INSTRUCTION MANUAL

1.0 GENERAL DESCRIPTION

The Chatham CH-720 was designed specifically to fulfill the requirements of the Civil Defense High Range Radiological Survey Meter CD V-720. Utilizing three ranges of 5, 50, and 500 roentgens per hour full scale, it measures gamma and x-ray radiation fields from 0.5 to 500 roentgens per hour and detects beta particle radiation even in the presence of such fields. An air-filled ionization chamber serves as the radiation detecting element. The chamber has a thin window which permits the transmission of beta particles into the chamber volume, thereby making detection possible. With the window covered by a movable shutter the instrument responds only to gamma or x-radiation. When the shutter is placed in the open position, the beta window is exposed and the unit also responds to beta radiation.

The current produced in the ionization chamber by the action of a radiation field is amplified by a single electrometer-tube circuit and then measured on a meter with an easily-read, linear scale, thereby providing a visual indication of the magnitude of the radiation field. The power for both the amplifier section and the ionization chamber is obtained from batteries.

The instrument can be carried easily in one hand by means of the handle or suspended comfortably from the neck or shoulder with the adjustable carrying strap. It is completely ruggedized and designed to operate under adverse field conditions.

The accuracy of the instrument is within ± 15% of true dose rate throughout a temperature range from −20°F to +125°F. It is also within ± 15% for photon energies from .08 MeV to 1.2 MeV with the beta shutter in either the open or closed position. It is unaffected by altitude changes up to 25,000 feet.

2.0 THEORY OF OPERATION

When the instrument is exposed to radiation some of the energy of the radiation field is absorbed within the walls of the ionization chamber. As a result, electrons are ejected from the walls into the air contained within the chamber. As these electrons traverse the chamber, they create a considerable amount of ionization in the air by collision processes. Under the influence of the electric field existing between the chamber electrodes the ions move to the electrodes and are collected. Thus, a current which is directly proportional to the magnitude of the radiation field flows in the external circuit connected to the ionization chamber.

When the thin beta window of the chamber is exposed, beta particles can penetrate the chamber and initiate the process described above. Since the movable beta shutter is sufficiently thick to stop these particles, the instrument will not respond to this form of radiation with the shutter in the fully closed position.

3.0 INSTALLATION

3.1 Battery Installation and Replacement

The top cover assembly should first be removed by loosening the fastening screw and slowly raising the top cover from the case shell. This should be done carefully to avoid any excessive strain on the ionization chamber cable. The back end of the top cover should be tilted upwards until the ionization chamber cable can be disconnected by gently pulling on the aluminum tubing which shields the cable plug-in connector. Also remove the ground connection by pulling off slowly. The batteries can now be installed in the following manner:

1. Close the 22½ volt battery strap by means of the snap fastener.
2. Insert the positive side of the plate supply battery as shown in figure 3 making sure that the pin on the battery contact terminal fits into the hole in the contact plate on the battery. The positive terminals of all three batteries should be toward the + POS. marking on the battery mounting bracket.

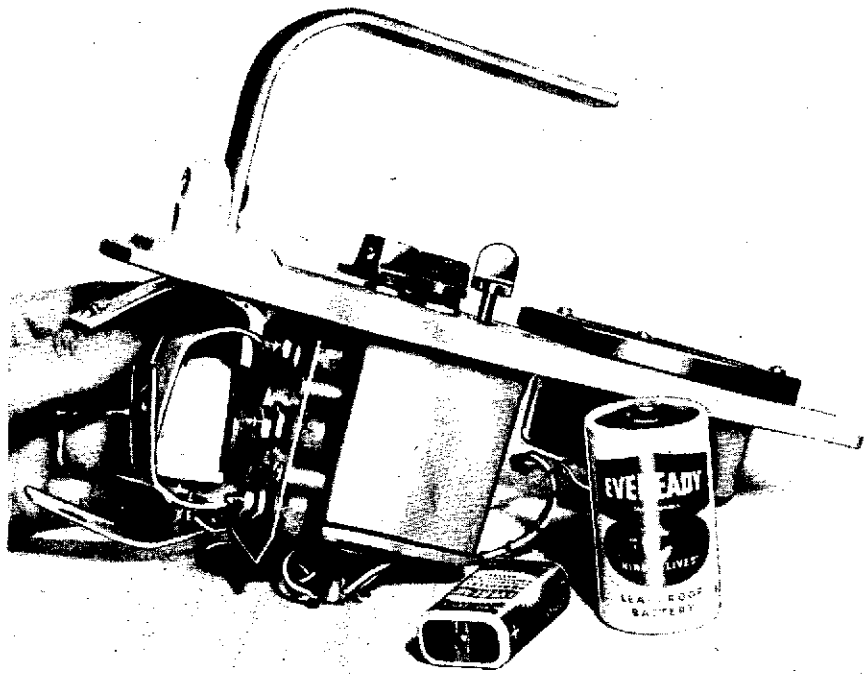

Figure 3

3. Press the negative side of the battery into the strap until the contact pin slides into the hole on the negative contact plate of the battery.
4. Repeat steps 2 and 3 to insert the second 22½ volt battery.
5. Close the 1½ volt D-cell battery strap by means of the snap fastener.

6. Insert the button contact which forms the positive terminal of the 1½ volt D-cell into the positive battery contact terminal as shown in figure 4.

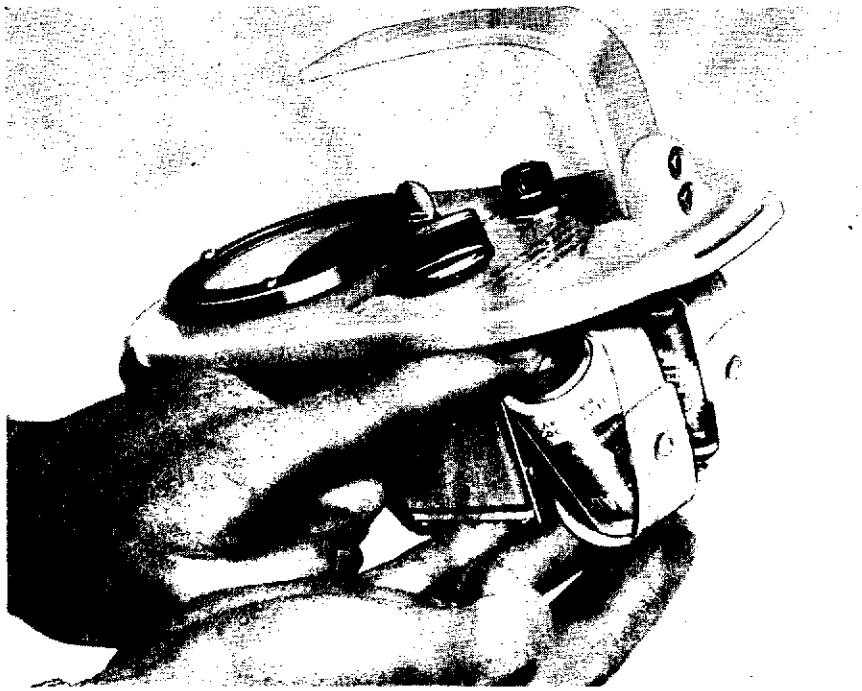

Figure 4

7. Press the negative side of the battery into the strap until the negative battery contact terminal slides into the recess on the negative side of the battery. The battery strap will also make adequate contact with other types of batteries which do not have the recess on the negative side.

3.2 Carrying Strap

The carrying strap is attached to the instrument by inserting each end of the strap through the respective slots at the ends of the top cover and then threading the ends through the adjusting slides. The adjusting slides are also used to vary the length of the strap to a suitable carrying position.

4.0 OPERATION

4.1 General

The instrument has been designed so that a minimum of attention on the part of the operator is required to obtain satisfactory performance. After properly installing the batteries and carrying strap as described in section 3, the unit is set into operation by carrying out the procedures described below.

4.2 Zero Adjust

The SELECTOR SWITCH should be rotated clockwise to the ZERO position and the ZERO control located on the top cover adjusted until the meter reads zero. This step can be carried out at any time during the operational life of the instrument and under any conditions of radiation.

4.3 Circuit Check

The SELECTOR SWITCH should now be rotated to the extreme counter-clockwise CHECK position and maintained in that position while the reading is noted. This reading should be above the CIRCUIT CHECK mark on the meter. If at any time during the operation of the unit this reading is below the mark, the batteries should be checked and the defective ones replaced.
The operator will notice that upon release, the SELECTOR SWITCH automatically returns to the OFF position so that it is necessary to maintain pressure on the switch to hold it in the CIRCUIT CHECK position. This is done to eliminate the possibility of inadvertently leaving the instrument on in the CIRCUIT CHECK position.
A fresh set of batteries provide a minimum of 150 hours of continuous service under normal conditions.

4.4 Determination of Radiation Field

The selector switch should now be rotated to the X-100 range. If no deflection is obtained the X-10 range should be selected. Similarly, if no deflection is obtained the switch should be placed on the X-1 range and left on that range until an off-scale reading is obtained. When this occurs, the next highest range should be selected until the deflection can be read on one of the higher ranges. In all cases the magnitude of the radiation field will be given by the product of the meter reading and the scale multiplier.

EXAMPLE:

Assume a reading of 2.5 is obtained on the middle, or X-10 scale. The radiation field will, therefore, be 2.5 x 10, or 25 roentgens per hour.

5.0 OPERATORS MAINTENANCE

5.1 Batteries

The operator generally should not attempt any maintenance beyond the replacement of batteries, particularly under field conditions. The instrument is designed so that the batteries can be replaced without exposing any critical circuit elements and without requiring the use of special tools. Whenever the instrument is to be stored for prolonged periods of time, the batteries should first be removed to prevent any damage due to their deterioration in the equipment.