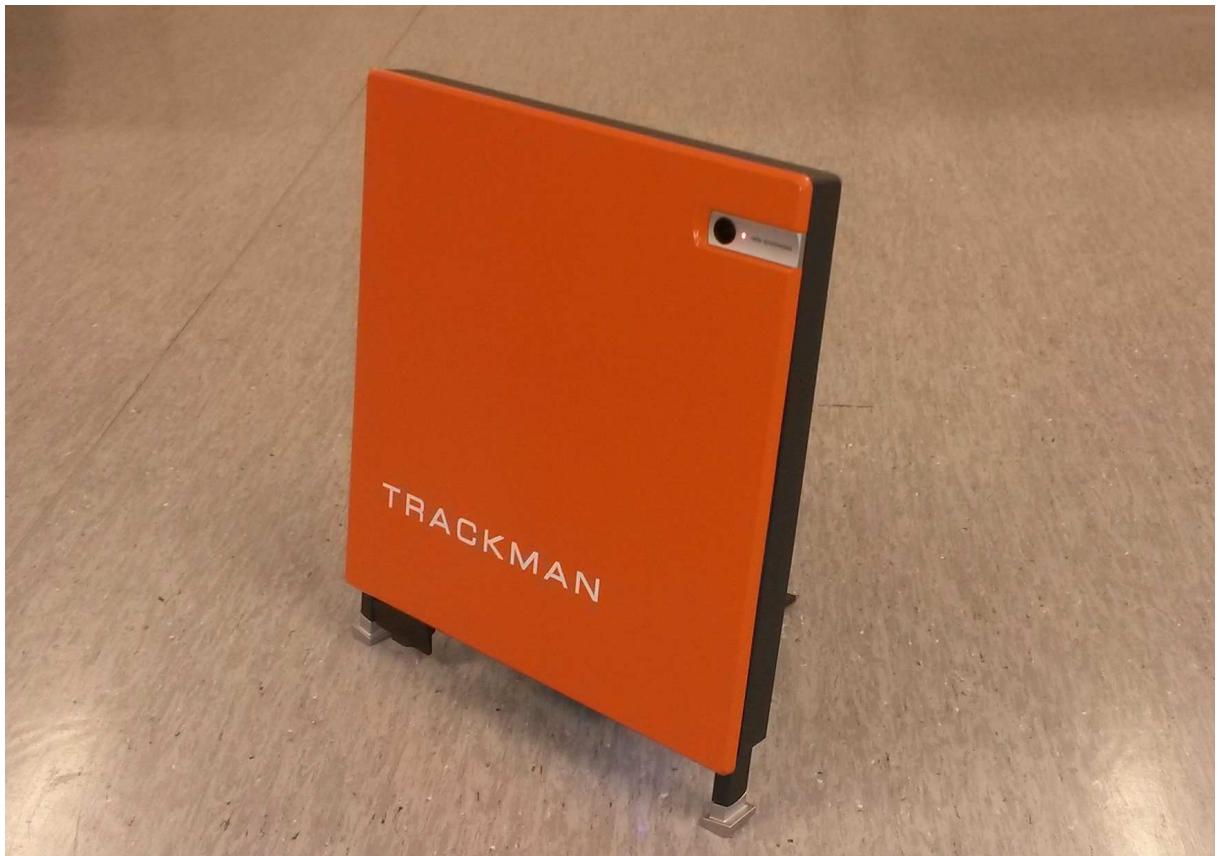




# TrackMan™ Radar Unit Installation and Safety Instruction

**Model: TrackMan4 (TMA4A)**





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## 1 Introduction

This document provides instructions and warning in order to safely install and operate the TrackMan 4 Radar Unit

This document provides also instructions on how to make basic setup of the TrackMan™ system.

This document does not describe the TrackMan™ application software and how to operate it. This is provided in separate document.



## 2 Safety Instructions

### 2.1 Regulatory Notice

#### FCC compliance

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 Class B digital apparatus complies with Canadian ICES-003.

*Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.*

This device complies also with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

- 1) *l'appareil ne doit pas produire de brouillage, et l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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/TC technician for help.

**Caution**

Never try to open or repair the device yourself. Any changes or modifications not expressly approved by TrackMan A/S could void the user's authority to operate the device.



## **2.2 Warning: Radiation Hazard**

### **Radiation Safety Warning.**

This device radiates a low level of microwave electromagnetic radiation from the front window and top when in use. The radiated power is significantly lower than the international safety standards for microwave frequencies. However, the user should maintain a minimum distance of 20 cm from this device during operation.



## 2.3 ***Caution: Safety precautions***

Use the following safety instructions to ensure your own personal safety and to help protect the TrackMan™ radar unit.

### **General**

- Do not attempt to service the device yourself. Always follow installation instructions closely.
- Only use cables and accessories approved by TrackMan A/S together with your TrackMan™ Radar Unit.
- The AC adaptor may become hot during normal operation of the TrackMan™ system. Use care when handling the adaptor during or immediately after operation.
- If the TrackMan™ system has been used in wet weather, clean all items with a dry cloth after use.

### **Power**

- The TrackMan™ Radar Unit has a build in battery for stand-alone operations
- Do NOT cover the TrackMan™ Radar Unit while in use
- Only use the AC adaptor supplied with the TrackMan™ Radar Unit for battery charging. Use of another adaptor may cause fire or explosion.
- Before you connect the TrackMan™ Radar Unit to an electrical outlet, check the AC adaptor voltage rating to ensure that the required voltage and frequency match the available power source.
- To help prevent electric shock, plug the AC adaptor and device power cables into properly grounded power sources. These power cables may be equipped with 3-prong plugs to provide an earth grounding connection. Do not use adaptor plugs or remove the grounding prong from the power cable plug. If you use a power extension cable, use the appropriate type, 2-prong or 3-prong, to mate the AC adaptor power cable.
- Make sure that the computer and AC adaptor connected to the TrackMan™ Radar Unit are connected to the same power outlet. Failure to comply with this requirement could cause electrical shock and create permanent damage on both the TrackMan™ Radar Unit and the computer.
- Place the AC adaptor in a ventilated and dry area. Do not cover the AC adaptor that will reduce cooling.
- Be sure that nothing rests on your AC adaptors power cable and that the cable is not located where it can be tripped over or stepped on.

TrackMan A/S accepts no liability for failure to comply with these requirements.

## 3 Installation instructions

### 3.1 System description

The TrackMan™ radar system is a standalone measurement system for the detection and measurement of golf club and golf ball movements.

The system consists of:

- TrackMan™ Radar Unit model TMAN4
- Lap Top computer or PDA (not part of TMAN4 package)
- Interface USB cables (For service only)
- AC adaptor for battery charging
- TrackMan™ TPS software

The following diagram depicts the TrackMan™ system:

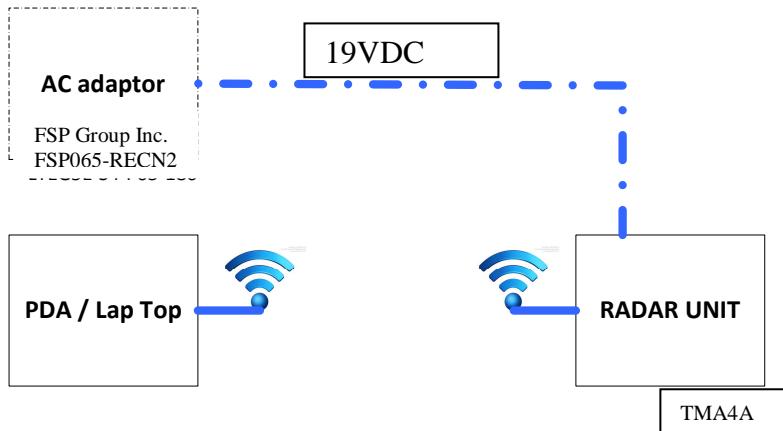


Figure 1: TrackMan™ system block diagram

For normal operation, the Radar is connected to a PDA / Laptop through a wireless WiFi connection. The AC adaptor is only required for battery charging. Optionally a Gigabit Ethernet connection are provided for fixed installation.

### 3.2 System specifications

The TrackMan™ radar unit is a robust construction, with chassis made of polycarbonate. The front of the TrackMan™ has an orange logo from where behind the microwave radiation is transmitted and received. The WiFi antennas are integrated in the unit and place on top of the Radar.



Figure 2: TrackMan™ radar unit, model TMAN4 front view

The TrackMan™ Radar Unit also has a built-in digital camera, which looks out through a window in the front.

#### **WARNING !**

**Make sure that the orange front and the camera window of the TrackMan™ Radar Unit is handled with care. Avoid any load or bumping into with the front of the TrackMan™ Radar Unit.**



## TrackMan™ Radar Unit , model TMAN 4

|                          |   |   |
|--------------------------|---|---|
| Operating Frequency      | CE Market:<br>10.500 - 10.600GHz<br>24.000 - 24.250GHz<br><br>US + CDN Market:<br>10.500 - 10.550GHz<br>24.075 - 24.175GHz<br><br>Operating frequency is fixed during manufacture |   |
| Transmitter power        | +17dBm (10GHz, US market)<br>+12dBm (10GHz, CE Market)<br>+8 dBm (24GHz)  |   |
| Antenna gain             | 15 dB (10GHz)<br>12 dB (24GHz)  |   |
| Horizontal beam          | 65° ( $\pm 14^\circ$ )  |   |
| Vertical beam            | 19° shaped (-5° to +60°)  |   |
| Dimensions               | Width: 310 mm<br>Depth: 60 mm<br>Height: 310 mm   |   |
| Mass                     | ~3 kg   |   |
| Main power supply        | 19VDC,<br>65W maximum during charging   |   |
| Data interface           | Primary<br>Secondary  | WiFi, 5GHz 802.11n<br>WiFi, 2.4GHz 802.11 b/g/n<br>USB2.0 high speed (Service Only)<br>Gigabit Ethernet |
| Environmental, operating |   | +5°C to + 40°C (+41°F to +104°F) ambient<br>100% humidity   |
| Environmental, storage   |   | -20°C to + 55°C (-4°F to +131°F) ambient<br>100% humidity   |
| WiFi                     |   | 2.4GHz 802.11 b/g/n<br>5GHz 802.11n   |

The TrackMan™ Radar Unit consists of the following sub-assemblies and/or printed circuit board assemblies:

- Radar analog signal processing
- Antennas for transmitting and receiving
- Embedded Computer Module for Radar Data Processing
- Adjustable legs with motors
- Digital camera
- Battery charger
- WiFi modules
- GPS receiver



The TrackMan™ Radar Unit is splash proof and designed to withstand rain showers. When using the TrackMan™ system in very wet weather it might be necessary to dry off water drops at the camera window, in order to get proper pictures of the landing field.

The TrackMan™ Radar Unit has two motorized legs for leveling the radar unit.



**Figure 4: TrackMan™ radar unit, model TMAN4 back side view**

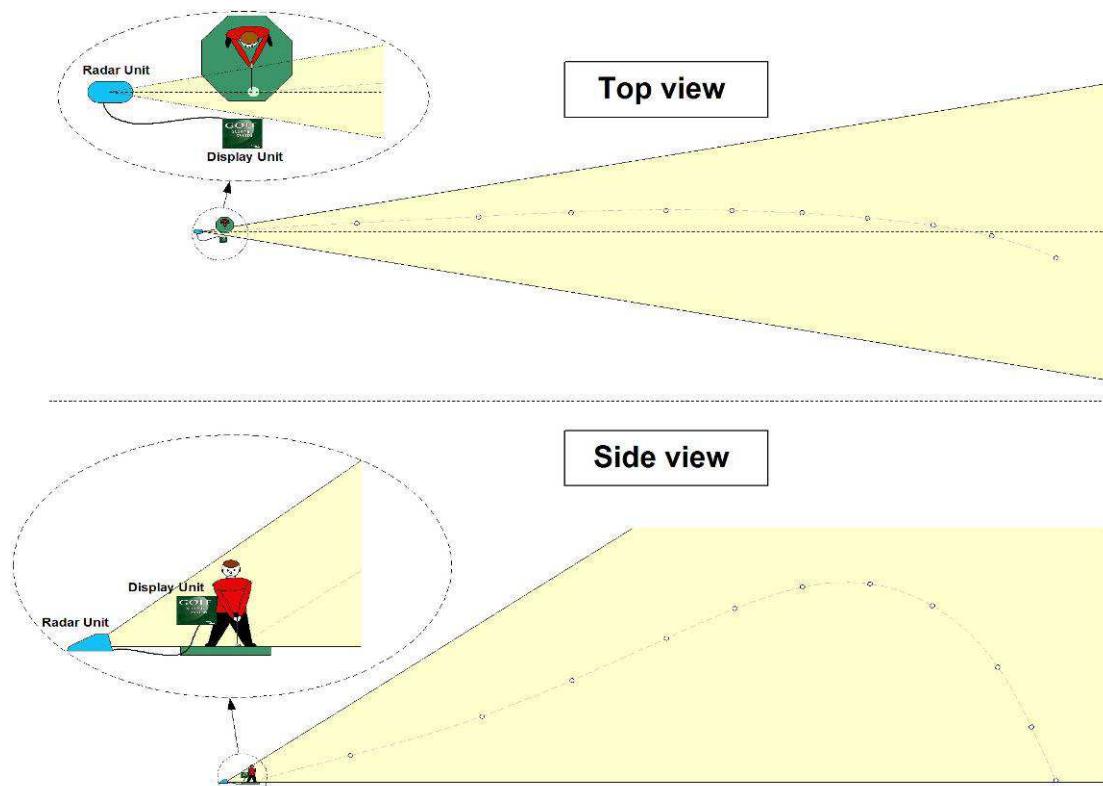


**Figure 4: TrackMan™ radar unit, model TMAN4 bottom view**

### 3.3 Setting up the system

This section explains how to connect and set up the system in a typical Golf Application.

The system requires a free line-of-sight to the ball throughout the complete flight of the ball in order to be able to deliver measurement data.



**Figure 3: Recommended placement of the TrackMan™ Radar Unit.**

The TrackMan™ Radar Unit should be placed roughly 2½-3m directly behind the desired tee-off position. The camera window should be in a straight line to the ball – if anything better a little to the right (for right-hand players) than to the left of the ball!

The system requires a free line-of-sight to the ball throughout the complete flight. Avoid standing in front of the radar in such a way, that if you hook the ball, you will be blocking the radar beam.

Avoid as much as possible large obstacles, especially metallic obstacles, close to the radar and within the beam of the radar. Metallic objects in the beam of the radar will have a negative effect on the measurement accuracy.



If it is impossible to avoid metallic obstacles in the beam, the accuracy can be increased by adding intentionally reflectors or by using microwave absorbing materials to avoid the main reflectors to enter the radar. Please consult TrackMan A/S support team for guidelines on how to do this.

**NOTE!** Some types of fluorescent light tubes emit significant electromagnetic noise. Placement of the TrackMan™ Radar Unit nearby such types of light tubes will have a negative influence on the tracking capability of the TrackMan™ system.

## 4 Warranty Comments

The TrackMan™ Radar Unit contains NO user serviceable parts inside. In case of defect or malfunctioning TrackMan™ Radar Unit, TrackMan A/S authorized personal ONLY must repair the unit.

**IMPORTANT** The box is sealed to prevent unauthorized access to the inside of the TrackMan™ Radar Unit. If the sealed is broken any warranty agreement will terminate immediately. Warranty will also terminate immediately if:

- Use of non-approved AC adaptor or incorrect direct applied DC voltage
- Use of non-approved cables between the TrackMan™ Radar Unit and the computer in fixed installation.
- If the TrackMan™ Radar Unit is not installed or operated in compliance with this manual.

For full description of the warranty and the scope hereof, reference is made to the warranty agreement between the user and TrackMan A/S.