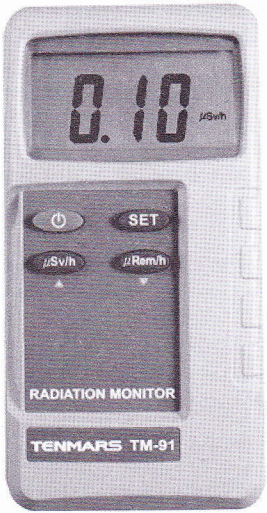
TENMARS

RADIATION METER

TM-91/TM-92



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TENMARS ELECTRONICS CO., LTD

CONTENTS

1. INTRODUCTION

This manual contains valuable information about the nature of ionizing radiation that should be understood by the user so that accurate measurements can be made. Information on the care of your Geiger counter is also included. If the following instructions are followed, your radiation monitor will give you many years of reliable service.

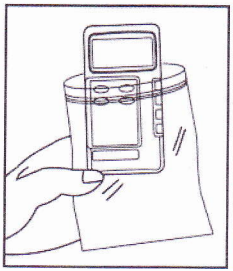
The radiation meters are very sensitive pieces of equipment. Although housed in a high –impact case, the Geiger-Mueller tube that senses radiation is fragile. If the unit is dropped, the G-M tube may break. Exposure of the unit above 40℃ (100℉) may also cause the G-M tube to stop functioning.

The electronic circuitry is sensitive to high humidity(over 90%RH).

2. SAFETY PRECAUTION

⚠	**CAUTION** Take extremely care for the following conditions while measuring

⚠	**CAUTION** Please put the radiation monitor into a plastic zipper bag before operating it in a radiative contaminated area to avoid radiative dust falling on the monitor's surface



- Do not operate the meter under the environment with explosive gas (material), combustible gas (material) steam or filled with dust.

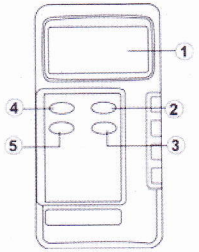
- Do NOT put the unit in a very hot place(such as a car, glove box, especially during summer).
- Do NOT allow the unit to get wet. However, if it cannot be avoided, clean it with a towel and allow unit to air-dry for several days(do not place in an oven or microwave).
- Do NOT back cover to bemoved only by qualified service technician.internal operating voltage is over 400VDC.
- In order to avoid reading incorrect data, please replace the battery immediately when the symbol "  " appears on the LCD.
- In order to avoid the damage caused by contamination or static electricity, do not touch the circuit board before you take any adequate action.
- Operating Environment: Indoors use. This instrument has been designed for being used in an environment of pollution degree 2.
- Operation Altitude: Up to 2000M.
- Operating Temperature & Humidity: 5℃ ~40 ℃, 0%~ 80%RH.
- Storage Temperature & Humidity: -10℃ ~ 50℃, 0%~ 70%RH.

3. SPECIFICATI

- Display : 3 1/2 digits LCD with maximum reading 1999.
- Sampling :
  20 second/ times(TM-91).
  5 second/ times(TM-92)
- unit selection :
  μSv/h or μRem/h(TM-91).
  μSv/h or mRem/h(TM-92)
- Display Range :
  0.01μSv/h~19.99μSv/h(TM-91) or
  1μRem/h~1999μRem/h(TM-91)
  0.1μSv/h~199.9μSv/h (TM-92) or
  0.01mRem/h~19.99mRem/h(TM-92)
- Measurement Range :
  0.50μSv/h~19.99μSv/h(TM-91) or
  50μRem/h~1999μRem/h(TM-91)
  0.5μSv/h~199.9μSv/h (TM-92) or
  0.05mRem/h~19.99mRem/h(TM-92)
- Alarm function : alarm set default 0.50μSv/h,can set 0~19.99μSv/h(TM-91) alarm set default 0.5μSv/h,can set 0~199.9μSv/h(TM-92).
- Auto Power Off function : set time default 30 min, can set 0~60min;0 min disable auto power off.
- Low battery indication "[−+]".
- Power : 9V battery、NEDA 1604、IEC

6F22 or JIS 006P
- Battery Life : About 50 hours(Alkaline battery).
- Over load display "OL"
- Accuracy : ±20% (Cesium-137)
- Energy dependency : 30KeV to 1.3 Mev
- Weight : 220g.
- Size : 143x74 x34 mm (LxWxH)

4. IDENTIFYING PARTS



1. LCD display.
2. Setup function button.
3. Units and setup function down button.
4. Power ON / OFF button.
5. Unit and setup function up button.

5. OPERATION PROCEDURE

- Press the power (⏻) swithbutton : All segment of the LCD indicator is illuminated together with BEEP signal for about two second. We are now ready for testing.
- Intermittent BEEP signal follows during detection,auxliary radiation strength sensing. The higher the repetition rate.
- Press the (µSv/h) button: Select test unit µSv/h (T1) (TM-91).
- Press the (µRem/h) button: Select test unit µRem/h(T2) (TM-91).
- Press the (mRem/h) button: Select test unit µRem/h(T2)(TM-92).
- Press the (SET) button for more than 1 second to enter setting alarm mode , the LCD display "ALR" first the press the setting value, press the " (µSv/h) ▲ " button or " (mRem/h) ▼" button change the digit value, Alarm the initial value 0.5µSv/h, Press again (SET) button more than 1 second to enter setting auto power-off(APO), the LCD display "APO" first the setting value, press the " (µSv/h) ▲ " button or " (mRem/h) ▼"

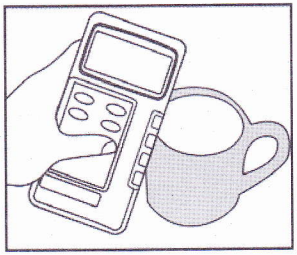
button change the digit value, Auto power-off setting, the initial value is 30 minutes. Press again (SET) button more than 1 second to enter setting buzzer ON or OFF ,the setting default is always "ON", the LCD display "ON" or "OFF" ,press the " (µSv/h) ▲" button or " (mRem/h) ▼" button change the ON or OFF. Press again (SET) button more than 1 second to enter setting calibration facfor, the LCD display "CF" first the setting value, press the " (µSv/h) ▲ " button or " (mRem/h) ▼" button change the digit value, Calibration facfor the initial value 1.00, Press again (SET) button more than 1 second to exit and return to measurment mode.

- The Geiger-mueller tube is located behind the slots in the upper edge of the case. The surface of the tube is very thin .This allows beta radiation to penetrate and to be detected with greater efficiency. (Beta rays and other types of radiation will be discussed in the next section). This thin surface is fragile and poking sharp objects through the slots will damage the tube.

- Your Geiger Counter is designed to be sensitive to:

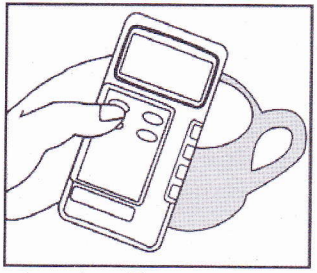
1. Gamma radiation (which includes X-rays).
2. Beta radiation.

- Gamma radiation and X-rays can penetrate the plastic case with comparative ease.
- Beta radiation can most efficently enter the case through the slots. Although Beta radiation is easily detected. It is difficult to measure accurately. Therefore, when a radioactive object is being searched for Beta radiation, the open slots in the case should be positioned in such a way that they are exposed to the object(see Figure 1).



(Figure 1)

- If the unit shows a significantly higher reading with increasing beep sound volume in this position, you can be certain that the object is emitting Beta radiation.
- Now position the unit as shown in Figure 2. In this position, where radiation cannot pass directly through the slots (Beta radiation travels in straight lines for the most part) only gamma and X-ray radiation from the object wil be detected.



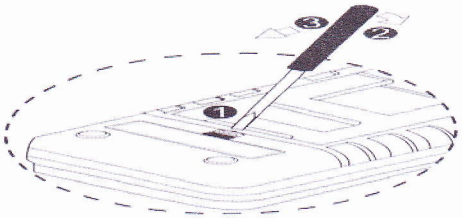
(Figure 2)

This is the position in which to hold the geiger counter to take readings.

6. BATTERY REPLACEMENT

	WARNING
⚠	If the symbol " [−+] " appears on the LCD, please replace the battery immediately

- Use " — " form screwdriver to insert into battery cover hole (OPEN).
- Press completely screwdriver into battery cover hole and fix it on slide of hole.
- Push screwdriver towards the back and remove battery cover out.



(Figure 3)

7. NOTICE

Geiger Counter to be accurate within reasonable standards of acceptance, and includes instructions that, if followed ,will yield accurate measurements. Manufacturer assumes no liability for damages, consequential or otherwise that may arise from the use of the Geiger counter by any person, under any circumstances. The Geiger counter is sensitive to gamma, beta and X-ray radiation, but not necessarily to extremely low energy forms, or alpha, neutron or microwave radiation. Do not open Geiger counter or otherwise tamper with or attempt to service it.

8. INTERACTION OF RADIATION WITH MATTER

The particles and photons that result from nuclear decay carry most of the energy released from the original unstable nucleus. The value of this energy is expressed in electron Volts, or eV. The energy of beta and alpha rays is invested in the particles speed. A typical beta particle from Cesium-137 has an energy of about 500,000 eV, and a speed that approaches that of light. Beta energies can cover a wide range, and many radioisotopes are known to emit betas at energies in excess

of 10 million eV. The penetration range of typical beta particles is only a few millimetres in human skin.
Alpha particles have even shorter penetration ranges than beta particles. Typical alpha energies are on the order of 5 million eV, with ranges so short that they are extremely difficult to measure. Alphas are stopped by a ~nin sheet of paper, and in air only travel a few inches at most before coming to a stop. Therefore, alpha particles cannot be detected without being in close contact with the source, and even then only the alphas coming from the surface of the source can be detected. Alphas generated within the source are absorbed before reaching the surface. Due to short range, alpha particles are not a serious health hazard unless they are emitted from within the body when their high energy, in close contact with sensitive living tissue their high energy, in close contact with sensitive living tissue, is an extreme hazard. Fortunately, almost all alpha-emitting substances also emit gamma rays, allowing for their detection.
Neutrons, having no net charge, do not interact with matter as easily as other particles, and can drift through great thickness of material without incident. A free neutron, drifting through space, will decay in an average of 11.7 minutes, yielding a proton and

an electron (beta ray). The neutron can also combine with the nucleus of an atom, if its path carries it close enough. When a neutron is absorbed into a nucleus, it is saved from its ultimate fate (decay), but may render the nucleus unstable. This absorption process is used in medicine and industry, to create radioactive elements from non-radioactive ones. Detecting neutrons is specialized and beyond the scope of typical Geiger counters, but most possible neutron sources also emit gamma and beta radiation, affording detection of the source.
The highly energetic X-ray and gamma rays lose their energy as they penetrate matter. X-rays have an energy of up to about 200,000 eV, compared to gamma radiation which can be as energetic as several million eV. One million e V gamma radiation can penetrate an inch of steel. Gamma and X-ray radiation are by far the most penetrating of all common types, and are only effectively absorbed by large amounts of heavy, dense material of high atomic number, such as lead.

9. END OF LIFE

Caution : this symbol indicates that equipment and its accessories shall be subject to a separate collection and correct disposal