

SMARTS II

Wideband RF Radiation Area Monitor

Operating Manual



narda

Safety Test Solutions

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© 2022
Order no.: 2688/98.21
Published: 05/2022
Earlier edition: 04/2022
Subject to change.
Our normal guarantee and
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Printed in Germany

SMARTS II

Wideband RF Radiation Area Monitor

Operating Manual

WARNING

Strong electromagnetic fields

High-level electromagnetic fields may be hazardous to your health. This monitor cannot protect you from all electromagnetic hazards that you could encounter.

- ⇒ This Monitor should only be used after you have read this manual, understood how it operates and consulted with your company's safety officer.

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1 Introduction

This chapter contains a short introduction about measuring electromagnetic fields, about using the SMARTS II, and about the structure of this Operating Manual.

- 1.1 Measuring electromagnetic fields
- 1.2 About this monitor
- 1.3 About this Operating Manual

1.1 Measuring electromagnetic fields

In today's world, many industries utilize equipment that generates electromagnetic fields. Our modern need for communications as well as the efficiency of electromagnetic heating systems and the safety that radar systems provide us are just a sample of the applications that are benefitted by exploitation of the electromagnetic spectrum. We also have various engineering considerations as well as regulatory requirements to use the electromagnetic spectrum wisely. Various authorities have long defined limit values designed to protect users from the dangers of exposure to such emissions, and the SMARTS II is an effective tool to help companies and individuals demonstrate compliance.

1.2 About this monitor

The SMARTS II area monitors provide continuous detection of RF radiation within a specific area. The SMARTS II uses wideband sensor technology. The result is an area monitor that covers most of the usable RF spectrum in a single monitor with shaped frequency response that matches the safety standard used to determine compliance. The dual sensor design detects all types of electromagnetic fields up to 100 GHz. The microwave portion of the sensor employs thermocouple detectors so that radar signals are accurately converted to true RMS values while the diode design used for the lower

frequencies provides RMS detection even in very complex, multi-signal environments. SMARTS II monitors respond equally to all polarizations and cover almost a hemisphere. They can even be mounted on a metallic wall. There is a SMARTS II model shaped to match most of the major safety standards.

The SMARTS II operates from a 9-volt lithium Ultralife battery (U9VL) or an external +12 V to +24 V (Floating) supply. Every monitor has an audible and visual alarm indication. An alarm condition causes a voltage transition (-4/+4 V) to occur at the **STATUS** jack. When the SMARTS II is operated from an external power supply, you have the option to use the contacts of an SPDT (Single Pole Double Throw) relay to indicate alarm status. The status relay cannot be used under battery operation. Either the voltage transition signal or the relay contacts can be used to provide remote alarms, a record of alarm conditions, and/or automatic shutoff of equipment.

Applications

The SMARTS II performs measurements for human safety purposes, particularly in workplace environments where high electric or magnetic field strengths are likely.

The SMARTS II is an area monitor that can be installed on ceilings and walls, with automatic frequency response evaluation according to a selected safety standard. SMARTS II emits warning sounds if user settable thresholds are exceeded. SMARTS II is ideal for security installations in aircraft hangars or military facilities, thanks to its frequency range of up to 100 GHz and measurement range of up to 3000% of the limit value of the chosen safety standard.

1.3 About this Operating Manual

Usage of the brochure


- ! Read this manual carefully and completely before operating the device.
- ! Observe all notices provided therein.
- ! Store this document with the device and make it available to all users.
- ! Only ever, pass the device on to third parties together with the Operating Manual.

Characters and symbols used

Various elements are used in this Operating Manual to indicate special meanings or particularly important passages in the text.

Symbols and terms used in warnings

According to the American National Standard ANSI Z535.6-2006, the following warnings, symbols, and terms are used in this document:





	<p>The general danger symbol warns of risk of serious injury when used with the signal words CAUTION, WARNING, and DANGER. Follow all the instructions in order to avoid injuries or death.</p>
<p>NOTICE</p>	<p>Indicates a danger that results in damage to or destruction of the instrument.</p>
<p>CAUTION</p>	<p>Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
<p>WARNING</p>	<p>Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>
<p>DANGER</p>	<p>Indicates a hazardous situation which, if not avoided, will result in death or serious injury.</p>

Structure of warnings

All warnings are structured as follows:

<p>⚠ SIGNAL WORD</p>
<p>Type and source of danger Consequences of failure to observe warning ⇒ Instructions for preventing danger</p>

Symbols and marks used in this document

	Important instruction - Indicates an instruction that must be followed to avoid danger.
	Requirement - Indicates a requirement that must be met before the next instruction can be carried out, e.g. ✓ The instrument is switched off.
	Instruction - Indicates a single instruction, e.g. ⇨ Switch the instrument on.
<ol style="list-style-type: none">1.2.3.	Sequence of instructions - Indicates a sequence of instructions that must be carried out in the order given.
	Result - Indicates the result of carrying out an instruction, e.g. ↴ The instrument starts a self test.
Bold Type	Control element - Indicates a control element on the instrument, e.g. ⇨ Press the Enter key.
CAPITALS	Menu name - Indicates a menu name, e.g. ⇨ Open the MAIN menu.
Blue Type	Cross reference (in PDF document only) Indicates a cross reference to another part of the document. Click on the blue type in the PDF document to jump directly to the cross reference.

2 Preparing the SMARTS II for use

- 2.1 Intended use
- 2.2 Unpacking
- 2.3 Operation
- 2.4 Electromagnetic fields
- 2.5 Sensor area
- 2.6 Power supply
- 2.7 Batteries
- 2.8 Instrument overview

2.1 Intended use

! Use the device only under the conditions and for the purposes for which it was designed.

! Pay particular attention to the information in the corresponding datasheet.

Intended use also means the following:

! Observe the national accident prevention regulations at the deployment location.

! The device may only be operated by appropriately qualified and trained personnel.

Also consider:

! Only approach unknown field sources with careful observation of the SMARTS II and its alarm.

2.2 Unpacking

Packaging

The packaging is designed to be re-used as long as it has not been damaged.

- ⇒ Keep the original packaging and use it whenever the monitor needs to be shipped or transported.

Package contents

Check that all the following items have been delivered:

- SMARTS II area monitor (selected model corresponding to the safety standard to be measured)
- Mating 9-pin connector:
 - Connector - D-SUB
 - Backshell - D-SUB
- Battery, Ultralife U9VL lithium
- Operating manual
- Test report

Checking the device for shipping damage

After unpacking, check the device and all accessories for any damage that may have occurred during shipping. Damage may have occurred if the packaging itself has been clearly damaged. Do not attempt to use a device that has been damaged.

- ⇒ Check for completeness as well as any transport damages.

⚠ WARNING
<p>Underestimation of the electromagnetic field</p> <p>Risk of personal injury or death to persons at risk as well as permanent damage to the device</p> <p>⇒ Do not operate a damaged device</p>

In the event of an incomplete delivery and damages to the monitor or accessories, please contact your Narda sales partner. You can find the Narda sales partner responsible for you on the Narda website at www.narda-sts.com.

Recovery after shipping and storage

Condensation can form on a device that has been stored or shipped at a low temperature

when it is brought into a warmer environment. To prevent damage, wait until all condensation on the surface of the device has evaporated. The device is not ready for use until it has reached a temperature that is within the guaranteed operating range. For temperature ranges see the corresponding datasheet which can be downloaded at www.narda-sts.com.

⚠ WARNING
<p>Underestimation of the electromagnetic field Risk of personal injury or death to persons at risk as well as permanent damage to the device</p> <p>⇒ The monitor is not ready for use until it has reached a temperature within the operating range. (see corresponding datasheet at www.narda-sts.com)</p>

2.3 Operation

Electrical voltages are present inside the device.

- ! Do not bring the device into contact with live parts.
- ! Do not open the device. Opening the device invalidates any warranty claim.
- ! Only use accessories intended for the device.

Operation of a damaged device or component may result in significant measurement errors and consequential damages.

- ⇒ Before using the monitor, check the sensors with a test source for a proper functionality. This particularly applies to the thermocouple sensors, which can be affected by different mechanical stresses and environmental influences.
- ⇒ Always try to inform yourself of the frequencies and field strengths that you could be expected to encounter.
- ! Check the device and components regularly for damage. Cracks or fractures in the housing indicate possible damage to the sensors.
- ! In the event of damage or suspected malfunction, take the monitor out of operation and contact your local sales partner. Addresses can be found on the Internet under www.narda-sts.com

2.4 Electromagnetic fields

Strong electromagnetic fields

Very strong electromagnetic fields are generated in the vicinity of certain radiation sources, which can lead to personal injuries or death in the case of endangered persons.

- ! Observe safety barriers and markings.
- ! People with active implants in particular must avoid dangerous areas.

Improper model

By selecting an improper model not corresponding to the safety standard to be measured, dangerous fields can be overlooked. Staying within such fields may cause injury or death to persons at risk.

- ! Select the model corresponding to the safety standard to be measured.
- ! Select initially the most sensitive setting.
- ! Only approach unknown field sources with careful observation of the SMARTS II and its alarm.

⚠ WARNING
<p>Strong electromagnetic fields</p> <p>Risk of personal injury or death to persons at risk</p> <ul style="list-style-type: none">⇒ Observe safety barriers and markings.⇒ In particular, persons with electronic implants must keep away from dangerous areas.⇒ Make sure to select a model corresponding to the safety standards to be measured

2.5 Sensor area

Metallic stickers in the sensor area can lead to measurement errors, in particular to an underestimation of the electromagnetic field strength.

⚠ WARNING
<p>Underestimation of the electromagnetic field</p> <p>Risk of personal injury or death to persons at risk</p> <ul style="list-style-type: none">⇒ Do not attach metallic stickers to the sensor area⇒ Only attach metallic sticker to metallic surfaces (i.e. the user interface at the top side of the SMARTS II, see 2.8 Instrument overview)

2.6 Power supply

NOTICE

A power supply is not included

- ⇒ For external power supply operation, the power supply unit must be acquired separately

Damaged power supply

If a power supply is damaged, live parts may become accessible and result in electric shock injuries.

- ! Do not use a damaged power supply.

When a power supply is opened, live parts may become accessible and death or electric shock injuries may occur.

- ! It is not planned to conduct repairs on the power supply. In case of visible defects or malfunctions, the entire device must be replaced.
- ! Never open a power supply.

⚠ WARNING

Electrical voltages are present inside the power supply

Risk of personal injury or death to persons at risk

- ⇒ Do not use a damaged power supply
- ⇒ Never open a power supply

Mains voltage, condensation, temperatures, ventilation

Incorrect mains voltage, condensation, high or low temperatures and insufficient ventilation can damage a power supply.

- ! Check **before** the connection of the power supply that its operating voltage matches the mains voltage.
- ! Do not use a power supply with condensation. If condensation cannot be avoided, e.g. because the power supply is cold and is brought into a warm room, it must be dry before establishing a connection.
- ! Only use the power supply indoors, and within the specified temperature range (see datasheet for the power supply).

2.7 Batteries

Impermissible environmental conditions

Too high temperatures and humidity can lead to a short circuit and cause a fire. This may result in personal injury or destruction of the batteries.

- Check regularly whether the storage temperature and humidity are within the specified limits. Information on the limits can be found in the datasheet for the U9VL battery.
- Do not leave discharged batteries in the device for long periods of time. The housing can also be damaged from the inside through leaking electrolyte.
- When storing the batteries, make sure that they do not come into contact with metallic objects.

Improper handling of batteries

Improper handling of batteries can cause personal injury and damage to the device or the batteries.

- ! Do not open, crush or disassemble batteries.
- ! Do not drop batteries from a great height.
- ! Do not solder anything to batteries.

Use and replacement of batteries

Improper replacement of batteries may result in injury and damage to the device or the batteries.

- ! Only operate the device with the permitted batteries (see 1.2 About this monitor) or refer to the datasheet for information on the permissible types).
- ! Never short-circuit the contacts of the batteries, i.e. never touch both terminals with metal parts at the same time.
- ! Observe the polarity of the snap connector and insert the batteries accordingly.
- ! Always close the battery compartment immediately after replacement, and never operate the device with the battery compartment open.

Combustion of the batteries

Through an incorrect use it is possible that the batteries could ignite. This can cause injuries and damage to the batteries.

- ! To prevent the batteries from igniting, do not expose the batteries to high temperatures for long periods of time.
- ! If the anode or cathode of the batteries comes into contact with another metal, heat may

develop and the electrolyte may leak. The electrolyte is flammable. If the electrolyte has leaked, the batteries must be immediately removed from the vicinity of a fire.

- ! If batteries burn, irritation may occur in the eyes, skin and respiratory tract as a result of developing smoke or vapors (see next section).

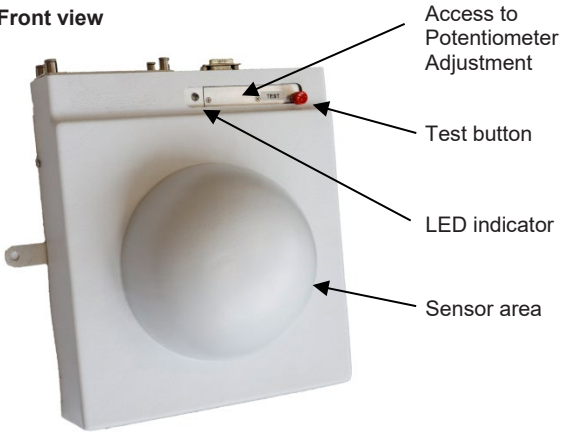
Dangerous emitted substances

Under normal handling conditions, no dangerous substances will escape from the batteries, and thus no contact with toxic substances can occur. The only danger of leakage is from mechanical damage to the housing. If chemicals should escape, the following must be observed:

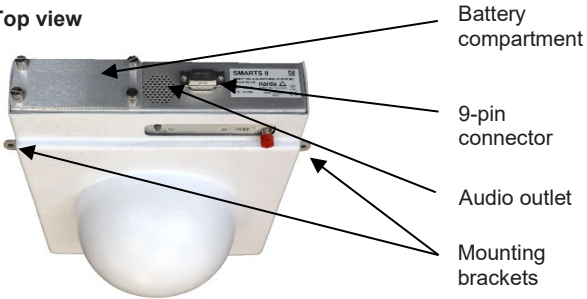
- ! Emitted gases (from fire or mechanical damage) can cause respiratory problems. In case of an emergency, see a doctor immediately.
- ! Skin irritation may occur if the skin comes into contact with chemicals. Wash the skin thoroughly with soap and water.
- ! Irritation of the eyes may occur. Immediately wash the eyes thoroughly with water and seek medical attention.
- ! Wipe up spilled electrolyte with an absorbent piece of cloth. However, protect the skin, eyes and respiratory tract from contact with the electrolyte.

2.8 Instrument overview

Front view



Top view



3

Operation overview

This chapter describes important features and elements of the SMARTS II.

- 3.1 Test button
- 3.2 Alarm indications
- 3.3 Sensor
- 3.4 Battery compartment
- 3.5 Input/output connector

3.1 Test button

The **TEST** button provides a means to test most of the monitor circuitry. Briefly pressing the **TEST** button simulates an alarm condition. For battery operation that means an audible and visual alarm and an electronic signal and, at DC supply operation an additional relay activation. The audible and visual indications will warn as long as the user is pressing the **TEST** button.

3.2 Alarm indications

Audible

The audible alarm is sufficiently loud for most indoor applications. An external alarm indication, audible and/or visual, is recommended when the SMARTS II is located in an area with significant ambient noise.

When the SMARTS II detects radiation at its preset alarm threshold or higher, a continuous audible alarm is generated.

Visual (LED indicator)

The red LED indicator flashes approximately every forty seconds whenever the SMARTS II is functioning normally.

When the SMARTS II detects radiation at its preset alarm threshold or higher, the LED indicator flashes for 10 ms every second.

Alarm indication overview

Condition	Audible and visual alarm indications	Status signal
Normal operation	LED flashes every 40 sec.	Low
Low battery	Alarm chirps and LED flashes every 40 sec.	Low
Test key depressed	Continuous sound, LED flashes every sec.	High
Alarm	Continuous sound, LED flashes every sec.	High
Disconnected Sensor	Continuous sound, LED flashes every sec.	High

3.3 Sensor

The SMARTS II detects all types of electromagnetic fields up to 100 GHz. The monitor uses a dual sensor design. The microwave portion of each sensor employs thermocouple detectors so that radar signals are accurately converted to true RMS values while the diode design used for the lower frequencies provides RMS detection even in very complex, multi-signal environments. The output of the high frequency sensors is combined and fed to a low-noise amplifier circuit. Similarly, the output of the low frequency sensors is combined and fed to another low-noise amplifier.

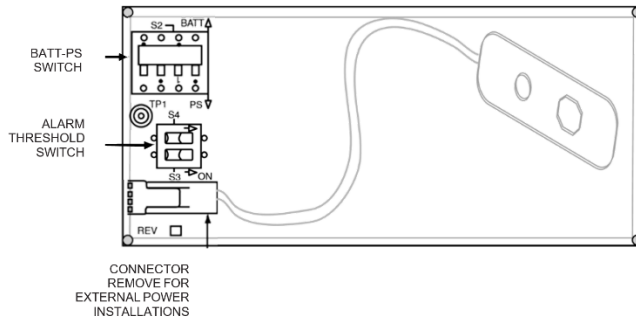
The output of these two amplifier circuits is scaled in terms of percent of the respective human safety standard. The sum of these two amplifier levels is used to determine whether the monitor is above or below the alarm threshold that has been selected by the user. SMARTS II respond equally to all polarizations and cover almost a hemisphere.

3.4 Battery compartment

Removing the cover that is attached with four captive screws accesses the battery compartment. The cover has an RFI (Radio Frequency Interference) gasket to ensure that the internal circuits remain isolated from strong electromagnetic fields.

The U9VL battery can be inserted in the battery compartment. The **BATT-PS** (battery-power supply) switch and a two-section **Alarm Threshold** DIP switch are also located within the battery compartment.

Inside battery compartment:

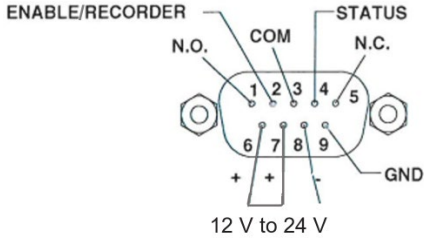


3.5 Input/output connector

All input and output connections are made via a single, 9-pin D-subminiature male connector located on the top side of the SMARTS II. A mating connector is supplied with the monitor. This input/output connector is used to provide connections for:

- Relay contacts (N.C., COM., and N.O.)
- ENABLE/RECORDER
- STATUS (voltage transition signal, -4 V/+4 V)
- External +12 V to +24 V floating power

The input/output connector is filtered to protect the SMARTS II from strong electromagnetic fields. However, a shielded cable is highly recommended.



Pin nr	Function
1	N.O. (Normally open)Relay contact
2	ENABLE/RECORDER (0/-1 V)Input/Output
3	COM (Common)Relay contact
4	STATUS (-4 V/+4 V)Input/Output
5	N.C. (Normally closed)Relay contact
6	+12 V to +24 V (shorted to 7),Floating supply see 4.5 External power supply operation
7	+12 V to +24 V (shorted to 6),Floating supply see 4.5 External power supply operation
8	-VFloating supply
9	GND Input/Output (internal Ref voltage, not same as -V)

4 Operation and installation

- 4.1 Location
- 4.2 Options
- 4.3 Mounting the SMARTS II
- 4.4 Basic battery operation
- 4.5 External power supply operation
- 4.6 Alarm threshold adjustment
- 4.7 Test button
- 4.8 Remote alarm indication
- 4.9 The ENABLE feature
- 4.10 Remote test
- 4.11 Low battery indication

4.1 Location

The location where you mount the SMARTS II depends on many factors. See 5 Determining location for an explanation and recommendations.

4.2 Options

It is important to decide how the SMARTS II will be used before you mount it. It is far easier to change settings and make connections with the monitor in front of you rather than after it is mounted. The important decisions involve:

- **Power Source** – either the internal U9VL battery or an external +12 V to +24 V floating power supply can power the monitor.

- **Alarm Threshold** – the default setting is 50% of Standard. Three more sensitive settings are available.
- **Alarm Indications** – either the internal audible and visual alarm indication and/or a remote indication can be used. External alarms require a cable connection.
- **Remote Test** – available with a cable connection.
- **Enable** – alarm operation can be inhibited when people are not present during high power operation.

4.3 Mounting the SMARTS II

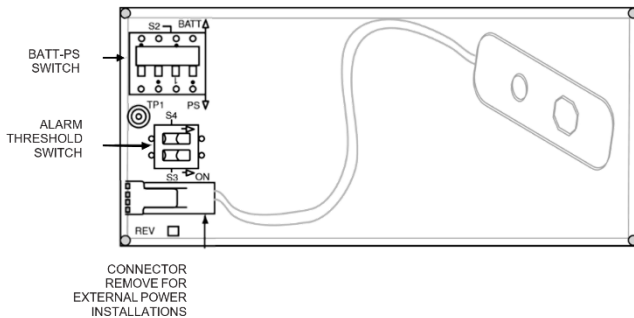
The SMARTS II is attached with two screws. The type and size of the screws are determined by the mounting surface. The SMARTS II can be attached to any surface, even conductive metal surfaces.

4.4 Basic battery operation

The SMARTS II can be used in its basic form by operating from the internal U9VL battery and the built-in audible and visual alarm indication. No external connections are required.

To operate the SMARTS II from a battery without external connections

1. Remove the battery-compartment cover by loosening the four captive screws. The screws should only be finger tight but a slot is provided for a screwdriver should it be needed.
2. Connect the battery. The monitor is shipped with the battery supplied in a separate package to maintain battery life while in storage and during shipment.
3. Move the **BATT-PS** switch (battery-power supply), which is located inside the battery compartment, to the **BATT** position.



4. Set the alarm threshold to the desired level. See 4.6 Alarm threshold adjustment.

5. Put the battery in place into the compartment.
6. Replace the battery-compartment cover and finger-tighten the four captive screws. It is important that the screws are tightened sufficiently so that the cover slightly compresses the EMI gasket.
7. Mount the monitor in the desired location using the holes in the mounting brackets and screws suitable for the surface that the monitor is being mounted on.

4.5 External power supply operation

The SMARTS II can be operated from an external low voltage supply. It can also be connected to an external circuit to make use of its remote-alarm capability by using the same cable and connector used for the power supply.

NOTICE

Incorrect voltage applied

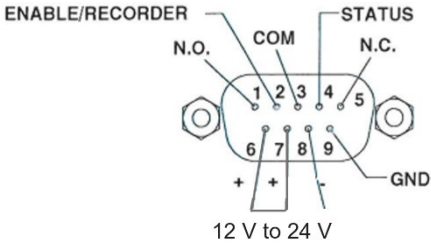
Risk of malfunction and permanent damage to the device

- ⇒ pin 6 and pin 7 are shorted
- ⇒ If both pins are in use, the same voltage must be applied on both pins (+12 V to +24 V).

To operate the SMARTS II from an external low voltage supply

1. Remove the battery compartment cover by loosening the four captive screws. The screws should only be finger tight but a slot is provided for a screwdriver should it be needed.
2. Remove and disconnect the battery if it has previously been installed. The monitor is shipped with the battery supplied in a separate package to maintain battery life while in storage and during shipment.
3. Move the **BATT-PS** switch (battery-power supply), which is located inside the battery compartment, to the **PS** position.
4. Set the alarm threshold to the desired level. See 4.6 Alarm threshold adjustment.
5. Ensure that the battery connector is not touching a metal surface. Alternately, the battery connector and leads may be removed by simply disconnecting at the printed circuit board.
6. Replace the battery-compartment cover and finger-tighten the four captive screws.
7. Connect the SMARTS II to a +12 V to +24 V external power supply.
8. Mount the monitor in the desired location using the holes in the mounting brackets and screws suitable for the surface that the monitor is being mounted on.

Connector, D-subminiature male:



⚠ CAUTION

Underestimation of the electromagnetic field
Risk of personal injury and malfunction of the device
 ⇒ Use shielded cable to make connections to the input/output connector

4.6 Alarm threshold adjustment

The alarm threshold can be set to any one of four values: 10%, 25%, 35%, or 50% of Standard. The default setting is 50% of Standard.

To change the alarm threshold

1. Remove the battery-compartment cover by loosening the four captive screws. The screws should only be finger tight but a slot is provided for a screwdriver should it be needed.
2. Adjust the two-section DIP-switch located inside the battery compartment to set the alarm threshold to the desired level. Use the diagram on the inside of the battery compartment cover to determine the correct setting for each section.

	Alarm Threshold	S3	S4
	10 %	OFF	OFF
	25 %	OFF	ON
	35 %	ON	OFF
	50 %	ON	ON

3. Replace the battery compartment cover and finger-tighten the four captive screws. It

is important that the screws are tightened sufficiently so that the cover slightly compresses the EMI gasket.

4.7 Test button

See 3.1 Test button.

4.8 Remote alarm indication

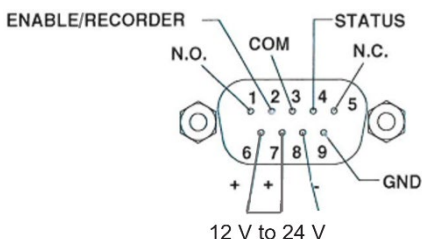
When the SMARTS II detects radiation at its preset alarm threshold or higher, an electronic signal is provided at the **STATUS** line (pin 4) to activated various user-supplied remote circuitry.

Alarm status can be detected remotely by using the **STATUS** signal, the **RECORDER** output level, and/or the **STATUS** relay (SPDT) connections.

! The relay cannot be used under battery operation.

⚠ CAUTION
<p>Incorrect contact rating of the relay</p> <p>Risk of malfunction and permanent damage of the relay</p> <p>⇒ Do not exceed relay contact rating of 3 W @ 250 mA, 28 V</p>

- The level on the **STATUS** line (pin 4) transitions from -4 V under standby conditions to a +4 V under alarm conditions.
- The **ENABLE/RECORDER** line (pin 2) serves a dual function. When used to monitor field strength, the Recorder Output Level varies from 0 V to -1 V. Full scale represents the level at which the SMARTS II is set to sound its alarm. For example, if the Alarm Threshold is set to 50% of Standard, a -0.5 V level indicates that the field strength is approximately 25% of Standard.
- The **SPDT STATUS** relay operates whenever there is an alarm condition. Under alarm conditions, there is a connection between the common **COM** (pin 3) and the normally open **N.O.** (pin 1).



4.9 The ENABLE feature

To avoid the alarm indication being on constantly, the **ENABLE** input can be used in situations where the standard operating procedure produces RF fields above the alarm threshold and exposure to people is possible. Examples include an anechoic chamber and the deck of a ship. The **ENABLE** input can be tied to a motion sensor or an interlock switch. Under these conditions, the SMARTS II activates its alarms only when two conditions are satisfied:

- High levels of RF are present (above the monitors alarm threshold) **and**,
- Motion is detected or a door is open.

To use the ENABLE feature

- To inhibit the SMARTS II alarm function under certain conditions connect a switch or relay between the **ENABLE** line and the monitor's ground, **GND**: Pin 2 (**ENABLE/RECORDER**) and pin 9 (**GND**) on the Input/Output Connector.
- The SMARTS II will function normally whenever the relay contacts or the switch is open.
- The SMARTS II alarm function will not function whenever the relay contacts or the switch is closed.

4.10 Remote test

It is possible to test the SMARTS II from a remote location when it is not practical to reach the **TEST** button.

To test the SMARTS II alarm function

- ⇒ Briefly ground the **STATUS** line (pin 4). The monitor should go into alarm status. This is best accomplished by connecting a cable to the 9-pin Input/Output connector. The test is made by connecting pin 4 (**STATUS**) to pin 9 (**GND**).

For relay activation

- ⇒ Connect pin 4 (**STATUS**) through the switch and a 10 k Ω resistor to pin 6 or 7 (for +12 V operation), or through the switch and a 100 k Ω resistor to pin 6 or 7 (for +24 V operation). This will test the system and cause the relay to change position.

4.11 Low battery indication

The SMARTS II indicates a low battery situation by "chirping" its audible alarm. The alarm will sound for 10 ms in approximately forty-second intervals whenever the battery level is low.

The battery should be replaced as soon as possible.

5

Determining location

This chapter include points to consider when choosing the SMARTS II monitoring location.

- 5.1 Overview
- 5.2 Factors determining area coverage
- 5.3 Preferred location
- 5.4 Alternate locations

5.1 Overview

The factors that determine when a SMARTS II monitor will activate its alarms include:

- Alarm threshold setting of the monitor.
- The field strength at the monitor in terms of percent of the respective human safety standard.

The alarm threshold is set at the factory at 50% of Standard. Three more sensitive settings are available: 35%, 25%, and 10% of Standard.

The actual field strength required for the monitor to activate its alarms depends not only on the alarm threshold setting but the field strength of each frequency component. The sensitivity of SMARTS II area monitors varies with the specific model. All models have shaped frequency response. For example, one model follows the ICNIRP 1998 occupational limits. The ICNIRP 1998 occupational limits are 1 mW/cm² from 10 MHz to 400 MHz and 5 mW/cm² above 2 GHz. If the SMARTS II was set to the least sensitive setting of 50% of Standard, then the threshold (excluding tolerances) would be 0.5 mW/cm² in the VHF region and 2.5 mW/cm² in the microwave region. The "weighting" of the frequency response of the sensors automatically compensates for multiple signal

environments.

Area coverage is a far more complicated subject. There are several factors that should be considered in determining the best location for the monitor and the area that can be considered "protected".

5.2 Factors determining area coverage

Energy sources, either purposeful emitters such as antennas, or unintentional emitters such as waveguide leaks, can be omnidirectional or focused in one direction. Field strength (power density expressed in mW/cm^2 or W/m^2) drops off rapidly with distance from the source. In the far field, field strength follows the inverse square law, i.e., at twice the distance there is one quarter the field strength. Similarly, at ten times the distance, the field strength is only one percent as strong. Factors influencing area coverage include (amongst others):

- Position of the SMARTS II
- Location of the energy source
- Location of people
- Energy level of the source.
- Direction of energy being emitted

5.3 Preferred location

The *ideal location* for a SMARTS II is *between the source of energy and people*. The SMARTS II should be "pointed" at the energy source. Under these conditions, the sensitivity of the monitor is never an issue because it will always detect a higher field level than the people are exposed to. Since the SMARTS II activates its alarms at levels below the Standard, the monitor will always activate its alarm whenever people are in a field that exceeds the Standard. Under these conditions, there is no limit to the area that is "covered".

- ! Every other location scenario involves a great deal more thought and some risk that people can be exposed to field levels above the Standard while the SMARTS II is in fields below its alarm threshold.

5.4 Alternate locations

- **Mounting the SMARTS II closer than people will be to the energy source, but not between the two.** A test bench is a common example of this situation. The worker sits or stands in front of a test bench that contains a piece of equipment, like an amplifier, that is being tested. The SMARTS II is typically hung from the ceiling just above the transmitter. In this application, the monitor normally detects an unexpected "leak". Such a leak can occur when there is a missing, or poor, connection.

- **Mounting a SMARTS II in a small room with conductive walls.** Transportable military shelters and the remote broadcast trucks used in television radio operations for Electronic News Gathering (ENG trucks) have similar attributes. Both are relatively small "rooms" with conductive walls, ceilings, and floors. An energy leak can be detected in two ways – directly and/or via reflection off the wall or ceiling.
- **Mounting a SMARTS II further from the energy source than people will be.** Although it is possible to use a SMARTS II in this application, it is risky. In order to use this approach successfully, it is important to calculate the relative energy levels that the monitor and people will be exposed to based on the distance from the energy source to the monitor and the distance from the source. Then, determine whether the monitor is sensitive enough to provide "protection".
- **Inside large industrial process systems.** SMARTS II area monitors can be used as a form of built-in monitoring in large systems.

6 Maintenance

This chapter describes the maintenance of the SMARTS II.

- 6.1 Cleaning
- 6.2 Repair and modification
- 6.3 Proper disposal

6.1 Cleaning

Penetrating liquids

Liquids that penetrate inside the device, could damage or destroy it.

- ⇒ Make sure that no liquids penetrate inside the device.

Solvent

Solvents can damage the surfaces of the device.

- ⇒ Do not use any solvents to clean the device and power supply.

6.2 Repair and modification

The device is designed for low maintenance. Regular function testing is recommended to ensure faultless monitoring.

Unauthorized or improper repairs or modifications

Unauthorized or improper repairs or modifications can impair the accuracy and function of the device.

- ! Repairs should only be carried out by approved Narda Service Centers. Otherwise, any warranty claims shall lapse.
- ! Modifications to the device are not permitted. Modifications void any warranty claims.
- ! Only have function testing or calibration carried out by suitable laboratories. Find out in advance whether the supplier is competent for your measuring task.

- ⇒ If you have any questions, please contact your local Narda sales partner.

6.3 Proper disposal

Disposal of used equipment

The crossed-out wheeled garbage can symbol indicates that this product is subject to the European WEEE Directive 2012/19/EU on the disposal of waste electrical and electronic equipment and must be disposed of separately from household waste in accordance with your national regulations.



In the European Union, all electronic measuring systems purchased from Narda after August 13, 2005 can be returned at the end of their useful life.

- ⇒ For more information, contact your Narda distributor.

Disposal of removable batteries

- ⇒ Batteries must not be disposed of in household waste, but must be disposed of separately from the product in accordance with the applicable regulations. They can be returned free of charge to the appropriate collection points, your dealer or directly via Narda.
- ⇒ Please discharge the batteries before disposal.

Disposal of permanently installed batteries

There are no permanently installed batteries in this device.

Deleting private data

- ⇒ Make sure that you delete any stored private data before passing on or disposing of the device.

⚠ CAUTION
<p>Your SMARTS II contains a Lithium ion battery There is a risk of fire and burns if the battery is handled improperly</p> <ul style="list-style-type: none"> ⇒ Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water ⇒ Do not attempt to open or service the battery ⇒ Replace only with the battery designated for this product

7 Specifications

- 7.1 Specification
- 7.2 Declaration of conformity
- 7.3 Declaration of origin

7.1 Specification

All specifications are subject to change without prior notice.

The technical specifications may change due to product developments. The complete and latest technical specifications can be found in the datasheet of the product. The datasheet can be downloaded from the Narda website www.narda-sts.com under the corresponding product page.

7.2 Declaration of conformity

Hereby, Narda STS declares that this equipment is in compliance with the directives 2014/30/EU, EN 61326-1:2013, 2014/35/EU, EN 61010-1:2010, and 2011/65/EU.

The full text of the EU declaration of conformity is available at www.narda-sts.com/.

7.3 Declaration of origin

Country of Origin	Germany
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8 Ordering information

8.1 SMARTS II Sets part number

8.1 SMARTS II Sets part number

The ordering info can be found in the datasheet of the product.

The datasheet can be downloaded from the Narda website www.narda-sts.com under the corresponding product page.



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