

SICD MANUAL

OVERVIEW:

The Self-Indicating Cumulative Dosimeter is designed for military or similar applications where exposure to a nuclear weapon detonation (or similar very high *exposure rate*) is possible, and the potential *prompt* medical effects from very high radiation exposure needs to be evaluated.

Personnel exposure monitoring at the high levels measured by the SICD can be helpful in providing information to medical personnel for treatment protocols. See Table 1 below for possible medical effects at the different exposure levels.

The SICD is the ultimate in simplicity – it records and displays only high levels of exposure (>1 rem) and cannot be reset or modified by the user. The battery is good for the life of the dosimeter 5 - 10 years in normal use.

The operating range is 10 to 999 rem, and the SICD is not suitable for first responder use responding to a radiological event.

The SICD is sealed with no user options. Battery and SICD life is typically 5-10 years and the battery is not replaceable.

The SICD will detect photon radiation, >70keV pulse/burst and continuous. It will measure accumulative radiation from a nuclear weapon detonation.

APPLICATIONS:

A number of applications for the SICD are identified below in the areas of military, health care, safety, and environmental monitoring, including:

- ❖ SICD will permit real-time personnel radiation exposure assessment during a nuclear accident or incident involving very high levels of radiation exposure, affording military commanders the ability to make critical decisions regarding force commitment, or provide crucial information regarding troop rotation and replacement as required.
- ❖ Fitness of duty for military personnel after a nuclear weapon detonation or similar event.
- ❖ Use on a robotic arm system to determine the radioactivity level in very high radiation environments.
- ❖ Monitoring the exposure of personnel to very high levels of ionizing radiation over short of long terms.
- ❖ Survival kits for measuring radiation after a nuclear weapon detonation or similar event.

OPERATION:

There are no user interfaces to the SICD. The user cannot reset or change the reading. Before each use, the operator/supervisor should read and record the initial reading (REMstart). After exposure the operator/supervisor should read and record the ending reading (REMend). The actual exposure will be the difference between the start and end reading ($REM = REMend - REMstart$)

EXAMPLES:

$$REMend - REMstart = REM$$

- For REMend = 50 and REMstart = 0: $50 - 0 = \mathbf{50\ REM}$
- For REMend = 50 and REMstart = 5: $50 - 5 = \mathbf{45\ REM}$
- For REMend = 50 and REMstart = -5: $50 - (-5) = \mathbf{55\ REM}$
- For REMend = 100 and REMstart = 45: $100 - 45 = \mathbf{55\ REM}$

NOTES:

- The SICD is designed with accuracy range of 10 REM to 999 REM.
- The SICD display can display 1 REM to 999 REM
- It is normal for some units to have a starting value from the factory of -6 to +6 REM.
- It is normal for a reading to vary +2 or -2 REM from current reading.
- After exposure the reading cannot be reset to starting value. A starting reading must be taken before the SICD is used in the field.
- Over time a reading without further exposure will sag to a lower numbers. Sagging is more significant after 3 months.

SICD & BATTERY LIFE:

The SICD and battery life should be greater than 5 years under normal temperature and humidity conditions. SICD will last the longest in a low humidity room temperature environment.

TYPICAL RADIATION DOSES:

Following tables provides example radiation doses and their effects on humans. These will help the reader understand rem values in the real world situations. The SICD can read between 1 REM and 999 REM.

Table 1 – Typical Radiation Doses

Event	Exposure in rem
GENERAL PUBLIC: Maximum permissible annual dose (w/o medical & natural exposure)	0.17
Living in Boston, MA: Natural background per year (excluding radon)	0.10
Living Denver, CO: Natural background per year(excluding radon)	0.18
X-Ray Technician: additional (excluding background)	0.32
TV Set: annual dose to gonads from TV set	0.0002
Barium Enema: medical procedure received by the bone marrow	0.88
Chest X-Ray: medical procedure received by the bone marrow	0.01
Mammogram: medical procedure received by breast	0.50 -0.70
Airline Passenger: ten flights per year	0.003
Airline Crew: average per year	0.16
Nuclear worker: yearly legal dose	5.00
Non-Occupational: yearly legal dose	0.10
Pregnant Worker Non-Occupational: Over entire Pregnancy	0.50
Pregnant Worker Non-Occupational: After pregnancy declared (in 1 month)	0.05

Note: Generally, chronic exposure is less damaging than acute exposure because the body has a chance to repair damage as it occurs rather than being overwhelmed.

Table 2 - Effects of Dose On Humans:

Dose in rem	EFFECTS (with no medical treatment)
0-50	No obvious effects, blood chemistry changes
100	Minor radiation sickness in about 10% people
150	Minor radiation sickness in about 25% people
200	Radiation sickness in about 50% people
300	Radiation sickness in all exposed, about 20% death rate within 1 month
450	About 50% death rate without medical treatment
500	Radiation sickness within 4 hours, over 50% death rate
1000	Radiation sickness within 1-2 hours, over 100% death rate

These are guidelines only; users should consult their own radiation/medical expert.