NAVSHIPS 93329

TECHNICAL MANUAL

for

RADIAC
DETECTOR CHARGER
PP-354E/PD

LANDSVERK ELECTROMETER CO.
GLENDALE, CALIFORNIA

Department of the Navy
Bureau of Ships

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PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
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DEPARTMENT OF THE NAVY
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IN REPLY REFER TO
Code 346E-100

From: Chief, Bureau of Ships
To: All Activities concerned with the Installation, Operation, and Maintenance of the Subject Equipment

Subj: Technical Manual for Radiac Detector Charger PP-354E/PD, NAVSHIPS 93329

1. This is the Technical Manual for the subject equipment and is in effect upon receipt.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

4. Errors found in this publication (other than obvious typographical errors), which have not been corrected by means of Temporary Corrections or Permanent Changes should be reported. Such report should include the complete title of the publication and the publication number (short title); identify the page and line or figure and location of the error; and be forwarded to the Electronics Publications Section of the Bureau of Ships.

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H. K. JAMES
Chief of Bureau

RECORD OF CORRECTIONS MADE

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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GUARANTEE

The equipment including all parts and spare parts except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government, provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears and Contractor is notified thereof in writing within the aforementioned period and the defect is not the result of normal expected shelf life deterioration.

INSTALLATION RECORD

Contract	*Date*
NObsr 75142	31 Dec. 1957
NObsr 75613	21 Nov. 1958

Serial Number of equipment .....
Date of acceptance by the Navy .....
Date of delivery to contract destination .....
Date of completion of installation .....
Date placed in service .....

Blank spaces on this page shall be filled in at time of installation. Operating personnel shall also mark the "date placed in service" on the date of acceptance plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using NAVSHIPS NBS 383 (revised) except for Marine Corps equipment, in which case the "Signal Equipment Failure Report" form shall be used and distributed in accordance with instructions pertaining thereto. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superceding instructions.

RADIOLOGICAL SAFETY WARNING

All personnel working in high intensity levels of radioactivity must exercise caution to prevent bedily damage. While the radiation from radioactive substances can not usually be seen or felt, prolonged or intensive exposure may result in serious damage. One tenth of a roentgen per day (.1 R/day) is considered to be the maximum amount of such radiation which can be absorbed continuously, every day, without serious damage.

If a radioactive source is required for calibration of the instrument described herein, due care must be exercised in handling it. The safety instructions enclosed herein, and with the source, must be closely followed.

Radio Activity Detection Identification And Computation

DEFINITIONS OF RADIOACTIVITY TERMS

Charger, radiac detector. A device for providing an electrostatic charge to a radiac detector. May include means for mesuring the amount of charge.

Computer-Indicator, radiac. A device which performs the combined function of computing and indicating radiac data.

Computer, radiac. A device which receives information from a radiac detector and does one or more of the following: scales, integrates or counts. Does not indicate.

Densitometer. An item specifically designed to measure the density or opacity of material.

Detector-Computer, radiac. A device specifically designed to detect and compute radioactivity information.

Detector, radiac. A device that is sensitive to radioactivity or free nuclear particles and produces a reaction which can be interpreted or measured by other components.

Indicator, radiac. A device which displays radioactivity detection, identification or computation information.

Radiacmeter. A device specifically designed to detect and indicate radioactivity. May or may not include radiac computer.

Radiac set. All the components and items required for a complete radioactivity detecting and measuring system.

Receptor, radiac. All the components and items required to receive record and/or indicate radioactivity data transmitted by a radiac data transmitting set.

Transmitting set, radiac data. All the components and items required to detect radioactivity and transmit radioactivity.

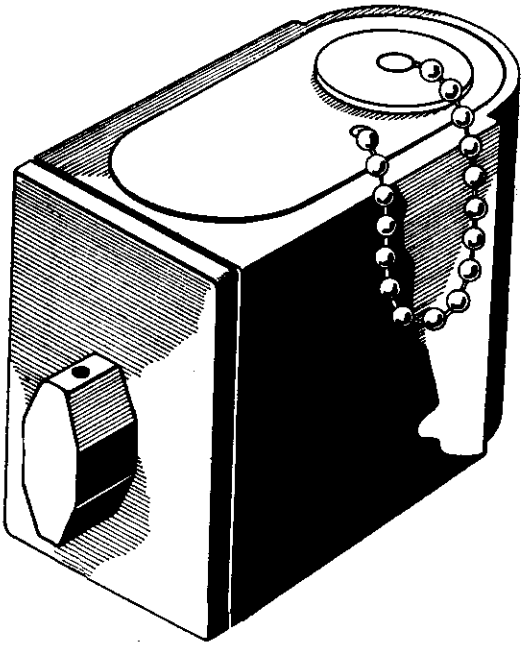


Figure 1-1. Radiac Detector Charger PP-354E/PD

SECTION 1

GENERAL DESCRIPTION

1. INSTRUCTION BOOK SCOPE.

This instruction book is concerned with Radiac Detector Charger PP-354E/PD. It contains data pertaining to the theory of operation, operation and maintenance of this unit, which is used for charging radiacmeters used for radiological survey purposes. This book supersedes all previous instruction books for this unit.

2. PURPOSE AND BASIC PRINCIPLES.

a. Radiac Detector Charger PP-354E/PD is used to charge Radiacmeters IM-9A/PD and higher, IM-50/PD series, IM-19/PD series, IM-143/PD series, and IM-20/PD series or similar types. The radiacmeters, more commonly called dosimeters, are used to give a continuous indication of the total amount of gamma radiation that they have been exposed to since charging.

b. Radiac Detector Charger PP-354E/PD is a frictional generator of static electricity. It caintains a socket for the radiacmeters that serves the dual purpose of electrical connection and mechanical clamping. Radiac Detector Charger PP-354E/PD (hereafter called simply the charger) directly converts the mechanical motion of turning its knob into a static electrical potential and hence requires no battery or other power source for its operation. The charger can be conveniently carried in the user's pocket.

3. PHYSICAL DESCRIPTION.

(See figure 1-1.)

Radiac Detector Charger PP-354E/PD is contained in a watertight case measuring 2-7/16 inches long by one inch wide by two inches high, overall. The hinged top section of the case contains the upper part of the charging socket, which continues into the body of the case. A removable plug closes the charging socket when it is not in use and the plug is secured to the charger by a length of bead chain. The bar-type operating knob for the charger is mounted on one end of the case. A window is provided in the bottom of the case to permit transmission of light to the radiacmeter.

Note

The dust cap is not watertight. If water collects in the receptacle, it should be thoroughly dried before use.

Although the charger is not of one-piece construction, it cannot be feasibly disassembled for maintenance purposes.

4. REFERENCE DATA.

a. NOMENCLATURE—Radiac Detector Charger PP-354E/PD.

b. CONTRACT DATA.—NObsr 75613, dated November 21, 1958.

c. CONTRACTOR.—Landsverk Electrometer Company, Glendale, California.

d. MANUFACTURER.—Landsverk Electrometer Company, Glendale, California.

e. COGNIZANT NAVAL INSPECTOR.—Inspector of Naval Material, Los Angeles, California.

f. RANGE.—0-250 DC volts, approximately.

g. POWER SUPPLY.—Self-contained frictional electrostatic generator.

h. OTHER RADIAC EQUIPMENT INVOLVED.—Radiacmeters IM-9A/PD and higher, IM-50/PD series, IM-19/PD series, IM-143/PD series, and IM-20/PD series or similar types.

i. DIMENSIONAL DATA.—2-7/16 inches long by 1 inch wide by 2 inches high overall.

j. WEIGHT.—2-½ ounces.

k. HEAT DISSIPATION.—None.

5. SIMILARITIES TO EXISTING EQUIPMENTS.

a. Radiac Detector Charger PP-354C/PD is similar to PP-354E/PD except for internal mechanical construction. Except it has no voltage regulator circuit.

b. Radiac Detector Charger PP-311/PD series is a similar type of equipment, but it is powered by dry batteries and is larger and heavier.

6. NON-INTERCHANGEABILITY

Radiac Detector Charger PP-354/PD cannot be used to charge the radiacmeters that can be charged with PP-354E/PD because of incorrect dimensional tolerances. Table 1-1 shows the applicability of the other radiac detector chargers.

TABLE 1-1. APPLICABILITY OF RADIAC DETECTOR CHARGER TYPES

RADIAC DETECTOR CHARGER TYPES	RADIACMETER TYPES				
	IM-9/PD	IM-9A/PD or higher	IM-50/PD series	IM-19/PD series	IM-20/PD series
PP-354B/PD PP-354C/PD and PP-354E/PD	No	Yes	Yes	Yes	Yes
PP-311/PD	Yes	Yes	Yes	Yes	Yes

SECTION 2

THEORY OF OPERATION

1. INTRODUCTION

Radiacmeters IM-9A/PD or higher, IM-50/PD series, IM-19/PD series, IM-143/PD series, and IM-20/PD series or similar types, require a source of DC voltage for charging purposes prior to use. Since the charging current required is very minute, the use of a frictional electrostatic generator is practical, in spite of the inherently high impedance of this type of generator. The voltage required to charge these radiacmeters, approximately 150 volts, can be obtained from an electrostatic generator of relatively small dimensions by the expenditure of a small amount of mechanical energy.

2. DETAILED THEORY OF OPERATION.

(See figure 2-1.)

a. ELECTROSTATIC GENERATOR. — The electrostatic generator used in this charger is contained within a plastic case that mounts within the charger. The generator consists of a rotor mounted on the shaft that also mounts the operating knob, an exciter pressed against the rotor by a spring, and a collector that serves as an electrode. The case of the generator is completely sealed, except for the operating shaft opening which is protected by a gasket. The exciter connects to the center pin of the charging socket and the collector connects to the body of the charger.

The generator operates in the following manner: When the operating knob is turned in a clockwise direction the exciter induces a positive charge on the surface of the rotor, and continued rotation brings the charged area under the collector. The edgewise contact of the collector effectively removes the charge for use as a DC potential. The charge will build up an increasing potential as long as the operating knob is turned and since the generator has extremely low internal leakage the potential thus produced will not leak off when the rotation of the operating knob is stopped. At approximately 200 volts, a gas diode voltage limiting tube will fire, reducing the charge. Reversal of the direction of knob rotation, operates a double pole double throw switch reversing the polarity of the generator output.

b. CHARGING SOCKET.—*(See figure 2-2.)*— The main portion of the charging socket is within the body of the charger (see A). A matching hole in the hinged top section serves to clamp the radiacmeter under charge into the socket.

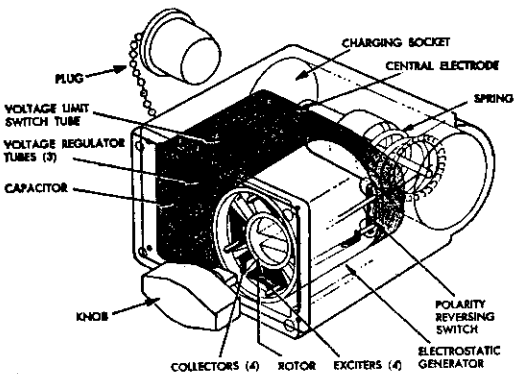
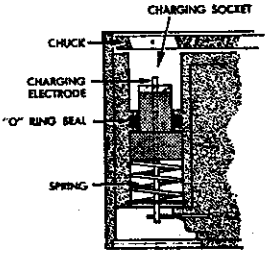
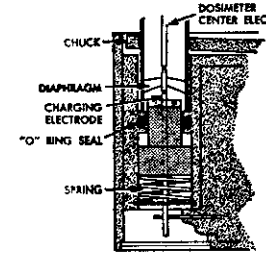


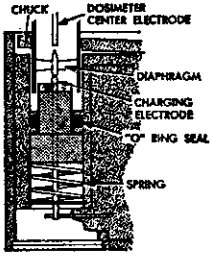
Figure 2-1. Radiac Detector Charger PP-354E/PD. Phantom View



A. Detail of charging socket.



B. Radiacmeter locked in charging postion.



C. Radiacmeter disconnected

Figure 2-2. Charging Socket Action

The center electrode of the charging socket is spring-mounted to provide a firm contact with the center electrode of the radiacmeter. When the radiacmeter is pressed into the charging socket and seats on the socket shoulder the springs are compressed and the diaphragm of the radiacmeter is flexed to make contact with the electrometer center electrode (see B). A polystryrene ring from the case, acts as a capacitor. The center electrode and the metal ring connect to one terminal of the electrostatic generator. When the top section is depressed after charging, the radiacmeter connection to the charger center electrode is broken (see C).

A plug is provided to seal the charging socket when the charger is not in use. The plug is attached to the charger by a length of bed chain.

c. CHARGER CONSTRUCTION. — With the charging socket plug in place the charger may be carried in a pocket without damage from dust. The window in the bottom of the charger and the cover plate for the electrostatic generator are both sealed.

SECTION 3

OPERATION

1. CONTROLS AND SOCKET.

The operating controls and the socket of Radiac Detector Charger PP-354E/PD are described below:

KNOB.—The operating knob of the charger actuates the electrostatic generator. It is normally turned in a clockwise direction. Counterclockwise rotation of the knob will reverse the polarity of the generator and reduce the charge.

HINGED TOP SECTION.—The hinged top section provides a clamping arrangement for the radiacmeter being charged.

SOCKET.—The charging socket provides a connection for the radiacmeter being charged. A plug is provided to protect the socket from dust when the charger is not in use.

2. OPERATING INSTRUCTIONS

(See figure 3-1.)

To operate Rradiac Detector Charger PP-354E/PD, proceed as directed below:

Step 1. Grasp the charger and depress the hinged top section.

Step 2. With the other hand, grasp the bead chain on the charging socket plug and pull the plug out.

Step 3. Insert the user radiacmeter in the charging socket while still holding the hinged top section, then release the top section.

This charger can be used with radiacmeters 1M-9A/PD and higher, 1M-50/PD series, 1M-19/PD series, 1M-20/PD series, 1M-93/PD series and 1M-143/PD series

1 Grasp the charger and depress hinged top section

2 Pull plug from charging socket by means of chain

NOTE

Always keep plug in charging socket when charger is not in use

3 Insert radiacmeter in charging socket while still holding top section down, then release top section

4 Place charger on a flat surface, then press radiacmeter into socket to seat it on the shoulder on the bottom of the socket

Plug for charging socket

5 Hold up to light and while viewing radiacmeter scale, turn charging knob clockwise to bring fiber image into view, continue knob rotation until fiber image is the equivalent of approximately 1 division MR to left of zero. If fiber image moves too far to the left, turn knob counterclockwise to bring it back

NOTE: Turning knob clockwise moves fiber to left (down scale) while viewing radiacmeter

6 Depress hinged top section—fiber image should move to zero, if it does not, repeat steps 4, 5 and 6, making the necessary allowance in fiber image position to the left of zero

7 Hold hinged top section down and remove radiacmeter

8 Replace plug in charging socket

NOTE: Turning knob moves fibre to left (down scale) while viewing Radiacmeter

Figure 3-1. Radiac Detector Charger PP-354E/PD, Operating Instructions

CAUTION

This charger cannot be used with Radiacmeter IM-9/PD.

Note

The charging procedure will be facilitated if the radiacmeter is placed in the charger so that the radiacmeter scale is horizontal and reads from left to right when the charger is in the position shown in Figure 3-1.

Step 4. Place the charger on a flat surface, then press the radiacmeter into the charging socket to seat it against the shoulder of the socket.

Note

Radiacmeters employ a diaphragm-type connection for the center electrode. Contact between the center electrode of charging socket and that of the radiacmeter cannot be made unless the diaphragm is flexed.

Step 5. While viewing the radiacmeter scale, turn the charging knob clockwise to bring the fiber image into view. Continue clockwise knob rotation until the fiber image has been moved the equivalent of one division to the left of zero. If the fiber image is moved too far to the left, turn the charging knob counter-clockwise to bring it back to the right position.

Note

On some Radiacmeter IM-9A/PD units the charging contact may not be made in the locking position. This will be evidenced by no control of the radiacmeter fiber. To charge such units, the charger must be held, so that the radiacmeter scale can be viewed while pressure is being exerted on the radiacmeter to seat it.

Step 6. Depress hinged top section and remove the radiacmeter.

Step 7. Replace the plug in the charging socket.

SECTION 4
MAINTENANCE

Radiac Detector Charger PP-354E/PD cannot be repaired because it cannot feasibly be disassembled. Therefore a faulty charger should be removed from use and turned into the nearest repair facility if a simple cleaning of its exterior surfaces and the charging socket does not restore it to working condition.

The exterior surfaces of the charger can be cleaned with a clean lintless cloth. Rub gently over all surfaces. Do not use any solvent on the exterior surfaces.

Particles of dust or lint in the charging socket can usually be removed with a steam of clean dry air. Exceptionally stubborn particles may have to be flushed out carefully with pure water-free petroleum ether. Use the least amount of petroleum ether possible, then evaporate it with blasts of air.

CAUTION

Do not blow the breath into the charging socket to clean it.

Moisture resulting from condensation can be removed by heating the charger with a 60 watt lamp. Place the bulb about six inches away from the charging socket opening and leave for about fitteen minutes.

Note

After cleaning the charger by any of the methods described above, it must be checked by charging two or more radiacmeters several times. Any evidence of imperfect operation, such as leakage or difficulty in charging, should warrant removing the charger from use.

CAUTION

Maintenance personnel must always be cognizant of the fact that Radiac equipment is used for the primary purpose of protecting human life and health, and for that reason should not permit the use of faulty Radiac equipment.

SECTION 5
PARTS LISTS

Note

Radiac Detector Charger PP-354E/PD employs a construction not amenable to disassembly and therefore its component parts cannot be feasibly replaced. Repair facilities should survey faulty chargers in accordance with current instructions.