

XTRA.BLACK BOX

User manual




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Safety

All products are designed as supplement to make 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.

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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)



- Ferrite block attached on the ethernet cable.




1.2 Installation

The Xtra.Black Box communicates wireless with the transponders in the 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.

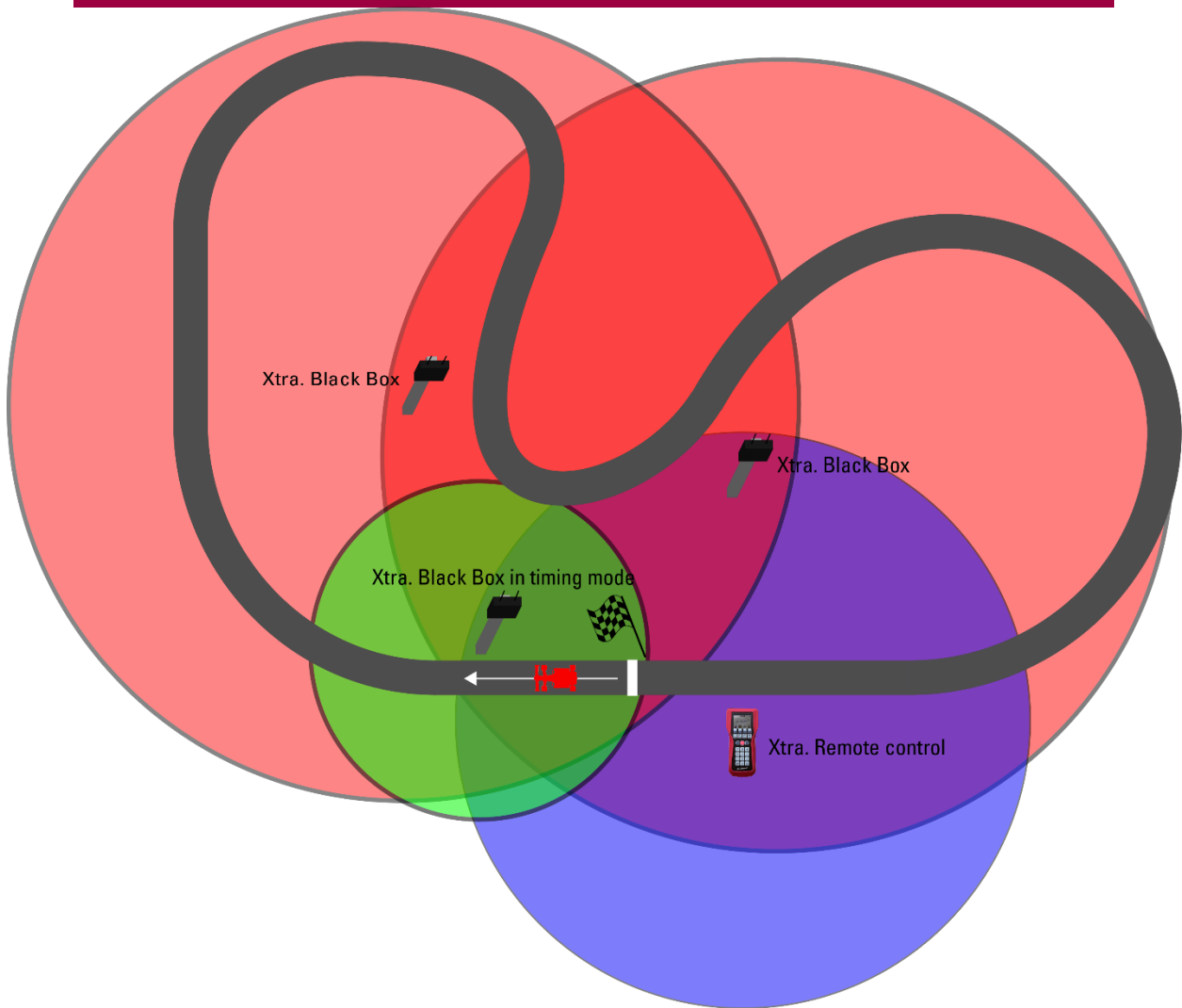


Figure 1 Optimal locations

1.2.1 Range Extender

On big kart tracks the karts can be outrange 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 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.

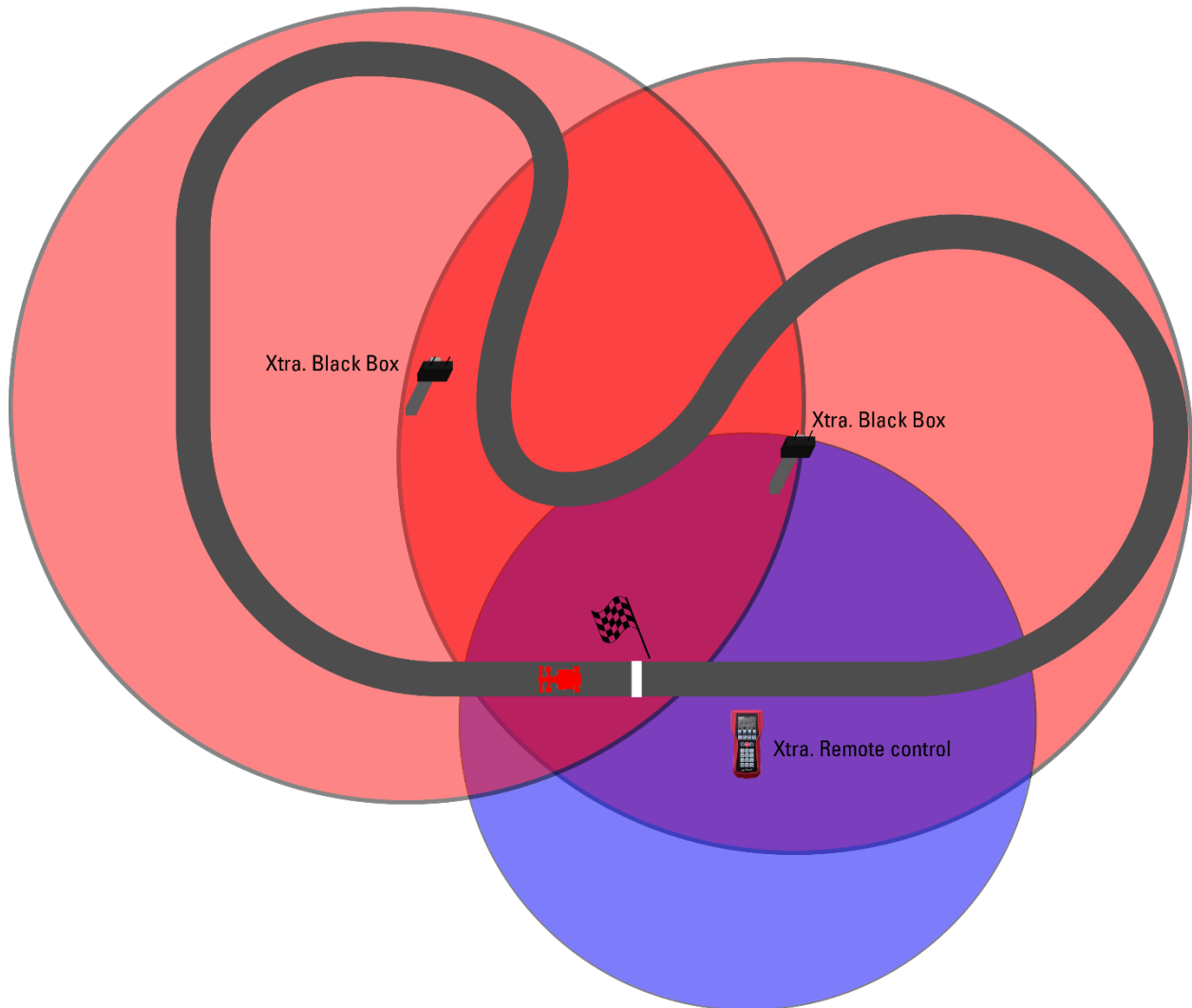


Figure 2 Best placement to extend the range

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.**

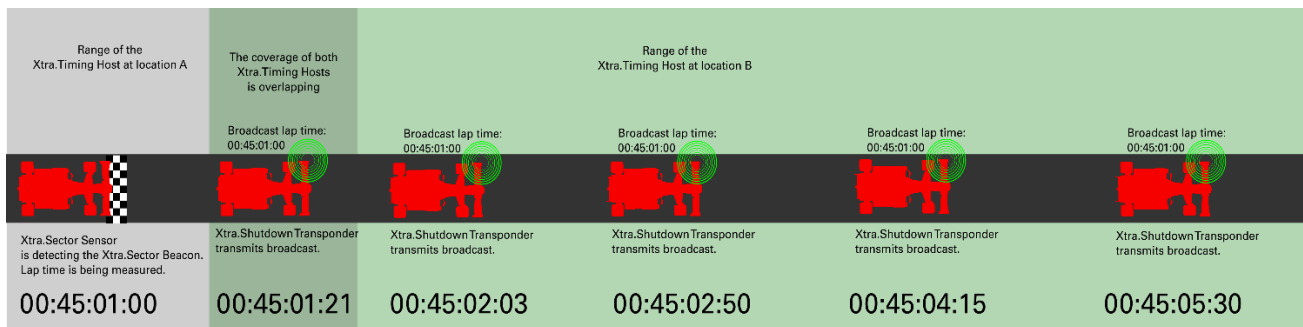


Figure 3: transmit example of the lap time to the Xtra.Timing Host

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 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.

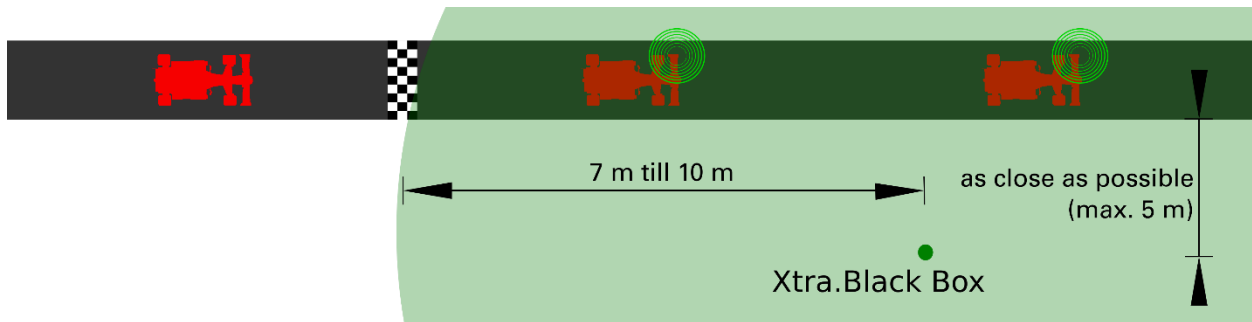


Figure 4: placement of the Xtra.Black Box relative to the Xtra.Beacon (marked as finish)

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.

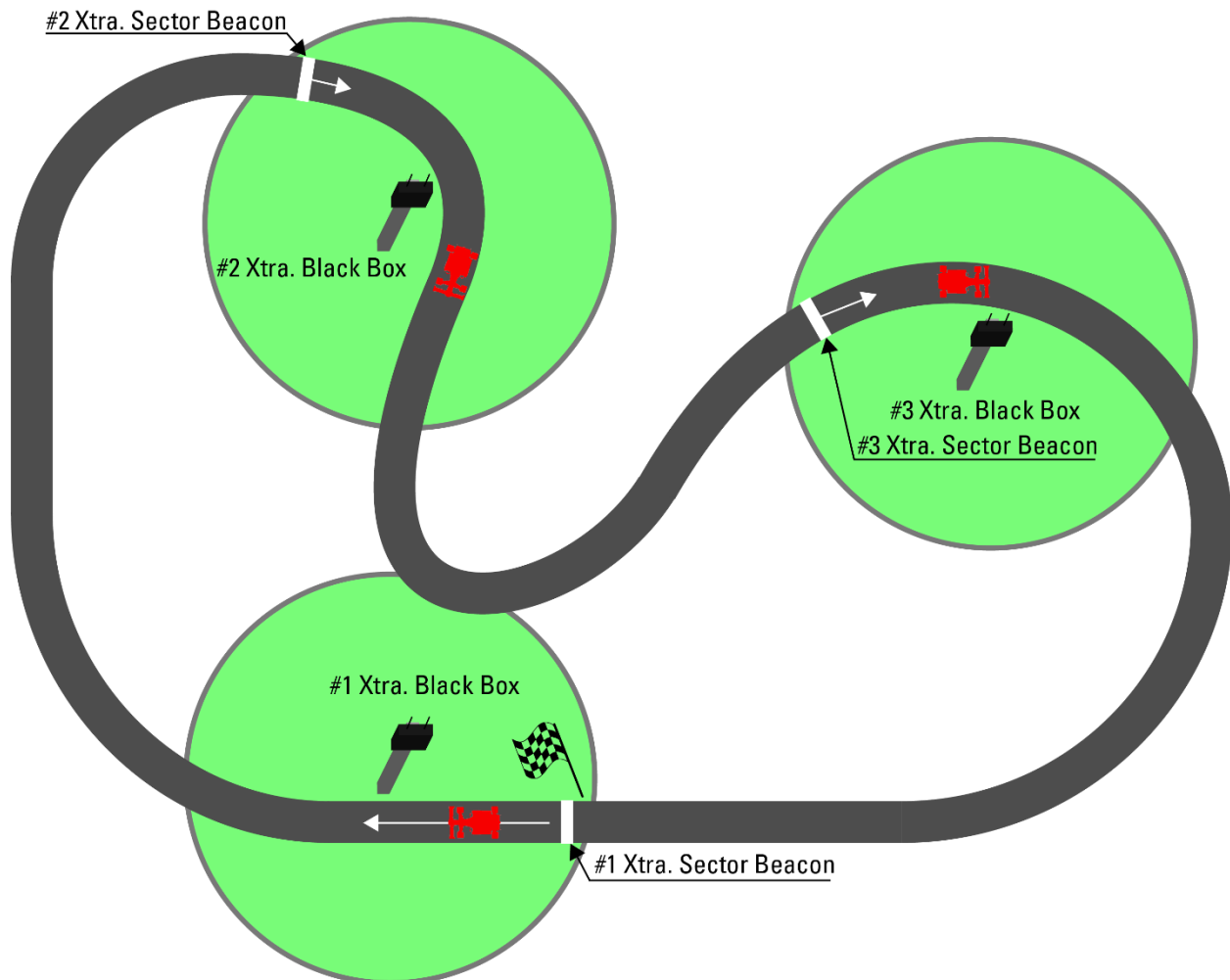


Figure 5 Intermediate lap times

1.2.4 Mounting

The Xtra.Black Box can be mounted 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.

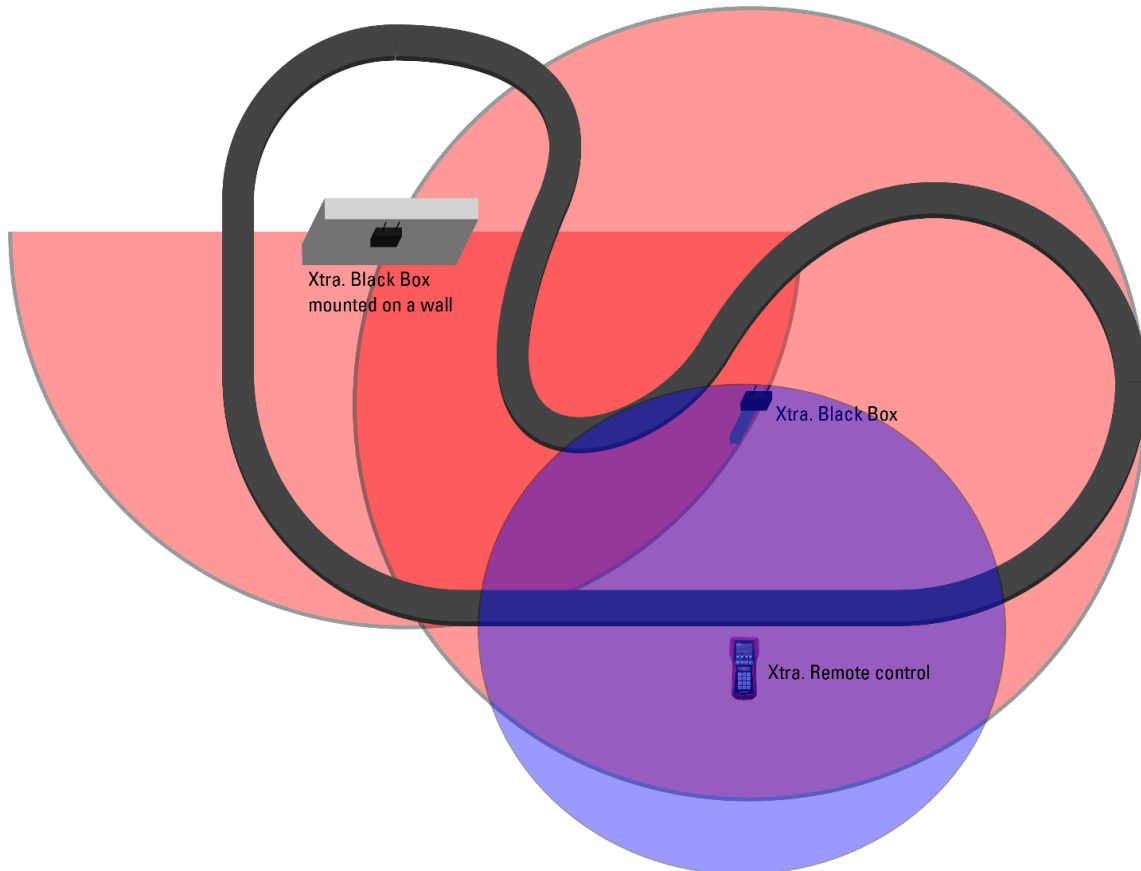


Figure 8 Range and obstacles

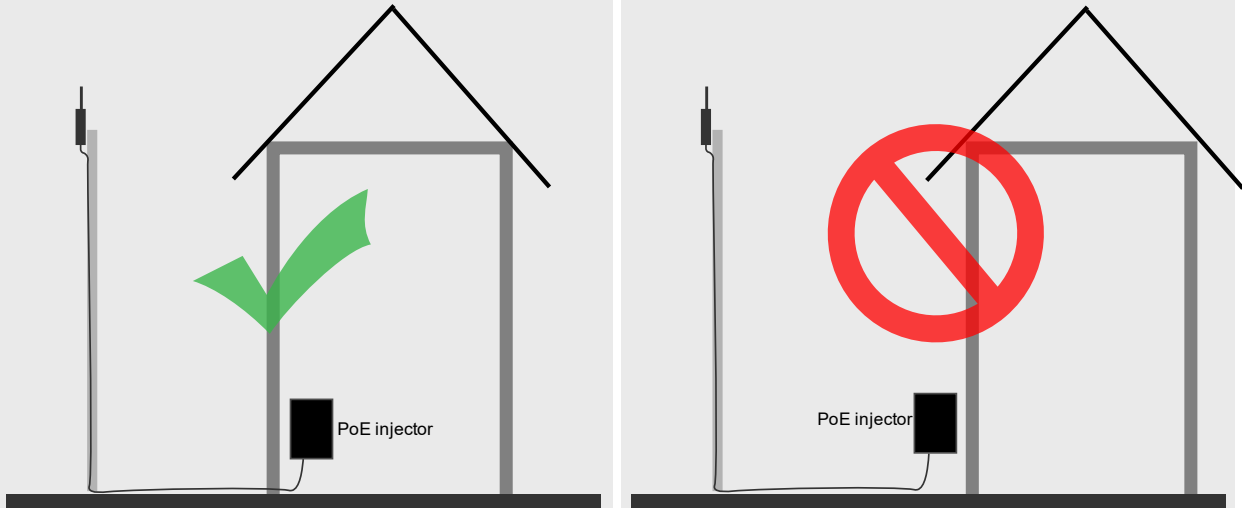
1.2.5 Ethernet

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!



The diagram consists of two panels. The left panel shows a PoE injector connected to a cable that enters a building from the outside. A green checkmark is placed over the cable entry point, indicating that the cable is protected from water. The right panel shows a similar setup, but the cable enters the building from the outside without any protection. A red 'no' symbol (a circle with a diagonal line) is placed over the unprotected cable entry point, indicating that this installation is incorrect and dangerous.

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

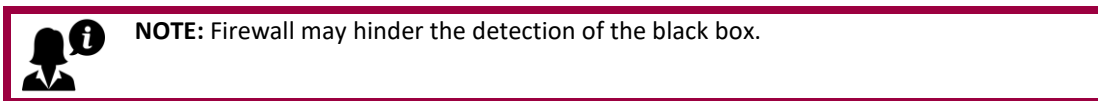
Please contact support@de-haardt.com for the advanced manual.

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.



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.

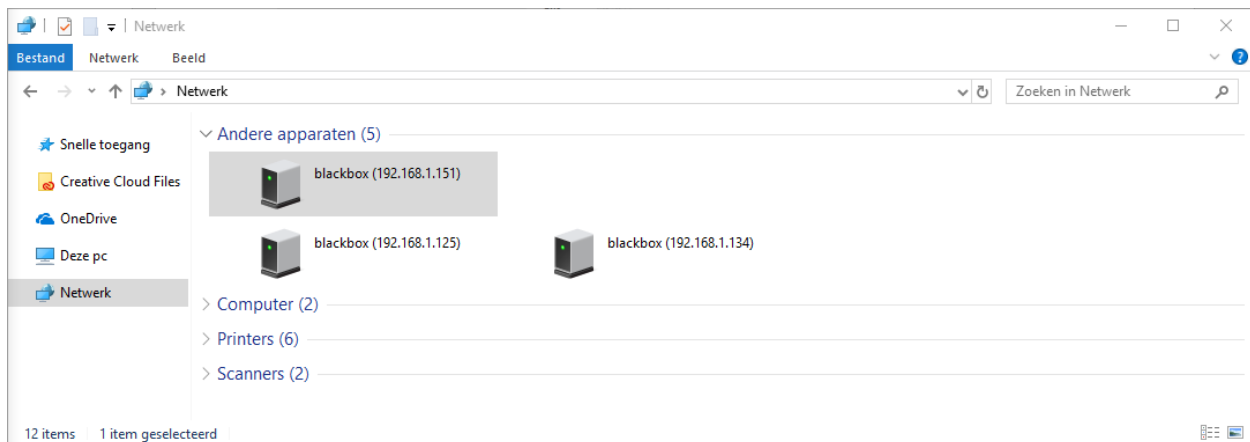


Figure 11 Network discovery on windows.

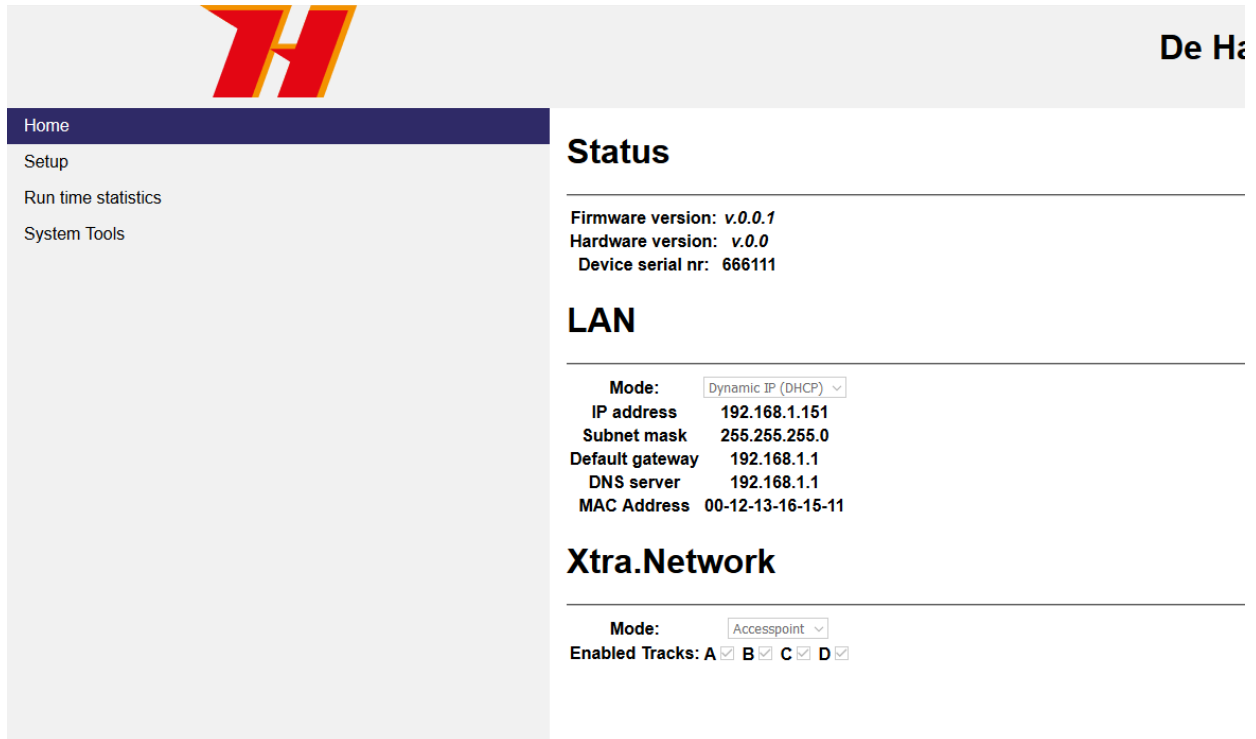
3.2 Webpage

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.



The screenshot shows the 'Home' page of the Xtra.Black Box interface. On the left is a navigation menu with 'Home' selected. The main content area is titled 'Status' and displays the following information:

- Firmware version: v.0.0.1
- Hardware version: v.0.0
- Device serial nr: 666111

Below this is the 'LAN' section, which shows the following settings:

- Mode: Dynamic IP (DHCP)
- IP address: 192.168.1.151
- Subnet mask: 255.255.255.0
- Default gateway: 192.168.1.1
- DNS server: 192.168.1.1
- MAC Address: 00-12-13-16-15-11

The final section is 'Xtra.Network', which shows:

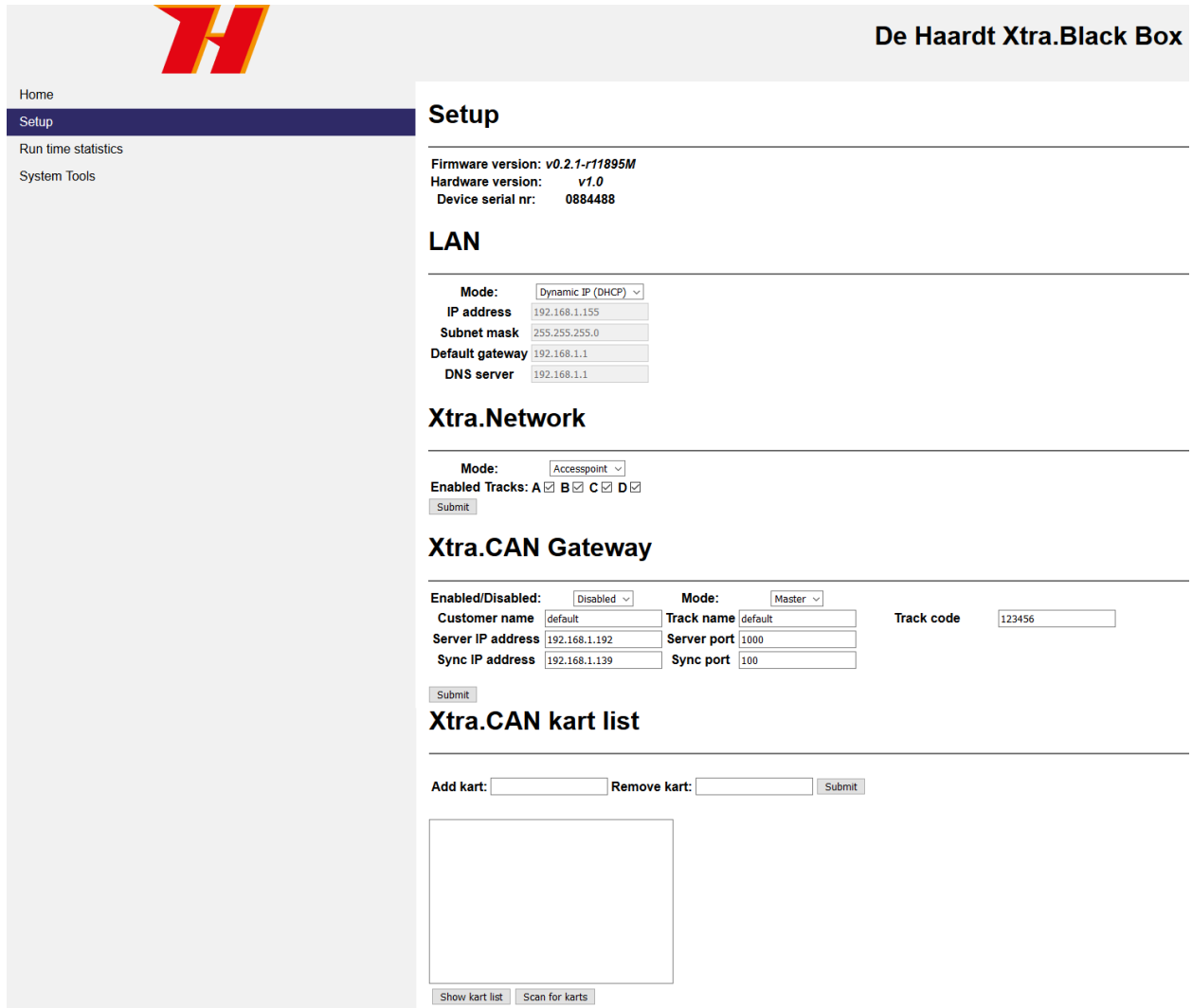
- Mode: Accesspoint
- Enabled Tracks: A B C D

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
- **CAN gateway:** nonstandard function
- **CAN kart list:** nonstandard function
- **Update server:** check online for available firmware updates



The screenshot shows the 'Setup' page of the De Haardt Xtra.Black Box. On the left is a navigation menu with 'Setup' selected. The main content area is titled 'Setup' and contains several sections:

- System Information:** Firmware version: v0.2.1-r11895M, Hardware version: v1.0, Device serial nr: 0884488.
- LAN:** Mode: Dynamic IP (DHCP). Fields for IP address (192.168.1.155), Subnet mask (255.255.255.0), Default gateway (192.168.1.1), and DNS server (192.168.1.1).
- Xtra.Network:** Mode: Accesspoint. Enabled Tracks: A, B, C, D (all checked). A 'Submit' button is present.
- Xtra.CAN Gateway:** Enabled/Disabled: Disabled. Mode: Master. Fields for Customer name (default), Track name (default), Server IP address (192.168.1.192), Server port (1000), Sync IP address (192.168.1.139), and Sync port (100). Track code: 123456. A 'Submit' button is present.
- Xtra.CAN kart list:** Add kart: [input] Remove kart: [input] [Submit]. A large empty box is shown below. 'Show kart list' and 'Scan for karts' buttons are at the bottom.


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.

LAN

Mode:	<input type="text" value="Dynamic IP (DHCP)"/>
IP address	<input type="text" value="192.168.1.151"/>
Subnet mask	<input type="text" value="255.255.255.0"/>
Default gateway	<input type="text" value="192.168.1.1"/>
DNS server	<input type="text" value="192.168.1.1"/>

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.

Xtra.Network

Mode:	<input type="text" value="Accesspoint"/>
Enabled Tracks:	A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D <input checked="" type="checkbox"/>

Figure 15 Webpage setup network

3.2.2.2 CAN gateway (nonstandard function)

The CAN gateway section has two features.

- Sending CAN data.
- Sync Xtra.Black Box

The first 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.

The second feature sets the Xtra.Black Box to master or slave mode to sync the CAN data messages. This feature requires two Xtra.Black Box one set to master mode and one set to slave mode. The sync IP address of the master has to be set to the IP address of the slave. The sync IP address on the slave has to be set to the IP address of the master. See chapter 3.1 for the IP address. The sync port has to be set to the same value on both master and slave.


Xtra.CAN Gateway

Enabled/Disabled:	<input type="text" value="Disabled"/>	Mode:	<input type="text" value="Master"/>		
Customer name	<input type="text" value="default"/>	Track name	<input type="text" value="default"/>	Track code	<input type="text" value="123456"/>
Server IP address	<input type="text" value="192.168.1.192"/>	Server port	<input type="text" value="1000"/>		
Sync IP address	<input type="text" value="192.168.1.139"/>	Sync port	<input type="text" value="100"/>		

Figure 16 Webpage CAN Gateway

3.2.2.3 CAN kart list (nonstandard function)

The Xtra.Black Box can poll the karts data. The Xtra.Black Box need to know which karts to poll. With the CAN kart list function the 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 kart numbers.

The CAN kart list section is where the kart numbers are entered. Only a single kart can be entered or removed at a time in the kart list. The scan for karts feature scans 245 karts (from 1 till 245) that are currently turned on. The **scan start after pressing OK**, see figure 17. 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.

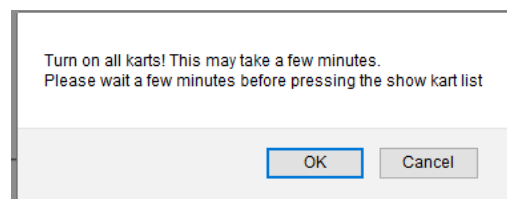


Figure 17 Start scan

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

Xtra.CAN kart list

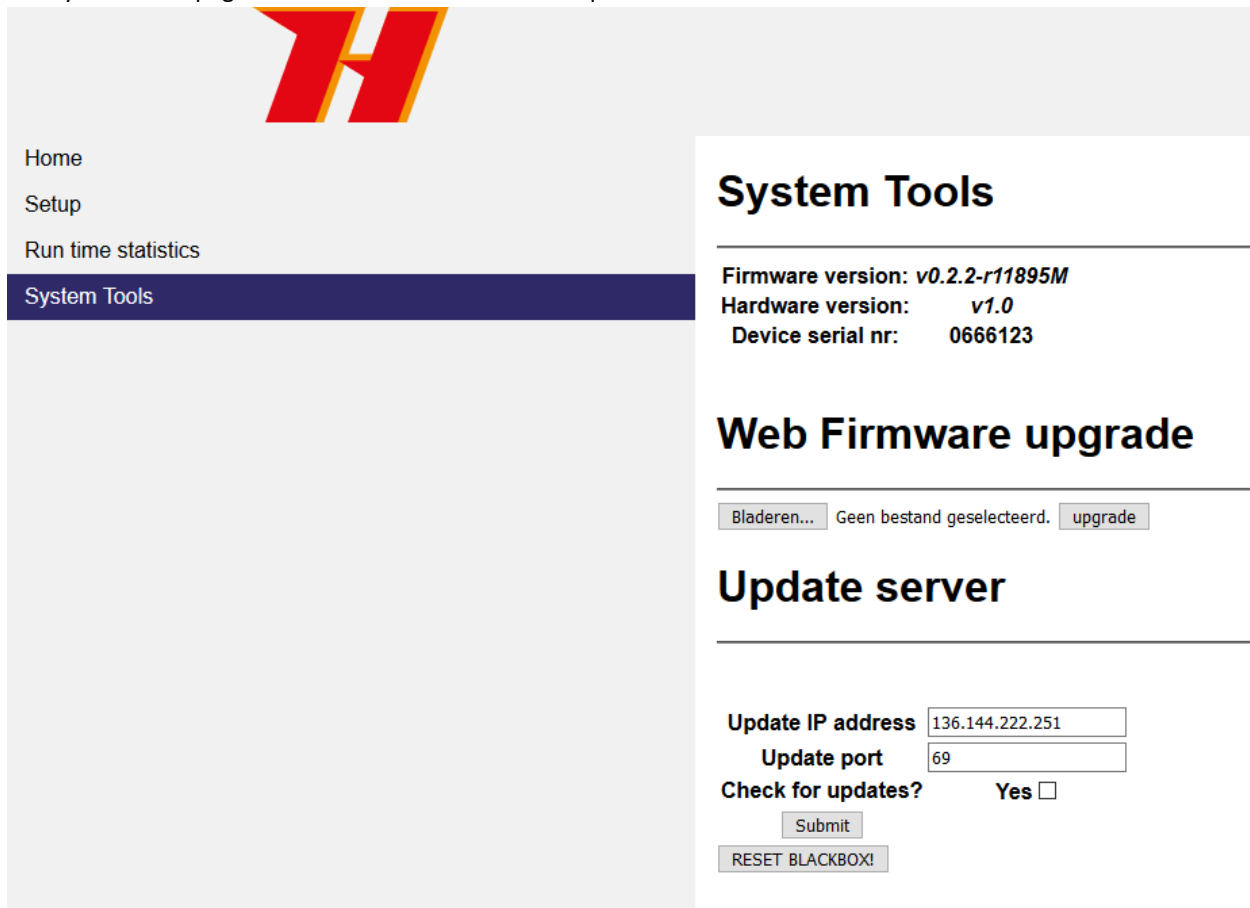
Add kart: Remove kart:

42

Figure 18 Webpage CAN kart list, kart nr 42 is 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.



The screenshot shows the 'System Tools' page of the Xtra.Black Box interface. On the left is a navigation menu with 'System Tools' selected. The main content area displays the 'System Tools' title, followed by system information: Firmware version: v0.2.2-r11895M, Hardware version: v1.0, and Device serial nr: 0666123. Below this is the 'Web Firmware upgrade' section, which includes a file selection area (currently empty) and an 'upgrade' button. The 'Update server' section contains input fields for 'Update IP address' (136.144.222.251) and 'Update port' (69), a 'Check for updates?' checkbox (unchecked), a 'Submit' button, and a 'RESET BLACKBOX!' button.

Figure 19 System tools

3.2.3.1 Update server

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 figure19. If available the new firmware is installed during the boot up.

Update server

Update IP address

Update port

Check for updates? Yes

Figure 20 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

Geen bestand geselecteerd.

Figure 21 Webpage firmware upgrade

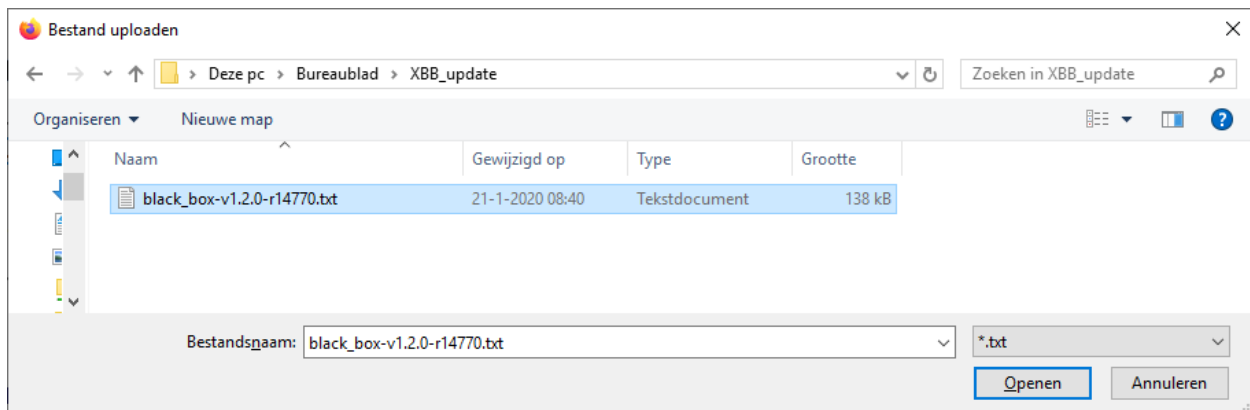


Figure 22 Firmware upgrade select file

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 23 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.**

3.3 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.

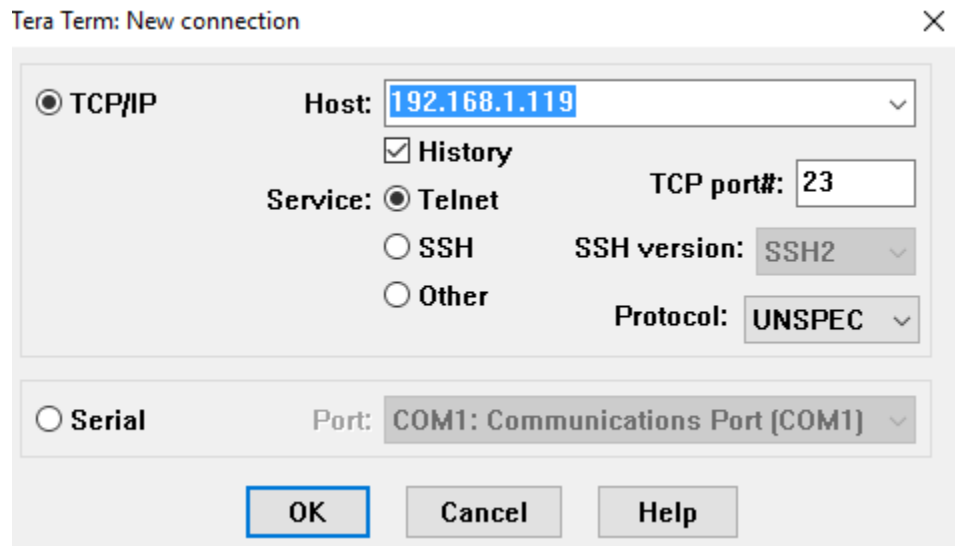
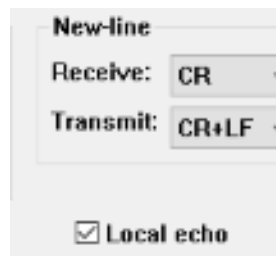


Figure 24 Telnet connection settings.

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

Figure 25 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	IP67			

[1] Environment has a big influence

4.2 Water and dust resistance

The Xtra.Black Box is rated as an IP65 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.