

**DOC 1575**

**DOM 410 RADIATION METER  
INSTRUCTION AND  
MAINTENANCE MANUAL**



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TITLE 1

THE DOM 410 RADIATION METER

**Practical applications**  
**Sets of Equipment in Common Use**

**11. GENERAL**

The DOM 410 is at the same time :

- a survey unit,
- a decontamination unit, as fine as necessary,
- a special measuring unit,
- an alarm unit, when provided with a warning light.

**111. SURVEY MISSIONS**

It is designed first of all to detect gamma radiations. When coupled to a gamma probe, measurement can be so accurate, at ambient temperature, that the actual value will always be lower than the recorded value within 20 % of the recorded value.

It is provided with 6 measurement ranges by direct reading on a single scale, and with a range indicator to limit the risks of error.

The dial is illuminated for night measurements.

Used with the gamma probe placed inside the radiation meter it is possible to measure the X or gamma radiation dose rates from 1 m R/h to 1,000 R/h (in case of personnel in the open).

Used with the gamma probe placed in the extension cable connector connected to the radiation meter, it is possible to measure the same radiation dose rates as above any time it is necessary to position the probe between 0 to 5 metres from the radiation meter.

## 112. DECONTAMINATION AND SPECIAL MEASUREMENT MISSIONS

For the detection of alpha and beta radiations or for the measurement of low level gamma radiations, an external probe receptacle connector is provided for connecting the required accessory.

The recording scale in use is the same as the one used for the above mentioned measurements, with the same range indicator and same dial illumination.

To proceed to the measurements involved by the usual beta and gamma decontamination operations, the following accessories are added to the DOM 410 radiation meter :

- a beta-gamma probe for DOM 410,
- an extension cable assembly for this probe,
- a scanning rod.

These accessories are housed in the lid of the transport suitcase.

The DOM 410 radiation meter, when used with the beta-gamma probe, can measure gamma radiation dose rates from  $15 \mu$  R/h to about 15 mR/h and detect beta radiations up to 1.000 c/s.

Many accessories that are not necessarily part of the sets of equipment can be connected to the radiation meter which is provided to this effect with two outputs (D.C. current and impulse outputs) : recorder, counter, fixed or variable threshold warning light, headset, etc...

## 113. ALARM MISSION

A warning light (AL 410) is added to the DOM 410 sets of equipment. It warns the personnel as soon as the radiation dose rate reaches half the full scale in each range, that is 5, 50 or 500 mR/h or 5, 50 or 500 R/h when used with the gamma probe.

When provided with the warning light and beta-gamma probe, the radiation meter can give the alarm as soon as the gamma radiation dose rate reaches about  $75 \mu$  R/h, on the 10 c/s range, and in beta-gamma, from five times the natural proper motion.



The warning light is housed in the radiation meter suitcase. It is protected against shocks by a flexible colourless polyethylene case. The DOM 410 radiation meter and its warning light are secured outside the vehicle by means of two bolted brackets.

However, the warning light can only be energized by an external power supply, for example by the storage battery of the vehicle.

#### 114. GENERAL CHARACTERISTICS

The radiation meter is a portable, self-contained instrument. It is power supplied by two 1.5 V dry batteries, type BA-30, housed in the handle. It can however be operated on 6 V, 12 V, or 24 V storage batteries or on 110 V or 220 V.A.C., 50 to 400 Hz, by using voltage adapters housed in the dry battery-container handle. These accessories are not part of the sets of equipment.

The radiation meter drift is lower than 20 % between  $-30^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ , independently of the power spectrum, from 80 KeV to 3 MeV ; of rugged and hermetically sealed construction, this equipment is designed to be used in the field and to be easily calibrated, checked or trouble shooted : use of plug-in printed circuit sub-assemblies, of transistors, which excludes any valve, possibility to check the instrument for proper operation without opening it.

The radiation meter with gamma probe, without dry batteries and without accessories weighs 2.5 kg.

#### 115. SETS OF EQUIPMENT

The radiation meter and its accessories are grouped in sets of equipment the components of which vary with the type of mission to be filled.

**12. SETS OF EQUIPMENT USED IN THE ARMY GROUND FORCES.**

**121. DOM 410 SURVEY AND ALARM UNIT  
(fig.1).**

This set of equipment is provided for survey and alarm missions. Its main components are listed in the table below.

N <sup>o</sup>	MAIN COMPONENTS	Qty	Dimensions in cm			Weight in kg
			L.	W.	H.	
1	DOM 410 radiation meter and gamma probe	1	23	10	19	2.5
2	Operator's Guide (bonded to the radiation meter)	1				
3	Carrying strap	1				
4	Warning light case for suitcase model A or B	1	A	18	11	5.5
			B	18	13.5	4
5	Case for 4 batteries, type BA 30	1	17	3.5	7	
6	Instruction and Maintenance Manual	1	21	13.5	0.5	
7	Source for checking the DOM 410 radiation meter for operation.	1	4	2.4	4.8	
8	Suitcase, model A or B	1	35	22	28	
9	Warning light	1	11	10	4	0.55

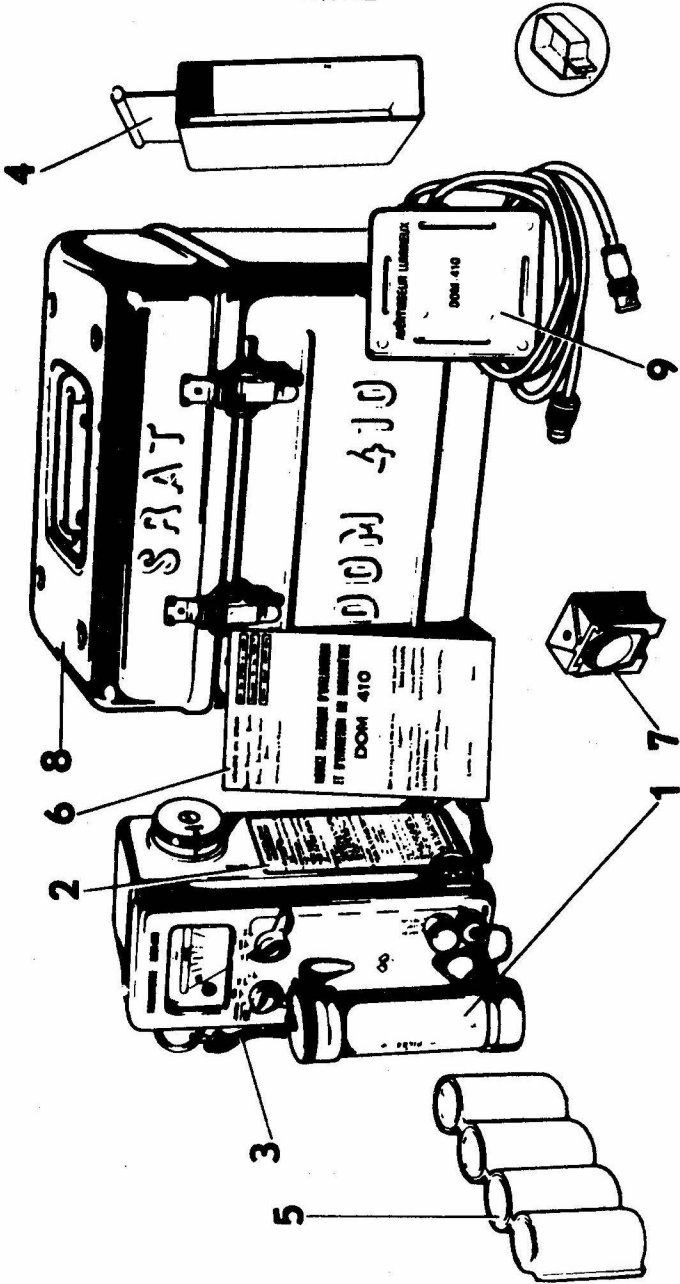


Fig. 1 - SURVEY AND ALARM UNIT (GROUND FORCES)  
THE WARNING LIGHT CASE ITEMIZED 4 IS MODEL B  
THE WARNING LIGHT CASE SHOWN IN A CIRCLE IS MODEL A

### 122 - DOM 410 SURVEY, ALARM AND DECONTAMINATION UNIT (fig. 2).

This set of equipment is provided for survey, alarm, beta and gamma decontamination.

N°	MAIN COMPONENTS	Qty	Dimensions in cm			Weight in kg
			L.	W.	H.	
1	DOM 410 radiation meter and gamma probe.	1	23	10	19	2.5
2	Operator's Guide (bonded to the radiation meter)	1				
3	Carrying strap	1				
4	Warning light case for suitcase model A or B	1	A 18	11	5,5	
			B 18	13,5	4	
5	Case for 4 batteries, type BA 30	1	17	3,5	7	
6	Instruction and Maintenance Manual	1	21	13,5	0,5	
7	Source for checking the DOM 410 radiation meter for operation	1	4	2,4	4,8	
8	Suitcase, model A or B	1	35	22	28	
9	Warning light	1	11	10	4	0.55
10	Beta-gamma probe	1	26	∅4		0.43
11	Extension cable assembly for beta-gamma probe	1	500			0.31
12	4 section scanning rod	1	120	∅2.5		0.78
13	Extension cable assembly for gamma probe	1	500	∅4		0.9
14	Extension cable reel	1	12	5.3	12	0.17

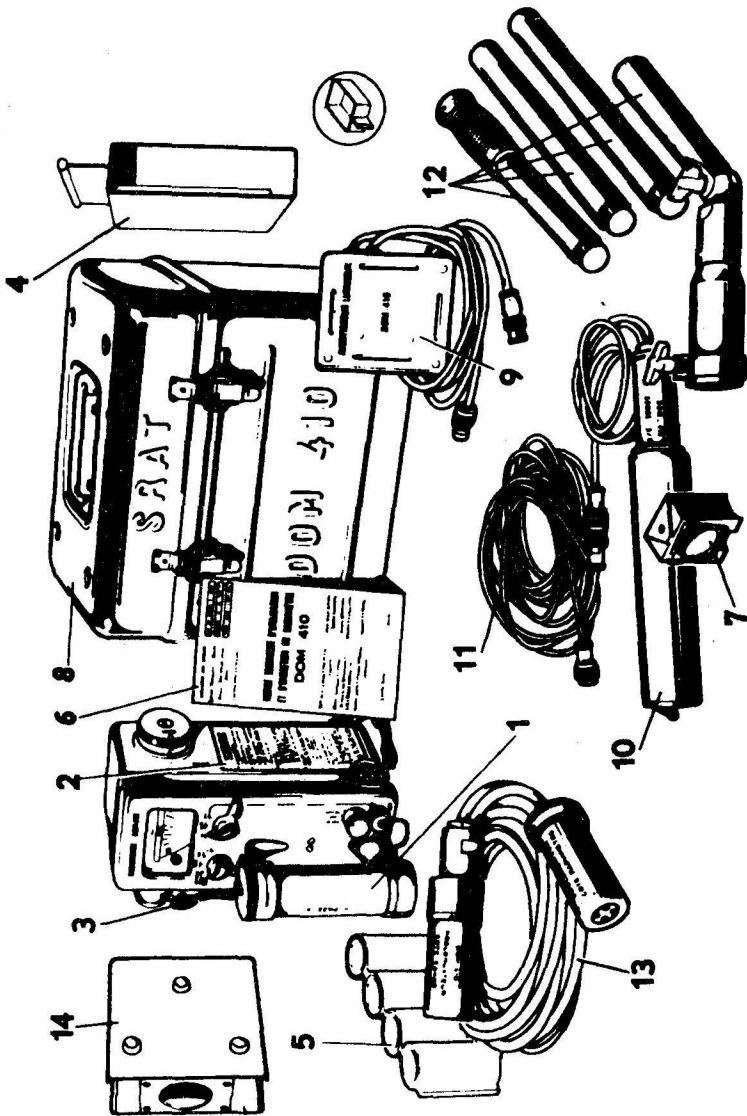


Fig. 2 - SURVEY, ALARM AND DECONTAMINATION UNIT (GROUND FORCES)  
THE WARNING LIGHT CASE ITEMIZED 4 IS MODEL B  
THE WARNING LIGHT CASE SHOWN IN A CIRCLE IS MODEL A



TITLE 2

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THE DOM 410 RADIATION METER AND ITS ACCESSORIES

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Description - Technical Characteristics - Utilization

**21. THE DOM 410 RADIATION METER AND ITS GAMMA PROBE**

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The radiation meter appears as a rectangular box made of black aluminized duralinox sheet metal consisting of body and cover.

The body and cover are assembled with 6 captive screws placed on the bottom of the radiation meter and connected one to another by a lead seal wire. A rubber gasket hermetically seals the two components.

**Opening the radiation meter in a unit not specialized in repair is strictly forbidden.**

The electronic part of the radiation meter is embodied in the cover, except for the gamma probe the housing of which is integral with the body.

The cover includes (fig. 3 and 4).

- 211 A window for the measuring unit (1)
- 212 Two control switches placed just below this window :
  - 212.1 The left hand one, called "sensitivity selector switch " (S), is provided to successively select one of the following positions :
    - 1) ARRET (OFF)
    - 2) CONTROLE (CHECK)
    - 3) 0-1 000
    - 4) 0- 100,
    - 5) 0- 10.

212.2 The right hand one, called "unit selector switch" (U), is provided to select one of the following units :

- 1) R/h
- 2) mR/h
- 3) c/s

213 A carrying handle, also used to house the dry batteries (2).

214 On the right hand side of the handle :

214.1 A time constant selector switch (T) provided to select a response time :

- 1) RAPIDE (FAST)
- 2) LENT (SLOW)
- 3) MESURE (MEASUREMENT) (Very slow).

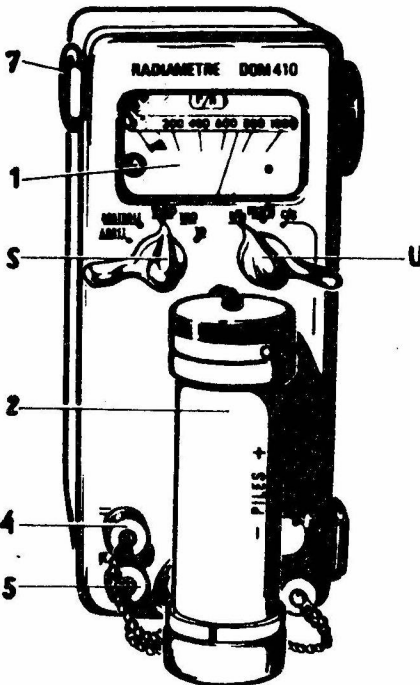


Fig. 3 - DOM 410 RADIATION METER  
(TOP VIEW)

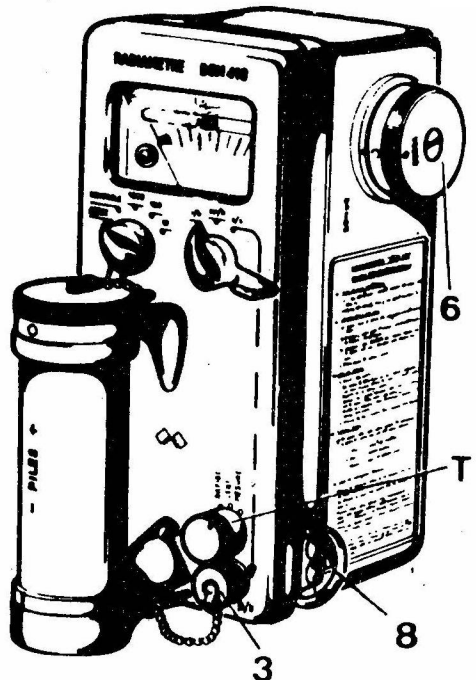


Fig. 4 - DOM 410 RADIATION METER  
(PERSPECTIVE VIEW)



- 214.2 A receptacle connector (3) marked "SONDE  $\beta/\gamma$ " (PROBE  $\beta/\gamma$ ) provided to use an external probe operated on the different ranges in the c/s position, for decontamination operations and fine measurement of radioactivity.
- 215 On the left hand side of the handle :
- 215.1 A receptacle connector (4) marked "=" provided to record the direct voltage across the terminals of a resistor series-connected to the microammeter. It can be used to connect the warning light or any other matched accessory.
- 215.2 A receptacle connector (5) marked "⌋" provided to record the impulses generated by the detector. It can be used to connect a head set or a counting scale, for example, that are not supplied with the sets of equipment.
- 216 The body provides a housing at the front for the gamma probe (6). The body is provided with 2 rings (7) and (8) for securing the snap hooks of the carrying strap.

## 217. THE GAMMA PROBE

The gamma probe has the shape of a cylinder provided :

- at one end, with a plug including three pins for securing the gamma probe to the radiation meter ;
- at the other end, with metal contacts for electrical connections.

These contacts shall remain perfectly clean. Each gamma probe is matched with a determined radiation meter. It has the same serial number as this radiation meter and shall **under no circumstances be used with another radiation meter.**

**218. MARKING (Refer to fig.17)**

On the rear bracket of the carrying handle, is secured a small plate (1) indicating :

- the market number and its date of notification ;
- the serial number of the radiation meter. Each meter has an individual number and two meters cannot have the same number whether they are to be used for civil or military applications. This number is a five figure number.

**NOTA.** On preproduction radiation meters (N<sup>o</sup> 00001 to 00200), this number is engraved on the rear face of the cover.

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**22. TECHNICAL CHARACTERISTICS OF THE DOM 410 RADIATION METER AND GAMMA PROBE**

**221. MEASUREMENT RANGES**

The DOM 410 radiation meter incorporates a gamma probe and a probe receptacle connector permitting to connect the beta-gamma probe and various matched accessories to the radiation meter.

The nine recording ranges, with a single scale and automatic display, are obtained by the combined use of two selector switches, one for sensitivity (S), the other for selection of unit (U).

POSITION		RANGE OBTAINED	COMMENTS
Of S sensitivity switch	Of U unit selector switch		
Arret (OFF)	Any	All systems of radiation meter, in particular the dry battery system, are off.	
Controle (CHECK)	Any	For checking dry batteries for proper conditions before dose rate measurements.	
1000 100 10	R/h	0 to 1000 R/h 0 to 100 R/h 0 to 10 R/h	The mR/h and R/h positions of the U selector, switch corresponding to measurements <u>exclusively</u> made with the gamma probe of the radiation meter.
1000 100 10	mR/h	0 to 1000 mR/h 0 to 100 mR/h 0 to 10 mR/h	
1000 100 10	c/s	0 to 1000 c/s 0 to 100 c/s 0 to 10 c/s	Measurements, with probes other than gamma probe shall <u>mandatorily</u> be made on the c/s range.

## 222. ACCURACY

### 222.1 Usual measurements

At normal temperatures, measurement is so accurate that the actual value is always lower than the recorded value within 20<sup>o</sup>/o of the recorded value.

### 222.2 Thermal compensation

Temperatures between - 30<sup>o</sup>C and + 60<sup>o</sup>C cannot alter measurements by more than 20<sup>o</sup>/o.

## 223. POWER SUPPLY - AUTONOMY

The radiation meter is supplied by two 1.5 V, type BA-30, series connected "torch" batteries.

The dry batteries are not supplied with the set of equipment.

With a set of new batteries, the radiation meter can normally operate for at least 16 consecutive hours. In the case of discontinuous use, the autonomy is increased due to the dry battery regeneration and it can reach 50 hours.

With a voltage adapter (1), the radiation meter can operate on a 6 V, 12 V or 24 V.D.C. storage battery.

With a different type of voltage adapter (1) it can operate on 110 or 220 V.D.C., 50 to 400 Hz.

## 224. OPERATING CONDITIONS

The radiation meter is designed to operate at temperatures ranging - 30<sup>o</sup>C to + 60<sup>o</sup>C in a moisture environment included between 0 and 100<sup>o</sup>/o.

The radiation meter remains waterproof and operational under one metre of water. It can withstand shocks and vibrations when carried aboard a vehicle.

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(1) Not part of the DOM 410 radiation meter sets of equipment.

When the radiation meter is placed in a radioactive field the radiation amount of which increases from 0 to 10,000 R/h, its pointer never returns to the rear when set to a determined range.

The Geiger-Muller tube of the DOM 410 gamma probe can withstand a dose at least equal to 100.000 roentgens during operation ; this does not modify by more than 10<sup>0</sup>/o the radiation meter indications.

## 225. FLUCTUATIONS AND RESPONSE TIME

A radioactive source has a constant particle emission rate **only on an average**. On the other hand, the gamma photons must generate electrons inside the Geiger-Muller tube to be detected.

If only intervals of short durations are observed the source emission rate and the Geiger-Muller tube rate will show large variations.

These fluctuations constitute a physical phenomenon inherent to radioactivity and not to the DOM 410 radiation meter. The microammeter indication shall then fluctuate. The shorter the response time will be the larger the fluctuations. The response time is the time required by the pointer to reach a position very close to its new equilibrium position after a fast variation of the measured radiation dose rate.

To make possible the utilization of the DOM 410 radiation meter aboard a vehicle, this equipment has been given a response time of about 1 second.

However, such a short response time is not necessary in all cases and on the other hand it has the inconvenience of increasing the fluctuations.

The radiation meter therefore has been provided with a 3-position switch permitting to select three different response times :

- RAPIDE (FAST) (1 second response time),
- LENT (SLOW) (5 seconds response time),
- MESURE (MEASUREMENT) (1 minute response time).

## 226. ISOTROPY - ANISOTROPY

When a nuclear radiation measuring instrument always give a similar response, whatever its orientation may be, it is said to be isotropic.

If its indication varies with its angular position relatively to the emission source, it is said to be anisotropic.

The DOM 410 radiation meter is anisotropic or isotropic depending on the type of measurement that is to be made.

It enables to localize a "hot point" of radioactivity (radioactive debris, zero point...) or more generally the direction of a dose rate gradient, the instrument reading being higher when the radiation meter is turned towards the "hot point" or in the direction of the gradient.

On the other hand, in a uniform radioactive field, the DOM 410 radiation meter is absolutely isotropic, the radioactive sources being uniformly distributed on the ground and sending towards the detector a similar plane whatever the orientation of the radiation meter may be.

If an isotropic response of the instrument is required under any circumstances, it is necessary to use the extension cable assembly in which the DOM 410 radiation meter gamma probe is to be placed.

When this extension cable assembly is positioned vertically, its response is indeed absolutely isotropic, the Geiger-Muller tube being in the centre of the gamma probe and being also perfectly summetrical about its axis.

## 23. UTILIZATION OF THE DOM 410 RADIATION METER AND GAMMA PROBE.

### 231. REMOVING THE INSTRUMENT FROM ITS SUITCASE

To remove the radiation meter from its suitcase, unhook the rubber strap maintaining it in the suitcase, grip the radiation meter handle and pull out the instrument vertically to withdraw it from its container.

Use type BA-30 dry batteries. They shall not remain in an instrument which is not in use.

A case is provided inside the suitcase for storing the dry batteries for a maximum of one week.

### 232. INSTALLING THE DRY BATTERIES

Check that the sensitivity selector switch (L.H. switch) is set to ARRET (OFF).

- Remove the knurled cap from the handle end by screwing it out by approximately 1/20 th of a turn.
- Insert two 1.5 V type BA-30, dry batteries as shown in the diagram placed on the battery-container handle, i.e. — terminal (metal cap) facing knurled cap (fig.5).
- Reposition and lock the knurled cap by pressing and screwing it in by 1/20 th of a turn.

### 233. PRELIMINARY CHECK

The unit selector switch (U) (R.H. switch) being set to any position, move the sensitivity selector switch (S) (L.H. switch) to "CONTROLE" (CHECK).

The pointer of the measuring instrument shall come in the right hand side of the dial corresponding to the indication "PILES BONNES" (CORRECT BATTERIES).

Should the pointer remains in the half dial marked "PILES A REMPLACER" (REPLACE BATTERIES), the batteries shall then be replaced.

Should the pointer remains in the left hand side of the dial although the batteries are correct, the radiation meter shall be sent for repair.

### 234. RADIOACTIVITY MEASUREMENT

Before starting any measurement, the dry batteries shall be checked by setting the S switch to "CONTROLE" (CHECK).

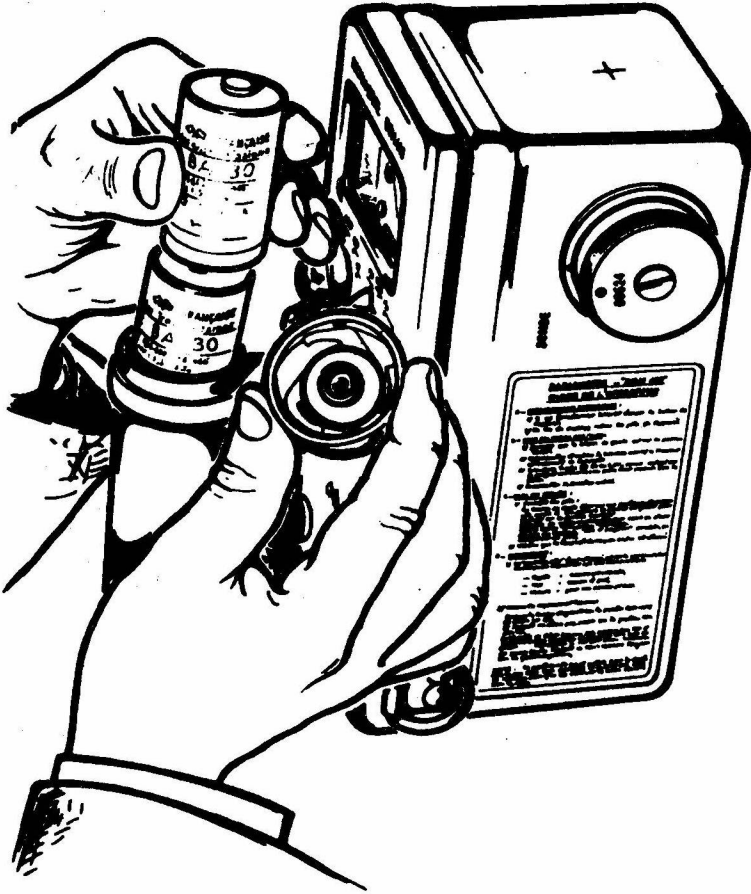


Fig. 5 — DOM 410 RADIATION METER (INSTALLATION OF BATTERIES)



Before starting any measurement, the response time selector switch (T) shall normally be set to one of the three following positions :

- "RAPIDE" (FAST). If the instrument is aboard a moving vehicle (1 second response time).
- "LENT" (SLOW). If it is used by walking personnel (5 second response time).
- "MESURE" (MEASUREMENT). If an accurate measurement is necessary (1 minute response time).

Gamma radiation measurements are made with the gamma probe. They can be made, the probe being inside the radiation meter or at the end of the extension cable assembly, at a variable distance from the radiation meter.

**CAUTION :** All measurements are made, the unit selector switch (U) being set to position R/h or mR/h.

**THE c/s POSITION IS ONLY USED WITH THE BETA-GAMMA PROBES.**

Never lay the radiation meter on the ground or on a object likely to be contaminated.

**234.1 Measurement with the gamma probe placed inside the DOM 410 radiation meter - Measurement of the ambient gamma radiation dose rate.**

The gamma probe is normally used inside the radiation meter. It shall be re-installed in the radiation meter after it has been used with the extension cable assembly.

Move the unit selector switch (U) to R/h and the sensitivity selector switch (S) to 1 000. On the dial the figures rotate and a 0 to 1 000 scale appears as well as, in the small window, the selected unit R/h.

If the radiation dose rate acting upon the DOM 410 radiation meter gamma probe is sufficient, there shall be a pointer deflection. The pointer shall stabilize or fluctuate around an average position and indicate the ambient gamma radiation dose rate value after a response time of about :

- 1 second when set to "RAPIDE" (FAST),
- 5 seconds when set to "LENT" (SLOW),
- 1 minute when set to "MESURE" (MEASUREMENT).

If the pointer stabilizes in the black portion of the dial (between 0 and 100 R/h), move the sensitivity selector switch to 100, leaving the unit selector switch set to R/h. Similarly, step down to the 0-10 R/h scale and to the 0-1 000 mR/h scale (sensitivity switch set to 1 000, unit switch set to mR/h), then to 0-100 mR/h and finally to 0-10 mR/h if necessary.

This procedure can be simplified when the radiation dose rate is known approximately, as it is then possible to immediately select the scale to be used.

In particular, when the instrument is used and there is no radiation, the selected scale is 10 mR/h and the higher scales are used only when the pointer moves to full scale.

#### **234.2 Measurement with the gamma probe connected to the radiation meter by means of the extension cable assembly.**

- Move the extension cable assembly out of the suitcase by pulling it upwards.
- Unwind the extension cable.
- Unlock the extension cable assembly to remove it from its reel for such purpose, screw out the knurled cap by 1/20 th of a turn and separate both parts.
- Replace the reel in the suitcase.
- Remove the gamma probe from its housing and insert it in the external probe casing marked "COTE SONDE" (PROBE SIDE) so that the datum points engraved on the external probe casing and on the probe cap are facing each other (fig. 6).
- Lock the knurled cap by pressing it and screwing it in by 1/20 th of a turn.
- Insert the extension cable connector marked "COTE RADIOMETRE" (RADIATION METER SIDE) in its housing in the instrument body so that the connector and instrument body datum points are facing each other (fig. 6).
- Lock by turning as indicated above.
- For measurement, proceed as indicated in para. 234.1.

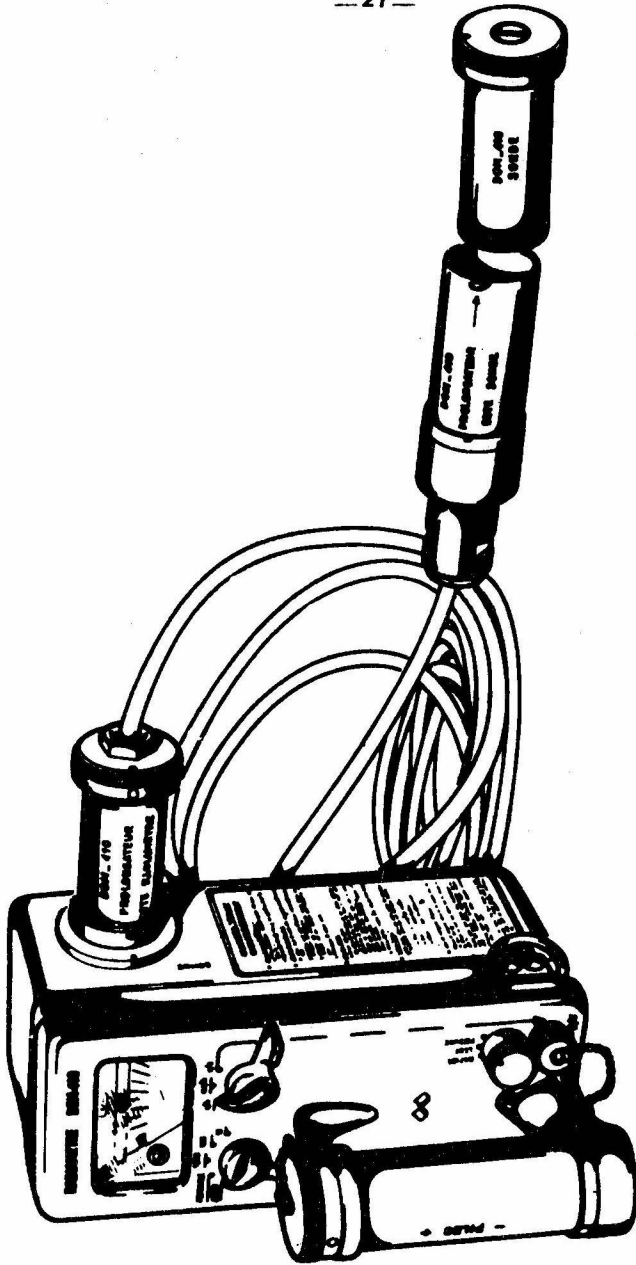


Fig. 6 — DOM 410 RADIATION METER  
INSTALLATION OF THE GAMMA PROBE EXTENSION CABLE ASSEMBLY



Fig. 7 — CARRYING THE DOM 410 RADIATION METER  
(WHEN NOT IN USE)

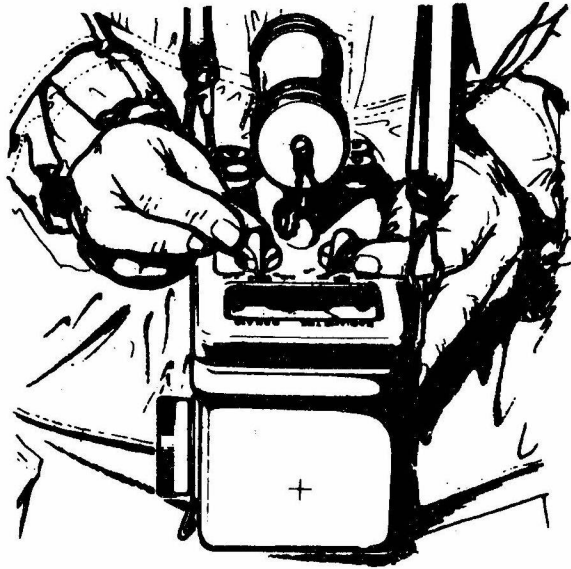


Fig. 8 — CARRYING THE DOM 410 RADIATION METER  
(WHEN IN USE)

### 243.3 Installation of the gamma probe.

- Insert the gamma probe integral with the knurled cap in the housing provided in the front part of the radiation meter so that the cap and instrument body datum points are facing each other.
- Lock the cap by turning it as indicated in para. 234.2. The gamma probe is thus positioned in the housing so as to provide proper electrical connections.

## 235. CARRYING THE RADIATION METER

The suitcase contains a carrying strap that the operator hooks to two rings placed on each side of the radiation meter and passes behind his neck.

Two carrying positions are possible :

- one position when not in use (fig.7) ;
- one position when in use (fig.8).

## 236. TURNING OFF THE RADIATION METER

When the instrument is no longer used, check the sensitivity selector switch is set to "ARRET" (OFF) in order to prevent rapid wear out of the dry batteries.

When the radiation meter is not to be used any more during the day batteries shall be removed from the handle at the end of the mission and placed in the plastic case provided in the suitcase.

Put the radiation meter and accessories back in their respective places in the suitcase.

## **24. THE ACCESSORIES OF THE DOM 410 RADIATION METER**

### **241. EXTENSION CABLE ASSEMBLY FOR GAMMA PROBE.**

It mainly consists of a 5 metre long, three-wire cable.

At one end of the cable is a hollow cylinder designed to house the gamma probe.

At the other end is a dummy probe designed to replace the gamma probe in the radiation meter and provide the electrical connections.

### **242. CARRYING STRAP**

Made of a plastic lanyard withstanding down to  $-40^{\circ}\text{C}$  temperatures, it is provided with two snap hooks. These hooks are snapped to the rings placed on each side of the radiation meter. At one end, the strap is folded around itself when passing through the snap hook.

The length of the folded strap can be adjusted by means of a ring, in order to adapt the dimensions of the strap to the size of the individual carrying the radiation meter.

### **243. SOURCE FOR CHECKING THE DOM 410 RADIATION METER FOR OPERATION.**

It has the shape of a 24 x 40 x 48 mm rectangular plastic box having a centre hole and various recesses that enable to give different positions to the beta-gamma probe or to the DOM 410 radiation meter and obtain information on different ranges of the radiation meter.

The radioactive substance, housed in a recess around the centre hole consists of a pellet of radium-226 bromide (1  $\mu\text{Ci}$  activity) enclosed in a sealed plastic envelope, classified in the 4th category, group 42 402. Such substance does not expose the personnel to any risk of radiation. However the opening of more than 2 DOM 410 suitcases after long storage shall take place in a ventilated area or better else, in the open air (diffusion of radon).

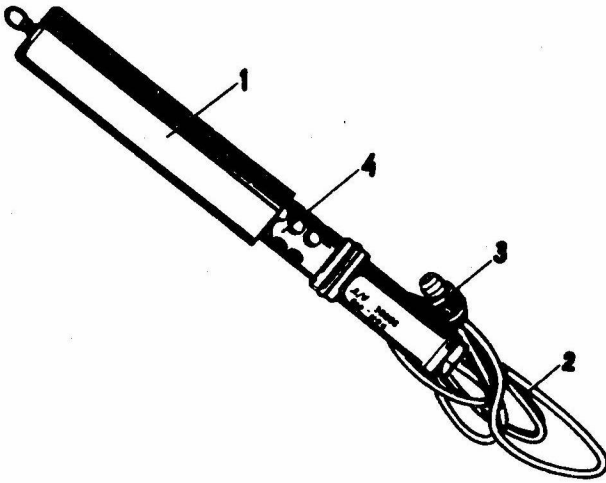


Fig. 9 — BETA-GAMMA PROBE

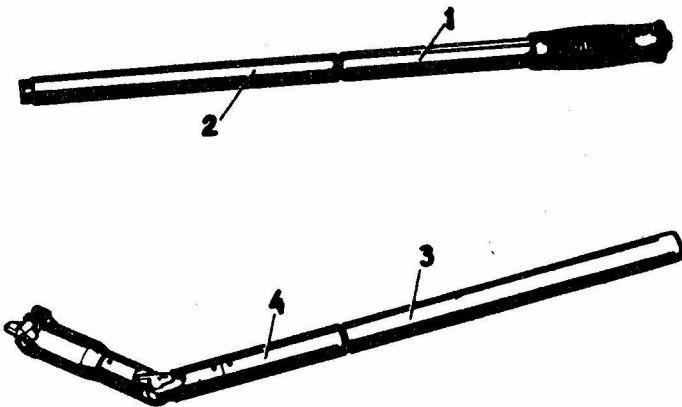


Fig. 10 — SCANNING ROD

#### 244. WARNING LIGHT

The warning light has the shape of an 11 x 10 x 4 cm rectangle including a casing and a cover.

The casing and cover are screwed together by a centre screw placed in the casing. Hermetical sealing is provided by a rubber seal.

The casing offers a red light, on one of its side faces, that flashes to give the alarm.

Two cables are placed on the side of the casing ; one is provided with a two-pole and locating pin plug, the other one with a coaxial plug. These plugs are to be plugged in the junction box provided on the vehicle.

The voltage supply is included between 8 and 28 Volts.

#### 245. BETA-GAMMA PROBE (fig.9)

The beta-gamma probe has the shape of an about 4 cm dia. black cylinder (1), terminated by an approx. 1.50 m long cable (2) provided with a plug connector (3).

The cylinder is a protective cap. It can be removed by **screwing it fully out and by pulling it out**. A metal tube (4), drilled with many holes, then appears. The Geiger-Muller tube, the walls of which are very thin, is housed inside the drilled tube. It is "VERY FRAGILE".

The cylinder (1) is thick enough to stop beta rays. The probe can thus :

- make a total estimate of beta + gamma radiations ;
- when provided with its cap, solely measure the gamma radiation dose rate ;
- by subtracting such measurement from the previous results, estimate beta radiation dose rate.

**CAUTION :** When refitting the probe case forming a protective cap on the beta-gamma probe, screw on without exaggeration, in order to avoid any damage.



## 246. EXTENSION CABLE ASSEMBLY FOR THE BETA-GAMMA PROBE.

It is a 5 metre long cable provided with a connector at each end. The first connector is designed to match the beta-gamma receptacle connector of the radiation meter, the second one to be connected to the beta-gamma probe connector. Both connectors of the extension cable assembly shall be screwed together before being placed back into the suitcase.

## 247. SCANNING ROD

The scanning rod (fig.10) is made of four cylindrical sections. The two centre sections, (2) and (3), are terminated with external and internal threads.

The end section (1) has only one thread and an end cap used as a grip.

The last section (4) has a thread at one end and an expansion joint at the other end to accommodate the beta-gamma probe.

A small screw and a wing nut are provided to maintain the probe in position.

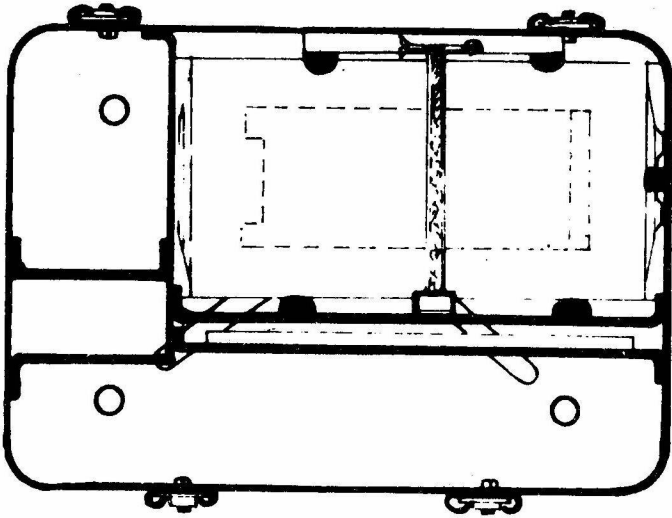
## 248. SUITCASE

The suitcase has the shape of a 35 x 22 x 28 cm metal box with round edges.

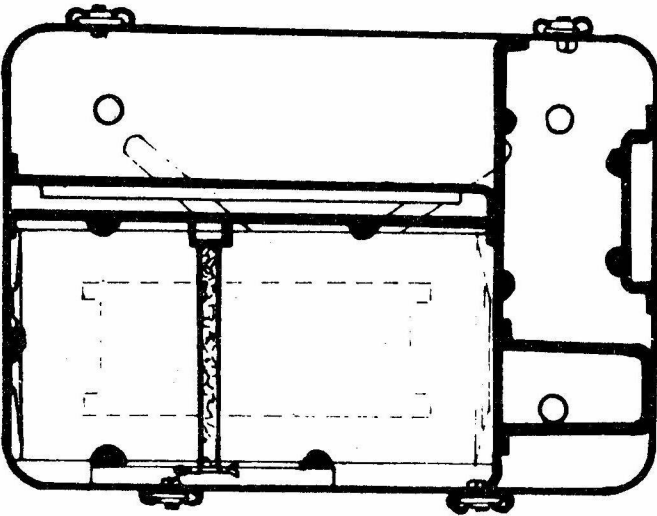
The box consists of two parts, the case and the lid, assembled with four spring toggle joints. A rubber seal provides hermetical sealing of both elements.

**248.1** Four bosses protrude from the case bottom ; they are made to lay the suitcase on the ground without scratching its bottom. Four similar bosses are sunk into the lid. These bosses enable to stack the suitcases. The lid also has a carrying handle.

The case is divided into compartments and can contain the DOM 410 radiation meter and its accessories.



MODEL A



MODEL B

Fig. 11 — INTERNAL ARRANGEMENT  
OF THE DOM 410 RADIATION METER SUITCASE

The larger compartment accommodates the DOM 410 radiation meter. This instrument rests in the suitcase on a rubber mount and is maintained on its smaller faces by rubber pads and on its larger side faces by rubber blocks. It is maintained in position by a rubber strap passing above the battery-container handle.

The long-shaped compartment accommodates the gamma probe extension cable assembly. This one is secured to its reel. This reel is maintained in the compartment by rubber blocks.

Another compartment accommodates the warning light. This one, to avoid damage that could result from transport, is protected by a flexible transparent polyethylene case.

A polyethylene case for four BA-30 dry batteries is placed in a 4th compartment.

The checking source fastened by its clip to one of the suitcase partitions.

Finally, a compartment is provided for the Manual between the radiation meter and the extension cable assembly.

Internal arrangement of the suitcase varies with the models in service : the suitcase, model A, and the suitcase, model B (See fig.11), each model corresponding to a warning light case of same identification (see fig. 1 and 2).

**248.2** The lid is designed to accommodate the accessories necessary to the decontamination operations (fig.12).

It includes two rubber mounts from one smaller side to the other.

By starting from the lid edge, the following elements shall be placed on these mounts, as indicated on the diagram secured to the lid :

- the four sections of the scanning rod,
- the beta-gamma probe,
- then, the extension cable assembly of the beta-gamma probe is wound up and housed against the lid edge.

These elements are secured by folding back the two mobile supports and locking them to the fixed supports.

One of the two fixed supports is provided with a thread on which the beta-gamma probe connector shall be screwed in.

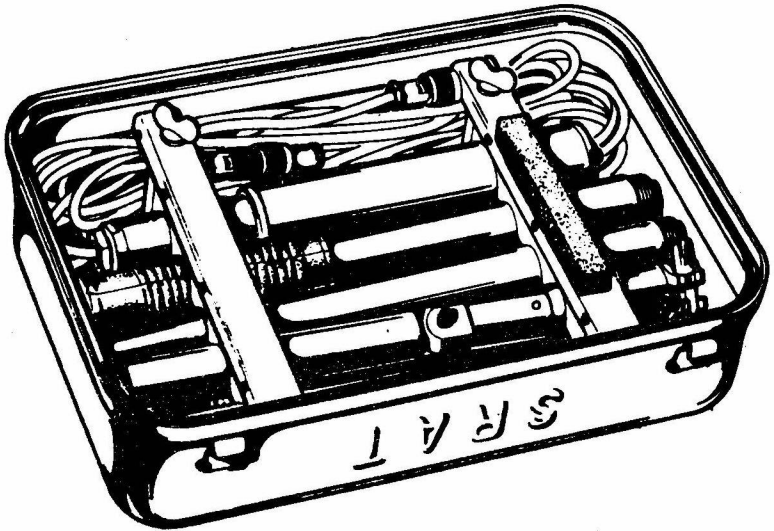


Fig. 12 -- SUITCASE LID WITH DECONTAMINATION ACCESSORIES

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## **25. UTILIZATION OF THE DOM 410 RADIATION METER AND WARNING LIGHT.**

(see block diagram in figure 13)

### **251. INSTALLATION OF THE RADIATION METER AND WARNING LIGHT.**

- Prepare the radiation meter as indicated in the paragraph 231 and 232.
- Install the radiation meter in its **support bracket**, adjust the lanyard and tighten,
- Unwind the warning light cables.
- Screw out and remove the knurled **cap covering the radiation meter receptacle connector** marked (=).
- Connect the cable of the **vehicle junction box** to the radiation meter receptacle connector marked (=).
- Remove the warning light from the **suitcase** and pull it out of its protective case. Place this case **back** into the suitcase.
- Install the warning light into its **support bracket**, adjust the lanyard and tighten.
- Connect the **coaxial plug connector** to the corresponding receptacle on the vehicle junction box.
- Connect the **two-pole and locating pin plug connector** of the warning light to the corresponding **power receptacle** on the vehicle junction box.

If this sequence of connecting operations is **not complied with**, the warning light may start to flash spontaneously.

The same phenomenon may occur when the **radiation meter** is removed from the vehicle, if the warning light **remains connected** and if the supply voltage is still delivered by the **vehicle junction box**.

### **252. CHECKING THE WARNING LIGHT FOR OPERATION**

Proceed to the preliminary check of the **radiation meter** as indicated in para. 233.

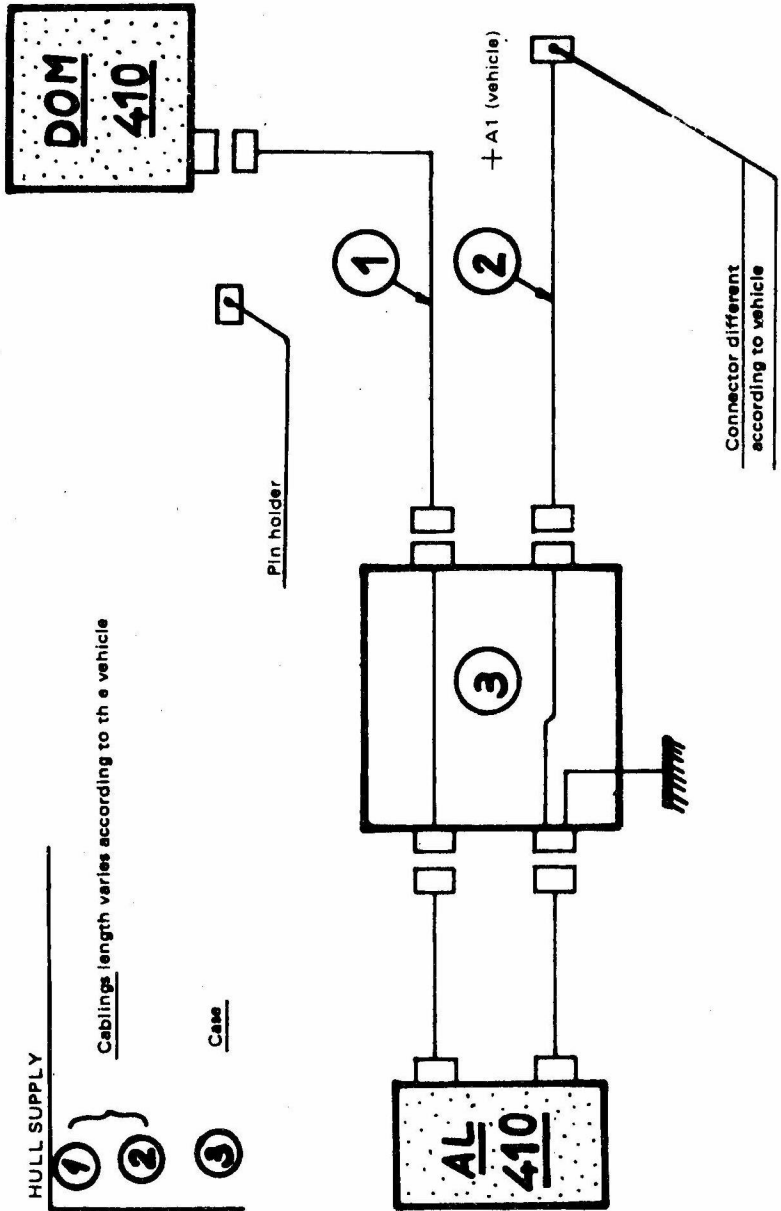


Fig. 13 — INSTALLATION ON A VEHICLE OF THE DOM 410 RADIATION METER AND AL 410 WARNING LIGHT

If the dry batteries are correct, the warning light shall flash when the sensitivity selector switch of the DOM 410 radiation meter is set to "CONTROLE " (CHECK).

The warning light gives the alarm when the instrument pointer exceeds half the recording scale.

The alarm threshold is therefore a function of the selected range.

### 253. SETTING THE RADIATION METER

Set the unit and sensitivity selector switches so as to be on the range where the alarm is required.

For example, to have the alarm for 50 mR/h :

- set the sensitivity selector switch to 100 ;
- set the unit selector switch to mR/ h.

The warning light is ready to operate and will start to flash as soon as the selected threshold is attained, i.e., in the example, 50 mR/h.

### 26. UTILIZATION OF THE DOM 410 RADIATION METER AND BETA-GAMMA PROBE.

- The beta-gamma probe and other decontamination accessories (scanning rod and extension cable assembly) are used to detect the slightly radioactive substance emitting gamma or beta rays.
- The decontamination accessories are housed in the lid of the suitcase. To remove them, unlock the two mobile supports of the suitcase lid, then lift these supports.

The scanning rod sections and extension cable assembly are then released. The beta-gamma probe, the connector of which is screwed on a thread secured to one of the supports remains attached to the lid.

### 261. MEASUREMENT OF DECONTAMINATION USING THE BETA-GAMMA PROBE.

- Fully screw out the protective cap of the " $\beta/\gamma$ " probe receptacle connector located on the right hand side near the handle of DOM 410 radiation meter.
- Fully screw in, in its place, the probe connector (electrical connection is obtained only when it is locked in position).
- Move the unit selector switch to c/s then the sensitivity selector switch to 1,000, 100 or 10.
- Bring the probe near to the place where radioactive substances are to be detected.
- Read the indication supplied by the instrument.

To measure the gamma radiation dose rate alone of the radioactive dusts, use the probe with its metal cap.

To estimate the beta radiation dose rate, screw out the metal cap. The probe is thus sensitive both to beta and gamma rays.

The indication supplied by the measuring instrument corresponds to the number of impacts per second delivered by the Geiger-Muller tube of the probe. Select sensitivity in order to only read measurements outside the black portion of the dial, and by moving always from 1,000 to 100, then from 100 to 10.

NOTE — Natural radioactivity (cosmic rays, radioactivity of ground,...) gives an indication of 1 to 2 c/s on the 0-10 c/s range.

### 262. MEASUREMENT OF DECONTAMINATION USING THE PROBE AND ITS EXTENSION CABLE ASSEMBLY.

The extension cable assembly enables remote measurement of beta and gamma rays. For such measurement, screw one of the cable ends to the "SONDE  $\beta/\gamma$ " ( $\beta/\gamma$  PROBE) receptacle connector of the DOM 410 radiation meter and the other end to the probe connector.

Proceed then as described in para. 261.



263. MEASUREMENT OF DECONTAMINATION USING  
THE BETA-GAMMA PROBE, ITS EXTENSION CA-  
BLE AND THE SCANNING ROD.

The scanning rod enables to place the beta-gamma probe at an about 1.20 m distance from the individual and explore places of uneasy access.

To proceed to measurement :

- take the four sections of the rod and assemble them together.
- insert the grip of the beta-gamma probe in the expansion joint  
The probe cable shall pass through the slot of this joint.
- fold back the attaching screw and screw in the wing nut to se-  
sure the probe.
- proceed to measurement as indicated in paragraphs 261 and  
262.

CAUTION — Do not touch any contaminated object with the probe.

The beta-gamma probe does not operate  
if the unit selector switch is set to mR/h or R/h  
Be sure it is set to c/s

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TITLE 3

MAINTENANCE - STORAGE - TRANSPORTATION

31. FIRST ECHELON MAINTENANCE

311. ACCESSORIES AND TOOLS

- Checking source
- Dry cloth
- Soft brush

312. PERIODIC MAINTENANCE

**312.1 Checking the radiation meter for operation**

**312.1.1 Frequency**

During normal operation, the radiation meter shall be checked once a month.

**312.1.2 Preliminary check**

Insert the dry batteries.

Set the sensitivity selector switch to "CONTROLE" (CHECK). If the instrument pointer moves to the left of the centre datum line, in the "PILES A REMPLACER" (BATTERIES TO BE REPLACED) part of the dial, install a set of new dry batteries. Start the operation again. If the pointer still moves to the left of the centre datum line, the unit is defective and is to be returned for repair.

**312.1.3 Checking the radiation meter for operation**

The military unit is not qualified for accurate checking of the DOM 410 radiation meter calibration. It is, however, possible to check the instrument for proper operation with sufficient accuracy, using the checking source.

a) Radiation meter coupled to the beta-gamma probe.

- connect the beta-gamma probe and set the unit selector switch to c/s.

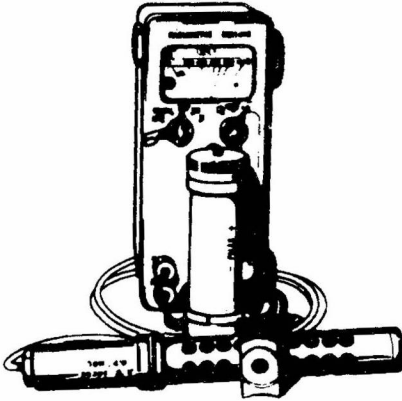


Fig. 14  
CHECKING THE DOM 410 RADIATION  
METER FOR OPERATION ON  
1000 c/s RANGE

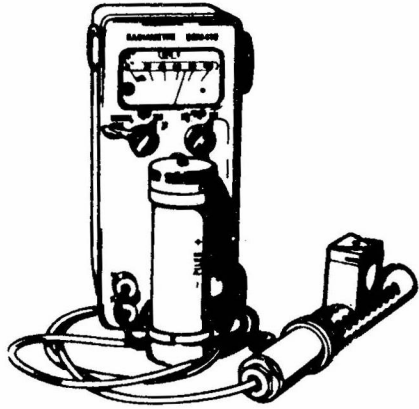


Fig. 15  
CHECKING THE DOM 410 RADIATION  
METER FOR OPERATION ON  
100 c/s RANGE

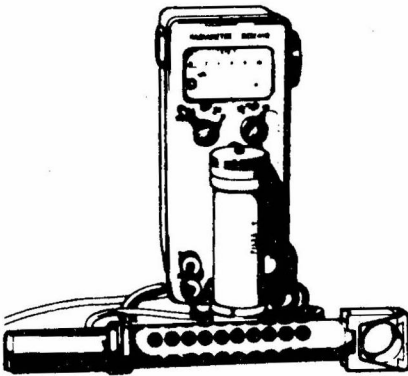


Fig. 16  
CHECKING THE DOM 410 RADIATION  
METER FOR OPERATION ON  
10 c/s RANGE



Fig. 17  
CHECKING THE DOM 410 RADIATION  
METER FOR OPERATION ON  
10 mR/H RANGE

- Set the sensitivity selector switch to 1 000 and place the probe in the source (fig.14). The instrument shall read 400 to 1 000 c/s.
- set the sensitivity selector switch to 100 and place the source on the probe as shown in figure 15. The instrument shall read 40 to 100 c/s.

**NOTE** — The reading can vary in the ratio of one of two, in both cases, depending on the source being or not facing a recessed part of the beta-gamma probe. Set the sensitivity selector switch to 10 and the probe as indicated in figure 16. The instrument shall read 3 to 10 c/s.

**b) Radiation meter coupled to the gamma probe.**

- set the unit selector switch to mR/h, the sensitivity selector switch to 10 and the response time switch to "RAPIDE" (FAST).
- install the checking source on the DOM 410 radiation meter the V being housed between the strengthening ribs of the instrument body at a place marked with a cross (fig.17).
- the DOM 410 radiation meter pointer shall then move by to 1 to 3 divisions and the indicator light located on the left bottom corner of the dial shall flash.
- if a radiation meter or one of its accessories does not operate properly, it shall be immediately sent for repair to the support organization.

## **312.2 Maintenance of contacts**

### **312.2.1 Frequency**

During normal operation, maintenance of contacts shall take place once a month.

### **312.2.2 Procedure**

The contacts placed at the end of the gamma probe shall be cleaned using a dry cloth. The use of abrasives (file, sand paper, etc. ) and solvents is forbidden.

### 313. NON PERIODIC MAINTENANCE

#### 313.1 Dry battery replacement

The time at which the dry batteries are discharged shall not normally be unnoticed if as recommended earlier, the batteries are checked every time before proceeding to a series of measurements.

To exchange the batteries, proceed as described in para. 232 for installing the batteries.

#### 313.2 Decontamination

A contaminated instrument can be efficiently brushed with a soft brush soaked in water containing a non alkaline detergent.

**IMPORTANT NOTE**  
**ANY OPERATION OTHER THAN THOSE ABOVE DESCRIBED IS STRICTLY PROHIBITED**

## 32. SECOND ECHELON MAINTENANCE

### 321. TOOLS

For second echelon maintenance operations, no specific tools are required.

### 322. PERIODIC MAINTENANCE

#### 322.1 General information

Periodic inspection and check of the instrument shall take place :

- on the occasion of the monthly inspections made by the "A.S." noncommissioned officer of the unit in charge to the instrument ;
- on the occasion of the half-yearly inspections made by the "A.S." commissioned officer of the corps ;
- mandatorily, before returning the equipment to service.

**322.2 List of maintenance operations**

TYPE OF OPERATION	FREQUENCY
Checking proper condition of instrument.	Monthly
Checking metal coating.	Monthly
Checking lead seals of instrument.	Before placing or replacing instrument into service.
Checking proper functioning (ref. para. 312).	Before placing or replacing instrument into service.
Checking beta-gamma probe.	Before placing or replacing instrument into service.
Checking proper condition of cable and extension cable assembly contacts.	Monthly
Checking warning light (ref. para. 252).	Monthly
Checking hermetical sealing of checking source radioactive element.	Monthly
Checking proper condition of accessories.	Monthly

**322.3 Return for repair**

Are to be systematically returned for repair to the Ordnance support organization concerned :

- dented instruments or instruments showing damaged internal coating.
- instrument that have not passed checks of paragraphs 312 and 252.

### 323. NON PERIODIC MAINTENANCE

Second echelon maintenance operations consist in exchanging the damaged components.

The list of replaceable parts is given in the following tables.

**IMPORTANT NOTE**  
**REPLACEMENTS OTHER THAN THOSE DEFINED**  
**HEREAFTER ARE STRICTLY PROHIBITED**

#### 323.1 DOM 410 Radiation meter

FIG.	ITEM	QTY.	DESCRIPTION
18	1	4	Screw, ISO, CB steel
	2	1	Fastener, chain
	3	4	Washer, CB steel
	4	3	Cap, chained
	5	1	Fastener, double, chain
	6	1	Screw, grub, ISO, CB steel
	7	1	Scw, set, ISO, CB steel
	8	1	Switch, selector, response time
	9	2	Screw, grub
	10	1	Switch, selector, sensitivity
	11	1	Cap, quick-disconnect
	12	2	Fastener, chain
	13	1	Chain, beaded
	14	1	Switch, selector, unit

#### 323.2.1 Gamma probe extension cable assembly

FIG.	ITEM	QTY	DESCRIPTION
19	1	1	Assembly, gamma probe extension cable, complete



**323.3 Extension cable reel**

FIG.	ITEM	QTY.	DESCRIPTION
20	1	1	Reel, extension cable, complete, installed
	2	6	Cushion, rubber

**323.4 Beta-gamma probe**

FIG.	ITEM	QTY.	DESCRIPTION
21	1	1	Probe, beta-gamma, complete, installed
	2	1	Ring, SR 551
	3	1	Case, probe
	4	1	Washer, CB steel
	5	1	Screw, ring

**323.5 Beta-gamma probe extension cable assembly**

FIG.	ITEM	QTY.	DESCRIPTION
22	1	1	Assembly beta-gamma probe, complete, installed.

**323.6 Scanning rod for beta-gamma probe**

FIG.	ITEM	QTY.	DESCRIPTION
23	1	1	Rod, scanning, for beta-gamma probe, complete
	2	1	Section, grip, alone
	3	2	Section, connecting
	4	1	Knob, tightening
	5	1	Pin, grooved, CB steel
	6	1	Screw, clamp
	7	1	Section, terminal, hinged, complete

FIG.	ITEM	QTY	DESCRIPTION
23	8	1	Section, terminal, mobile, alone
	9	1	Screw, ISO, CB steel, l.h. thread
	10	1	Washer, plain, CB steel
	11	1	Screw, hinge
	12	1	Section terminal, fixed
	13	1	Section, grip
	14	1	Plug, rubber
	15	2	Grip, rubber

**323.7 Carrying strap — Case for replacement batteries — Checking Source**

FIG.	ITEM	QTY	DESCRIPTION
24	1	1	Case, replacement batteries
	2	1	Fastener, spring
	3	1	Strip, carrying

**323.8 Suitcase lid**

**323.8.1 Lid, model A**

FIG.	ITEM	QTY	DESCRIPTION
25	1	4	Screw, fillister head machine
	2	1	Handle and plate
	3	8	Screw, fillister head machine
	4	4	Hook, catch
	5	1	Screw, hinge
	6	2	Washer, plain
	7	1	Washer, toothed
	8	1	Nut
	9	4	Washer, sealing
	10	4	Washer, cup
	11	4	Washer, toothed

FIG.	ITEM	QTY.	DESCRIPTION	
25	12	4	Nut	
	13	3	Rivet, split	
	14	1	Nut	
	15	1	Washer, toothed	
	16	2	Wahser, plain	
	17	2	Block, rubber	
	18	1	Screw, hinge	
	19	2	Block, rubber	
	20	2	Rivet, split	
	21	1	Rivet, split	
	22	1	Channel, upper	
	23	1	Fastener, DZUS	
	24	1	Washer, plain	
	25	1	Washer	
	26	1	Washer, plain	
	27	1	Ring, stop	
	28	2	Rivet, split	
	29	2	Bracket, catch	
	30	2	Block, rubber	
	31	2	Rivet, split	
	32	1	Plate, diagrammatic identification	
	33	3	Rivet, split	
	34	1	Mount, threaded, connector	
	35	1	Washer, toothed	
	36	1	Nut	
	37	1	Fastener, DZUS	
	38	1	Washer, plain	
	39	1	Washer — Washer, plain	
	40	1	Ring, stop	
	41	1	Channel, upper and bonded rubber block	
	42	2	Block, rubber	
	43	3	Rivet, split	
	44			

FIG.	ITEM	QTY.	DESCRIPTION
25	45	8	Nut
	46	8	Washer, toothed
	47	8	Washer, cup
	48	8	Washer sealing

323.8.2 Lid, model B

FIG.	ITEM	QTY	DESCRIPTION
26	1	4	Screw, fillister head machine
	2	1	Handle and plate
	3	8	Screw, fillister head machine
	4	4	Hook, catch
	5	1	Screw, hinge
	6	2	Washer, plain
	7	1	Washer, toothed
	8	1	Nut
	9	4	Washer, sealing
	10	4	Washer, cup
	11	4	Washer, toothed
	12	4	Nut
	13	3	Rivet, split
	14	1	Nut
	15	1	Washer, toothed
	16	2	Washer, plain
	17	2	Block, rubber
	18	1	Screw, hinge
	19	2	Block, rubber
	20	2	Rivet, split
	21	1	Rivet, split
	22	1	Channel, upper and bonded rubber block
	23	1	Fastener, DZUS
	24	1	Washer, plain

FIG.	ITEM	QTY.	DESCRIPTION
26	25	1	Washer
	26	1	Washer, plain
	27	1	Ring, stop
	28	2	Rivet, split
	29	2	Bracket, catch
	30	2	Block, rubber
	31	2	Rivet, split
	32	1	Plate, diagrammatic identification
	33	3	Rivet, split
	34	1	Mount, threaded, connector
	35	1	Washer, toothed
	36	1	Nut
	37	1	Fastener, DZUS
	38	1	Washer, plain
	3940	1	Washer — Washer, plain
	41	1	Ring, stop
	42	1	Channel, upper
	43	2	Block, rubber
	44	3	Rivet, split
	45	8	Nut
46	8	Washer, toothed	
47	8	Washer, cup	
48	8	Washer, sealing	

### 323.9 Suitcase

#### 323.9.1 Suitcase, model A

FIG.	ITEM	QTY.	DESCRIPTION
27	1	1	Grommet
	2	12	Cushion
	3	1	Loop
	4	1	Fastener, loop

FIG.	ITEM	QTY.	DESCRIPTION
27	5	1	Strap, rubber
	6	1	Pin, eye
	7	8	Nut
	8	8	Washer, toothed
	9	8	Washer, cup
	10	8	Washer, sealing
	11	4	Spacer
	12	4	Catch, spring
	13	8	Screw, fillister head machine

323.9.2 Suitcase, model B

FIG.	ITEM	QTY.	DESCRIPTION
28	1	10	Cushion
	2	1	Loop
	3	1	Fastener, loop
	4	1	Strap, rubber
	5	1	Pin, eye
	6	1	Grommet
	7	8	Nut
	8	8	Washer, toothed
	9	8	Washer, cup
	10	8	Washer, sealing
	11	4	Catch, spring
	12	8	Screw, fillister head machine

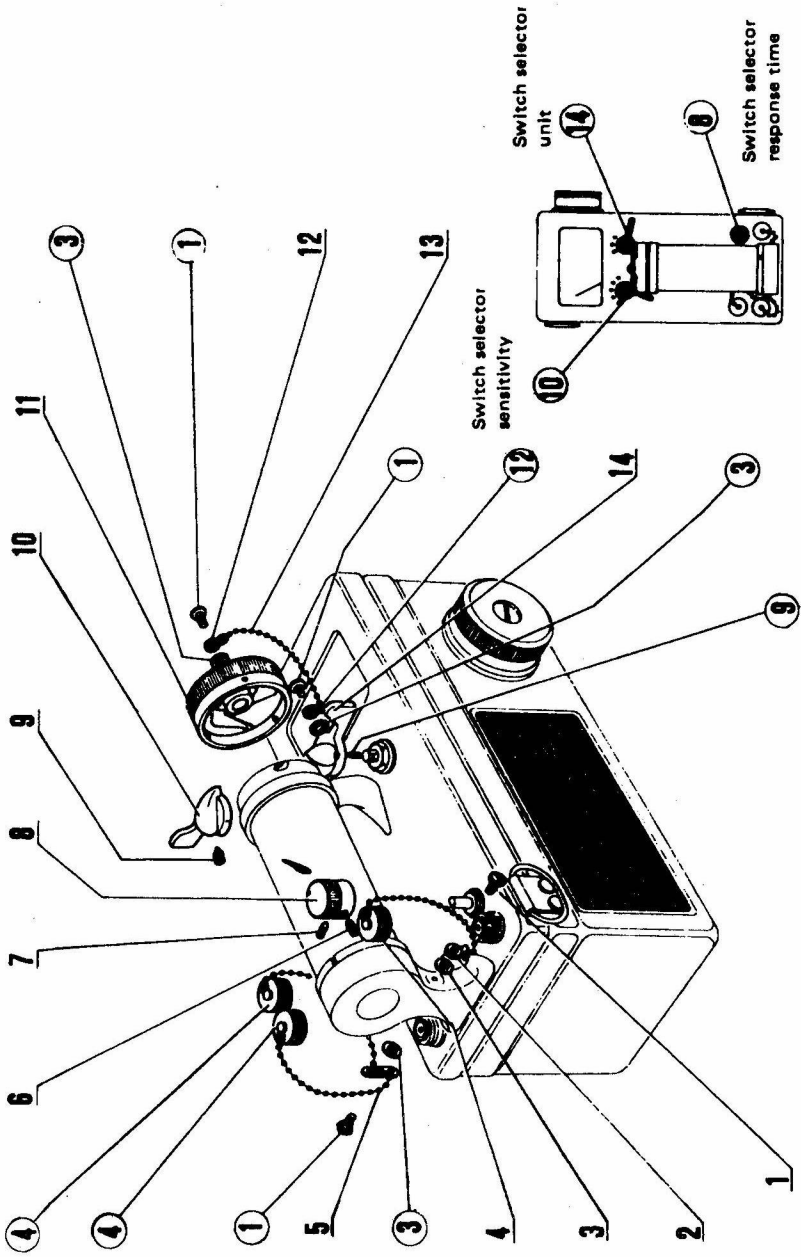


Fig: 18 - DOM 410 RADIATION METER

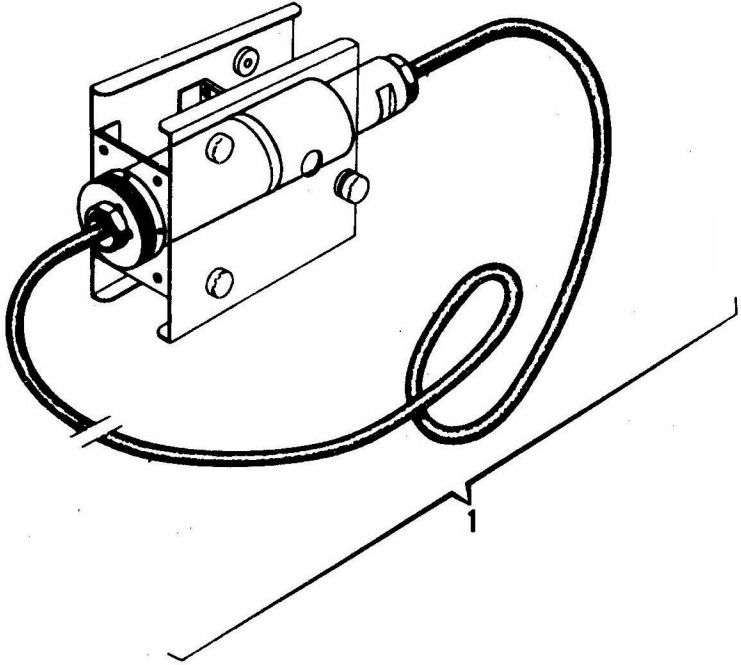


Fig. 19 — GAMMA PROBE EXTENSION CABLE ASSEMBLY

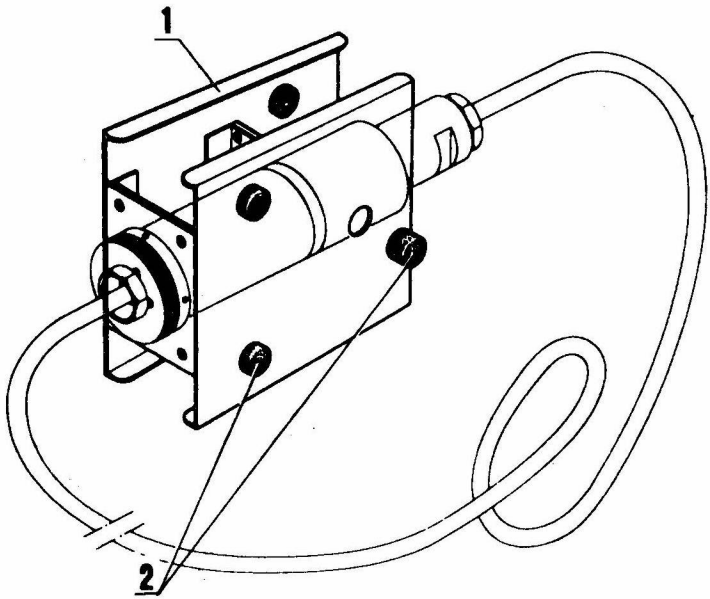


Fig. 20 — EXTENSION CABLE REEL



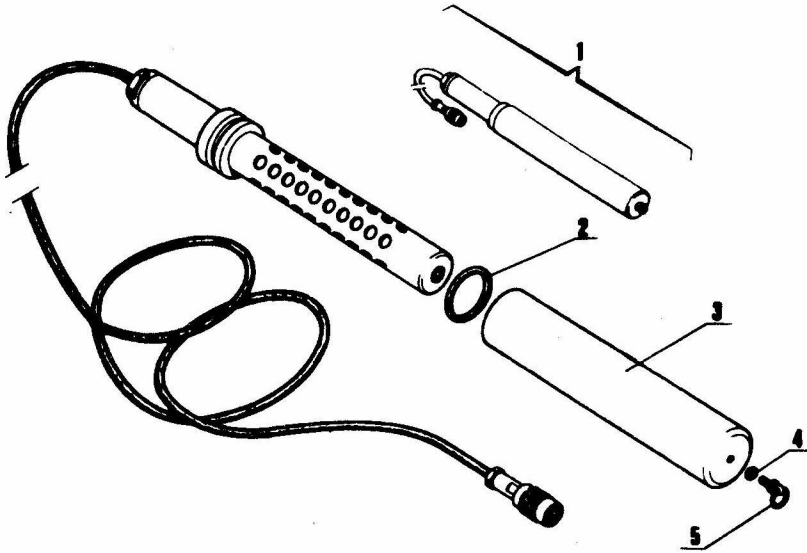


Fig. 21 — BETA-GAMMA PROBE

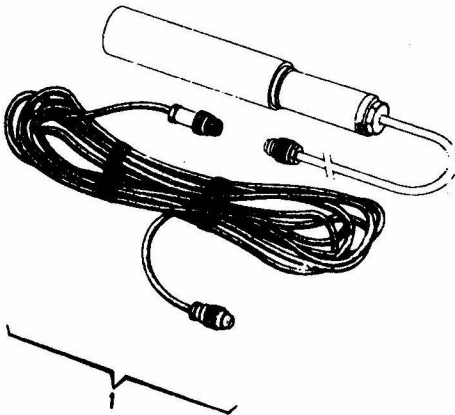


Fig. 22 — BETA-GAMMA PROBE EXTENSION CABLE ASSEMBLY

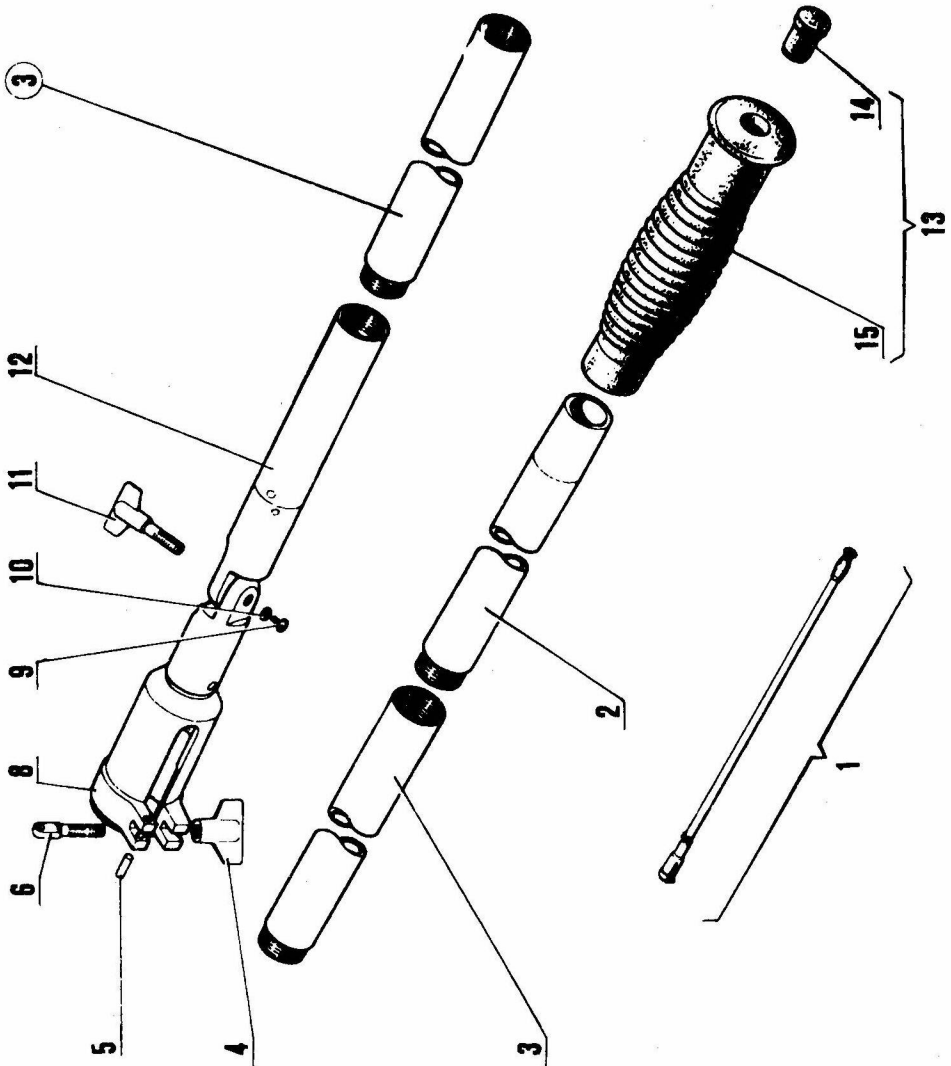


Fig. 23 - SCANNING ROD FOR BETA-GAMMA PROBE

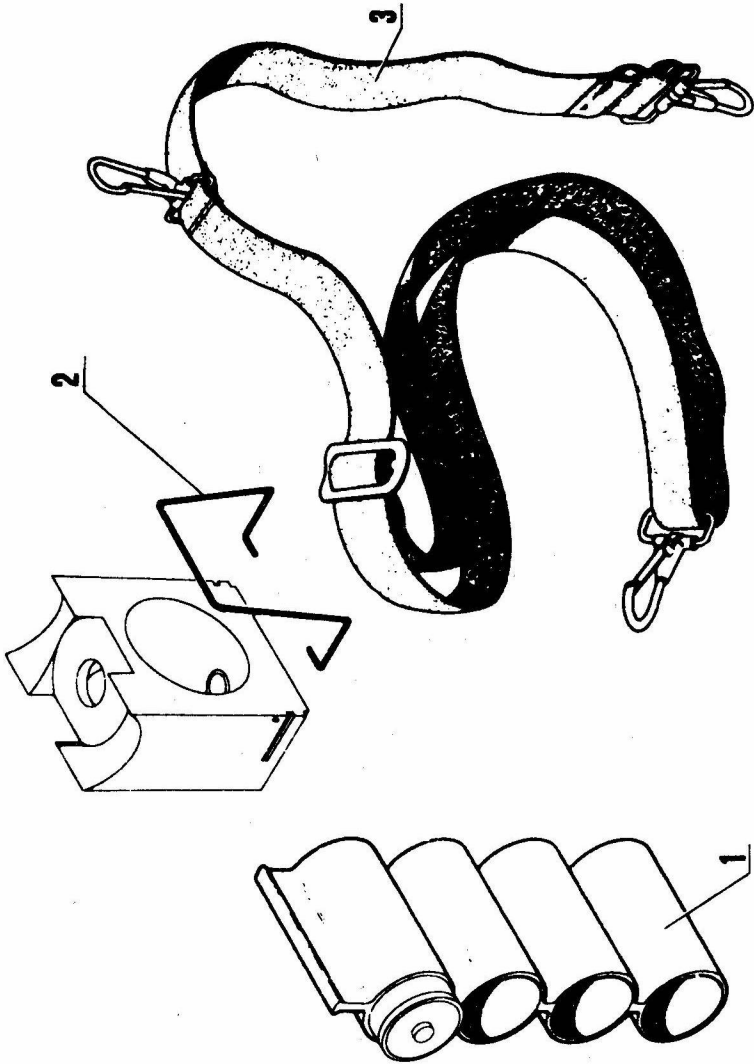


Fig. 24 - 1. CASE FOR REPLACEMENT DRY BATTERIES  
2: CHECKING SOURCE SPRING FASTENER - 3. CARRYING STRAP

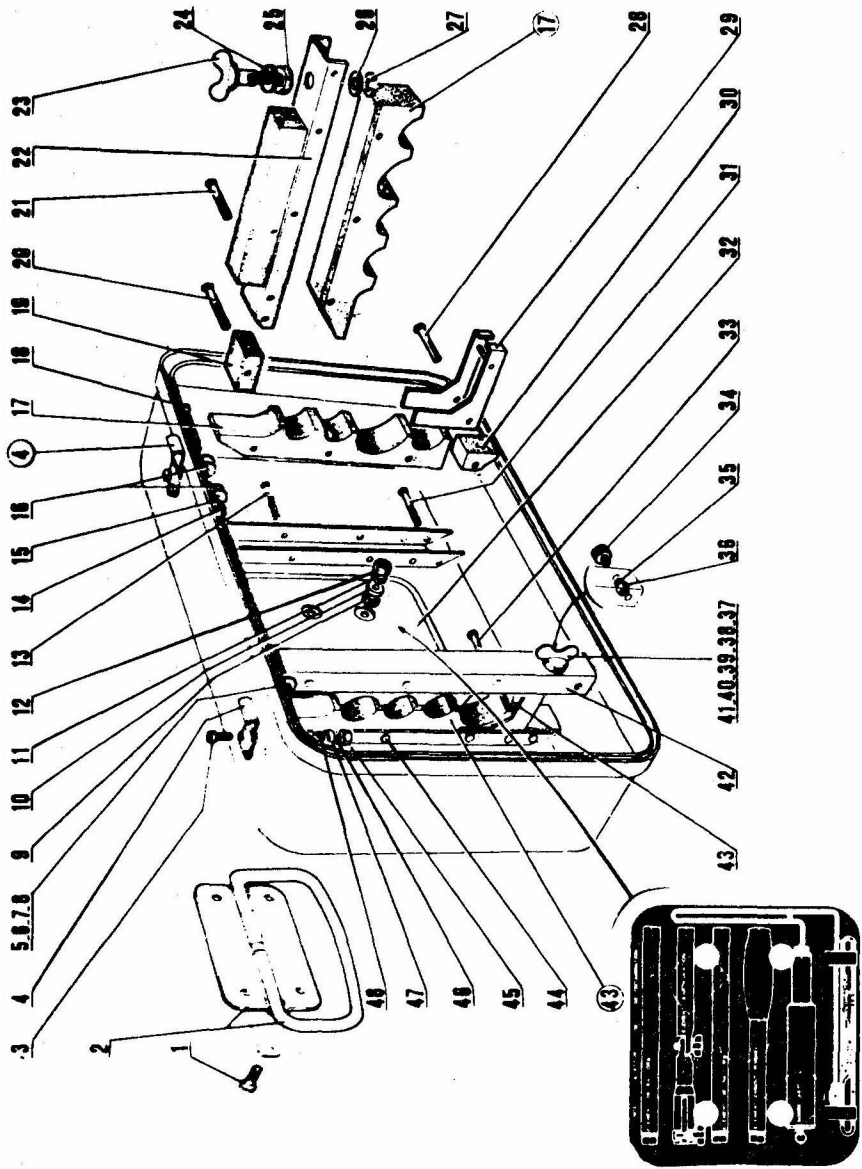


Fig. 2E - SUITCASE LID, MODEL A

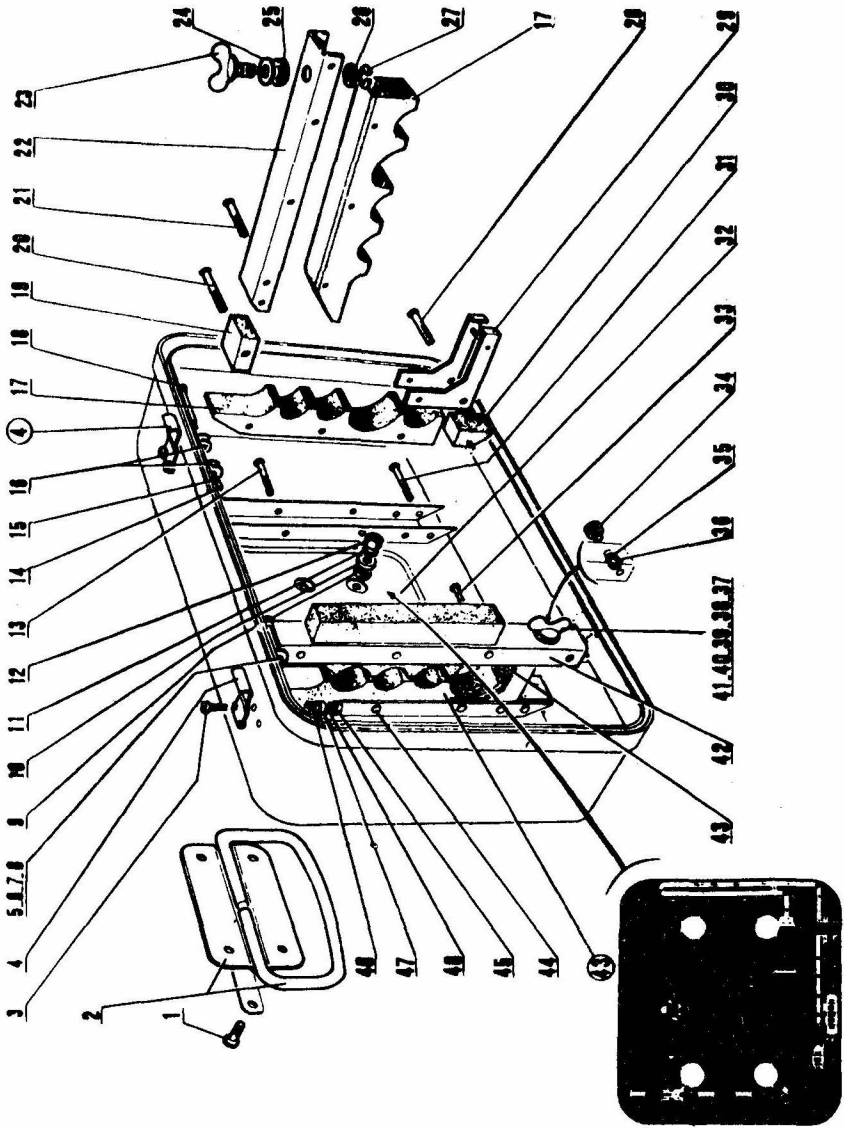


Fig. 26 - SUITCASE LID, MODEL B

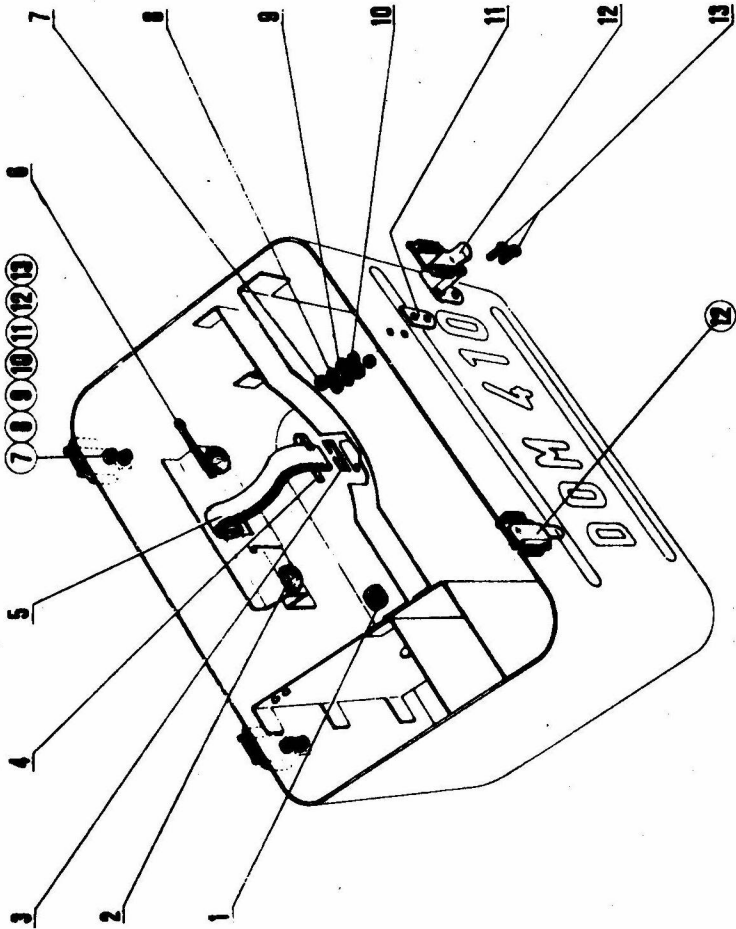


Fig. 27 - SUITCASE, MODEL A

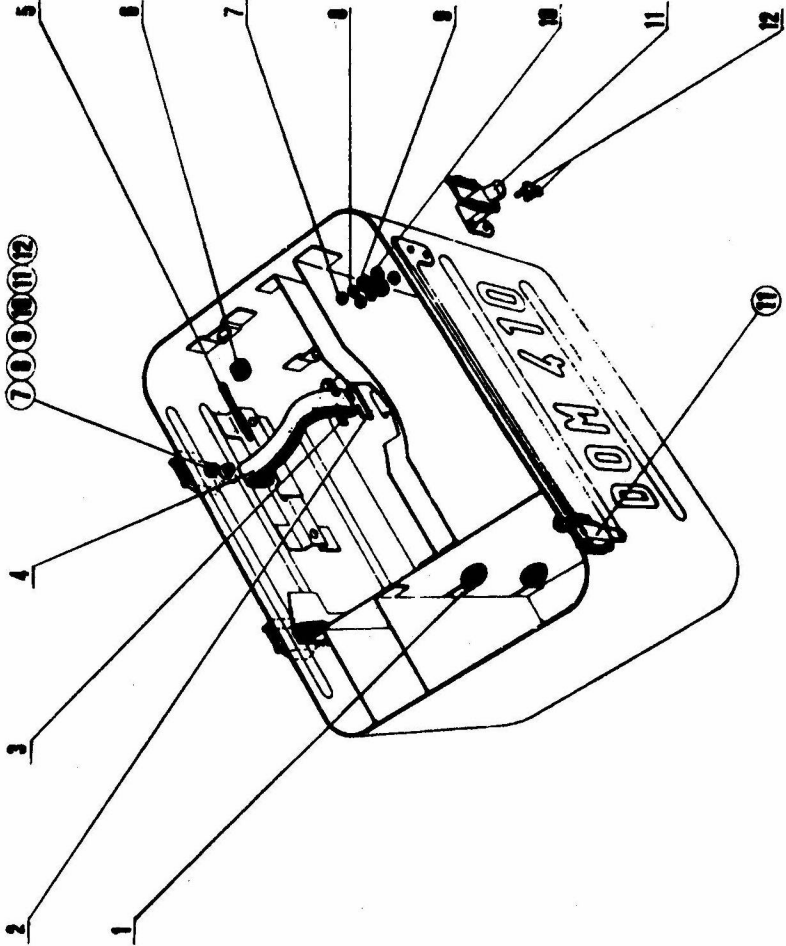


Fig. 28 - SUITCASE, MODEL B

### **33. STORAGE**

#### **331. PRELIMINARY CHECK**

Before storing the equipment, check proper functioning of the various components by complying with the first and second echelon maintenance requirements.

If necessary, have the equipment reconditioned.

#### **332. PROCEDURE**

- Remove the dry batteries
- Place the components of the set of equipment in the suitcase.
- Shut the suitcase.
- The equipment can then be stored at temperatures between  $-55^{\circ}\text{C}$  and  $+70^{\circ}\text{C}$ .

#### **333. MAINTENANCE INSPECTION**

Considering the precautions to be taken as regards the opening of the suitcases (ref. para. 243) it is necessary to proceed to :

- a half-yearly inspection of the complete equipment (ref. para. 322.2) ;
- a monthly inspection of the beta-gamma probe functioning.

### **34. TRANSPORTATION**

Transportation by rail or by air of the equipment placed in its suitcase is not the subject of particular specifications.





