEORY OF RADIO COMPASS OPERATION

In addition to its use as a radio communication receiver, Radio Compass SCR-263-A may be used to guide the aircraft to a transmitting station at its destination, or may be used to take bearings on transmitting stations as an aid to navigation. While the equipment is being used as a radio compass, the pilot and navigator can also hear the station signals and thus obtain weather reports or other flight information.

Either one or two radio control boxes are provided for remote control of the radio compass. If two control boxes are used, either position may take control of the equipment if the control switch is operated.

When the pilot wishes to fly the aircraft toward a transmitting station, that is, to use the equipment as a homing radio compass, the receiver is switched to "COMP." operation and the station tuned in. A rotatable loop set with the bearing pointer on the index provides the directional characteristic. The headset volume and the indicator response are then adjusted and the aircraft turned until the compass indicator points to the center.

The compass indicator will remain at the center as long as the aircraft is headed directly toward, or directly away from, the transmitter; however, the behavior of the compass indicator will determine whether the transmitter is ahead of, or behind, the aircraft.

If the aircraft is turned from the true course, the compass indicator pointer will deviate to either left or right from center.

If the transmitter is ahead and the aircraft is turned from the true course, the transmitter may be visualized as being located on the side indicated by the pointer, and turning the aircraft in that direction will bring it back on course and the pointer back to center.

If the transmitter is behind the aircraft, the indication is opposite, that is, if the pointer deviates from center and the aircraft is turned in the direction indicated, the deviation will increase, and the pointer will not return to center until the aircraft is turned through 180 degrees and is headed toward the transmitter.

The compass 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. The pointer remains at the center only when the transmitter is in line with the axis of the aircraft. The sensitivity of the compass indication is adjustable.

If the navigator wishes to take a bearing upon a transmitter, the loop is rotated until the compass indicator pointer is centered, in which case the bearing of the transmitter with respect to the axis of the aircraft is shown on the bearing indicator dial. The bearing of several transmitting stations may be taken in this manner in order to definitely establish the position of the aircraft. When bearings are thus taken, the equipment functions as a radio direction finder.

As shown in Figure 15, the radio compass equipment consists of a loop antenna, a loop input and amplifier stage, a 90-degree phase shifter, a balanced modulator, an audio oscillator, a non-directional antenna, a sensitive and selective receiver, a compass indicator, and an audio output circuit. The voltage induced in a non-directional 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 an edge of the loop is turned toward the transmitter and is zero when the plane of the loop is perpendicular to the direction of travel of the radio wave from the transmitter. The resultant voltage induced in the loop is 90 degrees out of phase with the voltage induced in the non-directional 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 through 90 degrees so that it is either in phase with, or in phase opposition to, the voltage induced in the non-directional antenna, depending upon which edge of the loop is turned toward the transmitter.

The voltage from the loop amplifier is then impressed upon the grids of the balanced modulator tube, which is actually two triodes combined into a single unit. The grids of the modulator tube are driven in phase opposition by the audio oscillator so that only one of the triode sections passes the loop signal at a time. Since the plates of the modulator tube are push-pull connected to the receiver circuits, they alternately add to, and subtract from, the voltage contributed by the non-directional antenna. The addition of the loop signal to the signal from the non-directional antenna reverses in phase as the loop is rotated through a null position. The audio oscillator 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 radio compass circuits are arranged so that if

DETAILED FUNCTIONING OF PARTS

the radio signal is coming from the left, the modulation is such that the compass indicator pointer moves to the left; and if the radio signal is from the right, the pointer moves 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 frequency of the audio oscillator, and the compass indicator pointer remains at center.

The operation of the various compass elements can be most easily followed by referring to the simplified schematic compass circuit diagram, Figure 16.

The voltage induced in the loop by a radio wave from the transmitter is coupled to the loop amplifier Tube VT-86 through transformer T24. The parallel combination of inductor L1 and capacitor C42-4 (in the plate circuit of Tube VT-86) 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 Tube VT-105 through capacitors C19-1 and C19-2. Figure 10 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.

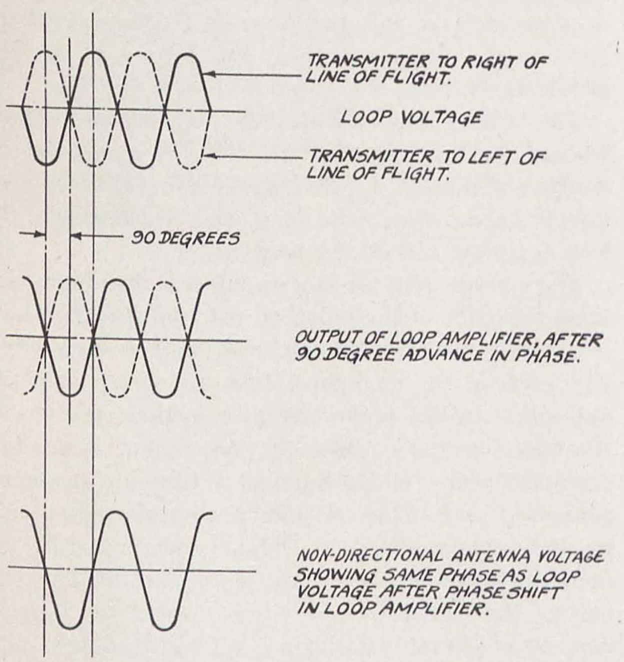

FIGURE 10 — PHASE RELATIONS OF LOOP AND ANTENNA SIGNAL COMPONENTS

The fixed coils of the dynamometer-type compass indicators are tuned to resonance at 48 cycles per second and serve as the tuned circuit of the audio oscillator Tube VT-96. Since the compass indicators have an alternating magnetic field of 48 cycles per second, current in the moving coils at the same frequency and in phase, will produce a deflection of the pointers toward one side of center. If the phase of the current in the moving coils is reversed the deflection of the pointers will also reverse. Voltage from the audio oscillator is impressed upon the grids of the modulator tube sections in phase opposition through resistances R12-3 and R12-4 and capacitors C4-4 and C4-5. Due to its characteristics and because of the magnitude of the audio oscillator voltage impressed upon its grids, the modulator tube functions as an electronic switch, permitting the loop voltage to pass through first one section, and then the other. Since the plates of the modulator tube are push-pull connected to transformer T27, the amplified loop voltage is added to the non-directional antenna voltage when one section of the modulator tube is functioning, and subtracted when the other section is functioning. The received signal is thus locally modulated at the frequency of the audio oscillator proportionately to the voltage induced in the loop.

The signal is then amplified, and the local modulation is detected and amplified to provide the 48-cycle per second energy for the moving coils of the compass indicators. 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 of center to the other.

The phase of the voltages acting in the modulator circuit for reception from the right and left are shown in Figure 11. When the transmitter is located on the axis of the loop, there is no voltage induced in the loop and consequently no local modulation of the received signal.

13. RADIO COMPASS UNIT BC-443-A

a. Mounting FT-213-A and Cabinet

The radio compass unit chassis is housed in a dust and spray proof cabinet formed of aluminum sheet and finished in black wrinkle enamel. A sub-base is permanently attached to the dust-proof cabinet by means of four rubber shock absorbers. The sub-base fits on Mounting FT-213-A and is held there by two Dzus fasteners. Stainless steel and bakelite slides in the base of the cabinet permit easy withdrawal of the chassis, which is held securely in place by a captive through-bolt running from the front panel of the chassis to a riveted nut in the back of the cabinet. A cut out section in the right side of the cabinet permits changing the location of the receptable for Plug PL-122 from the front panel to the side of the chassis for installation where this location is preferable. A plate attached to

DETAILED FUNCTIONING OF PARTS

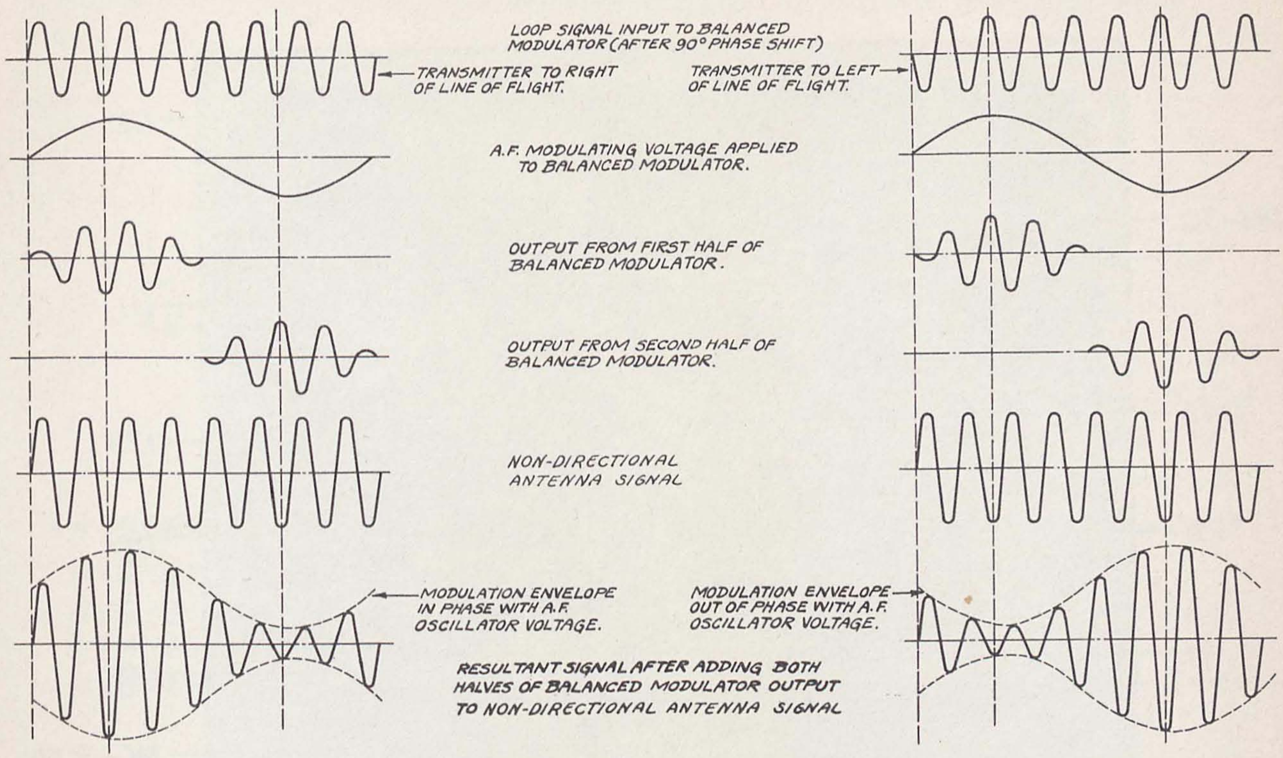

FIGURE 11 — BALANCED MODULATOR INPUT AND OUTPUT

the chassis by four screws covers this section when the plug receptacle is normally mounted on the front panel (see Figure 2).

b. Chassis

The chassis of the radio compass unit is formed of welded aluminum, and is so constructed that it may be placed on any of five sides for servicing without damage to any part. A panel containing the installation instructions is attached to the front end of the chassis by four screws seated in riveted clinch nuts. A setscrew wrench is clipped to the middle cross member of the chassis. The arrangement of the sub-assemblies and other components on and under the chassis deck is shown in Figures 12, 13, and 14.

c. Panel Items

This unit is completely controlled from either one or two remote positions, hence no operating controls are mounted on its front panel. The following items appear on the front panel or side of the chassis (see Figure 2).

(1) Release Knob

A knob, designated "RELEASE", is located in the lower center of the panel. This knob is attached to a captive through-bolt which holds the chassis securely in its cabinet. When turned counterclockwise, this bolt withdraws and releases the chassis from its cabinet.

(2) Sockets

Two sockets are provided to receive Plug PL-108 (Cord CD-365 or Cord CD-365-A to loop) and Plug PL-122 (cable to aircraft connector panel). The socket for Plug PL-122 may be removed from the front panel and mounted on the right side of the chassis if more convenient for installation purposes.

(3) Loop Gain Adjustment

A control marked "LOOP GAIN" is provided near the center of the radio compass unit front panel. This control is an installation adjustment and, after being set for a particular installation, need not be touched. Instructions for setting this control are given on the front panel of radio compass unit and in paragraph 10*b*(2).

(4) Threshold Sensitivity Adjustment

A control marked "THRES. SENS." is mounted next to the "LOOP GAIN" control. This control is also an installation adjustment, and limits the gain of the radio frequency amplifiers to a point below

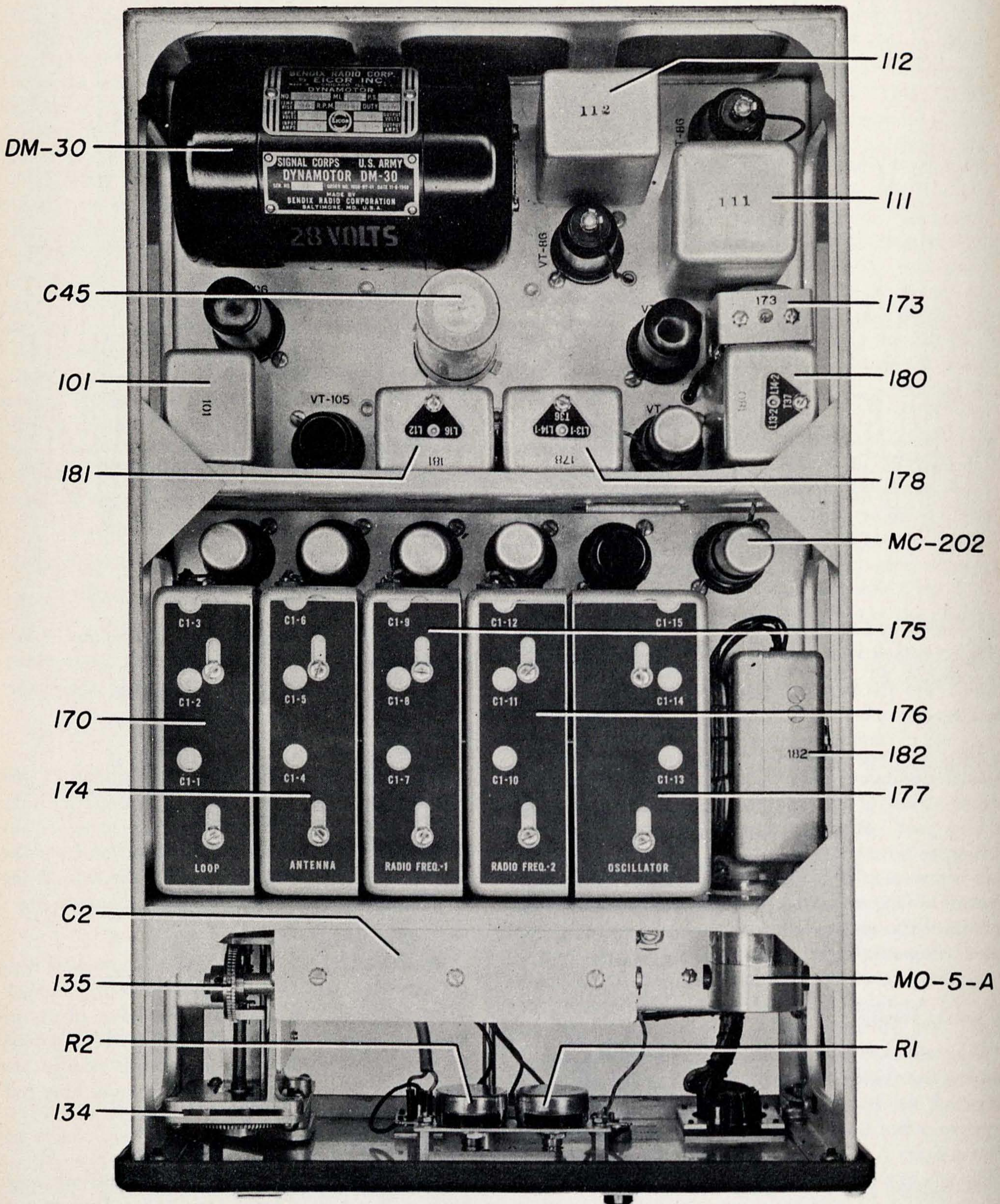

FIGURE 12 — RADIO COMPASS UNIT BC-443-A, TOP OF CHASSIS

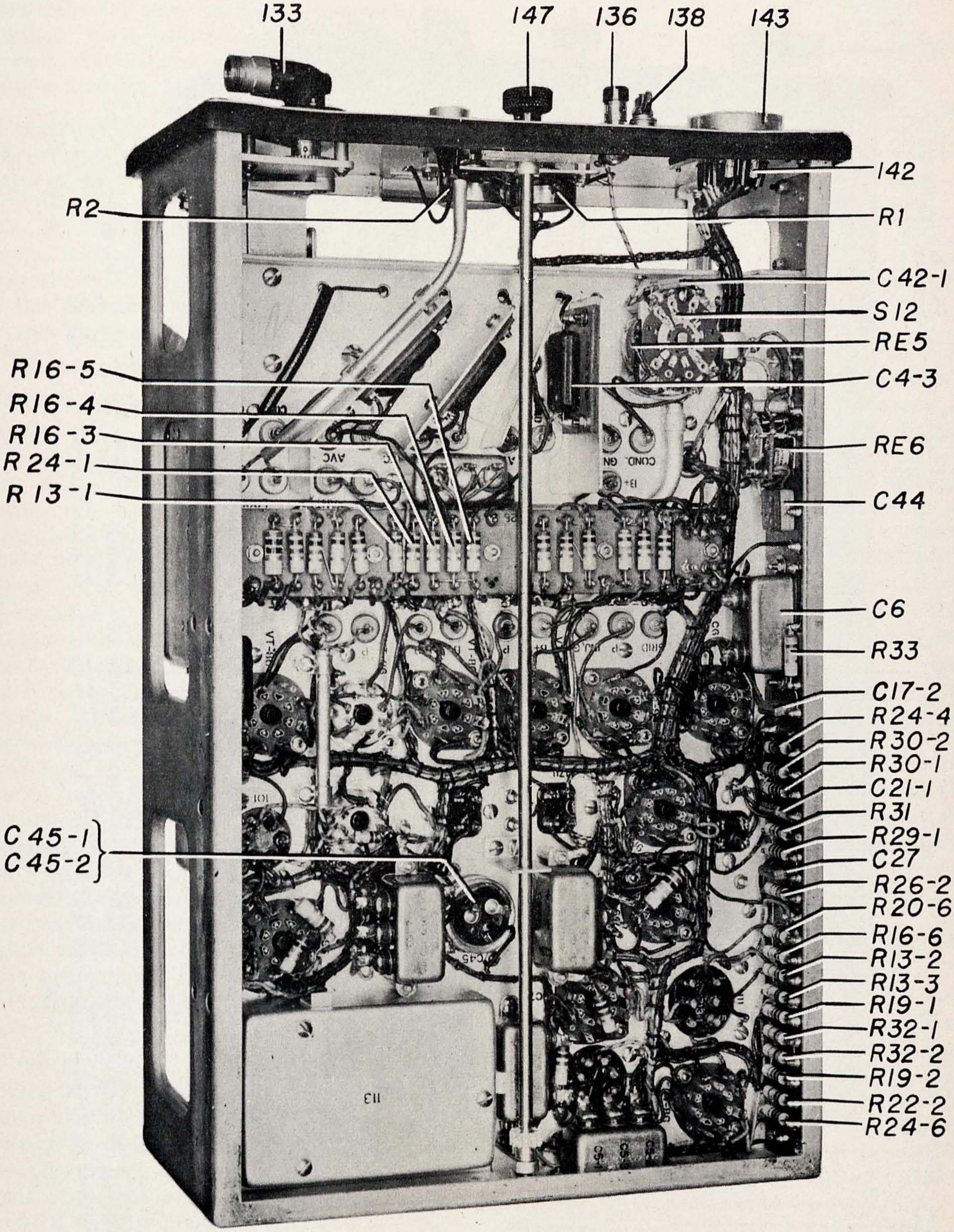

FIGURE 13 — RADIO COMPASS UNIT BC-443-A, LEFT BOTTOM VIEW OF CHASSIS

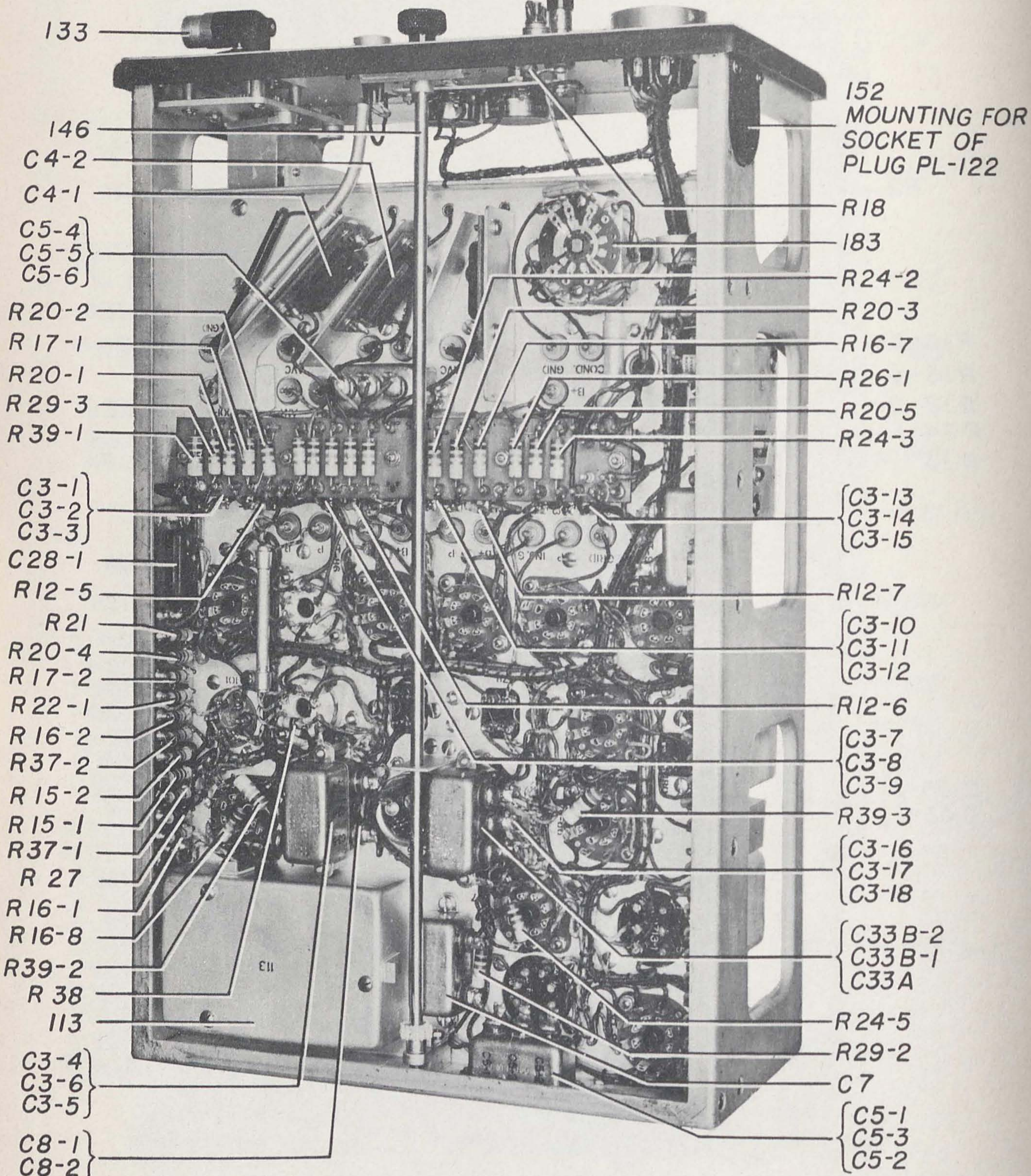

FIGURE 14 — RADIO COMPASS UNIT BC-443-A, RIGHT BOTTOM VIEW OF CHASSIS

DETAILED FUNCTIONING OF PARTS

which there will be little audible interference. The setting of this control is determined by the average radio frequency noise interference inherent in each airplane. Instructions for setting this control are given on the radio compass unit front panel, and in paragraph 10b(3).

(5) Miscellaneous

In addition to the items listed above, the antenna and ground binding posts, and the right-angle drive mechanism 133 are also located on the front panel. The right-angle drive mechanism may be rotated to various positions as described in paragraph 9c(6). Instructions for installation adjustments are etched on the front panel (see Figure 2). The gear ratio between the tuning shaft and the ganged capacitor is 120 to 1.

d. Circuits

(1) General

Radio Compass Unit BC-443-A comprises a compass circuit and a receiver circuit. The receiver circuits may be operated from the loop or non-directional antenna as desired. The frequency range (200–1750 kcs) is covered in three bands (200–410, 410–850, and 850–1750 kcs). Band selection is accomplished by a motor driven band change switch, the switch sections inserting into the circuits the coils for the desired band and shorting out all unused coils, thereby preventing any resonant absorption circuits. The complete schematic circuit diagram, Figure 49, shows the equipment being operated on band 1 on "COMP." from the left-hand (Navigator's) radio control box. The following circuit description traces the circuit for band 1 only. A corresponding description would apply to bands 2 and 3 should the band selector switch, switch S9 (Navigator's) be set to either of these positions. The important elements of the circuit are pointed out in Figures 12, 13, and 14. The wiring diagram of the radio compass unit is shown in Figure 53. The wiring diagram of the subassemblies is shown in Figure 52.

(2) Compass Circuit

When the "OFF-COMP.-ANT.-LOOP" switch S11 is set to the "COMP." position, the circuits function as shown by the block diagram, Figure 15, and the complete schematic circuit diagram, Figure 49. The theory of compass operation is explained in paragraph 12. The loop consists of an 8-turn, center-tapped coil. The outer ends of the winding and the center tap are connected to a plug receptacle in the

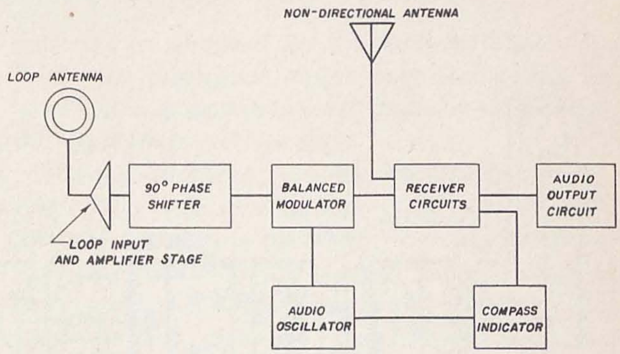

FIGURE 15 — RADIO COMPASS SCR-263-A, BLOCK DIAGRAM OF CIRCUIT FUNCTIONS

base of the loop through which the loop output voltage is fed into Cord CD-365 or Cord CD-365-A to the primary of the loop input transformer T24 (for Band 1). Refer to Figure 16. The secondary of transformer T24, tuned by the first section of the gang tuning capacitor C2-1 is connected to the grid of the loop amplifier Tube VT-86. A small neon tube NE1-2 connected between the grid and ground protects the tube and circuit element agains high voltages which may result from the operation of the airplane's transmitter or from high electrostatic charges. The plate of the loop amplifier tube is fed to the loop phaser 101 which consists of a shunt circuit (inductor L1 and capacitor C42-4) resonated to approximately 130 kcs and presents a capacitive reactance to signals of any frequency to which the compass may be tuned (200–1750 kcs). Since the plate resistance of the loop tube is very high compared to the reactance of its load (inductor L1, capacitor C42-4), the voltage across the capacitive reactance C42-4, in the plate circuit, is effectively changed in phase 90 degrees from the voltage on the grid of this loop amplifier tube.

The RF voltage across capacitor C42-4 is fed through capacitors C19-1 and C19-2 to the grids of the modulator Tube VT-105. The grids of the modulator tube are biased to cut-off and are connected in push-pull through capacitors C4-4 and C4-5, and resistors R12-4 and R12-3 to the plates of the audio oscillator Tube VT-96. These plates are connected in push-pull to the Compass Indicator I-65-D fields, which are resonated at 48 cycles by the capacitors C11 mounted in each compass indicator. The grid excitation for the audio oscillator is supplied through capacitors C8-1 and C8-2, which are cross-connected to the opposite plates. The audio frequency oscillator output voltage renders the two triode sections

DETAILED FUNCTIONING OF PARTS

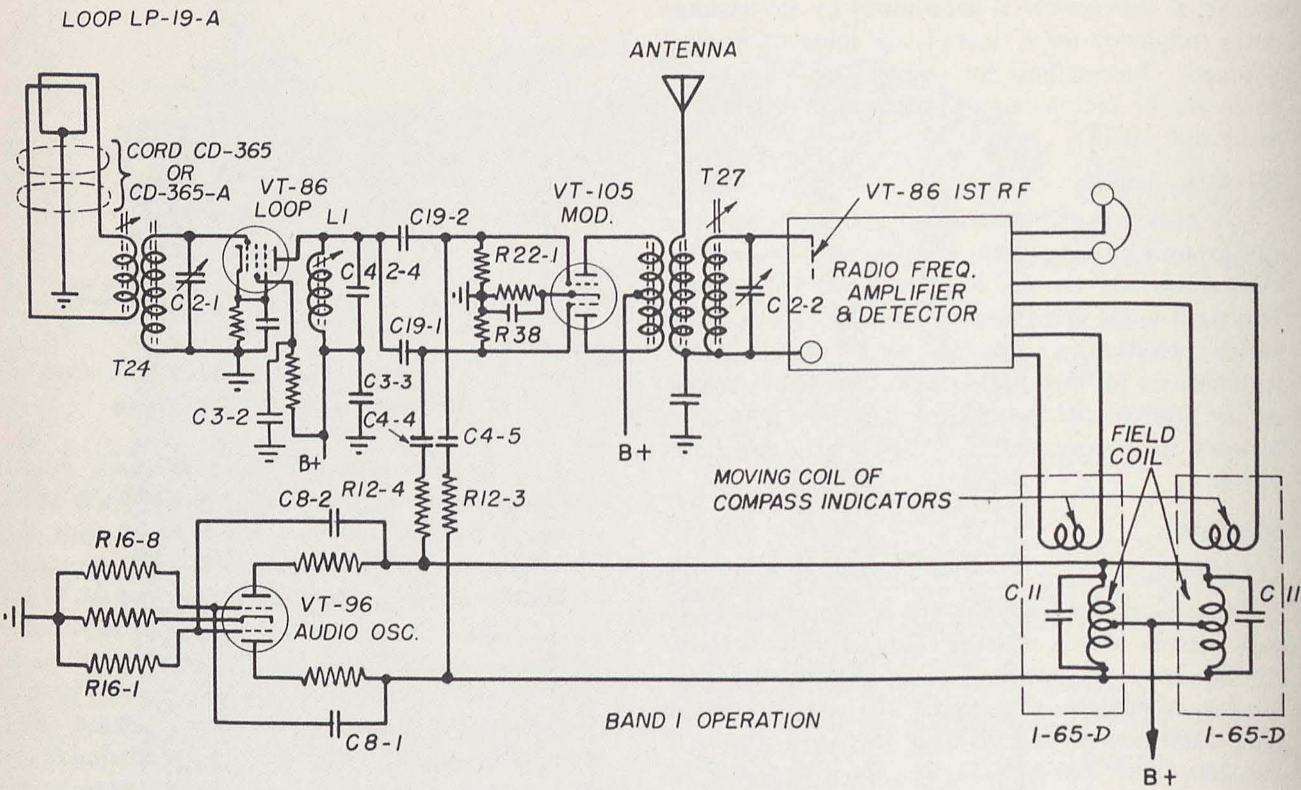

Figure 16 — Radio Compass SCR-263-A, Simplified Schematic Compass Circuit

of the modulator tube conductive in turn by alternately overcoming the cut-off bias on each grid. The plates of this modulator tube are connected in push-pull to one primary winding of the antenna input transformer T27. The non-directional antenna voltage is applied to the second primary of transformer T27. Both primaries are inductively coupled to the same secondary winding, which is tuned by capacitor C2-2, the second section of the gang tuning capacitor. This tuned secondary winding is connected to the grid of the first RF amplifier Tube VT-86, applying voltages from the loop and non-directional antenna to the grid of this first RF tube. However, the voltage of the loop is alternately changed in phase 180 degrees at twice the audio oscillator frequency by action of the push-pull modulator Tube VT-105; and therefore is alternately added to, and subtracted from, the antenna voltage at the grid of the first RF tube. Thus, a signal which is modulated at the audio oscillator frequency is applied to the grid of the first RF amplifier tube. The level of this signal depends on the effective height of the non-directional antenna. The loop gain control is provided to allow adjustment of the loop

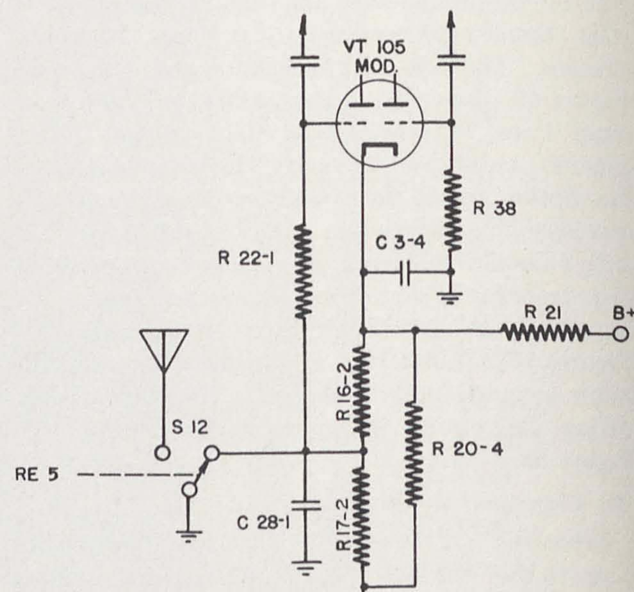

Figure 17 — Radio Compass Unit BC-443-A, Functional Diagram of Loop Gain Control

DETAILED FUNCTIONING OF PARTS

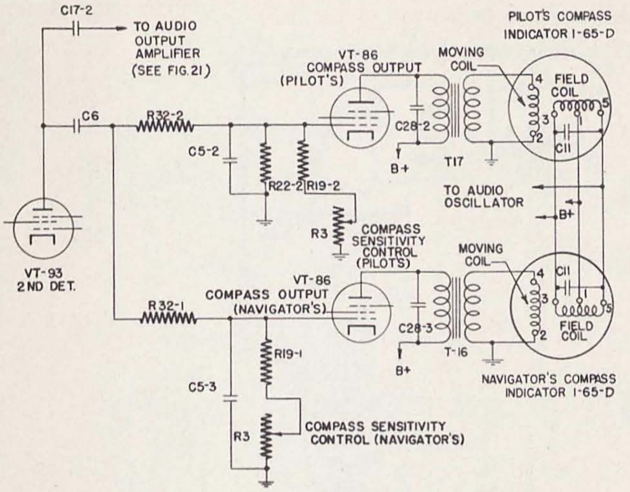

Figure 18 — Radio Compass SCR-263-A, Functional Diagram of Compass Control

modulator tube again so that the loop voltage at the grid of the first RF tube is at approximately the same level as the voltage from the non-directional antenna. Refer to Figure 17. The combined loop and antenna voltage is amplified and detected by the receiver circuits, and the audio frequency component, containing the signal and switching frequencies, is fed to the grid of the audio output Tube VT-66 through capacitor C17-2 (refer to Figure 21), and to the grids of the navigator's and pilot's compass output Tubes VT-86 through capacitor C6 (refer to Figure 18). The level of the audio voltage applied to the grid of each compass output tube is determined by the compass sensitivity control resistor R3 in the corresponding radio control box. The plate of each compass output tube is connected to the primary winding of individual compass indicator output transformers T16 and T17. The primaries of these transformers are resonated to 48 cycles by capacitors C28-2 and C28-3, and act as filters to pass only 48 cycles. The secondaries of the transformers are connected to the moving coils of the Compass Indicators I-65-D and provide the power required to actuate the compass indicator needles.

(3) Receiver Circuit

The receiver circuit is of the superheterodyne type, and consists of three stages of tuned radio frequency amplification (including first detector), a radio frequency oscillator, an intermediate frequency amplifier stage, a second detector and audio amplifier, an automatic volume control circuit, an audio output amplifier, and separate compass output amplifier tubes. A clear idea of the following circuit description can be obtained by reference to Figure 49. While the description traces only the circuit for band 1, it is applicable to other bands by substituting the appropriate coils for those bands.

The non-directional antenna connects to antenna relay 183 which performs three functions: when on compass or antenna operation, the non-directional antenna connects directly through the relay contacts to the primary of the antenna input transformer T27; when on loop operation, the relay contacts are arranged to ground the non-directional antenna, to substitute a capacitor C42-1 across the primary winding of transformer T27, and to increase the bias on the modulator Tube VT-105. A resistor R18 connects directly to the antenna, and permits electrostatic charges to leak off to ground when the antenna is ungrounded. The capacitor C17-1 prevents damage to the antenna transformer when a DC-voltage is applied to the antenna. The primary of transformer T27 inductively couples to the secondary, which is tuned by the second section of the gang tuning capacitor C2-2. The secondary of the transformer connects to the grid of the first RF tube. A small neon tube NE1-1 between the grid and ground protects the tube and circuit elements against high antenna voltages which may result from the operation of the airplane's transmitter or from high electrostatic charges on the antenna.

An inductor L16 in the cathode lead is resonated at 144.5 kcs by capacitor C16-1, and acts as a trap circuit 181 to attenuate unwanted signals near the intermediate frequency.

The plate of the first RF tube couples through transformer T30-1 to the grid of the second RF Tube VT-86, the secondary of the transformer T30-1 being tuned by the third section of the gang tuning capacitor C2-3. An IF trap circuit (inductor L12, capacitor C16-2) in the cathode lead of the second RF tube is tuned to 140.5 kcs. The plate of the second RF Tube VT-86 couples through transformer T30-2, the secondary of which is tuned by the fourth section of the gang tuning capacitor C2-4 and connects to the control grid of the first detector Tube VT-87.

The injector grid of the first detector tube is excited by the output of a triode oscillator tube which is tuned 142.5 kcs above the desired signal by the fifth section of the gang tuning capacitor C2-5. The plate circuit of this detector tube is tuned to 142.5 kcs and couples through capacitor C60 (which connects to the control grid of the first IF Tube VT-86) to a similarly tuned circuit. An inductor L15 in the cathode lead of this IF tube is resonated by a

DETAILED FUNCTIONING OF PARTS

capacitor C15 at 152.5 kcs to obtain a more uniform IF response.

The plate circuit of this IF tube is tuned to 142.5 kcs, and couples through a capacitor C61 to a second tuned circuit, which connects to one diode rectifier plate of the second detector Tube VT-93.

The grid of the second detector tube receives the rectified audio frequency signal at the junction of the diode load resistors R14-2 and R28.

The second diode plate is fed from the plate circuit of the IF tube through capacitor C21-1, and supplies the AVC bias for the first and second RF amplifiers, the first detector, and the IF amplifier tubes. The operation of this circuit is shown in Figure 19. The greater the amplitude of the received signal, the greater will be the voltage built up across the AVC load resistor R30-1 by the rectified carrier. Since the control grids of the preceding tubes are connected to the negative end of this resistor, the negative bias on them will be increased by a strong carrier, and because of their variable amplification characteristics, these tubes will operate at reduced gain on such signals. Conversely, on weak signals the bias introduced by the AVC will be smaller, and the tubes will operate at higher gain. This action tends, therefore, to maintain incoming signals at a constant level.

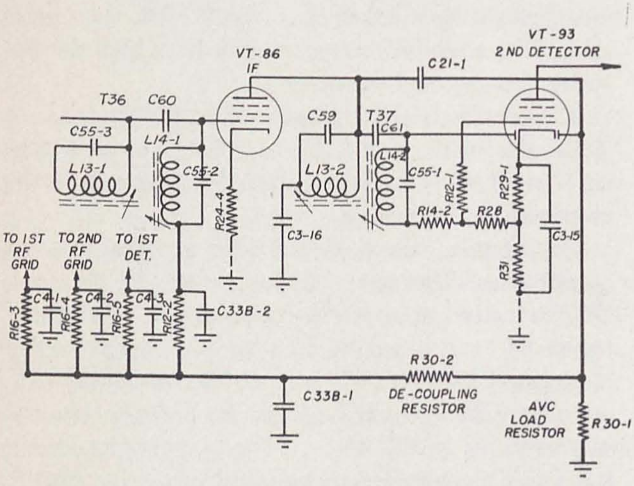

Figure 19 — Radio Compass Unit BC-443-A, Functional Diagram of AVC

Resistor R29-1 in the cathode lead of the second detector Tube VT-93 provide bias to the AVC diode which delays the action of the AVC circuit. AVC action cannot take place until the RF signal voltage on the AVC diode exceeds the IR drop in resistor R29-1. This prevents the AVC circuits from affecting signals which are below a predetermined level, thereby improving the weak-signal response of the receiver. The Tuning Meter I-70-B is in series with

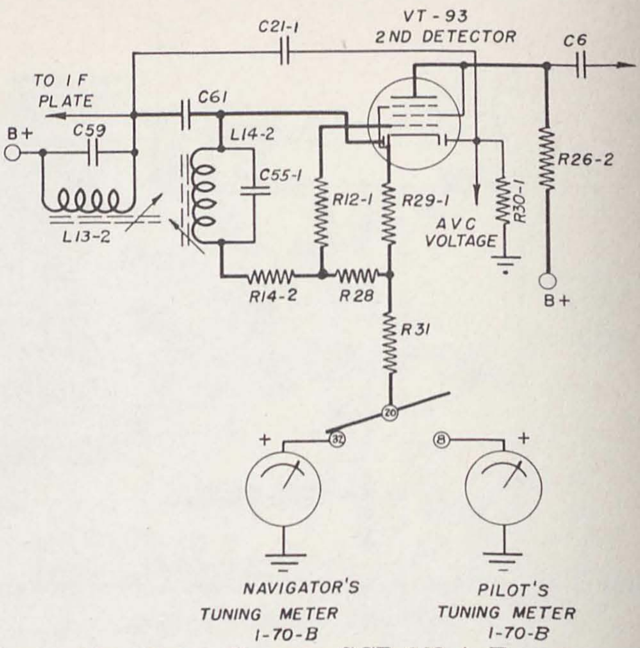

Figure 20 — Radio Compass SCR-263-A, Functional Diagram of Tuning Meter

the cathode lead of the second detector Tube VT-93, (see Figure 20). When no signal is being received, the plate current of the triode section will be at a maximum, since the only bias effective on the triode grid will be the voltage drop across resistor R29-1. This triode plate current will cause a full-scale left deflection on the tuning meter (the zero setting of the instrument being at the extreme right). When a signal is received, some second detector diode current, depending on the signal intensity, will flow through the diode load resistors R14-2 and R28. Since R12-1 connects to the junction of these resistors, an additional negative bias, equal to the IR drop across resistor R28 will be applied to the audio grid, serving to reduce the plate current and consequently cause the tuning meter deflection to swing toward the right. Since resistor R29-1 has a small resistance as compared to resistor R28, its increased IR drop, due to second detector diode current, will be negligible. Since the bias voltage developed across resistor R28 depends upon signal intensity at the second detector, the right hand deflection of the tuning meter, which measures this bias voltage, can be used to indicate exact tuning.

The plate of the second detector tube is resistance-capacitance coupled to the grid of the audio output Tube VT-66. The plate of the audio output tube is connected to the primary of the output transformer T15. The secondary of this transformer works into a low-pass filter network consisting of choke L10, and capacitors C34-1, C34-2 which is designed to

DETAILED FUNCTIONING OF PARTS

attenuate frequencies above 2500 cycles. The output of the filter network is connected to the headset jacks J3 in the radio control boxes. See Figure 21 for complete audio output and control circuit.

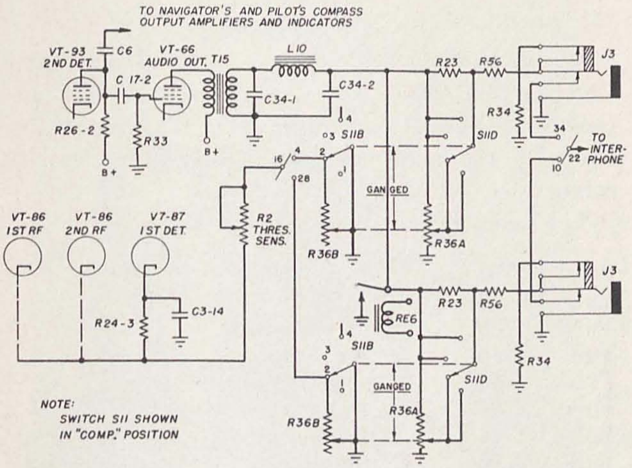

FIGURE 21—RADIO COMPASS SCR-263-A, FUNCTIONAL DIAGRAM OF AUDIO CONTROL

(4) Band Change Circuit

Band changing is effected by switching the tuned circuits in the loop, antenna, first RF, second RF, and RF oscillator stages by means of motor-driven switches. The operation of the band switch drive mechanism is shown in Figure 22. The motor armature drives a worm gear, which is ganged on a common shaft with the crank arm, the locking cam, and the control cam. The geneva disk, switches S5A and S5B, and the RF band change switches are ganged on another shaft. When the band selector switch S9 at the controlling radio control box is operated to select a different band, the band switch Motor MO-5-A is energized by completing the circuit to ground through the contacts of switches S9 and S5A. The motor drives the crank arm through one or two complete revolutions, which steps the geneva disk until the motor is de-energized by the opening of switch S5A which is ganged on the same shaft as the geneva disk and the switches that select the tuned

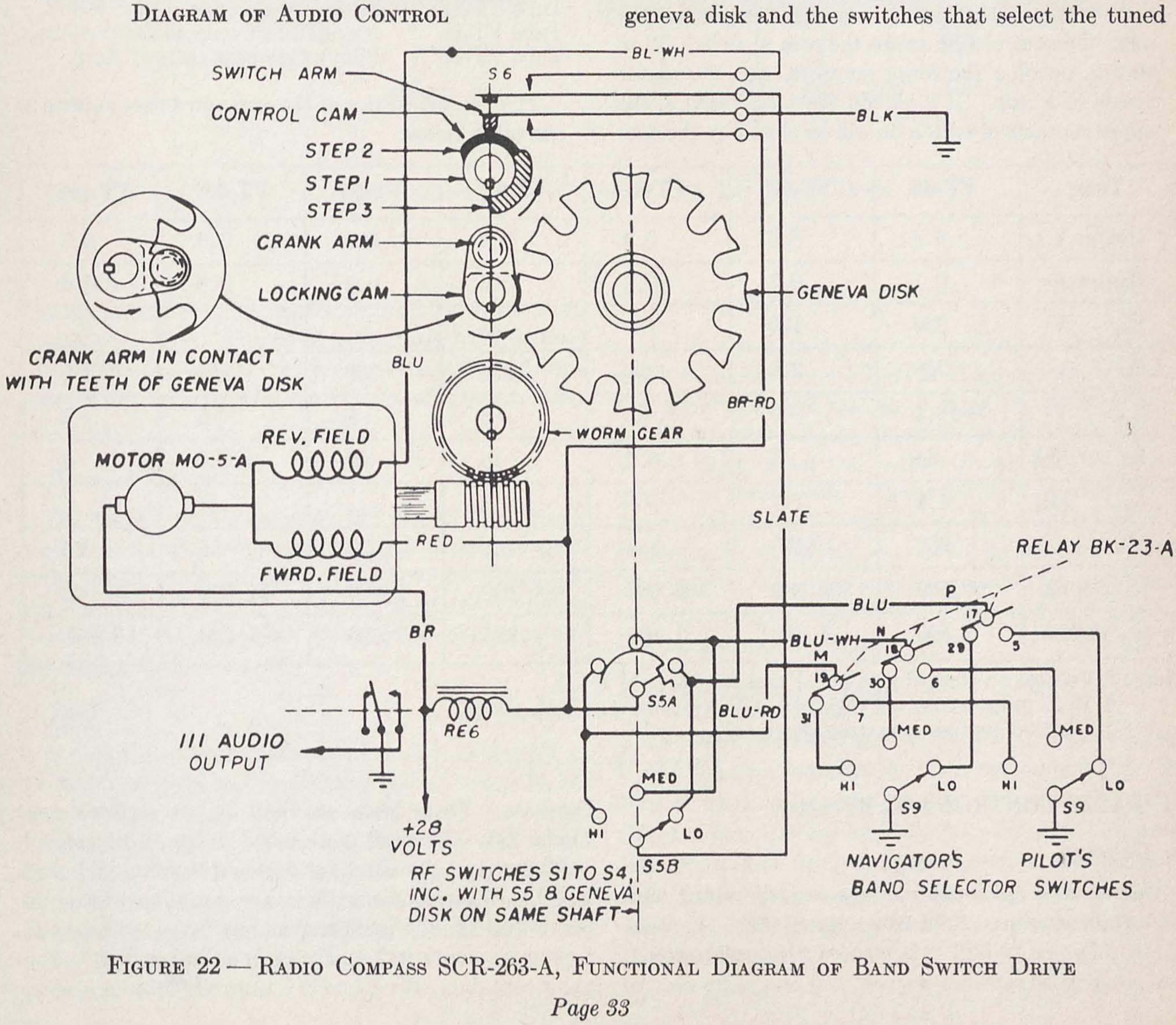

FIGURE 22—RADIO COMPASS SCR-263-A, FUNCTIONAL DIAGRAM OF BAND SWITCH DRIVE

circuits. Exact control of the positioning is obtained by the cam-operated switch S6. When the motor is at rest, the arm of the switch S6 is on step 2 of the control cam, and all contacts are open. When S9 is moved to the "MED." position (Figure 22), the forward field is energized, starting the motor in the direction shown by the arrows and operating relay RE6 which grounds the audio output of the radio compass to prevent noise while changing bands. When the motor starts, the switch arm is first raised by step 3 of the cam, closing the upper contacts which at this time perform no function since the corresponding contact of S9 will be open. As the motor continues operating, the arm of switch S6 will drop to step 1 of the cam, opening the upper contacts and closing the lower ones. The closing of the lower contacts provides an additional path to ground to keep the motor and relay RE6 energized after the opening of switch S5A by the movement of the geneva disk. When the crank arm has been driven past the geneva disk, engaging the locking cam with the arc of the disk, the control cam raises the arm of switch S6 to step 2, opening the lower contacts, and the motor coasts to a stop. If it should coast past step 2, the upper contacts of switch S6 will be closed by the control cam and will now energize the reverse field of the motor through the contacts of switches S5B and S9, and the motor will reverse to the proper position, where all contacts of S6 are open.

(5) Vacuum Tubes

A complement of 12 tubes is required for Radio Compass SCR-263-A, and all are used in Radio Compass Unit BC-443-A. Tubes may be replaced by removing the radio compass unit chassis from its cabinet.

The following vacuum tubes are required:

Tube VT-86	Loop Amplifier
Tube VT-105	Modulator
Tube VT-96	Audio Oscillator
Tube VT-86	1st RF Amplifier
Tube VT-86	2nd RF Amplifier
Tube VT-87	1st Detector
Tube VT-94	RF Oscillator
Tube VT-86	IF Amplifier
Tube VT-93	2nd Detector, AVC and 1st Audio
Tube VT-66	Audio Output Amp.
Tube VT-86	Navigator's Compass Output Amp.
Tube VT-86	Pilot's Compass Output Amp.

The characteristics of the vacuum tubes appear in the table below:

Tube	VT-66	VT-86	VT-87	VT-93	VT-94	VT-96†	VT-105‡
Heater V	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Heater A	0.7	0.3	0.3	0.3	0.3	0.8	0.3
E_{sg} V	250	100	100	125	...	...	...
E_p V	250	250	250	250	250	250	250
E_{cg} V	−16.5	−3	−3*	−3	−8	−5	−2
I_p MA	34	7	5.3	10	9	6	2
I_{sg} MA	6.5	1.7	5.5	2.3	...	...	...
Mu	200	1160	880	800	20	35	70
R_p Ohms	80,000	800,000	800,000	600,000	7,700	11,300	53,000
G_m μmhos	2,500	1,450	1,100	1,325	2,600	3,100	1,325

Note: * Voltage on control grid No. 1 and control grid No. 3.
† Both grids connected together at socket; likewise both plates.
‡ For each section measured separately.

14. RADIO CONTROL BOX BC-444-A

a. General

One or two radio control boxes are provided with each Radio Compass SCR-263-A installation. Each includes 5 Lamps LM-32 (3 in use and 2 mounted spares), one No. 6 Allen setscrew wrench, and one radio control box base. These boxes are built in two sections (see Figure 23). The cable is attached to the radio control box base, and the wires are soldered to terminal board TB10. Electrical connections are made from terminal board TB10 to the radio control box panel by means of a plug assembly 212 and socket assembly 213. The panel containing the controls is secured to the mounting

DETAILED FUNCTIONING OF PARTS

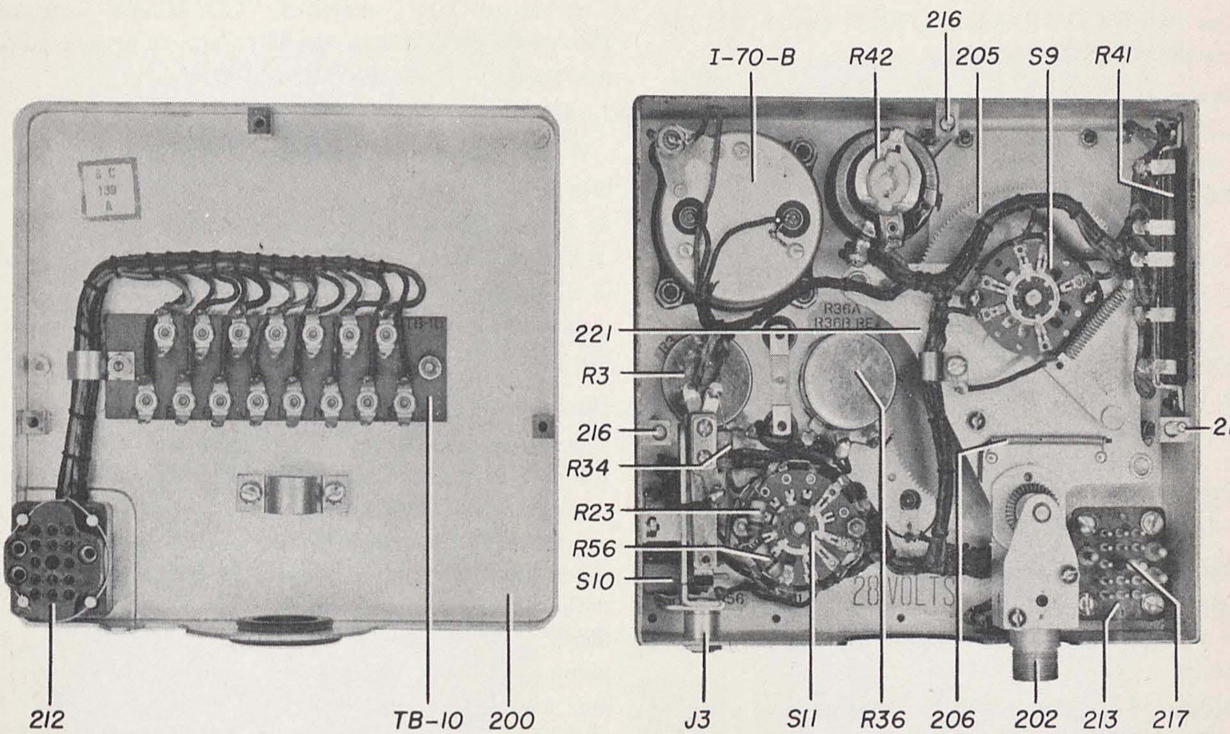

FIGURE 23 — RADIO CONTROL BOX BC-444-A, OPEN

base by means of three captive screws 216 and a plug release screw 217. The panel is removed from its base by first unscrewing the three captive screws and then unscrewing the plug release screw located in the lower left corner.

b. *Tuning Crank*

The tuning crank operates the dial of the remote control box and is connected through a train of gears to the tuning shaft, Coupling MC-203, elbow fitting 133, and the ganged tuning capacitor in Radio Compass Unit BC-443-A. The gear ratio between the crank and the tuning shaft is 1 to 2.

c. *Dial*

A radial disk-type dial is used, and is calibrated at every 5 kcs from 200 to 410 kcs and at every 10 kcs from 410 to 1750 kcs. A mark with the word "ALIGN" is placed at the low frequency end of the dial on the 850–1750 kcs band for aligning the dials when interconnecting them to the radio compass unit with the tuning shaft. The dial is illuminated by one Lamp LM-32 (see Figure 3).

d. *Tuning Meter I-70-B*

Due to the high degree of selectivity of this equipment, a Tuning Meter I-70-B (2 MA zero right reading, 5 MA full scale left reading, 5 ohms DC resistance) is provided to show, by maximum deflection of the pointer to the right, when the radio compass unit is tuned exactly to the station. The meter is illuminated by a Lamp LM-32, and luminous paint is applied to the pointer and scale divisions as an aid during night flying. The pointer deflection is not necessarily an indication of field strength, therefore the meter should not be used as a distance meter.

e. *Band Change Switch*

The frequency band selector switch S9, located below the tuning dial, energizes the band switching motor and thus is capable of selecting any of the three bands, 200–410 kcs, 410–850 kcs, and 850–1750 kcs. A mask 222 attached to the switch shaft permits viewing only that part of the tuning dial associated with the band selected. The band range in use is marked on the mask. (See Figure 34.)

DETAILED FUNCTIONING OF PARTS

f. "OFF-COMP.-ANT.-LOOP" Switch

The "OFF-COMP.-ANT.-LOOP" switch S11 performs the following functions:

Section S11A at either radio control box, when set on "COMP.", "ANT.", or "LOOP", puts low voltage on one side of control switch S10, and energizes relay RE7 which closes contacts supplying low voltage to the entire radio compass equipment, and to the marker beacon receiver, if one is connected.

Section S11B at the radio control box having control, when set on "COMP.", completes the ground connection to the cathodes of the 1st RF, 2nd RF, and 1st Det. tubes directly instead of through resistor R36B, thus permitting the RF circuits to operate at maximum gain, controlled by the AVC action only. When on "LOOP", relay RE5 is energized, switching the non-directional antenna from the antenna stage to ground.

Section S11C at the radio control box having control, when set on "COMP.", energizes the audio oscillator tube by completing the ground connection to the cathode.

Section S11D at either radio control box, when on "COMP.", completes the circuit from the audio output transformer to ground through the variable arm of resistor R36A in parallel with the circuit to the headset jack. The audio level in the "COMP." position is therefore controlled independently at either radio control box, no matter which one has control.

When on "ANT." or "LOOP", the parallel circuit from the audio output transformer is completed to ground through all of resistor R36A.

g. Light Control

A control knob, engraved "LIGHTS", regulates the brilliancy of the instrument lamps on the frequency calibrated dial and the tuning meter.

h. Audio Control

A control knob engraved "AUDIO", regulates the level of the audio signal in the headset. When functioning on "COMP.", the equipment is operating on automatic volume control (AVC), and this knob, by varying a resistance network in the headset circuit, determines the audio level at that radio control box only, the level at the other control box being determined by the audio control at that box. When the equipment is functioning as a receiver on either "ANT." or "LOOP" positions, this control knob varies the gain of the radio frequency amplifiers, to permit flying radio range courses. On "ANT." or "LOOP" operation, the audio control at the controlling position determines the maximum audio level available at both positions. (See Figures 3 and 21.)

i. Compass Control

A control knob, engraved "COMPASS", regulates the needle deflection of the Compass Indicator I-65-D associated with the operating position only.

j. Miscellaneous

A No. 6 Allen setscrew wrench is mounted on the gear-drive plate inside the radio control box panel.

k. Control Indicator

A green jewel near the center of the control box, is illuminated on the control box in control. It requires one Lamp LM-32 which may be changed on the panel.

15. COMPASS INDICATOR I-65-D

One or two Compass Indicators I-65-D are used with Radio Compass SCR-263-A, one for each operating position. The compass indicators are designed for instrument panel mounting, and must be individually shock mounted if the instrument panel is not provided with shock absorbers. The compass indicator dial is marked with a small conventionalized figure of an airplane to indicate "On Course" flight. The dial markings and needle are coated with luminous paint for visibility during night flying. The compass indicator is lighted by means of one Lamp LM-32. The lamp

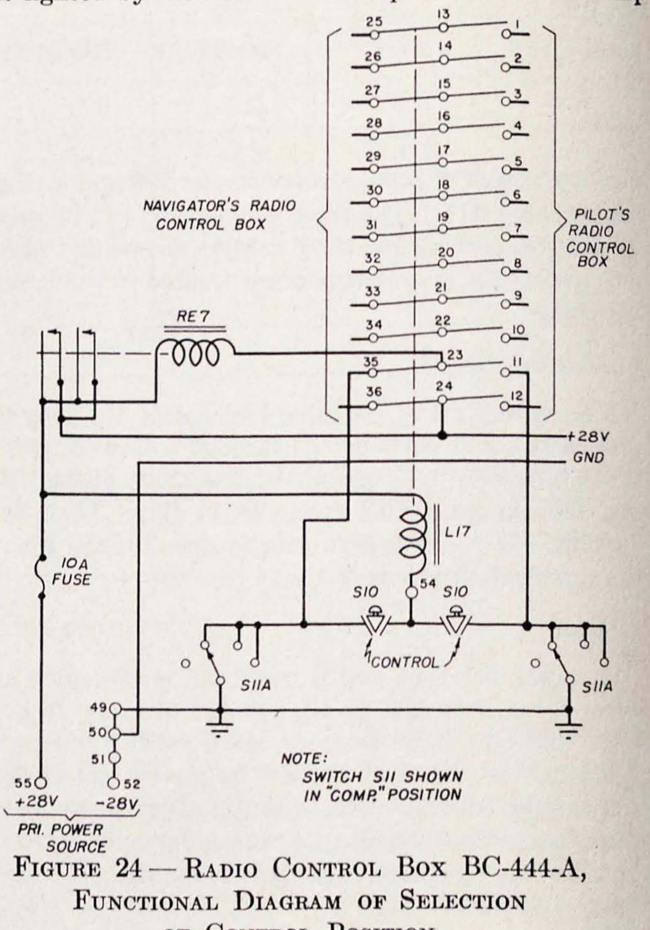

FIGURE 24 — RADIO CONTROL BOX BC-444-A, FUNCTIONAL DIAGRAM OF SELECTION OF CONTROL POSITION

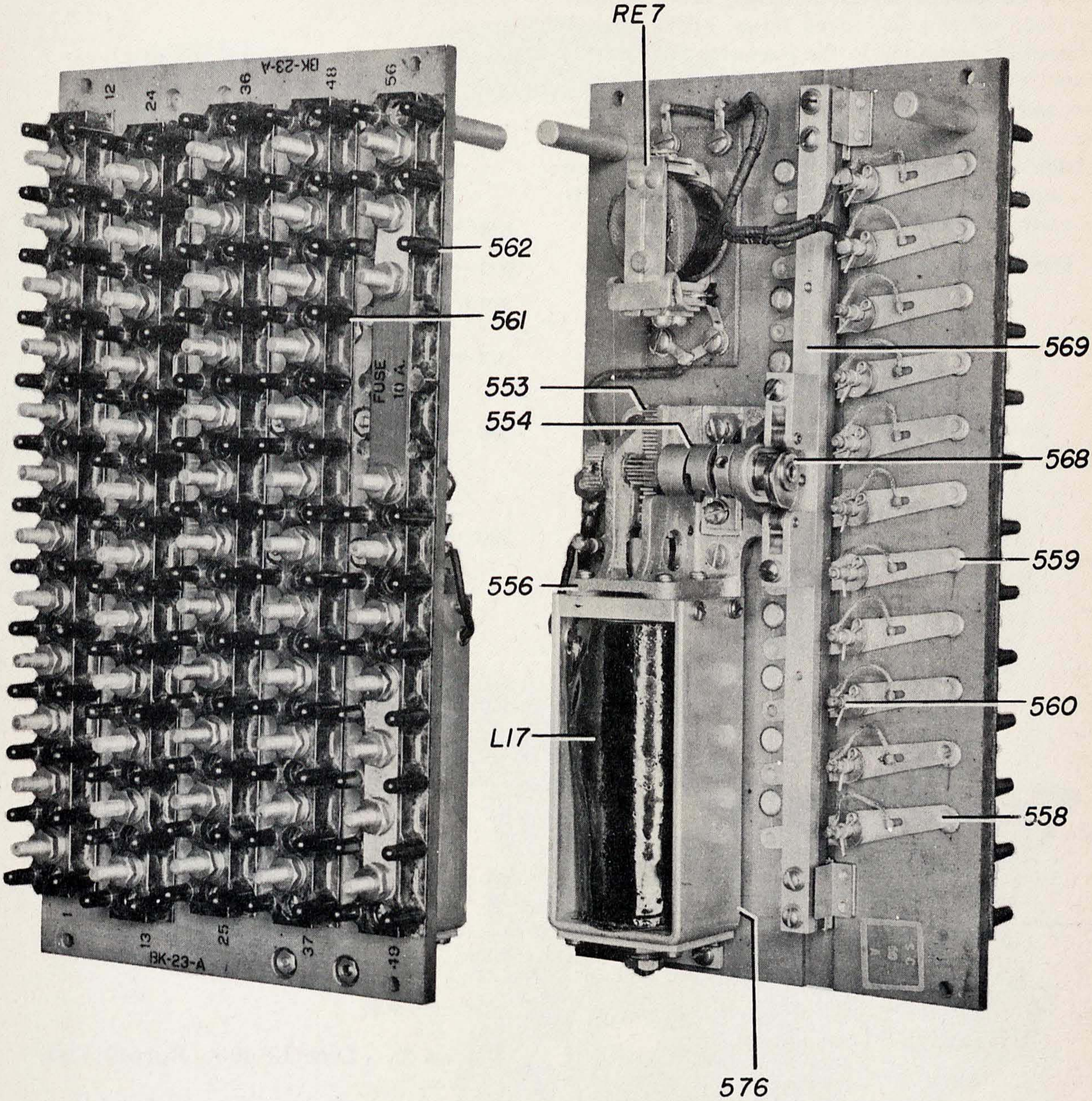

Figure 25 — Relay BK-23-A, Front and Rear Views

is connected to the socket for Plug PL-117. The movement is of the iron-core dynamometer type. The field coil is center-tapped and serves as the plate inductance for the audio oscillator, being resonated by capacitor C11 which is mounted inside the case. This capacitor may be replaced by removing the dust cover of the compass indicator, the two mounting screws which hold the capacitor in place, and withdrawing it until the soldering lugs are accessible. Terminals 2 and 4 of the socket marked PL-118 connect to the moving coil, and terminals 1, 3, and 5 connect to the field winding (see Figure 49). No loss of performance will result if one of the compass indicators is omitted and its equivalent resistance and capacitance substituted as in paragraph 9*c*(5).

16. RELAY BK-23-A

Relay BK-23-A provides means for transferring control of Radio Compass SCR-263-A from one radio control box to the other and means for electrical interconnection between the various units. It is a solenoid-operated, eleven-pole, double-throw switch and is designed for mounting in the connector panel of the aircraft conduit system. Relay RE7 is a part of this unit, and controls the low voltage input to the equipment. (See Figures 24 and 25.) In single control box installations Relay BK-23-A is not used (see Figure 51), and RE7 must be replaced with Relay SW-177-( ) which is available at signal supply sections.

17. LOOP LP-19-A (Figures 4 and 26)

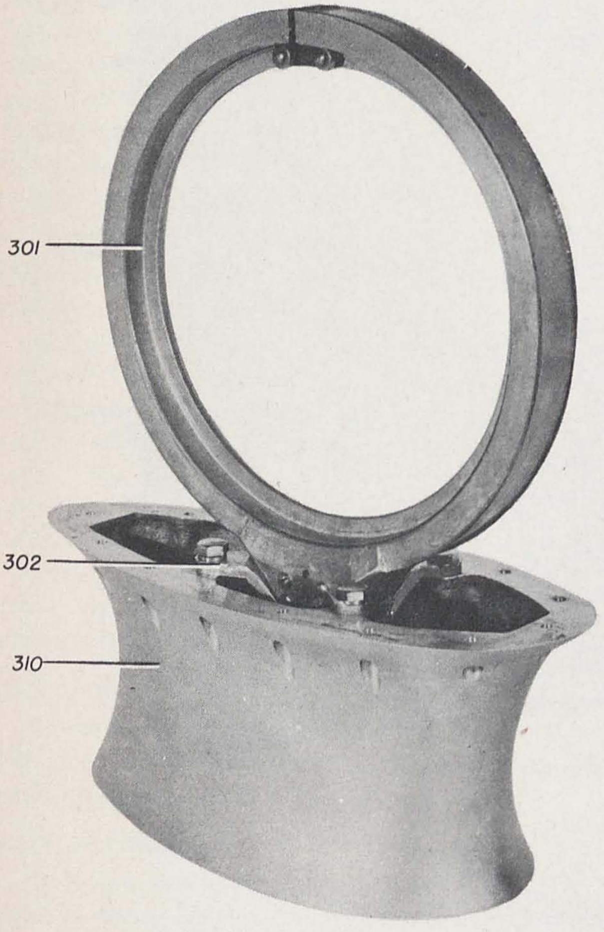

FIGURE 26 — LOOP LP-19-A, HOUSING REMOVED

Loop LP-19-A consists of an 8-turn coil with center tap, electrostatically shielded and enclosed in a zeppelin-type housing. Electrical connection to the loop is made through terminals 2, 3, and 4 of the socket for Plug PL-108 in the base of the housing. (See Figures 4, 26, 27, and 28.)

18. INDICATOR I-75-A (Bearing)

Essentially, Indicator I-75-A (Bearing) consists of a double-ended tuning shaft drive to which is connected,

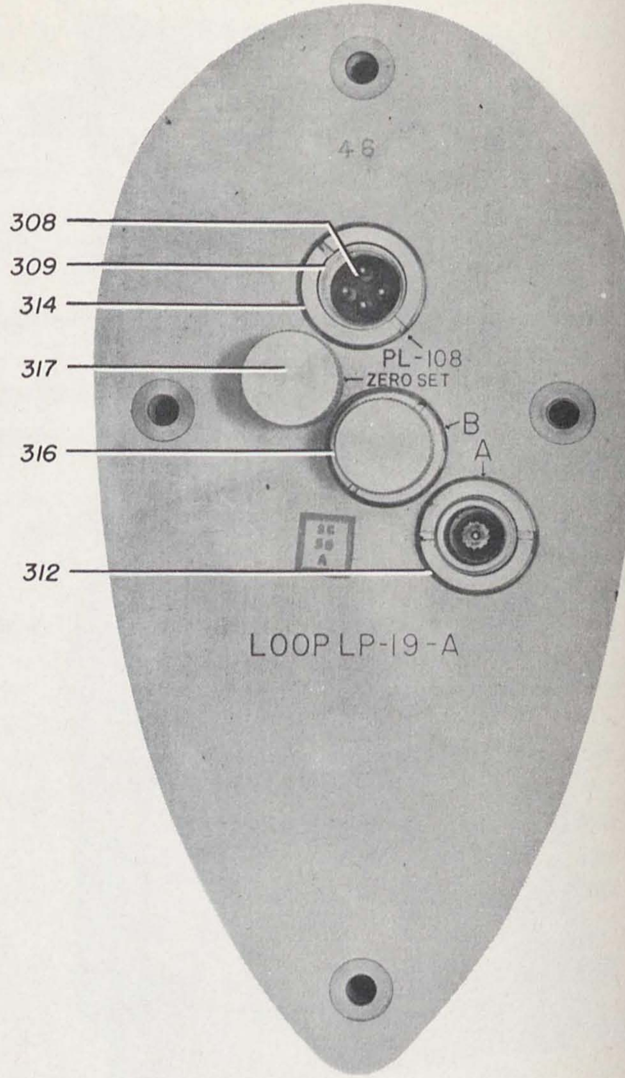

FIGURE 27 — LOOP LP-19-A, BOTTOM VIEW

through an appropriate gear-and-cam drive, a pointer that moves over the bearing scale. (See Figures 5 and 29.)

A cam strip 411 is contained in the cam housing assembly 418, and is provided with an adjusting screw at each 15 degrees around its periphery. The compensator, which is controlled by this cam strip, automatically applies the radio compass deviation correction to the bearing indicator pointer. The heading of the aircraft relative to magnetic North and any necessary East or West variation correction is applied by moving the bearing scale the proper number of degrees relative to the fixed index mark by means of the "VAR." knob. The scale which is visible through the small opening in

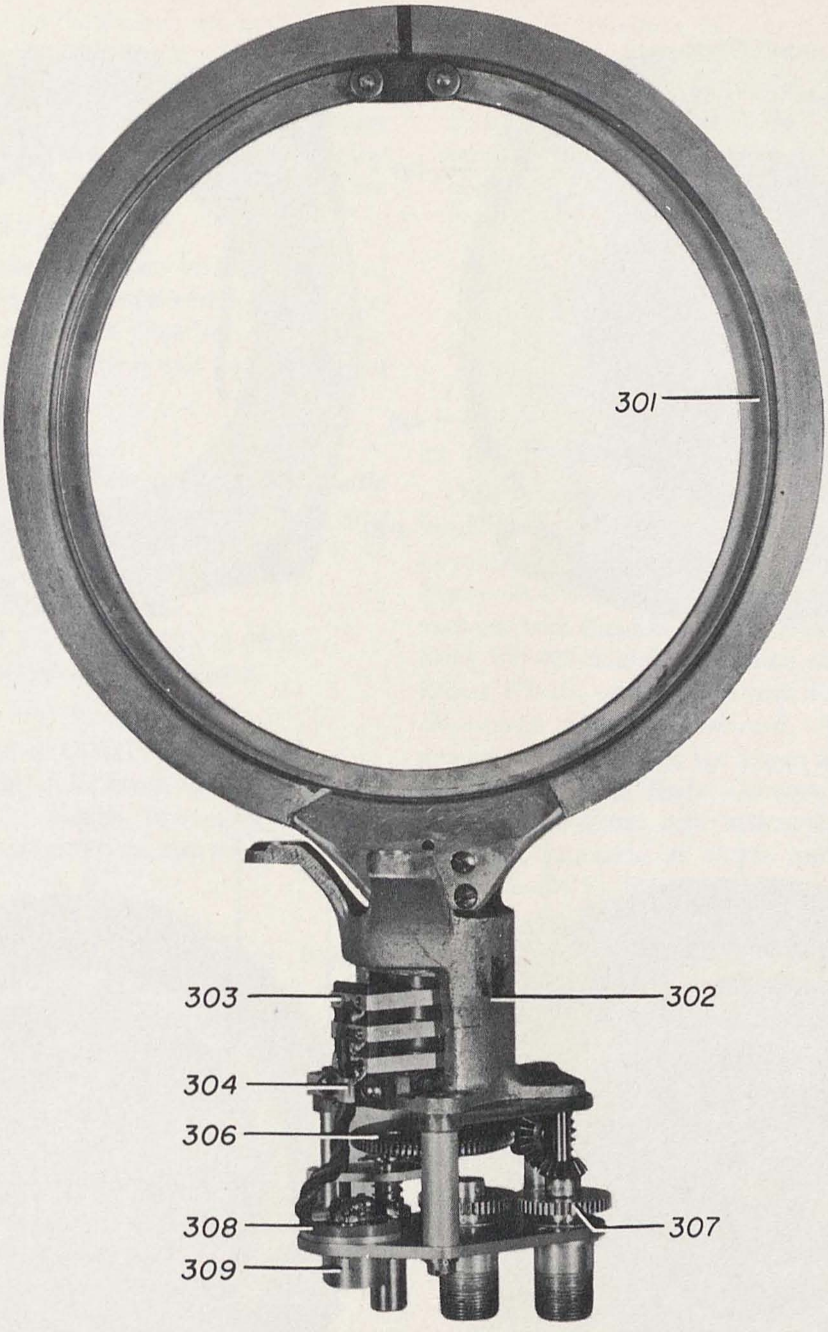

FIGURE 28 — LOOP LP-19-A AND ROTATOR ASSEMBLY

the lower center of the bearing indicator face is used as a reference scale when the radio compass deviation compensator is being adjusted.

19. TUNING SHAFT

A flexible mechanical cable with an inner flexible twisted-wire shaft is used to couple the tuning control of Radio Control Box BC-444-A to the tuning drive mechanism of Radio Compass Unit BC-443-A through Coupling MC-203, and for coupling Loop LP-19-A, and Indicator I-75-A (Bearing) to Control Unit MC-204. (See Figure 47.)

20. COUPLING MC-203

This coupling provides a means of interconnecting the tuning shafts from the two radio control boxes with

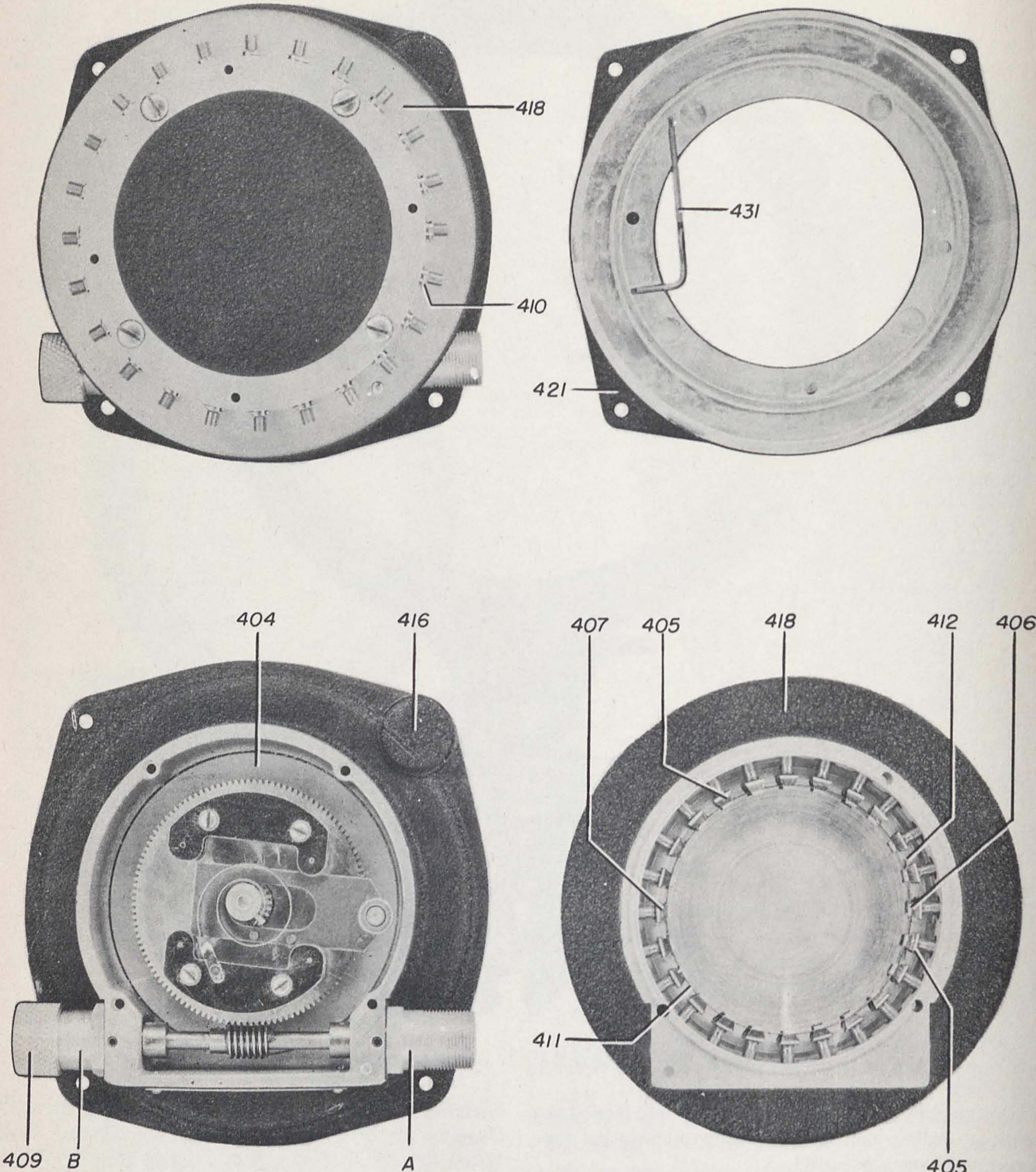

FIGURE 29 — INDICATOR I-75-A (BEARING), DISASSEMBLED

the tuning shaft from the radio compass unit (see Figure 47). There is no differential action; i.e., when the tuning crank on one control box is rotated the crank on the other box moves in unison. The ratio between the control box tuning shaft and the radio compass unit tuning shaft is 1 to 1. (See Figure 30.) Coupling MC-203 is not used on single control box installations.

21. CONTROL UNIT MC-204

This unit is connected as shown in Figure 47, and serves to operate the tuning shafts which rotate Loop LP-19-A and Indicator I-75-A (Bearing). The ratio between the crank on the control unit and the tuning shafts is 1 to 2.

22. CHART MC-220

One or two Charts MC-220 are furnished with Radio Compass SCR-263-A, one to be mounted near each radio control box. The legend on the charts is as follows:

CHART MC-220
OPERATION INSTRUCTIONS FOR
RADIO COMPASS SCR-263-A

GENERAL: Switch to COMP.
Push CONTROL switch for green light. Set BAND SWITCH. Tune to station frequency and rock tuning crank for maximum clockwise swing of tuning meter.

HOMING: Switch to COMP. Be sure bearing pointer is on index. Use COMP. knob to obtain desired swing of compass indicator needle. Station is ahead if needle is returned to zero by applying rudder in the direction of deflection. Station is aft if needle swings same as rudder.

DIRECTION FINDING: Switch to COMP. Maintain airplane heading. Turn outside bearing scale to magnetic heading of airplane and correct for variation using the variation knob. Turn bearing pointer in direction of compass indicator needle swing. Read AIRPLANE TO STATION bearing at head of bearing pointer and STATION TO AIRPLANE bearing at tail of bearing pointer. To obtain fix, repeat on one or more stations and plot bearings. Airplane at intersection of plotted bearings.

RECEPTION: Switch to ANT. On RANGE signals set INTERPHONE on MAX. and keep AUDIO knob adjusted for lowest audible volume. If noisy, try LOOP and crank MC-204 for best reception.

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23. CORD CD-365 and CORD CD-365-A

Cord CD-365 and Cord CD-365-A consist of three insulated flexible leads in a neoprene covered flexible metallic conduit as shown in the outline drawing Figure 65 and in Figure 30. Cord CD-365 is fitted at each end with Conduit Elbow FT-184 and Plug PL-108. Cord CD-365-A is fitted at one end with a Conduit Elbow FT-184 and at each end with a Plug PL-108. *Do not alter the length of this cord.* Where the length is greater than is needed, the excess should be coiled up and not cut off, as Radio Compass Unit BC-443-A is adjusted to operate with the capacitance of the cord length as supplied. If longer cords are required, a report should be forwarded through proper channels. Fabrication of longer cords should not be attempted in the field without specific approval and engineering direction, as any change in the capacitance of this cord will seriously affect the operation of the radio compass.

24. PLUGS

Radio Compass SCR-263-A is equipped with four types of plugs which are complete except for conduit ferrule and ferrule coupling nut. These plugs are not interchangeable. The number of connectors, sizes of ferrule, ferrule coupling nut, and conduit are listed in the following table:

DETAILED FUNCTIONING OF PARTS

	No. of Connectors			Air Corps Drawing No.		Flexible Conduit Size I.D.	Location of Plugs
	2 Amp.	10 Amp.	25 Amp.	Ferrule Coupling	Nut Ferrule		
Plug PL-108	..	4	..	36A2212-2	36A2213-2	3/8	2 at CD-365 or CD-365-A
Plug PL-117	1	..	..	SC-D-2331*	SC-D-2331*	1/8	1 at ea. I-65-D
Plug PL-118	..	3	2	36A2212-4	36A2213-4	5/8	1 at ea. I-65-D
Plug PL-122	..	18	4	36A2212-6	36A2213-6	1	1 at BC-443-A

* Refers to Signal Corps plug assembly drawing.

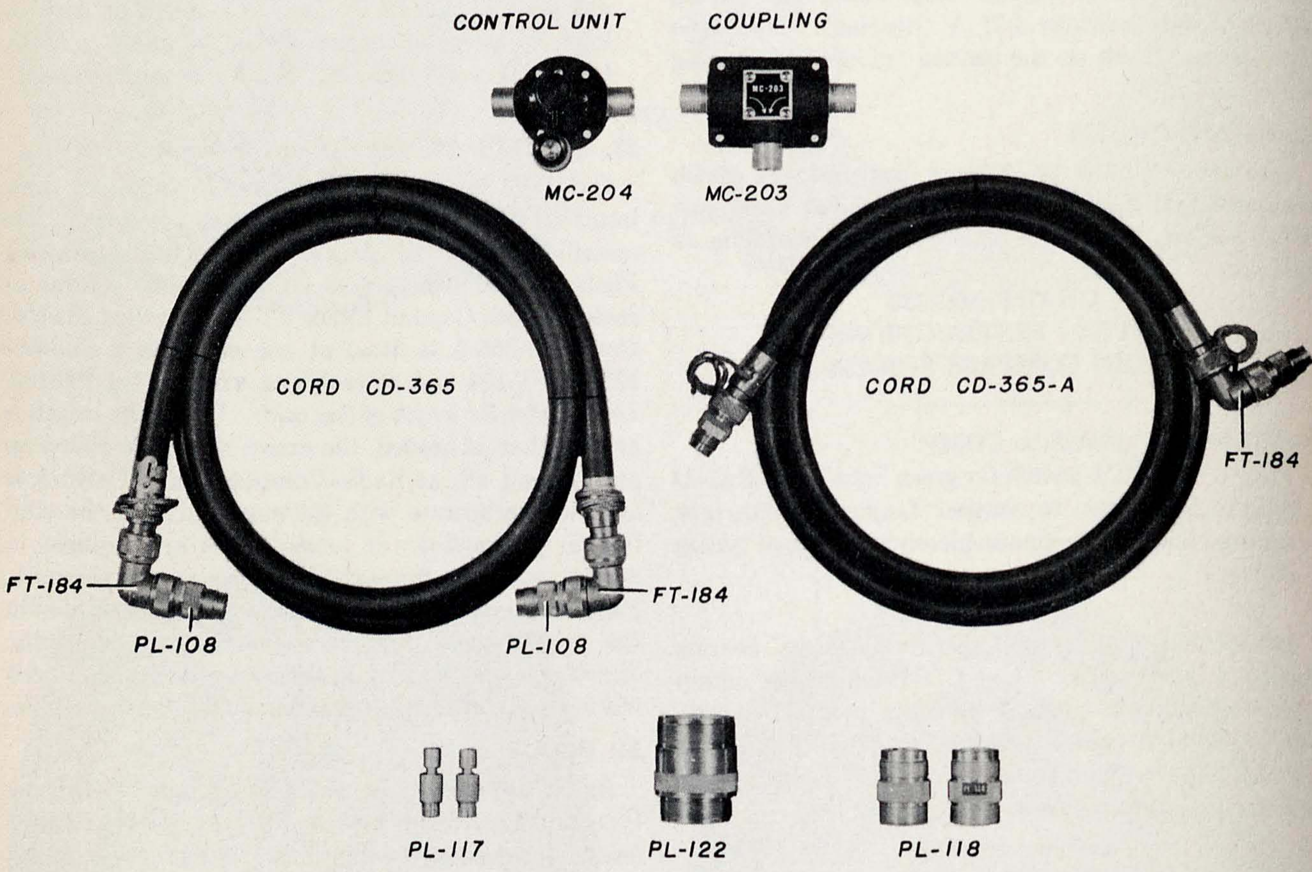


FIGURE 30 — CORD CD-365, CORD CD-365-A, COUPLING MC-203, CONTROL UNIT MC-204, AND PLUGS PL-108, PL-117, PL-118, AND PL-122

25. AUTOTRANSFORMER C-289

For installations which require a low-impedance output for operation with 500-ohm interphone equipments, an Autotransformer C-289 may be obtained from a Signal Corps Repair Section for this purpose. This transformer should be mounted on Relay BK-23-A and connected as follows: (See Figure 49 or 51.)

Autotransformer C- 289 Terminal No.	Connection	Dual Remote Control Relay BK-23-A Terminal No.	Single Remote Control Connector Panel Terminal No.
1	Ground	49	18
2	Interphone	any unused term.	any unused term.
3	Compass Output	22	10

MAINTENANCE

NOTE—ADJUSTMENT, REPAIR, OR DISASSEMBLY OF MAJOR COMPONENTS IS NOT AUTHORIZED TO BE DONE BY PERSONNEL OTHER THAN THAT OF THE SIGNAL CORPS RADIO SECTIONS AT AIR DEPOTS AND THE SIGNAL CORPS REPAIR SHOPS WHERE TRAINED PERSONNEL AND SUITABLE LABORATORY EQUIPMENT, SUCH AS SIGNAL GENERATORS, TEST SETS, SHIELDED ROOM, AND STANDARD COMPASS TEST SET-UP IS AVAILABLE.

26. OPERATIONAL INSPECTION OF COMPASS EQUIPMENT MOUNTED IN AIRCRAFT

The inspection of Radio Compass SCR-263-A when mounted in aircraft should be sufficiently thorough to determine whether the equipment is in working order. This inspection should be made with the airplane at least 200 feet distant from hills, buildings, towers, telephone lines, power lines, and other large electrically conductive objects which are likely to distort the radio frequency field.

a. Check the mounting of Radio Compass Unit BC-443-A, Radio Control Boxes BC-444-A, and Loop LP-19-A.

b. Inspect all plugs and mechanical couplings, and make certain that they are securely seated and that the outer collar is tight enough to prevent movement of the cables or tuning shafts in the couplings. Check headset cords. Clean all headset plugs. (A three-inch pencil eraser provides a simple means for cleaning these plugs.) All plugs and sockets should have an adequate amount of anti-seize compound on the threads to nsure lubrication.

c. Check all instrument lamps.

d. Operate equipment on "ANT." and "LOOP". Tune in several stations in each band. Select stations providing weak signals, and check receiver sensitivity. Check the operation of all controls at both control positions. Check noise in equipment. Check frequency calibration at both radio control boxes.

e. Operate equipment on "COMP." Check bearings of stations in each band against known bearings. Select stations providing weak signals and left and right bearings. Check both compass indicators for correct sensing. The compass indicator needles should point in the direction of the station. Check the deflection of the compass indicators against previously observed deflections.

f. Start aircraft motors. Repeat procedure of paragraph 26*e*. Check for any increase in noise and for instability of compass indicator needles.

27. GENERAL INSPECTION AND OVERHAUL OF COMPASS EQUIPMENT

NOTE—Remove Radio Compass Unit BC-443-A, Radio Control Boxes BC-444-A, Loop LP-19-A, Indicator I-75-A (Bearing), Cord CD-365 or Cord CD-365-A, and Compass Indicators I-65-D (see Figure 1) from the aircraft and return to the Signal Corps Radio Section at the proper Air Depot. Only the Signal Corps Radio Sections at Air Depots are authorized to make this inspection or to disassemble, adjust, or repair the above named units, except that, when necessary, certain limited repairs can be made at Signal Corps Repair Shops. This inspection should be conducted as follows:

a. General

Applicable to all parts. Inspect all nuts, bolts, and screws for looseness. Do not tighten or loosen glyptalled screws or nuts unless it is evident that they are loose. In the event they are loose, remove screws or nuts, apply glyptal, replace and tighten. Remove loose solder, dirt, and metallic chips. Clean equipment thoroughly and touch up scratched paint. Remove all traces of corrosion. Inspect soldered joints. Inspect wiring. If more than two strands are broken at a soldered joint, cut off lead and resolder. If wires seem to be breaking from vibration, clamp a soldering lug to lead and resolder. Inspect all plug connectors and clean if necessary.

b. Radio Compass Unit BC-443-A (Figures 2 and 12)

(1) Inspect unit as described in paragraph 27*a*, but do not disturb alignment adjustment. Do not disturb wiring unless necessary.

(2) Check all tubes in accordance with the table in paragraph 32*d*(3). If the plate current is less than 80% of normal plate current with 6.3 volts on the heater, replace the tubes. Replace all tubes used over 500 hours.

(3) Dynamotor DM-30 (Figure 31). The dynamotor should be inspected after 500 hours of service or once a year, whichever period is shorter. Disassemble the dynamotor as described in paragraph 29*c*. Examine the brushes 125 and 126 to see if they have worn properly and are free of hard spots. If such spots are apparent, replace the brush. Spotted brushes can be located by inspecting the commutator for grooves. Remove bearings 124 from armature 186, and clean with warm pene-

trating oil. Check bearings for broken or chipped balls. Clean away all old grease. Relubricate with Air Corps Grade 375 grease to cover the bearings. Master Lubricants Company Lubrico *M-6*, New York and New Jersey Lubricant Company *F-927*, and Royal Engineering Company *Royco 6A* comply with Air Corps Specifications for Grade 375 grease. Do not pack bearings. *Keep grease off commutators.* Wipe off dirt from commutators, dust covers 127, armature 186, and field coil assembly 187. If commutators do not have a smooth, even surface, place the armature in a lathe and rotate it. Polish the faulty commutator with a piece of soap stone, or take a very thin (.003-inch) cut using the lathe. Do not use sandpaper, as this causes deformation of the commutator bars. *Do not use emery cloth.* Remove all dust and dirt particles after polishing. A commutator should have a smooth polished surface free of dirt, grease, or ridges. *A commutator having a smooth or polished surface should not be stoned or turned down simply because it is discolored.* Under normal conditions, the commutators should not require turning down before the expiration of 5000 hours of service. After turning down, the commutator should be carefully examined to see if under-cutting of mica is necessary. A small brush, such as a toothbrush, should be used to remove any foreign particles that remain between the commutator bars.

(4) Capacitor drive assembly 134. Remove all dirt and old grease. Lubricate gears and tuning shaft coupling 133 as specified in paragraph 28.

(5) Tuning Capacitors C2. Inspect for dirt between plates. Carefully clean with a pipe cleaner. *Do not bend plates. Do not lubricate.* Do not blow out, as air hose may contain water, and the pressure may be so great as to bend the plates.

c. Radio Control Box BC-444-A (Figures 3 and 23)

Inspect as indicated in paragraph 27*a*. Clean and lubricate dial tuning mechanism 223 and tuning shaft coupling 202 as in paragraph 28. Visually inspect Tuning Meter I-70-B. Do not open the case. If unserviceable, replace the meter. Repair of meters should only be done by competent personnel designated by the Chief Signal Officer.

d. Loop LP-19-A (Figure 26)

Clean off all grease and dirt. Inspect socket 308 for corrosion, and clean if necessary. Inspect fit of loop mounting 310, and tighten if necessary. Inspect loop housing 315 for cracks and replace if necessary.

e. Compass Indicators I-65-D (Figure 6)

Inspect visually. Replace faulty compass indicators. Do not open inner case. A faulty capacitor C11 can be replaced by removing the outer case only. Repair of compass indicators should only be done by competent personnel at authorized instrument repair sections.

f. Relay BK-23-A (Figures 7 and 25)

Inspect as indicated in paragraph 27*a*. Clean all contacts including those of relay RE7 with carbon tetrachloride. Dress pig-tail leads if necessary. If it is apparent that the relay is operating satisfactorily, nothing further should be done. However, should the relay not function properly, the following information will aid in servicing the relay mechanism.

(1) Operating voltage, nominal 28V DC, minimum 20V DC, maximum 32V DC. The relay should be capable of positive operation at the minimum voltage. IN TESTING, DO NOT LEAVE VOLTAGE APPLIED TO THE COIL ANY LONGER THAN NECESSARY (NOT OVER 5 MINUTES), OR DAMAGE TO THE COIL OR MECHANISM MAY RESULT.

(2) The coil L17 resistance should be approximately 13.7 ohms.

(3) With no voltage applied to the coil, push the solenoid plunger in as far as it will go, at the same time holding the cam shaft 568 to prevent any overtravel. Release both the cam shaft and the plunger. The 180-degree ratchet 554 operated by the plunger and rack should just engage the mating ratchet so as to be ready for another stroke when the plunger is against the stop. This may be adjusted by loosening the large lock nut at the rear of the solenoid and moving the rear stop either in or out as required, and then tightening the lock nut.

(4) The ratchet spring should be adjusted for light pressure on the small ratchet gear on the end of the cam shaft. The pressure should be just enough to assure no reverse travel of the cam shaft.

(5) The cam should be set so as to start moving the contact bar when the rack and plunger is about half way into the solenoid. This can be adjusted by removing the cam shaft far enough to allow disengaging of the rack and pinion and rotating the entire pinion and cam assembly to the proper position and then replacing the cam shaft. This adjustment is properly made at the factory and unless the mechanism has been disassembled should not be changed.

(6) Contact spring pressure should be 70 grams ± 15

grams when measured with a gram gauge near the end of the contact arm 558.

(7) The plunger spring should be adjusted by means of the small screw and lock nut in the end of the solenoid, so that the plunger will return to rest against the stop in the unenergized position when it is slowly released by hand.

(8) The 180-degree ratchet spring should press against the surface of the ratchet so as to hold it against its mate. This pressure should not be greater than required, or it may cause operation failure at low voltages or under conditions of low temperature. The collar adjacent to the spring should be adjusted so as to just clear the spring when the sliding ratchet is in its extreme position.

(9) The detent springs at the end of the contact operating bar 557 should not be tight enough to cause objectionable drag to be placed on the operating bar. With the switch contact arms 558 centered on the switch contacts 559, the detent bracket should be adjusted for centering of the detent spring in the hole in the bracket. This can be done by loosening the two 4-40 screws at the end of the bar and sliding the bracket to position.

g. Indicator I-75-A (*Bearing*) (*Figures 5 and 29*)

(1) If an attempt has been made to apply more than 20 degrees radio compass deviation correction, the cam strip 411 may be bent, causing jumpy pointer action. If this is the case, return all adjusting screws to zero correction position, starting at Ref. No. 407 (zero degree position), and proceed alternately 15 degrees clockwise and 15 degrees counter clockwise until 180 degrees have been reached in both directions. Where large corrections of as much as 15 degrees have been applied, adjustment to zero correction should be made in two steps so as to minimize the chances of breaking or permanently deforming the cam strip. If with no correction applied, the cam strip 411 still is kinked or uneven, it will be necessary to install a new cam strip. This is a rather difficult operation and should be performed only when proper tools are available.

(2) The compensator should slide freely and return to rest in the extended position shown in Figure 29. The cam strip roller and the guide rollers should revolve very freely.

(3) There should be a minimum of backlash in the worm drive, and the worm shaft should not bind.

(4) The outer dial 420 should rotate smoothly but have sufficient friction to prevent its rotation with vibration.

h. Performance Test

Reassemble equipment, and measure performance as described in paragraph 34. Vibrate equipment, and note any increase in noise or clicks with and without RF input. If equipment is noisy or fails to meet performace requirements, re-examine the equipment until the trouble is discovered and eliminated.

i. Wiring and Miscellaneous Units

Inspect wiring at radio control box base 200 and socket 213 for abrasion or possible shorts. Inspect bonding in aircraft. Reassemble equipment, and safety wire. Inspect antenna lead-in, and replace if necessary.

j. Repeat Operational Inspection of Paragraph 26

28. LUBRICATION

The following parts require lubrication after the hours of service indicated below:

Part	Time	Lubricant
Dynamotor DM-30	500 hours	AC Grade 375
Capacitor Drive Assembly	500 hours	Worm gear to be lubricated with Dag colloidal graphite in addition to AC grade 375
Radio Compass Unit BC-443-A tuning shaft coupling 133	1000 hours	AC Grade 375
Radio Control Box BC-444-A, dial gear mechanism	1000 hours	AC Grade 375
Control Unit MC-204	As required	AC Grade 375
Coupling MC-203	As required	AC Grade 375
Tuning Shaft	As required	AC Grade 375
Plug threads	As required	Thread Lubricant
Relay BK-23-A	As required	Pioneer Low. Temp. Inst. Oil

DO NOT LUBRICATE the variable tuning capacitor, volume controls, or dynamotor commutators. Band switching Motor MO-5-A and Loop LP-19-A are permanently lubricated, and will not require attention, unless disassembled; in which case, the bearings should be repacked with a low temperature grease such as Air Corps Grade 375. Master Lubricants Company *Lubrico M-6*, New York and New Jersey Lubricant Company *F-927*, and Royal Engineering Company *Royco 6A*, comply with Air Corps Specifications for Grade 375 grease. If the dial gear-mechanism is disassembled, the ball bearings should be repacked with low temperature grease. All bearings are packed with *Royco 6A* grease at the factory.

29. DISASSEMBLY OF UNITS

a. Radio Compass Unit BC-443-A (Figure 2)

(1) The cabinet 148 is removed from Mounting FT-213-A by turning the two Dzus fasteners, lifting the front of the cabinet, and pulling forward.

(2) The chassis is removed from the cabinet by unscrewing the thumbscrew 147 marked "RELEASE" until the chassis is free and then withdrawing the chassis.

b. Removal of Dynamotor DM-30 from Chassis (Figures 13 and 14)

(1) Remove the three screws holding the cover of the hash filter 113. Lift off the cover by means of the two handles provided.

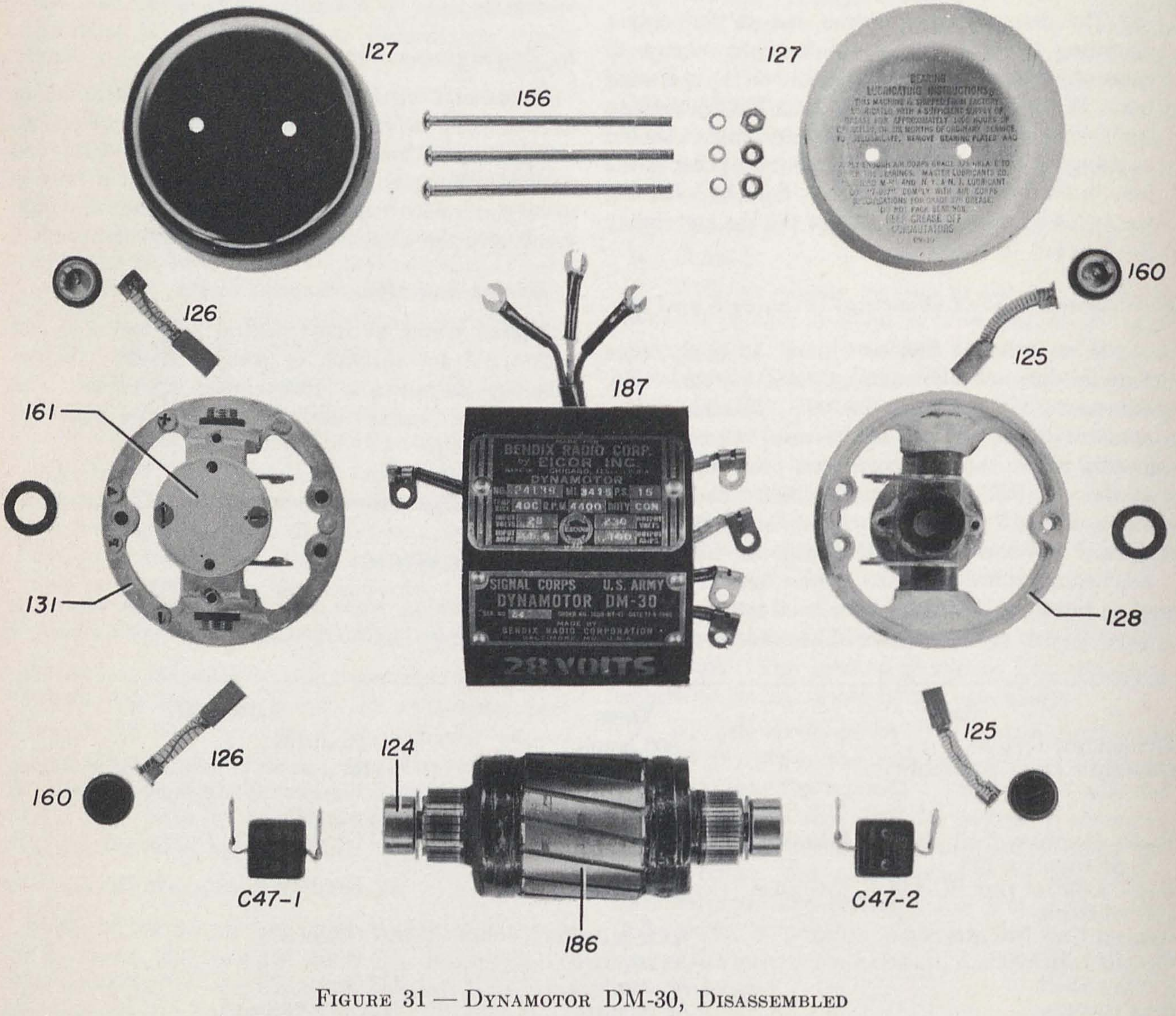


FIGURE 31 — DYNAMOTOR DM-30, DISASSEMBLED

(2) Disconnect the three dynamotor leads from the terminal board TB4.

(3) Cut the safety wire securing the dynamotor mounting screws 155, and remove the screws. Do not let the dynamotor drop.

NOTE: THE DISASSEMBLY OPERATIONS DESCRIBED IN PARAGRAPHS 29*c* TO 29*p*, INCLUSIVE, ARE NOT AUTHORIZED TO BE DONE BY PERSONNEL OTHER THAN THOSE OF THE SIGNAL CORPS REPAIR SHOPS AND THE SIGNAL CORPS RADIO SECTIONS AT AIR DEPOTS.

c. Dynamotor DM-30 Disassembly (Figure 31)

(1) Cut the safety wire on the screws holding the dust covers 127, remove the screws, and slide off the dust covers.

(2) Unscrew the brush retainers, and remove the brushes 125 and 126.

(3) Disconnect the leads from the brush holders on each end of the dynamotor. Unscrew the frame bolts 156, and remove the end brackets 128 and 131. Slide out the armature 186.

(4) Unscrew the field retaining screws and remove the fields. Be careful not to damage the wiring or insulation.

(5) In reassembling the dynamotor, make sure that the armature is replaced in the proper position. The commutator with the wide segments should be at the low-voltage end-bracket. Clean out carefully any dust or other foreign matter which might interfere with the armature clearance. Replace the brushes in their proper location with the + or − marking on the brush facing the corresponding marking on the end bracket. Apply glyptal cement to the frame bolts and field retaining screws. Replace safety wire.

d. Band Switch Drive Assembly, Ref. No. 182 (Figure 32)

(1) Slide the retainer spring 122 off the end of the band switch drive shaft 121, and withdraw the shaft.

(2) Unsolder the five wires from the band switch mechanism to the lugs on terminal board TB26 and the three wires to the lugs on terminal board TB27.

(3) Remove the two screws near the end of terminal board TB26 which secure the assembly to the chassis, and lift out the assembly.

(4) When reassembling, make sure that the arm of each wafer switch is in the same relative position before attempting to reinsert the band switch drive shaft. This may be ascertained by sighting through the shaft hole and noting the location of the positioning cut-out in each switch arm. Do not force

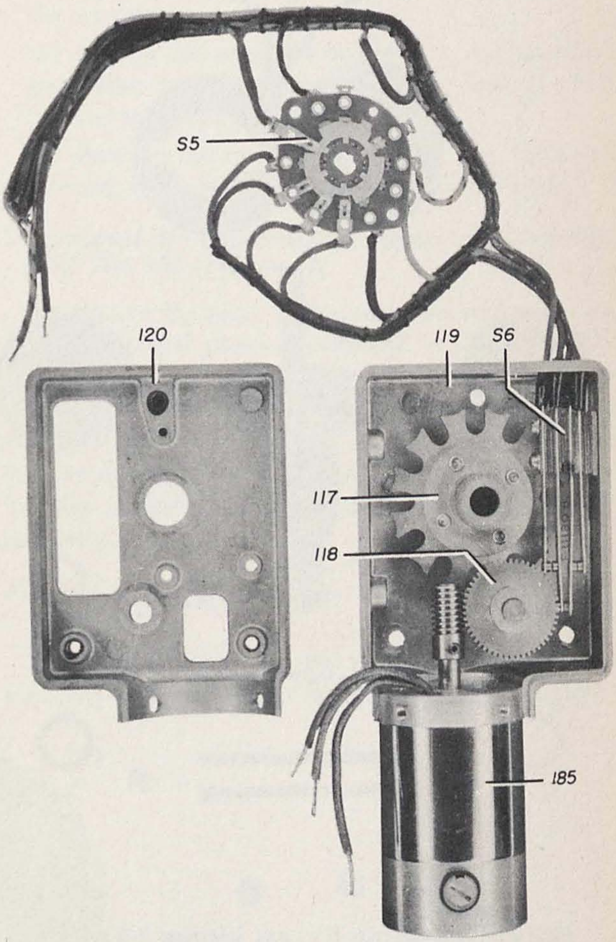


FIGURE 32 — BAND SWITCH DRIVE ASSEMBLY, REF. No. 182; OPEN

the band switch drive shaft since this may damage the switch wafers.

(5) After the band switch drive shaft is engaged with *all* of the switch wafers, rotate it *with the fingers* to make sure it is operating freely.

(6) The band switch drive assembly is disassembled by removing the three screws 132 holding together the two halves of the housing 119 and 120 and the four screws which secure the band switch Motor MO-5-A. When reassembling, apply glyptal cement to all screws.

e. Motor MO-5-A (Band Switching) (Figure 33)

(1) Unsolder the red, brown, and blue wires from the motor to the switch wafer S5.

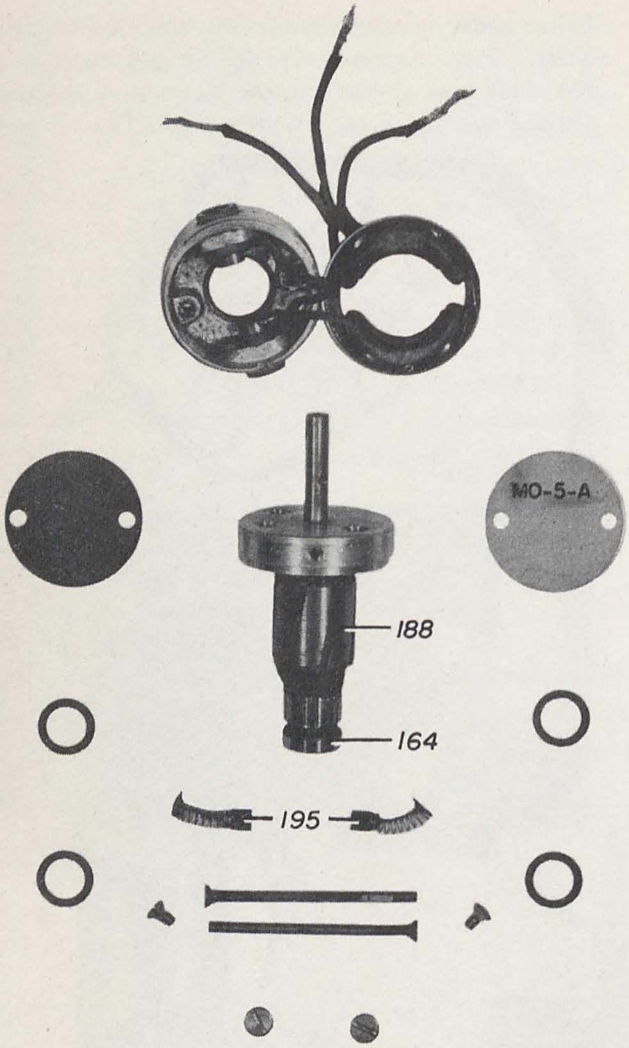


FIGURE 33 — BAND SWITCH MOTOR MO-5-A, DISASSEMBLED

(2) Remove the setscrew and remove the worm gear from the motor shaft.

(3) Remove the brush retaining screws in the sides of the motor, and withdraw the brushes 195.

(4) Remove the two screws from the brush-bell. Tap the rim of the front end-bell *lightly* with a wooden mallet or block until it separates enough from the housing to permit the insertion of a screwdriver blade. Pry the end-bell off the housing, being careful not to damage either.

(5) The armature 188 will probably be removed with the end-bell and, if so, can be separated from it by tapping lightly on the motor shaft with a wooden mallet or block.

(6) The rear end-bell is removed from the housing in the same way as the front end-bell.

(7) In reassembling the motor, the brush holders should first be mounted in the rear end-bell and the end-bell pressed on the housing. Make sure that the notch in the rim of the end-bell engages the positioning stud in the housing. Next, set the armature in place, and tap lightly to seat the rear bearing 164. Apply glyptal cement to all screws. Press the front end-bell in place, with the notch in the rim in line with the positioning stud, and draw up tightly by means of the two frame screws. Reassemble the brushes, making sure that the brush marked + is mounted in the brush holder marked +, and that both brushes are mounted with the markings on the brush facing the markings on the end-bell. Replace the brush retaining screws, being careful not to twist the brush wires. Replace the worm gear. Resolder the wires to the proper terminals on the switch wafer.

f. Removal of Antenna, Loop, RF, or Oscillator Assemblies from Chassis (Figures 12, 13, and 14)

To remove the antenna 174, loop 170, 1st RF 175, 2nd RF 176, or oscillator 177 assemblies from the chassis, withdraw the band switch drive shaft 121, unsolder the leads from the terminals which project through the chassis, and remove the two screws which secure each can to the chassis. The cover plate on each assembly is removed by unscrewing the four screws which hold it in place. When replacing these assemblies on the chassis, make sure that the arms of all switch wafers are in the same relative position before attempting to reinsert the band switch drive shaft. The band switch drive shaft should be inserted in place and operated by hand a few times before tightening the screws which mount the can to the chassis. This will assure a minimum of strain on the switch section and band switching mechanism.

g. Removal of Audio Output Transformer Assembly, or Compass Output Transformer Assembly 111, 112 (Figures 12, 13, and 14)

To remove either the audio output transformer assembly 111, or the compass output transformer assembly 112, unsolder the leads from the terminals and remove the four screws under the chassis which secure each assembly. These assemblies are potted and should not be opened.

h. Removal of Loop Phasing Assembly 101, or 152.5-kcs Trap Assembly 173 (Figures 12, 13, and 14)

The loop phasing assembly 101 and the 152.5-kcs trap assembly 173 can be removed from the chassis by unsoldering the connecting wires and removing the two screws under the chassis which fasten each item.

i. Removal of 1st IF 178, 2nd IF 180, or IF Trap Assembly 181 (Figures 12, 13, and 14)

To remove 1st IF 178, 2nd IF 180, or IF Trap Assembly 181, unscrew the nuts on the spade lugs and withdraw the shield can. Unsolder the leads from the terminals and remove the two screws holding the assembly to the chassis. In reassembling, do not tighten the screws holding the assembly until the shield can has been mounted and the nuts on the spade lugs brought up tight.

j. Removal of Antenna Switching Relay RE5 (Figures 13 and 14)

To remove the antenna switching relay, unsolder the leads to the terminals, and remove the two screws which mount the relay to the chassis.

k. Front Panel Disassembly (Figures 2, 12, 13, and 14)

To obtain access to parts located behind the front panel, proceed as follows:

(1) Remove the four screws holding the socket 144 and shell 145 for Plug PL-108 to the panel. Be very careful not to damage the connections to this plug.

(2) Take out the two screws holding the right-angle drive assembly 133 to the panel, and remove the assembly.

(3) Loosen the setscrews holding the ratchet wheel and collar to the "RELEASE" throughbolt shaft 146 and withdraw the throughbolt.

(4) Remove the four panel screws. Lay the panel forward, being careful not to damage the wiring.

l. Removal of Gang Tuning Capacitor Assembly, Ref. No. 134 (Figure 34)

To remove the gang tuning capacitor assembly 134, remove the front panel as described in paragraph 29*k*. Unsolder the tuning capacitor leads at the terminals under the chassis. Remove the nut holding the capacitor bracket to the stud in the chassis deck and the two screws under the chassis deck which are seated in the capacitor-drive mounting. Lift out the assembly.

m. Radio Control Box BC-444-A (Figures 3, 23, and 34)

The tuning drive and dial mechanism 221 may be removed from the radio control box panel as follows:

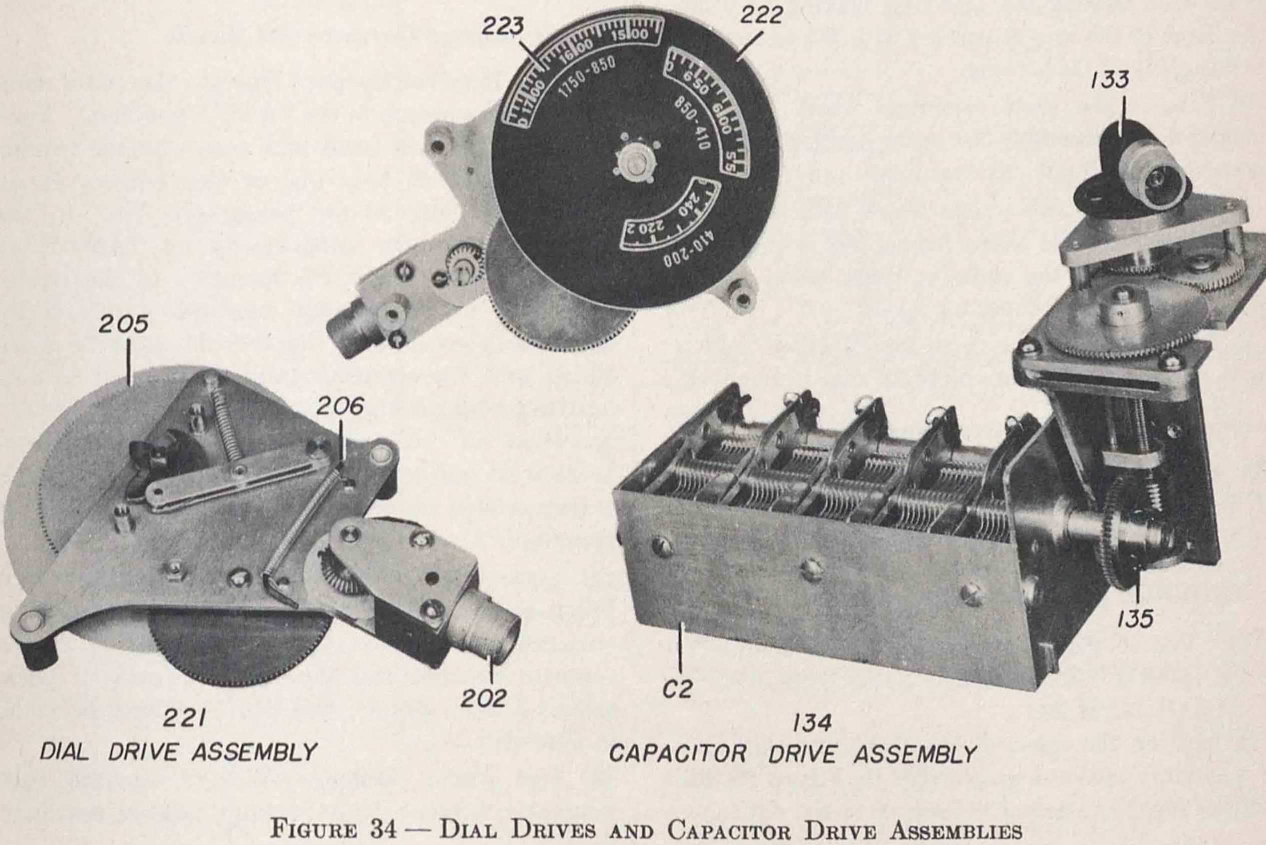


FIGURE 34 — DIAL DRIVES AND CAPACITOR DRIVE ASSEMBLIES

(1) Loosen the setscrews and remove the tuning crank 207 and the band selector switch lever 211.

(2) Remove the two screws holding resistor R41 to the side of the panel and the two screws holding the band switch wafer S9 to the dial plate, and remove the switch wafer from the drive. The wires to the wafer need not be disturbed.

(3) Remove the two screws above the dial which secure the lamp socket and reflector assembly, and the three large screws which hold the tuning drive and dial assembly to the panel.

(4) Withdraw the assembly, being careful not to damage the wiring to the switch wafer.

n. Indicator I-75-A (Bearing) (Figures 5 and 29)

To gain access to the mechanism of the bearing indicator, proceed as follows:

(1) Remove the four screws in the back of the mounting plate 421, and lift off this plate.

(2) Remove the four screws thus exposed in the cam housing assembly 418, and lift off this assembly.

o. Loop LP-19-A (Figures 4, 26, 27, and 28)

To disassemble Loop LP-19-A after it has been removed from the aircraft, proceed as follows:

(1) Remove the fourteen screws around the bottom of the loop housing 315, and after making sure that the plane of the loop is parallel with the axis of the housing, lift off the housing.

(2) Remove the three capscrews which hold the loop and shaft assembly 301 in the housing base 310, and carefully lift out this assembly.

(3) Remove the two screws which hold the brush holder assembly 303 to the hanger 302, and lift this assembly free of the collector rings, being careful not to damage the connecting wires.

(4) After removing the three screws which hold it to the hanger, the gear assembly 307 may be removed.

p. Relay BK-23-A (Figures 7 and 25)

To remove Relay BK-23-A from its mounting case 577, it is merely necessary to remove the four screws in the corners of the phenolic base plate of the relay.

30. TROUBLE LOCATION AND REMEDY

NOTE: USING PERSONNEL ARE AUTHORIZED TO PERFORM TEST OPERATIONS DESCRIBED IN PARAGRAPH 30.

a. In locating the cause of unsatisfactory operation, the procedure outlined graphically in Figure 35 will facilitate rapid location of the source of the difficulty.

b. When one 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.

c. Before removing the equipment from the aircraft, make the following checks:

(1) Ascertain that the fuse in Relay BK-23-A is not burned out, that Relay BK-23-A is operating properly, and that the battery voltage is normal.

(2) See that all cables are connected.

(3) See that Loop LP-19-A is installed and connected by means of a Cord CD-365 or Cord CD-365-A.

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

(5) Make continuity test as indicated in paragraph 32*c*.

31. TEST PROCEDURE

NOTE: THE TEST OPERATIONS DESCRIBED IN PARAGRAPHS 31*a* TO 31*d*, INCLUSIVE, ARE NOT AUTHORIZED TO BE DONE BY PERSONNEL OTHER THAN THOSE OF THE SIGNAL CORPS REPAIR SHOPS AND THE SIGNAL CORPS RADIO SECTIONS AT AIR DEPOTS.

a. Low Compass Output—All Bands

(1) Test Receiver Output: Operate the radio compass with the switch in the "ANT." position. Tune to stations in each band and note whether trouble is experienced on only one or two bands. If so, proceed as outlined in paragraph 31*b*. If the equipment operates satisfactorily on "ANT." on all bands, check "LOOP" operation of the equipment. If the equipment operates satisfactorily under both conditions, the trouble must be associated with the compass circuits. Proceed as outlined in paragraph 31*a*(2). If, however, the "LOOP" operation of the equipment is unsatisfactory, proceed as outlined in paragraph 31*d*. If trouble is encountered on all bands, proceed as outlined in paragraph 31*c*.

(2) Normal Receiver Output ("ANT." or "LOOP"): When normal "ANT." and "LOOP" operation is obtained on all bands, the trouble must lie in the compass circuits, and the tests outlined in paragraphs 31*a*(3), 31*a*(4), and 31*a*(5) should be made in sequence.

(3) Test Audio Oscillator: With a vacuum tube voltmeter, measure the AC voltage between terminals

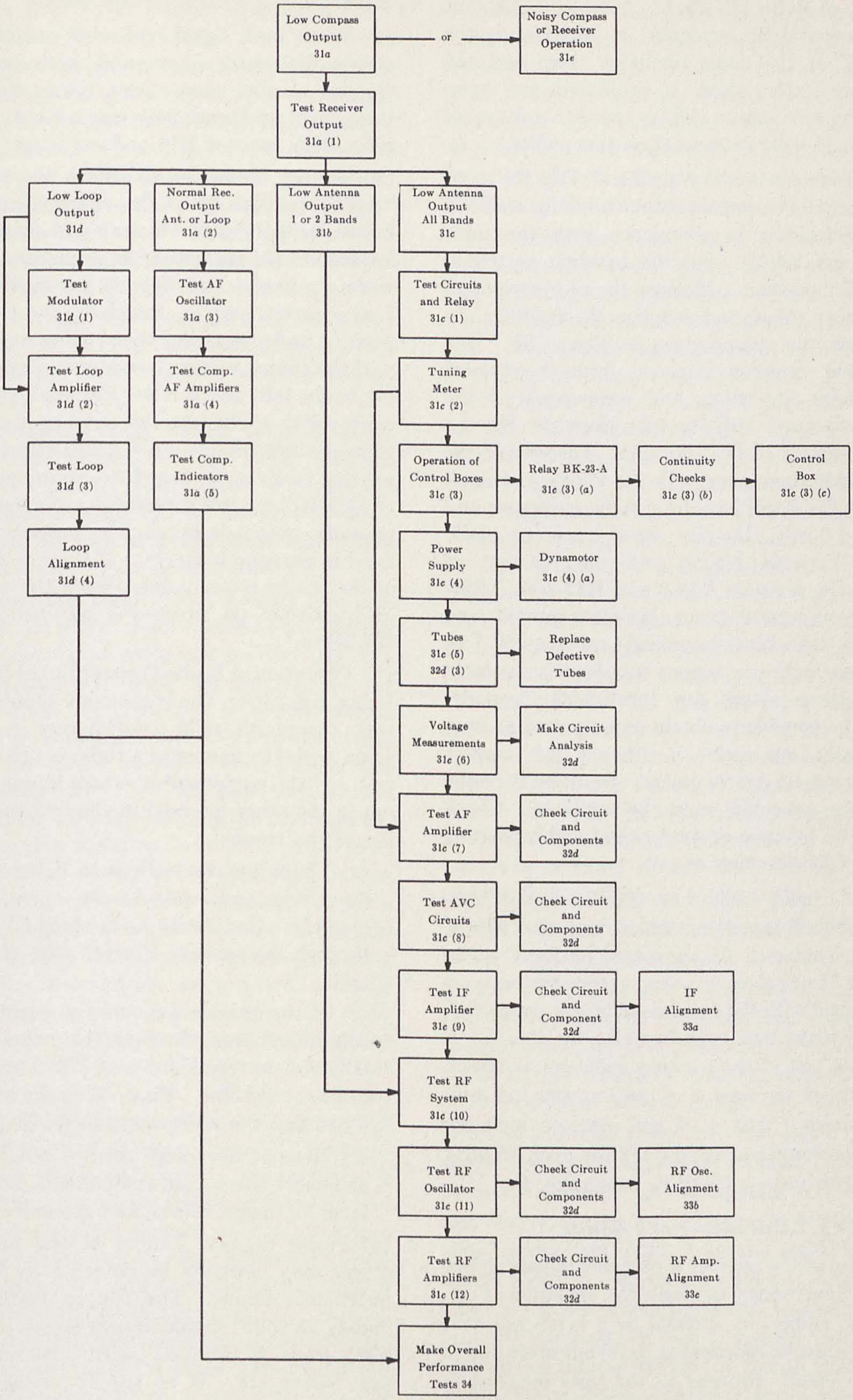


Figure 35 — Radio Compass SCR-263-A, Trouble Location and Remedy Chart

39 and 41 of Relay BK-23-A. A 0.1-mfd, 400-volt capacitor should be connected in series with the voltmeter. If the audio oscillator stage and the compass indicator which is connected are functioning properly, there will be an AC voltage of from 35 to 45 volts between these test points.

(4) Test Compass Audio Amplifiers: Test the navigator's and pilot's compass output tubes for emission and characteristics in accordance with the table in paragraph 32*d*(3). Set the function switch in the "ANT." position. Measure the socket voltages on the above tubes, and compare the readings obtained with the values given in Figure 37. If a considerable variation is noted from the typical values, check the wiring and components of the circuits associated with the tube elements. Set the switch in the "COMP." position. Disconnect the compass indicators, turn both the pilot's and navigator's "COMPASS" controls fully clockwise and apply a 1.5-volt, 48-cycle signal from an audio oscillator between ground and the junction of capacitor C6, resistors R32-1 and R32-2 on TB27. Connect an output meter between ground and terminal 4, then between ground and terminal 7 of the compass indicator output transformer assembly 112. If these stages are functioning properly, it should be possible to obtain an output of at least 10 milliwatts from each. If either of the compass indicator output transformers are defective, the transformer assembly must be replaced. Check capacitor C6 for open or short circuit and capacitors C5-2 and C5-3 for short circuit.

(5) Test Compass Indicators: Check compass indicators and their associated cables for opens, shorts, and poor contacts. If the tests outlined under paragraph 31*a*(3) show no voltage across the compass indicator field with the compass indicator connected, check the meter and capacitor C11 for shorts. If the moving coil of the compass indicator is intact, check between terminal 4 of the compass indicator and terminals 7 and 4 of the compass indicator output transformer assembly 112 for open circuits. Proceed with tests outlined in paragraph 34.

b. Low "ANT." Output—1 or 2 Bands

If operation of the receiver is obtained on one or two bands, it is unnecessary to check the operation of IF, 2nd detector, audio, etc., circuits, as it is obvious that these stages must be functioning to permit operation of at least one band. Proceed to the tests outlined in paragraph 31*c*(10).

c. Low "ANT." Output—All Bands

(1) When both signal and noise outputs are low or absent, first check all external cable connections, including antenna connections, power supply connections, fuses and headphone connections. Also, check relay RE5, resistor R18 and capacitor C42-1.

(2) Tuning Meter I-70-B: With the switch in the "ANT." position, check the operation of the tuning meter, the pointer of which should swing over to the left side of the scale after an approximate 30-second warm-up period. If there is no movement of one tuning meter pointer, switch to the second control position and check the other tuning meter.

If the tuning meter (or meters) respond by swinging to the left, and a relatively weak signal (5 or 10 microvolts) applied to the antenna terminal of the compass unit produces a counter swing to the right as the receiver is tuned to resonance frequency ("AUDIO" control turned fully clockwise), but still no audio output is obtainable, proceed to tests outlined in paragraph 31*c*(7). If there is no movement of the tuning meter pointer when the radio compass unit is turned on, proceed as outlined in paragraph (3) below.

(3) Operation of Radio Control Boxes BC-444-A and Relay BK-23-A: The equipment should be checked with the pilot's radio control box in control, and again with the navigator's radio control box in control. If the equipment operates in one position and not in the other, proceed in the following manner to locate the trouble.

(*a*) Check the connections to Relay BK-23-A and its wiring and contacts for opens, shorts, and grounds. Continuity tests should be made back through the cable to Plug PL-122 at the compass unit.

(*b*) If the trouble has not yet been found, make continuity tests through the cable from Relay BK-23-A to terminal board TB10 in the defective radio control box. Then check the wiring between TB10 and the socket assembly 213.

(*c*) Remove the radio control box from its base and check the wiring, components, and switch contacts for opens, shorts, and grounds.

(4) Power Supply: Failure of the primary power source may normally be detected by failure of the instrument lamps. The supply voltage (approximately 28 volts) should appear across the yellow and black leads on terminal board TB4 under the hash filter cover 113. If no supply voltage appears at this point, check the continuity of the primary wir-

ing, the contacts of Relay BK-23-A, and the "OFF-COMP.-ANT.-LOOP" switch S11.

(*a*) If supply voltage is normal, approximately 225 volts should appear across the red and black leads on terminal board TB4 under the hash filter cover. If this voltage is unreasonably low, check for short circuits in wiring or components associated with or connected to the high voltage supply. Lack of dynamotor output voltage, if the primary supply voltage is normal and there are no short circuits, indicates a defective dynamotor.

(5) Tubes: Test all tubes for emission and other characteristics described in paragraph 32*d*(3). Any tubes not having characteristics within standard limits should be replaced.

(6) Voltage Measurements: Socket voltages should be measured with the switch in the "ANT." position and compared with the values given in Figure 37. If any considerable variation from the typical values is noted, check all resistors, capacitors, and wiring in circuits associated with the tube elements.

(7) Audio Amplifier Test: Plug a headset into jack J3 on one of the radio control boxes and, making certain first that that radio control box has control of the equipment, touch the grid cap of the 2nd detector tube. A loud click or whistle should be heard. If no sound is heard, measure the socket voltages of the audio output Tube VT-66, and the 2nd detector Tube VT-93, and compare the readings obtained with the values given in Figure 37. If any considerable variation from the typical values 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 audio output tube (socket terminal 5), plug an output meter into jack J3, and measure the audio oscillator voltage required for an output of 50 milliwatts. If the stage is functioning properly, it will be possible to obtain this output with an audio oscillator voltage of less than 2.5 volts. Likewise, an audio oscillator voltage of approximately 0.5 volt applied to the grid of the 2nd detector Tube VT-93 should give an output of 50 milliwatts. If the output is low when feeding the audio oscillator into the grid of the 2nd detector, but normal when feeding into the grid of the audio output tube, connect the audio oscillator through a 0.1-mfd capacitor to the plate of the 2nd detector tube (socket terminal 3). If satisfactory output is obtained when the audio oscillator is connected to the grid of the audio output tube, but not when connected to the plate of the 2nd detector tube, capacitor C17-2 is defective.

(8) AVC Circuit Tests: Extreme insensitivity of the radio compass unit may be caused by failure of capacitors C4-1, C4-2, or C4-3. One of these capacitors opening up removes the RF ground from the grid return of the associated stage. If the AVC is inoperative, check capacitors C33B-1 and C33B-2 for short circuit. A defective 2nd detector Tube VT-93 may also cause ineffective AVC operation.

(9) IF Amplifier Tests: Apply a 142.5-kcs signal, 30% modulated at 400 cycles, to the grid of the IF tube and plug an output meter, adjusted to provide a load of 4000 ohms, into jack J3 on the radio control box. Measure the signal generator voltage required to produce an output of 50 milliwatts. If this stage is functioning properly, a signal generator input of less than 55,000 microvolts will be required. If more than 55,000 microvolts is necessary, adjust inductors L13-2 and L14-2 to determine whether or not the insensitivity is due to misalignment of the 2nd IF stage. If satisfactory alignment cannot be obtained, remove the 2nd IF assembly 180 and check all wiring and components. If the function of this stage is normal, apply a 142.5-kcs signal, 30% modulated at 400 cycles, from the signal generator to the grid of the 1st detector tube. If this stage is functioning properly, an input of less than 600 microvolts will be necessary to produce an output of 50 milliwatts. If more than 600 microvolts is necessary, carefully check alignment of the 1st IF stage, alignment procedure for which will be found in paragraph 33*a*(3). If satisfactory alignment and sensitivity of this stage cannot be obtained, remove the 1st IF assembly 178 and check all wiring and components.

(10) RF System Tests: Set the band switch on one of the bands on which trouble is encountered, and set the tuning dial to the alignment frequency for that band as given in paragraph 33*c*. Beginning at the grid cap of the 1st detector Tube VT-87 apply a signal of that frequency from the signal generator, 30% modulated at 400 cycles. An input of 900 microvolts to this stage from the signal generator should give approximately 50 milliwatts output from the audio amplifier. As the signal is fed successively into the grids of the 2nd RF stage, 1st RF Stage, etc., considerably less input from the signal generator should result in the same 50-milliwatt output. If a stage is reached where the signal necessary to produce 50 milliwatts output is greater than or only slightly less than it was for the preceding stage, that stage is faulty and tests outlined in paragraph 31*c*(11) or 31*c*(12) should be applied, as the case might be.

(11) RF Oscillator Tests: If socket voltage measurements on the 1st detector Tube VT-87 (see paragraph 31c(6)) fail to reveal the source of trouble, set the band switch to one of the inoperative bands, rotate the tuning dial to the alignment frequency for that band, as given in paragraph 33, and apply a signal generator voltage of that frequency, 30% modulated at 400 cycles, to the grid cap of the 1st detector Tube VT-87. Turn the "AUDIO" and "THRES. SENS." controls fully clockwise. It should be possible to obtain an output of 50 milliwatts at the audio output jack J3 for an input of less than 900 microvolts from the signal generator. If these conditions can be met, the trouble is in one of the RF stages, and the procedure outlined in paragraph 31c(12) should be followed. If the conditions cannot be met, check the alignment of the RF oscillator, following the procedure given in paragraph 33*b*. If satisfactory alignment is not obtainable, remove the RF oscillator assembly 177 and check all wiring, switch contacts, and other components.

(12) RF Amplifier Tests: If socket voltage measurements on the 1st and 2nd RF Tubes VT-86 (see paragraph 31c(6)) fail to reveal the source of trouble, set the band switch to one of the inoperative bands, rotate the tuning dial to the alignment frequency for that band, as given in paragraph 33*c*, and apply a signal generator voltage of that frequency, 30% modulated at 400 cycles, to the grid cap of the 2nd RF Tube VT-86. It should be possible to obtain an output at the audio output jack J3 of 50 milliwatts for an input of less than 120 microvolts from the signal generator. If these conditions cannot be met, check the alignment of the 2nd RF stage, following the procedure given in paragraph 33*c*. If satisfactory alignment is not obtainable, remove the 2nd RF assembly 176 and check wiring, switch contacts, and other components. If satisfactory output is obtainable from the 2nd RF stage, the procedure outlined above should be repeated for the 1st RF stage. It should be possible to obtain an output of 50 milliwatts with an input of 20 microvolts or less to the grid of the 1st RF tube. If the 1st RF stage is functioning properly, apply a 5-microvolt signal to the antenna post on the panel of the compass unit, and if 50 milliwatts (or more) output is not obtainable, check the antenna relay RE5 contacts, R18, C42-1, and operation of the relay 183. If normal operation is still unobtainable, remove the antenna stage assembly 174 and check wiring, switch contacts, and other components. Proceed with tests outlined in paragraph 34.

d. Low "LOOP" Output

Operate the radio compass with the switch in the "LOOP" position. Tune to stations in each band, observing whether trouble is encountered on all bands or only on one or two bands. If the equipment is inoperative on all bands, proceed as outlined in paragraph 31*d*(1) below. If, however, trouble is encountered on only one or two bands, remove the radio compass unit from the cabinet and set up on the test bench. Measure the voltage on the plates of the modulator Tube VT-105 for each setting of the band switch. If any considerable variation is noted from the values given in Figure 37, remove the antenna stage assembly 174, and check the contacts of switch S1-2 and the plate windings of transformers T27, T28, T29 for open or short circuits. If the nature of the trouble encountered on only one or two bands is not apparent from the foregoing tests, proceed as outlined in paragraph 31*d*(1).

(1) Modulator Test: Measure the socket voltages of the modulator tube, and compare with the values given in Figure 37. If any considerable variation from the typical value is noted, check the wiring and components of the circuits associated with the tube elements. With the function switch in the "COMP." position and the compass unit tuned to the aligning frequency (as given in paragraph 33*c*) on any one of the faulty bands, set the "LOOP GAIN", "COMPASS", and "THRES. SENS." controls fully clockwise and ground grid No. 1 (socket terminal No. 4) of the modulator tube. Apply a 7-microvolt signal generator voltage (of the aligning frequency) to grid No. 2 (socket terminal No. 3) of the Modulator tube and observe the compass indicators. If the modulator stage is functioning properly, the compass indicator pointers will deflect full-scale to the *right*. Repeat the test, grounding grid No. 2, and applying the signal to grid No. 1. The compass indicator pointers should deflect full-scale to the *left*.

(2) Loop Amplifier Test: Measure the socket voltages of the loop amplifier Tube VT-86 and compare the readings obtained with the values given in Figure 37. If any considerable variations from the typical values are noted, check the wiring and components of the circuits associated with the tube elements. If all bands are inoperative, remove the loop phasing assembly 101, and check all wiring and components for open or short circuits. If only one or two bands are inoperative, roughly check alignment of loop stage trimmer capacitors of the bands at fault. If proper alignment appears impossible, remove the loop tuning assembly 170, and check all wiring, switch contacts, and other components.

MAINTENANCE

(3) Loop Test: Test loop, brushes and rings, and loop Cord CD-365 or Cord CD-365-A for open or short circuits or grounds. Also check for poor contact at plugs.

(4) Loop Alignment: If it has been necessary to make any alteration in the settings of the loop stage trimmer capacitors, it will be necessary to completely realign this stage. The procedure outlined in paragraph 33*f* should be followed. Proceed with tests outlined in paragraph 34.

e. Noisy Compass or Receiver Operation

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

Check	For
Vacuum tubes	Microphonic or defective units
Dynamotor	Worn or arcing brushes
Loop Assembly	Corroded sockets, dirty brushes or rings
Cable Plugs	Poor contacts
Bonding	Loose connections, chassis not grounded, poor bonding on tuning shaft
Switches	Dirty contacts
Variable capacitors	Dirt between plates
Power Source	Loose or corroded connections
Circuits	Loose wires, defective capacitors or resistors

32. TYPICAL OVERALL VOLTAGE MEASUREMENTS

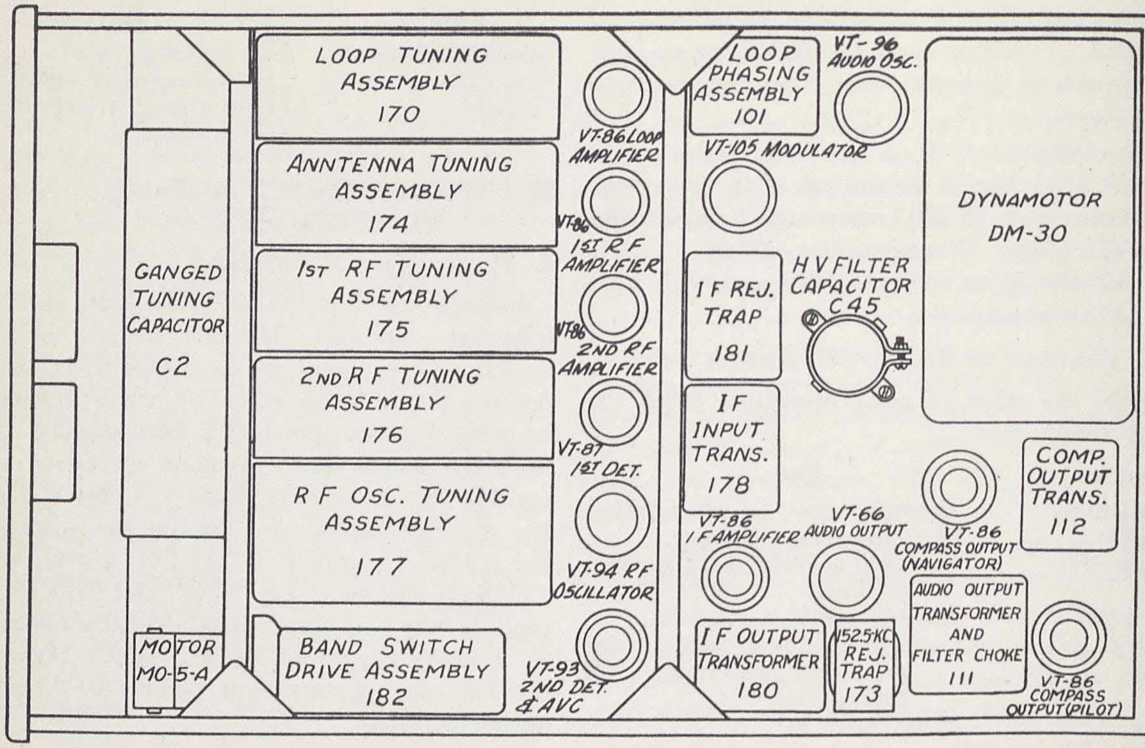
a. Typical Circuit Voltages

Voltages stated in the following tables apply for the following conditions. If values do not check within ±10% of those stated, the associated circuits and components should be tested. The measurements should be made with Test Set I-56-A using the 250-volt scale for plate, screen, and dynamotor secondary voltages, and the 50-volt scale for primary supply voltages, unless otherwise specified. Operate the equipment on the "ANT." position. "AUDIO", "COMPASS", "THRES. SENS.", "LIGHTS", and "LOOP GAIN" controls fully clockwise. Band selector switch on band 2. Primary supply voltage 28.5 volts. Measure from the following measurement points to chassis unless otherwise stated.

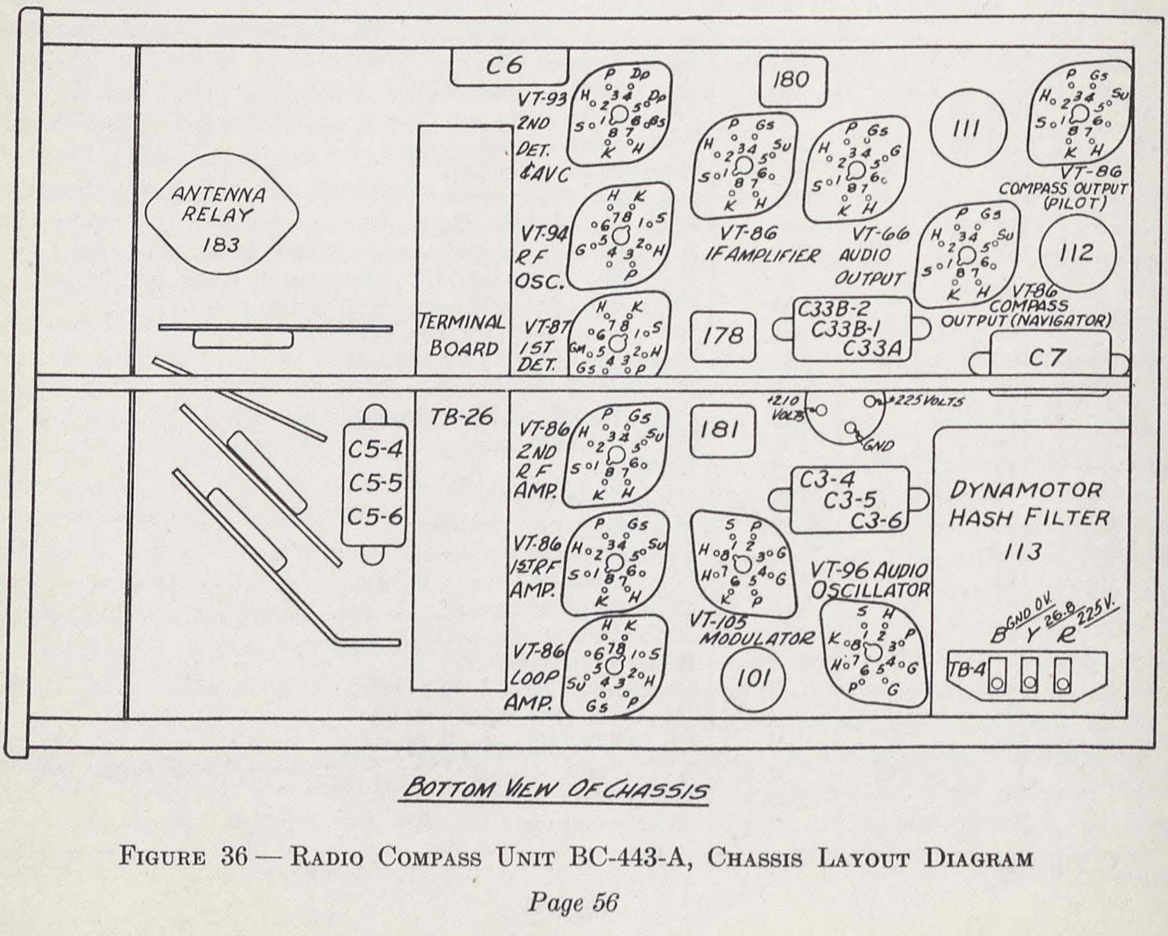
TYPICAL CIRCUIT VOLTAGES

Measurement Point		Voltage	Remarks
Term.	Ref. No.		
Bat. side	L7-1	26.8	Input to hash filter
Between	L7-1 & L7-2	26.4	One section of hash filter
+LV	DM-30	26.	Dynamotor input
+HV	DM-30	220.	Dynamotor output
5	111	217.	Input to filter choke
6	111	205.	Output to filter choke
2	111	197.	Plate side of audio trans. pri.
1	112	205.	B+ side of navigator's comp. output trans. pri.
2	112	190.	Plate side of navigator's comp. output trans. pri.
6	112	190.	Plate side of pilot's comp. output trans. pri.
4	180	166.	B+ side of 2nd IF trans. pri.
1	180	166.	Plate side of 2nd IF trans. pri.
2	178	190.	B+ side of 1st IF trans. pri.
3	178	190.	Plate side of 1st IF trans. pri.
B+	176	174.	2nd RF transformer
B+	177	62.	RF Osc.
B+	174	*118.	Mod. Plate coil C. T.
Plate #1	174	*118.	Modulator plate voltage
Plate #2	174	*118.	Modulator plate voltage
1	101	175.	B+ on phasing coil
6	101	175.	Plate on phasing coil
3	101	165.	Input from audio osc.
4	101	165.	Input from audio osc.
5	101	0.	On COMP. (Use 1-volt scale)
5	101	0.	On ANT. (Use 1-volt scale)
5	101	0.	On LOOP (Use 1-volt scale)
4	VT-93 socket	0.4	AVC diode voltage (Use 1.5-volt scale vacuum tube voltmeter)
J	PL-122	205.	B+ marker beacon
Fuse	BK-23-A	27.4	Supply voltage

* Switch to "COMP."



TOP VIEW OF CHASSIS



BOTTOM VIEW OF CHASSIS

FIGURE 36 — RADIO COMPASS UNIT BC-443-A, CHASSIS LAYOUT DIAGRAM

VT-86 PILOT'S COMPASS OUTPUT

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	193
4	SCREEN	65
5	SUP.	2.8
6		
7	HEATER	6.8
8	CATHODE	2.8

VT-86 NAVIGATOR'S COMPASS OUTPUT

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	193
4	SCREEN	65
5	SUP.	2.8
6		
7	HEATER	6.8
8	CATHODE	2.8

VT-86 I. F. AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	170
4	SCREEN	110
5	SUP.	0
6		
7	HEATER	6.8
8	CATHODE	5.0

VT-105 MODULATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	PLATE	**118
3	GRID	0
4	GRID	0
5	PLATE	**118
6	CATHODE	**5.2
7	HEATER	7.3
8	HEATER	7.3

VT-66 AUDIO OUTPUT

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	197
4	SCREEN	205
5	GRID	0
6		
7	HEATER	6.8
8	CATHODE	*13.0

VT-96 AUDIO OSCILLATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	**195
4	GRID	0
5	GRID	0
6	PLATE	**195
7	HEATER	6.8
8	CATHODE	**0.8

VT-93 2ND DETECTOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.7
3	PLATE	87
4	DIODE	0
5	DIODE	0.8
6	SCREEN	87
7	HEATER	6.7
8	CATHODE	*15.2

VT-86 LOOP AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	176
4	SCREEN	68
5	SUP.	2.6
6		
7	HEATER	6.8
8	CATHODE	2.6

VT-94 R. F. OSCILLATOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.7
3	PLATE	62
4		
5	GRID	-8.8
6		
7	HEATER	6.7
8	CATHODE	0

VT-86 1ST R.F. AMPLIFIER

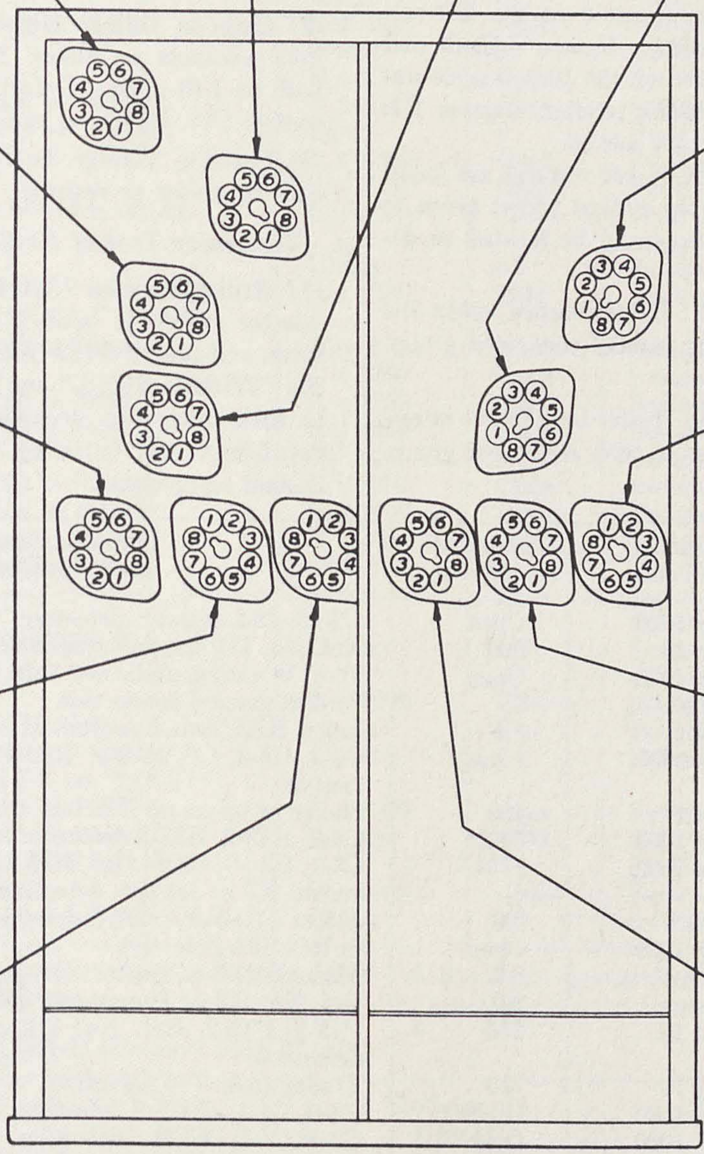
TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	176
4	SCREEN	69.0
5	SUP.	0
6		
7	HEATER	6.8
8	CATHODE	2.9

VT-87 1ST DETECTOR

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	192
4	SCREEN	89
5	SUP.	-1.0
6		
7	HEATER	6.8
8	CATHODE	3.4

VT-86 2ND R.F. AMPLIFIER

TERM	ELEMENT	VOLTAGE
1	SHLD.	GRND.
2	HEATER	6.8
3	PLATE	176
4	SCREEN	66
5	SUP.	0
6		
7	HEATER	6.8
8	CATHODE	2.9



* 25 VOLT SCALE. ** SWITCH TO "COMP."

NOTE:

HEATER VOLTAGE MEASURED BETWEEN TERMINALS 2 AND 7 EXCEPT VT-105 WHICH IS MEASURED BETWEEN TERMINALS 7 AND 8.

FIGURE 37 — RADIO COMPASS UNIT BC-443-A, VACUUM TUBE SOCKET VOLTAGE DIAGRAM

b. Typical Vacuum Tube Socket Voltages

See Figure 37, battery voltage, 28.5 volts. Equipment operating on "ANT." with the navigator's radio control box in control, and with pilot's radio control box disconnected; "COMPASS", "THRES. SENS.", "LOOP GAIN", "LIGHTS" and "AUDIO" controls all fully clockwise. Band switch on band 2. All voltages measured to the chassis unless otherwise stated. Allowable tolerance of voltage variation ±10%. Measurements made with Test Set I-56-A. Plate and screen voltages measured on the 250-volt scale unless otherwise specified. Heater, cathode and suppressor voltages measured on the 10-volt scale unless otherwise specified. Socket terminal number 1 is at ground potential on all tube sockets.

NOTE: When vacuum tube socket voltages are found to vary appreciably from the typical values given in Figure 37, the trouble can usually be located as described below:

(1) Heater Voltage High: Heater burned out in one of the tubes in the same parallel connected group. See Figure 48.

(2) Heater Voltage Low: Heater burned out in one of the tubes in the other parallel connected group. See Figure 48.

(3) Plate Voltage High: Open screen or cathode circuit. Defective tube.

(4) Plate Voltage Low: Ground on plate lead. Defective plate, screen, or cathode bypass capacitor. Defective plate coupling capacitor.

(5) Screen Voltage High: Open cathode circuit. Defective tube.

(6) Screen Voltage Low: Defective screen or cathode bypass capacitor. Defective plate coupling or bypass capacitor.

(7) Cathode Voltage High: Open cathode resistor. Poor contacts on Relay BK-23-A; inductor L12, L15, or L16 open. Defective threshold sensitivity control (R2, R36B) or tuning meter.

(8) Cathode Voltage Low: Defective cathode bypass capacitor or resistor.

c. Continuity Test of Radio Compass SCR-263-A

(1) Radio Compass Unit BC-443-A: Set the band selector switch to band 2 and remove all vacuum tubes and plug PL-122 from the compass unit. Set the "THRES. SENS." and "LOOP GAIN" controls to their maximum clockwise position. Using Test Set I-56-A, the following readings are typical for normal equipment.

Plug PL-122 Socket Terminal	Scale Used	Resistance (Ohms)	Probable Cause of Incorrect Reading
A to ground	R x 1000	Open	C3-15, 2nd detector defective
B to ground	R x 10	500	Ref. No. 111 or relay RE6 defective
D to ground	R x 1000	Open	Short in wiring, audio osc. tube defective
F to ground	Direct	0	Broken ground connection
G to ground	Direct	8.5	Relay RE5, switch section or coil defective
H to ground	R x 1000	1 meg.	C5-2, C5-3, C6, R19-1, R22-2, R32-1, or R32-2 defective
J to ground	R x 10	420	Shorts or opens on B+ bus
K to ground	R x 1000	500M	C5-2, R19-2, R22-2 defective
L to ground	R x 1000	175M	C3-7, C3-10, C3-14, R2, R13-1, R26-1 defective. 1st or 2nd RF or 1st det. defective
M to ground	Direct	5.0	Motor MO-5-A, or S5A defective
N to ground	R x 1000	Open	Switch S5A defective
P to ground	Direct	5.0	Motor MO-5-A, Switch S5A or S5B defective
R to ground	Direct	2.0	Ref. No. 113 or Dynamotor DM-30 defective
S to ground	R x 10	270	C45-1, C45-2, Ref. No. 113 or Dynamotor DM-30 defective
U to ground	R x 10	750	Transformer T16 defective
V to ground	R x 1000	Open	C3-6, C4-4, or C8-2 defective
W to ground	R x 1000	Open	C3-5, C4-5, or C8-1 defective
X to ground	R x 10	750	Transformer T17 defective
Plug PL-108 Socket Terminal			
2 to ground	R x 1000	Open	Ground in wiring or switch S1-1A defective
3 to ground	Direct	0	Broken ground connection
4 to ground	R x 1000	Open	Ground in wiring or switch S1-1A defective

MAINTENANCE

(2) Radio Control Box BC-444-A: Plug a headset into jack J3, set the band selector switch to band 2, the "OFF-COMP.-ANT.-LOOP" switch to the "COMP." position, unless otherwise specified, and the "LIGHTS", "COMPASS" and "AUDIO" controls to the maximum clockwise positions unless otherwise specified.

Ref. No. 213 Plug Terminal	Operate & Return to Original Setting	Scale Used	Resistance (Ohms)	Probable Cause of Incorrect Reading
A to ground		*R x 1000	5	Tuning Meter I-70-B open
B to ground	Headset plug out of jack J3	R x 100	7500	R23, R31-2, R36A, S11D defective
D to ground		Direct	0	Switch S11C defective
D to ground	Switch to "OFF"	R x 1000	Open	Switch S11C defective
F to ground		Direct	0	Broken ground wire
G to ground		R x 1000	Open	Switch S11B defective
G to ground	Switch to "ANT."	R x 1000	Open	Switch S11B defective
G to ground	Switch to "LOOP"	Direct	0	Switch S11B defective
G to ground	Switch to "OFF"	R x 1000	Open	Switch S11B defective
H to ground		R x 1000	Open	Jack J3 defective
H to ground	Headset plug out of jack J3	R x 1000	6200	Jack J3, resistor R34, R36A, or switch S11D defective
L to ground		Direct	0	Switch S11B defective
L to ground	"AUDIO" off, switch to "ANT.", "LOOP"	R x 1000	25M	Resistor R36B defective
M to ground	Switch to band 3	Direct	0	Switch S9 defective
M to ground		R x 1000	Open	Switch S9 defective
M to ground	Switch to band 1	R x 1000	Open	Switch S9 defective
N to ground	Switch to band 3	R x 1000	Open	Switch S9 defective
N to ground		Direct	0	Switch S9 defective
N to ground	Switch to band 1	R x 1000	Open	Switch S9 defective
P to ground	Switch to band 3	R x 1000	Open	Switch S9 defective
P to ground		R x 1000	Open	Switch S9 defective
P to ground	Switch to band 1	Direct	0	Switch S9 defective
R to ground		Direct	42	Lamp LM-32, R41, or R42 defective
R to ground	"LIGHTS" off	Direct	140	Lamp LM-32, R41, or R42 defective
S to ground		R x 1000	50M	R3 defective
S to ground	"COMPASS" off	Direct	8	R3 defective
T to ground	Switch on "COMP.", "ANT.", or "LOOP"	Direct	0	Switch S11A defective
T to ground	Switch to "OFF"	R x 1000	Open	Switch S11A defective
B to H	Switch to "ANT.", plug out of jack J3	R x 100	2700	Jack J3, R34, R56, or switch S11D defective
E to T		R x 1000	Open	Switch S10 defective
E to T	Depress "CONTROL"	Direct	0	Switch S10 defective

* Do not measure on any other range as Tuning Meter I-70-B may be damaged.

(3) Compass Indicator I-65-D (Remove Plug PL-118)

Plug PL-118 Socket Terminal	Scale Used	Resistance (Ohms)	Probable Cause of Incorrect Reading
2 to 4	R x 100	2300	Open moving coil
3 to 5	R x 100	2600	Open field coil or capacitor C11 defective
1 to 3	R x 100	1300	One side of field coil open
1 to 5	R x 100	1300	One side of field coil open
1, 2, 3, 4, and 5 to ground	R x 1000	Open	Coils or wiring grounded

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

(1) General

Before attempting to use Test Set I-56-A, the instructions in the first five paragraphs of Detailed Tests on Radio Sets, Section III of the Instruction Book for Test Set I-56-A, should be carefully studied.

(2) Cable Tests

If poor or erratic operation of the radio compass unit is noted, a continuity check on all plugs and connecting cables should be made in accordance with paragraph 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 paragraph 3 of the above reference, and the following chart.

Tube	Filament Selector	Tube Selector	"IN" Position	2nd Plate
VT-66	6	41	BCD	. .
VT-86	6	40	BCDE	. .
VT-87	6	44	BCDE	. .
VT-93	6	37	BEF (Pentode)	. .
		0	C (Diode)	D
VT-94	6	41	BD	. .
VT-96	6	41	BC	DF
VT-105*	6	42	BG	CD

*Use Adapter "B"

(4) Voltage, Current, and Resistance Measurements

If a test on all the tubes does not locate the trouble, voltage and current measurements should be made on the radio compass unit, using the Weston Model 665 Analyzer and Model 666 Socket Selector Unit. Set up the analyzer and socket selector block as indicated under paragraph 3 and 4 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 the table in paragraph 32*d*(5), provided the following rules are observed:

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

Keep AC-DC toggle switch on DC.

Place the other analyzer toggle switch on the "Volts-MA" position.

Connect short jumper cables from the selector block to the analyzer as indicated by the chart.

Select proper meter scale, and read scale accurately.

Make all voltage measurements using the *outside* pin jacks of the selector block.

Insertion of a cable pin at the *inside* position produces an open circuit to provide for current measurements.

In general, it is more convenient to measure resistance values at the tube sockets. Resistance measurements are always made with the low voltage supply disconnected and the analyzer toggle switch in the "Ohms" position.

Radio Compass Unit BC-443-A: Set up the radio compass unit without a non-directional antenna or loop.

Use a supply voltage of 28.5 volts.

Set "THRES. SENS.", "LOOP GAIN", "COMPASS", "LIGHTS", and "AUDIO" controls to the maximum clockwise positions.

Set tuning controls at 410 kcs; readings will deviate slightly when switching to other bands.

All plate and screen voltages are measured on the 250-volt scale.

All cathode voltages are measured on the scale indicated in the table.

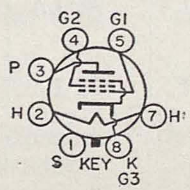
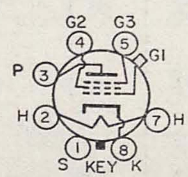
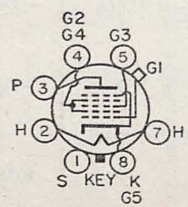
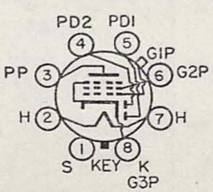
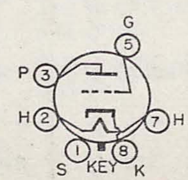
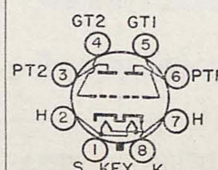
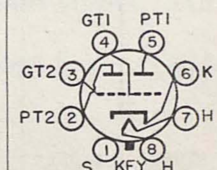
All current measurements are made on the lowest usable scale.

The metal tube shield connector of Test Set I-56-A must be grounded to the chassis of the radio compass unit.

(5) Voltage, Current, and Resistance Values Using Weston Model 666 Type 1B Socket Selector Block (Part of Test Set I-56-A).

Measurements made with the radio compass unit set up without non-directional antenna or loop, using a 28.5-volt battery and with the navigator's radio control box connected. The compass unit is operated on the antenna position on band 2 with the "AUDIO", "COMPASS", "LOOP GAIN", 'LIGHTS", and "THRES. SENS." controls turned fully clockwise.

TUBE CURCUIT ANALYSIS USING TEST SET I-56-A

Tube	VT-66		VT-86		VT-87		VT-93		VT-94		VT-96		VT-105	
	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks	Block Term. No.	Con. to Anal. Jacks
Plate Voltage	3	+250	3	+250	3	+250	3	+250	3	+250	3 Gnd.	+250 −V	2 Gnd.	+250 −V
	Gnd.	−V	Gnd.	−V	Gnd.	−V	Gnd.	−V	Gnd.	−V	6 Gnd.	+250 −V	5 Gnd.	+250 −V
Plate Current	3 out.	+25 Ma	3 out.	+5 Ma	3 out.	+5 Ma	3 out.	+5 Ma	.3 out.	+5 Ma	3 out. 3 in.	+10 Ma −Ma	6 out. *6 in.	+1 Ma −Ma
	3 in.	−Ma	3 in.	−Ma	3 in.	−Ma	3 in.	−Ma	3 in.	−Ma	6 out. 6 in.	+10 Ma −Ma	5 out. 5 in.	+1 Ma −Ma
Screen Voltage	4 Gnd.	+250 −V	4 Gnd.	+250 −V	4 Gnd.	+250 −V	6 Gnd.	+250 −V	....		....		....	
Screen Current	4 out. 4 in.	+5 Ma −Ma	4 out. 4 in.	+1 Ma −Ma	4 out. 4 in.	+1 Ma −Ma	6 out. 6 in.	+2.5 Ma −Ma	....		....		....	
Cathode Voltage	8 Gnd.	+25 −V	8 Gnd.	+5 −V	8 Gnd.	+5 −V	8 Gnd.	+25 −V	8 Gnd.	+5 −V	8 Gnd.	+10 −V	6 Gnd.	+5 −V
Diode Voltage	....		....		....		No Voltage with no Signal		....		....		....	
Diode Current	....		....		....		Static Current Too Low to Measure		....		....		....	
Base Diagram	 VT-66		 VT-86		 VT-87		 VT-93		 VT-94		 VT-96		 VT-105	

*Cathode current; subtract I_{p2} from this value to obtain I_{p1}.

Tube Function	Tube	Plate			Screen			Heater	Control Grid	Suppressor Grid		Cathode	
		V	MA	Ohms	V	MA	Ohms	Volts	Ohms	Volts	Ohms	Volts	Ohms
Loop Amp.	VT-86	176	4.0	5500	64	1.15	105M	6.8	4.2 ohms	2.6	500	2.6	500
1st RF	VT-86	176	4.0	5500	69.5	1.00	105M	6.8	2 megs	0	0	3.15	600
2nd RF	VT-86	176	4.0	5500	69.5	1.03	105M	6.8	2 megs	0	0	3.2	600
IF Amp.	VT-86	196	1.4	5500	161	0.2	50M	6.8	2 megs	0	0	4.5	600
Nav. Comp.	VT-86	193	3.6	2800	64.5	0.8	150M	6.82	50M	2.9	600	2.9	600
Pilot's Comp.	VT-86	191	3.6	2800	64	0.8	150M	6.82	280M	3.0	600	3.0	600
*Audio Osc.	VT-96	.	8.8	.	.	.	.	6.8	.	.	.	0.8	Open
	#5 pin	195	.	2500	.	.	.	.	50M	.	.	.	.
	#2 pin	195	.	2500	.	.	.	.	50M	.	.	.	.
*Mod.	VT-105	117 117	0.38	100M 100M				6.8	500M 500M			5.9	4500
1st Det.	VT-87	188	2.65	5100	87	4	21,500	6.82	2 megs	Mixer	Grid 50M	3.8	600
RF Osc.	VT-94	71	2.3	54M	.	.	.	6.82	50M	.	.	0	0
2nd Det.	VT-93	85	3.7	25M	85	.95	25,000	6.82	353M	Diodes Pin 4 Pin 5	. 1 meg. 300M	14.6	3500
Audio Out.	VT-66	197	20.0	800	207	3.7	390	6.82	350M	13.2	500	13.2	500

*Measured on "Comp." position. Plate current shown is total cathode current.

(6) Inductance and Transformer Data

Ref. No.	Name	Part of Ref. No.	Wind-ing	Case Term. No.	DC Res. Ohms	Tol. ±%	Inductance	Q	Notes On Test Procedure Coils Removed from Cans
L1	Loop Phaser	171	...	3-4	85	10	22 MH ±2% at 75 kcs	65 ±10% at 150 kcs	Resonant point with 100 mmf shunt capacitor, 105 kcs ±5 kcs, core in extreme clockwise position.
L7-1	RF Choke, Dyn. LV	113	...	...	0.06	10	40 μH	...	1000 CPS
L7-2	RF Choke, Dyn. LV	113	...	...	0.06	10	40 μH	...	1000 CPS
L8	RF Choke, Dyn. HV	113	...	...	40	10	24.2 MH	...	1000 CPS
L9	Filter Choke	111	...	5-6	150	10	5 H at 100 MA DC, 1000 CPS	...	...
L10	Low Pass Audio Filter	111	...	...	...	...	...	13 ±10% at 1000 CPS	Refer to T15.
L12	IF Trap 2nd RF	181	...	3-4	1.1	10	260 μH ±2% at 500 kcs	305 ±10% at 500 kcs	Inductance measurement, core set to 1.25 turns clockwise from maximum counterclockwise position. Remove C16-2.
L13-1	1st Det.	178	Plate	3-4	9.4	10	4253 μH ±2% at 150 kcs	180 ±10% at 142.5 kcs	Same as L12 except remove C35-2.
L13-2	IF Trans.	180	Plate	3-4	9.4	10	4253 μH ±2% at 150 kcs	180 ±10% at 142.5 kcs	Same as L12 except remove C59.
L14-1	IF Trans.	178	Grid	3-4	9.4	10	4253 μH ±2% at 150 kcs	180 ±10% at 142.5 kcs	Same as L12 except remove C55-2.
L14-2	2nd Det. Aud. Diode	180	...	3-4	9.4	10	4275 μH ±2% at 150 kcs	180 ±10% at 142.5 kcs	Same as L12 except remove C55-1.
L15	152.5-kcs Trap	179	...	3-4	0.26	10	57.0 μH ±2% at 1000 kcs	115 ±10% at 152.5 kcs	Same as L12 except remove C15.
L16	IF Trap 1st RF	181	...	3-4	1.05	10	248 μH ±2% at 500 kcs	242 ±10% at 500 kcs	Same as L12 except remove C16-1.
T15	Audio Output Transformer	111	Pri.	1-2	380	10	7.8 H ±10% at 25 MA DC, 60 CPS	...	...
			Sec.	3-4	480	10	...	...	Secondary measurement includes resistance of L10.
T16	Nav. Comp. Ind.	112	Pri.	1-2	2800	5	100 H at 60 CPS	...	With 4 MA in primary.
			Sec.	3-4	780	5	5 H at 60 CPS	...	...

Ref. No.	Name	Part of Ref. No.	Winding	Case Term. No.	DC Res. Ohms	Tol. ±%	Inductance	Q	Notes On Test Procedure Coils Removed from Cans
T17	Pilot's Comp. Ind.	112	Pri.	5-6	2800	5	100 H at 60 CPS	...	With 4 MA in primary.
			Sec.	7-8	780	5	5 H at 60 CPS	...	...
24	Loop Stage Trans. Band 1	170	Pri. + Sec.	...	...	...	1403 μH ±5% at 210 kcs	121 ±10% at 210 kcs	For Q and inductance measurements, the core is set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* as follows: Connect terminal 2 to terminal 3 and ground terminal 4.
			Pri.	3-4	0.27	10	...	...	
			Sec.	2-5	11.2	10	...	...	
5	Loop Stage Trans. Band 2	170	Sec. + Pri.	...	...	...	294 μH ±5% at 450 kcs	174 ±10% at 450 kcs	For Q and inductance measurements, the core is set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* as follows: Connect terminal 3 to terminal 5 and ground terminal 2.
			Pri.	2-3	0.26	10	...	...	
			Sec.	4-5	5.1	10	...	...	
6	Loop Stage Trans. Band 3	170	Sec. + Pri.	See Notes	...	...	51.5 μH ±5% at 900 kcs	110 ±10% at 900 kcs	For Q and inductance measurements, the core is set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* as follows: Connect terminal 3 to terminal 4 and ground terminal 5.
			Pri	4-5	0.3	10	...	...	
			Sec.	2-3	1.2	10	...	...	
27	Ant. Stage Trans. Band 1	172	Pri.	3-5	0.38	10	...	...	Inductance measurements *Secondary Only:* Shunt tertiary with 50-mmf capacitor and couple terminal 1 to terminal 2 with 15-mmf capacitor. Core set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* measured as above but with terminal 5 connected to terminal 6 and terminal 3 grounded. *Tertiary resonance point* 120 kcs ±10% with 80-mmf shunt capacitor.
			Sec.	2-6	10.4	10	1270 μH ±2% at 210 kcs	120 ±10% at 210 kcs	
			Ter.	1-6	110.0	5	See Notes	48 ±10% at 120 kcs	
			Pri. + Sec.	See Notes	...	...	1226 μH ±3% at 210 kcs	105 ±10% at 210 kcs	

Ref. No.	Name	Part of Ref. No.	Winding	Case Term. No.	DC Res. Ohms	Tol. ±%	Inductance	Q	Notes On Test Procedure Coils Removed from Cans
T28	Ant. Stage Trans. Band 2	172	Pri.	3-5	0.61	10	...	...	Inductance measurements *Secondary Only:* Shunt tertiary with 75-mmf capacitor and couple terminal 2 to terminal 6 with a 15-mmf capacitor. Core set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* measured as above but terminal 1 connected to terminal 5 and terminal 3 grounded. *Tertiary resonance point* 250 kcs ±10% with 75-mmf shunt capacitor.
			Sec.	1-2	4.4	10	309 μH ±2% at 500 kcs	138 ±10% at 500 kcs	
			Ter.	1-6	48	10	...	74 ±10% at 250 kcs	
			Pri. + Sec.	See Notes	...	...	267 μH ±3% at 500 kcs	111 ±10% at 500 kcs	
T29	Ant. Stage Trans. Band 3	172	Pri.	2-4	1.07	10	...	...	Inductance measurements *Secondary Only:* Shunt tertiary with 50-mmf capacitor and couple terminal 1 to terminal 5 with a 15-mmf capacitor. Core set at 1.25 turns clockwise from maximum counterclockwise position. *Primary and secondary in series* measured as above but with terminal 2 connected to terminal 6 and terminal 4 grounded. *Tertiary resonance point* 590 kcs ±10% with 75-mmf capacitor.
			Sec.	5-6	1.08	10	68.4 μH ±2% at 900 kcs	140 at 900 kcs	
			Ter.	1-6	18.3	10	See Notes	90 ±10% at 590 kcs	
			Pri. + Sec.	...	...	...	42 μH ±3% at 900 kcs	70 ±10% at 900 kcs	
T30-1	1st RF Stage Trans. Band 1	175	Pri.	4-5	93	5	...	24 ±10% at 121 kcs	*Primary resonance* 120 kcs ±10% with 175-mmf shunt capacitor. *Secondary inductance* measured with primary shunted with 175-mmf capacitor. Terminal 4 grounded and no capacity coupling between primary and secondary. Core set at 1.25 turns clockwise from maximum counterclockwise position.
			Sec.	2-3	9.5	10	1305 μH ±2% at 210 kcs	134 ±10% at 210 kcs	
T30-2	2nd RF Stage Trans. Band 1	176	Pri.	4-5	87	5	...	24 ±10% at 121 kcs	Same as T30-1.
			Sec.	2-3	9.5	10	1305 μH ±2% at 210 kcs	134 ±10% at 240 kcs	

Ref. No.	Name	Part of Ref. No.	Winding	Case Term. No.	DC Res. Ohms	Tol. ±%	Inductance	Q	Notes On Test Procedure Coils Removed from Cans
T31-1	1st RF Stage Trans. Band 2	175	Pri.	4-5	58	10	...	74 ±10% at 240 kcs	*Primary resonance* 240 kcs ±10% with 50-mmf shunt capacitor.
			Sec.	2-3	4.5	10	312 μH ±2% at 450 kcs	145 ±10% at 450 kcs	*Secondary inductance* measured with primary shunted with 50-mmf capacitor, terminal 4 grounded, and no capacity coupling between primary and secondary. Core set at 1.25 turns clockwise from maximum counterclockwise position.
T31-2	2nd RF Stage Trans. Band 2	176	Pri.	4-5	58	10	...	74 ±10% at 240 kcs	Same as T31-1.
			Sec.	2-3	4.5	10	312 μH ±2% at 450 kcs	145 ±10% at 450 kcs	
32-1	1st RF Stage Trans. Band 3	175	Pri.	2-3	30	10	...	90 ±10% at 450 kcs	*Primary resonance* 500 kcs ±10% with 45-mmf shunt capacitor.
			Sec.	4-5	1.1	10	72 μH ±2% at 900 kcs	205 ±10% at 900 kcs	*Secondary inductance* measured with primary shunted with 45-mmf capacitor, terminal 3 coupled to terminal 4 with 5-mmf capacitor. Core set at 1.25 turns clockwise from maximum counterclockwise position.
32-2	2nd RF Stage Trans. Band 3	176	Pri.	2-3	30	10	...	90 ±10% at 450 kcs	Same as T32-1.
			Sec.	4-5	1.1	10	72 μH ±2% at 900 kcs	205 ±10% at 900 kcs	
33	RF Oscillator Trans. Band 1	177	Pri.	3-4	2.1	10	...	...	...
			Sec.	2-5	7.8	10	745 μH ±2% at 300 kcs	115 ±15% at 300 kcs	*Secondary inductance* measured with primary open circuited, core set at 1.25 turns clockwise from maximum counterclockwise position.
T34	RF Oscillator Trans. Band 2	177	Pri.	3-4	1.55	10	...	...	
			Sec.	2-5	4.02	10	234 μH ±2% at 500 kcs	106 ±15% at 500 kcs	Same as T33.
T35	RF Oscillator Trans. Band 3	177	Pri.	3-4	1.15	10	...	...	
			Sec.	2-5	2.14	10	63.1 μH ±2% at 1000 kcs	90 ±15% at 1000 kcs	Same as T33.
T36	IF Input Coupler	178	...	...	...	...	...	...	Refer to L13-1 and L14-1.
T37	IF Output Coupler	180	...	...	...	...	...	...	Refer to L13-2 and L14-2.
301	Loop & Shaft Assembly	LP-19-A	...	Top to middle slip ring	0.06	5	24.3 μH ±1% at 1400 kcs	60 at 1400 kcs, Minimum 65 at 2800 kcs, Minimum	...

Inductance at radio frequencies may be measured with a high degree of accuracy by using a standard Boonton 100-A or 160-A "Q" meter, supplemented by an accurate means for measuring frequency and a standard variable capacitor accurate to within 1 mmf.

The true inductance, as given in the following relation, is determined by finding coil resonance at two frequencies, the higher frequency being exactly twice that of the lower. In the relation below, f is the lower frequency in kilocycles per second; C, the external capacitance required to resonate the inductance at that frequency; C_2 the external capacitance required to resonate the coil at the higher frequency. C_1 and C_2 are expressed in micromicrofarads and the inductance L is in microhenries.

$$L = \frac{19 \times 10^9}{f^2 (C_1 - C_2)}$$

In the foregoing table, inductances at radio frequencies were measured in this manner.

33. CIRCUIT ALIGNMENT PROCEDURE

This equipment has been carefully adjusted and aligned by the manufacturer and thoroughly inspected before shipment. The circuits are designed so that their alignment will be maintained over long periods of time. Before changing any adjustments, it must be ascertained that the difficulty is not the result of normal deteriorating influences, such as worn out vacuum tubes, blown fuses, improper operating voltages, broken cords, external RF interference, etc. Factory adjustments are sealed with red lacquer and are not to be altered unless absolutely necessary. DO NOT CHANGE ANY COIL ADJUSTMENTS ON LOOP, RF OSCILLATOR, OR RF ASSEMBLIES. Any questionable performance characteristics should be measured in accordance with paragraph 34 both before and after adjustment. All aligning adjustments are accessible from the top of the chassis (see Figure 38) and are:

Band	Aligning Freq.	Loop	Ant.	1st RF	2nd RF	RF Osc.
200–410 kcs	410 kcs	C1-1	C1-4	C1-7	C1-10	C1-13
410–850 kcs	850 kcs	C1-2	C1-5	C1-8	C1-11	C1-14
850–1750 kcs	1750 kcs	C1-3	C1-6	C1-9	C1-12	C1-15

a. IF Amplifier Alignment

(1) 2nd IF Stage Alignment 180

(*a*) Operate on "ANT.", and plug a 4000-ohm output meter into jack J3 on the radio control box which has control of the equipment. If both radio control boxes are connected, plug a dummy plug into jack J3 of the control box which is not in control. Set the "THRES. SENS." and both "AUDIO" controls fully clockwise. Set the tuning dial to 850 kcs on band 2.

(*b*) Apply a 142.5-kcs signal, 30% modulated at 400 cycles, directly to the grid of the IF amplifier Tube VT-86, leaving the regular grid clip in place. The signal generator output should be adjusted to about 100,000 microvolts.

(*c*) Adjust inductors L13-2 and L14-2 of transformer T37 for maximum output, reducing the signal generator voltage as necessary to keep the output of the radio compass unit at approximately 50 milliwatts. The input to this stage, when properly aligned, should be between 35,000 and 50,000 microvolts.

(2) Adjustment of 152.5-kcs Trap 173

With all equipment connected the same as for 2nd IF alignment (paragraph 33*a*(1)), adjust the signal generator to 152.5 kcs, 30% modulated at 400 cycles, and for an output of 1 or 2 volts. Rotate the adjusting screw in inductor L15 until *minimum* output is indicated on the output meter.

(3) 1st IF Stage Alignment 178

(*a*) With the radio compass unit tuned to 850 kcs on band 2, "AUDIO" and "THRES. SENS." controls turned fully clockwise, and switch in the "ANT." position, adjust the iron core of inductor L13-1 in transformer T36 to a position one revolution from its maximum counterclockwise rotation, and inductor L14-1 to approximately the midpoint of its rotation limits.

(*b*) Attach the lead from the signal generator to the grid of the 1st detector Tube VT-87, leaving the regular grid clip in place, and set the generator to 144.5 kcs, 30% modulated at 400 cycles, and for an output of 1000 microvolts. Adjust inductors L13-1 and L14-1 for maximum output. Reset the signal generator to a frequency of 140.5 kcs, and readjust inductors L13-1 and L14-1 for maximum output. Reset the signal generator to 144.5 kcs, and readjust inductors L13-1 and L14-1 for maximum output. This completes the alignment of this stage.

(*c*) Set the signal generator again at 142.5 kcs and check the input required for a 50-milliwatt output. This input should be approximately 600–850 microvolts.

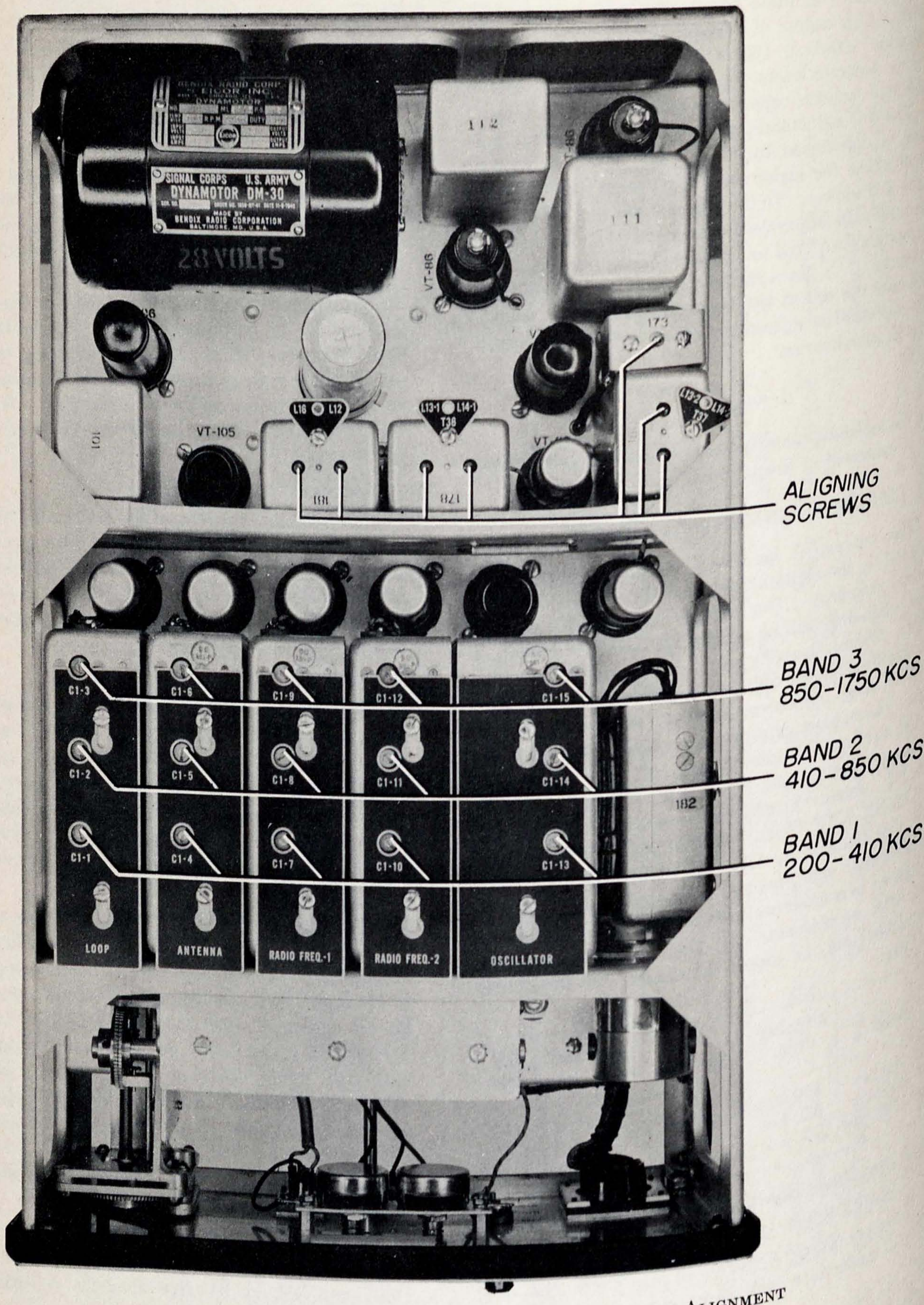


Figure 38 — Radio Compass Unit BC-443-A, Circuit Alignment

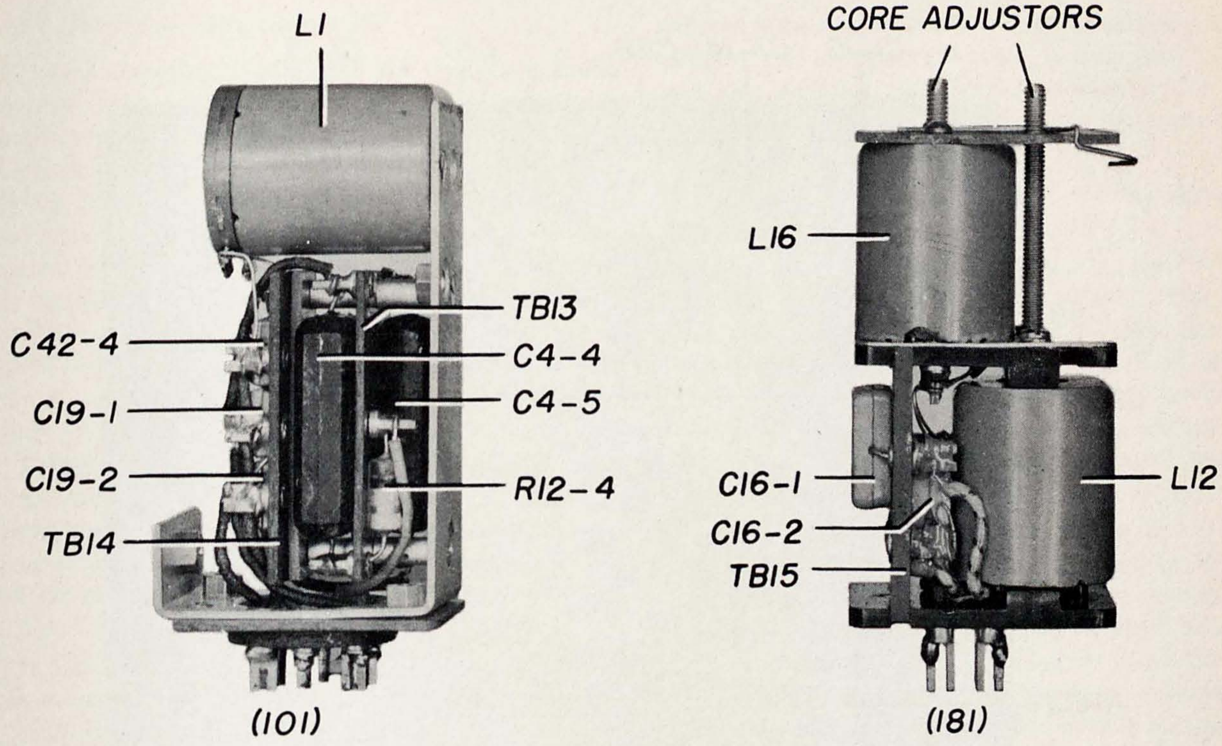


FIGURE 39 — RADIO COMPASS UNIT BC-443-A, LOOP PHASER 101, AND IF TRAP 181

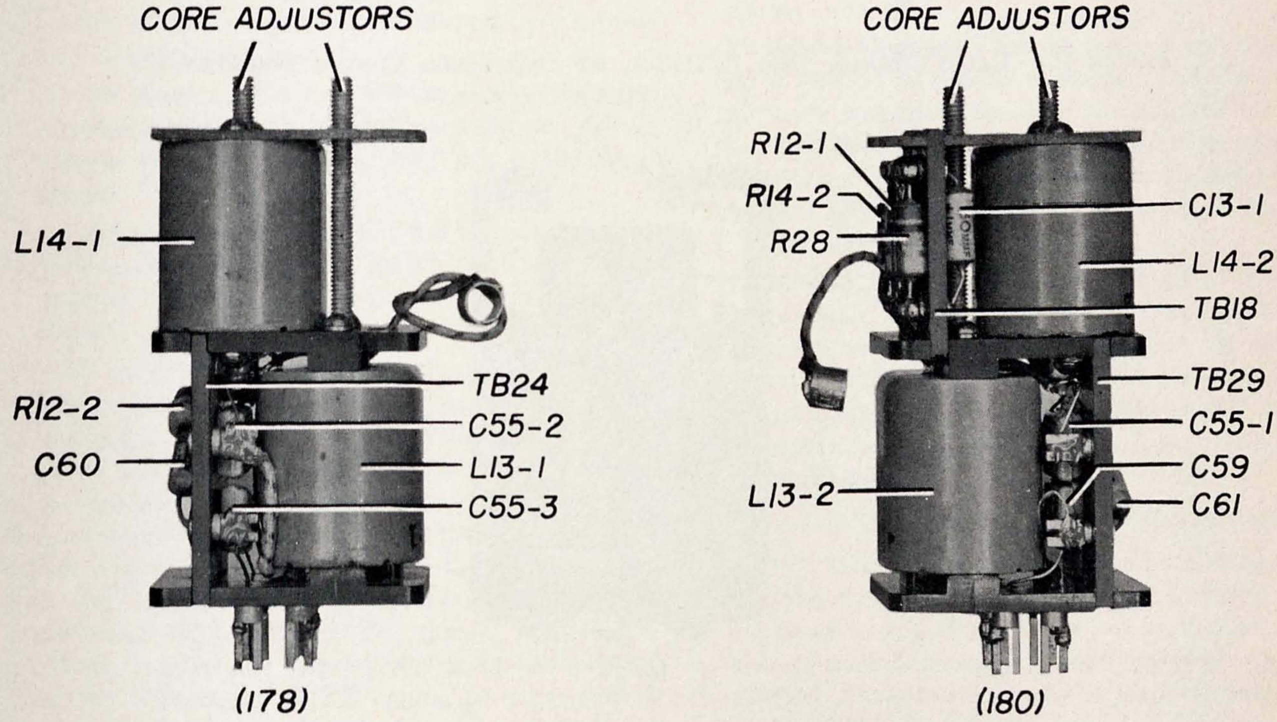


FIGURE 40 — RADIO COMPASS UNIT BC-443-A, 1ST AND 2ND IF TRANSFORMERS 178, 180

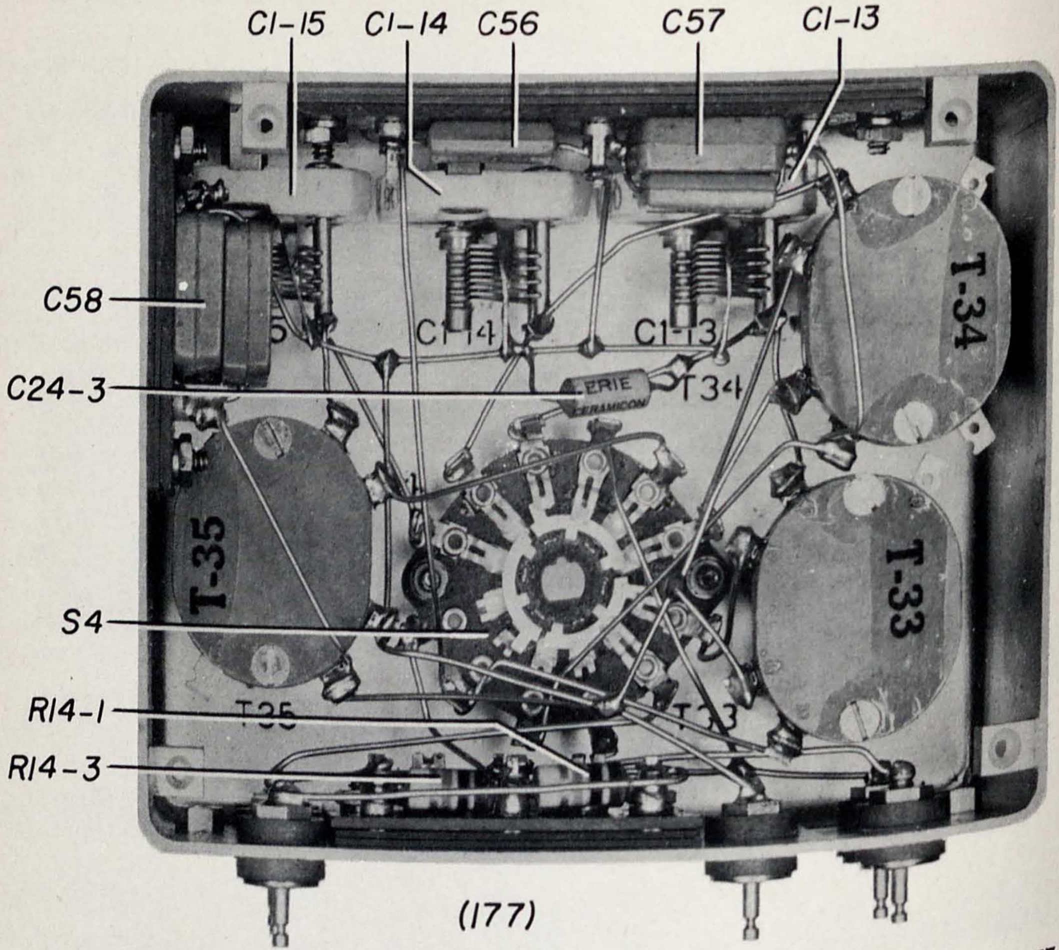


FIGURE 41 — RADIO COMPASS UNIT BC-443-A, RF OSCILLATOR TUNING ASSEMBLY 177

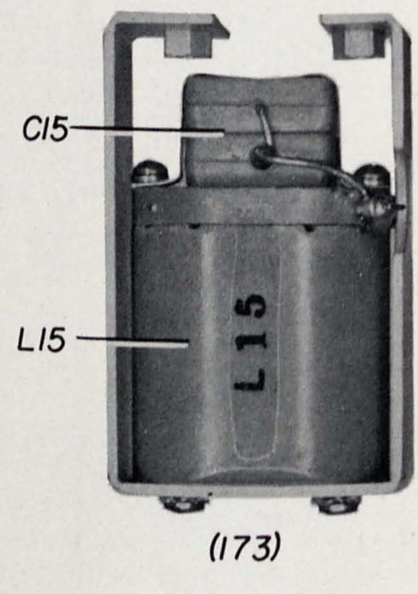


FIGURE 42 — RADIO COMPASS UNIT BC-443-A, 152.5 KCS REJECTION TRAP 173

b. RF Oscillator Alignment 177

Before attempting to align the RF circuits of Radio Compass Unit BC-443-A, the following precautions should be observed.

Connect the radio control box to the radio compass unit by means of a tuning shaft which should be as short as is practical. The radio control box should be fastened down solidly and the dial should be very carefully adjusted to the "ALIGN" mark when the tuning capacitor mechanism in the radio compass unit is against the stop with the capacitor plates fully meshed.

(1) Operate the compass unit with the switch on the "ANT." position, and the "AUDIO" and "THRES. SENS." controls at their maximum clockwise positions. Plug a headset into jack J3 on the radio control box which has control of the equipment, and couple a signal generator (hereafter referred to as generator No. 1) to the grid of the 1st detector Tube VT-87.

(2) Loosely couple a second signal generator (hereafter referred to as generator No. 2) to the grid of the IF amplifier Tube VT-86. Adjust to a frequency of 142.5 kcs, unmodulated.

(3) Set generator No. 1 to 1750 kcs, 1000 microvolts output, unmodulated. Rotate tuning dial to 1750 kcs on band 3 and adjust generator No. 2 to sufficient output to cause a heterodyne beat note to become audible in the headphones. Rotate trimmer capacitor C1-15 for zero beat.

(4) Set generator No. 1 to 850 kcs and set the radio compass unit dial to 850 kcs on band 2. Adjust trimmer capacitor C1-14 for zero beat in the headphones.

(5) Set generator No. 1 to 410 kcs and set the radio compass unit dial to 410 kcs on band 1. Adjust trimmer capacitor C1-13 for zero beat in the headphones.

NOTE: If subsequent sensitivity measurements indicate poor tracking at the low frequency ends of any of the bands, adjustment of the oscillator coil inductance on one or more bands will be necessary. The same equipment set-up and procedure used at the high frequency ends of the bands is used for this alignment, which is accomplished by adjusting the settings of the iron core screws (lacquered factory adjustments) in transformers T33, T34, or T35 (bands 1, 2, and 3 oscillator transformers, respectively) as the case may be. However, adjustment of T33 cannot be accomplished unless the band switch drive assembly is removed or a special tool is available. (See Figure 41.) *Be sure to re-seal these screws if it has been necessary to change their original factory adjustments.* If any alteration of the oscillator coil inductance is made, it is necessary to repeat the oscillator alignment procedure at the high frequency ends of the band or bands in question, as outlined above.

c. 1st and 2nd RF Amplifier 175, 176 and Antenna Stage Alignment 174

(1) Operate the radio compass unit in the "ANT." position, with the "THRES. SENS." and both "AUDIO" controls at their maximum clockwise positions. Plug an output meter into jack J3 on the radio control box which has control of the equipment, and connect a signal generator to the antenna post through a 50-mmf artificial antenna. Set the generator for 30% modulation at 400 cycles.

(2) Band 3 Alignment: Set the tuning dial to 1750 kcs on band 3 and adjust the signal generator to 1750 kcs and whatever output is necessary to produce just less than 50 milliwatts output. Adjust trimmer capacitors C1-12, C1-9, and C1-6 for maximum output, reducing the input from the signal generator as much as necessary to keep the output at approximately 50 milliwatts. Set the signal generator output at 10 microvolts and reduce the "AUDIO" control setting to the point at which slightly less than 50 milliwatts output is obtained, and re-adjust trimmer capacitors C1-12, C1-9, and C1-6 for maximum output.

(3) Band 2 Alignment: Set the compass unit tuning dial to 850 kcs on band 2, re-set the "AUDIO" control to its maximum clockwise position, and adjust the signal generator to 850 kcs and whatever output is necessary to produce just less than 50 milliwatts output. Adjust trimmer capacitors C1-11, C1-8, and C1-5 for maximum output.

(4) Band 1 Alignment: Set the tuning dial to 410 kcs on band 1, reset the "AUDIO" control to its maximum clockwise position, and adjust the signal generator to 410 kcs and whatever output is necessary to produce just less than 50 milliwatts output. Adjust trimmer capacitors C1-10, C1-7, and C1-4 for maximum output.

d. Threshold Sensitivity Control Adjustment R2

Set the "AUDIO" control to its maximum clockwise position, band switch to band 1 and tune from one end of the band to the other, first shorting the antenna terminal to ground through a 50-mmf capacitor. Note the amount of noise power output on the output meter. Adjust the "THRES. SENS." control, if necessary, to the point at which the noise does not exceed 25 milliwatts at any point in band 1. Now check the low,

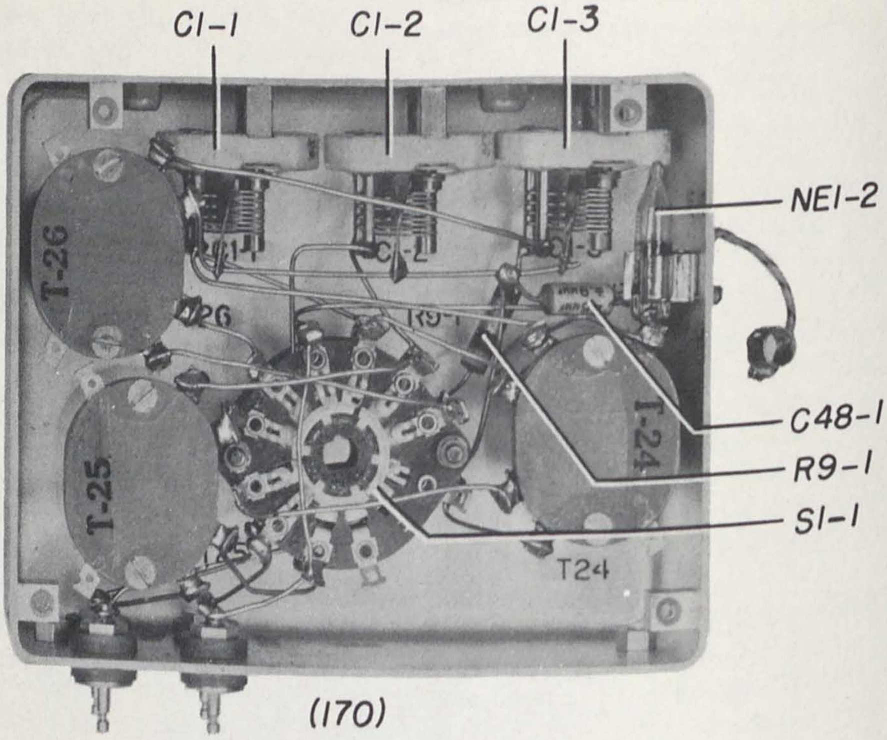


FIGURE 43 — RADIO COMPASS UNIT BC-443-A, LOOP TUNING ASSEMBLY 170

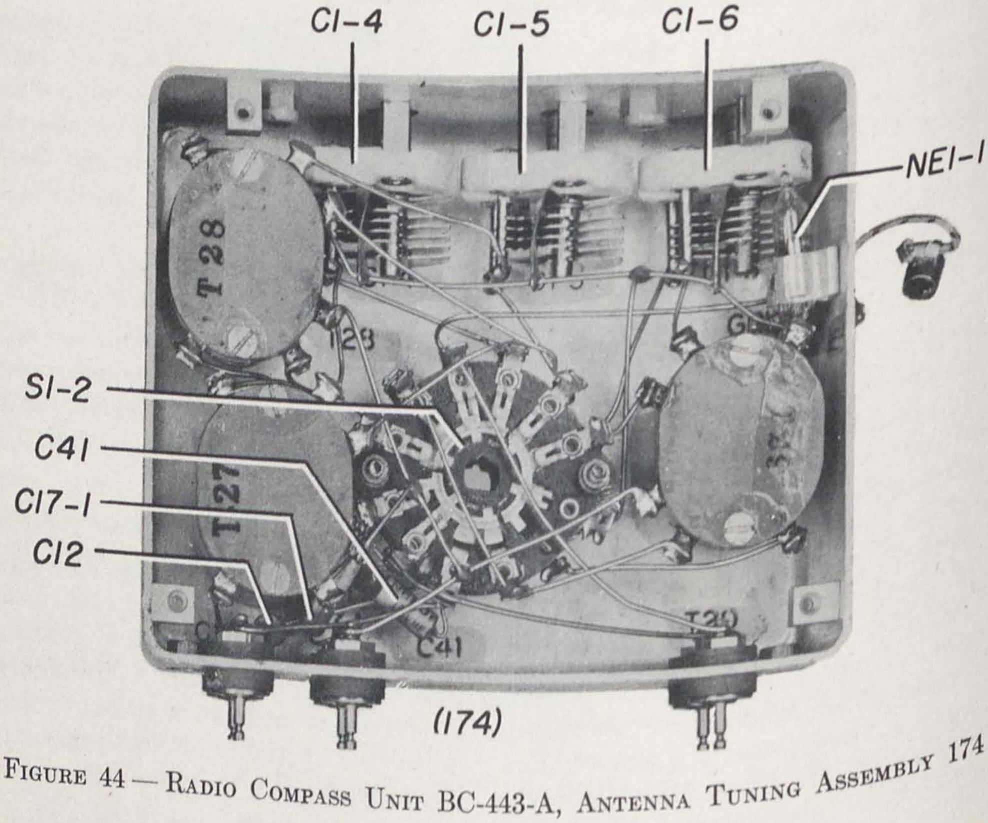


FIGURE 44 — RADIO COMPASS UNIT BC-443-A, ANTENNA TUNING ASSEMBLY 174

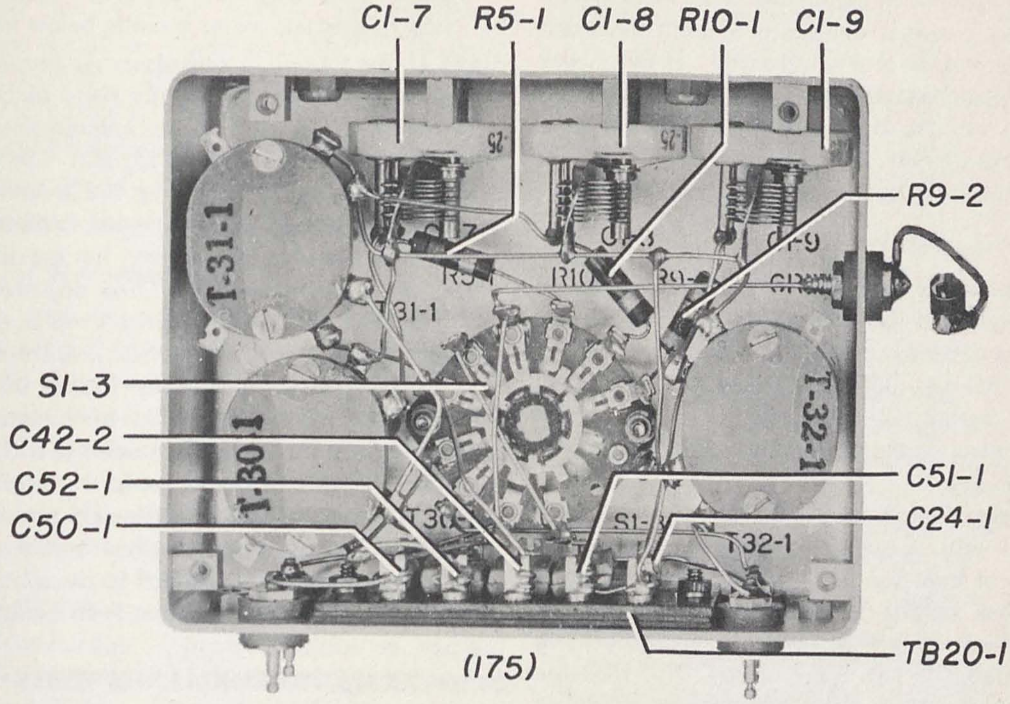


Figure 45 — Radio Compass Unit BC-443-A, 1st RF Tuning Assembly 175

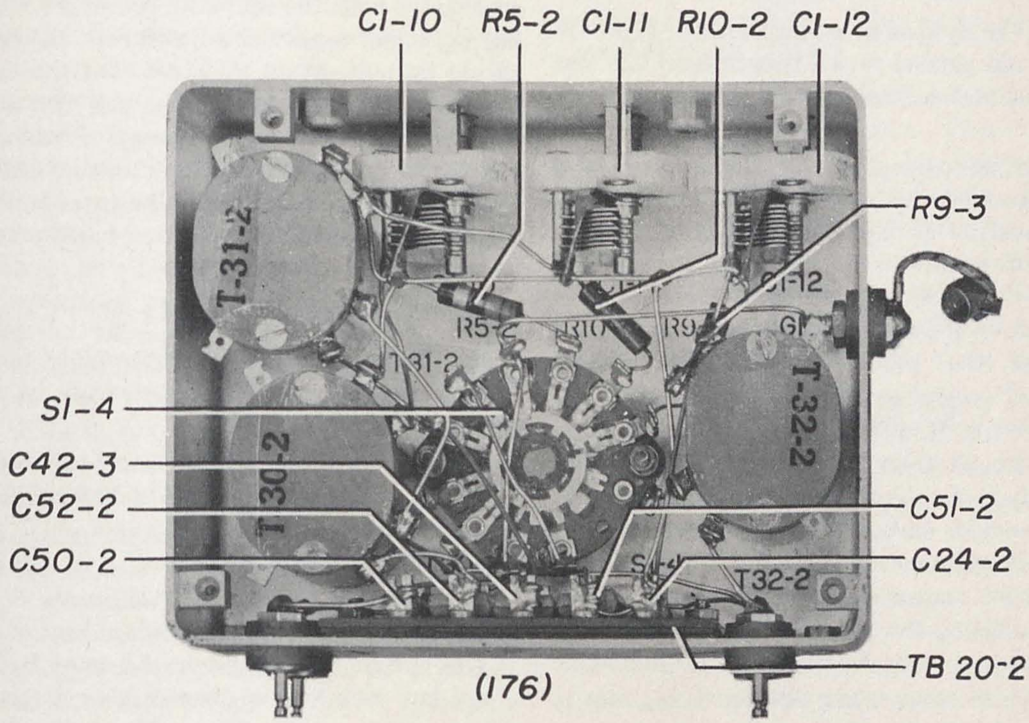


Figure 46 — Radio Compass Unit BC-443-A, 2nd RF Tuning Assembly 176

MAINTENANCE

middle and high frequency points of all three bands to see whether a signal of 5 microvolts or less introduced to the antenna terminal through a 50-mmf capacitor will produce an output of 50 milliwatts. If not, check the radio compass unit for excessive noise (paragraph 31*e*) and after locating the cause, reset the "THRES. SENS." control for less than 25 milliwatts maximum noise power output in any band as outlined above.

e. Adjustment of IF Trap 181

Connect the signal generator to the radio compass unit antenna post through a 50-mmf capacitor, and set the tuning dial to 200 kcs on band 1. Adjust the signal generator to 200 kcs, 30% modulated at 400 cycles, and for an output of 4 microvolts. Adjust the "AUDIO" control to the point at which 50 milliwatts output is obtained.

Reset the signal generator to 140.5 kcs and adjust the input to 1 volt. Leaving the generator set, adjust the iron core of inductor L12 (part of Ref. No. 181) until minimum output is obtained. Readjust the signal generator frequency to 144.5 kcs, and adjust the iron core of inductor L16 (part of Ref. No. 181) for minimum output. With these adjustments made as described there should not be over 30 milliwatts of power output with 1 volt of input.

f. Loop Stage Alignment 170

(1) Set up the equipment as illustrated in Figure 8. Turn the loop parallel to the transmission line and set the function selector switch to the "LOOP" position.

(*a*) Tune the compass unit to 1750 kcs on band 3 and adjust the signal generator to the same frequency and for an input to the loop of approximately 100 microvolts per meter, 30% modulated at 400 cycles. Adjust capacitor C1-3 for maximum indication on the output meter (or for maximum swing of the tuning meter), adjusting the "AUDIO" control to maintain the output meter reading below 50 milliwatts.

(*b*) Switch to band 2, and set the tuning dial at 850 kcs. Adjust the signal generator to the same frequency and for an input to the loop of approximately 100 microvolts per meter. Adjust capacitor C1-2 for maximum indication on the output meter, adjusting the "AUDIO" control to maintain the output meter reading below 50 milliwatts.

(*c*) Switch to band 1, and set the tuning dial to 410 kcs. Adjust the signal generator to the same frequency and for an input to the loop of approximately 100 microvolts per meter. Adjust capacitor C1-1 for maximum indication on the output meter, adjusting the "AUDIO" control to maintain the output meter reading below 50 milliwatts.

(2) If the "LOOP" sensitivity is unsatisfactory at the low frequency end of any band or bands, it will be necessary to readjust the inductance of the loop stage transformers T24, T25, and T26. This may be accomplished by repeating the procedure outlined above, adjusting the iron cores, which have been sealed in place at the factory, for maximum indication on an output meter. These adjustments should be made at the low frequency ends of the three bands: transformer T26 at 850 kcs, transformer T25 at 410 kcs, and transformer T24 at 200 kcs. (See Figure 43.) If it is necessary to change the settings of any of these core adjustments, it will be very important to readjust the loop trimmer capacitors C1-1, C1-2, and C1-3 as outlined in paragraph 33*f*(1) above. Also, if any core adjustments are changed, red lacquer should be applied to the adjusting screws after the readjustments have been completed.

34. OVERALL PERFORMANCE TESTS

a. General

If at any time the operation of the equipment is questionable, its performance should be measured in accordance with the following procedure. After making any major repairs or adjustments, the performance should be remeasured to insure that the adjustments have been properly made. The performance obtained as a result of these measurements should conform to the normal performance characteristics shown in the table in paragraph 34*d*, but in no case should be worse than the minimum performance characteristics shown in the table in paragraph 34*e*.

b. Standard Test Conditions

For all of the individual performance tests, the following standard test conditions must be maintained unless otherwise stated.

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

(2) Standard Output—50 milliwatts or 14.1 volts (signal and noise) into a standard load of 4000 ohms. This output may be obtained from either radio control box jack with a dummy plug plugged into the jack in the other radio control box. The dummy plug may be merely a telephone plug with no cord connected to it. On receiver operation ("ANT."

or "LOOP"), adjust the "AUDIO" control for standard signal-to-noise ratio. On "COMP." operation, adjust the "AUDIO" control fully clockwise.

(3) Artificial Antenna—Receiver ("ANT.") 50 mmf; compass ("COMP.") 50-mmf capacitance and 0.25-meter effective height.

(4) Standard Modulated Signal—30% at 400 cycles.

(5) Warm-up Period—20 minutes.

(6) Low Voltage Supply—28.5 volts.

c. Methods of Measurement

To make performance tests, each measurement should be accomplished as follows, and recorded on a form similar to the table in paragraph 34*d*.

(1) Sensitivity, "ANT.": Set the "THRES. SENS." control fully clockwise. Apply a standard modulated signal to the antenna terminal post through an artificial antenna. Set input at approximately 5 microvolts. Tune the radio compass unit carefully to resonance. Remove modulation leaving carrier on. Set the "AUDIO" control to obtain 12.5 milliwatts average noise output. Turn modulation on, and set input to that value which gives 50 milliwatts output. Remove modulation, and reset "AUDIO" control to obtain 12.5 milliwatts average noise output. Repeat until 50 milliwatts output is obtained with modulation on and 12.5 milliwatts noise with modulation off. Repeat the above procedure for each test frequency. The setting of the signal generator attenuator will indicate the sensitivity of the radio compass at the frequency under test.

(2) Noise Level: Operate on "ANT." position, with the "AUDIO" and "THRES. SENS." controls fully clockwise. Connect the antenna terminal to ground through an artificial antenna. Care should be taken to shield the radio compass unit and artificial antenna connection against pickup. Tune the equipment throughout its frequency range. Minimum noise level can be measured by operating on "ANT." and turning the "AUDIO" control fully counterclockwise, and if the noise output exceeds 0.050 milliwatt, trouble is indicated in dynamotor, filtering, or 2nd detector and audio circuits.

(3) IF Rejection Ratio: Measure the "ANT." sensitivity at the desired test frequency. Leaving the "AUDIO" control set at the point required for sensitivity measurement, set the signal generator at the point of greatest response near 142.5 kcs, and increase the attenuator output until 50 milliwatts is obtained. The ratio of the attenuator setting at 142.5 kcs to that required at the test frequency is the rejection ratio. NOTE: The harmonics of the signal will appear in the frequency range of the equipment (i.e., 285, 427.5, etc.). To avoid response from harmonics, select a test frequency removed from the harmonics by at least 20 kcs.

(4) Image Rejection Ratio: Measure the "ANT." sensitivity of the equipment first at the desired test frequency. Leaving the "AUDIO" control set at the point required for sensitivity measurement, set the signal generator at the point of greatest response near the frequency which is 285 kcs above the test frequency. Increase the generator output until 50 milliwatts is obtained. The ratio of the attenuator setting at the test frequency to that required at the image frequency will be the rejection ratio.

(5) AVC Action: Operate on "ANT." with "AUDIO" control fully clockwise. Apply a standard modulated signal to the antenna terminal through an artificial antenna. Measure milliwatts output against input from 1 microvolt to 0.5 volt at a test frequency of approximately 840 kcs.

(6) Selectivity, "ANT.": Measure the "ANT." sensitivity of the equipment as in paragraph (1) above at the desired test frequency. Increase the signal generator attenuator so that the output is 2, 10, 100, 1000, and 10,000 times the sensitivity measured. For each increase in input, vary the signal generator frequency above and below resonance, until the output is 50 milliwatts, and note the number of kilocycles off resonance. The worst selectivity will generally be at 1750 kcs.

(7) Sensitivity, "LOOP": Mount the loop beneath the reference transmission line. Operate on "LOOP" position. Turn the loop for maximum pickup. Adjust the "AUDIO" control for a signal-to-noise ratio of 4 to 1 as done for "ANT." sensitivity measurements as in paragraph 34*c*(1) above. Note the microvolts per meter field strength input at the center of the loop for standard output, taking into account the attenuation factor of the test set-up.

(8) Compass Sensitivity, Uniformity and Accuracy: Mount the loop beneath the reference transmission line. Operate on the "COMP." position. Use a 50-mmf, 0.25-meter artificial antenna. With the "COMPASS" control set in the maximum clockwise position, and a field strength of 1000 microvolts per meter at the center of the loop at 1000 kcs, taking into account the attenuation factor of the test set-up; loop rotation to give full-scale compass indicator deflection should not be greater than 5 degrees. Without altering these test conditions, adjust the "COMPASS" control so that 15 degrees rotation of the loop produces full-scale compass indicator deflection. Without changing the "COMPASS" con-

MAINTENANCE

trol, note the degrees rotation of the loop required to produce 0 and full scale right and left compass indicator pointer deflection for 50, 100, 1000, and 100,000 microvolts per meter input at different test frequencies.

d. Normal Performance Characteristics

Ref. Par. No.	Test Point			1-L	1-M	1-H	2-L	2-M	2-H	3-L	3-M	3-H
	Test Freq. (kcs)			205	300	400	420	600	840	870	1300	1700
34*c*(1)	Ant. Sens. (μV)			3.0	3.2	2.8	2.8	2.6	2.5	2.2	2.4	2.3
34*c*(2)	Noise Level (MW)			0.5	1.2	5.5	5.0	7.0	5.3	0.4	3.0	3.3
34*c*(3)	IF Rej. Ratio (x1000)			400	520	1000	1000*	1000*	1000*	1000*	1000*	1000*
34*c*(4)	Image Rej. Ratio (x1000)			1000*	1000*	1000*	1000*	800	300	325	63	25
34*c*(7)	Loop Sens. (μV)			60	53	50	55	38	38	50	35	30
34*c*(8)	Compass Sensitivity Uniformity Accuracy	50 micro-volts per meter	0	0	0	0	0	0	0	0	0	+.3
			R	15	13	13	16	14	10	19	15	15.5
			L	17	14	13	15	14	10	19	15	15
		100 micro-volts per meter	0	0	0	0	0	0	0	0	0	0
			R	13	12	12.5	14.5	12.5	11	17	14	12.5
			L	14	12	12.5	14	12	11	17	14	12.5
		1,000 micro-volts per meter	0	0	0	0	0	0	0	0	0	0
			R	11.5	9.5	10.5	12	10	8.5	15	12	11
			L	11	10.5	10.5	12	10	9	14.5	12	11
		100,000 micro-volts per meter	0	0	0	0	0	0	0	0	0	0
			R	8	7	7.5	10	8.5	8	13	10	9
			L	8	7	7.5	10	8	8	13	10	9
34*c*(5)	AVC Action (μV) Mod. 30%—Test			1	5	10	50	100	1000	.01V	.1V	.5V
	Freq. 840 kcs (MW)			50	200	230	280	300	375	440	510	540
34*c*(6)	"ANT." Selec.				10X		100X		1000X		10,000X	
	Test Freq. 840 kcs				5.1		8.3		10.7		12.7	

NOTE: *Refers to "greater than."

MAINTENANCE

e. Minimum Performance Characteristics

Ref. Par. No.	Test Point	1-L	1-M	1-H	2-L	2-M	2-H	3-L	3-M	3-H
	Test Freq. (kcs)	205	300	400	420	600	840	870	1300	1700
34*c*(1)	Ant. Sens. (μV)	Not worse than 10 microvolts								
34*c*(2)	Noise Level (MW)	Not worse than 50 milliwatts								
34*c*(3)	IF Rej. Ratio	Not less than 100,000 to 1								
34*c*(4)	Image Rej. Ratio	Not less than 100,000 to 1							Not less than 5000 to 1	
34*c*(7)	Loop Sens. (μV)	Not worse than 200 microvolts								
34*c*(8)	Compass Sensitivity Uniformity Accuracy — 50 microvolts per meter — 0	Not more than ± 2 degrees								
	50 microvolts per meter — R, L	Not more than 90 degrees loop rotation								
	100 microvolts per meter — 0	Not more than ±1 degree								
	100 microvolts per meter — R, L	Not more than 30 degrees loop rotation								
	1000 microvolts per meter — 0	Not more than ±1 degree								
	1000 microvolts per meter — R, L	Not more than 30 degrees loop rotation								
	100,000 microvolts per meter — 0	Not more than ±1 degree								
	100,000 microvolts per meter — R, L	Not more than 30 degrees loop rotation								
34*c*(5)	AVC Action (μV)	1	5	10	50	100	1000	.01V	.1V	.5V
	Mod. 30%—Test Freq. 840 kcs (MW)	.	.	230	280	300	375	440	510	540
		.	*	±50	±50	±50	±75	±100	±125	±150
34*c*(6)	"ANT." Selec. Test Freq. 1700 kcs		10X 9.6		100X 14		1000X 16		10,000X 19	

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

f. Voltage Inputs for Standard Output

The following table gives the approximate voltage input to the various stage of Radio Compass Unit BC-443-A for a standard output of 50 milliwatts, measured with an output meter plugged into jack J3 on the radio control box which has control of the equipment. The function switch is set for antenna operation, and the audio, loop gain and threshold sensitivity controls are all turned fully clockwise.

Input To	Measurement Point	Voltage
1st RF Amp.	Control grid	15 μV
2nd RF Amp.	Control grid	115 μV
1st Det.	Control grid (IF signal)	650 μV*
1st Det.	Control grid (RF signal)	900 μV
IF Amp.	Control grid	38,000 μV
2nd Det.	Triode grid	0.5 volts
Audio Output	Control grid	2.5 volts

* 142.5-kcs signal.

SECTION V

SUPPLEMENTARY DATA AND LIST OF REPLACEABLE PARTS

35. TABLE OF REPLACEABLE PARTS

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C
a. Radio Compass Unit BC-443-A (Assembly Dwg. No. AL71692-3)							
C1-1		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 170	Loop Stage Trim., Band 1	Hamm. or R.C.C.	QB7751-25	
C1-2		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 170	Loop Stage Trim., Band 2	Hamm. or R.C.C.	QB7751-25	
C1-3		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 170	Loop Stage Trim., Band 3	Hamm. or R.C.C.	QB7751-25	
C1-4		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 174	Ant. Stage Trim., Band 1	Hamm. or R.C.C.	QB7751-25	
C1-5		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 174	Ant. Stage Trim., Band 2	Hamm. or R.C.C.	QB7751-25	
C1-6		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 174	Ant. Stage Trim., Band 3	Hamm. or R.C.C.	QB7751-25	
C1-7		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 175	1st RF Stage Trim., Band 1	Hamm. or R.C.C.	QB7751-25	
C1-8		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 175	1st RF Stage Trim., Band 2	Hamm. or R.C.C.	QB7751-25	
C1-9		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 175	1st RF Stage Trim., Band 3	Hamm. or R.C.C.	QB7751-25	
C1-10		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 176	2nd RF Stage Trim., Band 1	Hamm. or R.C.C.	QB7751-25	
C1-11		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 176	2nd RF Stage Trim., Band 2	Hamm. or R.C.C.	QB7751-25	
C1-12		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 176	2nd RF Stage Trim., Band 3	Hamm. or R.C.C.	QB7751-25	
C1-13		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 177	RF Osc. Trim., Band 1	Hamm. or R.C.C.	QB7783-25	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
C1-14		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 177	RF Osc. Trim., Band 2	Hamm. or R.C.C.	QB7783-25	
C1-15		Capacitor	3 to 25 mmf ±10%, 500V, variable, special, part of Ref. No. 177	RF Osc. Trim., Band 3	Hamm. or R.C.C.	QB7783-25	
C2-1		Capacitor	5-section, variable, 400 mmf per sec. max., 20 mmf per sec. min., tolerance per sec. ±0.5% or 0.5 mmf (whichever is larger), special, part of Ref. No. 134	Loop Stage Tuning	R.C.C.	QF8489	
C2-2		Capacitor		Ant. Stage Tuning			
C2-3		Capacitor		1st RF Stage Tuning			
C2-4		Capacitor		2nd RF Stage Tuning			
C2-5		Capacitor		RF Osc. Stage Tuning			
C3-1		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	Loop Amp. Cath. Bypass	Aero	A25097	
C3-2		Capacitor		Loop Amp. Screen Bypass			
C3-3		Capacitor		Loop Amp. Plate Bypass			
C3-4		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	Mod. Cath. Bypass	Aero	A25097	
C3-5		Capacitor		Audio Osc. Plate No. 1 Bypass			
C3-6		Capacitor		Audio Osc. Plate No. 2 Bypass			
C3-7		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	1st RF Cath. Bypass	Aero	A25097	
C3-8		Capacitor		1st RF Screen Bypass			
C3-9		Capacitor		1st RF Plate Bypass			
C3-10		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	2nd RF Cath. Bypass	Aero	A25097	
C3-11		Capacitor		2nd RF Screen Bypass			
C3-12		Capacitor		2nd RF Plate Bypass			
C3-13		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	1st Det. Plate Bypass	Aero	A25097	
C3-14		Capacitor		1st Det. Cath. Bypass			
C3-15		Capacitor		2nd Det. Cath. Bypass			
C3-16		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special	IF Plate Bypass	Aero	A25097	
C3-17		Capacitor		IF Screen Bypass			
C3-18		Capacitor		Navigator's Comp. Out. Screen Bypass			
C3-19		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, side terminals, special, part of Ref. No. 113	LV Dyn. RF Filter	Aero	A25097	
C3-20		Capacitor		HV Dyn. RF Filter			
C3-21		Capacitor		HV Dyn. RF Filter			
C4-1		Capacitor	.05 mfd ±10%, 400V, fixed, paper, Type 345-8	1st RF AVC Filter	M.P.C.	A18015-503	
C4-2		Capacitor	.05 mfd ±10%, 400V, fixed, paper, Type 345-8	2nd RF AVC Filter	M.P.C.	A18015-503	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C
C4-3		Capacitor	.05 mfd ±10%, 400V, fixed, paper, Type 345-8	1st Det. AVC Filter	M.P.C.	A18015-503	
C4-4		Capacitor	.05 mfd ±10%, 400V, fixed, paper, Type 345-8, part of Ref. No. 101	Mod. Grid Coupling Low Freq.	M.P.C.	A18015-503	
C4-5		Capacitor	.05 mfd ±10%, 400V, fixed, paper, Type 345-8, part of Ref. No. 101	Mod. Grid Coupling Low Freq.	M.P.C.	A18015-503	
C5-1		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., top terminals, oil, paper, special	Pilot's Comp. Out. Screen Bypass	Aero	A25096	
C5-2		Capacitor		Pilot's Comp. Out. Grid			
C5-3		Capacitor		Navigator's Comp. Out. Grid			
C5-4		Capacitor	3-section, 0.1 mfd ±10%, 400V per sec., oil, paper, top terminals, special	1st Det. Screen Bypass	Aero	A25096	
C5-5		Capacitor		Mod. Plate Bypass			
C5-6		Capacitor		RF Osc. Plate Bypass			
C6		Capacitor	.5 mfd ±10%, 400V, fixed, oil, paper, special	Comp. Out. Grid Coupling	Aero	A25095	
C7		Capacitor	5 mfd +100% −0%, 50V, fixed, electrolytic, special	Audio Out. Cath. Bypass	Aero	A25100	
C8-1		Capacitor	2-section, 0.05 mfd ±5%, 400V per sec., oil, paper, side terminals, special	Audio Osc. Grid Coupling	Aero	A25099	
C8-2		Capacitor		Audio Osc. Grid Coupling			
C10-1		Capacitor	2-section, 0.5 mfd ±10%, 100V per sec., oil, paper, special, part of Ref. No. 113	LV Filter	Aero or Mallory	A25101	
C10-2		Capacitor		LV Filter			
C12		Capacitor	35 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 174	Ant. Parallel Padder	Erie	A25715-5	
C13-1		Capacitor	50 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 180	1st Audio Grid RF Filter	Erie	A25715-6	
C13-2		Capacitor	50 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 180	1st Audio Grid Bypass	Erie	A25715-6	
C14		Capacitor	100 mmf ±2%, 400V, ceramic, Type N-680-L, part of Ref. No. 180	2nd Det. RF Bypass	Erie	A25715-7	
C15		Capacitor	Two capacitors, 0.02 mfd ±2% total, 400V, mica, Type 1467, XM262 case, part of Ref. No. 173	IF Stage Trap Circuit Resonator	Aero	A25716-1	
C16-1		Capacitor	.005 mfd ±2%, 400V, mica, Type 1467, XM262 case, part of Ref. No. 181	1st RF Stage Trap Circuit Resonator	Aero	A25714-2	
C16-2		Capacitor	.005 mfd ±2%, 400V, mica, Type 1467, XM262 case, part of Ref. No. 181	2nd RF Stage Trap Circuit Resonator	Aero	A25714-2	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
C17-1		Capacitor	.001 mfd ±10%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 174	Antenna Coupling	Aero	A25713-102	
C17-2		Capacitor	.001 mfd ±10%, 400V, mica, Type 1468, XM262 case	Audio Out. Grid Coupling	Aero	A25713-102	
C19-1		Capacitor	250 mmf ±5%, 400V, mica, Type 1468, XM262, case, part of Ref. No. 101	Mod. Grid RF Coupling	Aero	A25713-251	
C19-2		Capacitor	250 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 101	Mod. Grid RF Coupling	Aero	A25713-251	
C21-1		Capacitor	100 mmf ±5%, 400V, mica, Type 1468, XM262 case	2nd Det. AVC Diode Coupling	Aero	A25713-101	
C24-1		Capacitor	5 mmf ±10%, 400V, ceramic, Type P-120-K, part of Ref. No. 175	Coupling on T32-1	Erie	A25715-1	
C24-2		Capacitor	5 mmf ±10%, 400V, ceramic, Type P-120-K, part of Ref. No. 176	Coupling on T32-2	Erie	A25715-1	
C24-3		Capacitor	5 mmf ±10%, 400V, Type P-120-K, part of Ref No. 177	RF Osc. Padder	Erie	A25715-1	
C25		Capacitor	15 mmf ±10%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 177	1st Det. Injector Grid Coupling	Aero	A25713-150	
C27		Capacitor	500 mmf ±10%, 400V, mica, Type 1468, XM262 case	1st Audio Plate RF Bypass	Aero	A25713-501	
C28-1		Capacitor	0.1 mfd ±5%, 400V, fixed, paper	Mod. Cathode Filter	M.P.C.	A18014-104	
C28-2		Capacitor	0.1 mfd ±5%, 400V, fixed, paper, part of Ref. No. 112	Pilot's Comp. out. Plate Resonator	M.P.C.	A18014-104	
C28-3		Capacitor	0.1 mfd ±5%, 400V, fixed, paper, part of Ref. No. 112	Navigator's Comp. Out. Plate Resonator	M.P.C.	A18014-104	
C29		Capacitor	25 mmf ±10%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 177	RF Osc. Grid Coupling	Aero	A25713-250	
C33A		Capacitor	0.1 mfd ±10%; 3-section, 400V, oil, paper, side terminals, special	IF Cath. Bypass	Aero	A25107	
C33B-1		Capacitor	0.025 mfd ±10%	IF AVC Filter			
C33B-2		Capacitor	0.025 mfd ±10%	IF AVC Filter			
C34-1		Capacitor	0.02 mfd ±10%, 400V, Type 342-12, part of Ref. No. 111	Low Pass Audio Filter	M.P.C.	A18015-203	
C34-2		Capacitor	0.02 mfd ±10%, 400V, Type 342-12, part of Ref. No. 111	Low Pass Audio Filter	M.P.C.	A18015-203	
C41		Capacitor	15 mmf ±3.5%, 400V, ceramic, Type N-680-K, part of Ref. No. 174	Ant. Coupling to 1st RF Grid	Erie	A25715-3	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
C42-1		Capacitor	50 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 183	Ant. Compensating	Aero	A25713-500	
C42-2		Capacitor	5 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 175	1st RF Plate Resonator, Band 2	Aero	A25713-500	
C42-3		Capacitor	50 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 176	2nd RF Plate Resonator, Band 2	Aero	A25713-500	
C42-4		Capacitor	50 mmf ±5%, 400V, mica, Type 1468 XM262 case, part of Ref. No. 101	Loop Phaser Circuit Resonator	Aero	A25713-500	
C44		Capacitor	0.01 mfd ±10%, 400V, mica, Type 1467, XM262 case	MO-5-A Filter	Aero	A25714-3	
C45-1 C45-2		Capacitor Unit	2-section, 20 mfd per sec., electrolytic, special	HV Filter HV Filter	Aero	A18093	
C47-1		Capacitor	0.01 mfd ±10%, 400V, mica, Type 1467, brown case, part of DM-30	Dyn. RF Filter	Aero	A4440-3	
C47-2		Capacitor	0.01 mfd ±10%, 400V, mica, Type 1467, brown case, part of DM-30	Dyn. RF Filter	Aero	A4440-3	
C48-1		Capacitor	45 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 170	Loop Stage Parallel Padder	Erie	A25715-9	
C48-2		Capacitor	45 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 177	RF Osc. Stage Parallel Padder	Erie	A25715-9	
C50-1		Capacitor	40 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 175	1st RF Stage Parallel Padder	Erie	A25715-12	
C50-2		Capacitor	40 mmf ±2%, 400V, ceramic, Type N-680-K, part of Ref. No. 176	2nd RF Stage Parallel Padder	Erie	A25715-12	
C51-1		Capacitor	45 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 175	1st RF Plate Resonator, Band 3	Aero	A25713-450	
C51-2		Capacitor	45 mmf ±5%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 176	2nd RF Plate Resonator, Band 3	Aero	A25713-450	
C52-1		Capacitor	175 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 175	1st RF Plate Resonator, Band 1	Aero	A25713-1750	
C52-2		Capacitor	175 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 176	2nd RF Plate Resonator, Band 1	Aero	A25713-1750	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
C55-1		Capacitor	270 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 180	2nd Det. Diode Circuit Resonator	Aero	A25713-271	
C55-2		Capacitor	270 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 178	IF Grid Circuit Resonator	Aero	A25713-271	
C55-3		Capacitor	270 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 178	1st Det. Plate Circuit Resonator	Aero	A25713-271	
C56		Capacitor Unit	Two capacitors, 662 mmf ±0.5% total, 400V, mica, special XM262 case, part of Ref. No. 177	RF Osc. Series Padder, Band 1	Aero	A25716-5	
C57		Capacitor Unit	Two capacitors, 1237 mmf ±0.5% total, 400V, mica, special, XM262 case, part of Ref. No. 177	RF Osc. Series Padder, Band 2	Aero	A25716-6	
C58		Capacitor Unit	Two capacitors, 2225 mmf ±0.5% total, 40V, mica, special, XM262 case, part of Ref. No. 177	RF Osc. Series Padder, Band 3	Aero	A25716-7	
C59		Capacitor	260 mmf ±2%, 400V, mica, Type 1468, XM262 case, part of Ref. No. 180	IF Plate Circuit Resonator	Aero	A25713-261	
C60		Capacitor	7.5 mmf ±10%, 400V, ceramic, Type P-120-K, part of Ref. No. 178	1st IF Coupling	Erie	A25715-10	
C61		Capacitor	3 mmf ±10%, 400V, ceramic, Type P-120-K, part of Ref. No. 180	2nd IF Coupling	Erie	A25715-11	
DM-30		Dynamotor DM-3	28V input, 230V output, special. Includes C47-1, C47-2, 124, 125, 126, 127, 128, 130, 131, 156, 160, 161, 186, 187	.	Eicor	AC56457-4	
FT-213-A		Mounting FT-213-A	Shock absorbing	Radio Compass Unit	Bendix	AL71622-2	
L1		Inductor	Special, part of Ref. No. 101	Loop Phaser	Bendix	AL71678-16	
L7-1		Choke	Part of Ref. No. 113	Dyn. RF (LV)	Bendix	AB6859-1	
L7-2		Choke	Part of Ref. No. 113	Dyn. RF (LV)	Bendix	AB6859-1	
L8		Choke	Part of Ref. No. 113	Dyn. RF (HV)	Bendix	AB6859-2	
L9		Choke	Part of Ref. No. 111	Filter	Bendix	AA19713-1	
L10		Choke	Part of Ref. No. 111	Low Pass Audio Filter	Bendix	AA19713-1	
L12		Inductor	Part of Ref. No. 181	IF Trap (2nd RF Cathode)	Bendix	AC56549-6	
L13-1		Inductor	Part of Ref. No. 178	1st Det. Plate	Bendix	AC56549-4	
L13-2		Inductor	Part of Ref. No. 180	IF Plate	Bendix	AC56549-5	
L14-1		Inductor	Part of Ref. No. 178	IF Grid	Bendix	AC56550-4	
L14-2		Inductor	Part of Ref. No. 180	2nd Det. Audio Diode	Bendix	AC56550-5	
L15		Inductor	Part of Ref. No. 173	152.5 kcs Trap (IF Cathode)	Bendix	AL72172-17	

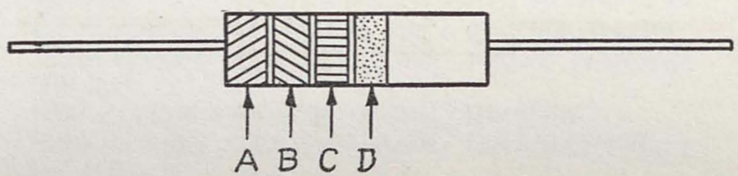
Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
L16		Inductor	Part of Ref. No. 181	IF Trap (1st RF Cathode)	Bendix	AC56550-6	
L19		Relay Coil	28V, 275 ohms, Part of RE5	.	Bendix	A28196	
MC-202		Shield MC-202	For tube grid caps	Grid Cap Shield	Alden	A25186-2	
MO-5-A		Motor MO-5-A	Band change motor	.	Pioneer	AC57588-2	
NE1-1		Lamp	Neon, 1/25 watt, 60V unbased, Type T2-CD-1010-CL, part of Ref. No. 174	Antenna Voltage Limiter	G.E.	B15347	
NE1-2		Lamp	Neon, 1/25 watt, 60V unbased, Type T2-CD-1010-CL, part of Ref. No. 170	Loop Voltage Limiter	G.E.	B15347	

RMA COLOR CODE FOR RESISTORS AND CAPACITORS

Color	Significant Figure	Decimal Multiplier	Tolerance	Voltage Rating
Black	0	1		
Brown	1	10	1%	100 Volts
Red	2	100	2%	200 Volts
Orange	3	1,000		300 Volts
Yellow	4	10,000		400 Volts
Green	5	100,000	5%	500 Volts
Blue	6	1,000,000		600 Volts
Violet	7	10,000,000		700 Volts
Gray	8	100,000,000		800 Volts
White	9	1,000,000,000		
Gold	.	0.1	5%	
Silver	.	0.01	10%	
No Color	.	.	20%	500 Volts

RESISTORS

The nominal resistance value of fixed composition resistors is indicated in two manners. The one in most common use indicates the value by bands of color as follows:



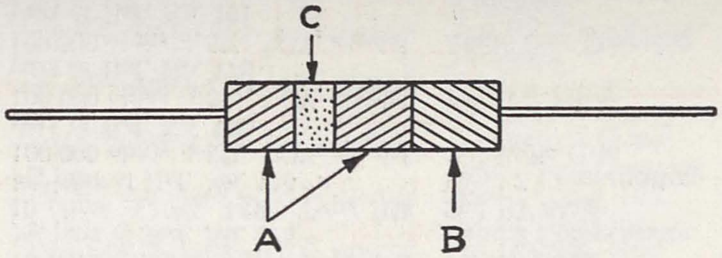
Band A indicates the first significant figure of the resistance of the resistor.

Band B indicates the second significant figure.

Band C indicates the decimal multiplier.

Band D, if any, indicates the tolerance limits about the nominal resistance value.

The least common system used for indicating nominal resistance value is as follows:

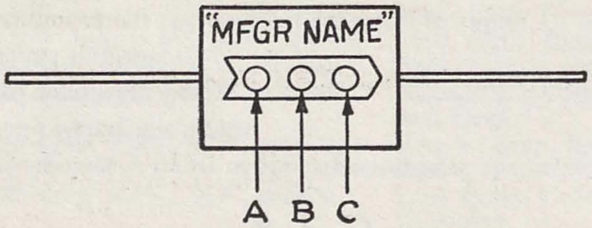


The body (A) of the resistor is colored to represent the first significant figure of the resistance value. One end (B) is colored to represent the second significant figure and a band, or dot (C) of color, located within the body color, indicates the decimal multiplier.

CAPACITORS

Two systems for color coding small fixed capacitors are in use. In either case, capacity is expressed in micromicrofarads and some means to avoid ambiguity in interpretation of colors provided. An arrow pointing from left to right or the manufacturer's name is generally used.

In general, capacitors having a working voltage of 500 volts are coded by means of three dots of color as follows:



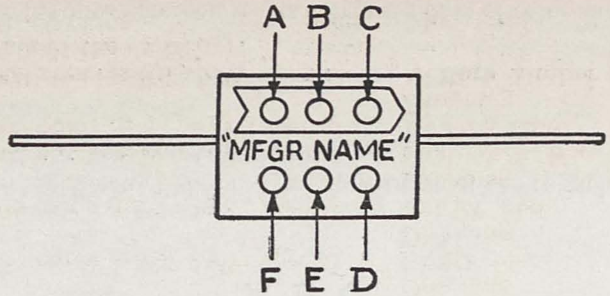
Dot (A) indicates the first significant figure of the capacitance of the capacitor.

Dot (B) indicates the second significant figure.

Dot (C) indicates the decimal multiplier.

An additional dot is sometimes shown when the working voltage is other than 500 volts. This dot indicates the voltage rating of the capacitor.

A second system now coming into common use involves six dots of color as follows:



Dot (A) indicates the first significant figure of the capacitance of the capacitor.

Dot (B) indicates the second significant figure.

Dot (C) indicates the third significant figure.

Dot (D) indicates the decimal multiplier.

Dot (E) indicates the tolerance about the nominal capacitance value.

Dot (F) indicates the voltage rating of the capacitor.

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
R1		Potentiometer	15,000 ohms, special	Loop Gain Control	I.R.C.	QB15353	
R2		Potentiometer	2,000 ohms, special	Thres. Sens. Control	I.R.C.	QB15352	
R5-1		Resistor	25 ohms ±10%, ½W, Type BW ½, part of Ref. No. 175	1st RF Stage Band 1 Compensator	I.R.C.	B1754-127-F	
R5-2		Resistor	25 ohms ±10%, ½W, Type BW ½, part of Ref. No. 176	2nd RF State Band 1 Compensator	I.R.C.	B1754-127-F	
R9-1		Resistor	3 ohms ±10%, ½W, Type BW ½, part of Ref. No. 170	Loop Stage Band 3 Compensator	I.R.C.	B1754-112-F	
R9-2		Resistor	3 ohms ±10%, ½W, Type BW ½, part of Ref. No. 175	1st RF Stage Band 3 Compensator	I.R.C.	B1754-112-F	
R9-3		Resistor	3 ohms ±10%, ½W, Type BW ½, part of Ref. No. 176	2nd RF Stage Band 3 Compensator	I.R.C.	B1754-112-F	
R10-1		Resistor	10 ohms ±10%, ½W, Type BW ½, part of Ref. No. 175	1st RF Stage Band 2 Compensator	I.R.C.	B1754-103-F	
R10-2		Resistor	10 ohms ±10%, ½W, Type BW ½, part of Ref. No. 176	2nd RF Stage Band 2 Compensator	I.R.C.	B1754-103-F	
R12-1		Resistor	100,000 ohms ±5%, ¼W, special, part of Ref. No. 180	1st Audio Grid	Erie	A18001-104	
R12-2		Resistor	100,000 ohms ±5%, ¼W, special, part of Ref. No. 178	IF AVC Filter	Erie	A18001-104	
R12-3		Resistor	100,000 ohms ±5%, ¼W, special, part of Ref. No. 101	Audio Osc. Dropping	Erie	A18001-104	
R12-4		Resistor	100,000 ohms ±5%, ¼W, special part of Ref. No. 101	Audio Osc. Dropping	Erie	A18001-104	
R12-5		Resistor	100,000 ohms ±5%, ¼W, special	Loop Stage Screen Dropping	Erie	A18001-104	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
R12-6		Resistor	100,000 ohms ±5%, ¼W, special	1st RF Stage Screen Dropping	Erie	A18001-104	
R12-7		Resistor	100,000 ohms ±5%, ¼W, special	2nd RF Stage Screen Dropping	Erie	A18001-104	
R13-1		Resistor	150,000 ohms ±5%, ½W, special	1st Det. Screen Voltage Divider	Erie	A18004-154	
R13-2		Resistor	150,000 ohms ±5%, ½W, special	Navigator's Comp. Ind. Screen Dropping	Erie	A18004-154	
R13-3		Resistor	150,000 ohms ±5%, ½W, special	Pilot's Comp. Ind. Screen Dropping	Erie	A18004-154	
R14-1		Resistor	50,000 ohms ±5%, ¼W, special, part of Ref. No. 177	1st Det. Inj. Grid Leak	Erie	A18001-503	
R14-2		Resistor	50,000 ohms ±5%, ¼W, special, part of Ref. No. 180	1st Audio RF Filter	Erie	A18001-503	
R14-3		Resistor	50,000 ohms ±5%, ¼W, special, part of Ref. No. 177	RF Osc. Grid Leak	Erie	A18001-503	
R15-1		Resistor	2,000 ohms ±5%, ½W, special	AF Osc. Plate Load	Erie	A18004-202	
R15-2		Resistor	2,000 ohms ±5%, ½W, special	AF Osc. Plate Load	Erie	A18004-202	
R16-1		Resistor	50,000 ohms ±5%, ½W, special	Audio Osc. Grid Leak	Erie	A18004-503	
R16-2		Resistor	50,000 ohms ±5%, ½W, special	Mod. Cath. Bias	Erie	A18004-503	
R16-3		Resistor	50,000 ohms ±5%, ½W, special	1st RF AVC Filter	Erie	A18004-503	
R16-4		Resistor	50,000 ohms ±5%, ½W, special	2nd RF AVC Filter	Erie	A18004-503	
R16-5		Resistor	50,000 ohms ±5%, ½W, special	1st Det. AVC Filter	Erie	A18004-503	
R16-6		Resistor	50,000 ohms ±5%, ½W, special	IF Screen Dropping	Erie	A18004-503	
R16-7		Resistor	50,000 ohms ±5%, ½W, special	RF Osc. Plate Dropping	Erie	A18004-503	
R16-8		Resistor	50,000 ohms ±5%, ½W, special	Audio Osc. Grid Leak	Erie	A18004-503	
R17-1		Resistor	100,000 ohms ±5%, ½W, special	Mod. Plate Dropping	Erie	A18004-104	
R17-2		Resistor	100,000 ohms ±5%, ½W, special	Mod. Cath. Bias	Erie	A18004-104	
R18		Resistor	1 megohm. ±5%, ¼W, special	Ant. Static Leak	Erie	A18001-105	
R19-1		Resistor	1,000 ohms ±5%, ½W, special	Navigator's Comp. Ind. Grid.	Erie	A18004-102	
R19-2		Resistor	1,000 ohms ±5%, ½W, special	Pilot's Comp. Ind. Grid	Erie	A18004-102	
R20-1		Resistor	5,000 ohms ±5%, ½W, special	Loop Stage Plate Dropping	Erie	A18004-502	
R20-2		Resistor	5,000 ohms ±5%, ½W, special	1st RF Plate Dropping	Erie	A18004-502	
R20-3		Resistor	5,000 ohms ±5%, ½W, special	2nd RF Plate Dropping	Erie	A18004-502	
R20-4		Resistor	5,000 ohms ±5%, ½W, special	Mod. Cath. Bias	Erie	A18004-502	
R20-5		Resistor	5,000 ohms ±5%, ½W, special	1st Det. Plate Dropping	Erie	A18004-502	
R20-6		Resistor	5,000 ohms ±5%, ½W, special	IF Plate Dropping	Erie	A18004-502	
R21		Resistor	200,000 ohms ±5%, ½W, special	Mod. Cath. Bleed.	Erie	A18004-204	
R22-1		Resistor	500,000 ohms ±5%, ½W, special	Mod. Grid	Erie	A18004-504	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
R22-2		Resistor	500,000 ohms ±5%, ½W, special	Pilot's Comp. Out. Grid	Erie	A18004-504	
R24-1		Resistor	600 ohms ±5%, ½W, special	1st RF Cath. Bias	Erie	A18004-601	
R24-2		Resistor	600 ohms ±5%, ½W, special	2nd RF Cath. Bias	Erie	A18004-601	
R24-3		Resistor	600 ohms ±5%, ½W, special	1st Det. Cath. Bias	Erie	A18004-601	
R24-4		Resistor	600 ohms ±5%, ½W, special	IF Cath. Bias	Erie	A18004-601	
R24-5		Resistor	600 ohms ±5%, ½W, special	Navigator's Comp. Out. Cath. Bias	Erie	A18004-601	
R24-6		Resistor	600 ohms ±5%, ½W, special	Pilot's Comp. Out. Cath. Bias	Erie	A18004-601	
R26-1		Resistor	25,000 ohms ±5%, ½W, special	1st Det. Screen Voltage Divider	Erie	A18004-253	
R26-2		Resistor	25,000 ohms ±5%, ½W, special	2nd Det. Plate Dropping	Erie	A18004-253	
R27		Resistor	100 ohms ±5%, ½W, special	Audio Osc. Cath. Bias	Erie	A18004-101	
R28		Resistor	250,000 ohms ±5%, ¼W, special part of Ref. No. 180	1st Audio Grid Load	Erie	A18001-254	
R29-1		Resistor	500 ohms ±5%, ½W, special	2nd Det.Cath. Bias	Erie	A18004-501	
R29-2		Resistor	500 ohms ±5%, ½W, special	Audio Out. Cath. Bias	Erie	A18004-501	
R29-3		Resistor	500 ohms ±5%, ½W, special	Loop Cath. Bias	Erie	A18004-501	
R30-1		Resistor	1 megohm, ±5%, ½W, special	2nd Det. AVC Diode Load	Erie	A18004-105	
R30-2		Resistor	1 megohm, ±5%, ½W, special	AVC Filter	Erie	A18004-105	
R31		Resistor	3,000 ohms ±5%, ½W, special	2nd Det. Cath. Bias	Erie	A18004-302	
R32-1		Resistor	300,000 ohms ±5%, ½W, special	Navigator's Comp. Out. Grid Isolating	Erie	A18004-304	
R32-2		Resistor	300,000 ohms ±5%, ½W, special	Pilot's Comp. Out. Grid Isolating	Erie	A18004-304	
R33		Resistor	350,000 ohms ±5%, ½W, special	Audio Grid	Erie	A18004-354	
R37-1		Resistor	75,000 ohms ±5%, ½W, special	Audio Osc. Plate Dropping	Erie	A18004-753	
R37-2		Resistor	75,000 ohms ±5%, ½W, special	Audio Osc. Plate Dropping	Erie	A18004-753	
R38		Resistor	500,000 ohms ±5%, ¼W, special	Mod. Grid	Erie	A18001-504	
R39-1		Resistor	65 ohms ±5%, 1W, special	Filament Current Equalizing	Erie	A18158-650	
R39-2		Resistor	65 ohms ±5%, 1W, special	Filament Current Equalizing	Erie	A18158-650	
R39-3		Resistor	65 ohms ±5%, 1W, special	Filament Current Equalizing	Erie	A18158-650	
RE5		Relay	Coil DC Res. 275 ohms, special, part of Ref. No. 183	Ant. Switching	Bendix	AA26464-2	
RE6		Relay	SPDT, Coil DC Res. 320 ohms, special	Noise Silencing	Leach	A30190	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
S1-1A S1-1B		Switch	Bakelite wafer, special, part of Ref. No. 170	Loop Stage Band Selector (Pri.)	Oak	QB9589-2	
S1-2A S1-2B		Switch	Bakelite wafer, special, part of Ref. No. 174	Ant. Stage Band Selector	Oak	QB9589-2	
S1-3A S1-3B S1-3C		Switch	Bakelite wafer, special, part of Ref. No. 175	1st RF Stage Band Selector (Pri. & Sec.)	Oak	QB9589-2	
S1-4A S1-4B S1-4C		Switch	Bakelite wafer, special, part of Ref. No 176	2nd RF Stage Band Selector (Pri. & Sec.)	Oak	QB9589-2	
S2 (A, B)		Switch	Bakelite wafer, special, part of Ref. No. 170	Loop Stage Band Sel. (Sec.)	Oak	QB9589-1	
S3 (A, B) (C, D)		Switch	Bakelite wafer, special, part of Ref. No. 174	Ant. Stage Band Sel. (Pri. & Sec.)	Oak	QB9589-4	
S4 (A, B) (C, D)		Switch	Bakelite wafer, special, part of Ref. No. 177	RF Osc. Stage Band Selector	Oak	QB9589-3	
S5 (A) (B)		Switch	Bakelite wafer, special, part of Ref. No. 182	Motor Position	Oak	QB9589-5	
S6		Switch	Cam-operated, special, part of Ref. No. 182	Motor Control	K.S. & S. Co.	C57496	
S12		Switch	Bakelite wafer, special, part of Ref. No. 183	Ant. Relay	Oak	A26138	
T15		Transformer	Part of Ref. No. 111	Audio Output	Bendix	AA19713-1	
T16 T17		Transformer Transformer	Part of Ref. No. 112	Navigator's Comp. Ind. Out. Pilot's Comp. Ind. Out.	Bendix	AA19712-1	
T24		Transformer	Part of Ref. No. 170	Loop Stage, Band 1	Bendix	AL72172-1	
T25		Transformer	Part of Ref. No. 170	Loop Stage, Band 2	Bendix	AL72172-2	
T26		Transformer	Part of Ref. No. 170	Loop Stage, Band 3	Bendix	AL72172-3	
T27		Transformer	Part of Ref. No. 174	Ant. Stage, Band 1	Bendix	AL72172-4	
T28		Transformer	Part of Ref. No. 174	Ant. Stage, Band 2	Bendix	AL72172-5	
T29		Transformer	Part of Ref. No. 174	Ant. Stage, Band 3	Bendix	AL72172-6	
T30-1		Transformer	Part of Ref. No. 175	1st RF Stage, Band 1	Bendix	AL72172-7	
T30-2		Transformer	Part of Ref. No. 176	2nd RF Stage, Band 1	Bendix	AL72172-8	
T31-1		Transformer	Part of Ref. No. 175	1st RF Stage, Band 2	Bendix	AL72172-9	
T31-2		Transformer	Part of Ref. No. 176	2nd RF Stage, Band 2	Bendix	AL72172-10	
T32-1		Transformer	Part of Ref. No. 175	1st RF Stage, Band 3	Bendix	AL72172-11	
T32-2		Transformer	Part of Ref. No. 176	2nd RF Stage, Band 3	Bendix	AL72172-12	
T33		Transformer	Part of Ref. No. 177	RF Osc. Stage, Band 1	Bendix	AL72172-13	
T34		Transformer	Part of Ref. No. 177	RF Osc. Stage, Band 2	Bendix	AL72172-14	
T35		Transformer	Part of Ref. No. 177	RF Osc. Stage, Band 3	Bendix	AL72172-15	
T36		Transformer	Part of Ref. No. 178	IF Coupler Input	Bendix	AC56848-1	
T37		Transformer	Part of Ref. No. 180	IF Coupler Output	Bendix	AC56848-2	
TB3		Term. Board	Under chassis, 27 lugs, shortside	.	Bendix	AC56490-1	
TB4		Term. Board	3 lugs, part of Ref. No. 113	.	Bendix	AB11639	
TB11		Term. Board	Includes C4-2	.	Bendix	AA26088-2	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
TB12		Term. Board	Includes C4-3	.	Bendix	AA26088-3	
TB13		Term. Board	Part of Ref. No. 101	.	Bendix	AA26015-1	
TB14		Term. Board	Part of Ref. No. 101	.	Bendix	AA26016-2	
TB15		Term. Board	Part of Ref. No. 181	.	Bendix	AA26047-1	
TB18		Term. Board	Part of Ref. No. 180	.	Bendix	AA26046-1	
TB19		Term. Board	Includes C4-1	.	Bendix	AA26088-1	
TB20-1		Term. Board	10 lugs, part of Ref. No. 175	.	Bendix	AA27846-1	
TB20-2		Term. Board	Part of Ref. No. 176	.	Bendix	AA27846-2	
TB21		Term. Board	9 lugs, part of Ref. No. 177	.	Bendix	AA25957-2	
TB22		Term. Board	3 lugs, part of Ref. No. 177	.	Bendix	AA25959-2	
TB23		Term. Board	2 lugs, part of Ref. No. 177	.	Bendix	AA25960-2	
TB24		Term. Board	Part of Ref. No. 178	.	Bendix	AA27843-1	
TB26		Term. Board	Under chassis, 46 lugs, crosswise	.	Bendix	AC56495-2	
TB27		Term. Board	Under chassis, 57 lugs, longside	.	Bendix	AL71640-2	
TB29		Term. Board	Part of Ref. No. 180	.	Bendix	AA27843-2	
VT-66		Tube VT-66	Power amp. pentode, Type 6F6, metal	Audio Output	Ken-Rad	BA30295	Spec. No. 71-766
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	Loop Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	1st RF Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	2nd RF Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	IF Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	Navigator's Comp. Out. Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-86		Tube VT-86	Triple-grid super-control amp., Type 6K7, metal	Pilot's Comp. Out. Amp.	Ken-Rad	BA30300	Spec. No. 71-786
VT-87		Tube VT-87	Pentagrid mixer, Type 6L7, metal	1st Detector	Ken-Rad	BA30299	Spec. No. 71-787
VT-93		Tube VT-93	Duplex-diode pentode, Type 6B8, metal	2nd Detector	Ken-Rad	BA30298	Spec. No. 71-793
VT-94		Tube VT-94	Triode, Type 6J5, metal	RF Osc.	Ken-Rad	BA30297	Spec. No. 71-794
VT-96		Tube VT-96	Twin triode, Type 6N7, metal	Audio Osc.	Ken-Rad	BA30301	Spec. No. 71-796
VT-105		Tube VT-105	Twin triode, Type 6SC7, metal	Modulator	Ken-Rad	BA30296	Spec. No. 71-1205
101		Loop Phasing Assembly	Includes C4-4, C4-5, C19-1, C19-2, C42-4, L1, R12-3, R12-4, TB13, TB14	Loop Phasing	Bendix	AC56541-1	
111		Transformer and Filter	Includes C34-1, C34-2, L9, L10, T15, potted	Audio Output and Filter	Bendix	AA19713-1	
112		Transformer	Includes C28-2, C28-3, T16, T17, potted	Comp. Indicator Output	Bendix	AA19712-1	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
113		Filter	Includes C3-19, C3-20, C3-21, C10-1, C10-2, L7-1, L7-2, L8, TB4	Dyn. Hash Filter	Bendix	AC56560-1	
117		Geneva Disc & Hub Assembly	Part of Ref. No. 182	.	Bendix	AB10346	
118		Worm Gear Shaft Assembly	Part of Ref. No. 182	.	Bendix	AB10344	
119		Housing	Part of Ref. No. 182	Right Side	Bendix	F11130	
120		Housing	Part of Ref. No. 182	Left Side	Bendix	F11131	
121		Band Switch Drive Shaft	Assembly	.	Bendix	AB11502	
122		Spring	For band switch drive shaft	Retaining	Bendix	B11010	
124		Dyn. Bearings	Special, part of DM-30	.	Eicor	A26183	
125		HV Brush Assembly	Part of DM-30	Pos. Brush Neg. Brush	Eicor Eicor	AA26185-1 AA26185-2	
126		LV Brush Assembly	Part of DM-30	Pos. Brush Neg. Brush	Eicor Eicor	AA26162-1 AA26162-2	
127		Dyn. Dust Cover	Special, part of DM-30	.	Eicor	.	
128		End Bracket Assembly	Less brush assembly, special, part of DM-30	High Voltage	Eicor	.	
130		Dyn. Pole Piece	Special, part of DM-30	.	Eicor	.	
131		End Bracket Assembly	Special, part of DM-30	Low Voltage	Eicor	.	
132		Screw	For band switch drive assembly (3 required), part of Ref. No. 182	.	Bendix	A111-42	
133		Right Angle Drive Assembly	For connection of remote tuning shaft	.	Bendix	AB10854	
134		Capacitor Drive Assembly	Includes C2, Ref. No. 133	.	Bendix	AC56412-1	
135		Split Gear Assembly	For capacitor drive assembly	.	Bendix	QB12057	
136		Ant. Post Assembly	.	.	Bendix	AA26075-1	
137		Ant. Post Ins. Bushing	For antenna post (2 required)	.	Bendix	A18155	
138		Ground Post Assembly	.	.	Bendix	AA26076-1	
139		Tube Socket	XXX bakelite	.	Cinch	AL71702-12	
140		Tube Socket	Isolantite, special	For Mod. Tube	Amphenol	A26077-1	
141		Tube Socket	Isolantite, special	For 1st RF Amp. Tube	Amphenol	A26077-2	
142		Base	22-contact, for Plug PL-122	Plug Socket	Bendix	AA25719-1	
143		Shell	For 22-contact plug socket	Plug Socket	Bendix	B9746-1	
144		Base	4-contact, for Plug PL-108	Plug Socket	Bendix	AA25741-2	
145		Shell	For Plug PL-108 socket	Plug Socket	Bendix	B9681	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C
146		Release Screw Shaft	Steel	Chassis Release	Bendix	A26062	
147		Release Knob	For release screw shaft	.	Bendix	B10721-1	
148		Rec. Case Assembly	Includes 149, 150, and 151	.	Bendix	AC56553-1	
149		Upper Mtg. Base	Part of Ref. No. 148	.	Bendix	L71633	
150		Mounting	Shock absorbing, Type ※150-P8, part of Ref. No. 148	Shock Absorbing .	Lord	A16330-7	
151		Case Assembly	Part of Ref. No. 148	.	Bendix	AL71690-1	
152		Cover Plate Assembly	For socket hole in case	.	Bendix	AB12131	
154		Wrench	For No. 6 Allen setscrews, same as Ref. Nos. 206 and 431	.	Allen	A18190-6	
155		Screw	For Dynamotor DM-30	Mounting	Bendix	B11636	
156		Bolts	Part of Dynamotor DM-30, special	Frame Support	Eicor	A27844	
158		Gear	For release-screw shaft	.	Bendix	A26061	
159		Collar	For release-screw shaft	.	Bendix	B9319	
160		Brush Retainer	4 required, part of DM-30	.	Eicor	.	
161		Bearing Cover	2 required, special, part of DM-30	.	Eicor	.	
163		Large Bearing	Special, for Motor MO-5-A	.	Pioneer	A100408	
164		Small Bearing	Special, for Motor MO-5-A	.	Pioneer	A100412	
170		Loop Tuning Assembly	Includes C1-1, C1-2, C1-3, C48-1, NE1-2, R9-1, S1-1, S2, T24, T25, T26	Loop Tuning	Bendix	AL71665-2	
173		Trap	Unshielded, includes C15, L15	152.5-kcs Rejection Trap	Bendix	AA26074-2	
174		Antenna Tuning Assembly	Includes C1-4, C1-5, C1-6, C12, C17-1, C41, NE1-1, S1-2, S3, T27, T28, T29	Ant. Tuning	Bendix	AL71664-2	
175		1st RF Tuning Assembly	Includes C1-7, C1-8, C1-9, C24-1, C42-2, C50-1, C51-1, C52-1, R5-1, R9-2, R10-1, S1-3, T30-1, T31-1, T32-1, TB20-1	1st RF Tuning	Bendix	AL71663-3	
176		2nd RF Tuning Assembly	Includes C1-10, C1-11, C1-12, C24-2, C42-3, C50-2, C51-2, C52-2, R5-2, R9-3, R10-2, S1-4, T30-2, T31-2, T32-2, TB20-2	2nd RF Tuning	Bendix	AL71663-4	
177		RF Osc. Tuning Assembly	Includes C1-13, C1-14, C1-15, C24-3, C25, C29, C48-2, C56, C57, C58, R14-1, R14-3, S4, T33, T34, T35, TB21, TB22, TB23	RF Osc. Tuning	Bendix	AL71662-2	
178		Transformer	Includes C55-2, C55-3, C60, L13-1, L14-1, R12-2, TB24	IF Input	Bendix	AC56848-1	
180		Transformer	Includes C13-1, C13-2, C14, C55-1, C59, C61, L13-2, L14-2, R12-1, R14-2, R28, TB18, TB29	IF Output	Bendix	AC56848-2	
181		Trap	Includes C16-1,C16-2,L12,L16, TB15	IF Rejection	Bendix	AC56555-2	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C
182		Band Switch Drive Assembly	Includes S5, S6, and Ref. Nos. 117, 118, 119, 120, 132 (3), 185	.	Bendix	AC56559-2	
183		Antenna Relay Assembly	Includes C42-1, RE5, S12	Ant. Switching	Bendix	AA26464-2	
185		Motor MO-5-A With Worm Gear	Part of Ref. No. 182, includes Ref. No. 195, and worm gear	.	Bendix	AB11496-6	
186		Dyn. Armature	Part of DM-30, special	.	Eicor	A30348	
187		Field Coil Assembly	Part of DM-30, special	.	Eicor	.	
188		Armature	Complete with bearings, special	For Motor MO-5-A	Pioneer	A100411	
192		Shield	For RE5	Ant. Relay Shield	Bendix	A26086-1	
195		Brush Assembly	Part of Ref. No. 185	Pos. Brush	Pioneer	A100409	
				Neg. Brush	Pioneer	A100410	

b. Radio Control Box BC-444-A (Assembly Dwg. No. AN90443-3)

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C
I-70-B		Meter I-70-B	2 MA zero right reading, 5 MA full-scale left reading, DC res. 5 ohms, special	Tuning Indicator	Weston	AA100414-1	
J3		Jack	For headset, 2-circuit, Type X4D	Audio Jack	Yaxley	A25577	
LM-32		Lamp LM-32	Instrument dial illuminating, 3V, 0.18 ±0.02 amps., special	.	P. Inst.	A18881-2	
R3		Potentiometer	50,000 ohms, special	Comp. Sensitivity Control	I.R.C.	A25807	
R23		Resistor	10,000 ohms ±5%, ¼W, special	Imped. Limiting	Erie	A18001-103	
R34		Resistor	8000 ohms ±5%, ¼W, special	Audio Load Compensating	Erie	A18001-802	
R36A		Potentiometer	20,000 ohms, special } Dual action	{ Audio Vol. Control }	I.R.C.	A25576	
R36B		Potentiometer	25,000 ohms, special } Dual action	{ Man. Sens. Control }			
R41A-1, R41A-2, R41B		Resistor	{230 ohms ±5%, C. T., 5W; 135 ohms ±5%} Type MW-3	Lamp Volt. Drop.	I.R.C.	A28957	
R42		Rheostat	100 ohms, 25W, Model H	Light Control	Ohmite	A26119	
R56		Resistor	3000 ohms ±5%, ¼W, special	Imped. Limiting	Erie	A18001-302	
S9		Switch	Bakelite wafer, Type H	Band Selector	Oak	QB6707	
S10		Switch	Push button, Type 3391	Control	H & H	QB15349	
S11A, S11B, S11C, S11D		Switch	Bakelite wafer, complete with shaft and detent, special	Off-Comp.-Ant.-Loop Selector	Oak	A25575	
TB10		Term. Board	15 lugs, part of Ref. No. 200	.	Bendix	AA25657-1	
200		Mtg. Base Assembly	Includes TB10 and Ref. No. 212	.	Bendix	AL71608-1	
202		Housing Assembly	Part of Ref. No. 221	Cable Pinion Housing	Bendix	AB8950	

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
205		Dial Gear Assembly	Part of Ref. No. 221	.	Bendix	AB11956	
206		Wrench	For No. 6 Allen setscrews, special, same as Ref Nos. 154, 431	.	Allen	A18190	
207		Crank	For remote drive, same as Ref. No 422	Tuning	Bendix	AB8917-2	
208		Knob	For R3	Compass Control	Bendix	AA25755-1	
209		Knob	For R36	Audio Control	Bendix	AA25756-1	
210		Knob	For R42	Light Control	Bendix	AA25754-1	
211		Lever	For S9 and S11	Switch Operating	Bendix	AA104948-3	
212		Plug Assembly	17-contact for socket Ref. No. 213, part of Ref. No. 200	.	Bendix	AB10032	
213		Socket Assembly	17-contact for plug, Ref. No. 212	.	Bendix	AA25742-1	
214		Detent Arm Assembly	Used on band switch mechanism	.	Bendix	AB11447	
215		Shaft	Assembly, used with switch S9	Band Switch Control	Bendix	AB11669	
216		Screw	Panel	Mounting	Bendix	B10251-2	
217		Screw	For releasing Ref. No. 213	Plug Release	Bendix	B10251-1	
221		Dial Drive Assembly	Includes Ref. No. 202, 205, 222, 223	.	Bendix	AE10841-5	
222		Dial Mask Assembly	Part of Ref. No. 221	.	Bendix	AA100733-2	
223		Dial Assembly	Part of Ref. No. 221	.	Bendix	AA25751-2	

c. Loop LP-19-A (Assembly Dwg. Nos. AS-837-5-D, L71583)

Ref. No.	Stock No.	Names	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C
301		Loop and Shaft Assembly	8-turn loop with 3-contact ring	.	Kear.	AS-942-4	
302		Hanger	.	Loop Support	Kear.	AS-901-2	
303		Brush Assembly	3 brushes and brush-holder assembly	.	Kear.	AS-943-1	
304		Clamp	.	Wire Clamp	Kear.	AS-953-1	
305		Bearing	Ball, Norma-Hoffman S-I-R	Loop Bearing	Kear.	S-160	
306		Gear	Worm, 48P, 80T, R.H., 1.6667 P.D., single thread	.	Kear.	AS-969-1	
307		Gear Assembly	Complete with coupling	Loop Drive	Kear.	AS-941-2	
308		Socket	4 term., XM262 bakelite	Plug PL-108 Socket	Kear.	AS-562-1	
309		Housing	For Plug PL-108 receptacle, XM262 bakelite	.	Kear.	AS-911-1	
310		Base	Housing base and insert assembly	Loop Mounting	Kear.	AS-944-2	
311		Packing	Synthetic rubber washer	Coupling Packing	Kear.	AS-917-1	
312		Nut	.	Gland Nut	Kear.	AS-902-1	
313		Packing	Synthetic rubber washer	Socket Packing	Kear.	AS-918-1	
314		Nut	.	Gland Nut	Kear.	AS-903-1	
315		Housing	Zeppelin type	Loop Housing	Kear.	AS-890-6	
316		Nut	Cap nut	To Cover Unused Tuning Shaft Fitting	Kear.	AS-481-1	
317		Nut	Cap nut	To Cover Detent	Kear.	AS-960-1	
318		Wrench	¼", for No. 8 Allen cap head screw	.	Allen	A100683	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
d. Coupling MC-203 (Assembly Dwg. No. AC56453-1)							
MC-203		Coupling MC-203	Special	For Coupling Two Radio Control Boxes To Radio Compass Unit	Bendix	AC56453-1	
400		Housing	Machined casting	.	Bendix	C55964	
401		Fitting and Shaft Assembly	Includes spline fitting & bevel gear (2 required)	.	Bendix	AA25639-1	
402		Fitting and Shaft Assembly	Includes spline fitting & bevel gear (1 required)	.	Bendix	AA25638-1	
403		Gasket	Fits under nameplate	Grease Retainer	Bendix	A26083	
432		Nameplate	Special, part of MC-203	Nameplate	Bendix	A25652	
e. Indicator I-75-A (Bearing) (Assembly Dwg. Nos. A25185-2, AS-831-4-E)							
I-75-A		Indicator I-75-A (Bearing)	With deviation corrector	Bearing	Kear.	AS-831-4	
404		Compensator & Helical Gear Assembly	Special	.	Kear.	AS-814-1	
405		Cam Holder Assembly	Special	For Cam Strip	Kear.	AS-832-1	
406		Cam Holder Assembly	Special	For Overlap of Cam Strip	Kear.	AS-818-1	
407		Cam Holder Assembly	Special	For Cam Strip O-Degree Position	Kear.	AS-819-1	
408		Knob	Special	East-West Variation	Kear.	AS-920-1	
409		Cap Nut	Special	For Unused Tuning Shaft Fitting	Kear.	AS-481-1	
410		Spring	Special	For Cam Adjusting Screws	Kear.	AS-675-1	
411		Cam Strip	Special	For Deviation Corrector	Kear.	AS-677-1	
412		Strip Support	Special	For Cam Strip	Kear.	AS-719-1	
413		Glass	Special	Indicator Face	Kear.	AS-774-1	
414		Ring	Special	Glass Retainer For Glass Face	Kear.	AS-775-1	
415		Gasket	Special	For Glass Face	Kear.	AS-776-1	
416		Gear Cover & Spring Assembly	Special	.	Kear.	AS-810-1	
417		Pointer & Shaft Assembly	Special	.	Kear.	AS-815-1	
418		Cam Housing Assembly	With deviation corrector, special	.	Kear.	AS-817-2	
419		Dial	Special	Fixed Index	Kear.	AS-823-1	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
420		Dial	Rotatable, special	Azimuth	Kear.	AS-824-1	
421		Cover	Rear mounting plate, special	Adjustment Cover	Kear.	AS-830-2	
431		Wrench	For No. 6 Allen setscrews; same as Ref. Nos. 154 and 206	.	Allen	A18190-6	

f. Control Unit MC-204 (Assembly Dwg. No. AA18966-1)

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
MC-204		Control Unit MC-204	.	For Rotating Loop And Bearing Indicator	Bendix	AA18966-1	
422		Crank Assembly	Same as Ref. No. 207	Loop and Bearing Indicator Rotating	Bendix	AB8917-2	
423		Housing	Machined casting	.	Bendix	A18965	
424		Shaft Operating Assembly	With crank shaft & gear	.	Bendix	AA18833-2	
425		Fitting, Cable Assembly	Complete with spline shaft and gear	.	Bendix	AA25712-1	

g. Cord CD-365 or Cord CD-365-A (Assembly Dwg. No. AC56469)

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
CD-365		Cord CD-365	Includes two FT-184, 72 inch cord, capacitance 140 mmf ±5%	Loop Coupling	Bendix	AC56469-1	
CD-365-A		Cord CD-365-A	Includes one FT-184, 72 inch cord, capacitance 140 mmf ±5%	Loop Coupling	Bendix	AC56469-2	
FT-184		Conduit Elbow FT-184	90° elbow	.	Bendix	B10862	
PL-108		Plug PL-108	4-pin	.	Bendix	AA25745-1	
426		Conduit	Flexible metallic, Neoprene-covered, 72-inch, special	Loop Cable Housing	Am. Brass	C56471	
427		Bushing	Part of FT-184, special	.	Bendix	A25775	
428		Nut	Conduit	Plug PL-108 Coupling	Bendix	B15403	

h. Mounting FT-213-A (Assembly Dwg. No. AL71622-2)

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
FT-213-A		Mounting FT-213-A	For Radio Compass Unit BC-443-A	.	Bendix	AL71622-2	

i. Compass Indicator I-65-D (Assembly Dwg. No. AC57623-1)

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Sig. C.
C11		Capacitor	.5 mfd ±2%, 400V, oil, paper, special	Field Resonating	Aero	A25098	
I-65-D		Indicator I-65-D	Sens. 35 degrees defl. at 700 micro-amp. Field coil inductance 39 ±0.8 henries at 60 cycles, 38V; DC res. 2600 ±50 ohms. Moving coil inductance 0.20 ±.02 henries at 1000 cycles, 3.5V; DC res. 2300 ±40 ohms	Compass Indicator	Weston	AC57623-1	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
LM-32		Lamp LM-32	Instrument dial illuminating 3.0V, 0.18 ±0.02 amp., special	.	P. Inst.	A18881-2	
429		Socket Base	For PL-118	.	Bendix	AA25744-1	
430		Socket Housing	For PL-118	.	Bendix	B9604	
452		Cap	For PL-117 Socket	Cover	Weston	.	
453		Socket	For PL-117	.	Weston	.	

j. Relay BK-23-A (Assembly Dwg. No. AN90644-2)

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
BK-23-A		Relay	Final Assembly	.	Bendix	AN90644-2	
L17 .		Solenoid	28-volt coil	.	Bendix	AA28972-1	
RE7		Relay	SPST, 28V coil, special	Power On-Off	LN	C57219	
553		Core Assembly	With gear rack	.	Bendix	AA25772-1	
554		Ratchet Assembly	.	To operate cam shaft	Bendix	AA26014-1	
556		Ratchet and Cam support Casting	.	.	Bendix	C56493	
558		Switch Contact Arm	With bushing	.	Bendix	AA25671-1	
559		Switch Contact	.	.	Bendix	A25703	
560		Bearing Stud	For contact arm	.	Bendix	A25660	
561		Term. Strip	Moulded bakelite (4 per unit)	.	Bendix	A25834	
562		Term. Strip	Moulded bakelite (1 per unit)	.	Bendix	A25765	
568		Cam Shaft Assembly	Complete with cam	.	Bendix	AA100331-1	
569		Switch Operating Bar Assembly	Complete with cam rollers	.	Bendix	AA29538-2	
576		Solenoid Assembly	Includes L17	.	Bendix	AA25693-2	
577		Cover Assembly	With mounting brackets	.	Bendix	AA25677-2	

k. Cable Plugs

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
PL-108		Plug PL-108	4-contact, (For Cord CD-365 or Cord CD-365-A)	.	Bendix	AA25745-1	
PL-117		Plug PL-117	1-contact, (For compass indicator lamps)	.	Bendix	AA25718-1	
PL-118		Plug PL-118	5-contact, (For Compass Indicator I-65-D)		Bendix	AB9730	
PL-122		Plug PL-122	22-contact (Compass unit to connector panel)	.	Bendix	AB10057	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
l. Chart MC-220			.	Instruction	E.C.A.	C57514	

m. Alignment Tool TL-138-B

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
TL-138-B		Alignment Tool TL-138-B	.	Circuit Alignment	Bendix	AB12439	

Ref. No.	Stock No.	Name	Description	Function	Mfr.	Drawing Numbers Bendix	Drawing Numbers Sig. C.
36. INTERCHANGEABLE PARTS							
154, 206, 431		Set Screw Wrench	See Ref. List, special	.	Allen	A18190-6	
175		Tuning Assembly	See Ref. List. Identical except for lettering and etching	1st RF Tuning	Bendix	AL71663-3	
176		Tuning Assembly	See Ref. List. Identical except for lettering and etching	2nd RF Tuning	Bendix	AL71663-4	
207, 422		Crank Assembly	See Ref. List	Tuning Rotating Loop	Bendix	AB8917-2	
316, 409		Cap Nut	See Ref. List	To Cover Unused Tuning Shaft Fitting	Kear.	AS-481-1	

SUPPLEMENTARY DATA AND LIST OF REPLACEABLE PARTS

37. NOTES

For identification purpose, all radio compass components are given Signal Corps type numbers. Parts of components are given Signal Corps type numbers or are marked by numbers or by letters and numbers. Generally, subassemblies and mechanical parts are marked by letters and numbers, the letters indicating the electrical nature of the part, viz:

C — Capacitor	MO — Motor
DM — Dynamotor	R — Resistor
I — Meter	RE — Relay
J — Jack	S — Switch
L — Inductor	T — Transformer
LM — Lamp	TB — Terminal Board
NE — Neon Lamp	VT — Vacuum Tube

When not given a Signal Corps type number, the number following the letter indicates the electrical characteristics, and size of component or part. All parts with the same letter and number are interchangeable. Following the letter and number is a dash and an additional number which serves to show the exact: (1), physical and electrical position; (2), use in equipment; and (3), location on drawings or diagrams. In all cases, when replacing a defective component or part, the marking, including the part number, must agree exactly with that of the replaced part. This means that the radio repairman must place the dash number on all new replacement parts. Parts designated by a letter and an adjacent number (e.g. C7, C50-2, etc.) are assigned by the manufacturer for reference purposes in a particular equipment and are not to be confused with Signal Corps type numbers, which may be recognized by a dash number after the letter, (e.g. I-70-B, DM-30, VT-86). Where parts assigned a Signal Corps type number have been used in this equipment, the type number assigned is used as the reference number. It should be noted in other than Signal Corps type numbers, that the largest dash number following a specific letter and number indicates the total number of these identical parts which are contained in the radio compass, except when the part is a multiple unit. Hence, C17-2 indicates there are two C17 capacitors used, since capacitor C17 is a single unit. C3-21 indicates there are seven C3 capacitors used, since C3 is a triple section unit. Interchangeable multiple section units with different values per section are identified as follows: C33A, C33B-1, C33B-2. Some switch sections have two or more groups of contacts which are indicated as follows: S1-1A, S1-1B. In all such cases, the first letter and number completely describe the unit, and indicate its interchangeability with units of like markings.

SUPPLEMENTARY DATA AND LIST OF REPLACEABLE PARTS

38. ADDRESSES OF MANUFACTURERS

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

Abbreviation	Manufacturer	Address
Aero	Aerovox Corporation	New Bedford, Mass.
Alden	Alden Products Co.	Rockford, Mass.
Allen	Allen Mfg. Co.	Hartford, Conn.
Am. Brass	American Brass Company	Waterbury, Conn.
Amphenol	American Phenolic Corporation	500 S. Throop St., Chicago, Ill.
Bendix	Bendix Radio, Division of Bendix Aviation Corporation	E. Joppa Rd., Towson, Md.
Cinch	Cinch Mfg. Co.	2335 W. Van Buren St., Chicago, Ill.
E.C.A.	Etching Co. of America	1520 Montana St., Chicago, Ill.
Eicor	Eicor	515 S. Laflin St., Chicago, Ill.
Erie	Erie Resistor Corp.	Erie, Pa.
G.E.	General Electric Vapor Lamp Co.	Schenectady, N. Y.
H & H	Hart & Hegeman Division, Arrow-Hart & Heg. Elec. Co.	Hartford, Conn.
Hamm.	Hammarlund Mfg. Co., Inc.	424 W. 33rd St., New York, N. Y.
I. R. C.	International Resistance Co.	401 N. Broad St., Phila., Pa.
Kear.	Kearfott Engineering Corp.	117 Liberty St., New York, N. Y.
K. S. & S. Co.	Kellogg Switchboard & Supply Co.	6650 S. Cicero Ave., Chicago, Ill.
Ken-Rad	Ken-Rad Tube and Lamp Corp.	Owensboro, Kentucky
Leach	Leach Relay Co.	5915 Avalon Blvd., Los Angeles, Cal.
L N	Leece Neville Co.	5363 Hamilton Ave., N.E., Cleveland, Ohio
Lord	Lord Mfg. Company	Erie, Pa.
M.P.C.	Micamold Products Corporation	1087 Flushing Ave., Brooklyn, N. Y.
Mallory	P. R. Mallory & Co.	Indianapolis, Ind.
Oak	Oak Mfg. Company	1260 S. Clybourn Ave., Chicago, Ill.
Ohmite	Ohmite Mfg. Company	4835 Flournoy St., Chicago, Ill.
Pioneer	Pioneer Gen-E-Motor Corporation	456 Superior St., Chicago, Ill.
P. Inst.	Pioneer Instrument, Division of Bendix Aviation Corporation	Bendix, N. J.
R.C.C.	Radio Condenser Co.	Camden, N. J.
Weston	Weston Electrical Instrument Corp.	Newark, N. J.
Yaxley	Yaxley Mfg. Division P. R. Mallory & Co., Inc.	Indianapolis, Ind.

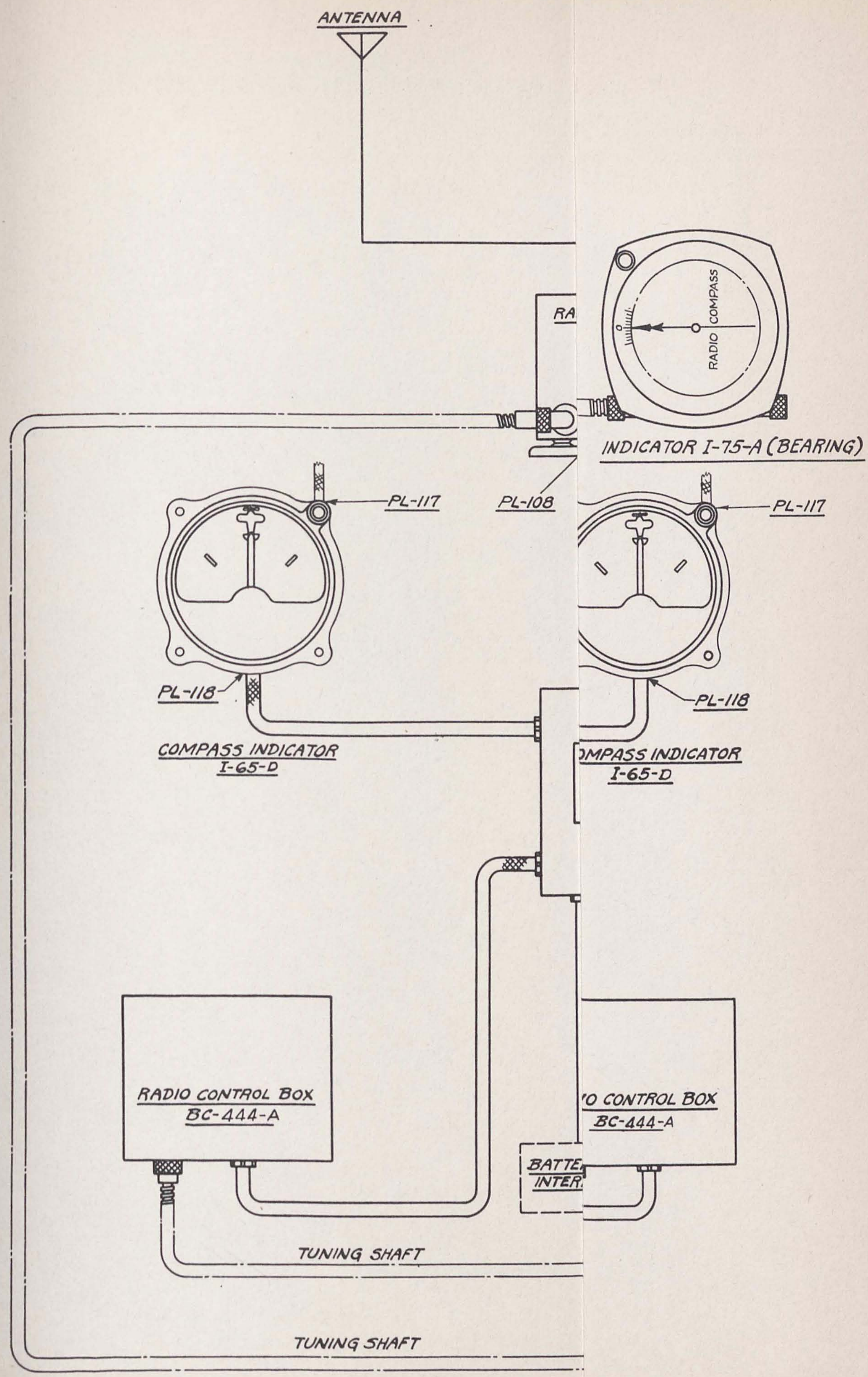


FIGURE 47 — RADIO COMPASS SCR-263-A, TYPICAL CORDING DIAGRAM

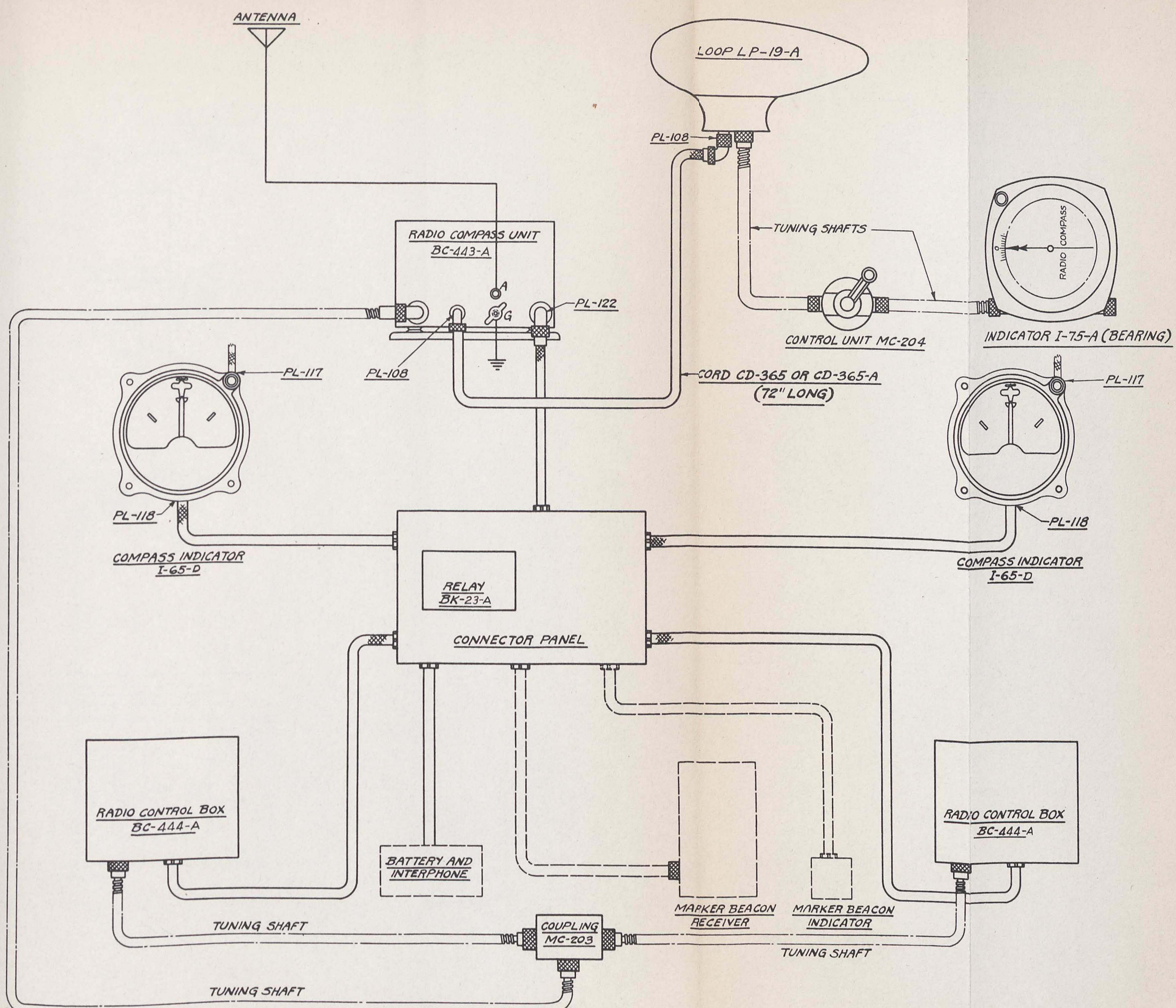
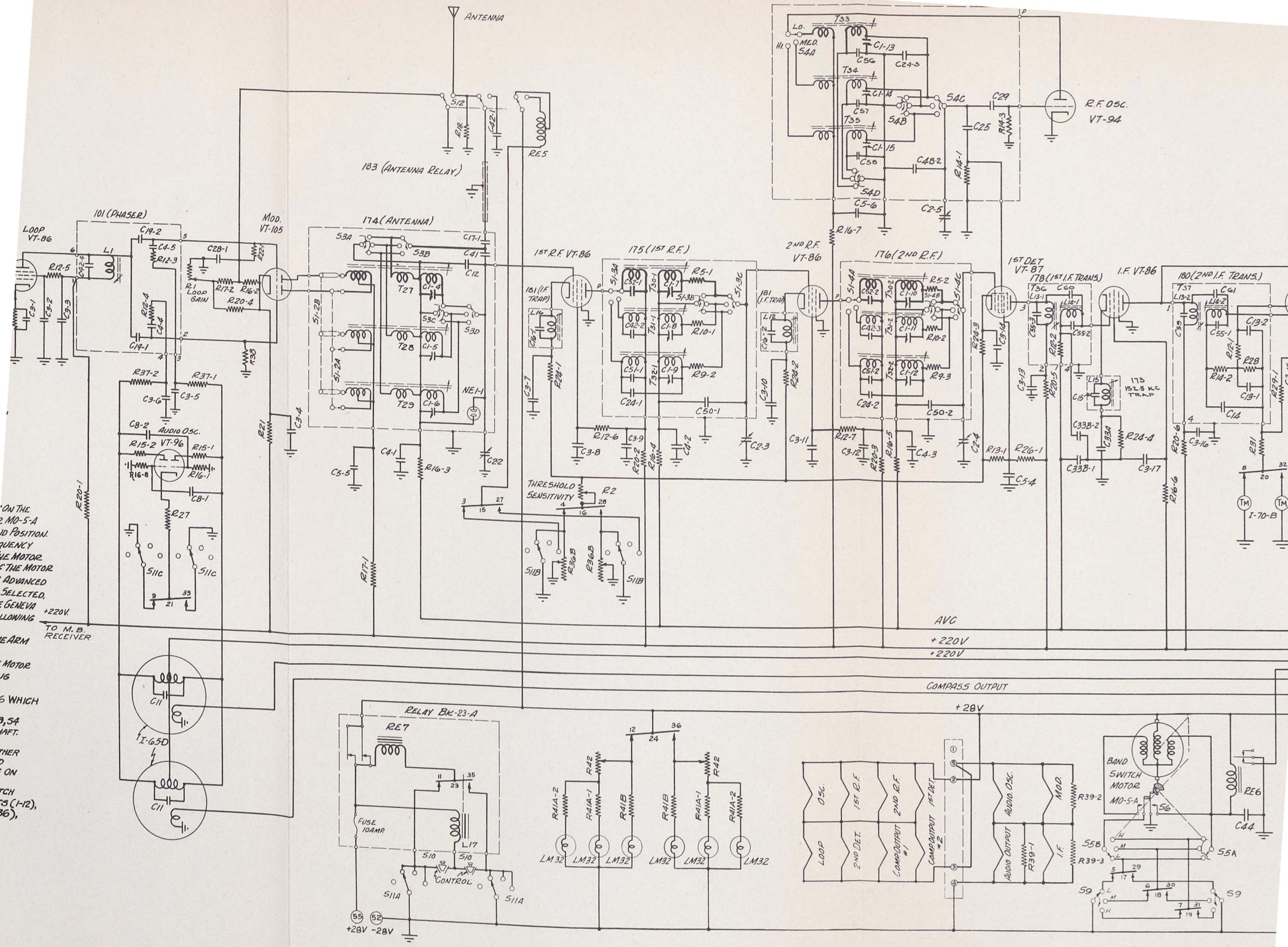
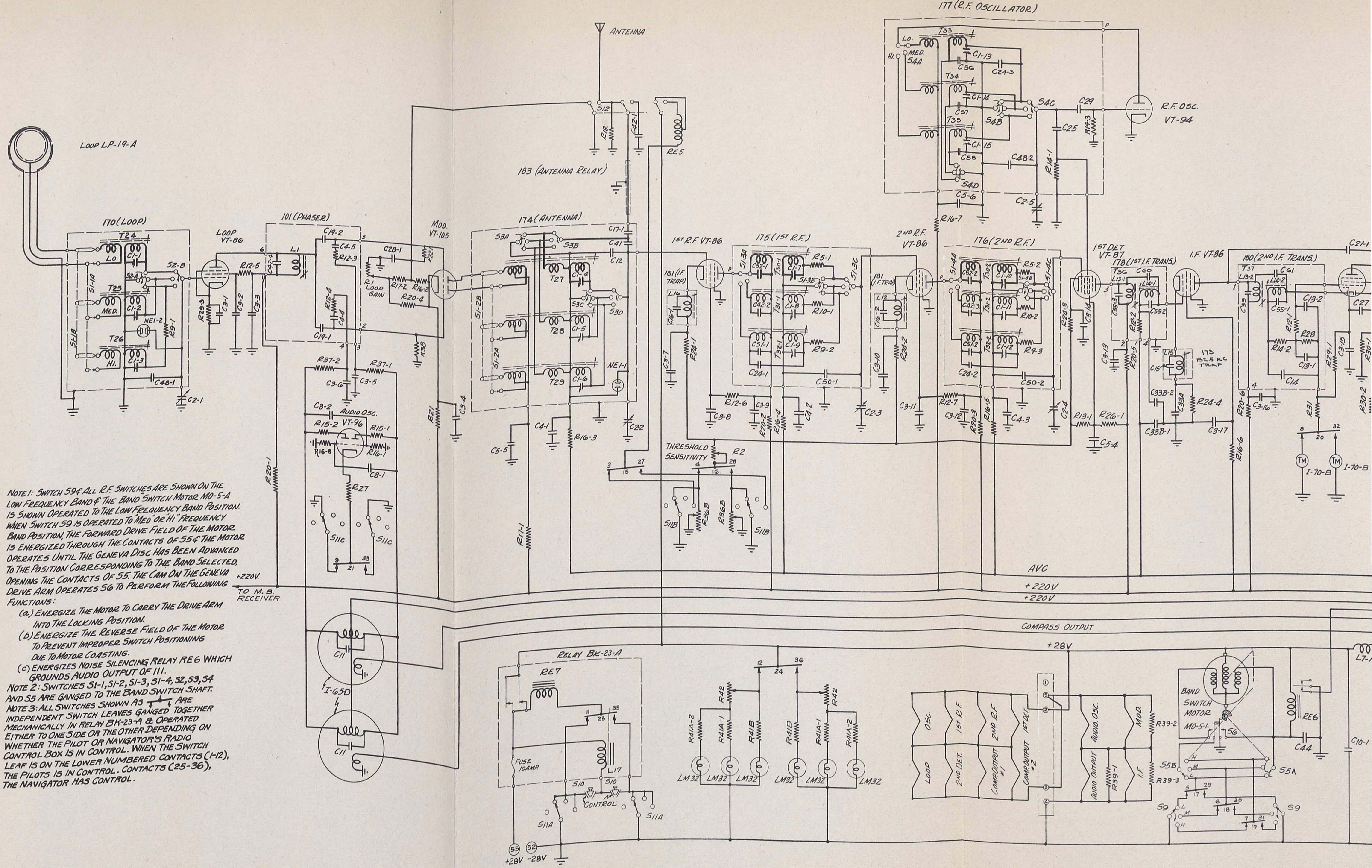


Figure 47 — Radio Compass SCR-263-A, Typical Cording Diagram



ANTENNA
183 (ANTENNA RELAY)
RE5
LOOP VT-86
101 (PHASER)
MOD. VT-105
174 (ANTENNA)
1ST R.F. VT-86
175 (1ST R.F.)
181 (I.F. TRAP)
2ND R.F. VT-86
176 (2ND R.F.)
1ST DET VT-87
178 (1ST I.F. TRANS.)
I.F. VT-86
180 (2ND I.F. TRANS.)
173 152.5 KC TRAP
R.F. OSC. VT-94
R1 LOOP GAIN
AUDIO OSC. VT-96
THRESHOLD SENSITIVITY
I-70-B
I-65D
RELAY BK-23-A
RE7
FUSE 10AMP.
CONTROL
+28V -28V
+220V. TO M.B. RECEIVER
AVC
+220V
+220V
COMPASS OUTPUT
+28V
OSC.
1ST R.F.
2ND R.F.
1ST DET.
LOOP
2ND DET.
COMP. OUTPUT #1
COMP. OUTPUT #2
AUDIO OSC.
MOD
AUDIO OUTPUT
I.F.
BAND SWITCH MOTOR MO-5-A
RE6
LM32
ON THE
2 MO-5-A
ID POSITION.
QUENCY
HE MOTOR
S THE MOTOR
S ADVANCED
SELECTED.
E GENEVA
LLOWING
E ARM
MOTOR
IG
S WHICH
9, S4
HAFT.
THER
D
ON
TCH
S (1-12),
36),



NOTE 1: SWITCH S9 & ALL R.F. SWITCHES ARE SHOWN ON THE LOW FREQUENCY BAND & THE BAND SWITCH MOTOR MO-5-A IS SHOWN OPERATED TO THE LOW FREQUENCY BAND POSITION. WHEN SWITCH S9 IS OPERATED TO "MED" OR "HI" FREQUENCY BAND POSITION, THE FORWARD DRIVE FIELD OF THE MOTOR IS ENERGIZED THROUGH THE CONTACTS OF S5 & THE MOTOR OPERATES UNTIL THE GENEVA DISC HAS BEEN ADVANCED TO THE POSITION CORRESPONDING TO THE BAND SELECTED, OPENING THE CONTACTS OF S5. THE CAM ON THE GENEVA DRIVE ARM OPERATES S6 TO PERFORM THE FOLLOWING FUNCTIONS:

(a) ENERGIZE THE MOTOR TO CARRY THE DRIVE ARM INTO THE LOCKING POSITION.
(b) ENERGIZE THE REVERSE FIELD OF THE MOTOR TO PREVENT IMPROPER SWITCH POSITIONING DUE TO MOTOR COASTING.
(c) ENERGIZES NOISE SILENCING RELAY RE6 WHICH GROUNDS AUDIO OUTPUT OF 111.

NOTE 2: SWITCHES S1-1, S1-2, S1-3, S1-4, S2, S3, S4 AND S5 ARE GANGED TO THE BAND SWITCH SHAFT.

NOTE 3: ALL SWITCHES SHOWN AS [switch symbol] ARE INDEPENDENT SWITCH LEAVES GANGED TOGETHER MECHANICALLY IN RELAY BK-23-A & OPERATED EITHER TO ONE SIDE OR THE OTHER DEPENDING ON WHETHER THE PILOT OR NAVIGATOR'S RADIO CONTROL BOX IS IN CONTROL. WHEN THE SWITCH LEAF IS ON THE LOWER NUMBERED CONTACTS (1-12), THE PILOTS IS IN CONTROL. CONTACTS (25-36), THE NAVIGATOR HAS CONTROL.

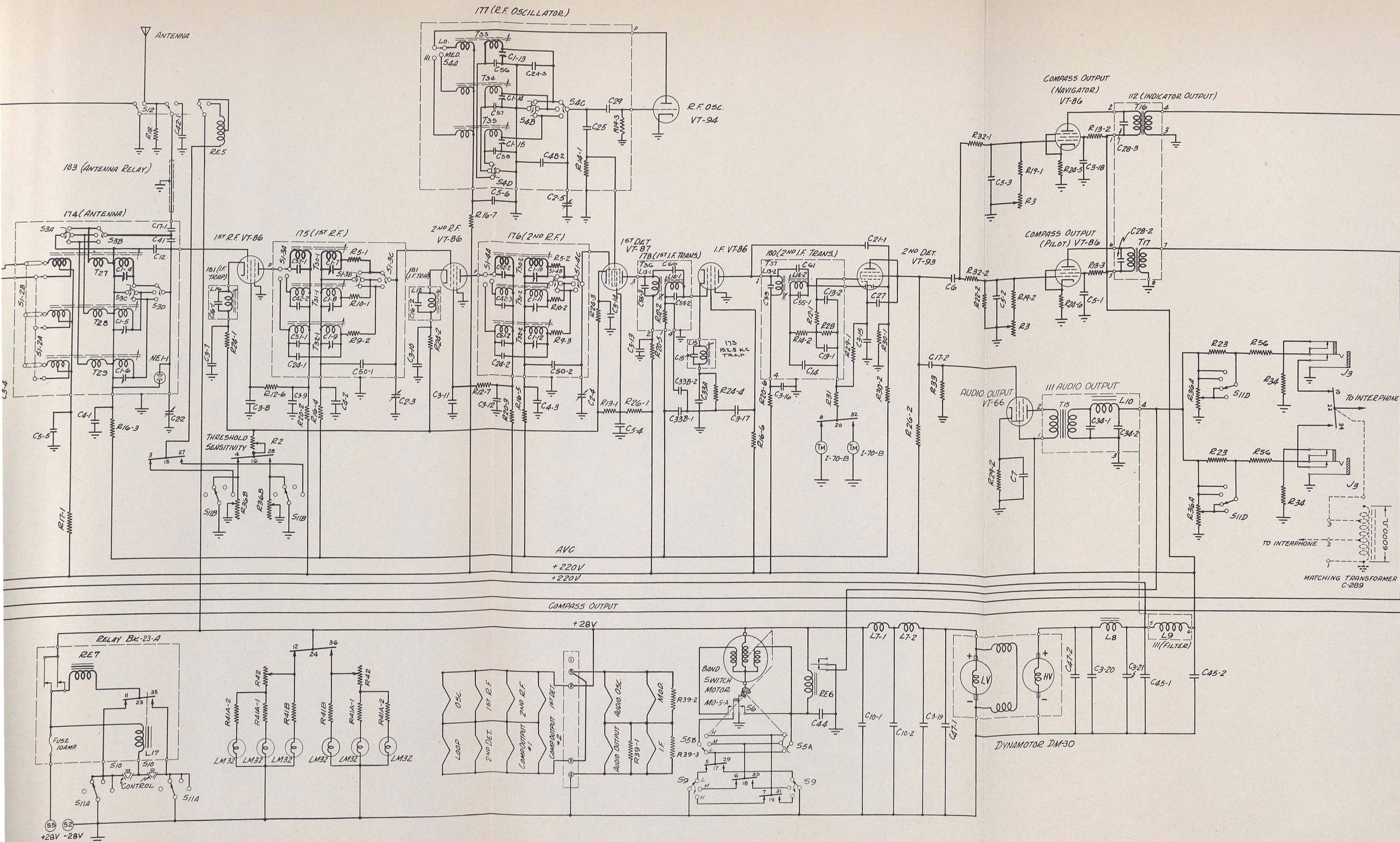
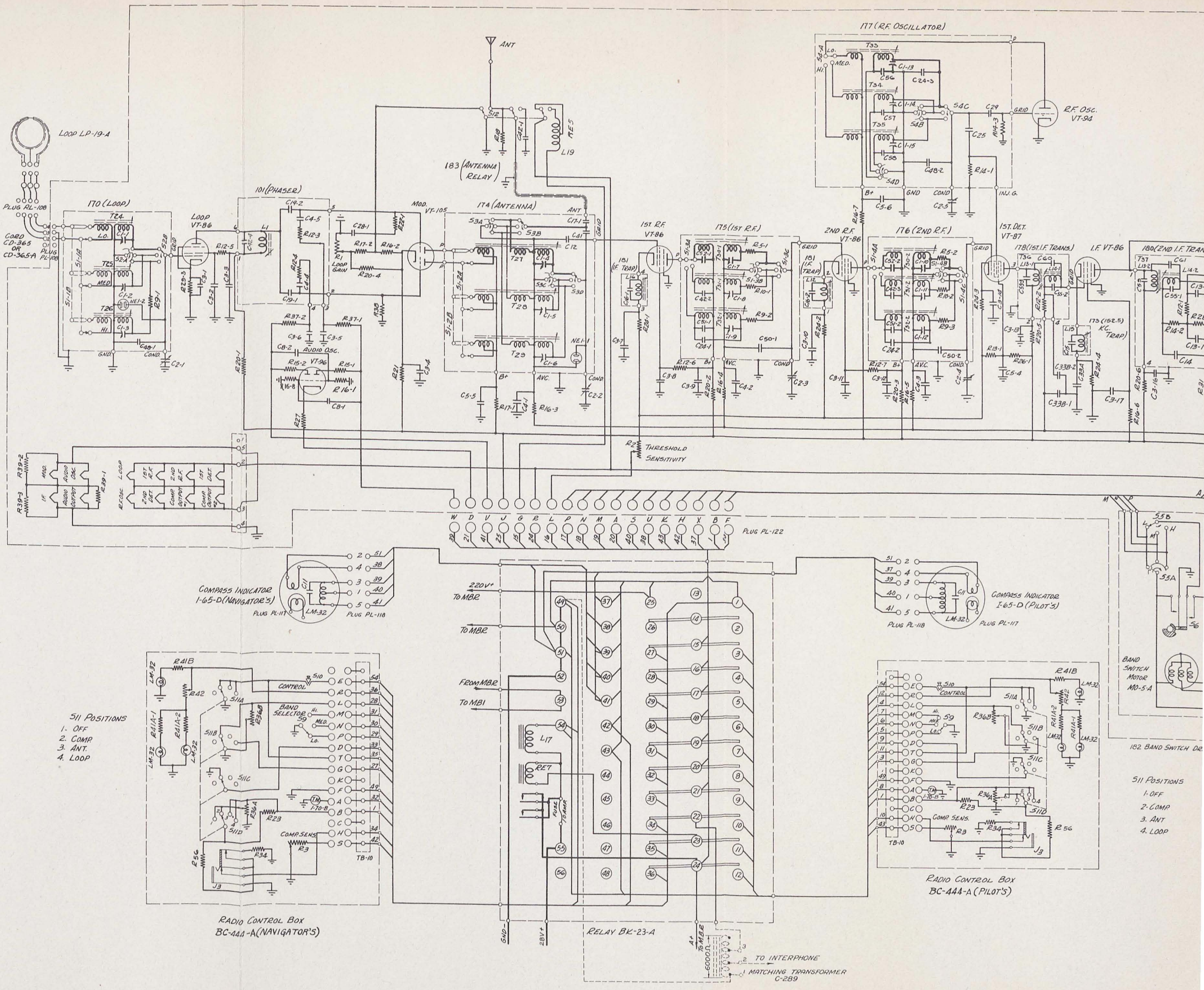


FIGURE 48 — RADIO COMPASS SCR-263-A, OVERALL SCHEMATIC CIRCUIT DIAGRAM

TABLE OF REPLACEABLE ELECTRICAL PARTS

REF. NO.	DESCRIPTION
C1	3 to 25 mmf
C2	5 sec., variable cap. 400 mmf per sec. max. 20 mmf per sec. min.
C3	3 sec., 0.1 mfd per sec.
C4	.05 mfd
C5	3 sec., 0.1 mfd per sec.
C6	0.5 mfd
C7	5 mfd
C8	2 sec., 0.05 mfd per sec.
C10	2 sec., 0.5 mfd per sec.
C11	0.5 mfd
C12	35 mmf
C13	50 mmf
C14	100 mmf
C15	0.02 mfd total
C16	0.005 mfd
C17	0.001 mfd
C19	250 mmf
C21	100 mmf
C24	5 mmf
C25	15 mmf
C27	500 mmf
C28	0.1 mfd
C29	25 mmf
C33A	0.1 mfd
C33B	0.025 mfd
C34	0.02 mfd
C41	15 mmf
C42	50 mmf
C44	0.01 mfd
C45	2 sec., 20 mfd per sec.
C47	0.01 mfd
C48	45 mmf
C50	40 mmf
C51	45 mmf
C52	175 mmf
C55	270 mmf
C56	662 mmf total
C57	1237 mmf total
C58	2225 mmf total
C59	260 mmf
C60	7.5 mmf
C61	3 mmf
R1	15,000 ohms
R2	2000 ohms
R3	50,000 ohms
R5	25 ohms
R9	3 ohms
R10	10 ohms
R12	100,000 ohms
R13	150,000 ohms
R14	50,000 ohms
R15	2000 ohms
R16	50,000 ohms
R17	100,000 ohms
R18	1 megohm
R19	1000 ohms
R20	5000 ohms
R21	200,000 ohms
R22	500,000 ohms
R23	10,000 ohms
R24	600 ohms
R26	25,000 ohms
R27	100 ohms
R28	250,000 ohms
R29	500 ohms
R30	1 megohm
R31	3000 ohms
R32	300,000 ohms
R33	350,000 ohms
R34	8000 ohms
R36A	20,000 ohms
R36B	25,000 ohms
R37	75,000 ohms
R38	500,000 ohms
R39	65 ohms
R41A	230 ohms
R41B	135 ohms
R42	100 ohms
R56	3000 ohms



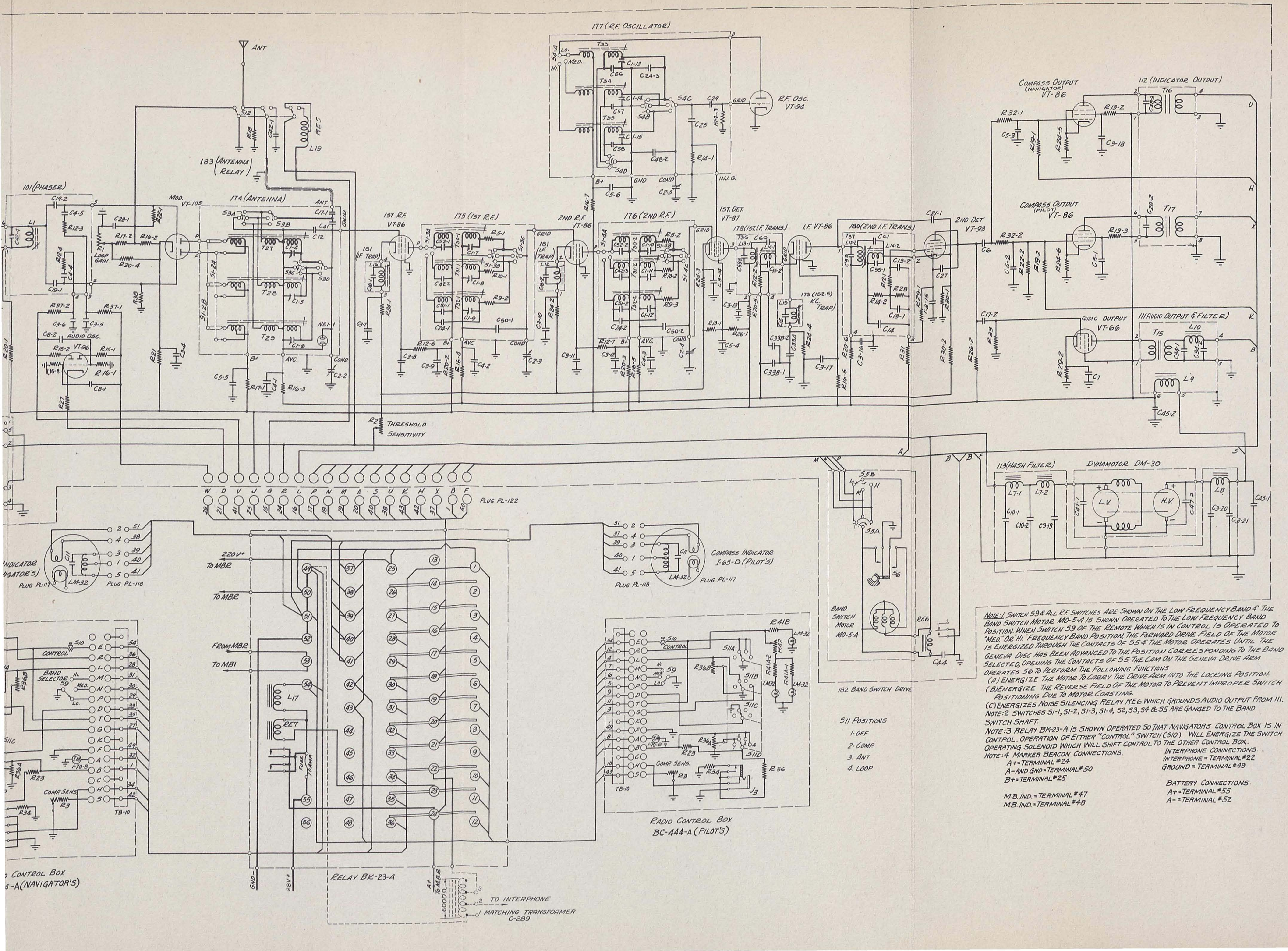


FIGURE 49 — RADIO COMPASS SCR-263-A, COMPLETE SCHEMATIC CIRCUIT DIAGRAM

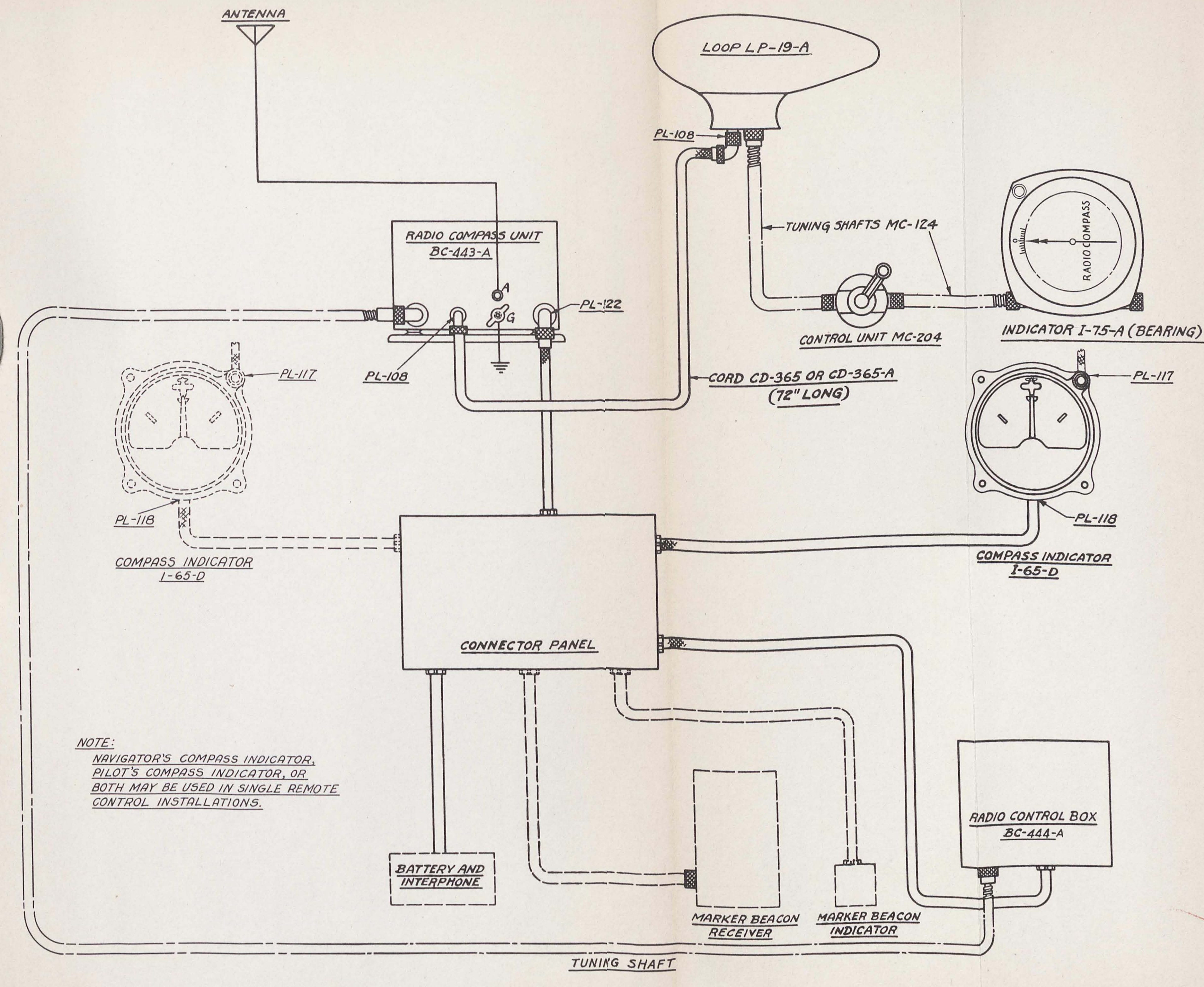


FIGURE 50 — RADIO COMPASS SCR-263-A, TYPICAL CORDING DIAGRAM—SINGLE CONTROL INSTALLATION

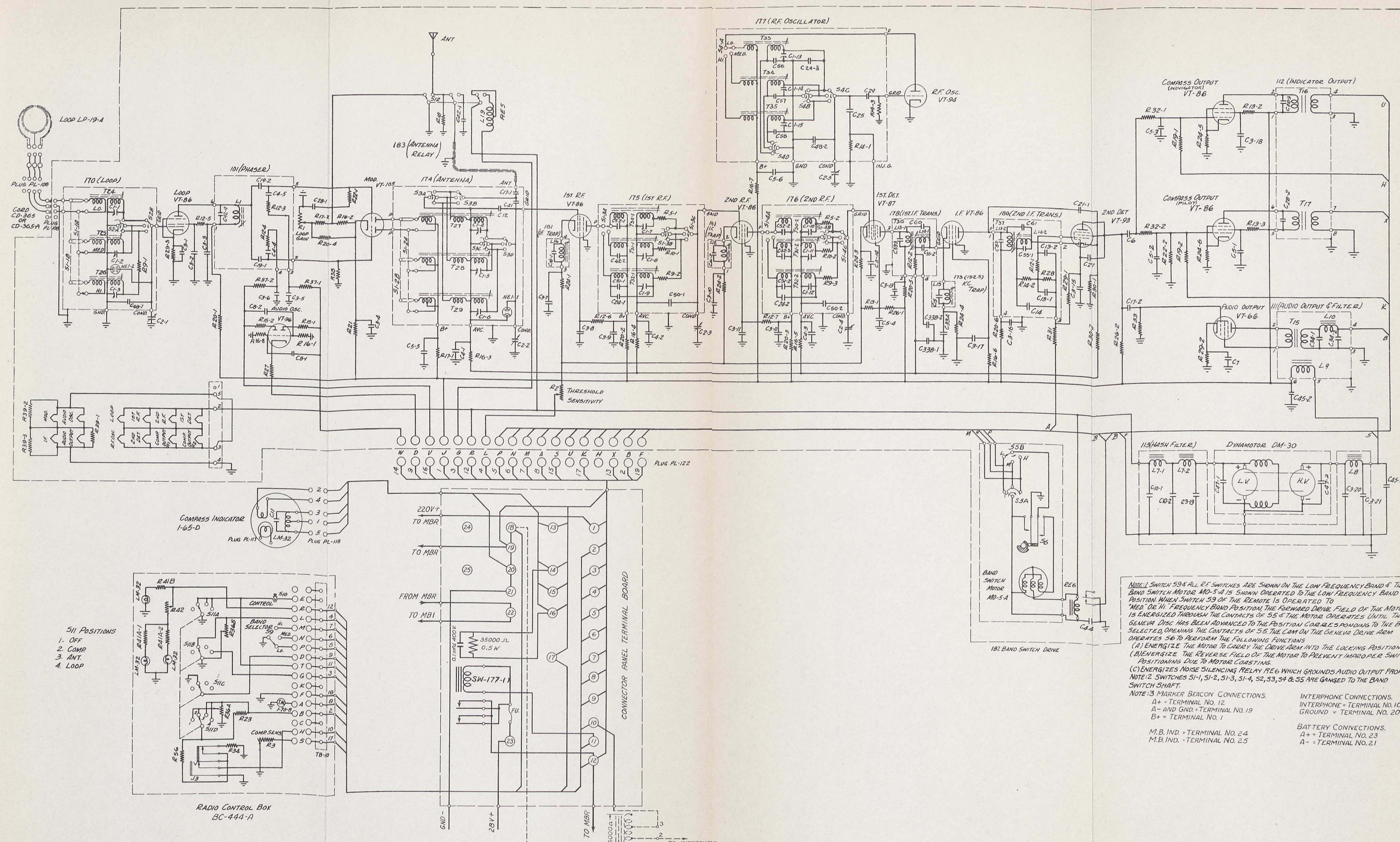
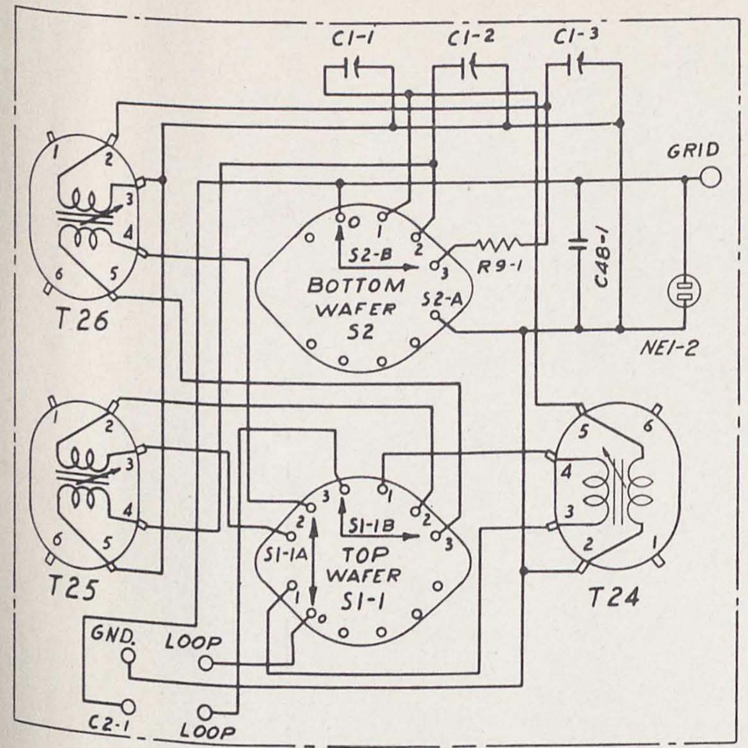
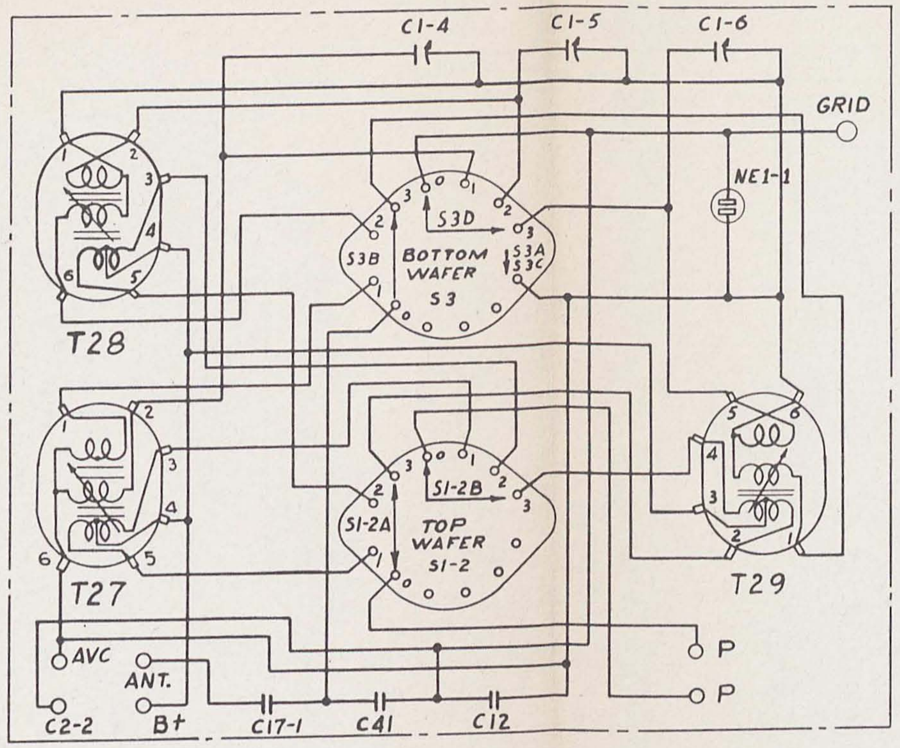


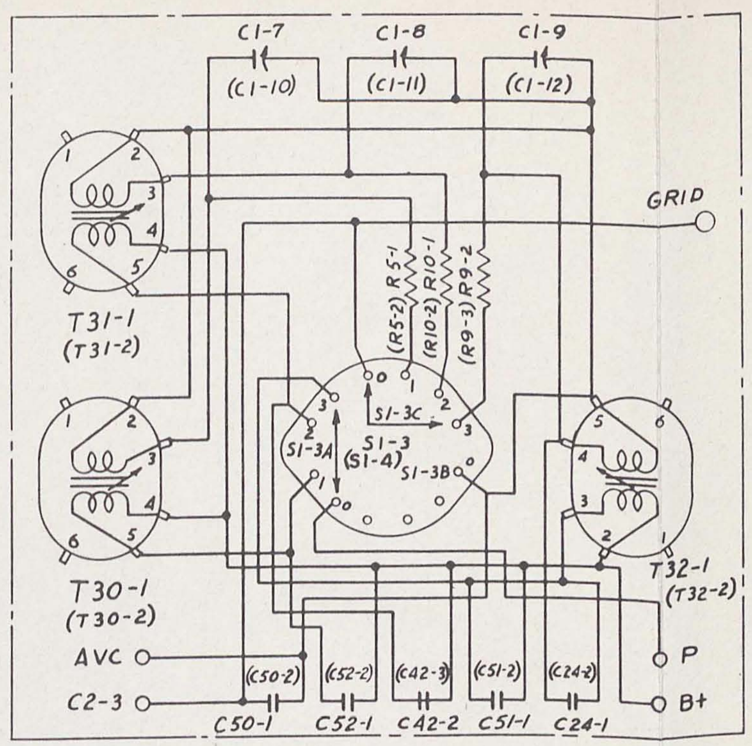
FIGURE 51 — RADIO COMPASS SCR-263-A, COMPLETE SCHEMATIC CIRCUIT DIAGRAM—SINGLE CONTROL INSTALLATION



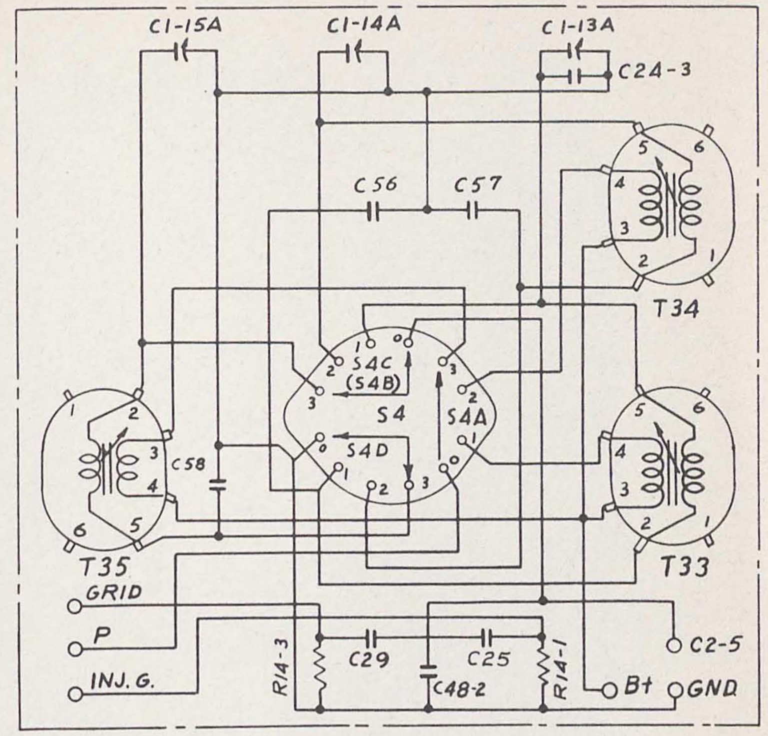
170
LOOP TUNING ASSEMBLY



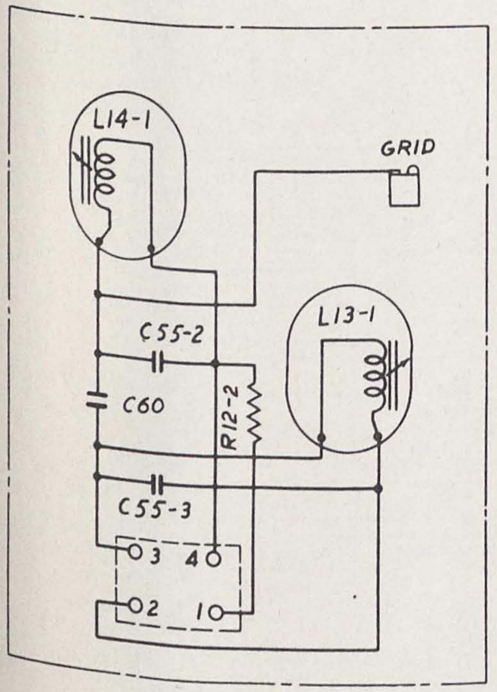
174
ANTENNA TUNING ASSEMBLY



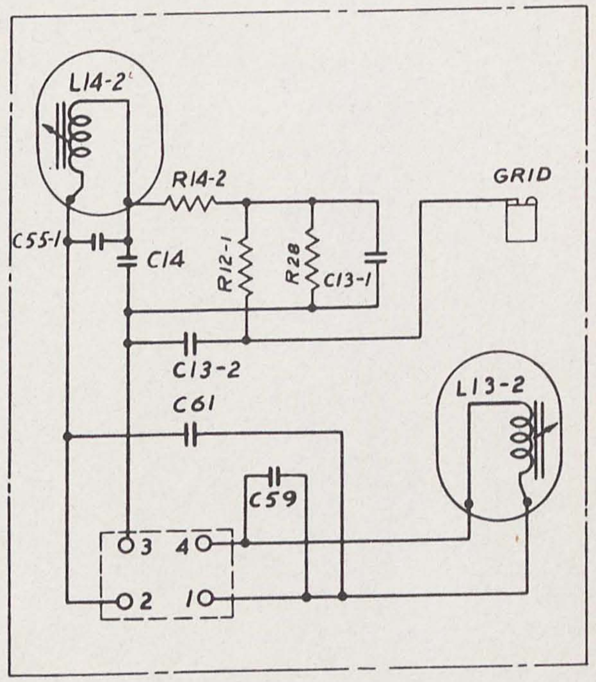
175
1ST R.F. TUNING ASSEMBLY
(SYMBOLS IN PARENTHESIS ARE FOR 176-2ND R.F.T. ASSY.)



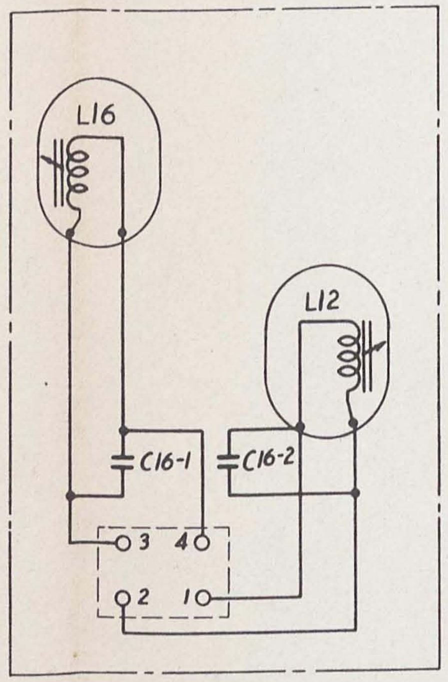
177
R.F. OSCILLATOR TUNING ASSEMBLY



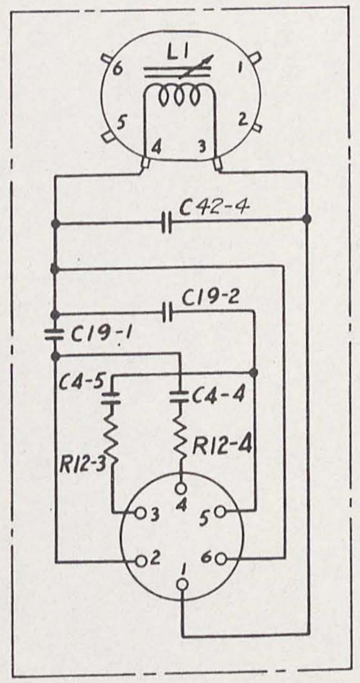
178
1ST I.F. TRANSFORMER



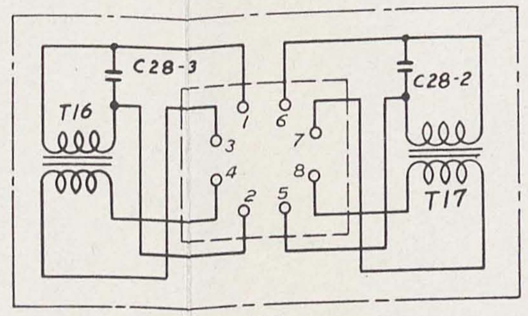
180
2ND. I.F. TRANSFORMER



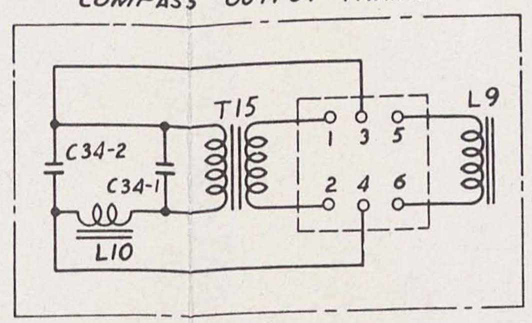
181
I. F. TRAP



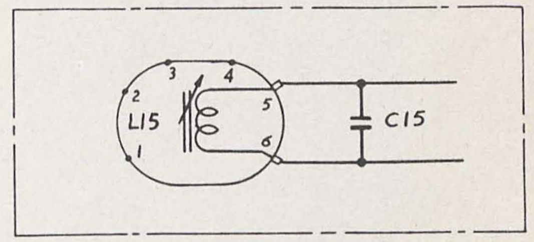
101
PHASE TRANSFORMER



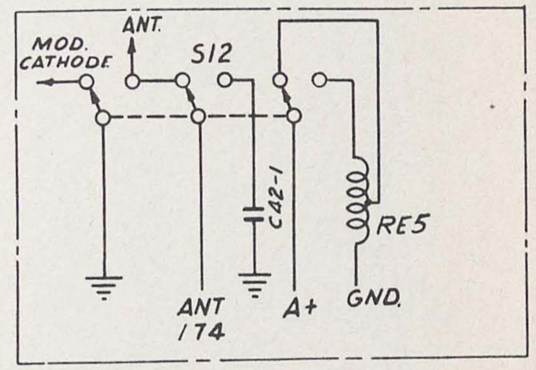
112
COMPASS OUTPUT TRANS.



111
PHONE OUTPUT TRANS. & CHOKE



173
152.5 K.C. TRAP



183
ANTENNA RELAY

FIGURE 52 — MAJOR SUBASSEMBLIES, SCHEMATIC WIRING DIAGRAM

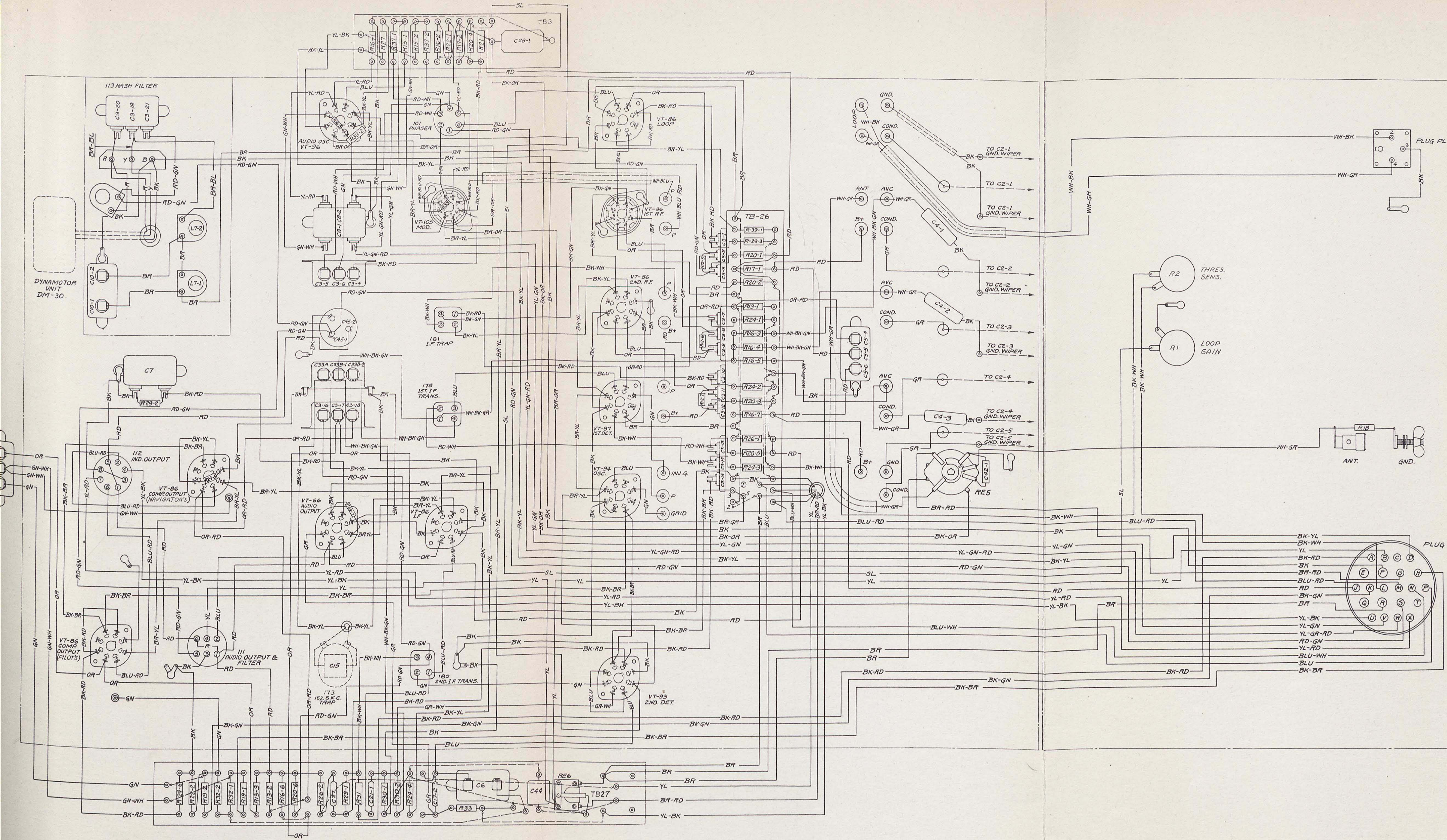
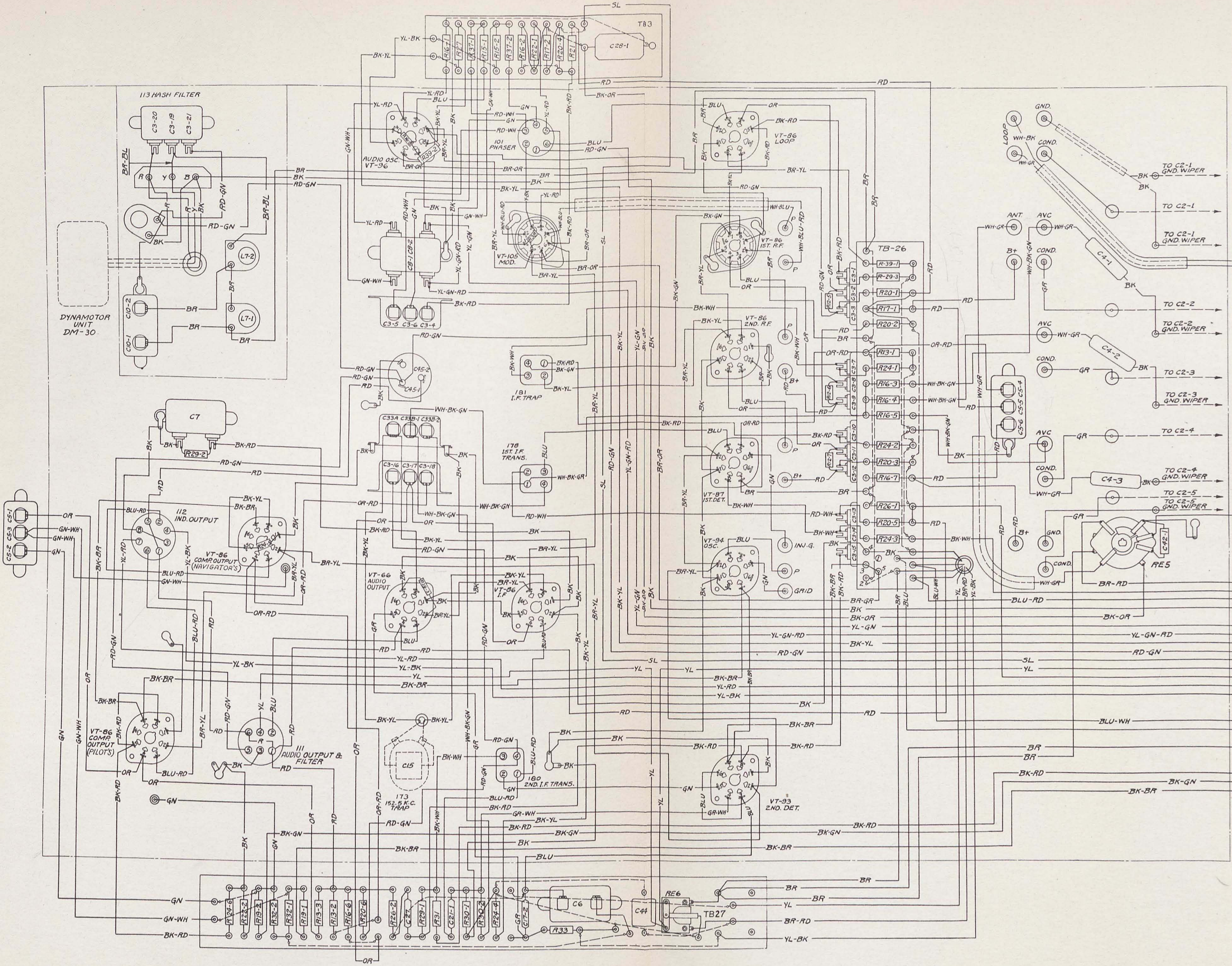
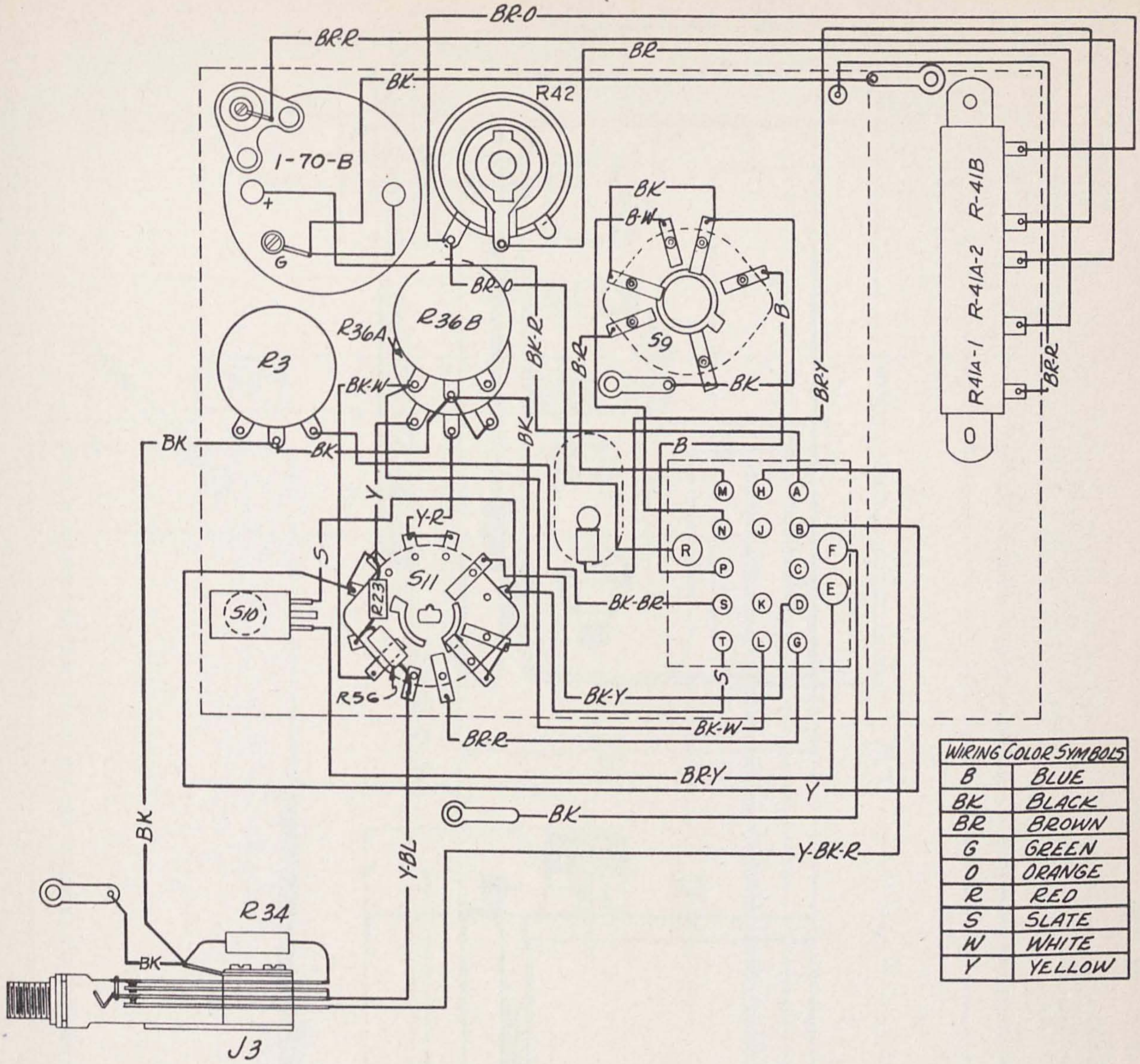


FIGURE 53 — RADIO COMPASS UNIT BC-443-A, WIRING DIAGRAM



TB3
C28-1
113 HASH FILTER
C3-20
C3-19
C3-21
DYNAMOTOR UNIT DM-30
C10-2
C10-1
L7-2
L7-1
AUDIO OSC. VT-96
101 PHASER
VT-105 MOD.
C8-1 C8-2
C3-5 C3-6 C3-4
C45-2
C45-1
181 I.F. TRAP
C7
R29-2
C33A C33B-1 C33B-2
C3-16 C3-17 C3-18
178 1ST. I.F. TRANS.
112 IND. OUTPUT
VT-86 COMP. OUTPUT (NAVIGATOR'S)
VT-66 AUDIO OUTPUT
VT-86 I.F.
VT-86 COMP. OUTPUT (PILOTS)
111 AUDIO OUTPUT & FILTER
C15
173 152.5 K.C. TRAP
180 2ND. I.F. TRANS.
VT-86 LOOP
VT-86 1ST. R.F.
VT-86 2ND. R.F.
VT-87 1ST. DET.
VT-94 OSC.
VT-93 2ND. DET.
TB-26
INJ.G.
GRID
LOOP
GND.
COND.
ANT.
AVC
TO C2-1 GND. WIPER
TO C2-1
TO C2-1 GND. WIPER
C4-1
TO C2-2
TO C2-2 GND. WIPER
C4-2
TO C2-3
TO C2-3 GND. WIPER
C5-6 C5-5 C5-4
TO C2-4
C4-3
TO C2-4 GND. WIPER
TO C2-5
TO C2-5 GND. WIPER
C42-1
RE5
C5-2 C5-3 C5-1
C6
C44
RE6
TB27
R33



WIRING COLOR SYMBOLS	
B	BLUE
BK	BLACK
BR	BROWN
G	GREEN
O	ORANGE
R	RED
S	SLATE
W	WHITE
Y	YELLOW

FIGURE 54 — RADIO CONTROL BOX BC-444-A, WIRING DIAGRAM

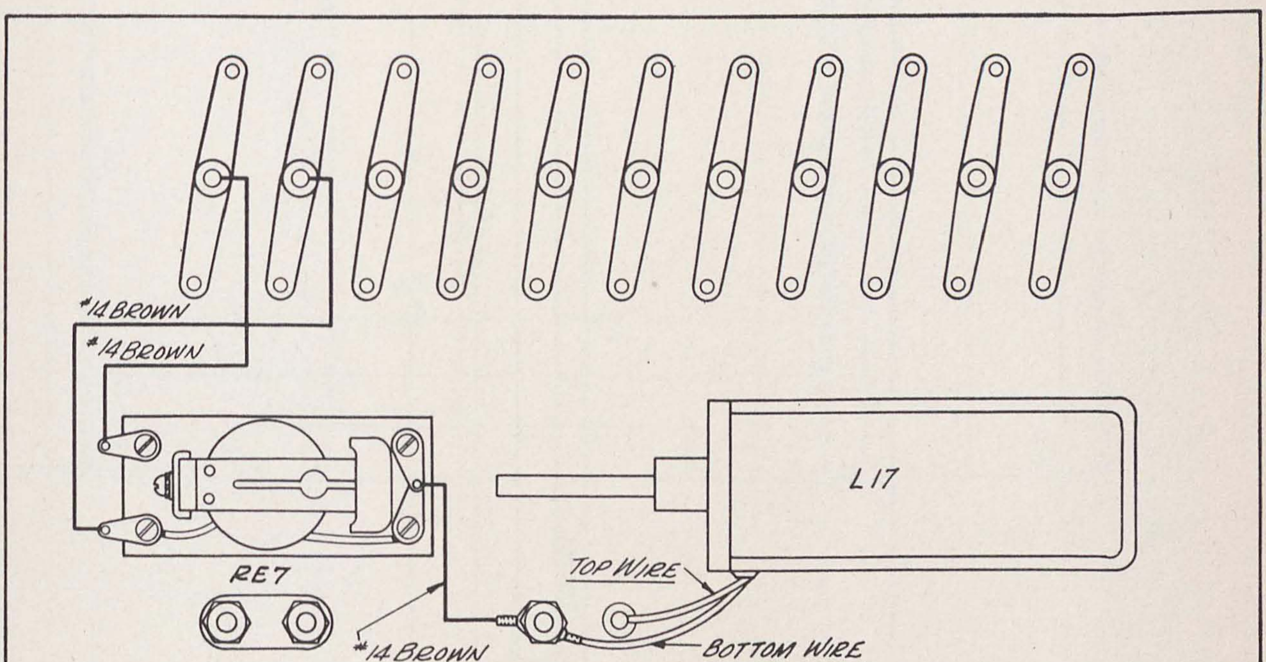


FIGURE 55 — RELAY BK-23-A, WIRING DIAGRAM

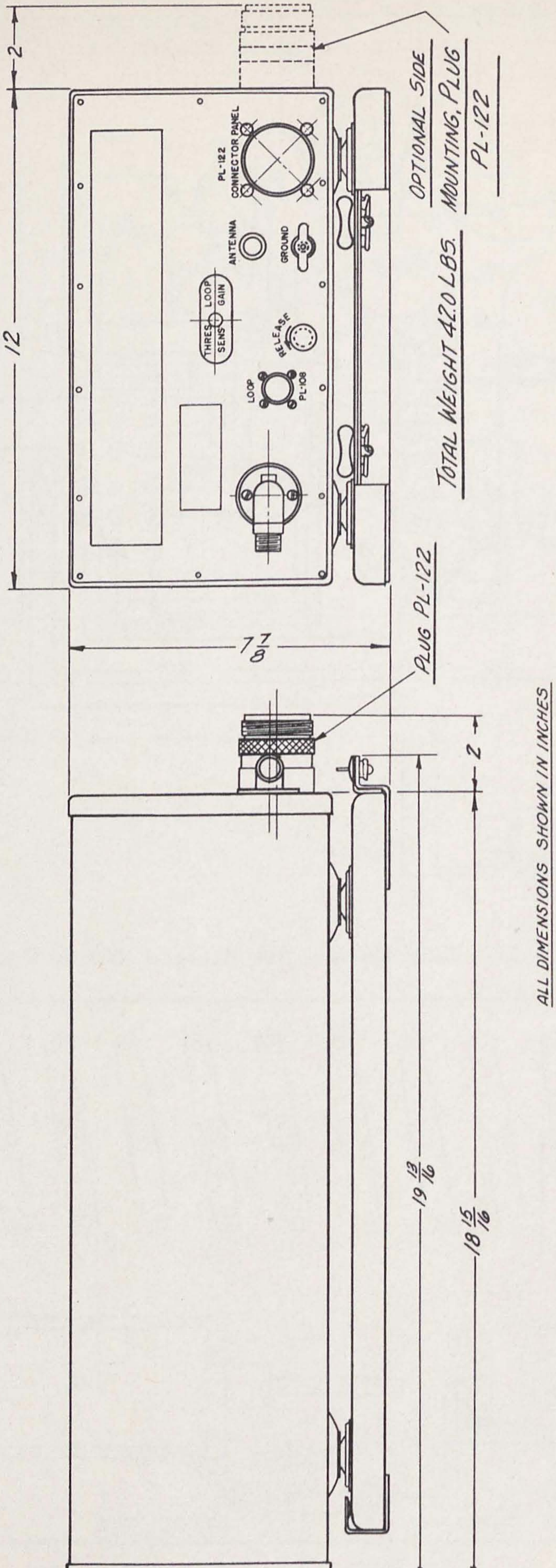


Figure 56 — Radio Compass Unit BC-443-A, Outline Drawing

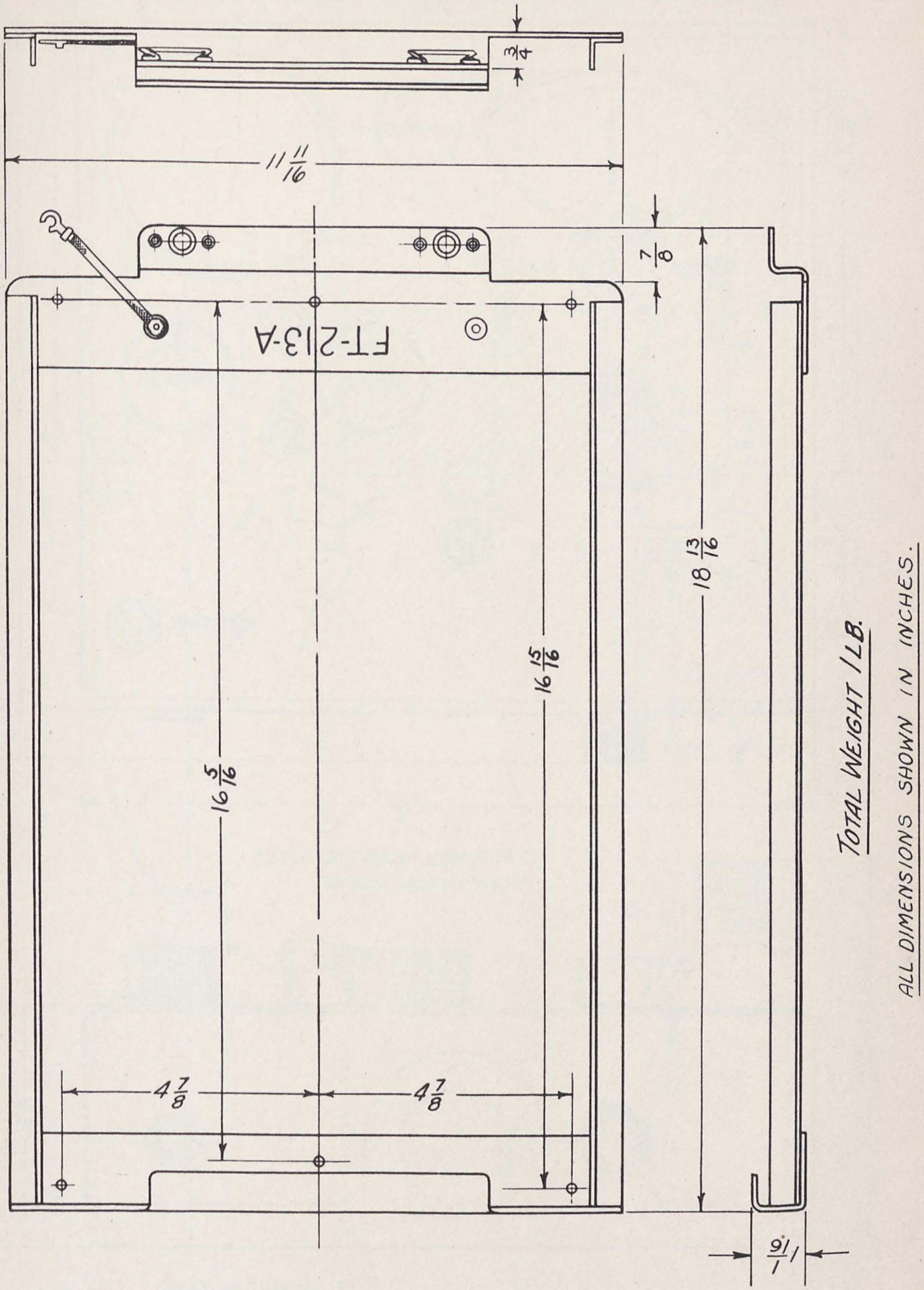


FIGURE 57 — MOUNTING FT-213-A, DRILLING PLAN

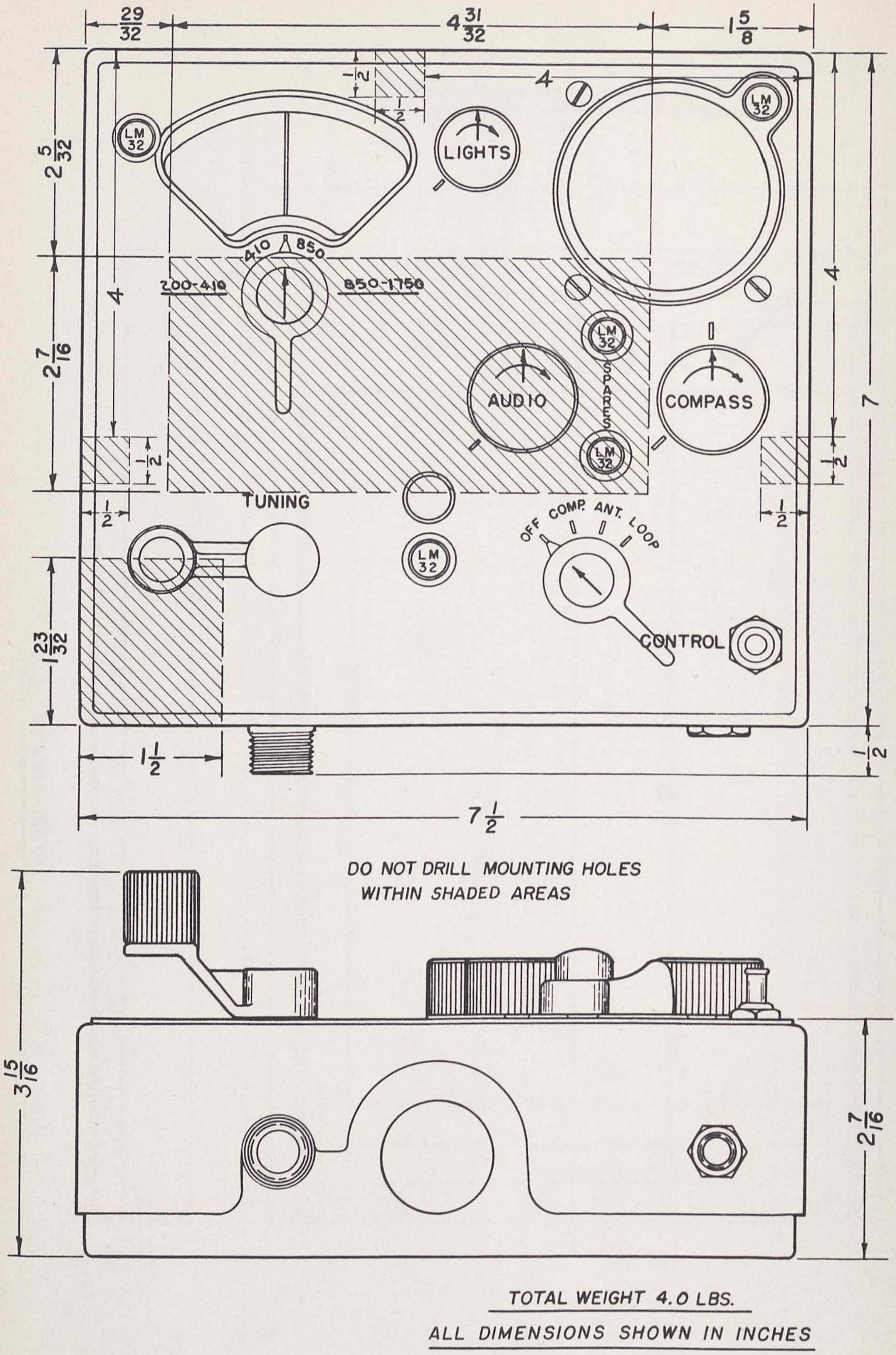


Figure 58 — Radio Control Box BC-444-A, Outline Drawing

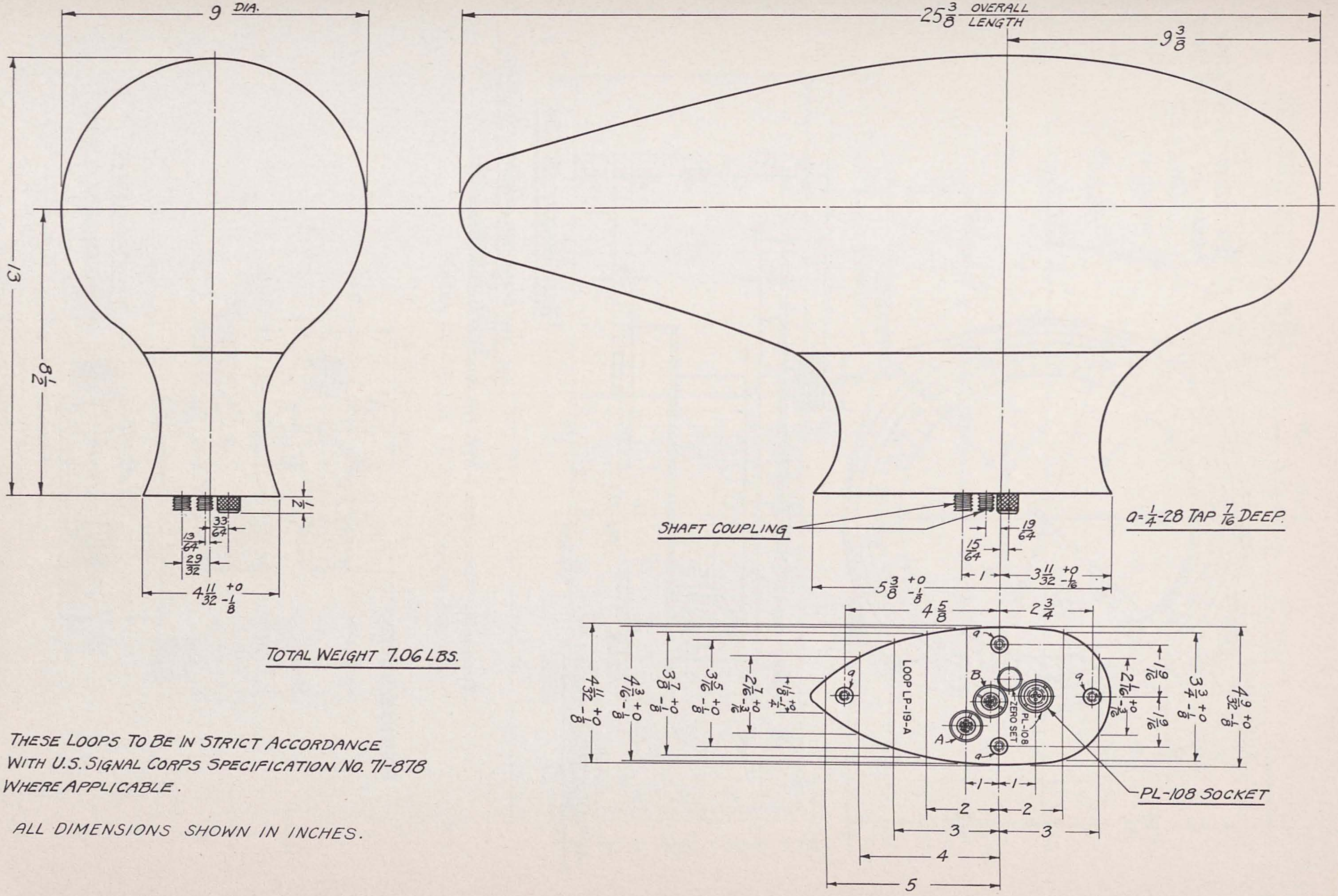


FIGURE 59 — LOOP LP-19-A, OUTLINE DRAWING

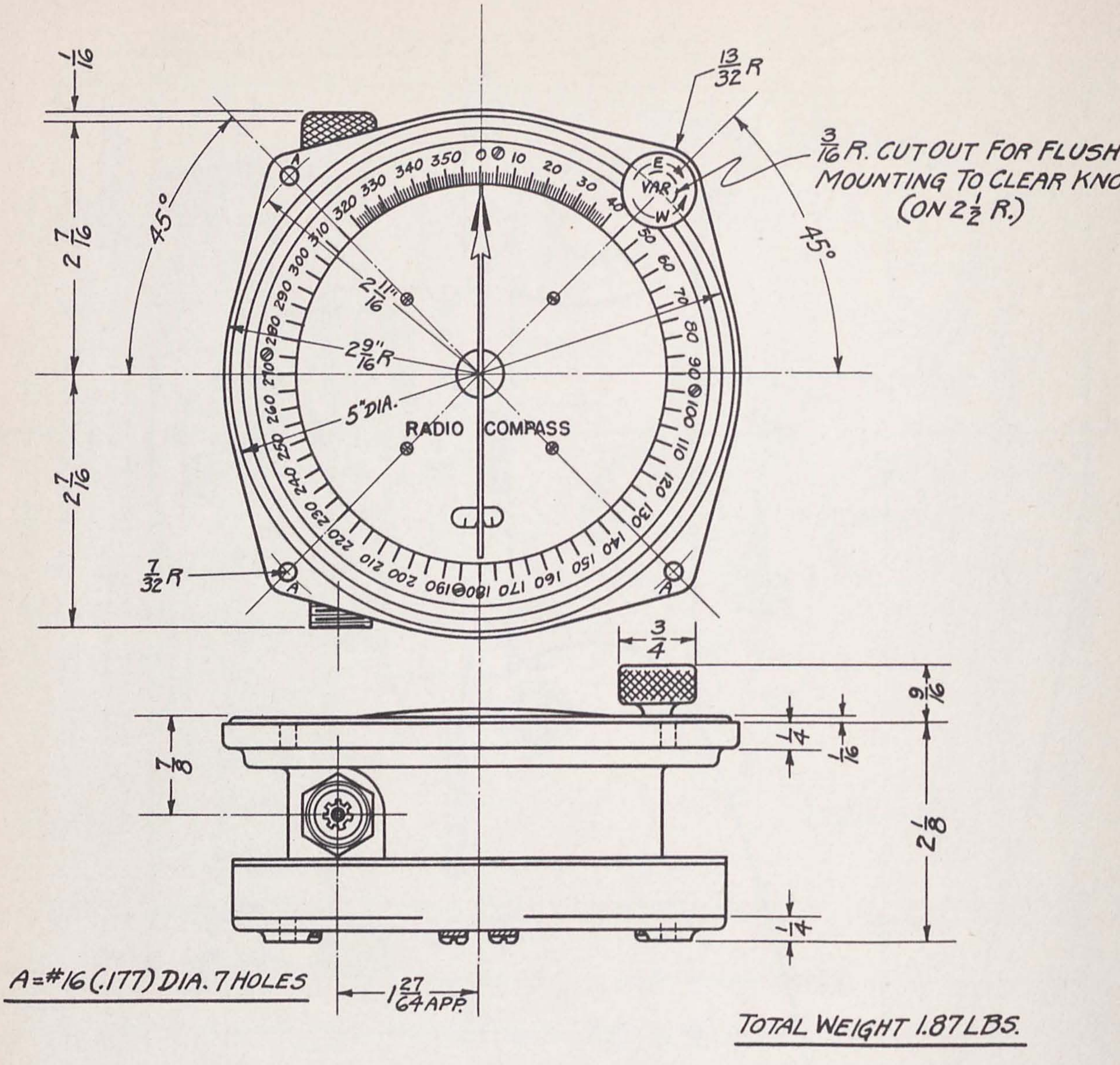


FIGURE 60 — INDICATOR I-75-A (BEARING), OUTLINE DRAWING

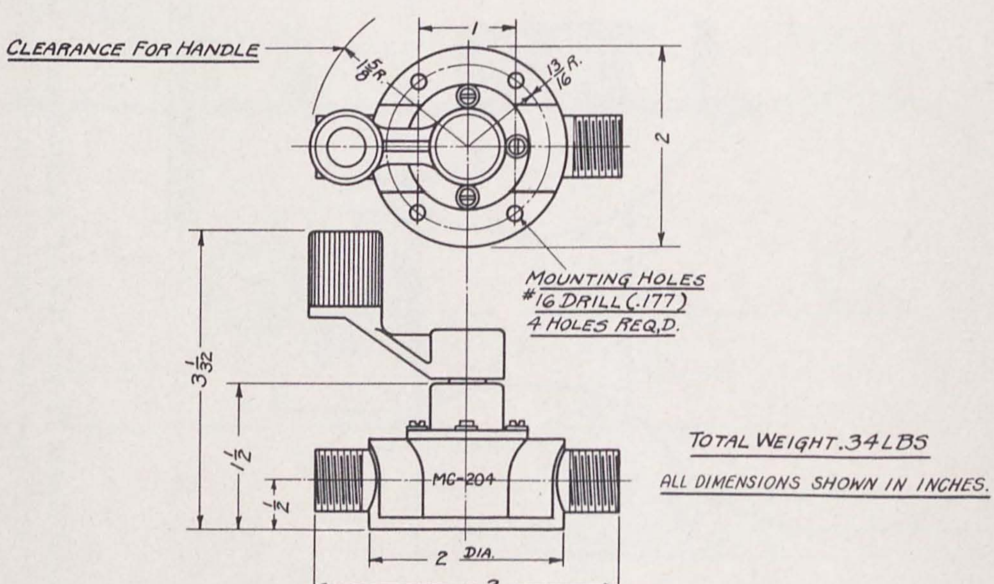


FIGURE 61 — CONTROL UNIT MC-204, OUTLINE DRAWING

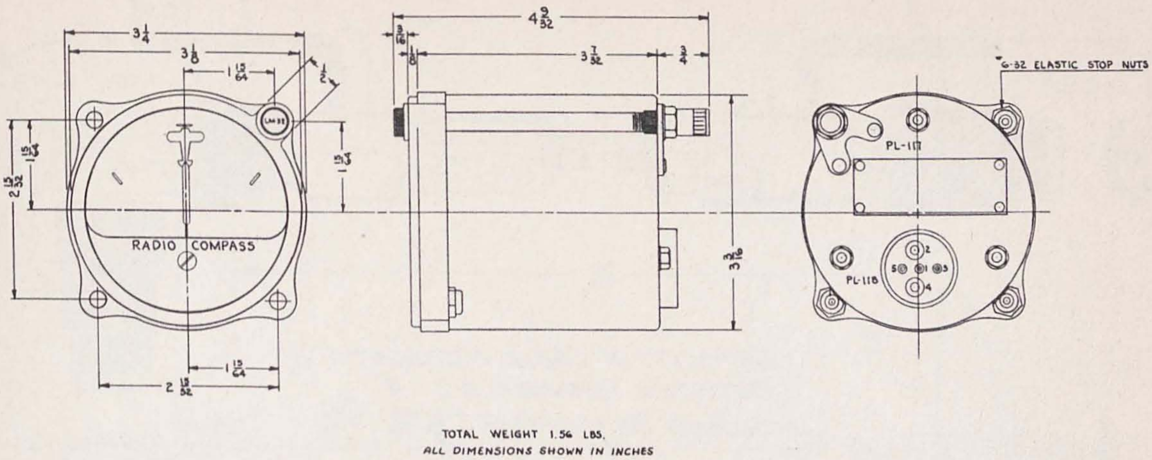


FIGURE 62 — COMPASS INDICATOR I-65-D, OUTLINE DRAWING

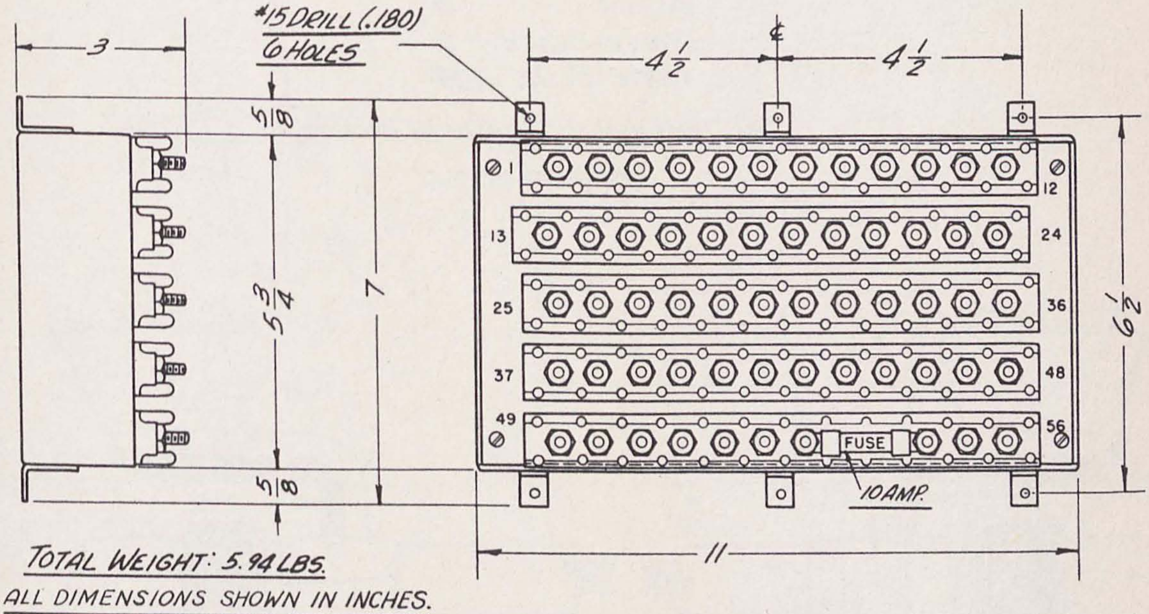


FIGURE 63 — RELAY BK-23-A, OUTLINE DRAWING

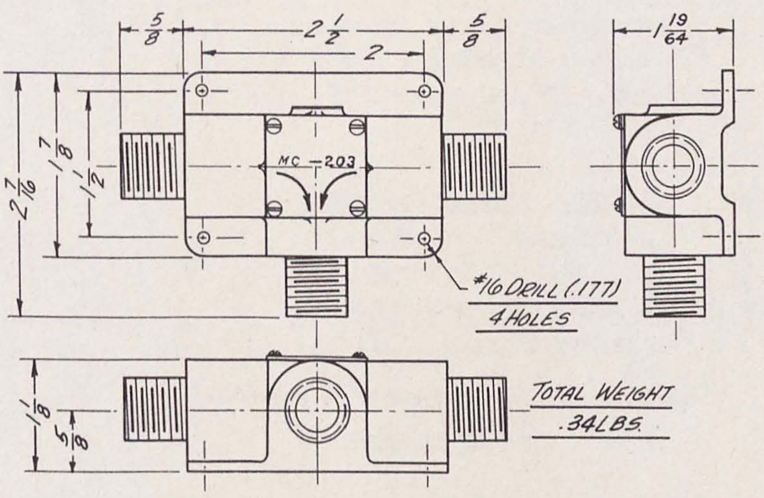
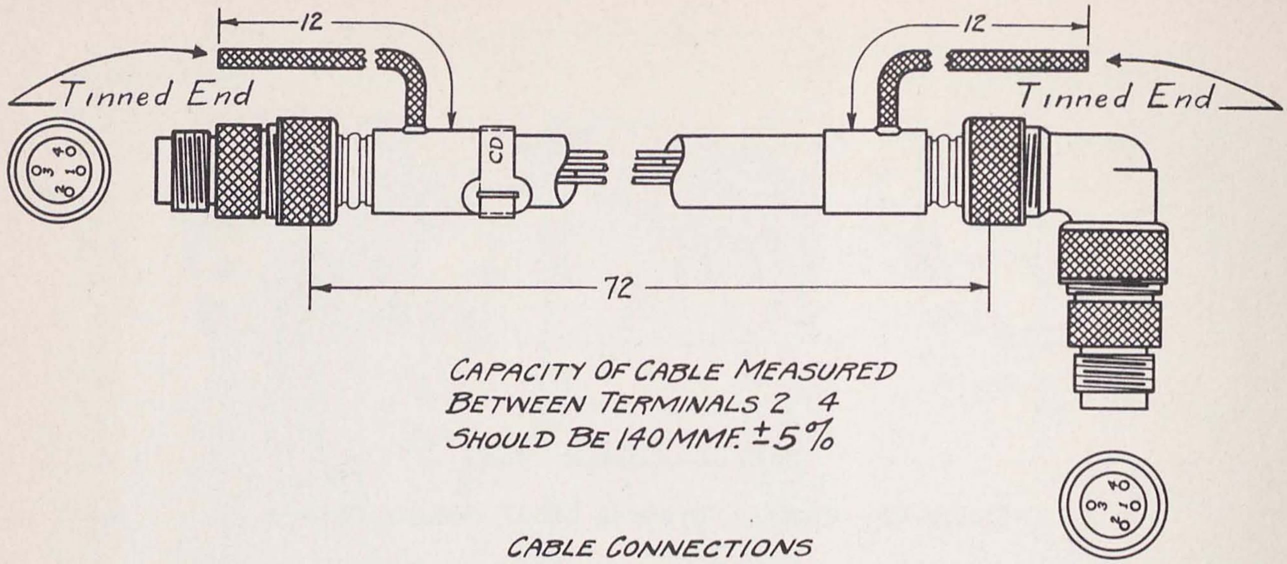


FIGURE 64 — COUPLING MC-203, OUTLINE DRAWING



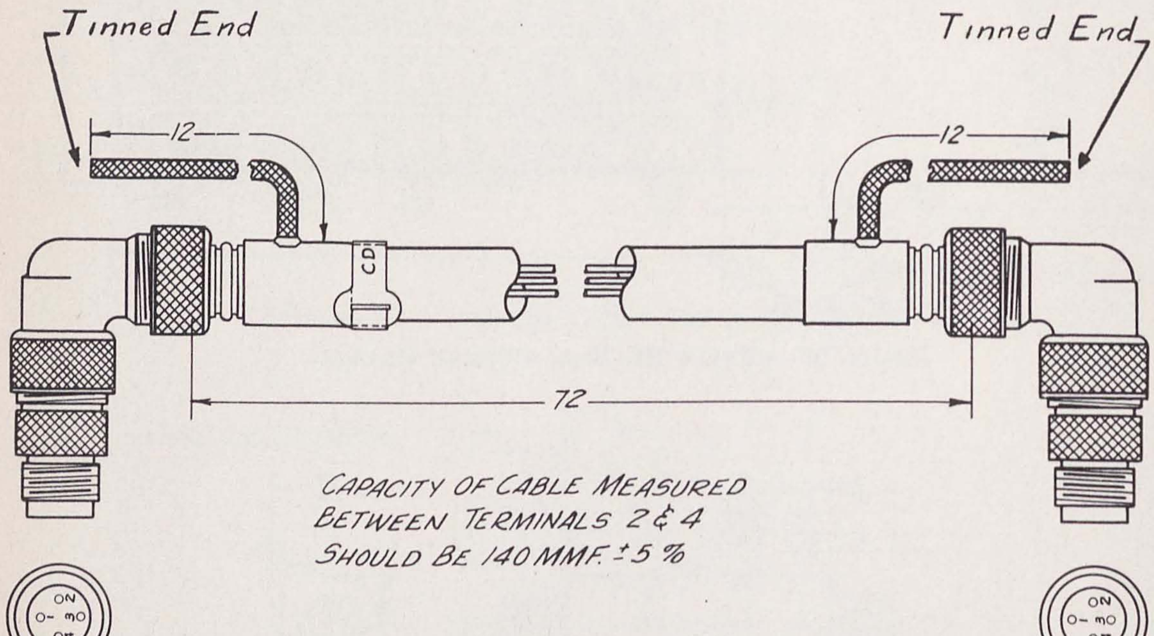
CAPACITY OF CABLE MEASURED
BETWEEN TERMINALS 2 4
SHOULD BE 140 MMF. ±5%

CABLE CONNECTIONS

COLOR	TERM.
BLACK	3
WHITE-BLACK	2
WHITE-BLUE	4

ALL DIMENSIONS SHOWN IN INCHES.

CORD CD-365-A



CAPACITY OF CABLE MEASURED
BETWEEN TERMINALS 2 & 4
SHOULD BE 140 MMF. ±5 %

CABLE CONNECTIONS

COLOR	TERM.
BLACK	3
WHITE-BLACK	2
WHITE-BLUE	4

ALL DIMENSIONS SHOWN IN INCHES.

CORD CD-365

Figure 65 — Cord CD-365 and Cord CD-365-A, Outline Drawing

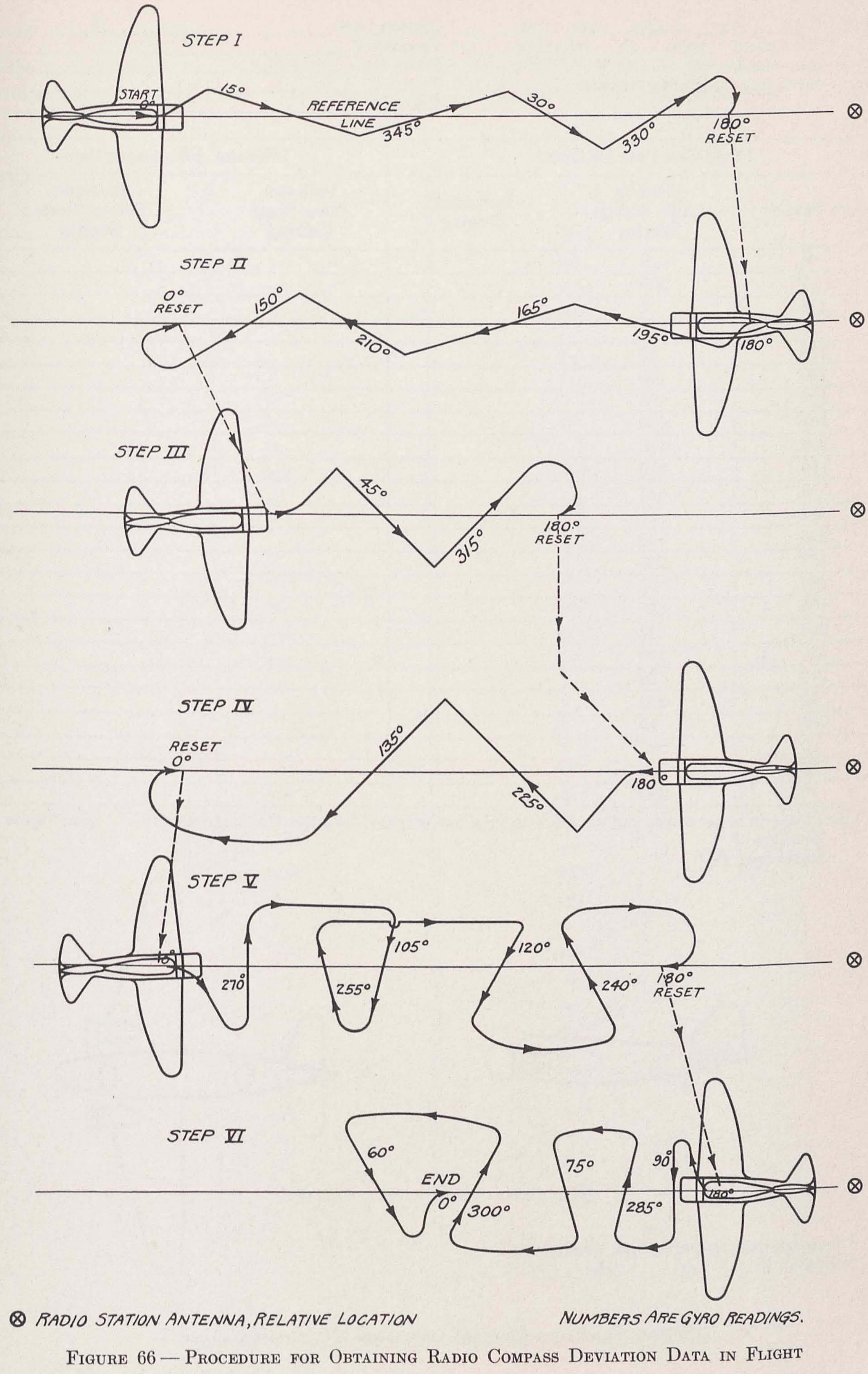


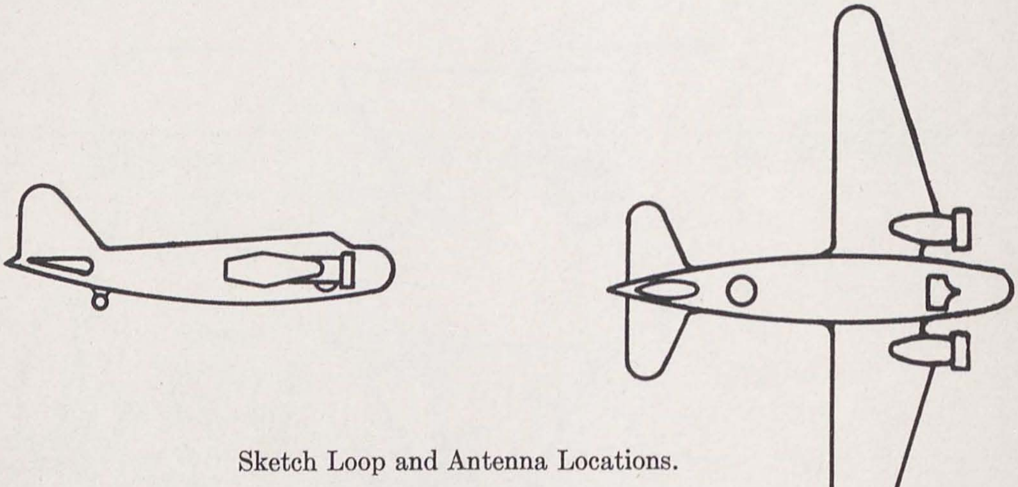
FIGURE 66 — PROCEDURE FOR OBTAINING RADIO COMPASS DEVIATION DATA IN FLIGHT

NOTE: Head toward station over predetermined point on reference line, steady, set GYRO on 0° and check loop on homing position.

Station Used ____________________
Frequency ____________________
Plane No. ____________________
Pilot ____________________
Recorder ____________________

Flight Test Data for Curve			Indicator Adjustment Data	
Gyro Bearing	Plane to Radio Station Bearing	Indicated Bearing	Indicator Inner Scale Bearing	Indicator Pointer Scale Bearing
* 0	0			
15	345			
345	15			
30	330			
330	30			
** 180	180			
195	165			
165	195			
210	150			
150	210			
* 45	315			
315	45			
** 225	135			
135	225			
* 270	90			
105	255			
255	105			
120	240			
240	120			
** 90	270			
285	75			
75	285			
300	60			
60	300			

NOTE: This form to be used in conjunction with "Radio Compass Deviation Calibration Curve." (See Figure 68).
* Set Gyro 0°
** Reset Gyro 180°



Sketch Loop and Antenna Locations.

Check required reference mark quadrature positions: 0°____ 90°____ 180°____ 270°____

FIGURE 67—RADIO COMPASS DEVIATION CALIBRATION DATA

Aircraft A. C. No. ____________ By ____________ Date ____________

Station ____________ Frequency ____________ K.C. Equipment Type ____________

Reference Line, Landmark: ____________ Predetermined Point ____________

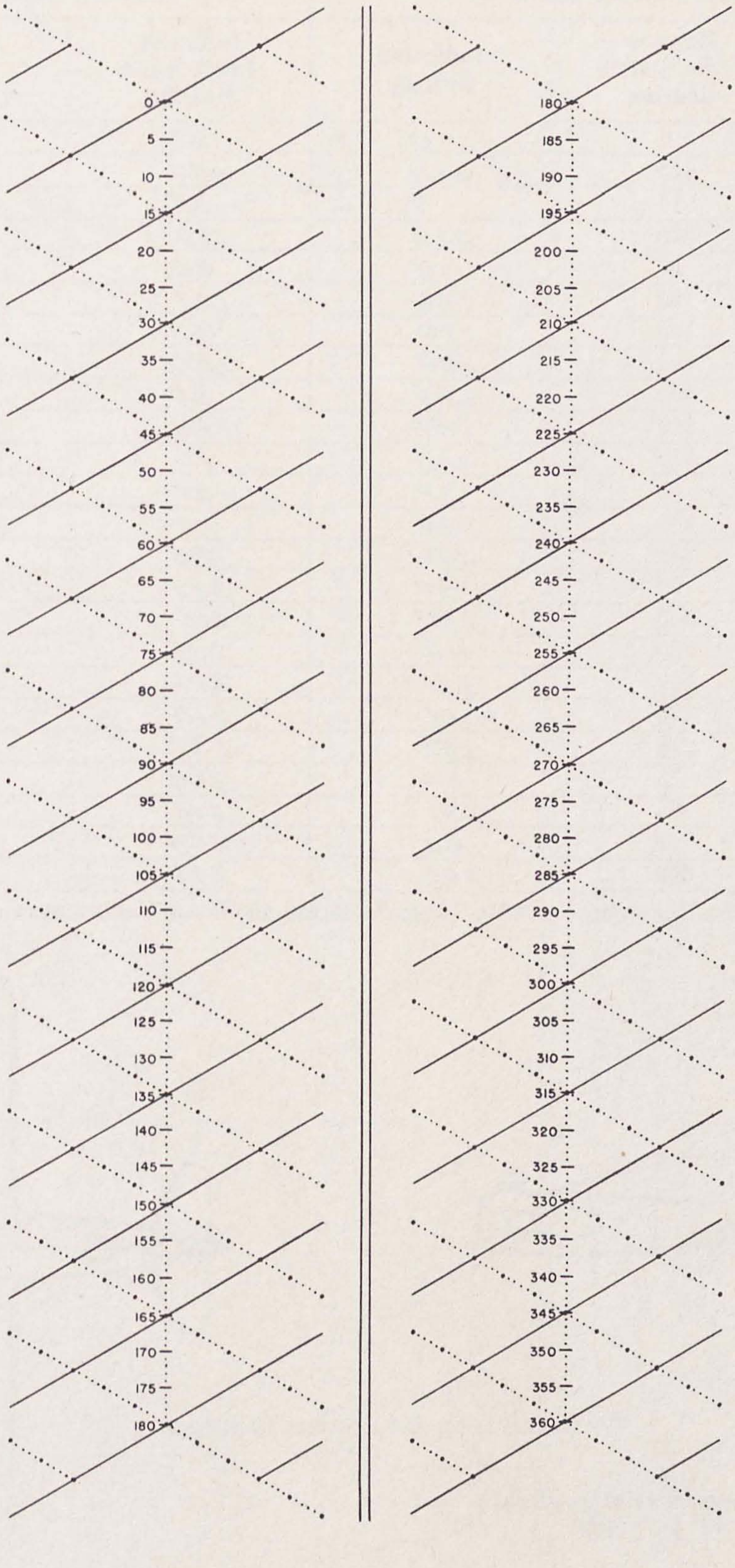


FIGURE 68 — RADIO COMPASS DEVIATION CALIBRATION CURVE