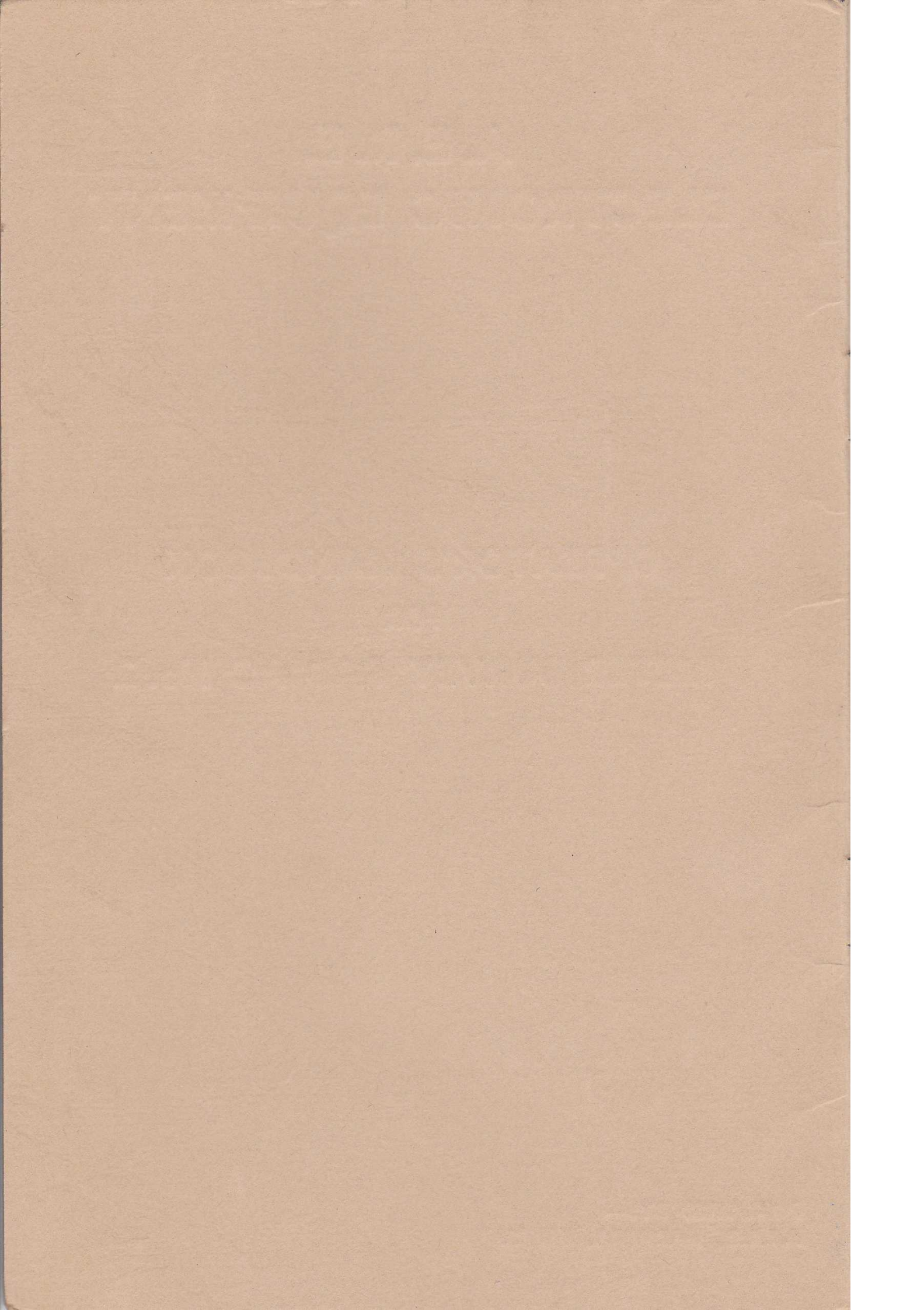


**A. E. R. E.**  
**ELECTRONIC EQUIPMENT**

**OPERATOR'S HANDBOOK**  
**FOR**  
**METER SURVEY RADIAC No. 2**

**PUBLISHED BY:—**  
**A.E.R.E., HARWELL, BERKS.**



METER SURVEY RADIAC NO. 2

OPERATOR'S HANDBOOK

FOREWORD

This booklet is produced expressly as an Operator's Handbook. It is intended to guide operators in the use of the above instrument. Full technical details and servicing instructions together with the circuit diagram and component details are given in the Instruction Manual.

Queries concerning this equipment should be addressed to:-

Dr. D. Taylor,  
Electronics Division,  
A.E.R.E.,  
Harwell,  
Nr. Didcot,  
Berkshire,  
England.

Additional copies of this handbook can be obtained from:-

Specifications and Manuals Section,  
A.E.R.E., Harwell, Nr. Didcot, Berks.

Price:- 2/6d.

September, 1955.

## AMENDMENT RECORD

To record the incorporation of an amendment in this hand-book sign against the appropriate number and insert the date.

Amendment No.	Amended by	Date
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OPERATOR'S HANDBOOK

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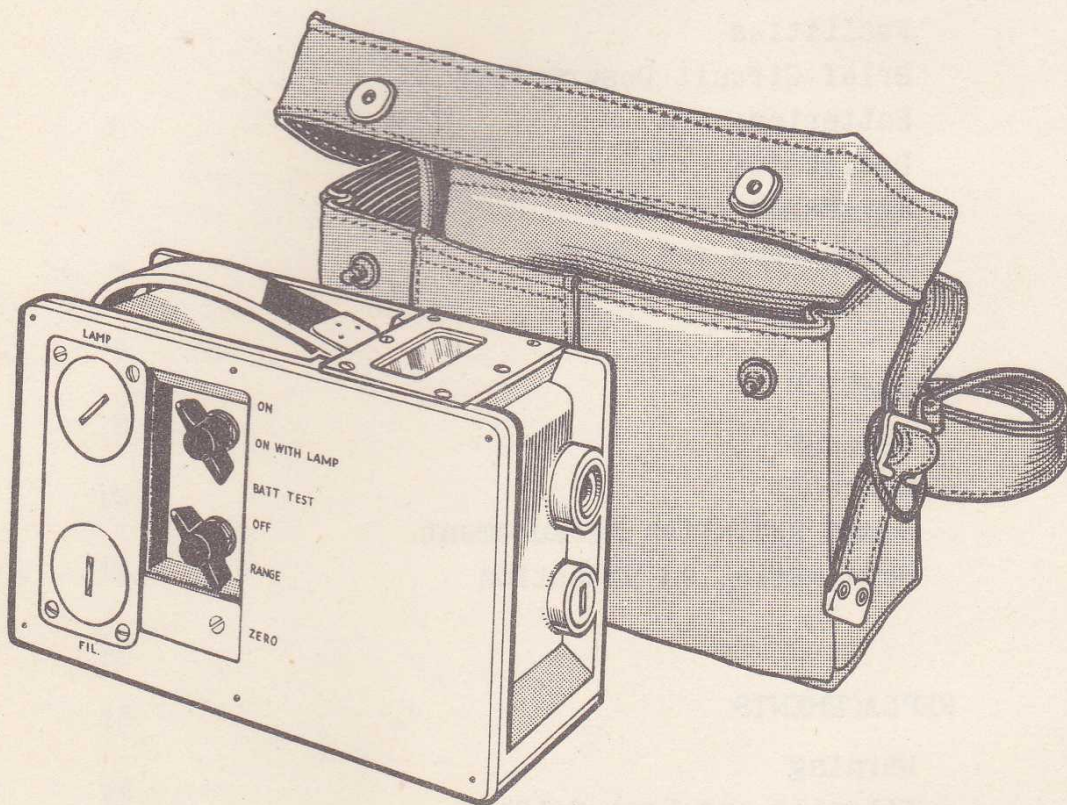
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METER SURVEY RADIAC NO. 2

## DESCRIPTION

### Function

The Meter Survey Radiac No. 2 is a portable battery operated instrument for the measurement of gamma radiation dose-rate over the range 0-300 R/hr.

### Facilities

The dose-rate in Roentgen-hour (R/hr.) is indicated on a direct reading meter with a linear scale. Three ranges are provided, 0-3R/hr., 0-30R/hr. 0-300R/hr. A moving scale on the meter is mechanically linked to the Range Switch to indicate the range in use. The ionisation chamber used has an air equivalent wall and the calibration is independent of gamma energy, within  $\pm 10\%$ , over the energy range 0.1-1MeV.

The instrument may be made sensitive to beta radiation by the removal of a panel which is normally screwed to the base of the instrument. A hinged flap and beta window assembly is opened when the base panel is removed. When the beta flap is open, beta particles of energy greater than about 0.4MeV can penetrate to the ionisation chamber detector element.

The operational controls are situated on the side of the instrument. When used for gamma measurement the instrument may be carried in its haversack, access to the controls is obtained through a flap on the side. The ON/OFF switch operates a flag on the meter to indicate the position of this switch. The meter scale can be illuminated by a lamp for use when the instrument is operated in the dark.

### Brief Circuit Description

The current collected in the ionisation chamber is measured by means of a single stage electrometer valve circuit. The indicating meter is connected in the cathode circuit of this valve and the standing current corresponding to zero ionisation chamber current is backed-off so that the meter reads zero deflection. The valve current is adjusted by varying the grid bias and the preset control that performs this function is known as the Set Zero Control. A further preset control provides for the adjustment of the sensitivity of the electrometer stage. This is known as the Calibration Control.

## Batteries

The batteries are located in a moulded compartment which is secured to the side plate and is sealed off from the main desiccated compartment.

Four batteries are used:-

Two 1.5V cells

Filament supply

Scale lamp supply

One 9V battery

Anode supply

One 30V battery

Chamber polarising supply

Grid bias supply

## Desiccator

A silica-gel desiccator is fitted to maintain a low relative humidity within the sealed compartment. The state of humidity within same may be determined by reference to the humidity indicator. The colour indication is azure blue when it is in a dry condition and tends to salmon pink when in a saturated state.

## Haversack Assembly

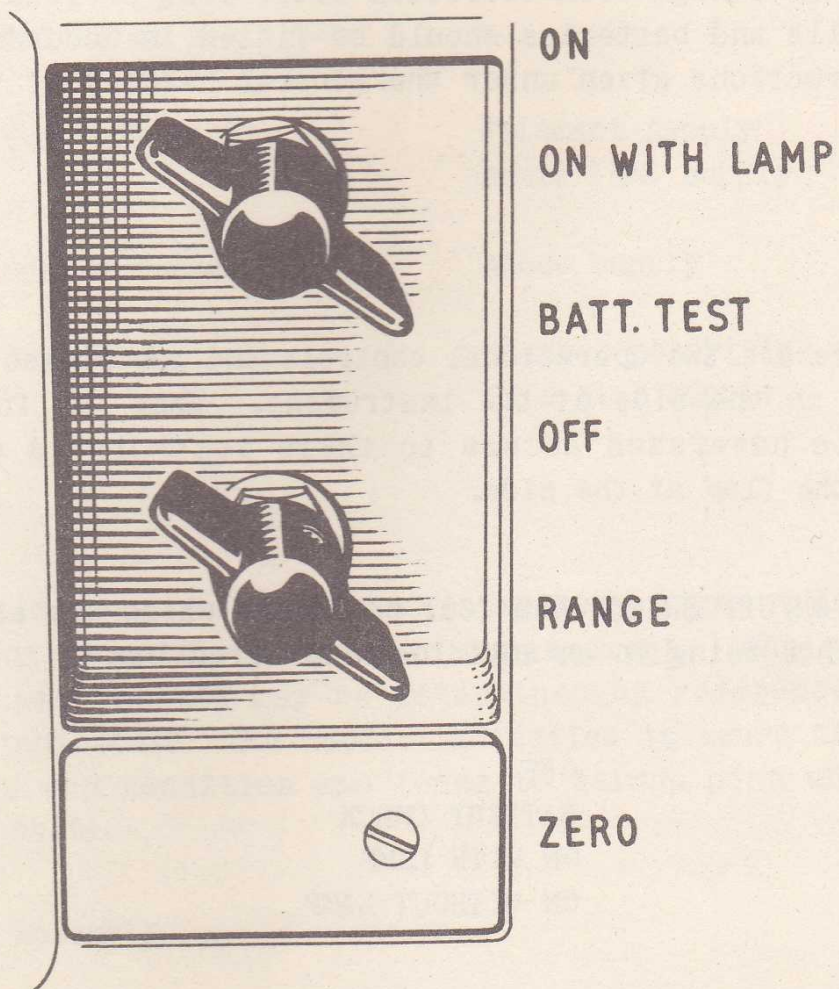
The instrument is normally used in a haversack which has a hinged lid with a toughened glass window. The haversack is made of a P.V.C. covered cotton material. A screwdriver for the adjustment of the preset controls is located in the lid of the haversack.

## Dimensions and Weight

Dimensions:-	Out of haversack	In haversack
Length	9.1/8"	11"
Width	3 3/4"	5"
Height	5.7/8"	7"

Weight including batteries:- 6 1/2 lbs.





### CONTROLS

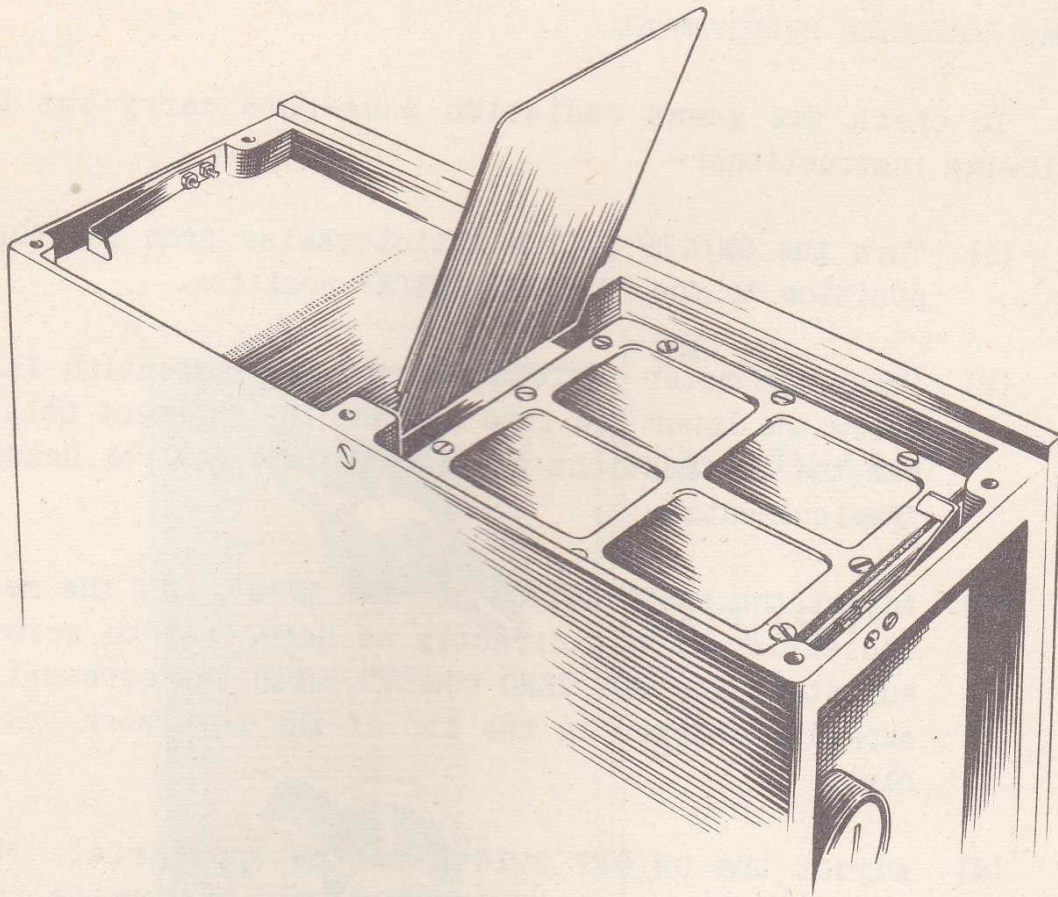
The SET ZERO CONTROL is a preset control for the adjustment of the meter zero. This is facilitated when the Range Switch is in the "Set Zero" position.

The CALIBRATION CONTROL should not normally be touched by the operator and should only be adjusted by the authority responsible for the maintenance of the instrument. Free access to this control is barred by a protective panel.

## Gamma Radiation Measurement

To check the gamma radiation dose-rate carry out the following instructions:-

- (1) Turn the ON/OFF SWITCH anticlockwise from the "OFF" position to the "BATTERY CHECK" position.
- (2) Check the meter indication. If the indication falls below the lower red line replace the Filament Cell as per the instructions given under the general heading "Replacements".
- (3) Adjust the RANGE SWITCH to "Set Zero". If the meter indication is not directly on zero, set to zero by adjusting the SET ZERO CONTROL with the screwdriver supplied (stowed in the lid of the haversack assembly).
- (4) Adjust the ON/OFF SWITCH to the appropriate "ON" position, i.e. with or without lamp, by turning in an anticlockwise direction. The instrument is now at operational readiness.
- (5) To measure the dose-rate of an area of contamination it is advisable to initially adjust the RANGE SWITCH to the least sensitive range (i.e. 0-300R/hr.).
- (6) The instrument may be held in any position to take a reading of gamma radiation and may be used without being removed from the haversack.
- (7) The lamp that provides the illumination of the meter scale is intended for intermittent use only as the working life of the cell is only of the order of about 16 hours. As the lamp is hardly visible in daylight, care should be taken that the ON/OFF SWITCH is in the "ON WITHOUT LAMP" position.
- (8) Care should also be taken to ensure that the instrument is switched off after use. It is not suggested that the instrument should be switched off between readings but rather that particular care be taken to avoid leaving it switched on overnight or during transit.



## BETA WINDOW

### Beta Radiation Detection

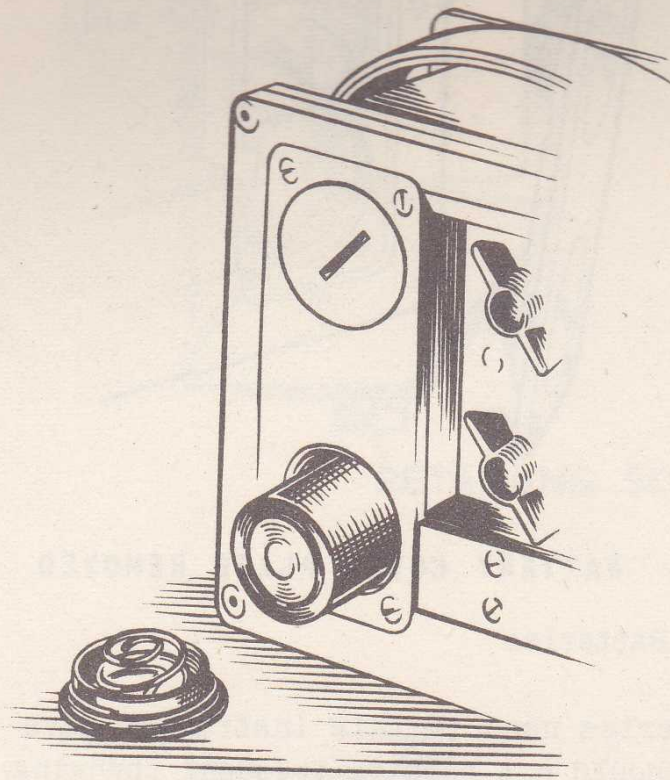
Beta radiation is less penetrating than gamma radiation and is normally absorbed by the case of the instrument. A thin window has therefore been provided through which beta particles can penetrate. During gamma measurement this window is covered by a hinged flap but is exposed when an assessment of beta radiation is required. The hinged flap is secured in both positions by a spring catch. Access to the flap is attained by the removal of a baseplate which is held in place by six screws.

To take a reading of beta radiation two separate measurements are required:-

- (1) Meter reading with the window uncovered (beta plus gamma radiation).
- (2) Meter reading with window covered (gamma radiation only).

The difference between the first and second readings gives the contribution due to beta radiation.

Under certain circumstances the operator may be permitted to replace the Bias and H. T. Batteries.



#### SPRING LOADED CAP REMOVED

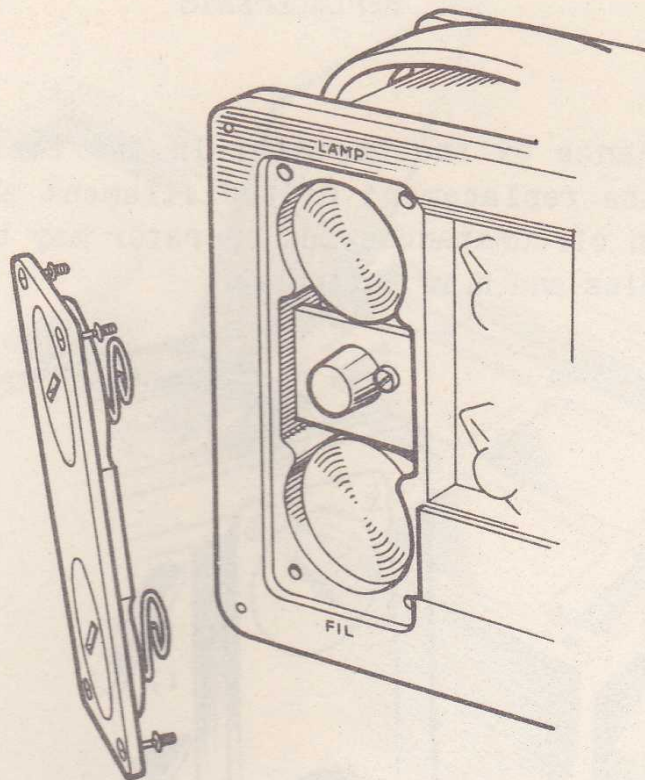
##### Filament and Lamp Cells

The Filament Cell should be replaced when the meter detection on the "Battery Test" position is below the lower red line on the meter scale. This should correspond to a battery voltage of 1.2V. The operating life to this voltage should be about 200 hours.

The Lamp Cell should be replaced as required. The useful working life with intermittent use should be about 16 hours.

Both these cells are each held in place by spring loaded caps situated on the battery compartment cover. Either cell may be replaced by unscrewing the appropriate cap. A wide slot in each cap enables the use of a coin to facilitate this.

It is recommended that after each filament cell replacement the voltage of the batteries should be checked as per the following paragraphs overleaf.



#### BATTERY COVER PLATE REMOVED

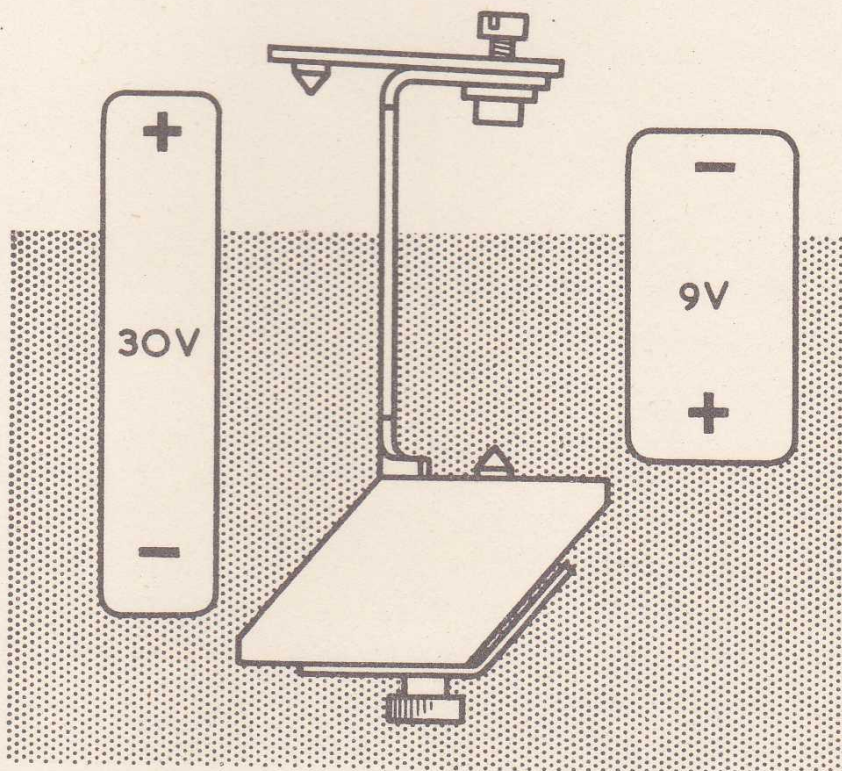
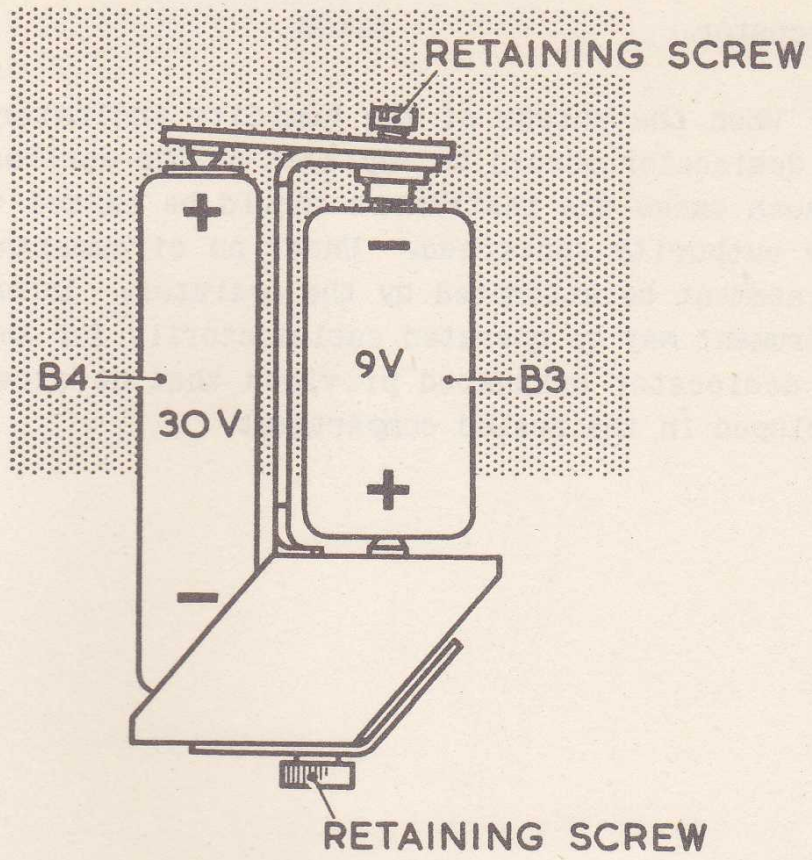
##### Bias and H. T. Batteries

The batteries used in this instrument have a long working life and should not require frequent changing. In general the layer type batteries have an operating life of about 500 hours.

The Anode Battery B3 should be replaced when the voltage (measured on a 1000 ohm/volt voltmeter) is 8.5V or below.

The Bias Battery B4 should be replaced when the voltage is 27V or below.

To replace either or both the above batteries, remove the battery cover plate (by releasing the four periphery screws) and extract the battery holder situated in the centre of the compartment. Slacken the appropriate retaining screws until the existing batteries can be extracted and the new ones inserted. Obviously it is most important to fit the batteries the correct way round. The polarities are marked on the base of the battery holder and those marked on the batteries should correspond. The retaining screws should then be tightened until the batteries are correctly located and firmly clamped between the contact points.



### BATTERY REPLACEMENT

## Desiccator

When the colour of the humidity indicator tends to pink the desiccator should be replaced at the earliest opportunity. In such cases the instrument should be handed to the maintenance authority concerned. Under no circumstances should the replacement be attempted by the operator. In an emergency the instrument may be operated satisfactorily for several days with the desiccator exhausted provided that no excessive leak has developed in the sealed compartment.

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