

**INSTRUCTIONS**

**FOR**

# **GEIGER COUNTER**

**MODEL 6157**

Pat. Applied for



**SEARS ROEBUCK & CO.**  
**CHICAGO, ILLINOIS**

## GENERAL DESCRIPTION:

1. Packed with each Geiger Counter are two flashlight "D" cells, the only batteries that are required for operation. Turn the range switch to the "OFF" position. Open the instrument by releasing the two catches on the ends of the case. Hold the case at the bottom with the left hand, grasp the handle with the right hand, and *carefully* lift the instrument out of the case.
2. Insert the batteries in the battery clamp, with the tops of both batteries in the direction of the arrow. Be certain that the batteries are making contact with the clamps at both ends. If the instrument is turned on, while out of the case, do not touch any of the parts inside, as there is a danger of a shock of 900 *Volts!*
3. Replace the instrument in the case and fasten catches. Turn on the instrument by turning the range switch. When first turned on, the needle will move to full scale for several seconds, and then fall back to the indicated reading. If turned on to "2.0" or "0.2" MR/HR, the neon indicating lamp will light for several seconds, and then blink intermittently, indicating a background count.
4. The scale of this instrument is calibrated in milliroentgens per hour (abbreviated MR/HR). A milliroentgen is 1/1,000 or .001 roentgen. (A roentgen is the amount of radiation that will ionize one cubic centimeter of dry air at standard temperature, and pressure, to the extent of creating one statcoulomb of charge). With the range switch in the "20" position, a deflection of full scale indicates 20 MR/HR; half scale 10 MR/HR, and each scale division is therefore 1 MR/HR. With the range switch in the "2.0" position, a deflection of full scale indicates 2 MR/HR; half scale 1 MR/HR, and each scale division is therefore 0.1 MR/HR. With the range switch in the "0.2" position, a deflection of full scale indicates 0.2 MR/HR, half scale 0.1 MR/HR, and each scale division is .01 MR/HR. Thus, the instrument indicates radiation from .01 MR/HR to 20 MR/HR.
5. The instrument may be used either with or without the headphones that are supplied. Insert the headphone plug in socket in top of case.
6. The instrument will indicate a background count when there are no radioactive substances in the vicinity. (See pp. 30-37 of "Prospecting for Uranium.") Background Count will be indicated as an occasional blinking of the neon, clicking in the headphones, and a low meter reading on the 0.2 MR/HR range.
7. While prospecting, the presence of radioactive material will be indicated by a more rapid flashing of the neon lamp, a more rapid clicking in the headphones, if they are being used, and a higher meter reading. The neon lamp flashes only on the 0.2 and 2.0 MR/HR ranges.
8. Operation of the instrument can be checked by taking the radioactive source packed with each instrument, holding against the probe, and observing the flashing of the neon lamp (except on the 20 MR/HR range). Also by the clicking in the headphones, and the meter deflection.
9. When there is an increase in the background count, rocks in the vicinity should be investigated by holding against the probe. Beta radiation can be checked by holding the specimen against the beta window (holes) in

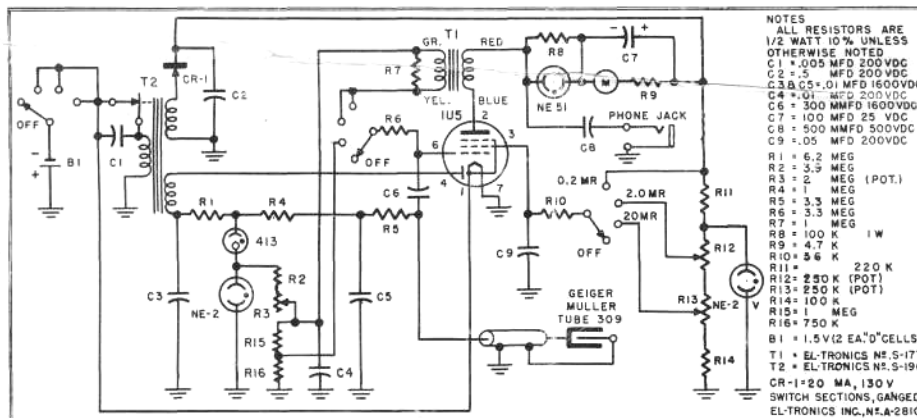
the probe. The probe may be removed from the clips, and inserted in crevices or holes for closer investigation.

### MAINTENANCE:

1. With very little care, your Geiger Counter will give long and reliable service. Even though the instrument has been tropicalized in manufacture for use in humid climates, and has a water resistant construction, it is important to keep it as dry as possible.
2. Replace the batteries as soon as exhausted to prevent damage from leaking batteries. The batteries should be removed when the instrument is stored for long periods,
3. For a more detailed discussion of care and maintenance, see pp. 36-37 of "Prospecting for Uranium"
4. If the instrument fails to operate, or is erratic or inconsistent in operation, replace batteries. The fact that the vibrator is operating does not necessarily mean that the batteries are good. Flashlight batteries are inexpensive and readily available. Be sure yours are fresh!

### OPERATION:

1. The operation of this instrument can be best understood by referring to the schematic circuit diagram below. Turning on the instrument to any of the three ranges completes the circuit from the batteries to the filament of the 1U5 tube, and the primary winding of the vibrator transformer T2.



The vibrator transformer interrupts the direct current from the batteries, producing an alternating current, which is stepped up through two secondary windings, to supply the high voltage for the Geiger tube and the plate and screen voltages for the 1U5 tube. The Geiger tube supply is rectified to direct current by the diode in the 1U5 tube. The 1U5 tube plate and screen supply is rectified by the selenium rectifier CR1.

2. The Capacitor C1, across the vibrator contacts, reduces arcing and prevents burning of the silver contacts. Capacitor C2 serves as a filter for the 1U5 plate and screen voltages. Capacitor C3, and Resistors R1 and R4 serve as a filter for the Geiger tube supply voltage. Voltage regu-

lator tube 413 and neon lamp NE-2 control the voltage to the Geiger tube within very close limits. The voltage drop across the neon lamp NE-2, appears across Resistors R2 and R3, which serve as a voltage divider. The voltage that appears across Resistor R3 is fed through the secondary winding of transformer T1, the switch and Resistor R6 to the control grid of the 1U5 tube as fixed bias voltage. Capacitor C4 is used to filter this bias voltage supply. Capacitor C5 provides additional filtering, after regulation of the Geiger tube supply voltage. Resistor R5 is the Geiger tube load resistor, through which voltage is applied to the type 309 Halogen Geiger tube.

3. When the instrument is in a radiation field, ionization takes place inside the Geiger tube, and a minute current flows for a very short time from the cathode (outer shell) to the anode (center wire), which is grounded. This current flows through Resistor R5 and causes a voltage pulse to appear across this resistor. This voltage pulse is coupled through Capacitor C6 to the control grid of the 1U5 tube.
4. The tube is normally non-conducting because of the fixed bias voltage. The voltage pulse from the Geiger tube allows the 1U5 tube to pass plate current through primary winding of transformer T1 and Resistors R8 and R9 and Meter M, which results in a deflection of the meter needle on a scale calibrated in MR/HR. Resistor R9 and Capacitor C7 are used to damp the meter movement and give a smooth needle response. The plate current flowing through Resistor R8 causes a voltage drop across this resistor. This also appears across neon lamp NE-5, which flashes the lamp. If the headphones are plugged into the circuit, this voltage is coupled to the headphones through Capacitor C8.
5. The change of ranges is effected by changing the voltage applied to the screen of the 1U5 tube. Resistors R11, R12, R13 and R14 form a voltage divider with taps to the range switch. Resistors R12 and R13 are potentiometers used to vary the screen voltage and calibrate the instrument.

#### **CALIBRATION:**

- i. The instrument was calibrated in manufacture and tested before shipment, but in time and with handling, it may need recalibration. To calibrate, remove the instrument from its case. Turn instrument on to the 20 MR/HR range. *Do not touch any parts on the chassis as there is the danger of a 900-volt shock*. Take the radioactive source packed with the instrument and place directly against the beta window in the probe, with the number indicating the strength of the source (in MR/HR) toward the probe. With a screwdriver, coin, or fingernail, turn the slotted shaft marked "CAL 20," located beneath the batteries until the meter reads the value marked in the source.

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