User Manual

Revision 1.6

Table of Contents

This manual will guide you step by step through the assembly and setup of your turfRad sensor. It is structured in two sections:

1. **Connecting the sensor**
2. **Sensor configuration**

There is also more information about the operation and features:

a. **Automatic operation**
b. **About WiFi**
c. **Internal Battery and Power**
d. **Buttons, LEDs and Buzzer**
e. **Software (turfRad Portal)**
f. **Support**
g. **Warranty**
h. **Specifications**
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If any questions arise in the setup process, feel free to contact your distributor or visit our Help Center at https://support.turfrad.com/ or scan the QR code below.

Introduction

This manual contains safety information and instructions for the proper use of the turfRad sensor.
For the latest version of this manual and other translations, please scan the QR code below or visit our website at www.terraradtech.com/manual.
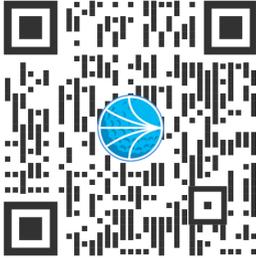
Please keep this manual in a safe place for future reference.

Safety Precautions

- DO NOT expose the sensor to any flammable sources.
- Under no circumstances are internal parts self-serviceable.
- DO NOT open the sensor.
- DO NOT connect the sensor to any power source supplying more than 18V DC.

Care and Maintenance

- The sensor is waterproof and can be cleaned with a hose.
- If the sensor gets dirty, wipe it down with a damp cloth.
- Avoid using any harsh chemicals or solvents, like acetone, on the sensor.
- DO NOT mix any bleach or cleaner when cleaning the sensor.
- If the sensor is malfunctioning, consult your local sales representative or turfRad support.

Important Information

- Ensure that this product is fully assembled before use. Check that all screws and bolts are tightened and inspect them regularly.
- Models may vary depending on the country.
- The content of this document is subject to change without prior notice.
- The content of this document may not be duplicated or reproduced in whole or in part without prior permission.
- TerraRad Tech assumes no responsibility for damages caused by earthquakes, fire, other natural disasters, actions of third parties, intentional or negligent misuse by the user, or use of the sensor under special conditions.
- TerraRad Tech is not liable for damages (such as losses, missed business profits, lost revenue, business interruptions, or loss of communication means) resulting from the use or inability to use the sensor.
- If the sensor exhibits defects due to manufacturing errors within the warranty period, it will be replaced or repaired in accordance with our warranty policy.
- TerraRad Tech is not liable for damages caused by improper operation of the sensor, damages due to the connection of incompatible accessories or the use of incompatible software.

What's in the box

turfRad™ Sensor

GPS Antenna

Power Cable Kit

Mounting Triangles

Allen Key

Screw 4 (+1)

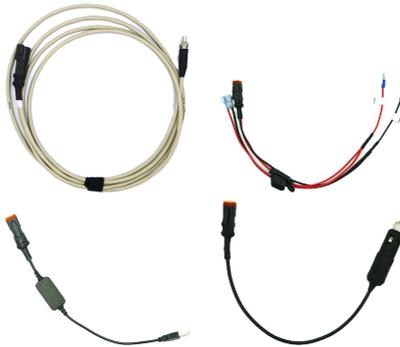Washer 8 (+2)

Locknut 4 (+1)

Wrench

1   Connecting the Sensor

1.

Place the GPS antenna close to the sensor. Then connect the black wire to the gold GPS connector.

2.

Choose the desired power cable for your setup. **We recommend using the direct wiring dongle for maximum reliability of your setup.** Alternatively, you can use the cigarette lighter plug or the USB dongle. Be aware that when using the USB dongle, the USB port must be rated for **5V 2A** and not 5V 1A. **If using the cigarette lighter plug, ensure it works reliably and doesn't easily lose power from vibrations (check green LED on the plug).**

3.

Next, connect the power cable to your vehicle. You can use either the direct wiring dongle, the USB dongle, or the cigarette lighter plug. **We do not recommend using the cigarette lighter plug in non-locking receptacles.** Now connect the other end to the 11-15V DC port of the turfRad sensor. Make sure the plug is fully inserted and screwed on tightly.

4.

The picture above shows the connected power cable and GPS antenna. When you power on your vehicle, the LED on the RESTART button should turn on. As soon as the GPS signal is found, the blue LED on the FUNCTION button will start to blink slowly (once per second). Note that this can take up to 20 minutes and requires a clear view of the sky.
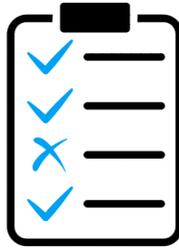
Checklist

1. Make sure the sensor has **power** (green LED light on the RESTART button is on).

   If that is not the case, check that all connections are properly plugged in and the vehicle has power.

2. The **GPS** antenna is mounted facing upwards and connected.

3. You are located at the facility where the mowers will return to and be stored, but **outside with a clear view of the sky**.

4. You have access to **WiFi** and you have the password ready.

5. You have enabled **Bluetooth** on your phone or tablet.

6. Confirm that the blue LED light around the FUNCTION button is blinking slowly; this confirms that a GPS satellite signal has been acquired. (Note that this can take several minutes!)

If the sensor is **beeping at regular intervals** and you don't see the blue FUNCTION LED, the internal battery is discharged and the sensor needs to be connected to a power source and **charged for approximately 1 hour**.
Make sure to use a USB outlet rated for **5V 2A** if using the USB dongle.

Now you are ready to configure your turfRad sensor!
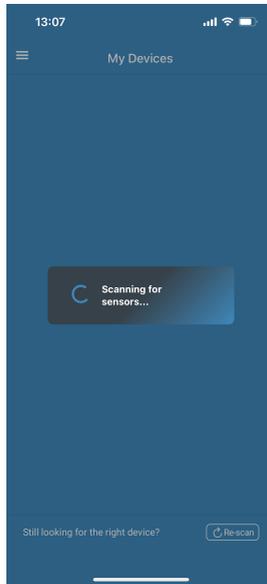
2   Sensor Configuration

To configure the sensor, you need the **turfRad mobile app.**
Please download the turfRad app from the App Store or Google Play Store.
Once you have installed the app, follow the steps on the next pages.
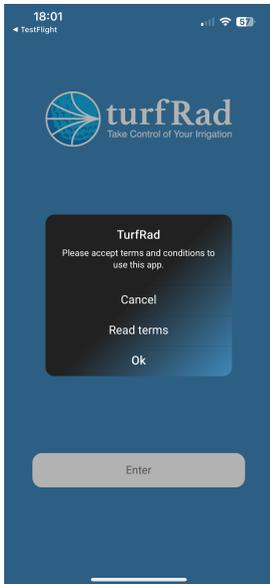
1. Open the turfRad app, read and accept the terms and conditions when prompted.

2. The app searches via Bluetooth for your turfRad sensor. Note: Do not pair or connect to the turfRad in your phone settings; the app handles this part.

3. Click "Connect" on your turfRad device to start the configuration. If you have multiple sensors, repeat steps 3-16 for each sensor.

You can also find online instructions on our **Help Center** including video tutorials at https://support.turfrad.com/.
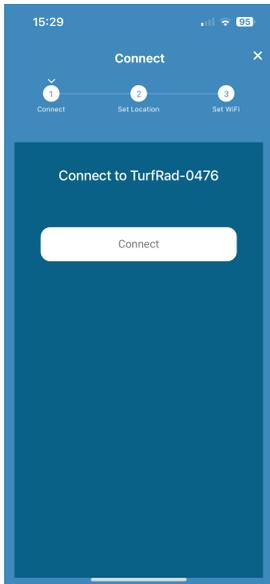
4. Press the "Connect" button to connect to the sensor over Bluetooth.
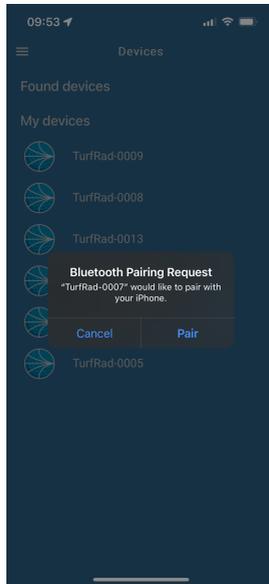
5. Allow the turfRad to "Pair" with your phone. This step will look slightly different on an Android device.

6. The app connects to the device.

7. Your phone location (blue dot) and sensor location (white logo) are shown on the map. Once you see both, press "Set facility location".
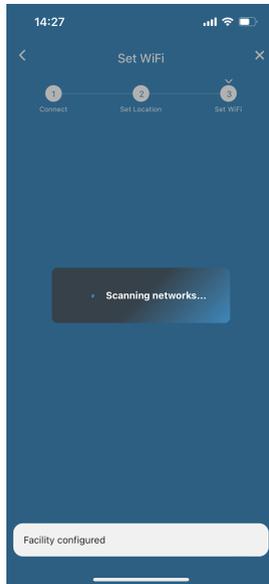
8. You will see a "Facility configured" confirmation on the screen and the sensor searches for WiFi networks within range.

9. Select your WiFi network from the list of networks. If you don't immediately see your network, hit refresh.

Note: If you do not see the sensor icon in step 7:

- Make sure the GPS antenna is connected and has a clear view of the sky.

- It can take up to 20 minutes to get GPS signal the first time you power on the sensor. If you only just powered on the sensor, wait a few minutes and try again.

Note: If the blue Current Location dot is not showing at your accurate location, you may need to enable "Accurate Location" in your phone settings.
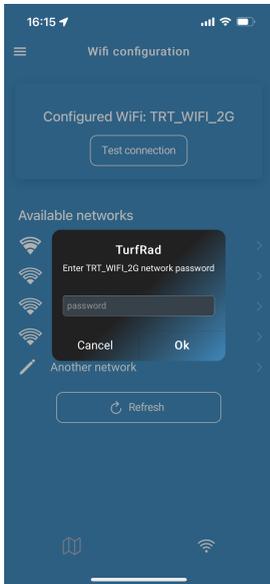
10. Enter the password for your WiFi network and click OK. Note: **Your phone might automatically capitalize the first letter!**

11. Your WiFi details are stored on the turfRad sensor.

12. The app performs a check on your WiFi network to confirm that the turfRad has the connectivity necessary.

13. Upon completion of the WiFi test, you get the test report. Contact your IT department or visit the turfRad Help Center if any of the steps are not successful after 2-3 attempts. The "Update Servers" step requires port 8883 to be allowed on the firewall.

14. After successfully connecting to WiFi, the app will check to make sure your sensor has the latest firmware installed. Updating may take up to 10 minutes. During this time, the function light on the sensor will flash quickly.

15. After completing the setup wizard, you are brought to the default "Sensor Status" screen.

∿	Display and check status of sensor.
🗺	View and configure sensor location and facility radius.
📶	WiFi settings.
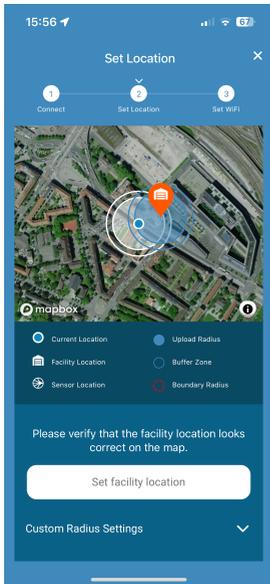
16. You can check the facility radius configuration by clicking the map icon in the bottom menu. If the upload radius overlaps your scan areas, you need to shrink the radius by setting a custom radius as described in the following section.
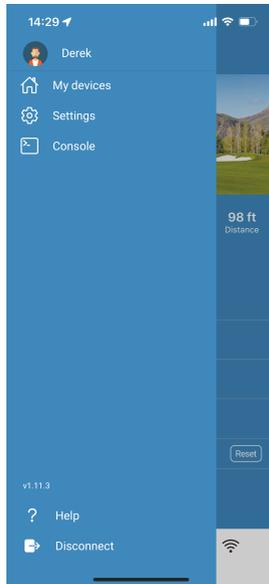
17. Click the horizontal lines on the top left and select "Disconnect" to go back to the list of saved devices.

18. You will see double-check marks and the words "set up" indicating that your sensor has been successfully set up. **Important: If you are configuring more than one sensor, you need to repeat steps 3-16 for each sensor!**

Congratulations! You have successfully set up your sensor. You can now drive onto the course and the measurement will start automatically.

Custom Facility Radius

If you found in step 16 that the upload radius overlaps your measurement areas, please follow the steps below to set a custom upload radius:
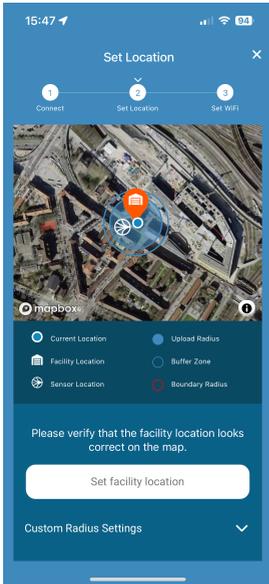
In the map icon tab, click the down arrow on custom radius. Scroll down.
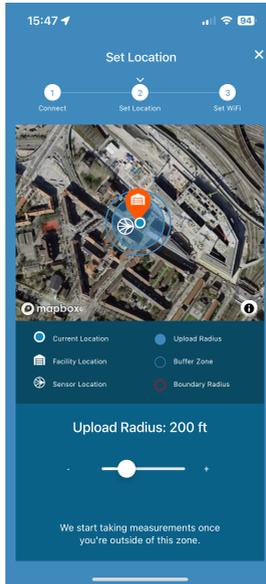
Adjust the "Upload Radius" slider until your measurement area is no longer covered by the blue shaded circle. Don't touch the buffer zone or boundary radius unless advised.
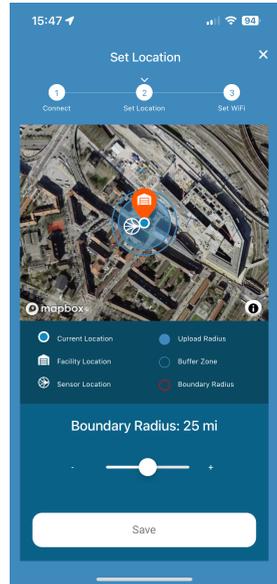
Use the "Save" button on the bottom of the page to store your custom radius on the sensor. Disconnect the sensor (step 17).

Additional Information

The Sensor Status tab in the turfRad mobile app can be used to monitor the status of active uploads and Over the Air (OTA) firmware checks and updates.

The sensor connects to WiFi upon returning to the upload radius, and uploads pending files. The sensor then connects again (fast blink) to check for OTA updates.
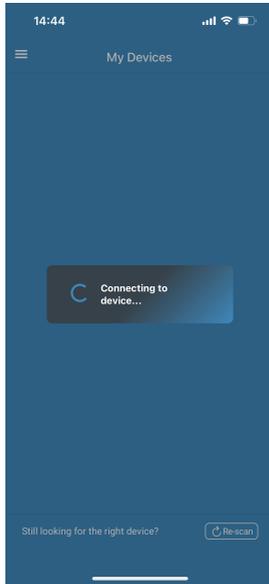
Once the sensor is configured, Bluetooth connection is only available if the sensor is in the "upload radius". If you cannot connect via Bluetooth after configuring, try disconnecting the GPS antenna, **reconnecting with Bluetooth**, and increasing the upload radius.

In case turfRad releases OTA firmware updates, the firmware download progress can be monitored in the OTA section of the Sensor Status tab.

Automatic Operation

turfRad Cloud

Start

Garage

Stop

Upload Radius
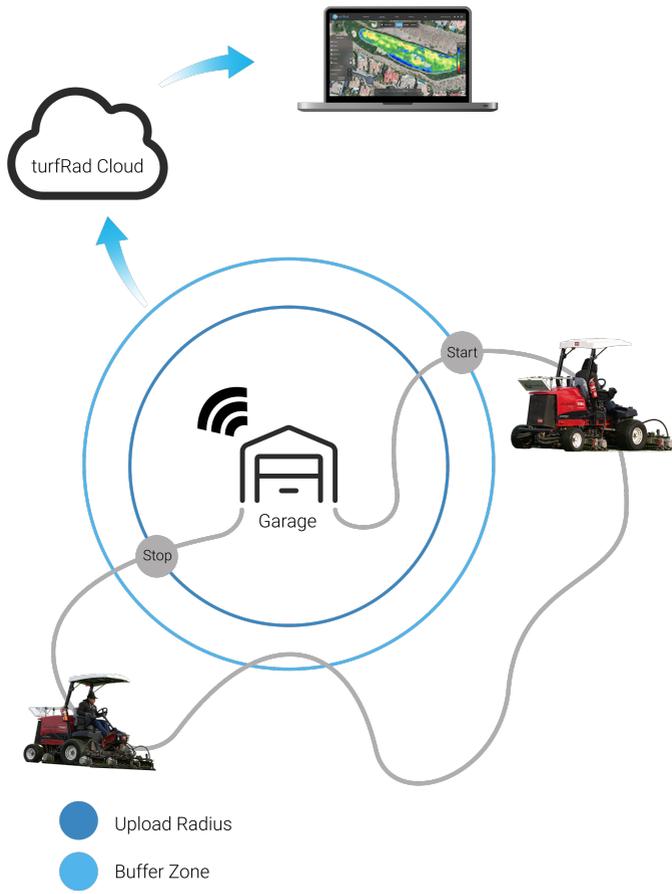
Buffer Zone

Automatic Operation

- Your turfRad sensor will **automatically start measuring** when you drive out of the "buffer zone". It will continue to measure until you cross back into the "upload radius".

- The sensor will stop measuring and start trying to connect to your WiFi network to upload the new data. After uploading, it also checks for new software updates ("OTA"), such that **your sensor always stays up-to-date**.

- Data will **not be collected inside the "upload radius"**. Confirm that the radius does not cover areas where you wish to collect data, see **Custom Facility Radius** section of the configuration.

- Once the sensor is configured, Bluetooth connection is only available in the "upload radius". **To connect with the mobile app, the sensor should be within the upload radius**. If you cannot connect via Bluetooth after configuring, try disconnecting the GPS antenna and increasing the upload radius.

- Do not worry if the power LED stays on after you turn off your equipment. The sensor is powering itself from its **internal battery**.

- **When using the cigarette lighter plug, be aware that rusted and oxidized sockets can cause unreliable power connections and may prevent the sensor from collecting data.**

About WiFi

The turfRad sensor will connect to your standard password-protected or open WiFi network. The sensor will NOT connect to networks that require web browser-based login.

Some browser-based login networks will be compatible with turfRad with an exception implemented by your IT department using the MAC address of the sensor. The MAC address can be found on the Sensor Status tab in the mobile app:

> WiFi
> Disconnected
> WiFi network: TRT_WIFI_2G
> MAC address: a0:a3:b3:01:bd:a8

If you do not have a strong WiFi signal accessible in your facility, we can (1) offer a WiFi hotspot which operates over cellular signal, providing a strong and reliable connection for turfRad to upload data, or (2) suggest a third-party LTE hotspot that can provide plenty of data for turfRad and can likely be delivered very quickly.

Teltonika Router

Solis Lite LTE Hotspot

Internal Battery and Power

Your turfRad sensor has a small internal battery to allow the sensor to upload data after you turn off your vehicle and to keep it running for short periods when you power off the vehicle. The battery charges from your vehicle and the sensor turns itself off after 20 minutes (when the data upload and a possible software update are completed).

When using the included USB dongle, you must ensure that the USB port used is rated for **5V 2A** and not 5V 1A. This information is usually written on the USB port. Do not split the USB connection to power multiple sensors; you may split the 12V cigarette lighter to power multiple sensors.

The 12V cigarette lighter plug includes the locking mechanism present on many equipment receptacles. To lock the plug in place, push it in and turn it clockwise. **We do not recommend using the cigarette lighter plug in non-locking receptacles.**

Buttons, LEDs and Buzzer

Your turfRad sensor is equipped with 2 buttons and 2 LED indicator lights to provide you with information on the state of the sensor and allow manual intervention.

| | SERVICE | RESTART | FUNCTION | 11-15V DC | GPS |

Restart Button	If your sensor is powered, this button restarts your sensor. This can occasionally be helpful if you're experiencing issues with the app or when troubleshooting with support. If not powered externally, pressing it turns off the sensor.
Function Button	This button allows your sensor to operate in "manual" mode. You can press the button to begin data collection. You can "long press" (hold down for 5 seconds) to force the sensor into data upload mode.
Restart LED	This light around the Restart button is lit anytime the sensor is powered (or on battery power).
Function LED	This light has 3 modes: **Steady On:** Data collection in process. **Slow Flash (1/sec):** The sensor has a GPS signal (location) and is in "idle" mode in the facility. **Quick Flash (5/sec):** The sensor is connected to WiFi, checking for updates, installing updates, or uploading data.

The turfRad sensor has a multi-tone beep/chirp. The following table summarizes the different beep patterns and their meanings:

Startup	4 beeps
GPS position lock	2 beeps
Measurement Start	4 beeps (low-high-low-high)
Upload complete	3 beeps (high-mid-low)

Software (turfRad Portal)

You can access your maps under the following link:
https://portal.turfrad.com
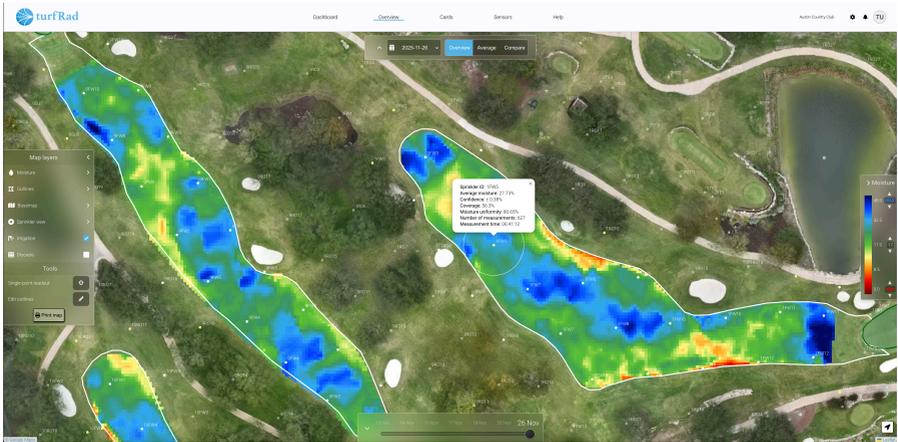
A **comprehensive overview of the software features and functions** can be found at: https://support.turfrad.com/turfrad-portal.
Under the following QR code, you can find a set of quick links that you can save to your home screen.

Support

If you have issues with your turfRad sensor or need assistance, visit our Help Center at https://support.turfrad.com/ or scan the QR code below.

Warranty

TerraRad Tech offers a limited manufacturer's warranty valid for a period of **2 years** from the original date of purchase. This warranty ensures coverage for defects in materials and workmanship under conditions of normal and intended use.

What is Covered:

- Repair or replacement of the product due to defects arising from faulty materials or poor workmanship.

- Necessary labor costs associated with the repair or replacement of defective components.

What is Not Covered:

- Damage resulting from misuse, abuse, or improper handling of the product.

- Unauthorized modifications, repairs, or alterations to the product.

- Normal wear and tear, including cosmetic damage such as scratches or dents.

- Damage caused by accidents, natural disasters, or power surges.

- Issues arising from the use of incompatible accessories, attachments, or software.

How to Claim Warranty: To initiate a warranty claim, please visit our Help Center at https://support.turfrad.com/ to submit a ticket and provide the following information:

- Proof of purchase, such as a receipt or invoice.

- The product's serial number for identification purposes.

- A detailed description of the issue, including any troubleshooting steps you have already performed.

- Photographs of the product and its setup, if applicable, to assist in diagnosing the problem.

Limitations of Liability: This warranty is limited to the repair or replacement of the defective product and does not cover indirect, incidental, or consequential damages. TerraRad Tech's liability under this warranty is strictly limited to the original purchase price of the product.
You can find our full warranty policy at www.terraradtech.com/support/#Hardware-Coverage.

Specifications

Specification	Details
Size	Sensor: 25x14x5in (63x36x13cm)
Weight	Sensor: 11lbs. (5kg)
Input voltage	12V DC
Power consumption	4.5W
Power consumption (on USB)	10W
GPS accuracy	3-5 feet (1-1.5m)
WiFi band	2.4GHz
Used network ports	443 (HTTPS) and 8883 (MQTT)
Measurement technique	Passive microwave radiometry (natural soil emission)
Waterproofness	Splash-proof
Compliance	RoHS, FCC, CE, RCM

Regulatory Addendum

All models are designed to be compliant with rules and regulations in locations they are sold and will be labeled as required. Any changes or modifications to equipment, not expressly approved by TerraRad Tech, could void the user's authority to operate the equipment.

Statement of Agency Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and

- This device must accept any interference received, including interference that may cause undesired operation.

FCC Class B Compliance Statement

The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Canada Notice

This equipment does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

European Declaration of Conformity

Hereby, TerraRad Tech AG declares that the full text of the European Declaration of Conformity is available at www.terraradtech.com/compliance.

For more information about compliance visit **www.terraradtech.com/compliance**.

> ## Warning
>
> ⚠️ This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

WEEE Statement

Recycling information in accordance with the WEEE and Battery Directives
The symbol on the product or its packaging indicates that this product must not be disposed of with other household waste.

English
For information about the disposal of Waste Electrical and Electronic Equipment (WEEE) in the European Union, please visit the following website:
https://ec.europa.eu/environment/waste/weee/

Français
Pour des informations sur l'élimination des Déchets d'Équipements Électriques et Électroniques (DEEE) dans l'Union Européenne, veuillez visiter le site suivant :
https://ec.europa.eu/environment/waste/weee/

Deutsch
Für Informationen zur Entsorgung von Elektro- und Elektronik-Altgeräten (WEEE) in der Europäischen Union besuchen Sie bitte die folgende Website:
https://ec.europa.eu/environment/waste/weee/

Español
Para obtener información sobre la eliminación de Residuos de Aparatos Eléctricos y Electrónicos (RAEE) en la Unión Europea, visite el siguiente sitio web:
https://ec.europa.eu/environment/waste/weee/

Português
Para informações sobre a eliminação de Resíduos de Equipamentos Elétricos e Eletrónicos (REEE) na União Europeia, visite o seguinte site:
https://ec.europa.eu/environment/waste/weee/

Italiano
Per informazioni sullo smaltimento dei Rifiuti di Apparecchiature Elettriche ed Elettroniche (RAEE) nell'Unione Europea, visitare il seguente sito web:
https://ec.europa.eu/environment/waste/weee/

Svenska
För information om avfallshantering av Elektriska och Elektroniska Apparater (WEEE) inom Europeiska unionen, besök följande webbplats:
https://ec.europa.eu/environment/waste/weee/

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