

## RadiSense®

### Product Manual



## Electric Field Sensors

With RadiSupply® Plug-In Card for the RadiCentre®

Sensor Model:

RSS1004

RSS1006

RSS1018

Card Model:

LPS1001A

## **RadiSense® Product Manual**

This service and operating manual pertains to the RadiSupply® plug-in card and the RadiSense® electric field sensors.

Card model: LPS1001A.

Sensor models: RSS1004, RSS1006 and RSS1018.

Made by DARE!! Instruments.

We ask that you read this manual carefully before operating your new product and adhere to any safety instructions it might contain.

A Quick Start Guide has been added to this product for your convenience. This double printed A4 sheet contains the basic start-up steps and the safety warnings for the RadiSense®.

Please keep the Quick Start Guide (and this regular manual) close at hand when you operate your new RadiSense®.

Please contact DARE!! Instruments or your local reseller if you have any questions.

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## Table of Content

WARNINGS & PRECAUTIONS .....	4
1 Introduction .....	6
1.1 Product Introduction .....	6
1.2 Related Products .....	6
2 The RadiSense® .....	7
2.1 Product Characteristics.....	7
2.2 Components.....	8
2.3 Different Models.....	9
2.4 Fiber Optic Cables .....	10
2.5 RadiSupply® Plug-In Card, Rear Panel .....	10
2.6 Beam Shutter .....	11
2.7 LASER Safety Measures.....	13
2.8 Fiber Handling and Maintenance .....	18
3 Installation.....	20
3.1 Hardware Configuration.....	20
3.2 Software Configuration.....	22
4 Using the RadiSense® .....	26
4.1 Manual Control .....	26
4.2 Remote Control.....	28
5 RadiSense® Command Set .....	29
5.1 General .....	29
5.2 Commands .....	30
5.3 Error Codes.....	33
6 RadiSense® Specifications .....	34
WARRANTY CONDITIONS .....	36
EUROPEAN DECLARATION OF CONFORMITY .....	37

## WARNINGS & PRECAUTIONS



Read the contents of the product manual (including the manual for the RadiCentre® system) and become familiar with the safety markings, instructions, operation and handling of the system.



Only qualified service personnel is allowed to carry out adjustments, maintenance or repairs on the equipment.



This equipment is designed to be used as a plug-in card for the RadiCentre®. Do not use this card in combination with any other main frame.



The RadiSense® 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 discarded at its 'end-of-life', please return it to your local reseller for recycling.

## WARNINGS & PRECAUTIONS



NEVER look into any of the fibre optic connectors. The LASER emits an infrared beam that is invisible to the naked eye. This may cause permanent eye damage. Avoid eye or skin exposure to direct or scattered radiation.



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, products that use a LASER can only be turned on by pressing the 'START' button of the RadiCentre® system for several seconds. An auditory warning will sound during this activation period.

(In combination with the RadiCentre® CTR1001S.)



Make sure that the fiber cables and 'beam shutter' are installed correctly before activating the system.



The field sensor calibration data of the RadiSense® probes is stored in flash memory within the RadiSupply® plug-in card. It is therefore not possible to interchange sensors and plug-in cards.



Do not activate the system if the fiber optic cables show any sign of damage or tampering.



To make the RadiSense® as safe as possible, the plug-in card and sensors have their own safety interlock system that is designed to work with the RadiCentre®.

# 1 Introduction

## 1.1 Product Introduction

The RadiSense® E-field sensor is designed for broadband electric field strength measurements. The sensor is optically isolated to minimize field perturbation.

Applications for the E-field sensor are:

- Radiated immunity field monitoring
- Anechoic chambers calibration
- Field homogeneity measurements
- RF broadcast and welding radiation-hazard monitoring
- Long term field monitoring

## 1.2 Related Products



### RadiCentre® system

The RadiCentre® is a modular EMC test system that serves as the user and computer interface for all the RadiCentre® plug-in cards and modules (such as the RadiField® system).



### RadiMation® software

RadiMation® is the EMC software package from DARE!! Instruments used for remote control and automated testing of the RadiCentre® plug-in cards and modules (such as the RadiField® system).

## 2 The RadiSense®

### 2.1 Product Characteristics

LASER Powered - The sensor is LASER powered. This allows for testing over very long periods of time without the need to change or recharge batteries.

Increased Measurement Accuracy - To perform accurate field measurements, the E-field sensor dimensions must be as small as possible compared to the wavelength of the measured signal. There are two reasons for this:

- First, because large sensor dimensions cause the sensor to resonate at lower frequencies and therefore causes measurement inaccuracies.
- Secondly, to maintain field uniformity in an anechoic chamber. The smaller the sensor, the better the obtainable resolution for field homogeneity measurements.

In TEM and G-TEM cells, sensor dimensions above 10 cm are large compared to the dimensions of the homogenate field area.

The sensor dimensions of the RadiSense® are extremely small, increasing measurement accuracy.

## 2.2 Components

The RadiSense® is delivered with the following items:



### RadiSense® E-field sensor (with fixed fiber cables)

Model: RSS1004, RSS1006 or RSS1018.

Electric field sensors to be used together with the RadiSupply® plug-in card.



### RadiSupply® plug-in card

Model: LPS1001A.

An electric field sensor plug-in card to be used in the RadiCentre® system.



### Fiber extension cable

Model: CBL1000

10 meter fiber extension cable with inline couplings.



### Cleaning wipes

Lint-free alcohol wipes to clean the fiber optic cable connectors.

Supporting documentation in the form of:

- USB stick containing:
  - The (digital) User Manual and Quick Start Guide.
  - Optional - The calibration certificate for the probes (if a certification was requested).
- Hardcopy of the Quick Start Guide.

## 2.3 Different Models

The RadiSense® sensor is available in 3 models; the RSS1004, RSS1006 and RSS1018. The difference between these models is the frequency range that they cover.

The sensors are enclosed in a rugged housing to minimize the risk of damage. Labels indicate the field directions for the three axis.



RadiSense® RSS1004

Frequency range: 9 kHz – 4 GHz



RadiSense® RSS1006

Frequency range: 10 MHz – 6 GHz



RadiSense® RSS1018

Frequency range: 30 MHz – 18 GHz

## 2.4 Fiber Optic Cables

Use an extension fiber to connect the sensors to the plug-in card mounted in the RadiCentre®. This extension fiber is a robust duplex fiber cable and uses dissimilar connectors to avoid misconnections. The fiber optic cable with FC connectors feeds LASER light to the field sensor. The fiber optic cable with FSMA connectors sends data from the sensor to the readout unit. Refer to chapter 2.8 for fiber handling and maintenance.

To ensure safe and correct operation of the sensor, only use the RadiSense® with the original fibers. Do not use other fibers than those supplied by DARE!! Instruments. Fiber extension cables are available on request. Contact your local reseller for more detailed information.

## 2.5 RadiSupply® Plug-In Card, Rear Panel

The following connections and indicators are found at the back panel of the RadiSupply® plug-in card:

POWER ON	This green LED lights up when the power is on and the interlock is closed.
LASER APERTURE	Connect to the E-field sensor through the fiber extension cable with FC connectors.
LASER ON	This red LED lights up when the LASER is active. For safety reasons, never disconnect the fiber optic cables when the LASER is switched on.
OPTICAL DATA INPUT	Connect to the E-field sensor through the fiber extension cable with FSMA connectors.



Figure 1: RadiSupply® plug-in card with beam shutter

## 2.6 Beam Shutter

The RadiSupply® plug-in card can only be used with a beam shutter. The beam shutter is mounted on the panel of the plug-in card and prevents accidental LASER light to be emitted if there is an unconnected LASER aperture. The beam shutter operates a reed contact in the module and needs to be in place to enable the laser. If the optical connector of the laser is not mounted, the black slide will shut the laser beam.



Figure 2: Beam shutter (red) on the RadiSupply® plug-in card (in the RadiCentre® system)

To connect the RadiSense® sensor, the slide in the beam shutter must be opened. Use a small tool (for example a tweezer) to open the slide in the beam shutter. Hold the slide open and insert the FC connector at the same time. While inserting the FC connector, keep the notch facing to the right, to mate with the slot in the socket.

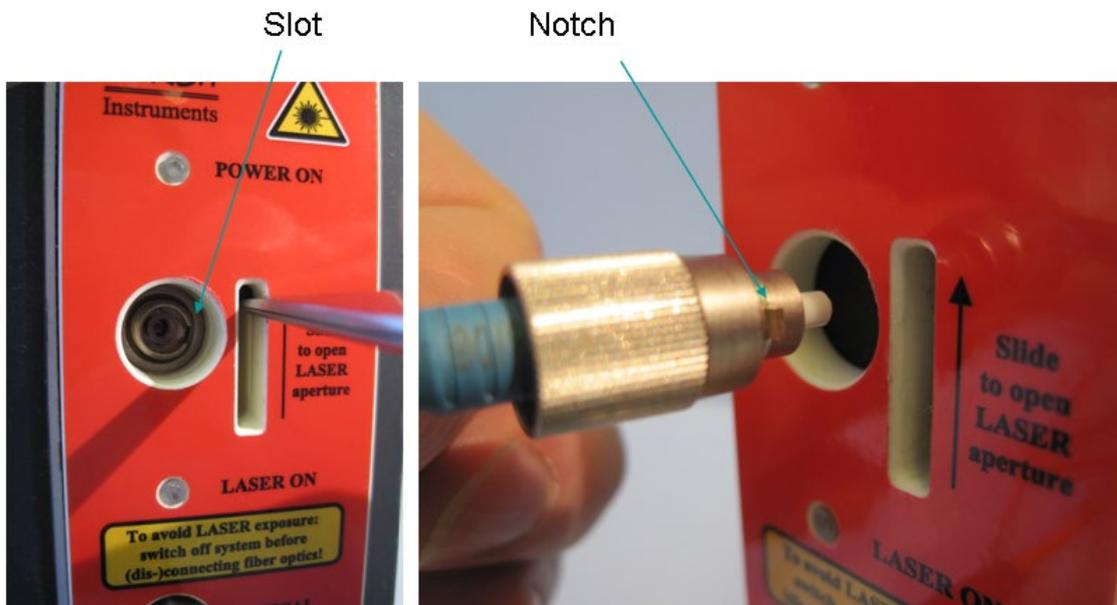


Figure 3: Opening the slide (left) and inserting the FC connector with the notch facing right (right)



Figure 5: Both the FC connector (top) and FSMA connector (bottom) are connected to the beam shutter

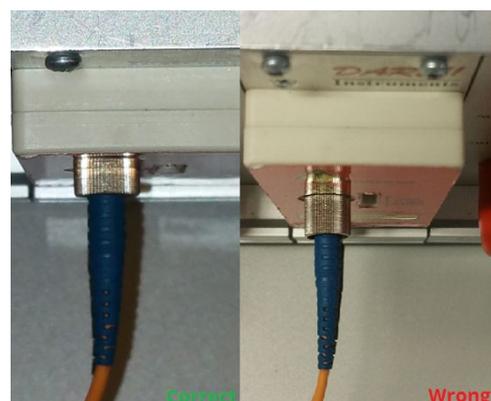
When the FC connector is inserted in the laser aperture, plug-in the FSMA connector in the optical data input.

Do not use any tools or excessive force to tighten the optical connectors!

If both connectors are properly connected, the RadiCentre® can be switched on and the LASER can be activated to start measurements.

Be sure that the FC connector is lined correctly (Figure 4a) otherwise the LASER will not start correctly.

Figure 4a: FC connector correctly lined (green) and not-correctly lined (red)



## 2.7 LASER Safety Measures

The RadiSense® uses a high-power LASER to supply energy to a remote measuring device. The wavelength of these LASERS is approximately 808nm. These are highly powerful, infrared lasers and are therefore invisible to the human eye.

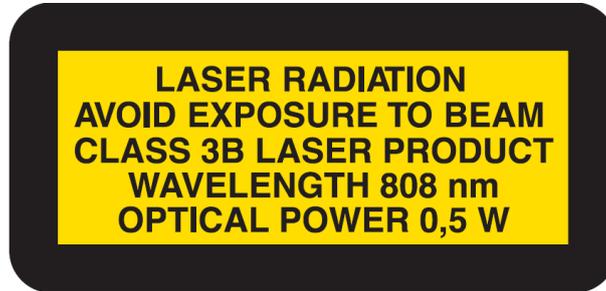


Figure 6: LASER safety warning label

During 'normal operations', exposure to LASER radiation is not possible because the system only uses fiber-coupled LASERS. 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 an infrared beam that is invisible to the naked eye. This will 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.
- Connect all fiber cables and install the 'beam shutter' (protective cover) before activating the system. Protective covers are identified by the following label:



Figure 7: Fiber cable cover label

*\*The LASER safety measures continued on the next page.*

- Do not activate the system if the fiber optic cables show any sign of damage or tampering.
- The RadiCentre® system is equipped with a remote interlock system. This interlock system prevents inadvertent LASER radiation. For example, to prevent LASER radiation when someone enters a shielded room and steps on a fiber.
- The remote interlock connection should be connected to an 'emergency master disconnect' and in series with the room door or fixture interlocks.
- 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.

RadiCentre® 2-slot and 7-slot specific:

- A 'LASER Code' is required to activate the RadiCentre® 2-slot and 7-slot systems. This LASER code enables the power supply to all installed (LASER) modules.
- To prevent accidental activation of the LASER, an 'Acknowledge' button will appear directly after the LASER 'Start' button is pressed. The LASER will only be activated if this button is pressed within the '4 seconds timeframe'.

RadiCentre® single-slot specific:

- To start the RadiCentre® 1-slot system (which has no touchscreen display), a 'Start' button needs to be pressed for at least 3 seconds to activate the LASER. If you are interrupted during the activation process (and release the 'Start' button by accident), the LASER will not be activated.
- 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.

### 2.7.1 LASER 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 tapping the touchscreen of the RadiCentre®.

(This safety feature is linked to the RadiCentre® 2- and 7-slot version. The LASER activation and safety is implemented differently in the RadiCentre® Single, see chapter 2.7.2.)

To meet the LASER safety precaution, enter the LASER Code in the 'LASER Code' screen and press 'OK' for confirmation (see Figure 8).

The default LASER code is: **3447**

This code can be changed by the customer in the main configuration screen (see Figure 9).

To change the laser code, the user will be asked to enter the current code ones and the new code twice (for confirmation). Press 'Close' to leave each notification and enter the code in the following numeric window (see Figure 10).

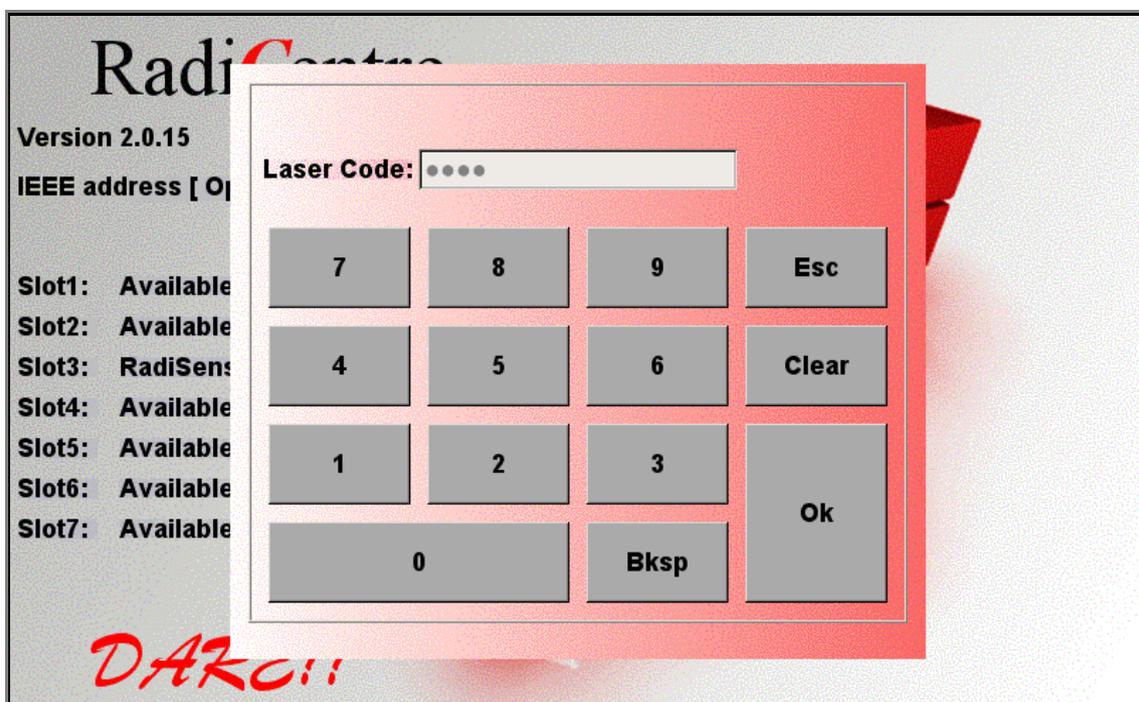


Figure 8: LASER code window

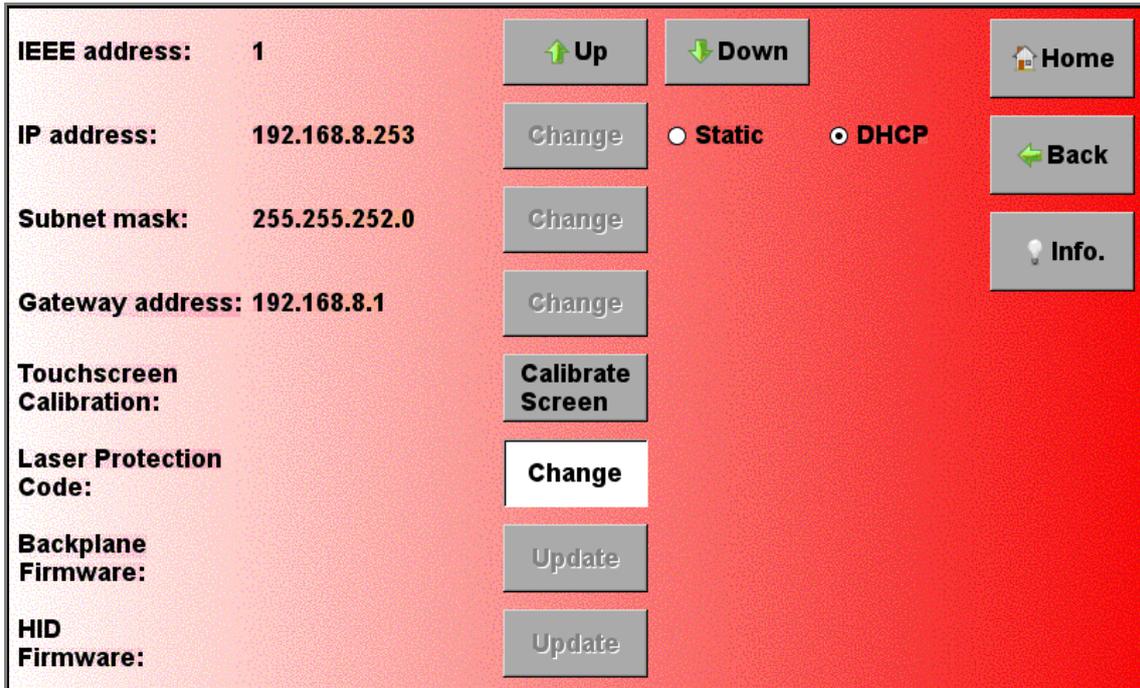


Figure 9: Change the laser protection code in the main configuration screen

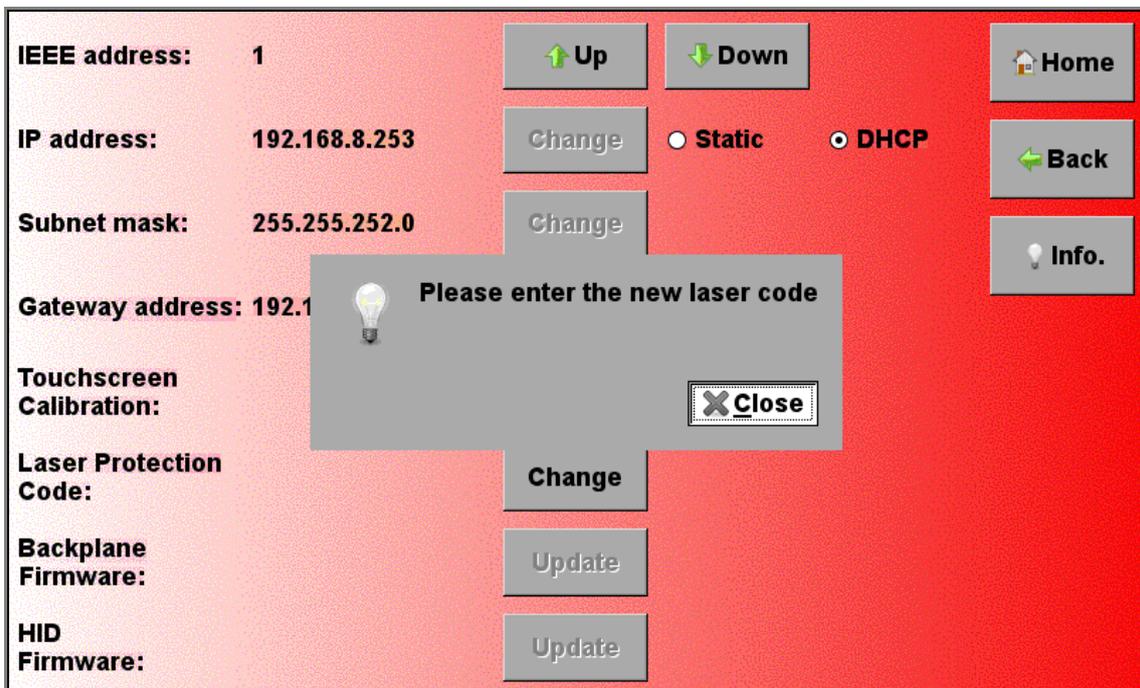


Figure 10: 'Enter new code' notification.

### 2.7.2 LASER activation - RadiCentre® Single

The RadiCentre® Single does not have a touchscreen, as a result the LASER code safety feature (mentioned in chapter 2.7.1) cannot be used. Instead a specific activation procedure combined with auditory warnings is used.

To activate the LASER in the RadiCentre® Single, follow these steps:

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

This means that:

- If you want to interrupt the activation process, all you have to do is release the 'Start' button (before the fifth 'beep'). The LASER will not be activated.
- If you are interrupted during the activation process (and release the 'Start' button by accident), the LASER will not be activated.
- If you press the button by accident (and do not wish to activate the LASER), the auditory warning will alert you to this action.

## 2.8 Fiber Handling and Maintenance

The fiber optic cables in the RadiSense® are a crucial part of the system. Improper handling and poor maintenance can cause deterioration or permanent damage. Please read the following handling and maintenance guidelines to ensure both your safety and the quality of the product.

### 2.8.1 Handling guidelines

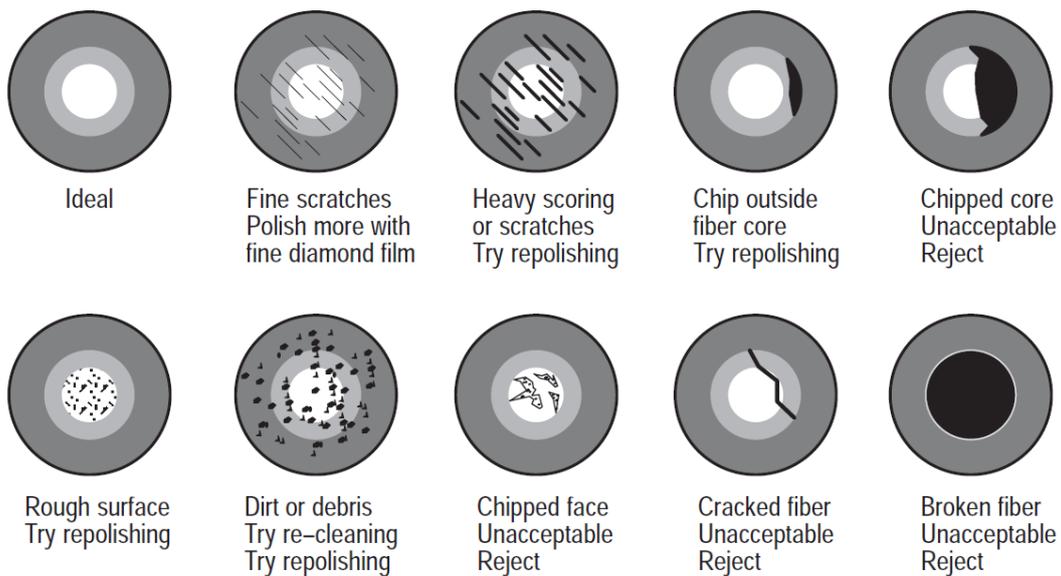
- Always place the plastic end-caps on the fiber connectors when they are not in use. Only use the supplied end caps.
- Never touch the tip of the fiber connector (core surface).
- Never drop the fiber connectors, as this may damage the core surface.
- Never bend the fibers (exceed the minimum bend radius (<5 cm)), as this will break the fiber core.
- Never pull the fiber connector out of a coupling by its orange jacket, always use the connector.
- Fasten the connectors by hand only, never use tools.
- Do not stand on or crush the fibers.
- Do not apply mechanical stress (pull) to the fibers.
- Switch off the system before detaching the fibers.

### 2.8.2 Maintenance guideline

Clean the contact surface of the fibers before installation with the lint-free alcohol wipes. Do not use other solvents or wipes. Fibers are clean and polished on delivery and do not need to be cleaned when installed for the first time.

### 2.8.3 Fiber conditions

Use the examples and instructions in the following figure as a guideline for further fiber maintenance.



**Figure 11: Examples of fiber conditions and maintenance**

## 3 Installation

### 3.1 Hardware Configuration<sup>1</sup>

The hardware configuration is carried out in the following 7 steps:

1. Choose the slot of the RadiCentre® system in which you want to install the plug-in card.
2. Remove the blind panel from this slot by removing the four screws of the panel (two on top and two at the bottom). See Figure 12.
3. Gently insert the plug-in card into the slot of the RadiCentre® and reinsert the four screws. See Figure 12.



Figure 12: Example of a (RadiSupply® LPS1001A) plug-in card installation

4. Switch on the RadiCentre® system. The new plug-in card will automatically be detected and initialized by the RadiCentre®.

*\*Steps 5 to 7 of the hardware configuration are visible on the next page.*

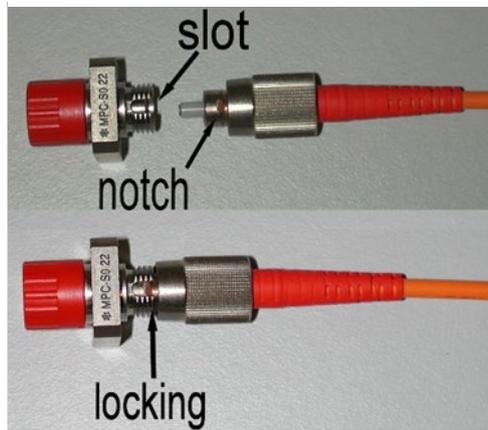
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<sup>1</sup> These are the basic steps in a plug-in card installation, the exact installation of your plug-in card might vary.

5. Connect the plug-in card to the desired device(s).

Place the RadiSense® E-field sensor where the field strength is to be measured.

Clean the ends of the fibers and connect the cables to both the sensor and the plug-in card. Make sure the latching pin of the FC connector fits correctly in the slot of the chassis connector (in line coupling).



**Figure 13: Slide the 'notch' correctly into the 'slot' to connect the FC connectors**

6. Connect the RadiCentre® system to your PC using any of the available interfaces of the RadiCentre® system; USB, RS232, Ethernet or IEEE-488 (optional).
7. Place the interlock plug of the plug-in card into the interlock connector of the RadiCentre®.

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.

## 3.2 Software Configuration

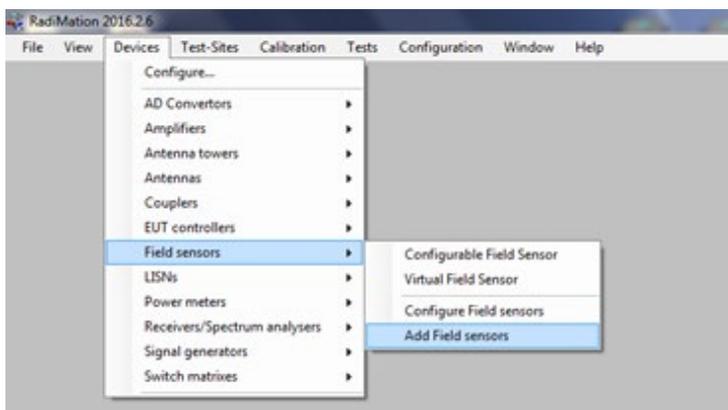
To control the RadiSense® from a computer, one can use either custom made software or the RadiMation® EMC software package from DARE!! Instruments, which can be downloaded from the DARE!! Instruments website.

If the RadiSense® is operated manually, this chapter can be skipped.

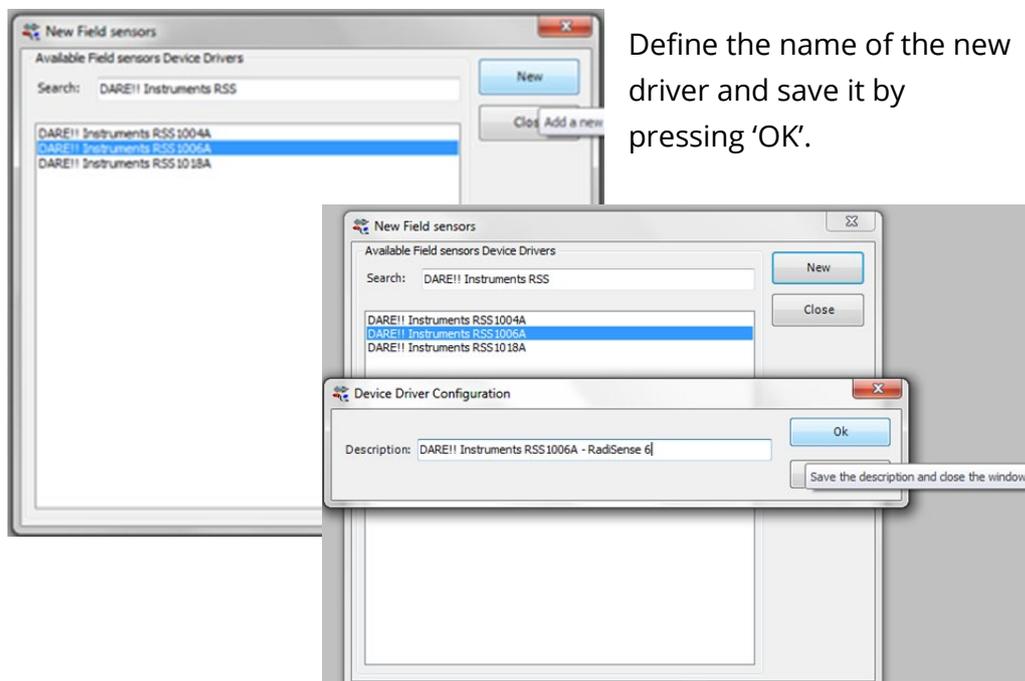
If RadiMation® software is used; select the required device driver for the RadiSense®.

### 3.2.1 RadiMation® Freeware driver

1. After the RadiMation® software is installed and started, select 'Devices' in the menu screen and 'Add Field Sensor' to select the driver for the RadiSense® / RadiCentre®:

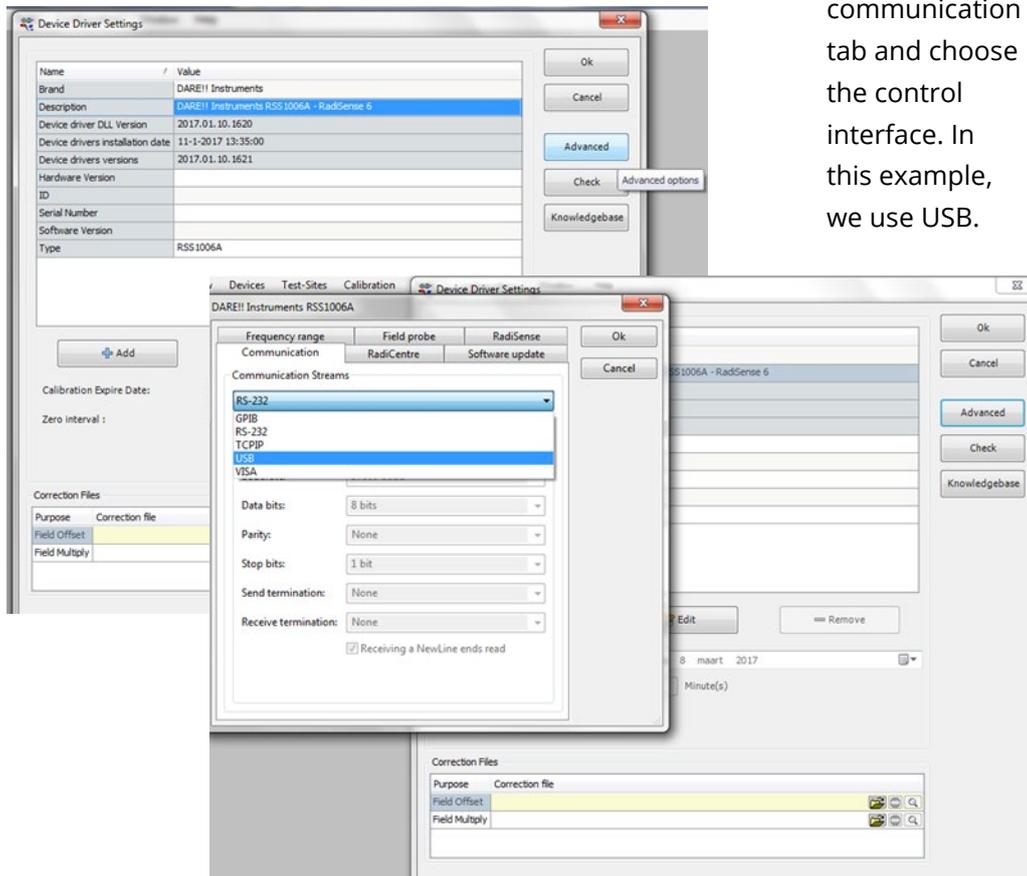


2. A new screen is shown, where the applicable product code of the RadiSense® / RadiCentre® can be selected. In this example, we add the RSS1006A driver for the RadiSense® 6 field probe and click on 'New'.

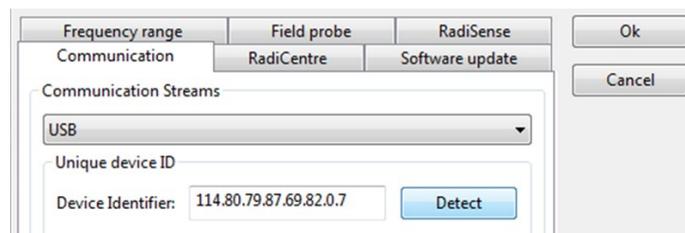


- The new driver can be configured by double clicking the driver and press the 'Advanced' button. Another window opens, where you can select the

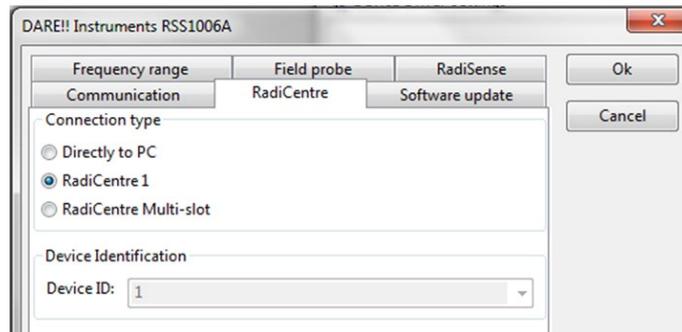
communication tab and choose the control interface. In this example, we use USB.



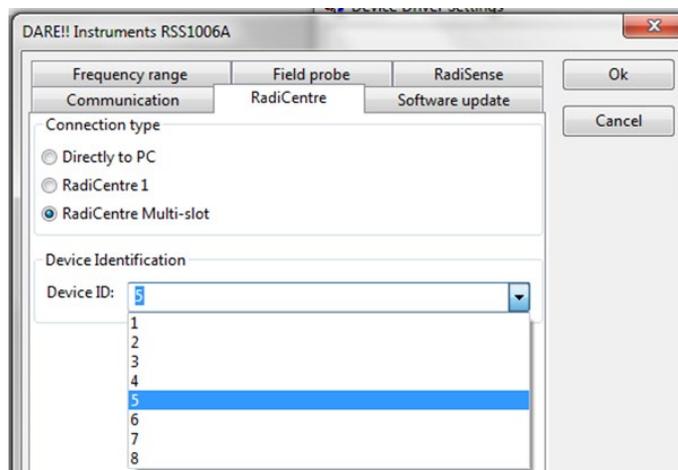
- To enable the USB communication, make sure the RadiSense® probe is connected to the PC USB port and press the 'Detect' button. After pressing 'Detect' the Device Identifier (ID) will be updated with the unique ID number (see typical example below). Make sure that there are no other DARE!! products connected to the same PC using USB.



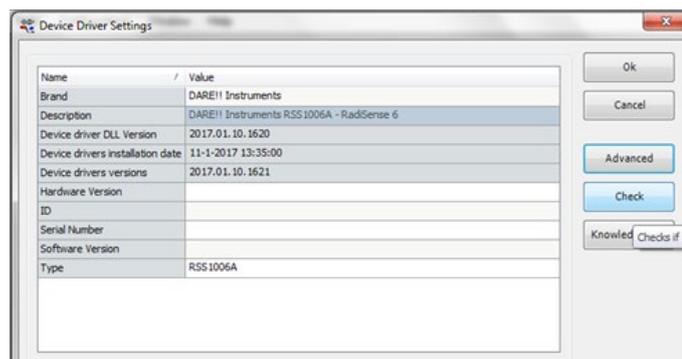
- For controlling the RadiSense® probe from a RadiCentre® single slot (CTR1001S) select under the tab “RadiCentre” the “RadiCentre 1”



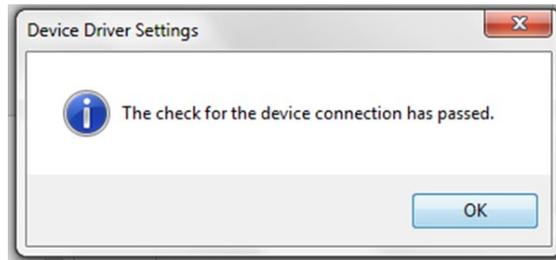
- For controlling the RadiSense® probe from a RadiCentre® 2-slot or 7-slot system (CTR1004B/CTR1009B) select under the tab “RadiCentre” the “RadiCentre Multi-slot’ and define the corresponding slot number in which the RadiSense® probe is installed. In this example the probe is installed in slot number 5.



- Upon completion of the correct settings of the communication interface click on ‘OK’.
- After clicking ‘OK’ you will go back into the device driver settings window. The communication can now be verified by clicking the ‘Check’ button on the right.



9. If all settings are correct, the message below will be shown. If an error is shown, please check and repeat the previous software configuration steps 1 to 9.



RadiMation® is now ready for use with the RadiSense® / RadiCentre® field sensor.

The RadiMation® software package verifies the field sensor at the beginning of each test (if a field sensor is selected).

If you are using the RadiSense® / RadiCentre® field sensor system with any other EMC test software package, we refer you to chapter 5 'RadiSense® Command Set'.

## 4 Using the RadiSense®

### 4.1 Manual Control

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

#### 4.1.1 Starting the LASER powered sensor

The LASER of the RadiSense® 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.



Figure 14: Laser 'acknowledge' button in the main screen

As long as the LASER is activated, the front and rear 'LASER ON'-LED's will light up to indicate LASER operation.

#### 4.1.2 Zeroing the probe

The 'Status' box will now indicate "Please Zero" and a 'ZERO' button will appear directly behind the 'STATUS' box. Press 'ZERO' to start zeroing the probe. As soon as the probe is zeroed, the 'STATUS' box will turn green, and the measured field strength is displayed in the 'STATUS' box of the probe.

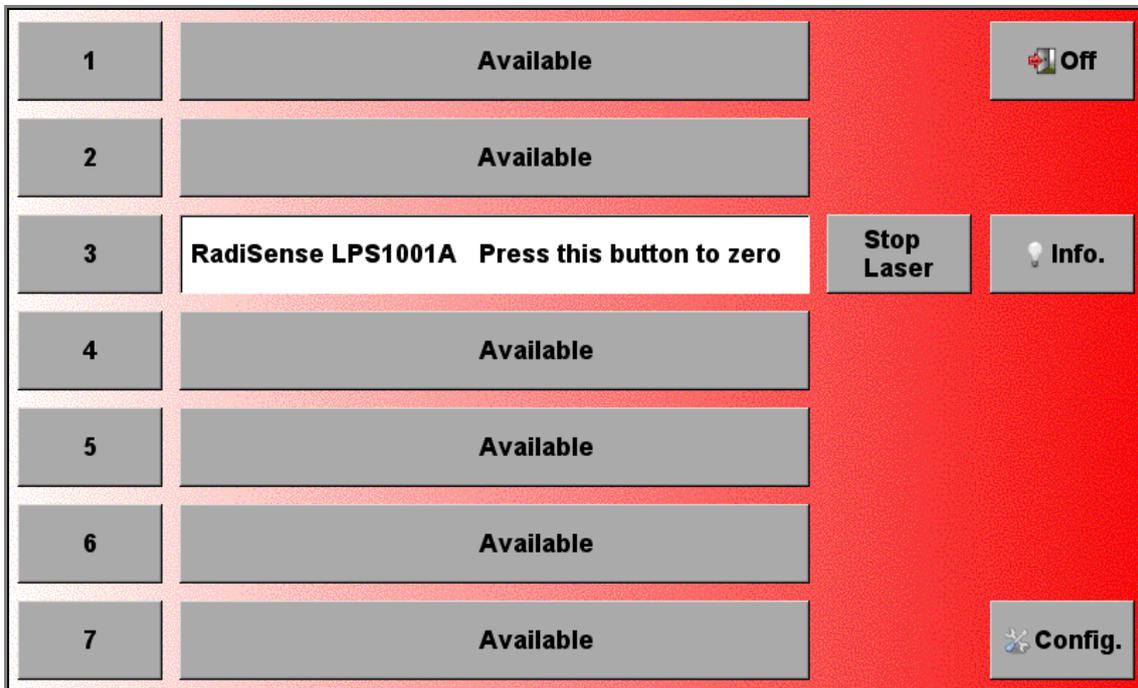


Figure 15: Zeroing the RadiSense® probe in the main screen

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.

#### 4.1.3 Reading probe data

Readings from the probe can be taken directly from the TFT screen, with the RadiMation® EMC software or any other (custom made) software package.

#### 4.1.4 Band selection RadiSense® RSS1004 <sup>2</sup>

The measurement bandwidth of the RadiSense® RSS1004 can be set to 'low', 'high' or 'full'.

- 'low' bandwidth = 9 kHz – 4 MHz
- 'high' bandwidth = 4 MHz – 4 GHz
- 'full' bandwidth = 9 kHz – 4 GHz

<sup>2</sup> This option is not available for the other RadiSense® models; RSS1006 and RSS1018.

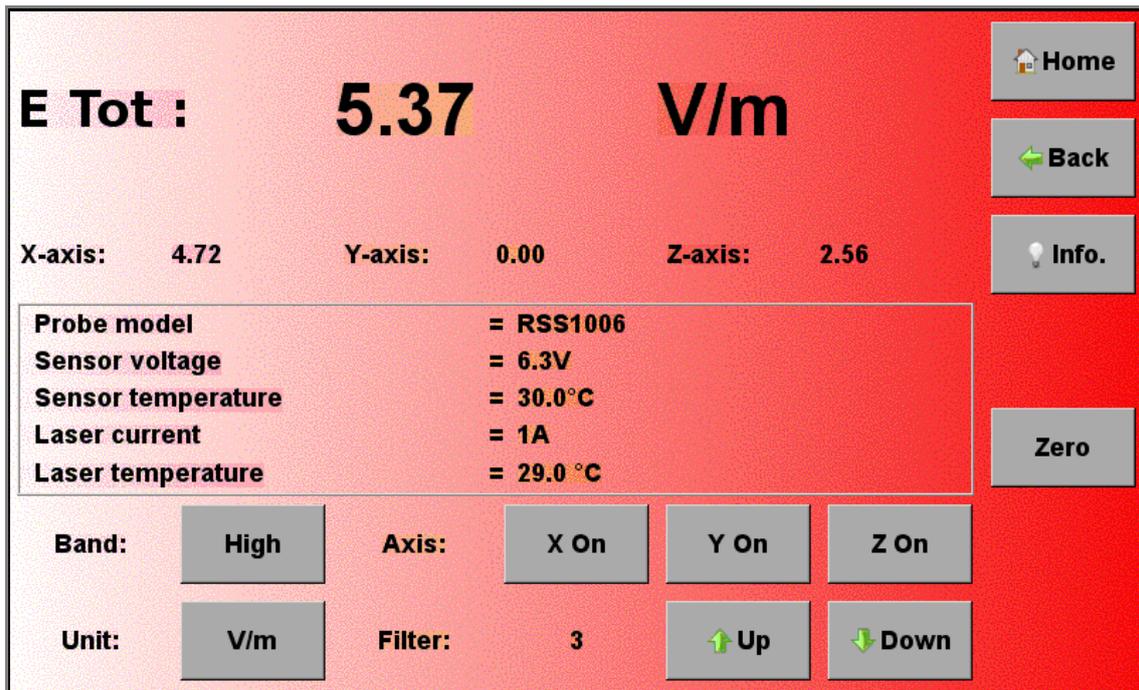


Figure 16: Example of the RadiSense® control screen

#### 4.1.5 Probe configuration and advanced measurement data

The 'STATUS' box in the main screen of the RadiCentre® only displays the isotropic field strength data. When more advanced data is required (such as field strength of the separate axis, probe temperature, LASER current etc.), one can go to the 'Module data' window by pressing the 'STATUS' box of the required device.

The 'Module data' window will display the isotropic field strength in a large font, together with the field strength data of each separate axis.

LASER temperature, LASER current and probe temperature are also displayed in the 'Module data' window.

To determine which axis will be used to calculate the isotropic field strength, simply press the axis buttons. Only the axes that are marked as 'ON' will be used to calculate the isotropic field strength value. This is done according to the following formula:

$$E_{\text{tot}} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

## 4.2 Remote Control

The RadiSense® can be controlled remotely through the interfaces of the RadiCentre®. The exact communication protocol can be found in the RadiCentre® manual. The specific commands for the RadiSense® are shown in chapter 5 'RadiSense® Command Set'.

## 5 RadiSense® Command Set

### 5.1 General

Please refer to the RadiCentre® manual for more information on the 'Device number'.

The RadiSense® can be controlled remotely through the interfaces of the RadiCentre®. The exact communication protocol can be found in the RadiCentre® manual. The specific commands for the RadiSense® are shown in this chapter.

#### Example RadiCentre® ports:

To get a reading from the RadiSense® card in slot 1, using the RadiCentre® serial port or the GPIB port, the following command can be sent:

```
" 1:D2 "
```

To get a reading from the RadiSense® card in slot 2, using the RadiCentre® serial port or the GPIB port, the following command can be sent:

```
" 2:D2 "
```

#### Example 'Holaday compatible' port:

To get a reading from the RadiSense® card in slot 1, using the RS232 port left of the Ethernet port, the following command can be sent:

```
" D2 "
```

Please note that every command has to be terminated with a carriage return (CR).

## 5.2 Commands

### 5.2.1 General commands for the RadiSense®

Instruction	Command	Reply
Set range <sup>3</sup>	<p>" Ra\r "</p> <p>Where <b>a</b> is the range:</p> <p><b>1</b>: 0 to 10V/m</p> <p><b>2</b>: 10 to 30V/m</p> <p><b>3</b>: 30 to 100V/m</p> <p><b>4</b>: 100V/m to end of spec.</p>	<p>" :Rx "</p> <p>Where <b>x</b> is the range.</p>
Axis on/off	<p>" Axyz\r "</p> <p>Where <b>x</b>, <b>y</b> and <b>z</b> are:</p> <p><b>D</b> for Disable</p> <p><b>E</b> for Enable</p>	<p>" :A "</p>
Get field	<p>" Da\r "</p> <p>Where <b>a</b> is notation:</p> <p><b>1</b>: short notation</p> <p><b>2</b>: long notation</p> <p><b>3</b>: all axis, short notation</p>	<p>" :Dxx.xxuuu "</p> <p>" :Dxx.xxuuurrrroboxyz "</p> <p>" :Dxx.xx;yy.yy;zz.zzuuu "</p> <p>Where:</p> <p><b>xx.xx</b> (or <b>y</b> or <b>z</b>) is the reading.</p> <p><b>uuu</b> is the unit:</p> <p><b>_V_</b> for V/m</p> <p><b>mW2</b> for mW/cm<sup>2</sup></p> <p><b>_V2</b> for (V/m)<sup>2</sup></p> <p><b>rrr</b> is the recorder out value from 0 to 255.</p> <p><b>o</b> is over range indicator:</p> <p><b>N</b> is Ok</p> <p><b>O</b> is over range</p> <p><b>b</b> is battery status:</p> <p><b>N</b> is Ok</p> <p><b>W</b> is warning</p> <p><b>F</b> is fail</p> <p><b>xyz</b> is the axis on/off status:</p> <p><b>D</b> for Disable</p> <p><b>E</b> for Enable</p>

\*This table continues on the next page.

<sup>3</sup> This command does not affect the actual internal RadiSense® measuring range, but is included for 'Holaday® compatible'. However, the set range value is used to calculate the recorder values in the 'Get field' command.

Commands, part 2

Instruction	Command	Reply
Filter reading	" Filter?\r "	" :Filter_a " Where <b>a</b> is the filter setting: <b>DYN</b> = dynamic (2 to 8 times depending on value) <b>1</b> = no average <b>2</b> = 2 times average <b>3</b> = 4 times average <b>4</b> = 8 times average <b>5</b> = 16 times average <b>6</b> = 20 times average
Filter setting	" Filter_a\r " Where <b>a</b> is setting: <b>DYN</b> = dynamic (2 to 8 times depending on value) <b>1</b> = no average <b>2</b> = 2 times average <b>3</b> = 4 times average <b>4</b> = 8 times average <b>5</b> = 16 times average <b>6</b> = 20 times average	" OK " Or N.A. (with Holaday compatible port)
Read battery Voltage	" B\r "	" :Bxx.xx " Where <b>xx.xx</b> is the battery voltage.
Set baud rate <sup>4</sup>	" Ca\r " Where <b>a</b> is setting: <b>1</b> : 2400,Odd,Data7,Stop1 <b>2</b> : 9600,Odd,Data7,Stop1	" :C "
Zero sensor	" Z\r " (for serial interface) or " ZERO\r " (for IEEE interface)	" :Z " No response is returned.

*\*This table continues on the next page.*

<sup>4</sup> This command can only be used on the 'Holaday compatible' port.

Commands, part 3

Instruction	Command	Reply
Set unit type	<p><b>" Ux "</b></p> <p>Where <b>x</b> is the unit:  <b>1</b> = V/m  <b>2</b> = mW/cm<sup>2</sup>  <b>3</b> = [V/m]<sup>2</sup>  <b>N</b> = Next unit</p>	<b>" :U "</b>
Read temperature	<p><b>" Ta\r "</b></p> <p>Where <b>a</b> is the unit:  <b>C</b> for degree Celsius  <b>F</b> for degree Fahrenheit</p>	<p><b>" :Txxx "</b></p> <p>Where <b>xxx</b> is the temperature.</p>
Sleep <sup>5</sup>	<p><b>" Sx\r "</b></p> <p>Where <b>x</b> is the sleeptime in seconds.</p>	<b>" :S "</b>
Identity	<b>" *IDN?\r "</b>	<b>Identity string of the RadiSense®.</b>

- IEEE commands for Interface Clear or Clear are not supported.
- IEEE Status flags in either serial or parallel poll, or as a service request, are not supported.
- When IEEE communication is used, the first command/request should be the "\*IDN?\r" command.

<sup>5</sup> This command is discarded by the RadiSense® and only implemented to be 'Holaday® compatible'.

### 5.2.2 Specific commands for the RadiSense® RSS1004

Instruction	Command	Reply
Band selection reading <sup>6</sup>	" <b>RADISENSE_BAND_?r</b> "	" <b>BAND_a</b> " Where <b>a</b> is the bandwidth: <b>1</b> = low bandwidth <b>2</b> = high bandwidth <b>3</b> = full bandwidth
Band selection setting <sup>6</sup>	" <b>RADISENSE_BAND_a</b> r " Where <b>a</b> is setting: <b>1</b> = low bandwidth <b>2</b> = high bandwidth <b>3</b> = full bandwidth	" <b>OK</b> " Or N.A. (with Holaday compatible port)

### 5.3 Error Codes

The following table shows the error codes for the 'Holaday compatible' port.

Error code	Description
" :E1 "	Internal buffer overflow (too long command)
" :E2 "	Command too long
" :E3 "	Invalid command
" :E4 "	Command too short, illegal character or invalid parameter
" :E5 "	Hardware error
" :E6 "	Parity error
" :E9 "	Sensor is not connected (LASER is off)

Please refer to the RadiCentre® Service & Operating manual for the error codes of the RadiCentre®.

<sup>6</sup> See chapter 4.1.4. Bandwidth: low = 9 kHz – 4 MHz, high = 4 MHz – 4 GHz, full = 9 kHz – 4 GHz.

## 6 RadiSense® Specifications

Model	RadiSense® 4	RadiSense® 6	RadiSense® 18
<b>Electric Field</b>			
Field measurement range	1 (0,25 <sup>7</sup> ) to 1.000 V/m	0,5 to 600V/m	1 to 600V/m
Overload indicator on	>1.000 V/m		
Max input level before damage	1.500 V/m		
Frequency range	10 kHz (4MHz <sup>8</sup> ) to 4 GHz	10 MHz to 6 GHz	30 MHz to 18 GHz
<b>Accuracy</b>			
10kHz to 10MHz	± 1,5dB	-	-
10MHz to 30MHz	± 3,0dB	± 1,5dB	-
30MHz to 1GHz	± 3,0dB	± 1,5dB	± 1,5dB <sup>8</sup>
1GHz to 4GHz	± 3,0dB	± 3,3dB	± 1,5dB
4GHz to 6GHz	-	± 3,3dB	± 1,5dB
6GHz to 18GHz	-	-	+ 1,5dB / - 4.0dB
Isotropy @ 1 GHz	< ± - 0,25 dB	< ± - 0,5 dB	< ± - 1,5 dB
Linearity	0,5 dB ±0,5 V/m		
Shape	Cubical	Spherical	Stalk
Electrical measuring volume	74 cm <sup>3</sup> (42 * 42 * 42 mm)	52 cm <sup>3</sup> (25mm Ø)	1 cm <sup>3</sup> (Length: 280mm)
Measuring speed sensor	5 samples/sec (60 samples/sec <sup>8</sup> )	60 samples/sec	

*\*This table continues on the next page.*

<sup>7</sup> With High band option #040

<sup>8</sup> Below 100MHz the frequency accuracy is + 1,5dB / - 4.0dB

RadiSense® Specifications, part 2

Model	RadiSense® 4	RadiSense® 6	RadiSense® 18
<b>Optical</b>			
LASER power	Max. 0,5 Watt output at aperture		
Wavelength	808nm		
LASER connector	FC/PC		
Data connector	FSMA		
Fibres	200/230 µm HCS, duplex		
Standard Fibre length	1,5m fixed to sensor, 10m extension with couplings		
<b>Safety</b>			
LASER product classification	Class IIIb		
Safety measures	Key switch (RadiCentre®), Remote interlock system (RadiCentre®), LED indications for LASER ON, Audible warning signals Redundant closed loop safety system Beam shutter with integrated interlock		
LASER switch on time	approx. 70 ms		
LASER switch off time	< 5 ms		
<b>Environmental conditions</b>			
Temperature range	15° to 35° Celsius		
Relative humidity	10 – 90% (non-condensing)		
<b>Warranty</b>			
Warranty	3 years (misuse excluded)		

## WARRANTY CONDITIONS

DARE!! Instruments offers a standard warranty term of three years on their products, starting from the shipping date. This warranty is applicable to all EMC test & measurement products, such as:

- RadiCentre® modular / multifunctional EMC test systems
- RadiControl® antenna tower/turntable controllers
- RadiField® Triple A field generators
- RadiGen® signal generators
- RadiPower® RF power meters
- RadiSense® laser powered E-field probes
- RadiSwitch® RF coaxial switches

If a defect occurs within the warranty term, a Return Material Authorization (RMA) 'Warranty Repair' request can be issued using the RMA link at <http://rma.dare.eu>. The defective product can then be shipped to DARE!! Instrument for repair by our service department.

There will be no charge for repair services (materials or labor) within the warranty term. The customer will need to cover the costs for returning the product to DARE!!, such as shipping and/or any applicable duties and taxes. DARE!! Instruments will arrange the courier and cover the costs for the return shipment.

These warranty terms are not applicable to:

- Fiber 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 DARE!! Instruments
- Calibration and/or re-calibration of the product
- Consumable products such as batteries, ink etc.

Repair services on products that are not covered by the DARE!! warranty will be charged to the customer. If a defect occurs to our product outside the warranty period, a RMA repair and/or re-calibration request must be issued using the RMA link at <http://rma.dare.eu>.

The repairs (outside the original warranty period) have a warranty limited to six months. Shipping conditions are the same as with repairs within the original warranty period.

## EUROPEAN DECLARATION OF CONFORMITY

We, DARE!! Instruments declare under our sole responsibility that the product;

**RadiSense®**

***Plug-in card model LPS1001A, with  
Electric field sensor models RSS1004B, RSS1006B and RSS1018B***

to which this declaration relates, is in accordance with the following Directives:

EMC-Directive 2014/30/EU  
Low Voltage Directive 2015/35/EU  
RoHS-Directive: 2011/65/EG

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

Emission: EN 61326-1:2013, Class A<sup>1</sup>  
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

The Technical Construction Files are maintained at;

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P.W.J. Dijkstra  
Title of authority: Director

<sup>1</sup> Conducted emission complies with Class B (household equipment)

