Version No. 1.0

MANUAL

Safe Training Systems Ltd

Series SBM-2D

Ionising Radiation Simulator

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Safe Training Systems Ltd

Thank you for purchasing a Safe Training Systems 800 Series simulator which we expect will give you many years of service.

Established in 1991 Safe Training Systems Ltd (STS) specialises in the design & manufacture of simulators for realistic training within industries using hazardous materials.

STS simulators are currently used by the following ;-

- Nuclear Power Stations
- Nuclear Fuel Manufacturers
- Nuclear Research Laboratories
- Civil Defence Organisations
- Nuclear Weapon Manufacturers
- Military Services

in the UK, Benelux, Canada, France, Germany, Scandinavia and the USA.

The STS product range includes the following ;-

STS 800 Series for training in surface contamination and de-contamination.
STS 900 Series for training in the use of Field Survey Instruments & Dosimeters.
STS Plumes for training in monitoring airborne releases of radiactivity or gases.
STS GASS for training in monitoring hazardous gases in enclosed spaces.

STS will also design & manufacture to customers' specific requirements.

STS Customer Care

STS is strongly committed to customer care and after-sales service. Should you have any queries regarding your STS 800 Series simulator please contact our sales office
(Monday - Friday 9.00 am - 5.30 pm)

Telephone + 44 (0) 1189799591

Website: www.safetrainingsystems.com
e-mail : sales@safetrainingsystems.com

STS welcomes any questions you may have regarding the features, setting up or operation of your instrument.

STS relies on feed-back from customers to assist with its continuous development programme.

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SECTION 1

WARNING NOTICES

All Safe Training Systems Ltd products are designed to function safely in the hands of both trainers and trainees, however we wish, to enhance your safety, to draw your attention to the following points:-

1.1 Control of Simulators

STS aims to make simulators that are indistinguishable from real instruments, so that the person being instructed experiences the best possible training.

A consequence of this is that there is a possibility that the simulator could be mistaken for a real instrument, and then used for a real monitoring task, when, obviously, no readings would result.

To guard against this danger, simulators must be effectively managed so that they cannot be used for real monitoring.

Some STS simulated probes such as the SBM2D are connected to real unmodified ratemeters for use in training. It is recommended that any such ratemeters are recalibrated before being used again with real probes.

1.2 High Voltage

The detector used in this instrument requires a 2KV supply which is provided by the electronics pack. Should it become necessary to open the probe or electronics, care must be taken to ensure that the instrument is switched off, and ideally the battery removed, before undertaking any adjustment.

1.3 Effect of Water on the Instrument

The detector in the probe of this instrument is of a robust design, suited to this particular application. If it is used in very wet conditions, entry of water into the detector or electronics may result in instrument failure, necessitating rectification by our Service Department.

1.4 Skin Irritation

The simulated radioactive source materials supplied with this system are of low toxicity and have no effect on the skin of most people. It is recommended that deliberate skin and eye contamination is avoided.

1.5 Intrinsic Safety

STS instruments are not designed to be intrinsically safe, and should not, therefore, be used in areas where there is a potential fire or explosion hazard.

1.6 Substitution of Source Materials

The source materials supplied by STS have been very carefully selected to ensure that they both comply with safety considerations and also perform well with the instruments.

Any substitution of other materials will both nullify the guarantee on the instrument, and also absolve STS from any responsibility for effects on the users.

SECTION 2

TRAINING WITH STS SYSTEMS

STS systems consist of simulated radiation sources, which may be powders or liquids, and a range of imitation probes. A further part of the system is a modified real ratemeter, or, for the more popular models, imitation ratemeters.

The systems are used for training staff who may become monitors or technicians; for flexible working training; for use in examinations and certification procedures; for developing and testing new procedures for safe working; and finally for staging very realistic exercises.

The instruments are designed to simulate all of the commonly used probes and ratemeters, with particular attention paid to factors which will improve the training aspects of the system.

In particular, STS systems allow the trainee to master the skill of probe manipulation and also to develop an understanding of the ease with which contamination spreads.

That system also allows realistic exercises to be conducted in the cleanup and disposal of spills, and in the handling of contaminated equipment, and in particular, accident victims.

2.1 Use of Radiation Simulants

These materials are supplied as part of the Safe Training Systems Ltd radiation simulation system, and must not be used for any other purpose, nor be substituted by any other material. Such substitution will render any guarantee null and void. Accidental skin contact by either LS1 or SS4 is very unlikely to result in any irritation or

other effect, but it is recommended that it is not deliberately applied to the skin, especially the face and eyes, and that accidental splashes are washed off immediately.

The gas or vapour generated by LS1 and SS4 when used as recommended is unlikely to pose a significant hazard to health or environment.

Please see the Safety Data Sheets for further information.

2.2 Liquid Source LS1

This liquid may be used in various ways to demonstrate the spread of radioactive contamination and to enable realistic training in the use of monitoring instruments to be undertaken. In addition, and equally importantly, it may be used to simulate decontamination processes. The liquid is dispensed from a small container with a pump-type dispenser, and will form droplets or patches on metal and fabric surfaces. These patches of contamination will be unobtrusive, especially if the surface is not in pristine condition.

It is suitable for use on soil, vegetation, vehicles and equipment, and also on staff who are wearing protective clothing, including emergency suits, laboratory coats, overalls, rubber gloves etc. The liquid will have no effect on these materials, but permeable clothing, wetted with the liquid should not be allowed to stay in contact with the skin.

Monitoring of contaminated equipment, plant and staff is carried out in the same way that it would be with real radiation instruments, and the use of a simulator embodying a real, or apparently real, ratemeter adds to this realism. Probes, of the same external form as the probes normally used, extend the realism considerably.

The simulation is particularly appropriate to alpha radiation, but training in the measurement of surface contamination levels of beta and gamma radiation may also be given.

To operate effectively the probe should be held within 1cm of the surface to be monitored. At or below 0.5cm a countrate of greater than 1000cps may be achieved, and this will diminish to zero when the probe has been moved to 3-4cm from the surface.

In addition, if the probe is brought in contact with LS1, it will become contaminated and emit a continuous signal, as a geiger or scintillator probe would when contaminated with a radioactive contaminant.

The discipline of good probe manipulation near surfaces is thus instilled by the system, resulting in good practice by the trainee when set to work.

Decontamination of equipment and protective clothing, vehicles, floors etc., may be demonstrated by washing with water or a water-detergent solution, and both will result in a reduction of countrate, but not necessarily complete cleaning.

Use of swabs also results in a reduction in countrate, and in this case it may be demonstrated that the swab has become contaminated during use.

Use of proprietary decontamination foaming sprays results in the complete removal of LS1 from both metals and fabrics.
Scenarios involving the monitoring and subsequent clean up of spills, of donning and doffing safety equipment and clothing, and of the spread of contamination by accidental contact with contaminated items and floors may be easily staged, and all will have considerable realism.

Depending on the quantity of LS1 spread, the surface texture, temperature and air movements, the apparent radiation will continue to be emitted for up to 3 hours. Evaporation of the liquid will cause the signal to reduce, and after 12hours no signal will be found, and the area will be completely clean of any residual contamination. This will then allow the training to be repeated in the same area without any problem of background signal.

2.3 Solid Source SS4

Solid source material, SS4, may be used in similar ways to liquid source LS1, in that it can be spread in the training area on the ground, equipment, protective clothing, etc. without having any effect on these items.

SS4 is free flowing powder which will not adhere to dry surfaces, so its use is limited to horizontal or near horizontal surfaces, in folds of cloth or clothing etc. Because it is more physically obvious than LS1, some consideration should be given to providing a suitable background against which its presence will not be immediately apparent - as SS4 is white in colour, a rough white surface is ideal, or use with sugar or salt for example, will mask the powder.

Monitoring is carried out as for LS1, and because of the increased surface area of the powder, a larger signal will be obtained. Decontamination may be demonstrated by washing, sweeping etc.

The useful training period by SS4 is about 2 hours for a 0.3g pile of material, after which the signal will decrease, reaching zero cps after about 4 hours. An inert powder will remain after the signal has completely disappeared.

2.4 Detector Cleaning

Where the detector is not heavily contaminated, it may be cleaned by washing in solvents. The detector should be placed in a 100ml beaker in a suitable fume hood, and washed several times in firstly, a hydrocarbon such as hexane, and then finally in acetone. Chlorinated solvents should not be used to clean this detector.

After washing, the detector should be dried for several hours at 50C in a ventilated oven.

Detectors which have bent or damaged central electrodes, damaged contacts or which are permanently stained within the electrode cavity must be discarded.

2.5 Potential Interference with STS Systems

a) Chemical interference

A single case has been reported of signals resulting from a leaking air conditioning system, presumably the chemical was a freon.

Interference has also been traced to cleaning solvents, particularly the pressurised types used in instrument workshops for cleaning switches, and probably containing chlorinated solvents. These problems can usually be identified by moving the instrument to another location.

SECTION 3

TECHNICAL INFORMATION

3.1 Set Up

The STS SBM2D probe may be used with the Digital Canberra MIP10. The Probe has a standard 16 pin fischer connector that plugs directly into the probe port on the instrument.

The SBM-2D probe is powered by the instrument and does not require batteries. The probe is automatically turned on when the probe is connected to the meter and the meter is powered on.

It is required that the Meter is plugged into the mains supply to ensure sufficient current is available to run the probe.

3.2 Response to stimulant

The probe contains a dual gas sensor and fan system, which enables it to detect the simulants SS4 and LS1 supplied by STS.

In use, the probe is used exactly as a real probe - it requires to be held close to the surface being monitored, and must be passed over the surface at a slow, steady rate, or the sensor will not detect the gas, thus promoting good monitoring technique.

3.3 Maintenance

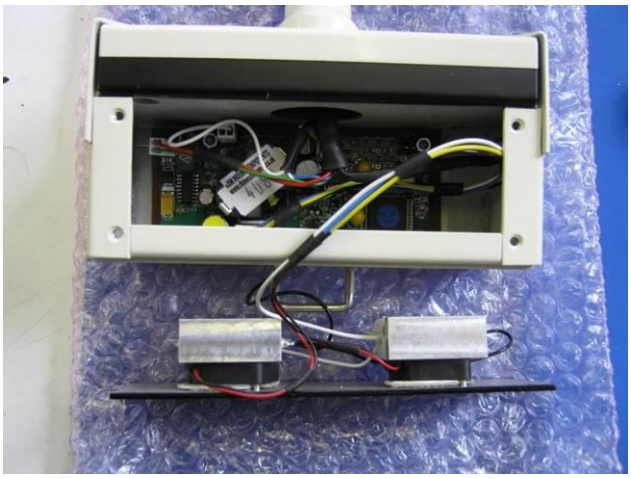
The gas sensor in the probe is a robust detector, and few problems arise in use.

The most common one is for the detector to become clogged with fluff, arising from monitoring clothing. The symptom usually seen is an increase in the "noise" on the display.

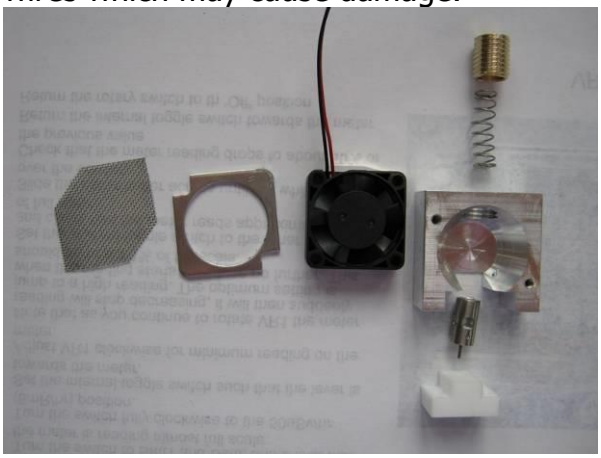
In order to change the detector the following procedure should be followed:

Turn off the instrument and unplug the probe, It must be noted that the probe generates pulses in excess of 2KV so the instrument must be turned off to prevent possible shock to the user and also potential damage by shorting to the instrument.

Looking at the perforated face plate of the probe remove the 4 screws through the cover and set aside.

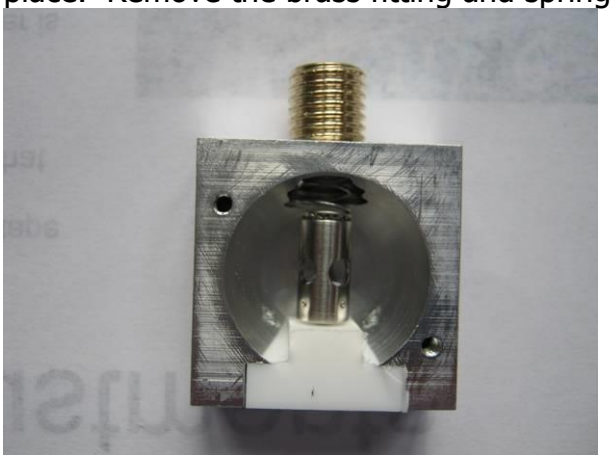


Carefully lift the detector plate from the probe body and disconnect the 5 way connector mounted on the circuit board. Care must be taken not to remove this by pulling on the wires which may cause damage.

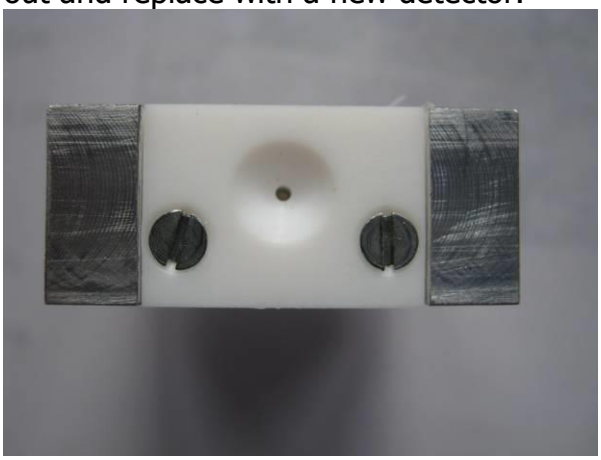


Once removed carefully undo the two screws through the detector plate. Before complete removal note the correct assembly of the components held by the screws. Remove the screws and carefully set aside the wire gauze and spacer, move the fan from the detector block to expose the brass tube mounted in the side of the detector.

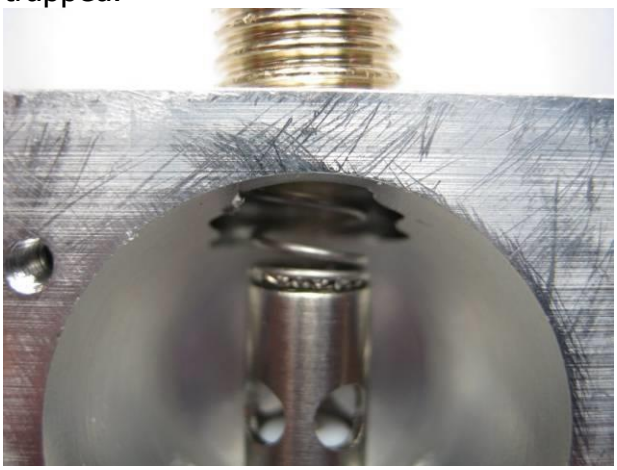
Unscrew the brass fitting slowly, there is a spring inside which holds the detector in place. Remove the brass fitting and spring.

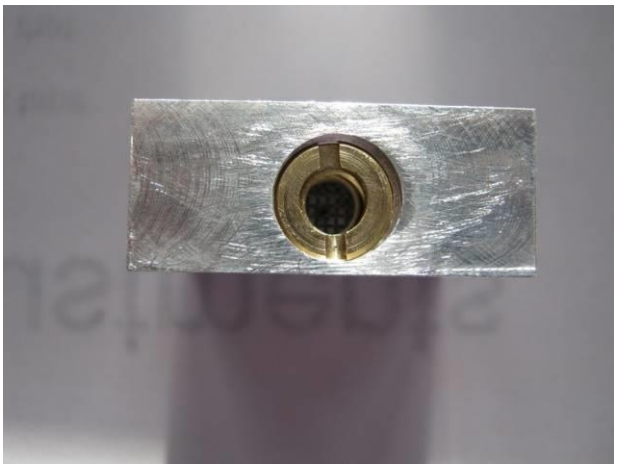


Unscrew the two screws through the white plastic block and carefully ease the detector out and replace with a new detector.

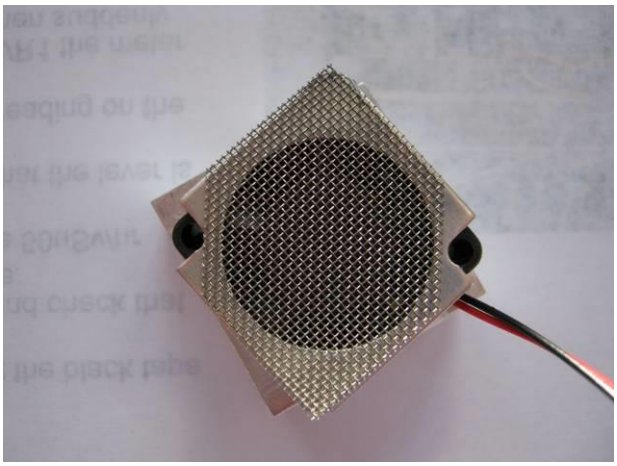


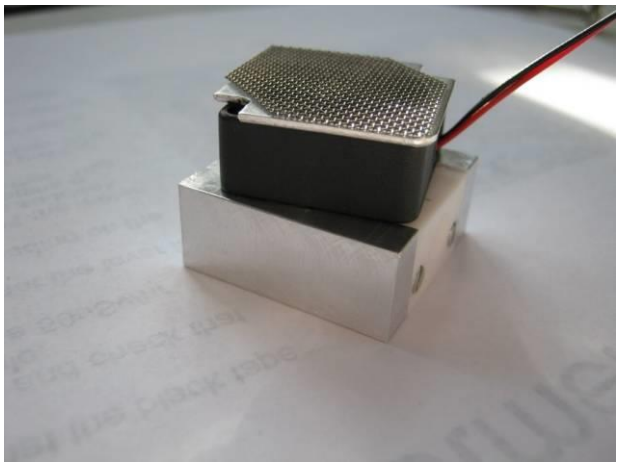
Reassemble the detector block by inserting the spring with the gauze end against the top of the detector and screwing the brass fitting back into place.
Screw the brass fitting in slowly making sure that the spring doesn't deform and get trapped.

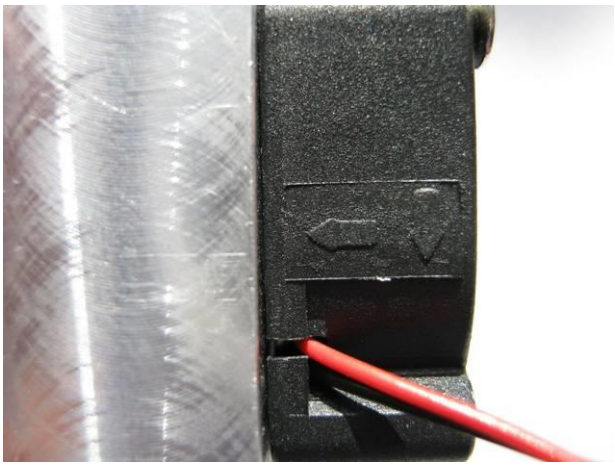




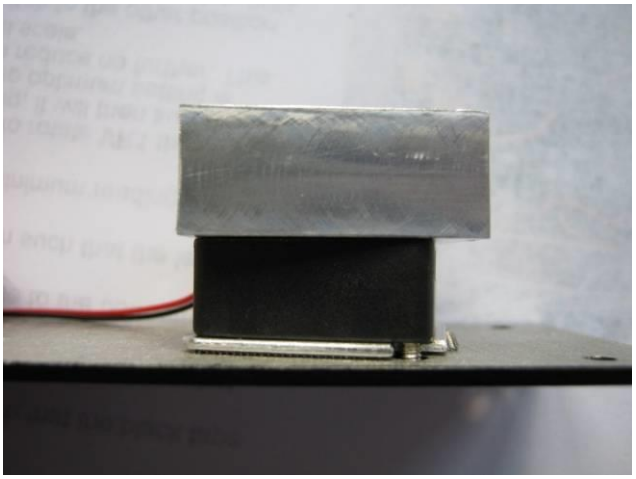
Reassemble the fan, spacer and gauze. Take care to make sure that the fan is the correct way round. There is an arrow on the fan body indicating the direction of air flow. This should be pointing towards the detector block.







Remount the assembly onto the detector plate with the two screws.



Align the detector plate and then the perforated face plate with the holes in the probe body and replace the 4 screws.

3.4 Warranty

All STS instruments are covered automatically by a 1 year warranty from the date of receipt of the instrument by the customer. The warranty covers the failure of the instrument due to component breakdown. The warranty is void if the instrument has been incorrectly used, connected to the wrong instrument or damaged through accident.

4.0

CE/UKCA Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of the manufacturer:

Safe Training Systems Ltd
Unit 33 Space Business Centre
Molly Millars lane
Wokingham
Berkshire
RG41 2PQ
UK

Product: STS Instruments Simulated Contamination Monitor 800 Series- SBM2D Probe

Equipment type: Battery Operated Training Simulator
The STS 800 Series Simulated Contamination Monitor as described in the Full Manual is in conformity with the relevant Union Harmonisation Legislation:

CE/UKCA Relevant legislation

The EUT met the **emissions** and **immunity** test requirements of the following requested standards

Description	**General Standard**	**Referenced Standard**	**Status**
Radiated Emissions (Group 1)	EN 55011:2016 + A1:2017 + A2:2021	CISPR 11:2015 + A1:2016 + A2:2020	Pass 18/09/2023
Conducted Emissions		Pass	
Mains Harmonics	EN IEC 61000-3-2:2019 + A1:2021	IEC 61000-3-2:2018 + A1:2020, Class A	Pass 18/09/2023
Mains Voltage Flicker (dmax=4%)	EN 61000-3-3:2013 + A2:2021	IEC 61000-3-3:2013 + A2:2021	Pass 18/09/2023
Electrostatic Discharge	EN IEC 61326-1:2021 Basic Immunity Requirement (Table 1)	EN 61000-4-2:2009 IEC 61000-4-2:2008	Pass 18/09/2023

Radiated RF Immunity	EN IEC 61000-4-3:2020	Pass 18/09/2023
Fast Transient Bursts	EN 61000-4-4:2012 IEC 61000-4-4:2012	Pass 18/09/2023
Surge	EN 61000-4-5:2014 + A1:2017 IEC 61000-4-5:2014 + A1:2017	Pass 18/09/2023
Conducted Immunity	EN 61000-4-6:2014 IEC 61000-4-6:2013	Pass 18/09/2023
Power Frequency Magnetic Field	EN 61000-4-8:2010 IEC 61000-4-8:2009	Pass 18/09/2023
Voltage Dips and Interruptions	EN IEC 61000-4-11:2020	Pass 18/09/2023

Signed for and on behalf of:

J Ward

Name: Jim Ward
Position: Director
Company: Safe Training Systems Ltd
Date: 31/01/2023