XTRA.BLACK BOX

User Manual

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Safety

All products are designed as supplement to make go-karting safer, but cannot replace safe track procedures. If equipment fails, the normal operating procedure must still be adequate to safely operate the track.
This guide has been written with great care. However, the manufacturer cannot be held responsible, either for any errors occurring in this publication or for their consequences.

Table of Contents

1 Get started

This manual helps with correctly installing, configuring and using the Xtra.Black Box. Every functionality the Xtra.Black Box offers will be explained.

1.1 What's in the box

Before proceeding, check the contents of the kit. The box consists of the following parts:

- **Xtra.Black Box**

- **Power over Ethernet (PoE) injector**

- **5 meter Ethernet cable (with one waterproof connector)**

1.2 Installation

The Xtra.Black Box communicates wireless with the transponders in the go-kart. **For an optimal wireless coverage the location is very important and must be chosen carefully!**

Placement depends on functionality. The Xtra.Black Box can be used as:

- **Range extender**: extend the radio range.
- **Access point:** interface for software parties.
- **Timing host:** interface for timing messages.

> Range extender and Access Point functionality are automatically used simultaneously.
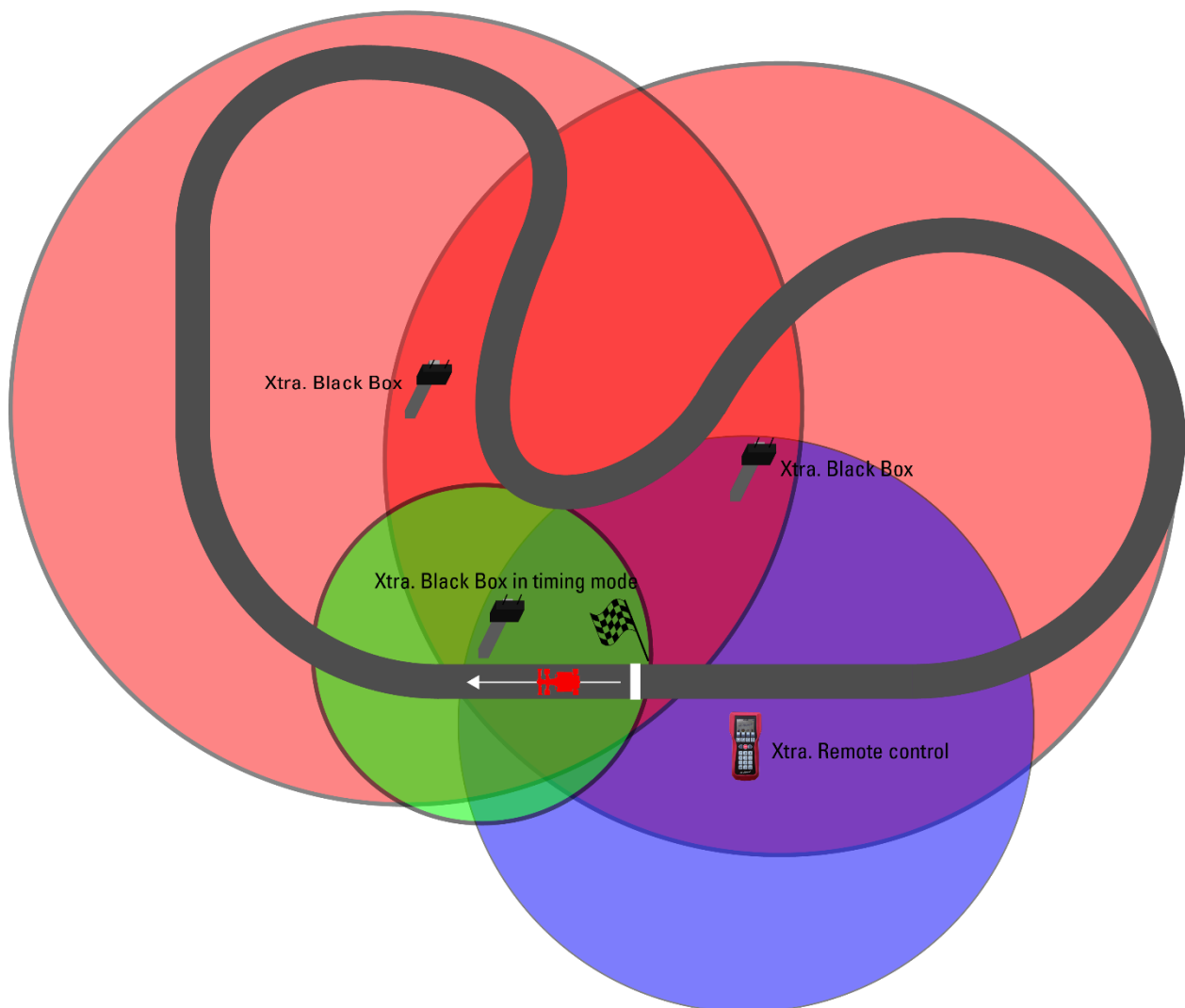
Figure 1 Optimal locations

1.2.1 Range Extender

On big go-kart tracks the go-karts can be out of range of the Xtra.Remote Control. To extend the range of the De Haardt wireless system the Xtra.Black Box can be used. This functionality can operate without ethernet communication. To provide power to the Xtra.Black Box the ethernet cable with the delivered Power over Ethernet (PoE) must be used. Other PoE injectors or routers complied with IEEE802af can be used.

> **IMPORTANT!**
> **For range extender functionality no configuration is necessary.**
> If you have to change the functionality, be sure you have access to your local network.
> **The Configuration can't be changed without an ethernet connection!**
> **See chapter 3 for more details.**

1.2.1.1 Placement

In figure 1 "Optimal locations" the optimal placing is illustrated:

- The Xtra.Black Box must be placed in range of the Xtra.Remote Control, Xtra.Range Extender or Xtra.Black Box.
- The best location is in the middle of the track.
- No obstacles between the Xtra.Black Box and the go-karts, see paragraph 11 figure 2.
- For big tracks multiple Xtra.Black Boxes can be used to cover the whole track.

For range specifications see paragraph 4 Technical specification. For advice please contact us on support@de-haardt.com.
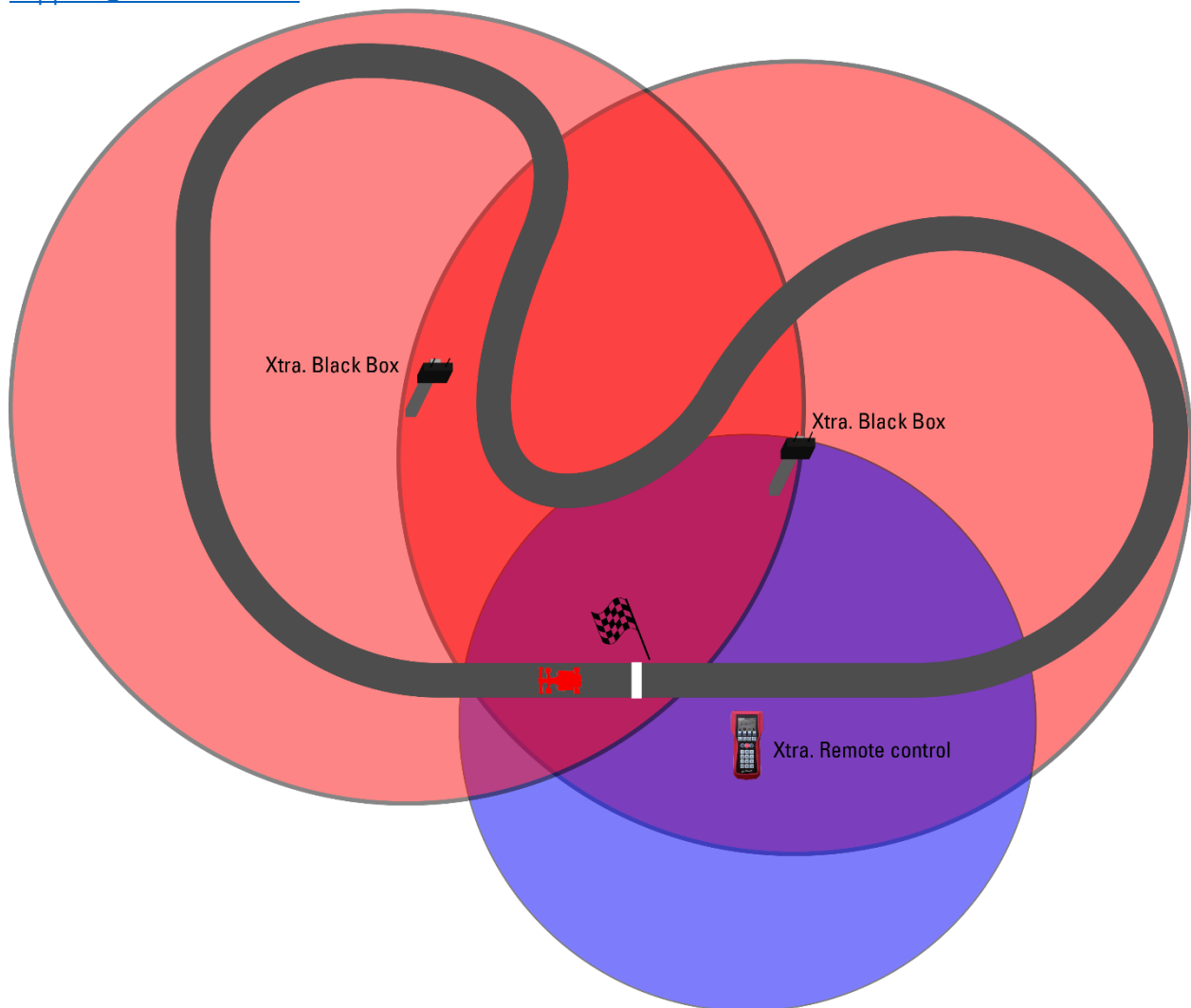
Figure 2 Best placement to extend the range

1.2.2 Access Point

With the Xtra.Black Box as access point third party software can communicate with de Haardt products in safety mode (***not timing!***). Ethernet connection is required for communication with the software. To provide power to the Xtra.Black Box the delivered Power over Ethernet (PoE) injector must be used. Other PoE injectors or routers complied with IEEE802af can be used.

1.2.2.1 Placement

Placement depends on the type of use. Contact support@de-haardt.com or your software supplier.

1.2.3 Timing Host

The Xtra.Black Box is capable of timing and can be switched to timing mode through the web interface. See Chapter 3 how to access the web interface.

Once the Xtra.Black Box has been set as a timing host it will receive lap-time messages transmitted by the Xtra.Shutdown Transponders. The Xtra.Shutdown Transponder transmits a number of messages containing the lap time. Those messages are being send, when the Xtra.Sensor detects a loop of the Xtra.Beacon (installed at the track). In order to assure that messages will be received, they are transmitted 5 times. This will be illustrated in figure 3.

> **IMPORTANT!**
> The Xtra.Black Box need to be configured as timing host. For configuration instructions, **see chapter 3 for more details.**
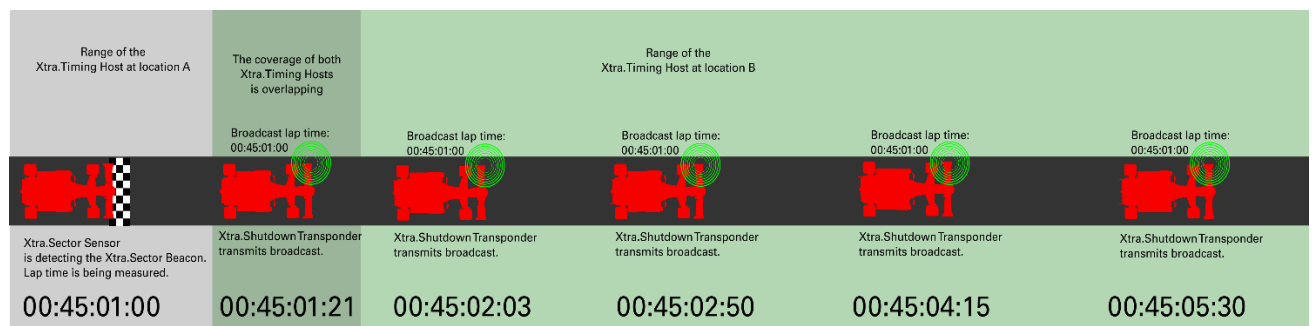

Figure 3: transmit example of the lap time to the Xtra.Timing Host

The example given in figure 4 consists of the coverage of an Xtra.Black Box if it is placed at location A (left-sided of the finish line) and if that one is placed at location B (right-sided of the finish line).

Both places can work, however location B is better because this location received all messages. If broadcast#1 gets interrupted due to external factors, the Xtra.Black Box at location A will not receive any lap time information. Examples of interruptions due to external factors:

- Other equipment that communicates over the same channel.
- Wide-spectrum RF energy which is produced by spark plugs, fluorescent tube starters, sparking switches.
- In some random circumstances, due to two Xtra.Shutdown Transponders which are transmitting their timing message at the same time.

To provide power to the Xtra.Black Box the ethernet cable with the delivered Power over Ethernet (PoE) must be used. Other PoE injectors or routers complied with IEEE802af can be used.

1.2.3.1   Placement

The best location to place a Xtra.Black Box is near the finish line, see figure 5.

- Towards the go-kart's direction of travel
- 7 till 10 meter away from the Xtra.Beacon
- As near as possible to the track, at least within 5 meter
- At a height of approximately 3 meter
- Hold at least 10 meter distance between the Xtra.Black Box operating as Timing Host and Xtra.Black box operating as Range Extender.
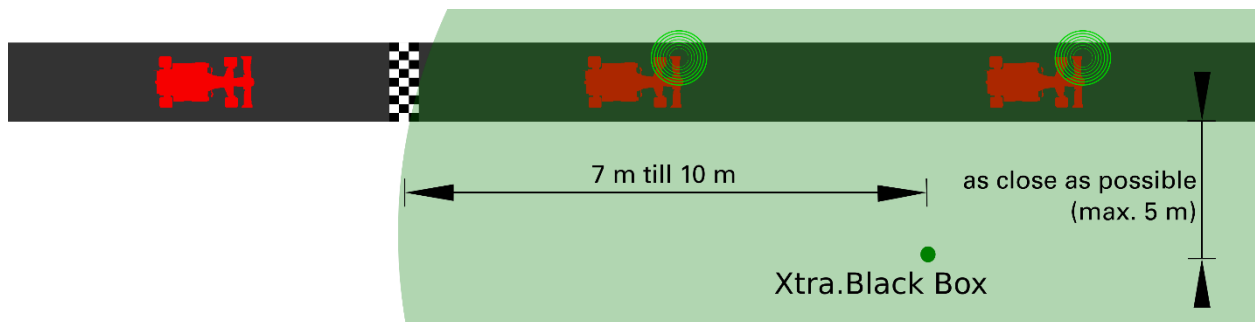

Figure 4: placement of the Xtra.Black Box relative to the Xtra.Beacon (marked as finish)

For intermediate lap times multiple Xtra.Beacons can be used. Every Xtra.Beacon require their own Xtra Black Box in timing mode, see figure 6.
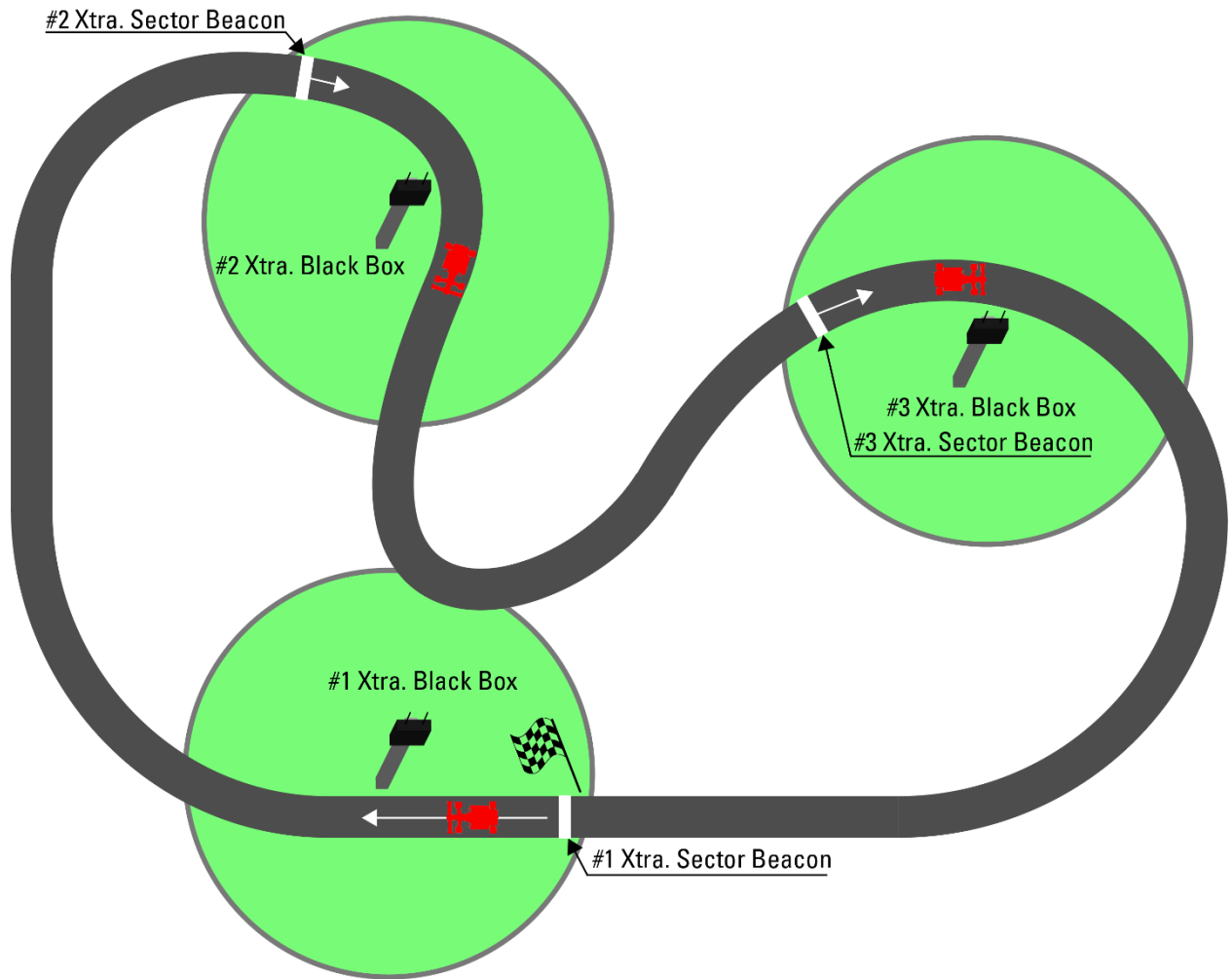
Figure 5 Intermediate lab times

1.2.4   Mounting

The Xtra.Black Box can be mount with **four M4** screws, see figure 6.

Figure 6 Xtra.Black Box mounting

Antennas must be vertical and pointed upward, see figure 7.

Figure 7 Vertical mounting

Mounting the Xtra.Black Box on a wall can reduce the strength of the radio. In particular walls or fences with steel in it, see figure 8.
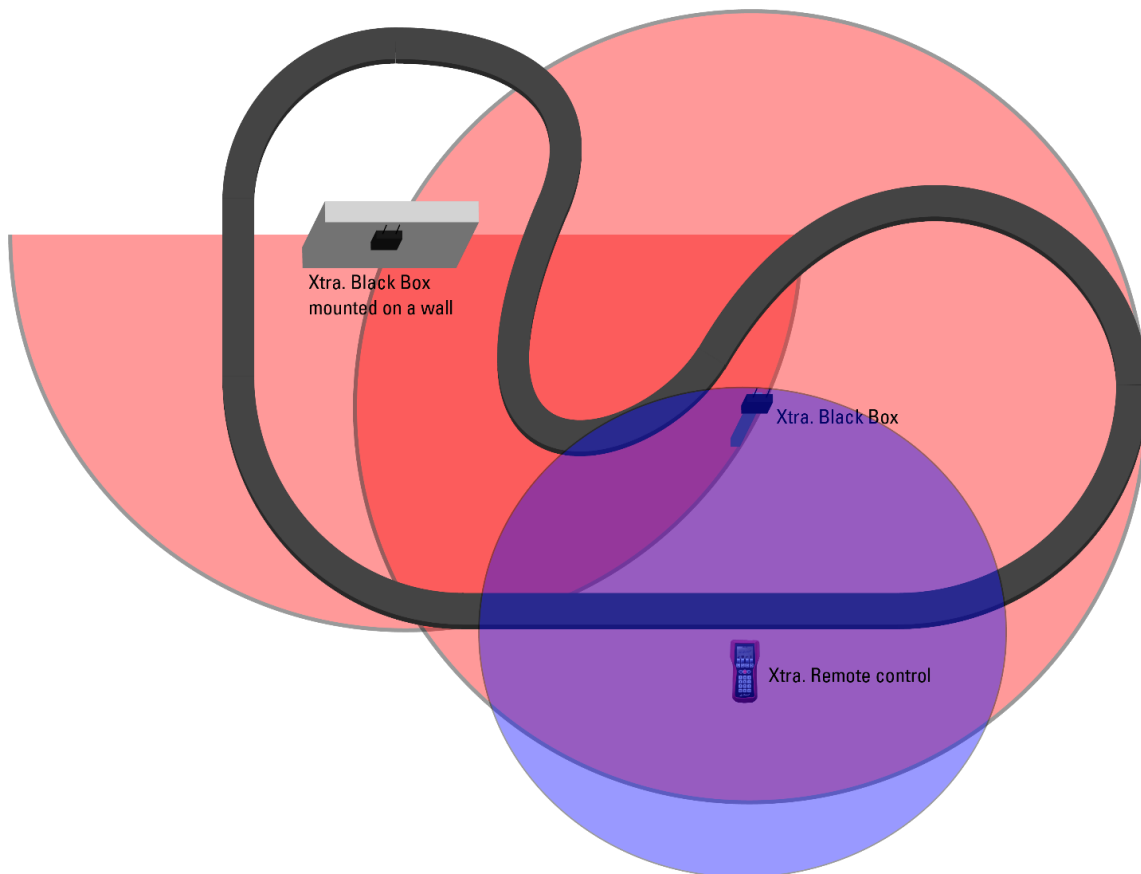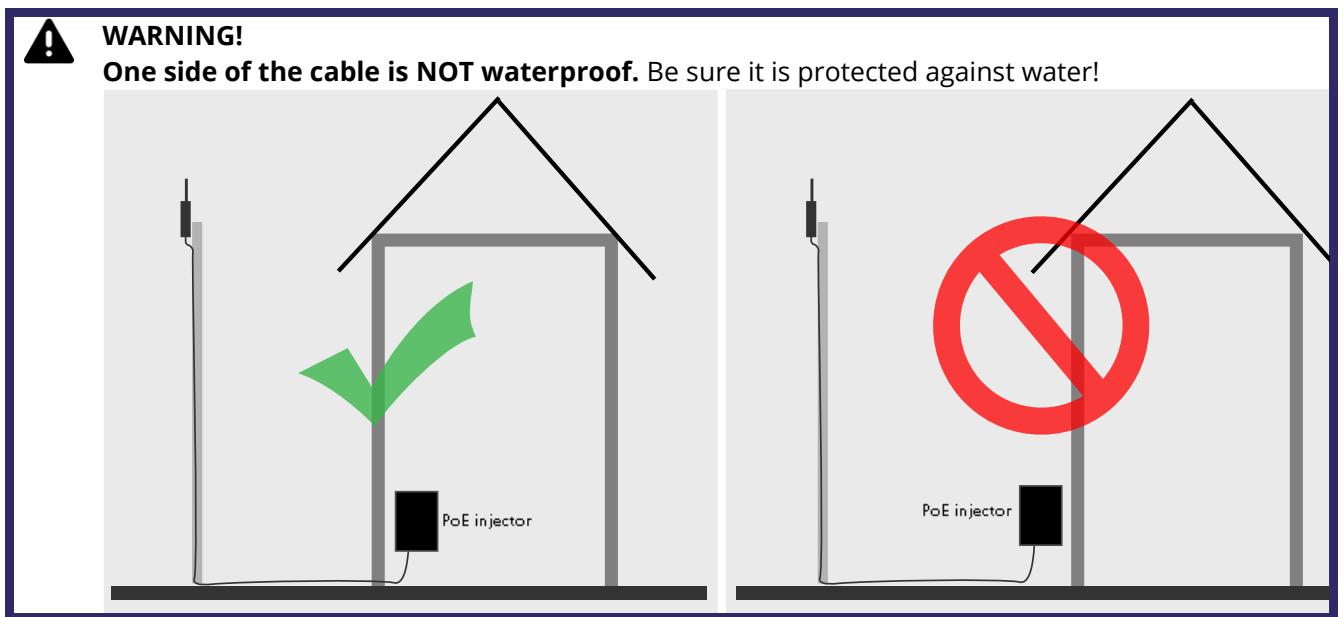
Figure 8 Range and obstacles

1.2.5   Ethernet

The Xtra.Black Box can be connected with ethernet to provide power and data communication. The delivered ethernet cable has a waterproof connector on one side, see figure 9.

Figure 9 Waterproof ethernet connector

> **⚠ WARNING!**
> **One side of the cable is NOT waterproof.** Be sure it is protected against water!
>
>

1.2.6   Antennas

The Xtra. Black Box use a Dual Band radio. To make use of both radio's the two antenna's must be connected. Screw the antennas clockwise and hand tight on the reverse SMA connectors. The short antenna must be mounted on radio 2. The long antenna on radio 1. See figure 9.

1.2.6.1   External Antenna

To improve the signal strength other antennas can be used, please contact us for the best options support@de-haardt.com.

2 Operation

2.1.1 Overview

The front is provided with 4 LEDs: Power, ethernet, radio 1 and radio2.

Figure 10 Front with led indication

2.1.2 LED indicator

2.1.2.1 Power

The first led is the power led this shows if the Xtra.Black Box is powered or not.

LED Color	Description
Green	Xtra. Black Box is powered. **The device is ON**
OFF	Xtra. Black Box has no power. **The device is OFF**

2.1.2.2 Ethernet

The second led indicates if there is an ethernet connection. If the LED is blinking fast then there is a lot of communication.

LED Color	Description
Green	Ethernet is linked
Flash green	Ethernet link and Ethernet activity/send or receive ethernet data.
OFF	No ethernet connection

2.1.2.3 Radio 1

The third led indicates the safety and timing radio.

LED Color	Description
Blue	Radio is active: send or received De Haardt Safety messages
OFF	No De Haardt radio activity

2.1.2.4 Radio 2

The fourth led displays the radio 2 communication.

LED Color	Description
White	Radio2 is active: send or received De Haardt Dual band messages
OFF	No De Haardt dual band activity

2.1.3 Software interface/ advanced manual

Please contact support@de-haardt.com for the advanced manual.

3 Configurations

Is the Xtra.Black Box is connected with ethernet to a local network or internet. It's settings can be changed with a computer. To connect with the Xtra.Black Box see 3.1 Find and Connect on network. If there is connection, the setting can be changed using the Xtra.Black Box's webpage, see 3.2 Find and Connect on network.

3.1   Find and Connect on network

Once the Xtra.Black Box has been connected to the network it will start broadcasting his ID on the network. Any **Windows PC** connected to the network will be able to see the Xtra.Black Box.

> **NOTE:** Firewall may hinder the detection of the black box.

Double clicking on the Xtra.Black Box will open the webpage of the Xtra.Black Box in the locally used web browser, see figure 11. This is currently only available in windows.
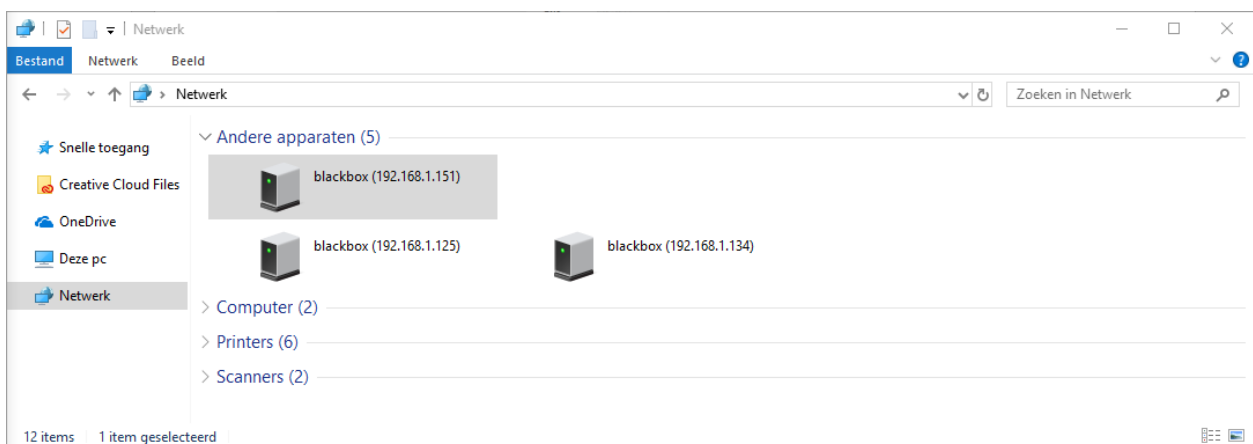Entering the IP address into the web browser will also open the webpage of the Xtra.Black Box.

Figure 11 Network discovery on windows.

3.2   Webpage

The webpage is divided in in 4 subpages:
- **Home:** shows all the currently set information
- **Setup:** change settings
- **Run Time Statics:** view statics for support purposes
- **System Tools:** view hardware/ firmware revision and update firmware

3.2.1 Home

The home screen shows all the currently set information such as the mode, IP address and enabled tracks.
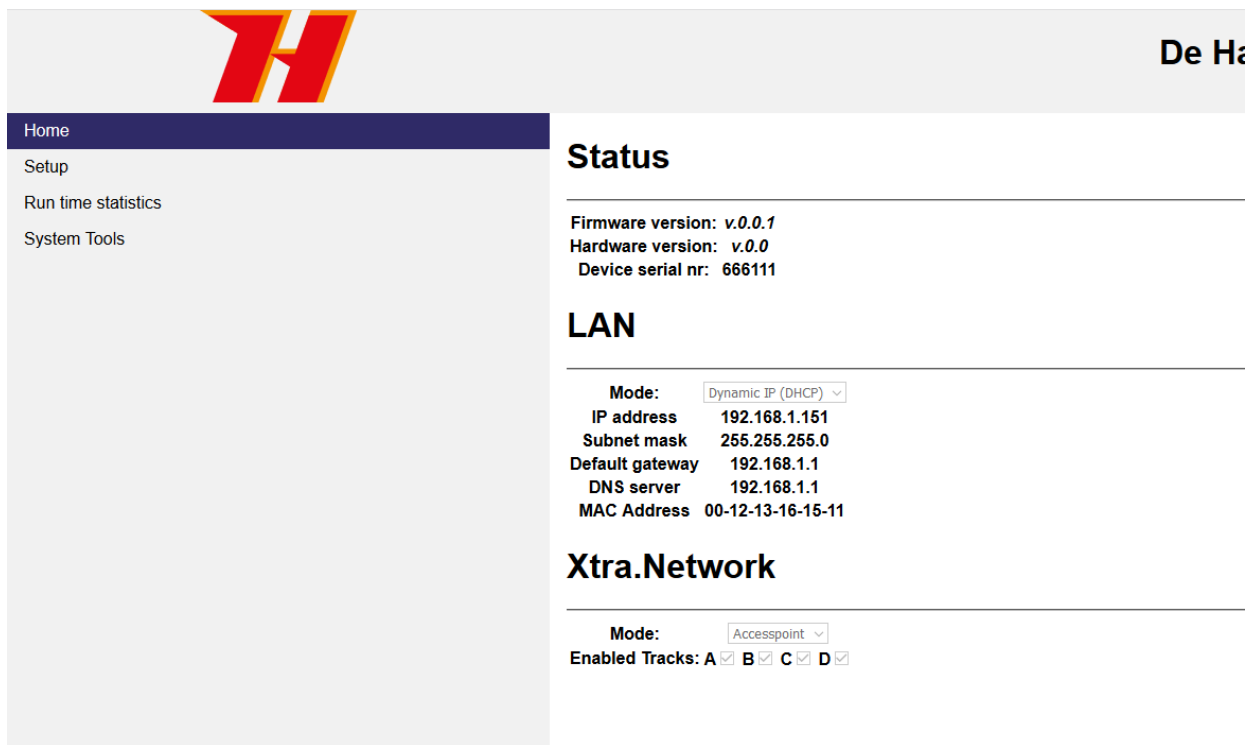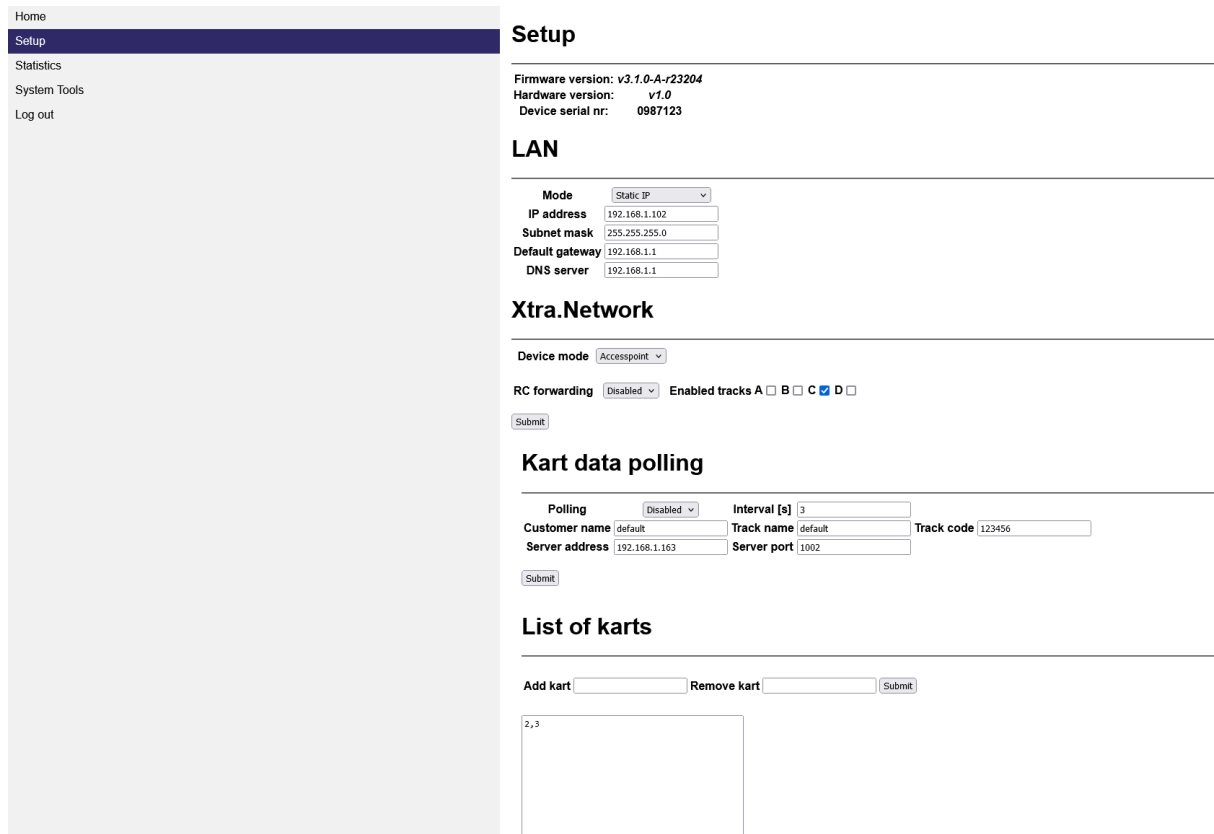

Figure 12 Webpage Home

3.2.2 Setup

The setup screen is where all the settings can be changed. The setup page has been divided into 5 sections. Each section will be further explained.

- **LAN:** changed LAN settings
- **Network:** switch access point/timing and select tracks
- **Kart data polling:** nonstandard function
- **List of karts:** nonstandard function

Figure 13 Webpage setup

LAN:

Under the LAN section two options can be selected. Dynamic IP(default) and Static IP.

When the LAN mode has been changed the Xtra.Black Box needs to be restarted for it to take effect.

Remove the Xtra.Black Box power or use the reset button.

> ⚠️ **WARNING!**
> **Changing the settings without prior knowledge could potentially disable access to this webpage and the Xtra.Black Box.**

Figure 14 Webpage setup LAN

3.2.2.1 Xtra. Network (radio settings)

Using the dropdown box the Xtra.Black Box can switch between access point mode and timing mode. Access point is the default mode which enables the Xtra.Black Box to act as a range extender. Timing mode sets the Xtra.Black Box to listen to timing messages. The tracks can be enabled and disabled using the check boxes. By default all the tracks are enabled. If no track is enabled then by default track A will be enabled.

Figure 15 Webpage setup network

3.2.2.2 Xtra.Network Bidi mode (**nonstandard function**)

Do not use this function without contacting your distributor or kart manufacturer. Please contact your distributor or kart manufacturer for options on this mode.

Figure 16 Xtra.Network Bidi mode

3.2.2.3　CAN gateway (**nonstandard function**)

This feature allows for the CAN data to be send to an external server. Enter an IP address and port number and CAN data will be send to the server. This could be used in combination with a customer name, track name and track code.

Kart data polling

Polling	Disabled ⌄	**Interval [s]**	3		
Customer name	default	**Track name**	default	**Track code**	123456
Server address	192.168.1.163	**Server port**	1002		

Submit

Figure 17 Webpage Kart data polling

3.2.2.4　List of karts (**nonstandard function**)

The Xtra.Black Box can poll the go-karts data. The Xtra.Black Box need to know which go-karts to poll. With the CAN kart list function the go-karts can be added or removed.

> **Please configure the transponders before polling.**
> If the transponders are not configured it can cause misconfiguration such as multiple go-kart numbers.

The List of karts section is where the go-kart numbers are entered. Only a single go-kart can be entered or removed at a time in the go-kart list. The scan for go-karts feature scans 245 go-karts (from 1 till 245) that are currently turned on. The **scan start after pressing OK**, see figure 18. It will take at least 2-5 min to complete the scan and while the scan is going on do not interrupt the scan. Pressing button will stop the scan.

Turn on all karts! This may take a few minutes.
Please wait a few minutes before pressing the show kart list
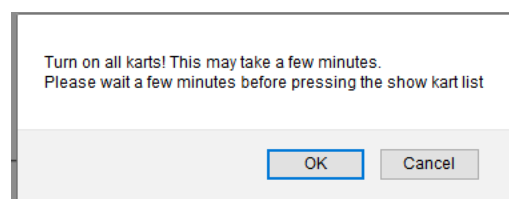
OK　　Cancel

Figure 18 Start scan

The scan is ready when the white LED (RADIO2) stops flashing simultaneously. Press "show kart list" to show the active go-kart.

List of karts

Add kart [_____] Remove kart [_____] [Submit]

```
2,3
```

[Show kart list] [Scan for karts]

Figure 19 Webpage List of karts, go-kart nr 2 and 3 are active

3.2.3 System Tools

The system tools page is where the firmware can be uploaded from the PC into the Xtra.Black Box.
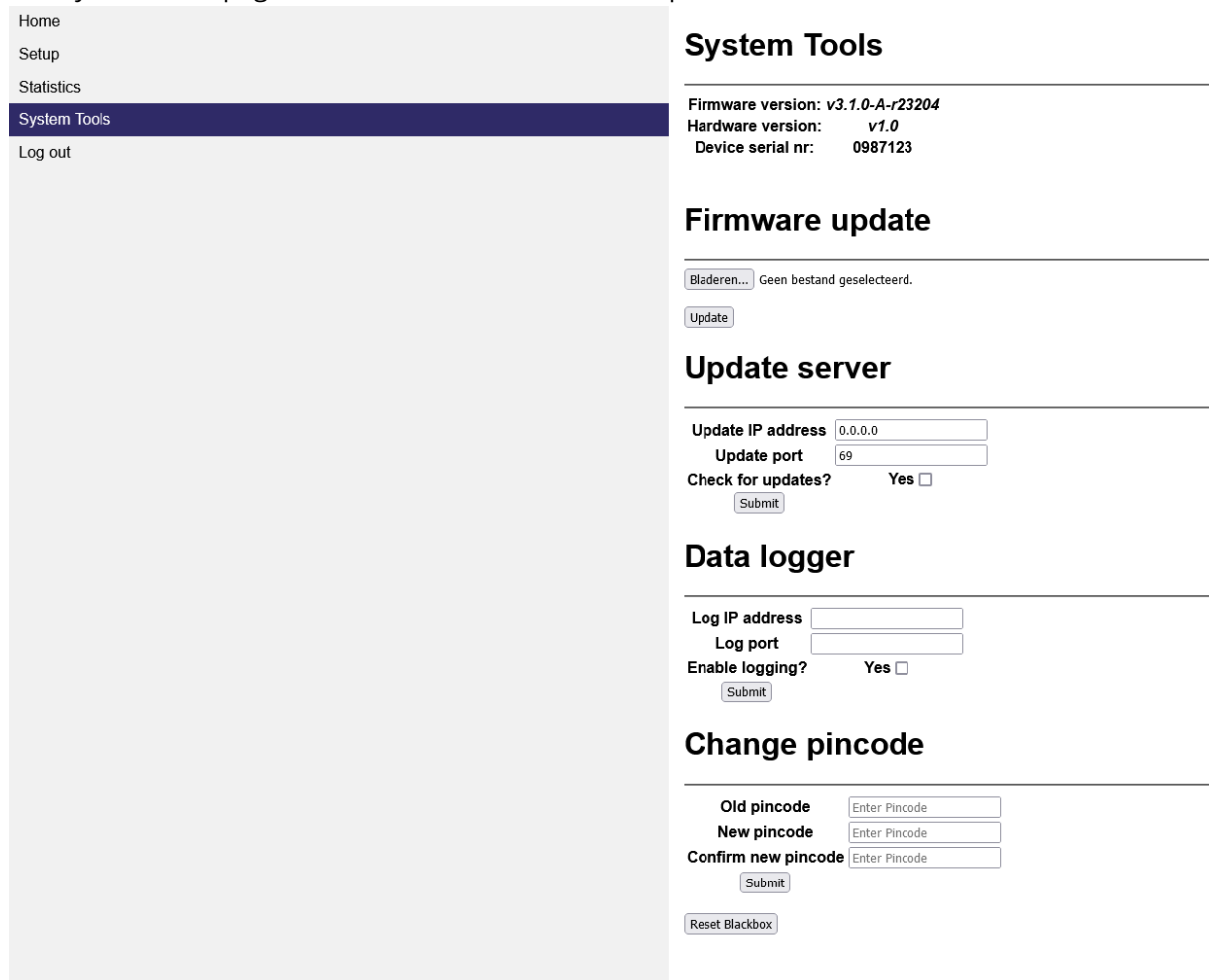

Figure 20 System tools

3.2.3.1 Update server(Currently disabled)

There are two options to upgrade to a new firmware. Online update and manual update is possible. The online update is described in this paragraph, for manual update see 3.2.3.2.

The Xtra.Black Box will look on the server for the most recent version. **Internet access is required!**

> ⚠️ **WARNING!**
> **The IP and port number are default set to The Haardt servers. Unless instructed otherwise do not change!**

When a firmware update is required tick the check box "check for updates". Once ticked reboot the system by doing a power cycle or press the reset button see figure 20. If available the new firmware is installed during the boot up.

Update server

Update IP address 136.144.222.251
Update port 69
Check for updates? Yes ☐
Submit

Figure 21 webpage update server

3.2.3.2 Web Firmware upgrade (Manual firmware update)

When there is a new firmware available it can be uploaded through the PC to the Xtra.Black Box.
To do this press browse file and select the firmware file.

Web Firmware upgrade

Bladeren... Geen bestand geselecteerd. upgrade

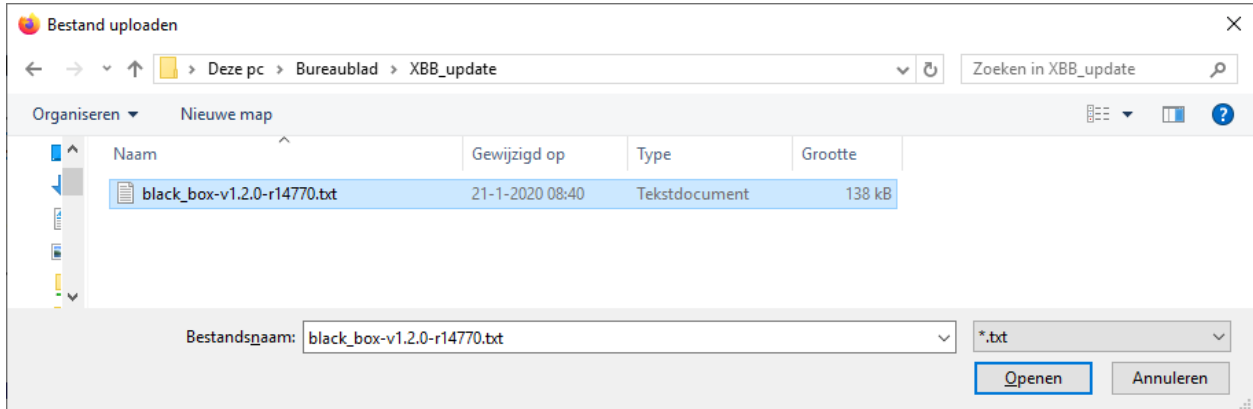*Figure 22 Webpage firmware upgrade*

Figure 23 Firmware upgrade select file

Select the File that we send to you.

> ⚠ **WARNING!**
> **Do not select any file other than the file supplied by De Haardt.**
> **Doing so can cause the Xtra.Black Box to stop working.**

Press upgrade to push the upgrade or update.

Firmware downloading. Please wait!

Figure 24 Firmware downloading. Please wait

Once the firmware has been downloaded a new webpage will be loaded prompting for a restart of the Xtra.Black Box.

> ⚠️ **Wait till the download is complete or the blackbox will not be updated.**

3.2.3.3   Data logger

The data logger allows the blackbox to automatically send information to De Haardt when support is needed. Only active it after contacting support@de-haardt.com

Data logger

Log IP address [   ]
Log port [   ]
Enable logging?   Yes ☐
[Submit]

Figure 25 Data logger

3.2.3.4   Change pincode

The blackbox now requires a pincode to enter the webpage. Default pincode is 0000 and can be changed here. It is recommended to change the pincode once you setup the blackbox.

Change pincode

Old pincode   [Enter Pincode]
New pincode   [Enter Pincode]
Confirm new pincode [Enter Pincode]
[Submit]

Figure 26 Change pincode

3.3 Telnet connection

Set up a Telnet communication between the PC and Xtra.Black Box. Make sure they are both connected to the same network. Follow these steps if you do not know how to set up the connection.

- Start Tera Term or another terminal application. This example will show the usage of Tera Term
- Go to File → new connection.
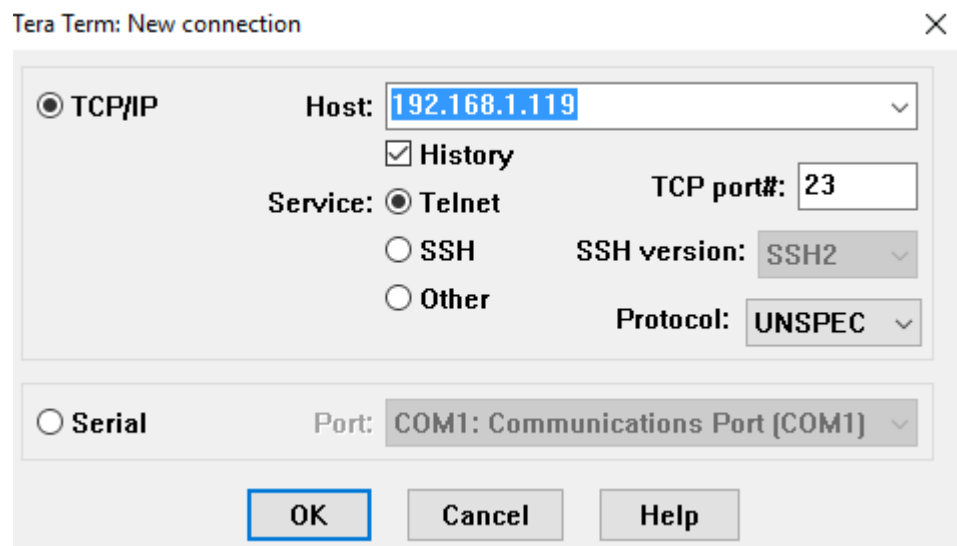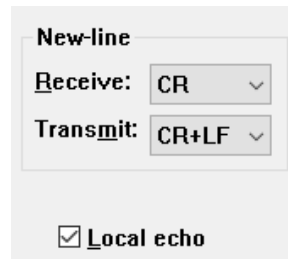- Make sure the correct IP address of the Xtra.Black Box has been entered.

Figure 27 Telnet connection settings.

- Make sure the correct terminal settings are set. Go to setup→ terminal. Make sure these options are set.

Figure 28 Terminal settings.

4 Technical specification

4.1 Specification

Description	Min	Typical	Max	Unit
Operational temperature	-10	-	55	°C
Input current		-	0.1	A
Radio Range safety band[1]		100		m
Radio Range timing band[1]		?		m
Radio Range dual band[1]		?		m
Radio frequency 1		433		Mhz
Radio frequency 2		868		Mhz
IP code	IP57			

[1] Environment has a big influence

4.2 Water and dust resistance

The Xtra.Black Box is rated as an IP57 device.

> ⚠️ **Only when the Xtra.Black Box antennas and waterproof* ethernet connector is used.**
> *see chapter 1.2.5 Ethernet

4.3 Power over Ethernet

The Xtra.Black Box is in compliance with IEEE 802.3af.

4.4 External antenna

To improve the radio sensitivity an additional antenna can be used. For more info see Installation Manual Xtra.External Antenna Kit EN v1.4.pdf or: support@de-haardt.com.

5 Support

For support, one can contact De Haardt's support department by email: support@de-haardt.com.