Pro
Series

raditeq

Product Manual

RadiSense® Ultra

Electric field probe

Models:

RSS3018U

www.raditeq.com

RadiSense Product Manual

This product manual pertains to the RadiSense® series.

RadiSense® RSS3018U - Electric field probe for measuring High speed CW & pulsed fields
RadiSense LPS3001A - Laser plug-in card for power and communication

Read this manual carefully before operating the product and make sure all the safety instructions are strictly followed. Please keep this manual close at hand when you operate your new Raditeq product(s).

Note that all product specifications are noted in the data sheet for this product. All product data sheets can be found on: https://www.raditeq.com/downloads/

Supplier Information

Raditeq B.V.
Vijzelmolenlaan 3
3447GX, Woerden
The Netherlands

Tel.: +31 348 200 100
Internet: www.raditeq.com
Email: sales@raditeq.com

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Table of Content

Table of contents

Table of Content - Continued

WARNINGS & PRECAUTIONS

Read the contents of this product manual carefully and become familiar with the safety markings, the product instructions and the handling of the system. Please refer to the applicable product manual(s) for further information regarding the operation and control of the product(s).

This product requires a protective earth connection. The mains power source for the equipment must supply an uninterrupted safety ground to the IEC input connector(s).

This equipment is designed to be used as a plug-in card for the RadiCentre® series. Do not use this card on its own or in combination with any other mainframe. Using this product with any other mainframe can cause harm and will void warranty.

To make Raditeq's product as safe as possible, all devices fitted inside a RadiCentre® must comply to the safety interlock system of the RadiCentre®. all Raditeq Plug-in cards are designed to work with the interlock fitted on all RadiCentre® systems.

Only Raditeq qualified maintenance personnel is allowed to perform maintenance and/or repair service on the equipment.

This product® contains materials that can be recycled and reused to minimize material waste. At the 'end-of-life', specialized companies can dismantle the discarded system to collect the reusable and recyclable materials. If your product is at its 'end-of-life', please return it to your local reseller or to Raditeq for recycling.

Position the product in such a fashion that power cables are easily accessible or connect the equipment to a mains network that can be easily disconnected from the mains.

For cleaning, use a clean, dry cloth (or a damp cloth where needed) and wipe the surface of equipment.

This product contains no hazardous substances as described in the RoHS Directive (2011/65/EU).

This product contains embedded software, which is field upgradeable from the RadiCentre® using the USB-A connection port on the backside panel of the RadiCentre®. For more information about updating your Raditeq plug-in card, please read the RadiCentre® manual.

Laser Safety

The RadiSense® system is a closed loop fibre system and therefore classified as a Class 1M laser system according to EN60825-1:2014 and EN60825-2:2005. In order to provide laser safety in case of a fibre failure or accidental disconnection of the fibres, the RadiSense® system is provided with an Automatic Laser Shut down (ALS) as described in the EN60825-2:2005.

INVISIBLE LASER RADIATION - DO NOT EXPOSE USERS OF TELESCOPIC OPTICS

Class 1M LASER product

Max. 500 mW at 808 nm

Although the RadiSense® system does not emit any harmful laser light under normal circumstances, never look into any of the fibre optic connectors.

As a safety precaution, products that use a laser can only be turned on using a laser Code. This code can be entered using the touchscreen of the RadiCentre® system (In combination with the RadiCentre® CTR1004B or CTR1009B).

As a safety precaution, the RadiSense® series can be started by following a dedicated starting procedure as described later in the RadiSense® product manual. (In combination with the RadiCentre® CTR1001S)

Make sure that the fibre optic cables are installed correctly before activating the system. Do not activate the system if the fibre optic cables show any sign of damage or tampering.

Only use optic fibre cables supplied by Raditeq, or one of her official Resellers. Using alternative cables will result in (burn) damage to the probe and fibres. The use of 3rd party cables also results in a void of warranty.

The RadiSense® uses a high-power laser to supply energy to a remote measuring device. The wavelength of this laser is approximately 808nm. This infrared laser is invisible to the human eye. During normal operation, exposure to laser radiation is not possible because the RadiSense® uses a fibre-coupled closed loop system with Automatic Laser Shut-down (ALS). However, we ask that you comply with the following precautions for your own safety:

NEVER look into any of the fibre optic connectors. The laser emits a beam that is invisible to the naked eye. Such light may cause permanent eye damage. Avoid eye or skin exposure to direct or scattered radiation.

- Assign a 'laser safety officer' in your company. The 'laser safety officer' is responsible for reviewing the safety precautions.
- Check and connect all fibre optic cables before activating the system.
- Do not activate the system if the fibre optic cables show any sign of damage or tampering.
- The RadiCentre® system is equipped with a remote interlock system.
- The remote interlock connection should be connected to an 'emergency master disconnect'.
- A visual 'LASER ON' indicator LED will light up when the laser is activated. This LED on the front panel of the RadiCentre® system serves as a reminder to the operator that one or more lasers are switched on.

Raditeq Introduction

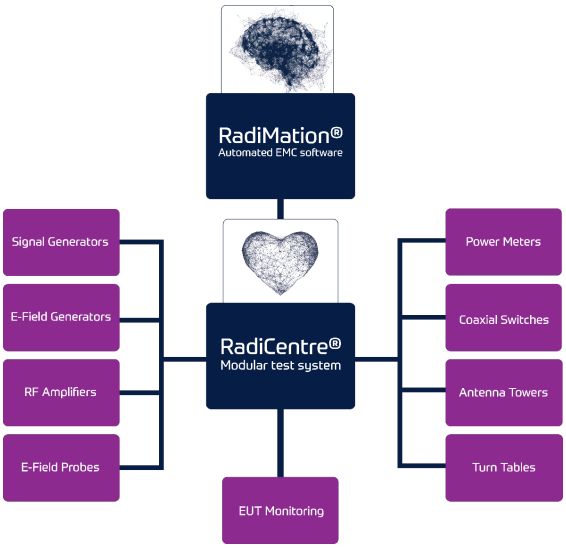
At the core of Raditeq's products and software lies the paradigm of effectiveness, efficiency, and accuracy. We firmly believe in empowering our customers with solutions that deliver unparalleled performance and reliability, without limitations on system extensiveness or compatibility.

In line with this philosophy, the RadiMation software is designed with an open architecture, welcoming compatibility with other brands and ensuring seamless integration with various EM/RF hardware brands. This approach allows our customers the flexibility to leverage RadiMation alongside other tools and systems, maximizing their capabilities and streamlining their testing processes.

Similarly, Raditeq hardware is engineered with versatility in mind, making it compatible with a wide range of EMC test software available on the market. Our hardware solutions are meticulously designed to ensure interoperability and ease of integration with third-party software, enabling customers to harness the full potential of their testing setups. In essence, our commitment to openness and compatibility underscores our dedication to empowering our customers with flexible and comprehensive solutions that meet their diverse needs and preferences. With Raditeq, you have the freedom to choose the best combination of hardware and software to achieve your EMC testing objectives with utmost effectiveness, efficiency, and accuracy.

The Brain of the system

RadiMation® serves as the central intelligence (The Brain) of Raditeq systems, seamlessly integrating Raditeq's products with a vast array of other brands. With over 6000 individual drivers available, there's a high probability that your device is already supported by RadiMation®. However, if your (white listed) device is not yet supported, Raditeq is dedicated to adding support for it at no additional cost. RadiMation® focussus on automating EMC tests and ensuring the quality of the output. Through rigorous driver testing and meticulous command verification, RadiMation® prioritizes accuracy and reliability in delivering results. As a result, it stands as the software with the utmost emphasis on producing correct outputs and achieving precise results, empowering users to conduct EMC testing with confidence and efficiency.



The Heart of the system

All of Raditeq's products are compatible with the RadiCentre® system, serving as its modular heart in EMC testing setups. The RadiCentre® is a versatile unit capable of accommodating up to eight individual devices, offering unparalleled flexibility in system configuration. With the RadiCentre® at its core, users have the freedom to construct comprehensive EMC testing systems tailored to their specific requirements. Whether it's combining multiple Raditeq devices, the RadiCentre® provides a seamless platform for building extensive and adaptable systems. This modular approach not only maximizes flexibility but also streamlines system management and maintenance. By consolidating multiple devices into a single unit, the RadiCentre® simplifies setup, operation, and troubleshooting, ensuring efficient and reliable performance in EMC testing endeavors.

The RadiSense® Series

Raditeq brings over 30 years of expertise in the field of EMC. In addition to designing both large and small EMC/RF projects for clients in automotive, defence, and aerospace industries, Raditeq offers considerable proficiency in anechoic chamber calibrations and conducting EMC immunity and emission tests. The extensive experience gained over three decades shapes Raditeq's vision in designing E-field probes, with pivotal decisions being made from the user's perspective.

The RadiSense® is a laser-powered electric field strength probe renowned for its exceptional measurement speed and accuracy. This E-field probe is versatile, suitable for immunity testing for EMC purposes, as well as calibrations of measurement setups in environments such as anechoic chambers, GTEM and TEM cell configurations, reverberation chambers, and more. The RadiSense® is reliable, and precise solution backed by a legacy of proven performance.

Streamlined Operations

Conducting tests and calibrations can be time-consuming and demanding for engineers. Ideally, one would like to initiate a test and move on. The RadiSense, as an E-field probe, requires minimal attention during testing. Originating over 25 years ago, it was the pioneer in laser-powered E-field probes, allowing the RadiSense to operate 24/7 without interruptions for battery replacements. Its compact size and dedicated design have minimal impact on probe measurements, and when not in use, it can be conveniently placed in a corner without the need to disconnect cables. The inherently complex nature of EMC tests and calibrations underscores the importance of a user-friendly operation for the E-field probe. The RadiSense® is easily operated manually through the RadiCentre and supports a set of software commands for configuring embedded functionalities, facilitating test automation. Compatible with multiple software packages from various manufacturers, the RadiSense seamlessly integrates with Raditeq's own EMC automation software, Radimation, providing a comprehensive solution for efficient and simplified testing processes.

Superior accuracy

Measurement errors during EMC tests or calibrations can lead to costly consequences. After all, overlooking problems or attempting to troubleshoot issues in anechoic chambers, designs, or setups that don't exist but are a result of probe measurement errors is undesirable. The RadiSense® excels in accuracy, significantly minimizing the risk of measurement errors.

The precision of the RadiSense® is meticulously determined by its well-thought-out shape, dimensions, and the materials used, effectively minimizing anisotropy and ensuring minimal impact on the uniformity of the generated field. Substantial research and development efforts have been dedicated to designing advanced data acquisition techniques applied in the RadiSense®. This includes the creation of an accurate antenna and measurement circuit that exhibits minimal drift and noise. The resulting measurement data is processed within the embedded software, utilizing sophisticated algorithms to achieve optimal linearity, frequency response, and isotropic response.

RadiSense® Ultra Applications

Below are stated a few examples of applications in which the RadiSense® can be used.

Pulsed field measurements
These involve capturing and analysing electromagnetic fields that occur in short bursts or pulses. They are crucial for assessing the transient behaviour ofbehaviour of electromagnetic phenomena and pulsed RF fields, like radar pulses.

Reverberation chamber testing
Reverberation chambers create an environment where electromagnetic waves bounce off walls or stirrers, producing a statistically uniform field. These chambers are used for EMC testing of devices and equipment, simulating real-world multi-path propagation condition.

Radiated immunity field monitoring
This involves monitoring and analysing electromagnetic fields to assess the susceptibility of electronic devices to external electromagnetic interference. It helps evaluate the resilience of devices against electromagnetic disturbances in their operating environment.

Anechoic chambers 16 point - calibration
Calibration: Anechoic chambers are specially designed rooms with highly absorptive walls, creating an environment free from reflections. The 16-point calibration process ensures the accuracy of the chamber's performance across different frequencies and orientations.

EMC immunity testing
EMC immunity testing evaluates the device's ability to withstand electromagnetic interference without malfunctioning. The probe can be used a reference of the field for these kinds of tests.

Field homogeneity measurements
This refers to the assessment of the uniformity of electromagnetic fields within a defined area. It ensures that the field strength remains consistent across the test environment, providing reliable and reproducible testing conditions.

RF broadcast and welding radiation-hazard monitoring
This involves monitoring and analyzing RF emissions from broadcasting stations and welding operations to assess potential radiation hazards to nearby electronic devices or personnel. It helps ensure compliance with safety regulations and minimizes interference risks.

RadiSense® Ultra | Pulsed E-Field Probe | Components

RadiSense® Ultra - Modular setup

The RadiSense set is a modular setup consisting of different components, allowing for interchangeability and expansion. Required components to make the system operational:

RadiSense® Ultra E-field probe - RSS3018U
Laser-powered electric field strength probe/sensor with superior accuracy.

RadiSense LPS card - LPS3001A
Laser supply and communication plug-in card/module: Dedicated to the RadiSense®, this module, in conjunction with the Radicentre, serves as the interface between the user and the probe.

RadiCentre® Modular test system
Modular test system: A modular rack with one or more slots to provide power to modules and interface with them. The RadiCentre, depending on the model, offers users the ability to manually operate the probe (and/or other Raditeq measuring equipment) using a touch-sensitive display. Additionally, the RadiCentre, regardless of the model, acts as a bridge between the PC and your Raditeq measuring equipment, enabling control of the RadiSense and other devices through (automation) software. The RadiCentres® which can be used for the RSS3018U are:

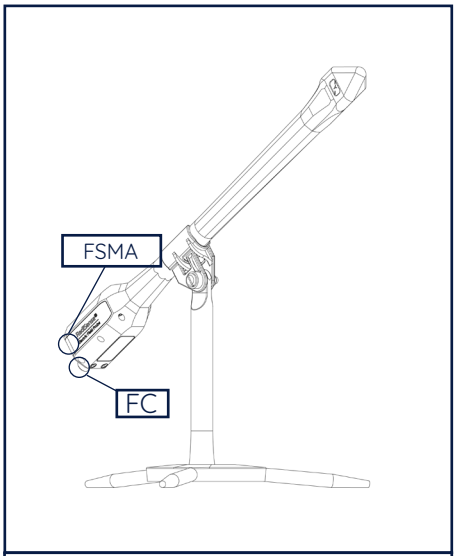
- CTR1001S - Single slot RadiCentre®
- CTR1004B - Two slot RadiCentre®
- CTR1009B - Seven slot RadiCentre®
- CTR2008A - Eight slot RadiCentre®

To achieve the maximum measurement speed of the RadiSense® RSS3018U note that a CTR2008A is needed. This RadiCentre® is specialized in speed and accuracy and therefore the best choice when using the RadiSense® Ultra.

Custom fibre cables
The fibre cables included in the set, designed to connect the RadiSense E-field probe to the LPS laser module, are custom-made with a dedicated design for optimal optical coupling and minimal interference with measurements. These cables are standard available from 10 meter up to 100 meters. Deviating optic fibre lengths can be requested.

RadiSense® Ultra | E-Field probe

The RadiSense® Ultra E-field probe is engineered for ultra-fast measurements, enabling the precise measurement of CW fields and capture of pulsed fields. Its unique stick probe design houses the intelligent components within the aluminium back portion, while the antennas are strategically positioned at the tip of the stick, beneath the X, Y, and Z stickers. Further details regarding the probe's positioning and angle of the antennas are found in the chapter: 'positioning the stick probe'.



Distinguished by its high quality laser-powered technology, the RadiSense® Ultra eliminates the need for batteries and minimizes downtime. Instead, it relies on a fibre optic cable for laser power supply and communication.

These cables are seamlessly connected via FSMA and FC connectors located on the back of the probe, facilitating direct attachment from the laser power supply plug-in card to the probe. This streamlined setup ensures efficient and reliable operation, making the RadiSense® Ultra

Laser power supply card - LPS3001A

The laser power supply card, also referred to as the LPS card, serves as the primary power source for all RadiSense® probes. This critical component ensures the optimal functionality of the entire system.

LPS card connectors:

The LPS card is equipped with two essential connectors:

- **Power connector - FC connector** : Delivers the necessary power to the connected RadiSense® probes.
- **Communication connector - FSMA connector:** Facilitates communication between the LPS card and the associated probes.

Protective measures for the LPS Card

When there is no probe connected to the Laser power supply card, it is imperative to cover both connectors using the supplied caps provided by Raditeq. This precautionary step safeguards the connectors from potential damage and environmental influences.

Compatibility of the LPS3001A

The LPS3001A is exclusively compatible with the RSS3018U probe. Ensure that this specific Laser power supply Card is utilized only with the designated probe to guarantee optimal system performance. By adhering to these guidelines and specifications, users can maintain the reliability and efficiency of the RadiSense® system, ensuring seamless operation during laser-powered applications.

RadiCentre(s) Modular test system

The RadiSense® Ultra, when paired with the LPS3001A, is seamlessly compatible with the entire range of RadiCentre® modular test systems. This includes the following models:

CTR1001S - Single Slot RadiCentre®
CTR1004B - Two Slot RadiCentre®
CTR1009B - Seven Slot RadiCentre®
CTR2008A - Eight Slot RadiCentre® (Optimal speed performance)

Core functionality

The RadiCentre® Modular Test System is designed to serve as the central hub, acting as the heart of your EMC (Electromagnetic Compatibility) system. It provides a foundational framework for conducting comprehensive tests and measurements.

Scalability concept

The key concept behind the RadiCentre® is scalability. You have the flexibility to expand and extend your system gradually, aligning with your evolving testing requirements over time. This modular approach empowers users to customize their EMC setup according to specific needs and applications.

Optimal performance for the RadiSense® Ultra

For peak performance, it is recommended to combine the RadiSense® Ultra with the CTR2008A RadiCentre®. This 8-slot modular test system is specifically designed to unlock the full potential of the RadiSense® Ultra probe.

Maximum Speed Capability

The CTR2008A RadiCentre® provides unparalleled access to the maximum speed of the RadiSense® Ultra probe, allowing for an impressive 6 megasamples per second. This capability ensures precision and efficiency in data acquisition, making it an ideal pairing for applications demanding high-speed performance.

By selecting the appropriate RadiCentre® model for your specific requirements, users can harness the full capabilities of the RadiSense® Ultra, achieving optimal results in their high-tech testing and measurement applications.

The LPS (Laser power Supply) card will be pre-installed inside The RadiCentre® modular test systems as a standard. This inclusive configuration ensures a streamlined setup process, allowing users to focus on their testing and measurement tasks without the need for separate installations.

RadiSense® Ultra optic fibre

Connect the sensors to the plug-in card mounted in the RadiCentre® using an extension fibre. Ensure the use of a robust duplex fibre optic cable for this purpose. The extension fibre employs dissimilar connectors, specifically FC connectors for laser light transmission to the field sensor, and FSMA connectors for bi-directional data communication between the field sensor and the plug-in card.

Connector Considerations

- FC Connectors: Transmit laser light to the field sensor.
- FSMA Connectors: Enable bi-directional data communication between the field sensor and the plug-in card.

Exclusive use of Raditeq-supplied cables

For the RadiSense® system, it is imperative to adhere to the exclusive use of fibre optic cables supplied by Raditeq. The warranty associated with the RadiSense® will be void if non-Raditeq supplied cables are utilized.

Warranty implications

Using cables from sources other than Raditeq may compromise the integrity of the system, resulting in potential damage. As a consequence, any issues arising from the use of non-approved cables will not be covered under the warranty provided by Raditeq.

Protect your investment

To safeguard your investment and ensure continued support from Raditeq, it is strongly recommended to exercise caution and strictly follow the guidelines regarding the use of supplied cables. This adherence not only preserves the warranty coverage but also guarantees the optimal performance and longevity of your RadiSense® system.

For further clarification or inquiries related to warranty terms and conditions, please reach out to your local reseller or contact Raditeq directly. Your understanding and cooperation in this matter are crucial for maintaining the reliability and longevity of your RadiSense® system.

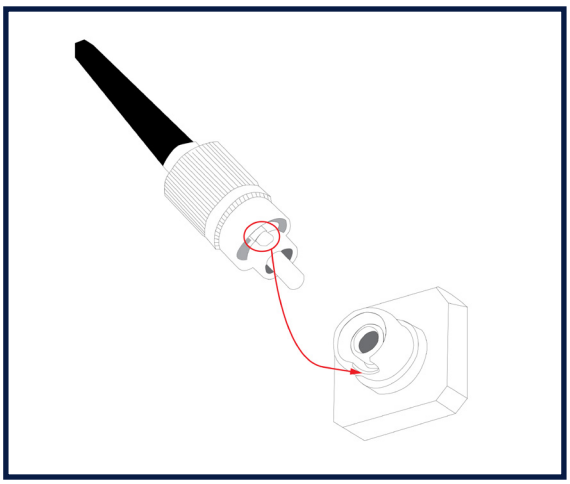
New optic fibre cables

For more detailed information and new fibre optic extension cables and their specifications, please contact your local reseller. They will provide comprehensive details and assist in selecting the appropriate extension cables tailored to your specific requirements.

Connecting the FSMA/FC connector

For proper operation, please make sure that both optic fibre cable connectors are properly connected an that the notch of each connector is placed correctly into the slot of the FC and FSMA connector.

- The FSMA connector - Insert the core into the connector and screw on the connector part.
- The FC connector - The natch for the FC connector need be carefully locked into the slot before it can be screwed on and tightened.



FC Connector

Fibre optic conditions

Refer to the examples and instructions provided in the accompanying figure as a comprehensive guideline for ongoing fibre maintenance. The figure illustrates proper techniques and practices to ensure the optimal condition of fibre optic cables.

Caution and doubts regarding fibre optic cable

Exercise caution during maintenance activities. If any doubts arise concerning the condition of the fibre optic cables, do not proceed without proper guidance. Contact your local reseller or Raditeq for assistance and advice.

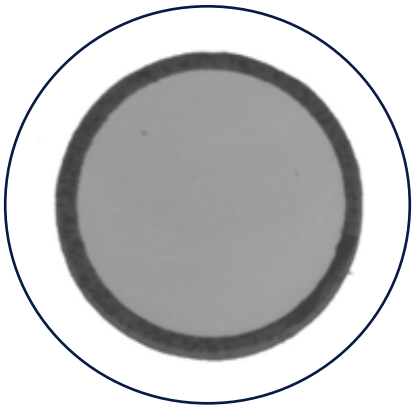
Specialized Equipment and Training:

It is essential to note that inspecting fibre optic cable connectors requires specialized equipment and training. Attempting maintenance without the necessary expertise may lead to damage or improper handling. If unsure, seek professional assistance to guarantee the integrity of your fibre optic connections.

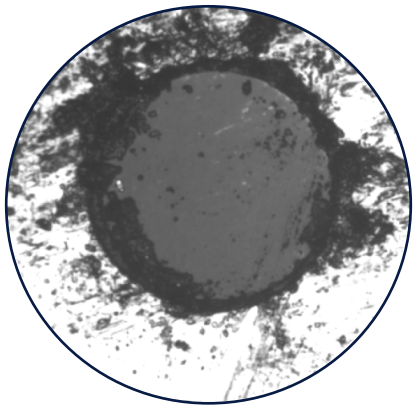
How to check the optic fibre cables

To inspect the optic fibre cables of RadiSense® probes, an optical camera is required. If the user does not have access to such a camera, they are encouraged to contact their local reseller for assistance. The reseller can perform a thorough check of the fibre and offer minor repairs if necessary.

Optical cameras are designed to be placed over the tip of the connector (the white part) and display an image on a PC or connected display. It is essential to focus on cleaning the core of the fibre, rather than the sides or metal parts. Below is an example illustrating the difference between a clean and dirty optic fibre core.



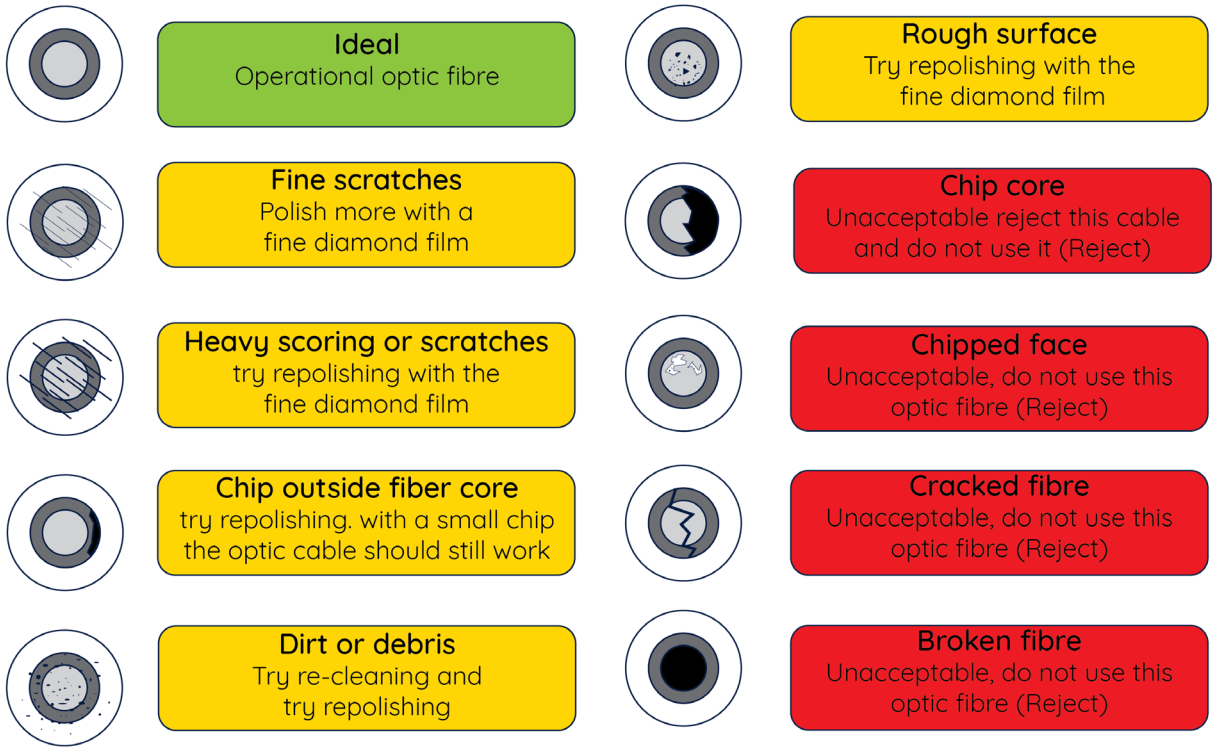
Clean fibre



(very) dirty fibre

When using the previously mentioned cameras, only inspect the core of the optic fibre. Under no circumstances should the core be cleaned with anything other than the provided alcohol wipes or similar wipes. Grease, dirt or lint can contaminate the core and potentially cause damage to the fibre or the probe. Therefore, it is crucial to exercise caution and adhere strictly to recommended cleaning procedures to maintain the integrity and functionality of the fibre optic cables and probes.

Example of different optic fibre conditions



Reference figure for fibre maintenance

Non-ideal fibre conditions

Any deviation from ideal conditions will (ultimately) result in damage to the optic fibre cable or the probe itself. Should the fibre core become contaminated, it may be possible to clean it using the supplied alcohol wipes. However, if cleaning with these cloths proves ineffective, specialized treatment is necessary.

In such cases, it is advisable to reach out to your local reseller for assistance. They can provide professional cleaning services for the fibre or facilitate the replacement of a broken cable. It's crucial to note that a "Reject" status indicates that the optic fibre cable should no longer be used. Any condition other then ideal should be cleaned before use. Attempting to use it in this condition will lead to the probe malfunctioning or sustaining damage. Therefore, prompt action is essential to maintain the integrity and functionality of the probe system

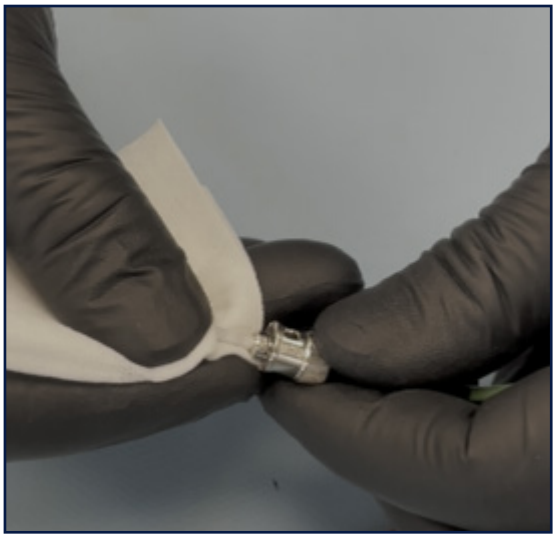
Contact information:

For any queries related to fibre maintenance, reach out to your local reseller or contact Raditeq directly. They are equipped to provide guidance, answer questions, and offer assistance to ensure the continued reliability and performance of your system.

Your commitment to proper maintenance practices ensures the longevity and effectiveness of your fibre optic connections within the RadiSense® system.

(Importance of) fibre maintenance

The fibres supplied with the E-field probe demand regular maintenance to ensure uninterrupted communication and power supply between the LPS card and the E-field probe. Failure to conduct regular maintenance may result in performance issues.



Risks of contamination

Prolonged use without proper maintenance can lead to ingrained dirt, causing permanent damage to the fibre optic connections. This, in turn, may result in communication and power supply issues.

Regular cleaning and inspection

To prevent contamination and maintain optimal performance, it is essential to clean and inspect the optical connections regularly. Utilize the alcohol wipes provided with your product for effective cleaning.

Caution during disconnect-connect cycles

The frequency of disconnecting and connecting fibre optic cables impacts the risk of introducing grease, dirt or dust onto the connectors. Exercise caution during these cycles to minimize the chance of contamination.

Warning: high power laser light

Dirt, grease or dust on the connector can burn into the fibre optic cable when high-power laser light is guided through it, rendering the fibre useless or severely damaged.

Fibre contact surface cleaning instructions

Before installation, ensure the optimal performance of your fibres by following these cleaning instructions:

Use lint-free alcohol wipes:

- Clean the contact surface of the fibres using lint-free alcohol wipes.
- Use gentle, but thorough, motions to ensure effective cleaning.

Avoid other solvents or wipes:

- Do not use any solvents or wipes other than the lint-free alcohol wipes provided.
- Alternative solvents or wipes may compromise the cleanliness and performance of the fibres.

Initial installation cleaning note:

- Fibres are delivered clean and polished.
- When properly following the handling guidelines provided, cleaning during the first-time installation is not necessary.

Regular cleaning:

- Clean connectors using the provided alcohol wipes regularly

Following the recommended handling guidelines is crucial to maintaining the cleanliness of the fibres. If these guidelines are adhered to, the fibres are delivered in an optimal state and will not require additional cleaning during the initial installation. By consistently using lint-free alcohol wipes and avoiding other solvents, you ensure the continued cleanliness and effectiveness of your fibre optics, contributing to the reliable and efficient operation of your RadiSense®

Optical fibre cable/connector handling guidelines

To prevent damage and ensure the optimal performance of your optical fibre cables and connectors, adhere to the following guidelines:

Minimize disconnect-connect cycles

- Limit unnecessary disconnect-connect cycles to reduce the risk of contamination.

Prompt inspection

- Inspect connections regularly to identify and address potential issues promptly.

Protective caps

- Always place the protective caps on the fibre optic cable connectors when not in use.
- Use only the supplied protective caps for this purpose.

Avoid touching the core surface

- Never touch the tip of the fibre optic cable connector (core surface).
- If the tip is accidentally touched, clean it with the supplied alcohol wipes before usage.

Avoid dropping connectors

- Never drop fibre optic cable connectors, as this may damage the core surface.

Mind the bend radius

- Never bend fibre optic cables beyond the minimum bend radius of <5 cm, as this can break the fibre optic cable core.

Proper disconnection

- Never pull the fibre optic cable out of a coupling by its orange jacket.
- Always pull the on FC or FSMA connector itself.

Hand fastening only

- Fasten connectors by hand only; never use tools.

Avoid physical stress

- Do not stand on or crush the fibre optic cable.
- Avoid applying mechanical stress (pull) to the fibre optic cable.

Switch off before detaching

- Switch off the system before detaching the fibre optic cable to ensure safe disconnection.

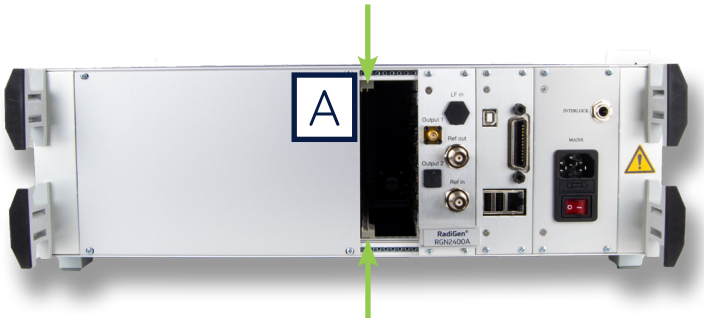
Operation of the RadiSense® with the RadiCentre®

Installation into the RadiCentre

Follow the instructions below for installing the Raditeq plug-in card into the RadiCentre® correctly:

Step 1:

- Before proceeding, ensure that the RadiCentre® is turned OFF.
- Choose an empty slot in the RadiCentre® suitable for installing the plug-in card.
- Unscrew the four screws on the blind panel covering the slot (two at the top and two at the bottom) to remove it.



Step 2:

- Insert the plug-in card into the rail of the empty slot, following the orientation shown in picture A.
- Position the plug-in card into the slot and gently push it in using the lower part of the card.
- Continue pushing until the card reaches the end of the rail, then securely push it into the backplane socket.

Step 3:

- Once the plug-in card is correctly inserted into the backplane socket, secure it by tightening the four screws at the top and bottom of the card (as indicated in picture B).
- Use a screwdriver type Poze, size PZ1 for this purpose.

Step 4:

- After installing the plug-in card, connect the AC mains power cord to the back of the RadiCentre®.
- Switch the ON/OFF button to the ON position.
- The RadiCentre® can now be started by tapping the touch screen or by pressing the front ON button.

Once installed properly, the plug-in card should be automatically recognized by the RadiCentre® when turned ON. It will displayed by the RadiCentre® or visible in the used software.

Configuring the RadiSense® System

- Place the RadiSense® E-field sensor where the field strength is to be measured.
- Clean the ends of the fibre optic cable connectors if necessary and connect the fibre optic cables to both the sensor and the plug-in card.
- Connect the RadiCentre® system to the PC using any of the available interfaces of the RadiCentre® system; USB, Ethernet or IEEE-488 (optional).
- Make sure the interlock safety system is closed when connecting to the RadiCentre®.
- If the interlock system loop is not closed/connected the RadiSense® laser will not start. Note that if the interlock loop is broken whilst the laser is active, that the laser of the RadiSense® will be shut off. The Interlock loop needs to be closed or reconnected before the laser can be restarted again.

The hardware installation for the plug-in card is now complete. The user can control the plug-in card either through the touchscreen on the RadiCentre system (only available for the 2 and 7-slot versions), or by using the control commands in combination with an external software package such as the RadiMation EMC test software

RadiCentre® Ultra eight slot Specific

The RadiCentre® CTR2008A is deliberately designed without a display, prioritizing speed and versatility. In addition to its focus on speed, an 8th plug-in card slot has been added to maximize plug-in card capacity. Thus, enabling applications that require up to 8 probes/devices simultaneously. This ultra-high-speed performance and expanded slot capacity come at the expense of the built-in display utilized by the RadiCentre® CTR1009B.

To manually control and read out the RadiSense® Ultra probe, users can utilize RadiMation® or another compatible software package. For detailed instructions on integrating the RadiCentre® with RadiMation® software, please refer to the software explanation section in this manual. It provides comprehensive guidance on RadiMation® for efficient operation and data interpretation with the RadiCentre®.

Activating the laser of the RadiSense®

The RadiCentre® Ultra model CTR2008A lets the RadiSense® ultra be used at its maximum speed capacity. Therefore, the combination of the CTR2008A and RadiSense® Ultra is suggested. The RadiSense® Ultra like all other RadiSense® Probes is a laser power supplyed probe which is powered from the RadiCentre®. As an additional safety measure the RadiCentre® has a safety feature which needs to be triggered before the laser can be activated.

To activate the laser in the RadiCentre® Ultra CTR2008A , follow these steps:

1. Press the 'LASER ON' button on the front panel (of the RadiCentre® CTR2008A) and hold it.
2. Five loud 'beep' sounds can be heard; four short beeps followed by one long beep.
3. On the fifth 'beep' the laser link is activated and the red "LASER ON' LED' (on the LPS plug-in card) lights up.
4. Release the 'LASER ON' button.

RadiCentre® 2-slot and 7-slot specific:

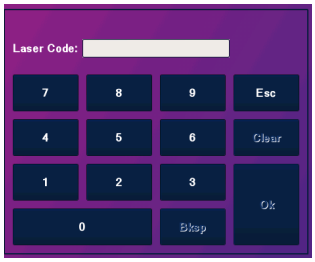
The RadiCentre® CTR1004B and RadiCentre® CTR1009B are equipped with a touch screen display to manually control the RadiSense® probe

Using the RadiSense® with a RadiCentre® TouchScreen

Manual Control*

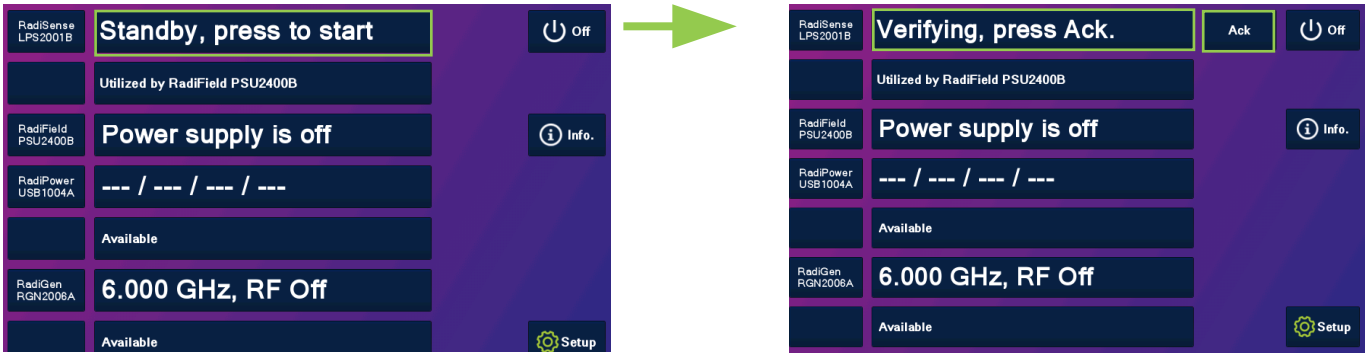
Once the RadiCentre® is switched on, the RadiSense® can be activated from the 'main' screen on the RadiCentre® touch-screen.

Starting the laser power supplyed sensor



The laser of the RadiSense® Ultra field sensor can be started from the 'main' window of the RadiCentre®. To activate the sensor, press the 'Start' button for the required sensor and, within 4 seconds, the 'ACK' button. A short sound will be audible until the safety loop is closed successfully. As long as the laser is activated, the front and rear 'LASER ON'-LED's will light up to indicate laser operation.

Note if the laser code is not entered at the start-up of the RadiCentre® the laser code numpad will pop-up when activating the RadiSense® laser.



Laser safety code

As a safety precaution, products that use a laser can only be turned on using a laser code. This code can be entered into the system by use of the touch screen of the RadiCentre®.

This safety feature is linked to the RadiCentre® 2- and 7-slot version. Only the laser activation and safety is implemented differently in the RadiCentre® Slim.

To meet the laser safety precaution, enter the laser code in the ‘LASER Code’ screen and press ‘OK’ for confirmation.

The standard/default Laser code is **3447**

RadiCentre® CTR1001S specific

The RadiCentre® Slim model CTR1001S can be used in combination with the RadiSense® electric field probe series. The RadiSense® is a laser power supplyed probe which is powered from the RadiCentre®. As an additional safety measure the RadiCentre® has a safety feature which needs to be triggered before the laser can be activated.

The RadiCentre® Slim model CTR1001S does not have a touch-screen. Instead a specific activation procedure combined with audible warnings is used.

To activate the laser in the RadiCentre® Slim, follow these steps:

1. Press the 'Start' button on the back panel (of the RadiCentre® CTR1001S) and hold it.
2. Five loud 'beep' sounds can be heard; four short beeps followed by one long beep.
3. On the fifth 'beep' the laser link is activated and the red 'LASER ON' LED (on the LPS Plug-in card) lights up.
4. Release the 'Start' button.

This means that:

- If the activation process is to be interrupted, release the 'Start' button (before the fifth 'beep'). The laser will not be activated.
- If the activation process is interrupted (and released 'Start' button by accident), the laser will not be activated.
- The user is warned by an audible warning when the start button is pressed by accident (i.e. without the intention to activate the laser).

To prevent accidental activation of the laser, an auditory warning will alert you of the laser activation procedure (if the 'Start' button is being pressed). To interrupt the activation process, all you must do is release the 'Start' button.

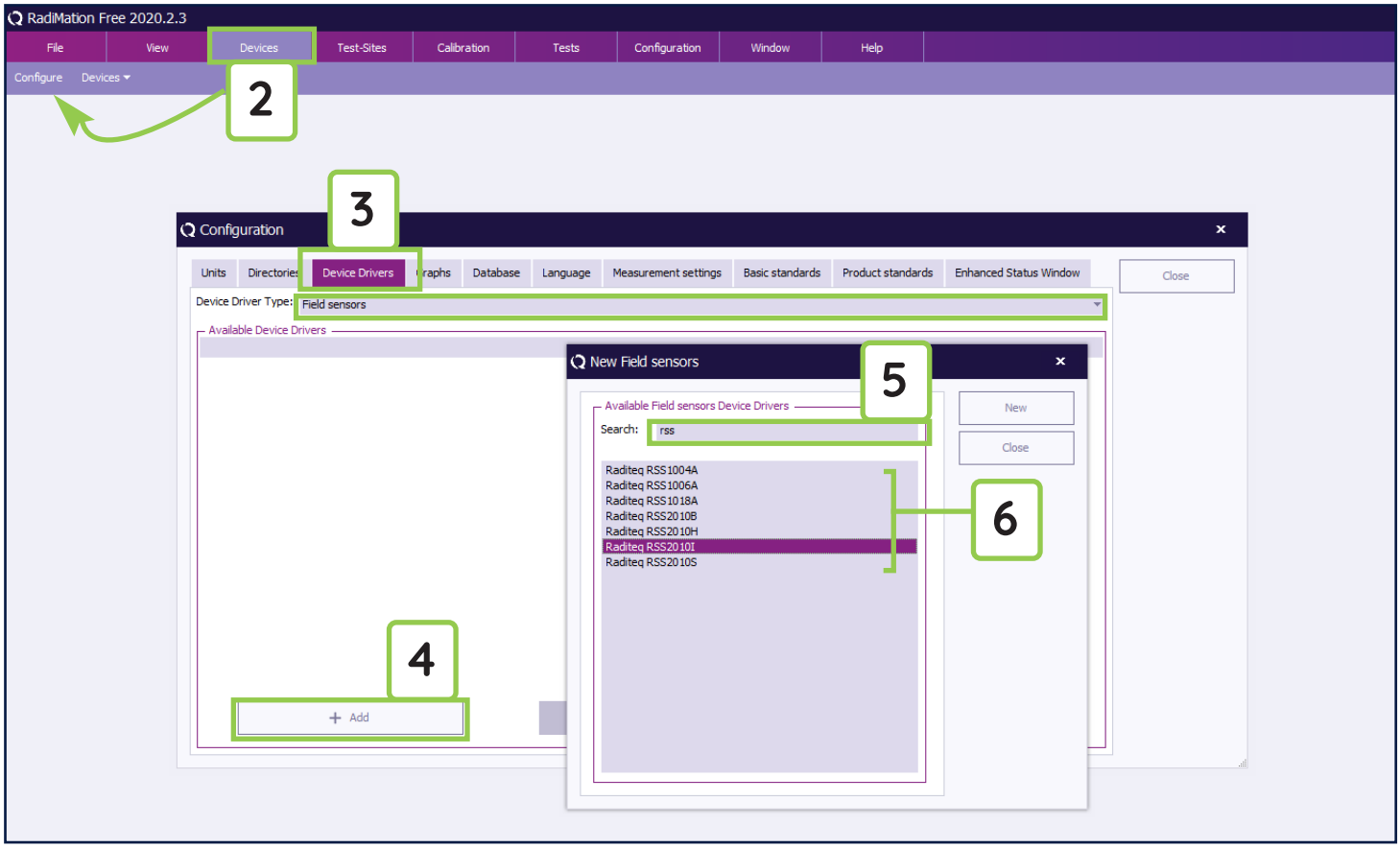
Software configuration

To control the RadiSense from a computer, one can use either custom made software or the RadiMation® EMC software package from Raditeq, which can be downloaded from the Raditeq website. If the RadiSense® is operated manually using a RadiCentre® CTR1004B or CTR1009B, this chapter can be skipped.

Configuring the RadiSense® in RadiMation®

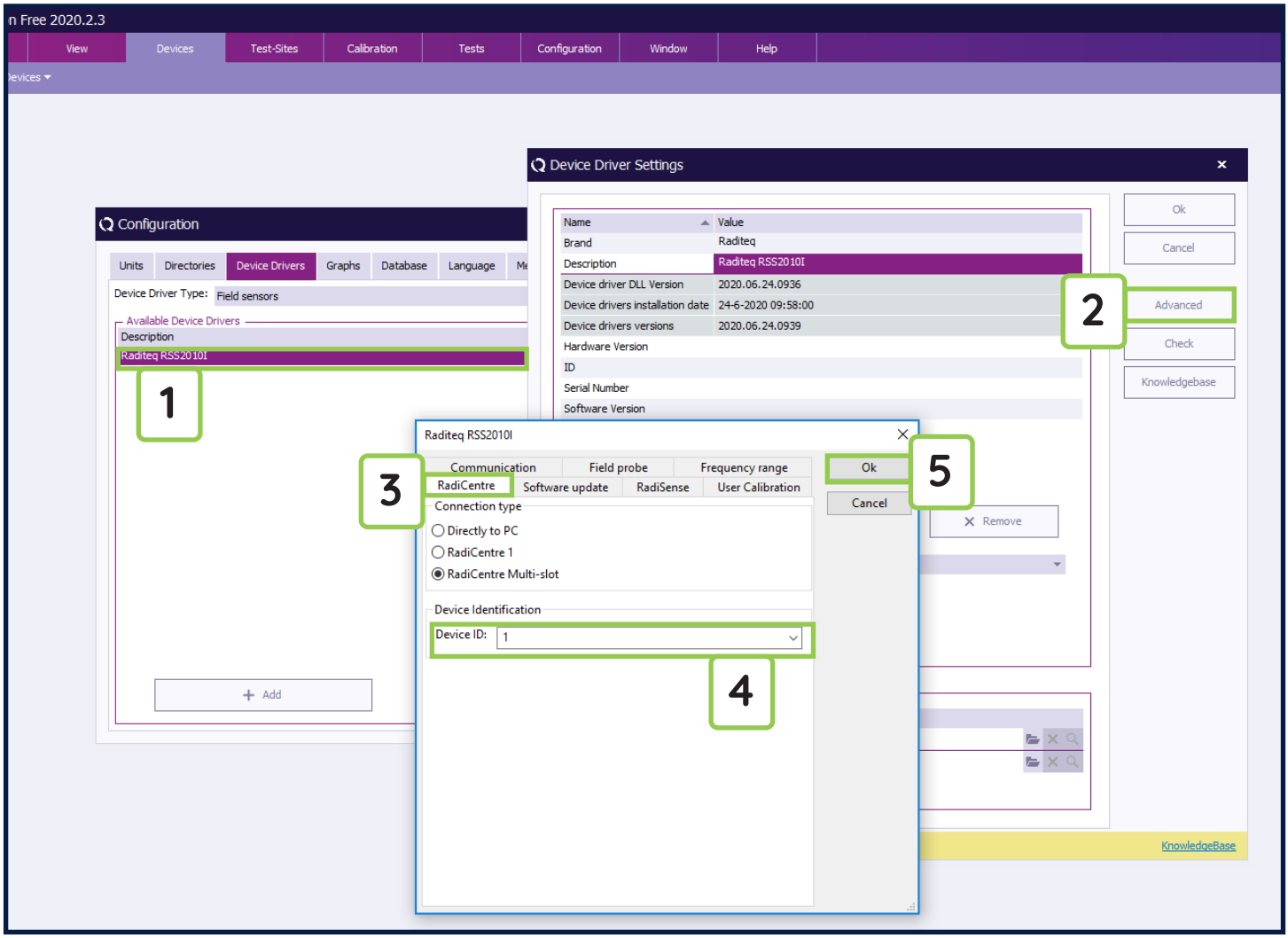
The RadiSense® device driver is part of the [Field Sensor] device driver family

1. Download and start the latest version of RadiMation®; **https://www.raditeq.com/radimation-download**
2. Select the button 'Device' at the top menu bar, followed by clicking 'Configure'.
3. In the configuration screen select 'Device Drivers' and Select 'Field Sensors' as driver type.
4. Click the 'Add' button to open the selection of available drivers in RadiMation®.
5. Enter 'RSS' in the search bar which will show all available RadiSense® drivers.
6. Select the Raditeq RSS3018U driver, double click it (Optional, rename it) and press 'OK'.



How to connect the RadiSense® to the RadiCentre®

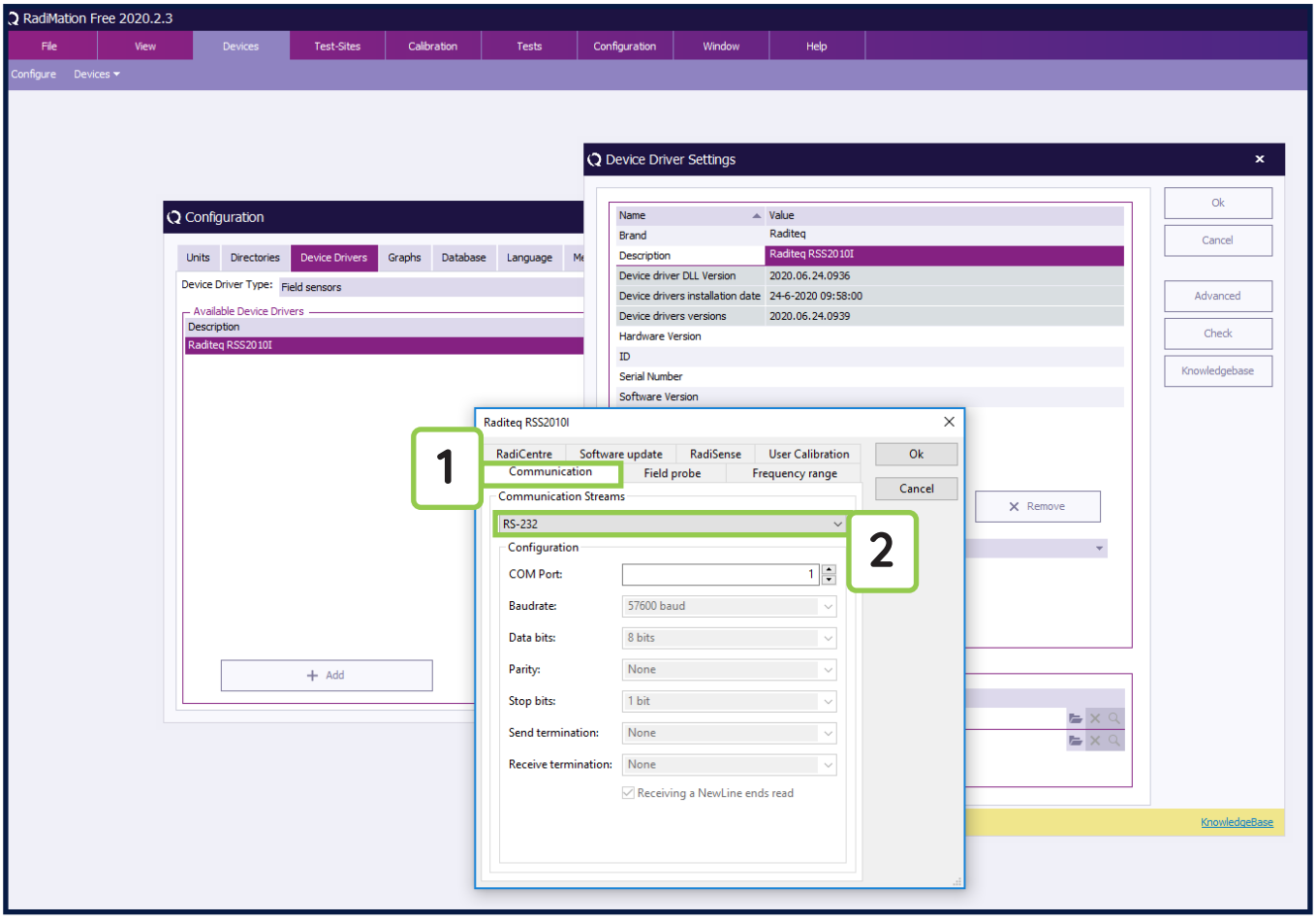
1. Select the recently added RadiSense® driver
2. Select ‘Advanced’
3. Click on the tab ‘RadiCentre®’
4. Under device identification select the RadiCentre® slot number the RadiSense® plug-in card is installed in
5. When the correct slot number is chosen, continue to set the communication of the RadiSense® by clicking ‘Communication tab’ (next page).



Setup the communication of the RadiSense® to the RadiCentre®

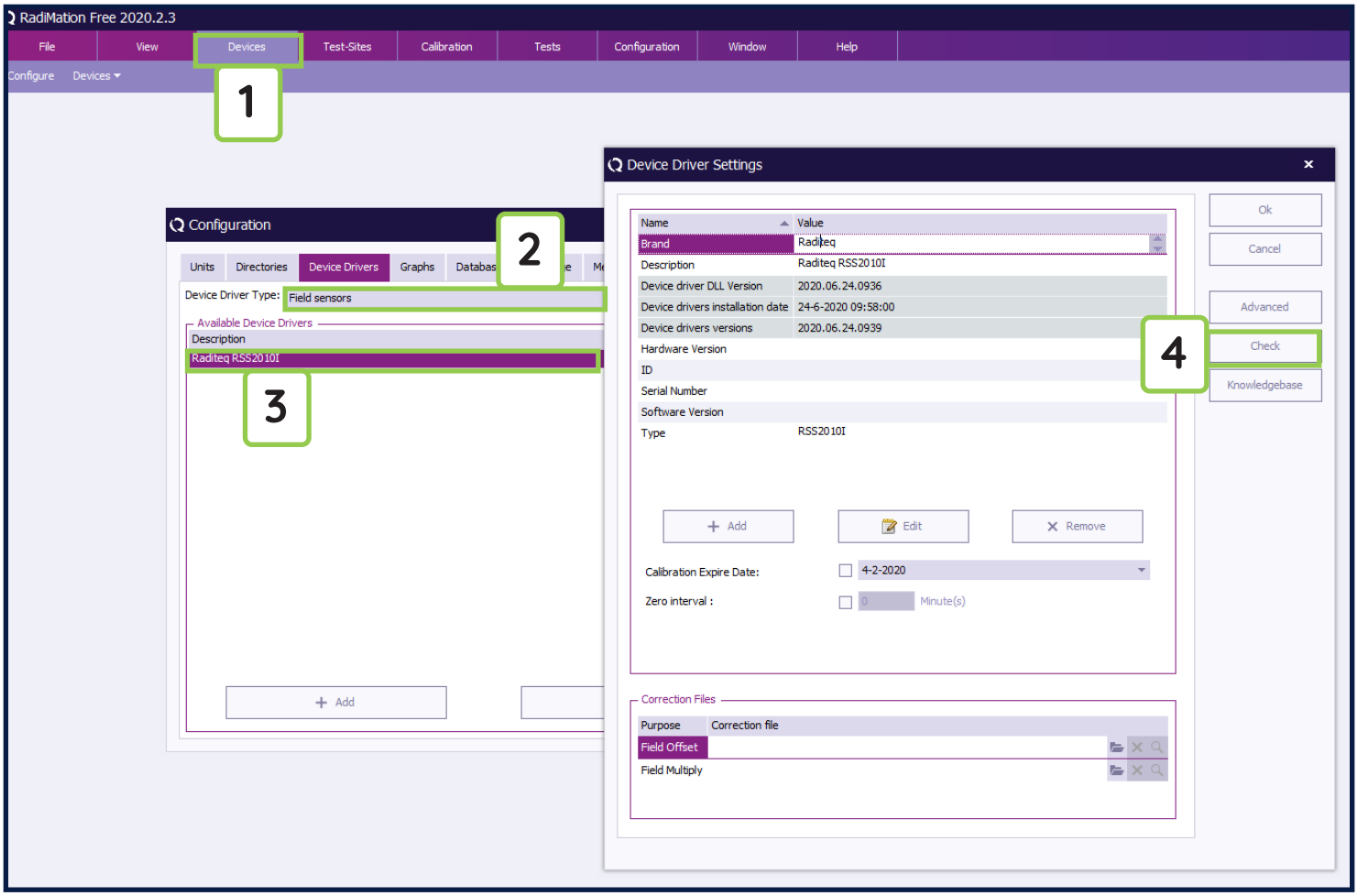
1. When in the advanced RadiSense® Driver settings click on the tab 'Communication'
2. Select the interface to used, for example:
    - GPIB
    - TCPIP
    - USB
    - VISA

3. When these steps are performed continue to the next steps for checking the communication of the RadiSense®.



How to check whether the RadiSense® is properly connected to RadiMation®

1. Select ‘Devices’ in the top menu bar
2. Open ‘Device Drivers’ and select Device driver type: ‘Field Sensors’
3. Double click the recently configured RadiSense® or click ‘Edit’.
4. Finally select the ‘Check’ button on the right side of the opened screen.
5. When correctly configured, RadiMation® will notify you that the device is correctly installed.



Important information

When you need support with the configuration of your Radi-Product in RadiMation®, please consult the RadiMation® support team at: radimation-support@raditeq.com

It is also advised to visit the RadiMation® Wiki page and the FAQ section, which can be found at: https://wiki.radimation.com

RadiMation® software can be downloaded at: https://www.raditeq.com/radimation-download/

RadiSense® User Functions & Handling

Starting a measurement with the RadiSense® Ultra requires some configuration of the probe and consideration of important factors. Neglecting this step can lead to unforeseen errors and problems during the measurement process. Therefore, it is crucial to ensure that the probe is properly configured and all relevant factors are taken into account to achieve accurate and reliable results.

Zeroing the probe

If the 'Status' box indicates "Press this button to zero", the probe still needs to be zeroed, and pressing the button will start the zeroing of the probe. As soon as the probe is zeroed, the 'status' box will display the measured field strength of the probe (see below).

The E-field sensor is now powered on and will return optical data to the RadiCentre® system. As long as the probe returns optical data, the laser will continue to power the sensor. If the loop is interrupted, the laser will switch off immediately. For maximum accuracy, it is recommended to re-zero the probe whenever the probe temperature changes by more than 5 °C.

Using the RadiSense® | Field Measurements

Probe configuration and advanced measurement data

The 'STATUS' box in the main screen of the RadiCentre® only displays the total isotropic field strength. When more advanced data is required (such as field strength of the separate axis, probe temperature, laser current etc.). When going into the 'Instrument'-screen by pressing the 'STATUS' box of the required device from the main screen. The 'Instrument'-screen will display the isotropic field strength in a large font, together with the field strength data of each separate axis. In addition; probe information and laser information are also displayed in the 'Instrument'-screen

The calculation of the isotropic field strength, is performed according to the following formula:

$$Etotal = \sqrt{Ex^2 + Ey^2 + Ez^2}$$

Etotal = Isotropic field value
Ex = Measured field X-axis
Ey = Measured field Y-axis
Ez = Measured field Z-axis

Setting the correct measurement frequency

To measure the correct field strength, the current measurement frequency must be sent to the probe. When using the probe manually, in combination with a RadiCentre or RadiMation, the frequency can be set in the control window of the RadiCentre using the button in the left bottom corner:

When using the probe under software control in an automated test setup, the control software must set the correct frequency for each test frequency, using the correct software commands. Please refer to the programming manual how to set the correct frequency. When using RadiMation EMC software, the device driver of RadiMation will automatically take care of this.

Select the filter setting

The probe allows the user to select different averaging filters to optimize performance for different applications. The averaging filter can be set between filter 1 and filter 12, where filter 11 is the highest filter setting with approximately 1 second update rate.

Due to the intrinsic non-linear behaviour of RF diode detectors typically used in E-field probes, the noise contribution when measuring low field strength values is significantly higher compared to the noise levels when measuring high field strength levels. Therefore, it is recommended to use a higher filter setting when measuring low field strength levels.

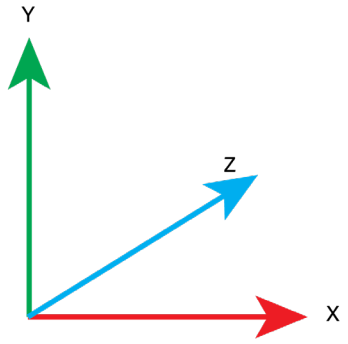
Please note, a lower filter setting will increase measurement speed at the cost of increased noise levels. On the other side, a higher filter setting will reduce measurement speed while reducing the noise.

1 = 2 MHz (No Averaging)
2 = 500 kHz (4x averaging)
3 = 100 kHz (20x averaging)
4 = 25 kHz (80x averaging)
5 = 10 kHz (200x averaging)
6 = 1 kHz (2000x averaging)
7 = 500 Hz (4000x averaging)
8 = 250 Hz (8000x averaging)
9 = 100 Hz (20000x averaging)
10 = 10 Hz (2e5x averaging)
11 = 1 Hz (2e6x averaging)

DYN = depending on the range of the axis with the highest field:
Range 200-1500 V/m: filter 3
Range 10 – 199.99 V/m: filter 4
Range 2 – 10 V/m: filter 5
Range 0 – 1.99 V/m: filter 6

Positioning the stick probe

The RadiSense stick probe consist of a stick with “antenna elements” at one end and a “body” containing the measuring electronics. This design ensures that the sensing part of the probe is as small as possible and located as far away from the measuring electronics as possible to measure the field as accurately as possible with minimal reflections.



Axis (dipole antenna) of the probe

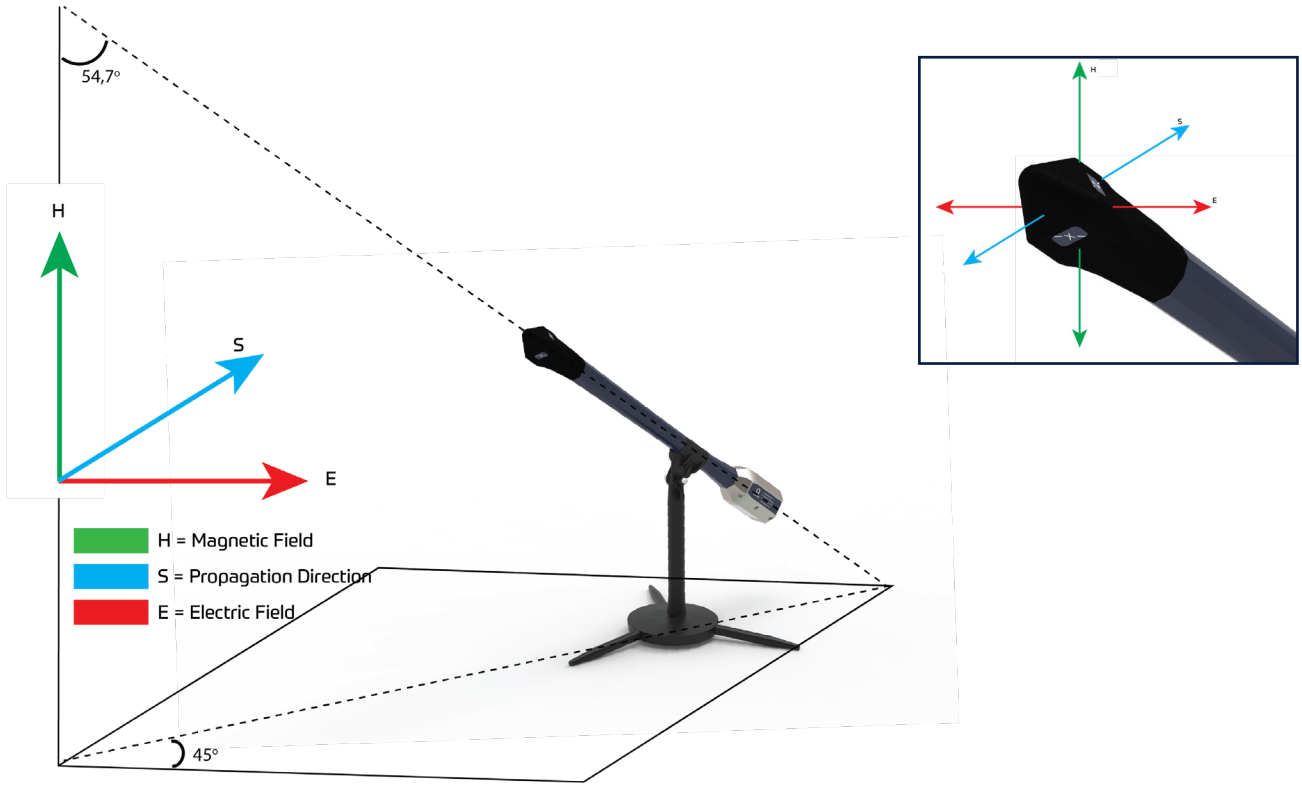
However, positioning the stick probe may seem more challenging than positioning spherical probes like the RadiSense 10 Series. This is mainly because the dipole antennas are not directly visible. However, positioning RadiSense stick probes does not have to be difficult at all, and this chapter explains the correct approach and what to consider when positioning them.

Considerations beforehand

There is no absolute instruction for positioning the probe; all guidance in positioning should be considered relative to the polarization of the field being measured. It is always recommended / good practise to use the probe in the same manner and positioning as during calibration when applying the correction factors determined during calibration. Refer to your calibration report (if available) for the positioning guidance.

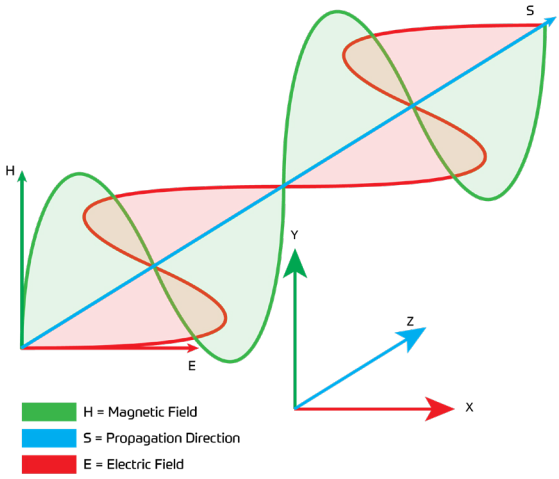
Minimal interference and maximum accuracy

The “tip” (the end of the stick) of the probe containing the sensing elements should be aligned with the propagation line of the field so that the transmitting antenna is “aimed” at the sensing part of the probe. The body should not be located in the propagation line of the field. The “tip” is the part that should be closest to the transmitting antenna. Image below illustrates how the probe is positioned.



Matching field with probe axis

For a correctly measured electric field (E), it is best to position the antenna of the desired axis in line with the electric field.

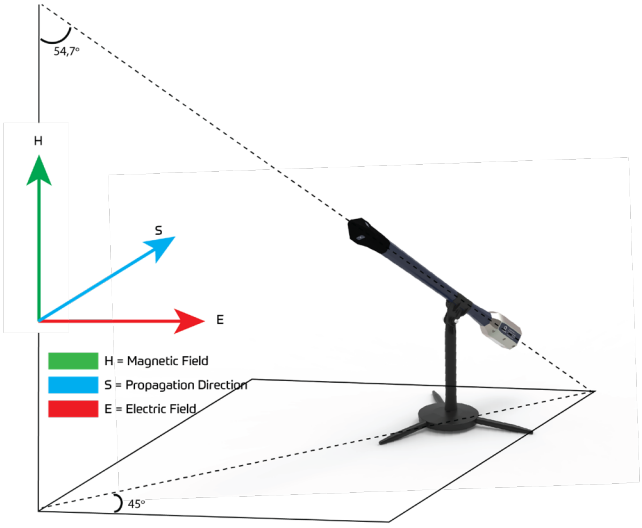


The magic angle

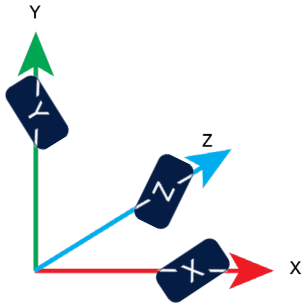
The RadiSense stick probe can be positioned at an angle of 57.4 degrees to ensure that with a 360-degree rotation around its axis, all sensing elements are aligned with the field at least once. The rotation where each axis “peaks” will differ by approximately 120 degrees relative to the other axes. The provided mount ensures that the stick probe is set at the magic angle of 57.4 degrees by default.

Aligning the dipole antenna’s with the field polarization

To simplify the alignment of the antenna elements, RadiSense stick probes are equipped with stickers indicating the orientation of the dipole antennas located in the tip of the stick. One of the axes (X, Y, or Z) should be aligned with the electric field being measured. The RadiSense is designed so that, when positioned correctly, the other “non-measuring” axes are perpendicular to the field. This ensures the most accurate measurement possible.

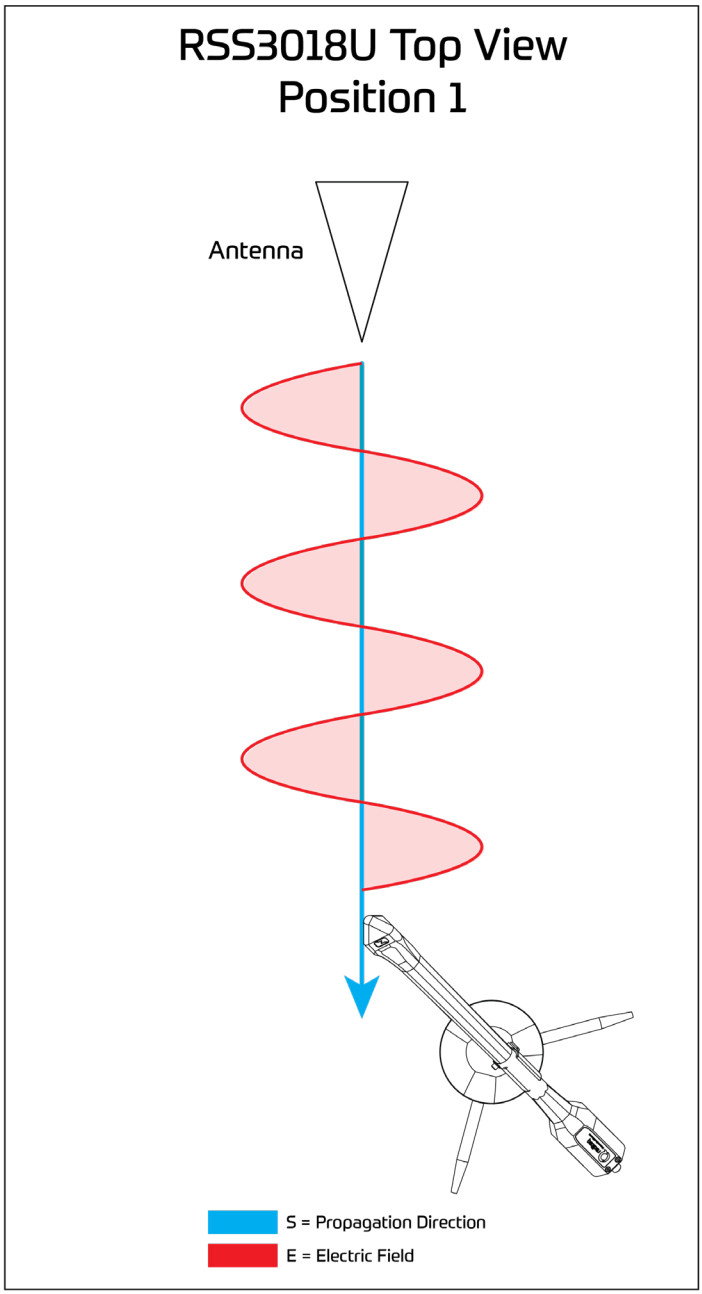


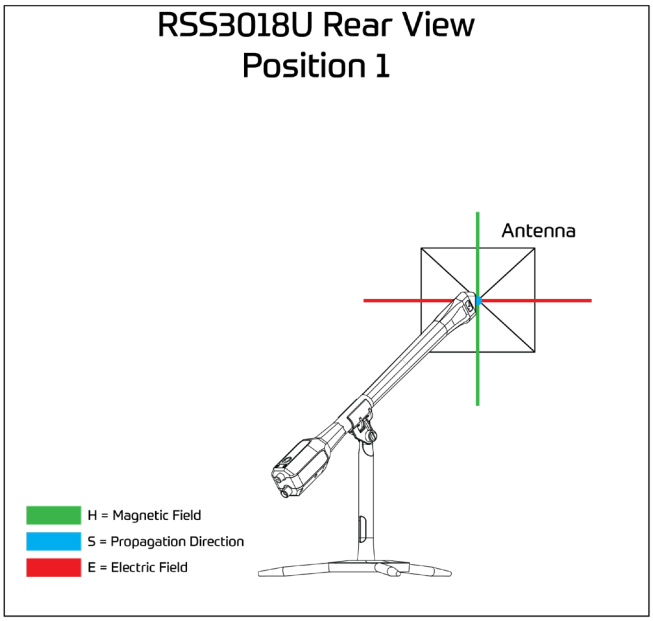
In images on the right , the field within the chamber is depicted. In this example, the electric field (E) is horizontal in the chamber. Consequently, the magnetic field (H) is vertical, and the propagation direction (S) is indicated by the blue arrow. On the right is illustrated how the probe should be positioned using the stickers on the tip of the probe to align the X-axis with the horizontal field, maximizing measurement along the X-axis. Additionally, it shows that the Y-axis is perpendicular to the field, thus vertical, while the Z-axis is aligned with the propagation direction, minimizing measurement along the Y and Z axes. When the probe is rotated approximately 120 degrees around its axis, depending on the direction of rotation, either the Y or Z axis will align with the field, and another 120-degree rotation will align the last axis.



If the probe body (of a stick probe) is aligned and pointing directly at the antenna, this is incorrect.

Probe positioning illustration





How to measure a pulse with the RadiSense® Ultra

The RadiSense® Ultra can be used in three measurement modes:

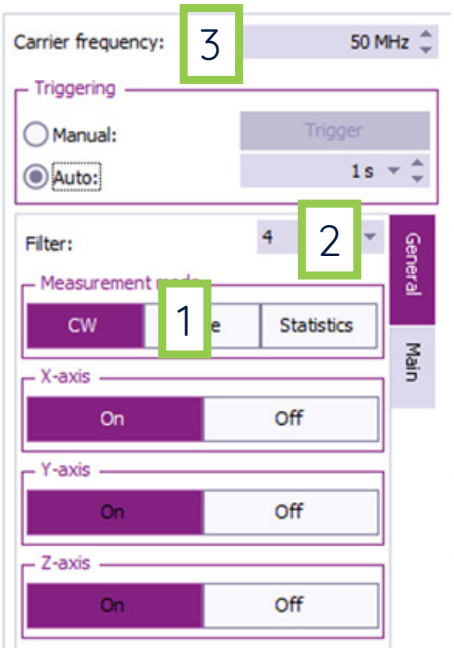
- Continuous Wave (CW): For constant wave signal measurements
- Pulse: For pulse-modulated signal measurements
- Statistics: For reverberation chamber calibrations

Depending on the signal to be measured, the appropriate mode should be set. This can be done, for example, using RadiMation® free-ware software or by utilizing commands described in the programming manual.

Constant wave (CW) measurements

To measure continuous wave signals, the CW mode should be selected. These settings are accessable through RadiMation® Device -> Field Sensor -> RSS3018U. Subsequently, the user needs to configure the following measurement settings:

1. Range
2. Filter
3. Frequency



Range

Depending on the signal level to be measured, adjust the range the following applies:

- CW Field strength < 50 V/m -> Range 1 (High gain)
- CW Field strength > 40 V/m -> Range 2 (Low gain)

Filter

Depending on the signal, adjust the filtering configuration. A lower measurement speed, but may also increase the noise. Higher filter but lower noise. For measuring low field strengths, it's advisable details can be found at page 29 and in the programming manual.

Frequency

The RadiSense includes frequency-dependent factory adjustment factors to ensure accurate measurements by the probe. To apply these factors correctly, the probe should be provided with the carrier frequency of the CW signal being measured. Detailed information on the frequency settings can be found at page 29.

RadiSense® Ultra pulse measurements

The Pulse mode supports the measurement of a pulse-modulated signal. Based on a triggered measurement, the pulse duration, rise/fall times, peak value, average value, and RMS value of the collected data are calculated and displayed.

To measure pulse modulated signals, the pulse mode should be selected. Subsequently, the user needs to configure the following measurement settings:

1. Range
2. Filter
3. Trigger level
4. Frequency

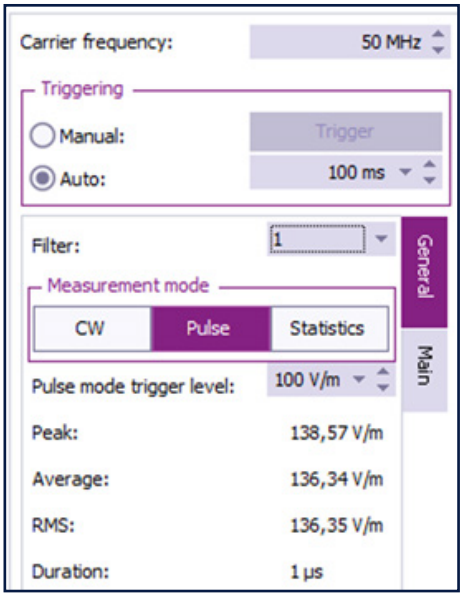
Range

Depending on the signal level and the pulse duration to be measured, adjust the range accordingly.

Range	1	2
Fieldstrength range	2 - 50 V/m	40 – 1200 V/m
Minimum Pulse Width	100 us	1 us

Filter

The filter setting dictates the level of averaging applied to the measured signal. Lower filter settings optimize measurement speed but may elevate noise levels. Conversely, higher filter settings sacrifice speed for reduced noise. In pulsed mode, selecting the appropriate filter configuration depends on the characteristics of the applied signal. If the pulse duration is relatively short compared to the averaging window defined by the filter setting, the measurement of the pulse could be distorted or the pulse might be entirely filtered out.



Trigger level

To capture pulse-modulated signals accurately, it's crucial to configure the trigger level precisely. When the applied signal crosses the trigger level, a triggered measurement is initiated. The first pulse after the trigger is then analyzed, and parameters such as pulse duration, rise/fall times, peak value, average value, and RMS value are calculated and displayed based on the data collected at the trigger.

Frequency

The RadiSense includes frequency-dependent factory adjustment factors to ensure accurate measurements by the probe. To apply these factors correctly, the probe should be provided with the carrier frequency of the signal being measured. Detailed information on the frequency setting can be found at page 29.

RadiSense® Ultra statistic measurements

The statistics mode facilitates mapping statistical data based on the measured field data. The acquired data includes all the essential information required to calibrate reverberation chambers using the RadiSense as a reference point. The following statistical information can be requested and displayed for each individual axis and the total field value (isotropic) over the duration of the configured observation time:

- Average measured field level
- Minimum measured field level
- Maximum measured field level
- Sample standard deviation

To measure in statistics mode the following settings need to be configured:

- Triggering mode
- Filter
- Measurement values to display
- Observation time

Triggering mode

The triggering mode can be set to two different modes::

- **Triggered**
  When sending a trigger command, a single measurement is taken with a duration equal to the configured observation time.
- **Continuous**
  A new measurement is initiated by the RadiSense probe, immediately after the completion of a preceding measurement, with a duration equal to the configured observation time.

Filter

The filter setting dictates the level of averaging applied to the measured signal. Lower filter settings optimize measurement speed but may elevate noise levels. Conversely, higher filter settings sacrifice speed for reduced noise.

Measurement values to display

The ‘Measurement values’ selection can be used to select which statistics should be reported by the field probe. This can be used to transfer all the measurement values of all the axis from the probe, or only transfer a subset of the measurement values of one or more axis. The measurement values can be used to reduce the overall data transfer, to allow faster measurement results to be available to the PC.

Observation time

The observation time determines the period over which statistical data is obtained aand can be configured from the minimum observation time (which is depending on the measurement values that are displayed) and a maximum of 100 seconds. If the observation time cannot be evenly divided by the filter setting, it will be rounded down. For example, if the filter is set to 1 second and the observation time is set to 1.5 seconds, the statistical data will be calculated based on 1 second (the shortest time).

Warranty Conditions

Raditeq B.V. offers a standard warranty term of three (3) years on their products, calculated from the shipping date, under the condition that the product is registered on www.raditeq.com. For registration of the product, the customer should provide the product model, serial number and the responsible reseller (if applicable). If the product is not registered, a limited warranty term of one (1) year will be applicable.

Return Material Authorization (RMA) & Warranty repair

If a defect occurs to our product within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at www.raditeq.com/support**.** Upon receipt of the request, an RMA number will be provided. Please do not send the product without this RMA number! The defective product should be shipped to our service department at the following address:

Raditeq B.V. – Service Department
Vijzelmolenlaan 3
3447GX WOERDEN
The Netherlands

There will be no charge for repair services (materials or labour) within the (extended) warranty term.
These warranty terms are not applicable to:

- Normal wear and tear
- Fibre optic cables
- Products that have been improperly used
- Products that have been used outside their specified range
- Products that have been improperly installed and/or maintained
- Products that have been modified without approval of Raditeq
- Calibration and/or re-calibration of the product

Repair services on products that are not covered by the Raditeq warranty will be charged to the customer.

Repairs outside warranty

If a defect is not covered under warranty, an RMA fixed-repair can be ordered on the RMA link: www.raditeq.com/support If a re-calibration is needed after repair, this calibration should be ordered separately. The calibration will be performed at the ISO17025 accredited calibration laboratories of DARE!! Calibrations, based on the applicable service code / prices.

Warranty after repair

For repairs outside the original warranty period, a limited warranty of six months is applicable on the performed repair. Shipping conditions are the same as with repairs that are covered within the original warranty period.

Shipping

The customer will need to arrange shipping and cover for the costs (like e.g. transportation costs, duties, taxes) for sending the defect product the service department of Raditeq in The Netherlands. Raditeq will arrange the courier and cover for the costs for the return shipment after repair.

EU Declaration of Conformity

We

Raditeq B.V.

of

Vijzelmolenlaan 3
3447GX Woerden
The Netherlands

Declare under our sole responsibility that the

Product: RadiSense® Ultra Series
Models: RSS3018U | LPS3001A

Are in accordance with the European directives:

EMC Directive 2014/30/EU
Low Voltage Directive 2014/35/EU
RoHS Directive: 2015/863/EU

Per the provisions of the applicable requirements of the following harmonized standards:

Emission:	EN 61326-1:2013, Class A1 Electrical equipment for measurement, control and laboratory use.
Immunity:	EN 61326-1:2013, Industrial level, performance criteria A Electrical equipment for measurement, control and laboratory use.
Safety:	EN 61010-1:2010, Safety requirements for electrical equipment for measurement, control, and laboratory use EN60825-1:2014, Safety of laser products - Part 1: Equipment classification and requirements

The technical construction files are maintained at the address specified above.

Date of issue:	02/03/2024
Place of issue:	Woerden, The Netherlands
Authorized by:	P.W.J. Dijkstra
Title of authority:	Director

UKCA Declaration of Conformity

In accordance with UK Government Guidance

1. **Product Model / Type:**
   - a. Product: The RadiSense® Ultra - Electric Field Probe
   - b. Model: RSS3018U | LPS3001A
   - c. Batch/Serial: 1
   - d. Specifications: Field Probe

2. **Manufacturer:**
   - a. Name: Raditeq B.V.
   - b. Address: Vijzelmolenlaan 3 | NL-3447GX Woerden | The Netherlands

3. This declaration is issued under the sole responsibility of the product manufacturer.

4. The object of the declaration described above is in conformity with the relevant UK Statutory Instruments and their amendments:

2008	**No 1597**	The supply of Machinery (Safety) Regulations 2008
2016	**No 1101**	The Electrical Equipment Safety Regulations 2016
2016	**No 1091**	The Electromagnetic Compatibility Regulations 2016
2012	**No 3032**	The Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

5. We hereby declare that the product described above, to which this declaration of conformity refers to, is in conformity with the essential requirements of the following standards:

Reference & Date	Title
2014/30/EU	**EMC Directive**
2014/35/EU	**Low Voltage Directive**
2015/863/EU	**RoHS Directive**

6. **Additional Information:**
   The technical documentation for the machinery is available from:

Name:	Raditeq B.V.
Address:	Vijzelmolenlaan 3 | 3447 GX Woerden | The Netherlands
Place of issue:	Woerden, The Netherlands
Date of Issue:	01/03/2023
Name:	P.W.J. Dijkstra
Function:	Director

Raditeq B.V. | Vijzelmolenlaan 3 | 3447GX Woerden | The Netherlands

www.raditeq.com | T:+31 348 200 100