#1

SUPERSEDED FILE

INSTRUCTION BOOK
(OPERATING)

FOR

RADIO SET SCR-518-A
(HIGH ALTITUDE ALTIMETER)

MANUFACTURED BY

RCA MANUFACTURING CO., Inc.

CAMDEN, N. J., U. S. A.

Cover, Pg V

RESTRICTED

PUBLISHED BY AUTHORITY

OF

THE CHIEF SIGNAL OFFICER

ORDER No. 1402-PHILA.-42 3,000
ORDER No. 1403-PHILA.-42 10,000

n.d.

Copy 1

INSTRUCTION BOOK
(OPERATING)

FOR

RADIO SET SCR-518-A
(HIGH ALTITUDE ALTIMETER)

MANUFACTURED BY

RCA MANUFACTURING CO., INC.

CAMDEN, N. J., U. S. A.

RESTRICTED

PUBLISHED BY AUTHORITY

OF

THE CHIEF SIGNAL OFFICER

ORDER NO. 1402-PHILA -42

ORDER NO. 1403-PHILA -42

ORDER NO. 1701-WF -42

SAFETY NOTICE

PERSONNEL ENGAGED IN THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT OR SIMILAR EQUIPMENT ARE URGED TO BECOME FAMILIAR WITH THE FOLLOWING RULES BOTH **IN THEORY AND IN THE PRACTICAL APPLICATION THEREOF.** IT IS THE DUTY OF EVERY RADIOMAN TO BE PREPARED TO GIVE ADEQUATE FIRST AID AND THEREBY PREVENT AVOIDABLE LOSS OF LIFE. YOUR OWN LIFE MAY DEPEND ON THIS.

PRONE-PRESSURE METHOD OF RESUSCITATION

1. PROTECT YOURSELF with dry insulating material.
2. BREAK THE CIRCUIT by opening the power switch or by pulling the victim free of the live conductor.

   DON'T TOUCH VICTIM WITH YOUR BARE HANDS until the circuit is broken.

(A) (B) (C)

3. LAY PATIENT ON STOMACH, one arm extended, the other arm bent at elbow. Turn face outward resting on hand or forearm.
4. REMOVE FALSE TEETH, TOBACCO OR GUM from patient's mouth.
5. KNEEL STRADDLING PATIENT'S THIGHS. See (A).
6. PLACE PALMS OF YOUR HANDS ON PATIENT'S BACK with little fingers just touching the lowest ribs.
7. WITH ARMS STRAIGHT, SWING FORWARD gradually bringing the weight of your body to bear upon the patient. See (B).
8. SWING BACKWARD IMMEDIATELY to relieve the pressure. See (C).
9. AFTER TWO SECONDS, SWING FORWARD AGAIN. Repeat twelve to fifteen times per minute.
10. WHILE ARTIFICIAL RESPIRATION IS CONTINUED, HAVE SOMEONE ELSE:
    (a) Loosen patient's clothing.
    (b) Send for doctor.
    (c) Keep patient warm.
11. IF PATIENT STOPS BREATHING, CONTINUE ARTIFICIAL RESPIRATION. Four hours or more may be required.
12. DO NOT GIVE LIQUIDS UNTIL PATIENT IS CONSCIOUS.

INSTRUCTION BOOK (OPERATING)

FOR

RADIO SET SCR-518-A (HIGH ALTITUDE ALTIMETER)

MANUFACTURED BY

RCA MANUFACTURING CO., INC.

CAMDEN, N. J., U. S. A.

RESTRICTED

NOTICE:—This document contains information affecting the national defense of the United States within the meaning of the Espionage Act (U. S. C. 50:31, 32). The transmission of this document or the revelation of its contents in any manner to any unauthorized person is prohibited.

The information contained in documents marked RESTRICTED will not be communicated to the public or the press, but it may be communicated to any person known to be in the service of the United States, and to persons of undoubted loyalty and discretion who are cooperating in governmental work. (AR 380-5).

PUBLISHED BY AUTHORITY

OF

THE CHIEF SIGNAL OFFICER

ORDER NO. 1402-PHILA -42

ORDER NO. 1403-PHILA -42

ORDER NO. 1701-WF -42

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

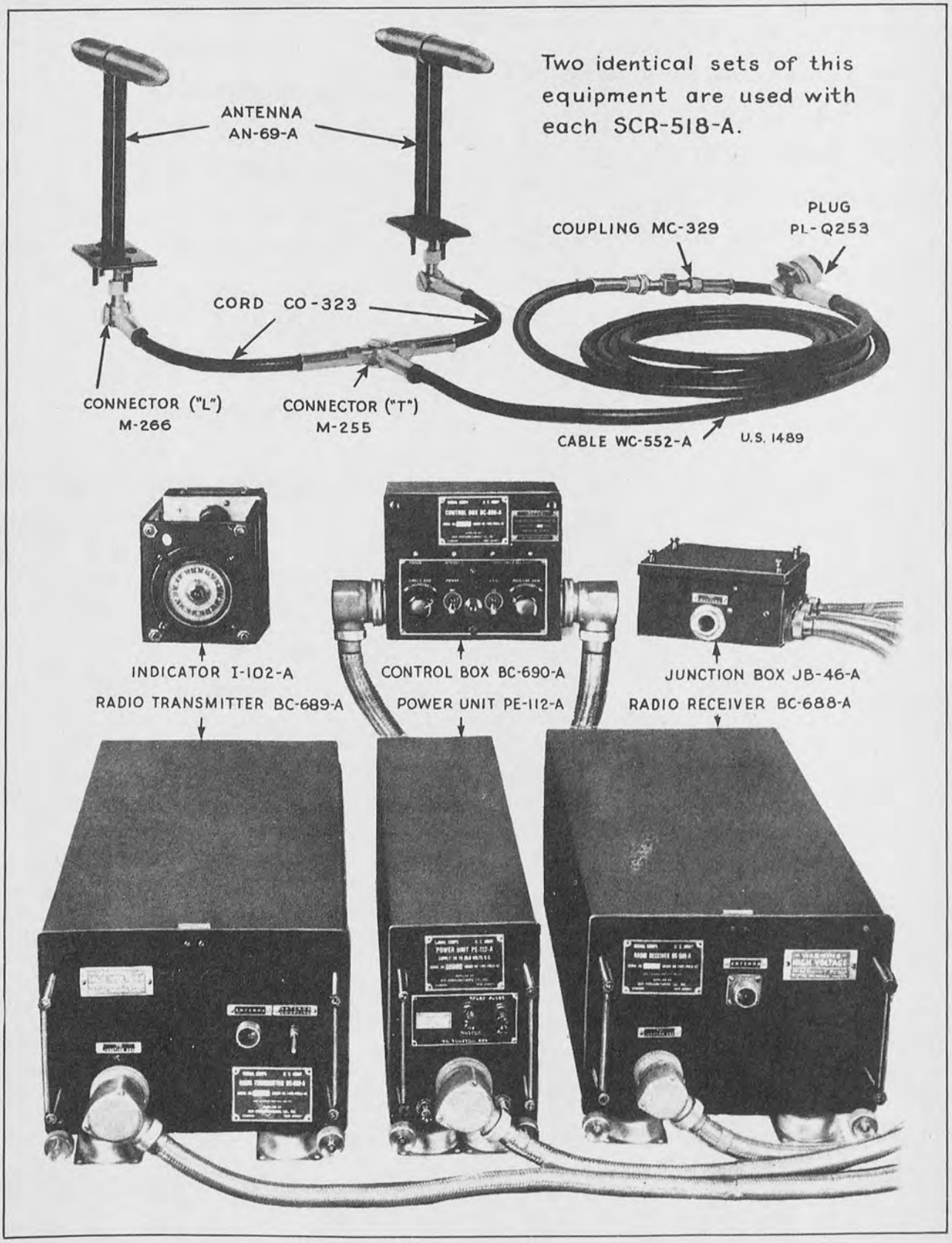


FIGURE 1. RADIO SET SCR-518-A

SECTION I

DESCRIPTION

1. GENERAL

Radio Set SCR-518-A (High Altitude Altimeter) consists of a complete set of apparatus for installation on aircraft for use in determining the height above the terrain. The nominal range of the equipment is from 0 to 20,000 feet, but it is operative to an altitude of approximately 30,000 feet. See paragraphs 4g and 5c. The complete set of main components when equipped with tubes and fuses, with cable interconnections, with antenna arrays, and primary power source connections, properly made, constitutes a complete and operative equipment. All necessary voltages, other than the primary source, are generated within the equipment. The source of power is an aircraft d-c supply of 24 to 28.6 volts. The total power consumed is approximately 300 watts.

2. MAIN COMPONENTS

Radio Set SCR-518-A consists of seven main components, each (with the exception of the antenna equipments and antenna transmission lines and connectors) housed in an individual metal case. The connections to the source of power are not supplied.

a. Antenna Equipment RC-128-A and Transmission Lines and Connectors

Two Antenna Equipments RC-128-A are required for each Radio Set SCR-518-A; each consists of two Antennas AN-69-A for attachment to a metal surface on the under side of the fuselage or on the wing surface of the aircraft, and a Cord CD-645. One antenna equipment is connected to the radio transmitter through a cord comprising two lengths of Cable WC-552-A, one Coupling MC-329 (wing disconnect), and one Plug PL-Q253. The ends of each length of Cable WC-552-A are fabricated with a Connector M-307 (sleeve) and a Connector M-303 (bead insulator and pin). A second antenna equipment is used for the radio receiver and is similarly connected. The distance between antenna equipments should not be less than ten feet clear open space. It may be less where the body of the plane, or other metal construction acts as a shield between them.

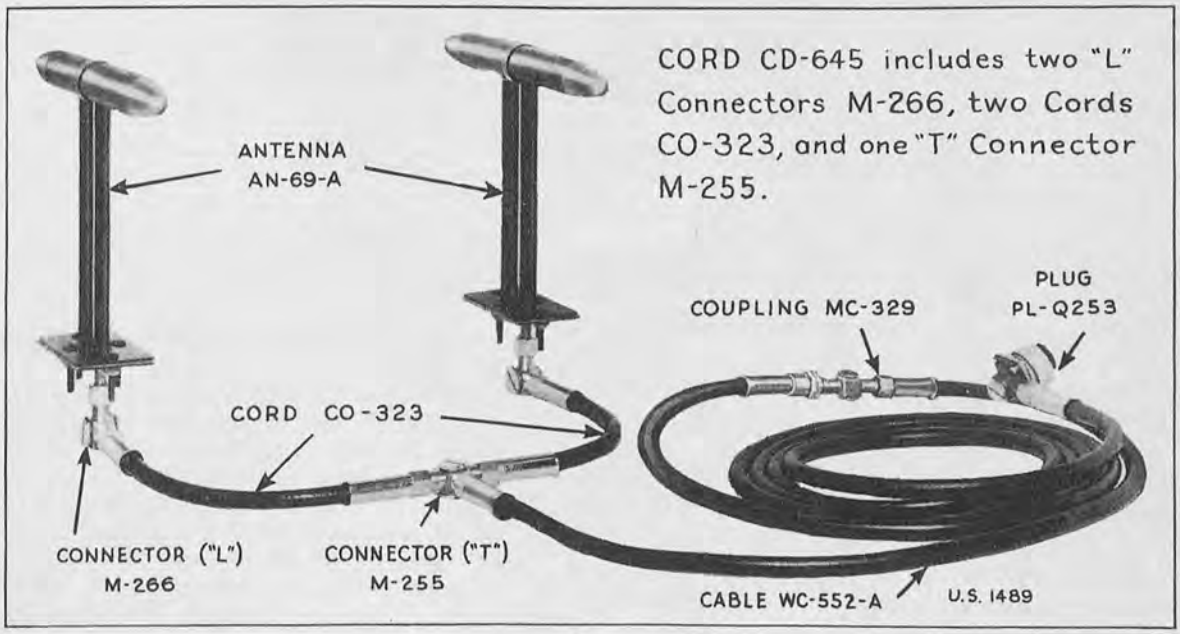


FIGURE 2. ANTENNA EQUIPMENT RC-128-A and TRANSMISSION LINES and CONNECTORS

b. Indicator I-102-A

Indicator I-102-A displays the altitude of the aircraft in feet. It is designed for mounting on the instrument panel of the aircraft, or equivalent location. It is connected to Radio Control Box BC-690-A by a large six-foot cable (CD-648). The indicator is an electrostatic focus and deflection type cathode-ray tube. When in operation two circles are traced on the screen by the electron beam, and two lobes appear in each circle traced, the arc of each scale between lobes being proportional to the height above the terrain. The position of one of these lobes on each circle is at zero and that of the other depends on the time elapsed between transmission and reception and hence each gives a direct reading on the calibrated scale in terms of altitude. The 2000 foot inner circle or vernier scale is for interpolation readings ("HUNDREDS OF FEET"), and the outer circle or scale is for 0 to 20,000 foot and higher readings ("THOUSANDS OF FEET").

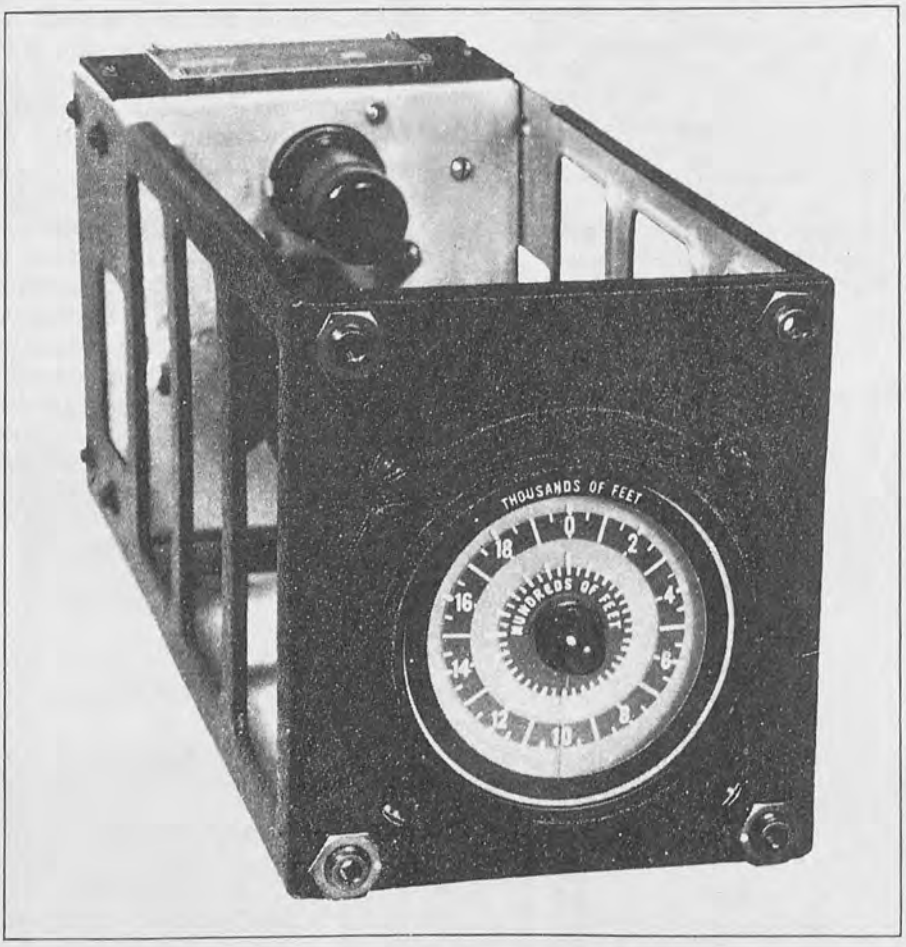


FIGURE 3. INDICATOR I-102-A

c. Junction Box JB-46-A

Junction Box JB-46-A with cables and connectors is used for interconnections between the various units of the equipment. It should be located within easy cable run of all other units and relatively close to the aircraft d-c supply.

d. Power Unit PE-112-A (includes Mounting FT-322-A)

Power Unit PE-112-A converts the 24-28.6 volt d-c power supplied by the aircraft d-c supply system, into suitable potentials for operation of Radio Transmitter BC-689-A, Radio Receiver BC-688-A, Indicator I-102-A and Radio Control Box BC-690-A. It may be mounted independently or grouped with other units of the equipment. The location must be such as to provide ample clearance and complete freedom for Mounting FT-322-A which is part of and protects the unit from shock and vibration.

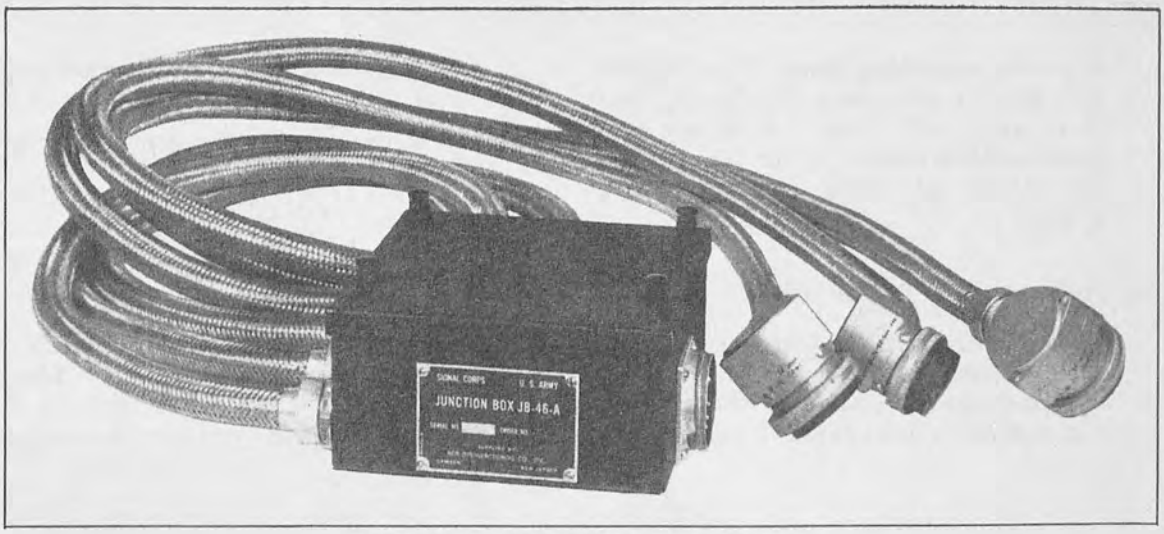


FIGURE 4. JUNCTION BOX JB-46-A

FIGURE 5. POWER UNIT PE-112-A

The two operating fuses, Fuse FU-37 (3 ampere) and Fuse FU-38 (20 ampere) and a set of spare fuses are provided and are located on the front panel, the latter set being marked "Spare Fuses."

e. Radio Control Box BC-690-A

Radio Control Box BC-690-A is designed for convenient mounting in the aircraft, in a location accessible to the pilot or other persons designated to operate the equipment. It may be mounted adjacent to Indicator I-102-A.

On the panel of the control box are the following controls:

"ON-OFF" Switch
"Circle Size" Control
"AVC-ON-OFF" Switch
Receiver Gain Control

The functioning of the controls is explained under "Operation." There are also four screw driver controls for installation and service adjustments only.

FIGURE 6. RADIO CONTROL BOX BC-690-A

f. Radio Receiver BC-688-A (includes Mounting FT-282-A)

Radio Receiver BC-688-A amplifies the reflected signals picked up by the receiving antenna array and converts them into a form suitable for operating Indicator I-102-A. It may be mounted independently or grouped with Radio Transmitter BC-689-A and Power Unit PE-112-A. The location must provide complete freedom for Mounting FT-282-A with ample clearance to permit rocking. The connection cables must be dressed to prevent additional loading or restriction of movement of the shock mountings.

g. Radio Transmitter BC-689-A (includes Mounting FT-282-A)

Radio Transmitter BC-689-A contains the power oscillators, timing oscillators, and circuits for modulating the r-f carrier. It is mounted in a similar manner to Radio Receiver BC-688-A on Mounting FT-282-A and requires careful dressing of cable.

FIGURE 7. RADIO RECEIVER BC-688-A

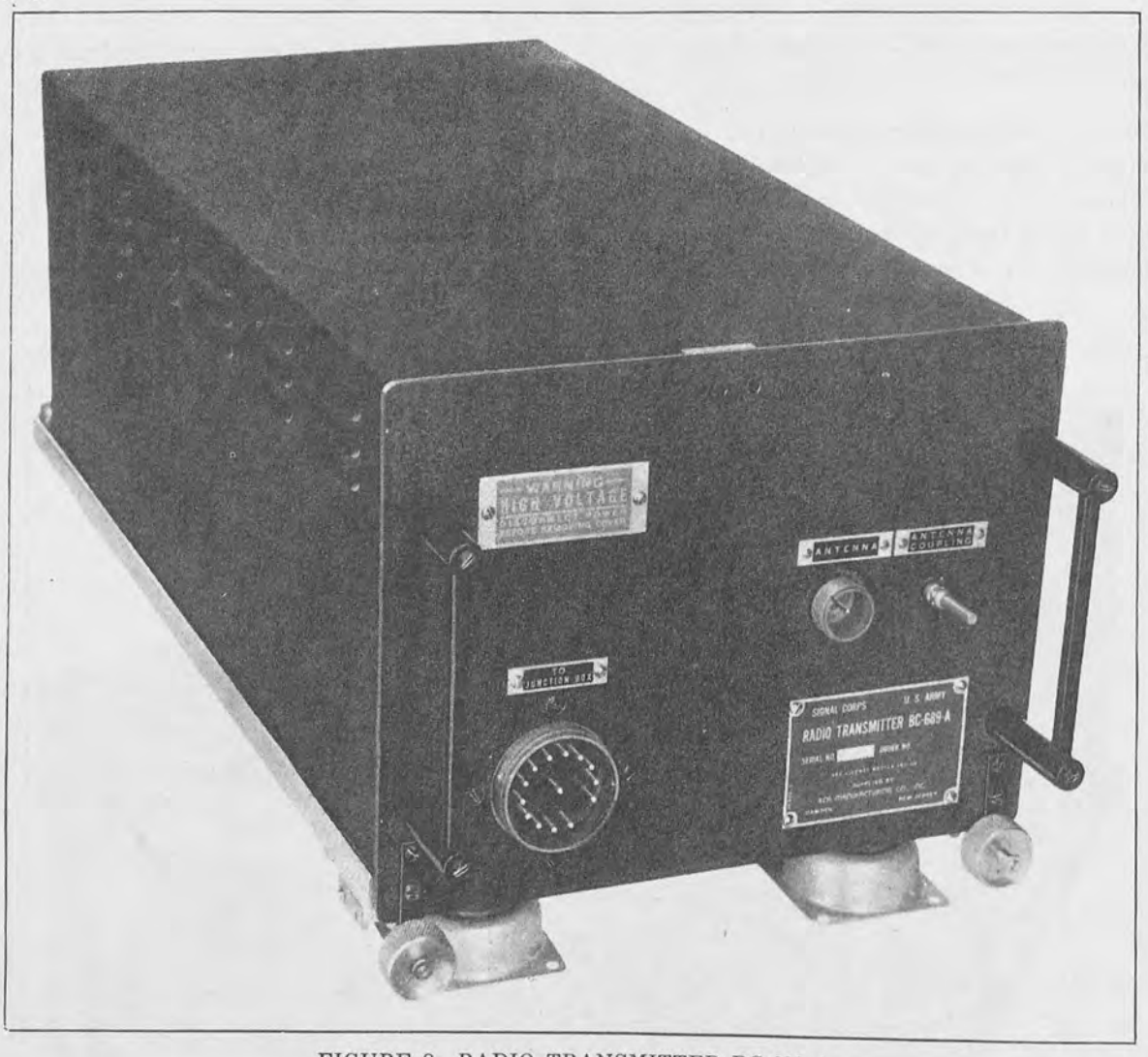
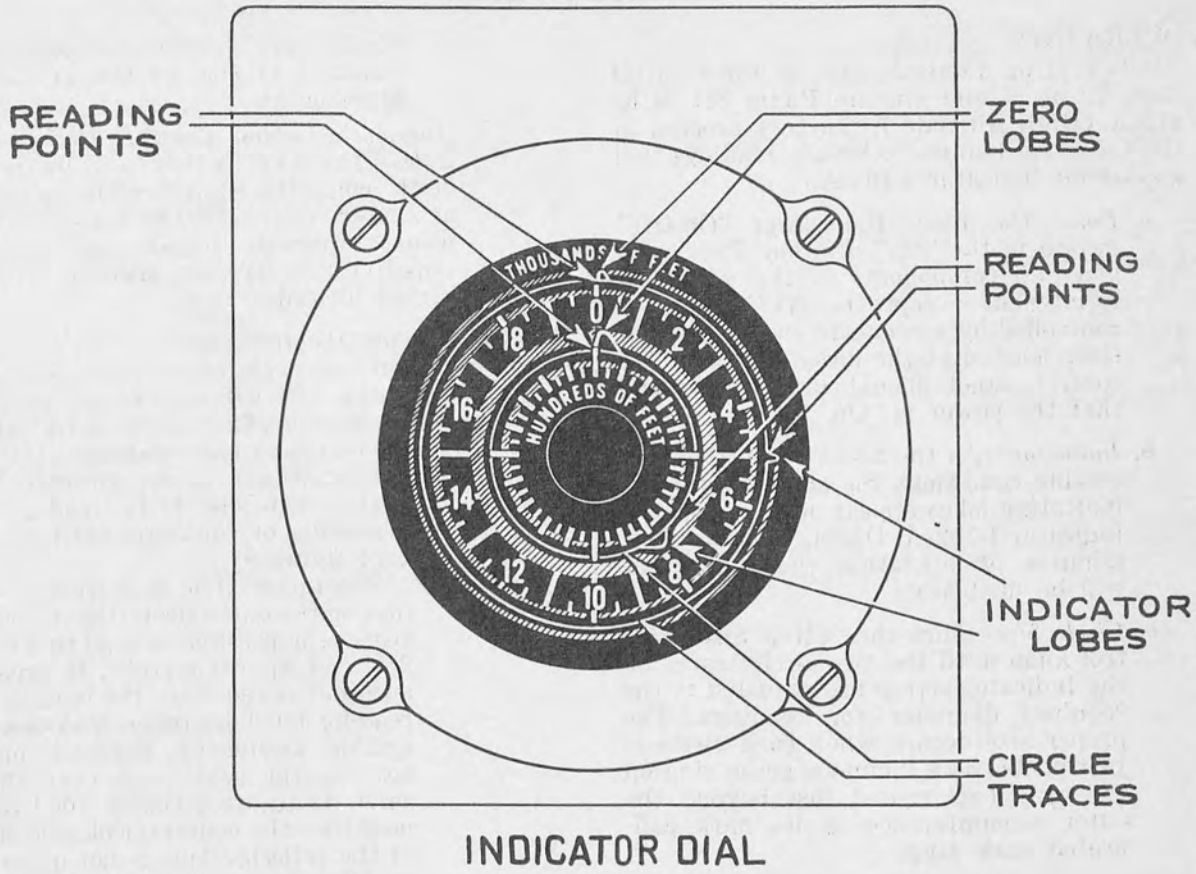


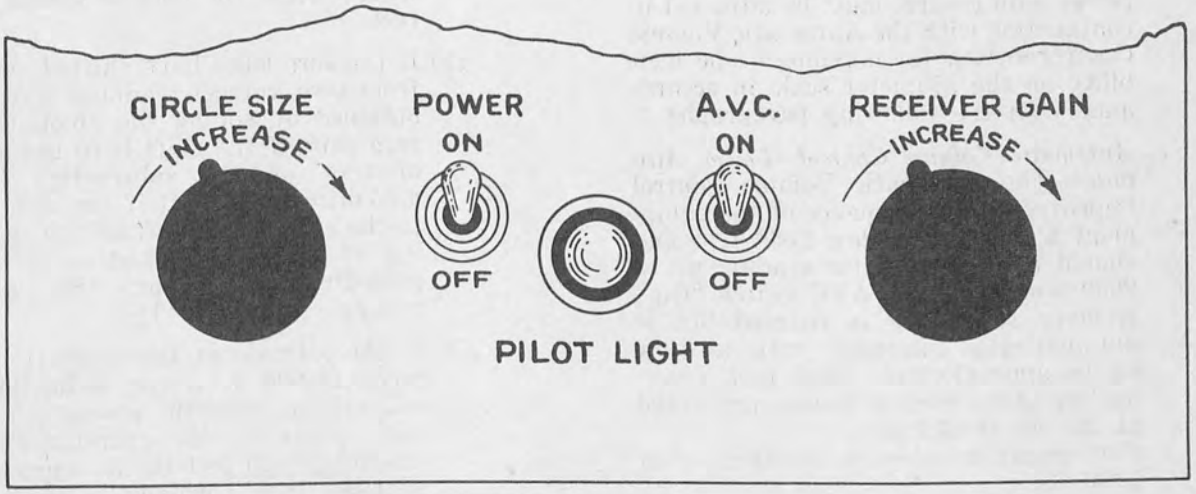
FIGURE 8. RADIO TRANSMITTER BC-689-A

3. TABLE OF MAIN COMPONENTS

Quan.	Unit	Size in Inches	Weight in Pounds
2	Antenna Equipments RC-128-A (each comprising two antennas AN-69-A and one Cord CD-645) and Transmission Line (Cable WC-552-A) and Connectors.	AN-69-A 8¼ x 7½ x 1 over-all; . . . Base Plate of AN-69-A 3 x 1¾	8.5
1	Cord CD-646, Control Box to Junction Box, 40 feet long.	Conduit 0.920 o.d. . . . . . Plug PL-208 and PL-209 2¼ x 2 o.d.	13.1
1	Cord CD-648, Control Box to Indicator, 6 feet long.	Conduit 1.210 o.d. . . . . . Plug PL-210 2½ x 2 o.d. Plug PL-211 2¼ x 2 o.d.	3.1
1	Junction Box JB-46-A, including Cords CD-647, CD-649, and CD-650 (cords each 4 feet long).	JB-46-A 7½ x 7⅛ x 3⅝; . . . . . . Conduit 0.765 o.d. Plugs PL-206 and PL-207 2⅛ x 2 o.d. Plug PL-205 2⅛ x 1-11/16 o.d.	7.0
1	Indicator I-102-A including Cathode Ray Tube.	13-3/32 x 4⅞ x 5⅛	3.4
1	Power Unit PE-112-A including Mounting FT-322-A, Fuses and Spare Fuses.	23 x 5-11/32 x 9-1/32	20.5
1	Radio Control Box BC-690-A.	7½ x 6⅛ x 5¾	5.1
1	Radio Receiver BC-688-A including Mounting FT-282-A.	23 x 10-7/16 x 9-1/32	14.8
1	Radio Transmitter BC-689-A including Mounting FT-282-A.	23 x 10-7/16 x 9-1/32	18.3
			93.8



INDICATOR DIAL



CONTROLS

FIGURE 9. CONTROLS AND INDICATOR DIAL

SECTION II

EMPLOYMENT

4. OPERATION

All Operating Controls are on the Control Box. To start and operate Radio Set SCR-518-A (High Altitude Altimeter) proceed in the following manner. Altitude readings will appear on Indicator I-102-A.

a. Power On—Place the power "On-Off" switch in the "On" position. This energizes all components of the Altimeter Equipment except the AVC which is controlled by a separate switch. A pilot lamp located at the lower center of the control panel should light, indicating that the power is "On."

b. Indicator—As the tubes reach their operating conditions the circle traces and indicating lobes appear on the screen of Indicator I-102-A. During the first few minutes of operation the indications will be unsteady.

c. Circle Size—Turn the "Circle Size" control knob until the two circle traces on the Indicator screen are adjusted to the required diameter for readings. The proper size occurs when each circle is just visible as a luminous green ring on the gray background just beyond the outer circumference of its dark calibrated scale ring.

d. Sensitivity—Turn the "Receiver Gain" control to adjust the lobe readings for clearest legibility on the indicator screen. Maximum receiver sensitivity may be used at the higher altitudes and less than maximum sensitivity may be required at the lower altitudes. The receiver gain control must be adjusted in conjunction with the Automatic Volume Control switch for maximum lobe legibility on the altimeter scale in accordance with the following paragraphs.

e. Automatic Volume Control—Lower Altitudes—The Automatic Volume Control improves the performance of the equipment at altitudes below 2000 feet and should only be used for reading up to 2000 feet. With the AVC switch "On," receiver sensitivity is reduced but is automatically increased with altitude up to approximately 2000 feet. Overloading of the receiver is thus prevented at the lower altitudes.

For operation when descending below 2000 feet:

(1) At any convenient altitude above 1000 feet throw AVC Switch "On."

(2) Adjust "Receiver Gain" control until the initial lobe appearing at zero on the 2000-foot scale is the proper height.

(3) The reception lobe giving the altitude reading on the 2000-foot scale should now remain approximately constant in size as the ground is approached.

f. Automatic Volume Control—Higher Altitudes—The AVC Switch must be turned "Off" when the equipment is operating at altitude above 2000 feet, as the AVC would otherwise impair the receiver sensitivity in certain sections of the higher altitude ranges.

g. Reading the Indicator—

(1) On each scale (inner and outer) the index lobe will appear at the zero calibration. The second or reflection lobe on each scale indicates the absolute altitude of the aircraft. The part of the lobe to be read is the beginning or counterclockwise edge (see figure 9).

The inner circle is merely a vernier on the outer circle. On the outer circle it is possible to read to within 250 feet approximately; if greater accuracy is required, the inner scale reading must be taken into consideration, as follows: Read the outer scale to the next lower even thousand (in figure 9 this is 4000 feet; note that the counterclockwise edge of the reflected lobe is not quite up to 5000 feet). To the next lower even thousand foot reading of the outer scale (4000 feet) add the reading obtained from the inner scale, which is 750 feet. The actual altitude displayed in Figure 9 is, therefore, 4750 feet. The inner scale can, with practice, be read to within 25 feet.

(2) If the zero lobes have shifted away from zero, correct readings may be obtained by adding the amount of zero shift if the shift is to the left of zero, and by subtracting the amount of zero shift if the shift is to the right of zero, from the reading of altitude obtained as in the preceding paragraphs. (See also paragraph 5b below.)

(3) If the altitude of the aircraft exceeds 20,000 feet, the indications will still indicate the absolute altitude, providing the operator adds exactly 20,000 feet to the apparent altitude. It will usually be obvious (from the pressure altimeter, for instance) when the aircraft is at or above 20,000 feet. For example, if the operator knows that the aircraft is at least 20,000 feet high, but the indicator shows only 2700 feet, the actual altitude is obviously 22,700 feet. (See par. 5c concerning use of the altimeter at higher altitudes.)

h. Terrain—Flying over rough terrain will show fluctuating indications and flying over water should give a steady indication.

5. PRECAUTIONS DURING OPERATION

a. Accuracy of Reading—Under normal variable service conditions the following inaccuracies of performance are to be expected.

Initial deviation from perfect accuracy 50 feet + ¼ of 1% of the time or absolute altitude.

At zero altitude — maximum error in reading—50 feet.

At 20,000 feet altitude—maximum error in reading—100 feet.

Example: Maximum reading at 20,000 feet—20,000 + 50 + 0.0025 x 20,000 = 20,100 feet. Minimum reading at 20,000 feet —20,000 − (50 + 0.0025 x 20,000) = 19,900 feet.

b. Observable Defects

(1) Circle traces of unsymmetrical shape will cause inaccurate readings.

(2) Circle traces badly off center will cause inaccurate readings.

(3) Shifting of zero transmission lobes will cause incorrect scale readings, but correct readings may be obtained by adding or subtracting the "shift reading" of the zero lobe to or from the indicator reception lobe reading.

c. Excessive Altitudes—Use of Radio Set SCR-518-A (High Altitude Altimeter) at altitudes in excess of 30,000 feet may result in impaired operation.