

DroneScout Bridge - Manual

November 2024 - version 1.0

Remote ID for drones



The latest version of this manual is located here:

https://download.bluemark.io/ds_bridge.pdf



Intended audience: users of the ds100/ds101 DroneScout Bridge

Disclaimer: we are not responsible or liable for errors or incomplete information in this document.

Version history

version	date	description
1.0	November 2024	● Initial release



QUICK START

DroneScout Bridge has several operation modes:

- wireless relay (default)
- receiver
- receiver USB

For receiver and receiver USB, see the remainder of this manual for setting up the device. The wireless relay mode is the default mode. In this mode, it receives RemoteID signals and wireless relays them in a format that your RemoteID app on your smartphone understands. In this mode DroneScout Bridge needs to be powered by a USB host device (smartphone, computer, USB power bank etc).

Power

- Connect the DroneScout Bridge to your USB power bank, smartphone or other USB-C host device that can power up the device.
- Once powered, a blue LED will be solid on.

Configuration

- After the DroneScout Bridge is powered, press the configuration button. The *blue* config LED is now flashing blue (on, off, on, off, ...).
- Connect to the DroneScout_Bridge WLAN network (no password needed)
- Point your browser to <http://192.168.50.1> or scan the QR code.



configuration web-page



Contents

Quick start	3
1 Introduction	5
1.1 Audience	5
1.2 Specifications	5
1.3 What's in the Box	7
1.4 Installation	8
1.5 Using DroneScout Bridge	10
1.6 Android/iOS app	10
1.7 Open Drone ID	11
2 Configuration	12
2.1 Configuration page	12
2.2 Firmware	15
3 Troubleshooting	16
4 Warranty	17
5 More information	18



1 INTRODUCTION

Thank you for purchasing and using DroneScout products!

The latest version of this user manual may be downloaded at the following link:

https://download.bluemark.io/ds_bridge.pdf

(Direct/Broadcast) Remote Identification (Remote ID) adds “beacon” capability to drones to broadcast basic information of airborne drones, such as the operator’s registration number, drone serial number and current position. The EU and USA have rules that make Remote ID mandatory for drones over 250 grams weight. The beacon information can be used by general public, law enforcement and drones to give better situation awareness of the airspace around them.

BlueMark Innovations BV offers Remote ID transponders and receivers. DroneScout Bridge ds100/ds101 is a small device that can receive RemoteID signals. It can output this information using Bluetooth, so your favorite RemoteID app on your smartphone can receive those. Not only can you increase the detection range, but also most smartphones don’t support receiving popular RemoteID signal methods such as WLAN Beacon. DroneScout Bridge will make those drones visible. The product can also output the detected drones on a serial interface (UART, MAVLink protocol). See <https://dronescout.co> for more information about our products.

1.1 Audience

This document is intended for users that want to use the *DroneScout Bridge ds100/ds101*. This can be users that want to use it to enhance RemoteID detection on their smartphones, or users that want to install the product on their drone and connect it to their flight controller to detect nearby drones. Finally, DroneScout bridge can also be used by DIY enthusiasts or system integrators that want to add RemoteID detection to their product/project.

1.2 Specifications

DroneScout bridge consists of an embedded system with a Bluetooth and WLAN radio interface to receive Remote ID signals.

Regulation

The DroneScout bridge is able to receive DRI/B-RID signals according to these technical standards:

region		
EU	ASD-STAN FprEN-4709-002:2023 (E) (Part 002: Direct Remote Identification)	June 2023
USA	ASTM, International (ASTM) F3586–22, with additions	July 2022



Key specifications:

- **Compliant with international regulations**
 - EU ASD-STAN DIN EN 4709-002:2023
 - USA ASTM Remote ID Standard ASTM F3411-22a-RID-B/ F3586-22
- Support for popular Remote ID transmission protocols:
 - BLE legacy
 - BLE long range
 - ~~WLAN NaN 2.4 GHz~~ (support planned by firmware upgrade)
 - WLAN Beacon 2.4 GHz
- Frequency bands
 - 2.4 GHz
 - ~~5 and 5.8 GHz~~ (hardware limitation)
- Detection range up to 1.5 km¹
 - Omni-directional antenna (IPEX3) with 3 dBi gain (ds100).
 - On-board PCB antenna with 3 dBi gain (ds101), detection range up to 1 km
- Connectors
 - USB-C
 - 2x JST SH connector 4-pin (3.3V Logic levels – ESD-protected)
- MAVLink protocol 2
 - ADS-B vehicle messages
 - OpenDroneID messages
- LEDS
 - 1x status LED
- Power
 - USB-C
 - 5 -15 V (JST SH connector)
 - power consumption (average): ~ 470 mW @ 5V
 - reverse polarity protection
 - voltage peak protection
- Dimensions (l x w x h):
 - 42 x 14 x 4 mm (ds100)
 - 46 x 14 x 4 mm (ds101)
- Operating temperature
 - -20°C to +85°C
- Weight:
 - 3.5 gram (ds100)
 - 2.5 gram (ds101)
- Mounting
 - M2 mounting hole



¹ The detection range depends on several factors such as the receiver antenna gain, transmission protocol, weather conditions, flying height, receiver height line of sight etc. Non-compliant RemoteID transponders have typically much less detection range. ■ ■ ■ ■



Figure 1 - DroneScout Bridge ds100 (left) and ds101 (right)

1.3 What's in the Box

The following package contents should be present:

- 1x ds100 or ds101 DroneScout Bridge including external IPEX3 WLAN/Bluetooth antenna (ds100)



1.4 Installation

DroneScout Bridge has several operation modes:

- wireless relay (default)
- receiver
- receiver USB

wireless relay mode

In this mode, the DroneScout bridge will receive RemotelD signals and will rebroadcast them (wireless relay) in a format that the smartphone can detect. The transmit power is low (-24 dBm), range is less than 25 meters.

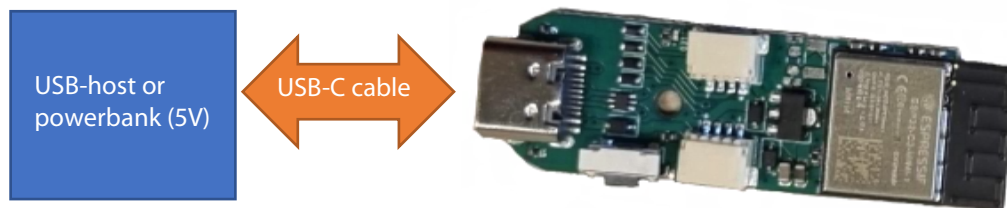


Figure 2 - Connect an USB-C cable to DroneScout Bridge to power the device.

Connect a USB-C cable to the DroneScout Bridge and power it by an USB power bank, your phone or other USB host device. Once it receives, power, a blue LED will be on.

receiver mode

In this mode, the DroneScout bridge will receive RemotelD signals and will output this information on the *UART OUT* interface. Connect the DroneScout Bridge using the *UART OUT* connector to the flight controller. On the back each pin is described. The baud rate is 115200 and it uses MAVLink version 2 messages. The device can output signals using ADSB vehicle messages (https://mavlink.io/en/messages/common.html#ADSB_VEHICLE) or OpenDroneID message pack format (https://mavlink.io/en/messages/common.html#OPEN_DRONE_ID_MESSAGE_PACK). A blue LED will be on if the device has power.

Wiring

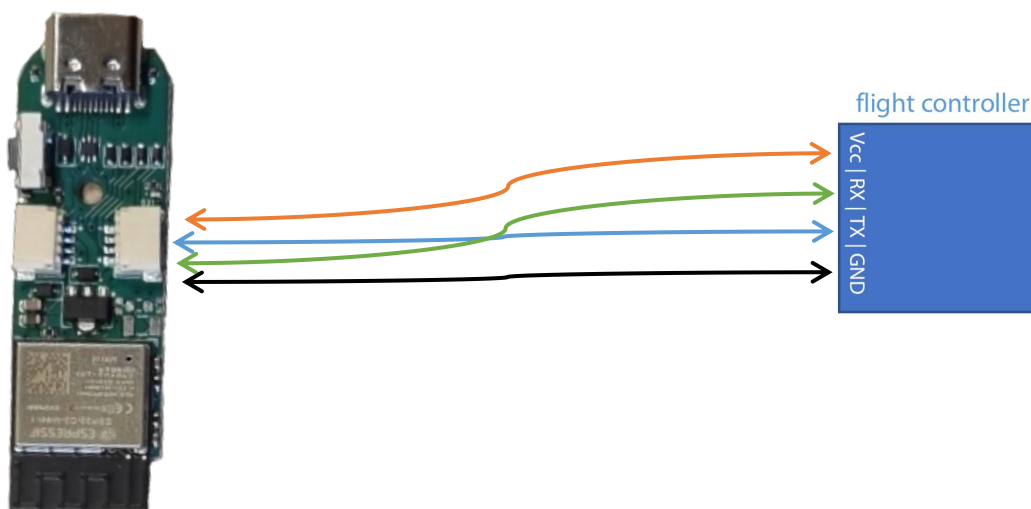


Figure 3 - Connect a 4-pin JST-SH between flight controller and DroneScout Bridge using this wiring scheme



receiver USB mode

In this mode, the DroneScout bridge will receive RemotelD signals and will output this information using the *USB-C* interface. The USB host device will detect a serial interface, typically `/dev/ttyACM0`. The baud rate is 115200 and it uses MAVLink version 2 messages. The device can output signals using ADSB vehicle messages (https://mavlink.io/en/messages/common.html#ADSB_VEHICLE) or OpenDroneID message pack format (https://mavlink.io/en/messages/common.html#OPEN_DRONE_ID_MESSAGE_PACK). A blue LED will be on if the device has power.

Note: due a hardware limitation, receiver USB mode can only output information to the USB host device.

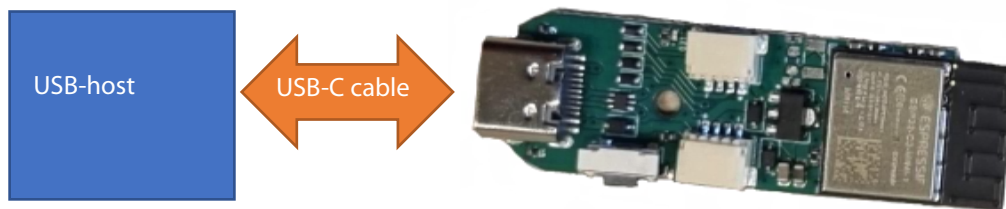


Figure 4 - Connect a USB-C cable to DroneScout Bridge to power and receive RemotelD messages

multiple cascaded DroneScout Bridge devices

DroneScout Bridge devices can be connected in the receiver and receiver USB mode. Multiple DroneScout Bridge devices can increase the RemotelD detection performance. For instance by configuring one device to Bluetooth detection, the other one to WLAN detection at channel 6 etc. Connect a 4-pin JST-SH cable between the *OUT UART* port of device #1 and *IN UART port* of device #2. Device #2 will receive the RemotelD detection data from device #1 and will forward it to the *OUT UART* port (or USB-C)

To be extended.

Example source code

To receive and display MAVLink messages of DroneScout Bridge, we provide source code (C and Python).

<https://github.com/BluemarkInnovations/RemotelD-DroneScout-Bridge-C>

<https://github.com/BluemarkInnovations/RemotelD-DroneScout-Bridge-Python>

Antenna

- Install the external ds100 antenna vertical (+/- 15 degrees) for optimal performance.
- Install the ds101 with internal antenna in the horizontal plane.
- The antennas should not be obstructed by nearby metal objects.

ds100 vs ds101 antenna.

The onboard antenna of the ds101 is not omni-directional if it is operated stand-alone. At certain angles, the detection range (gain) is much less. See this document for the ds101 antenna diagram <https://www.ti.com/lit/an/swra117d/swra117d.pdf> The document also states that if such antenna device is connected to a device (like laptop), the antenna pattern will be different (more omni-directional).

On the other hand, the ds100 antenna is omni-directional by design.



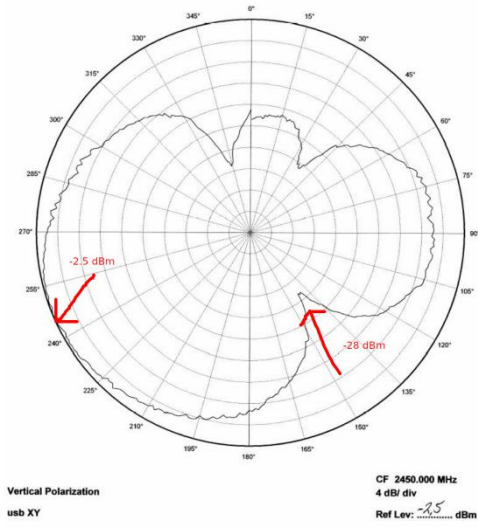


Figure 7: USB Dongle XY Plane

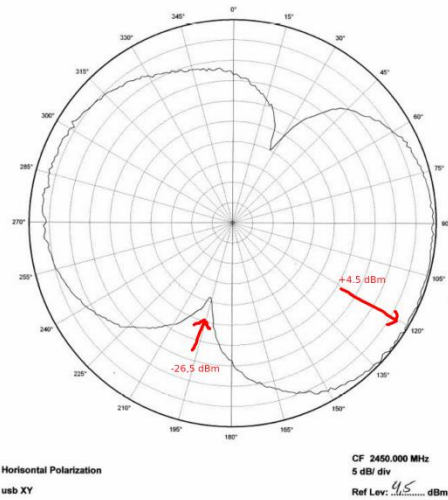


Figure 8: USB Dongle XY Plane

Figure 5 - Antenna pattern of the ds101 (stand-alone setup) source: <https://www.ti.com/lit/an/swra117d/swra117d.pdf>

1.5 Using DroneScout Bridge

- Install the device using section 1.4
- Wait for the blue LED to be permanently on.
- DroneScout Bridge detects nearby RemoteID devices. (Default configuration.)

If you use DroneScout Bridge as wireless relay, see section 1.6 for Android/iOS apps that can be used for RemoteID detection.

If you are connecting it to a flight controller and use ADSB vehicle output format, see this ArduPilot page: <https://ardupilot.org/copter/docs/common-ads-b-receiver.html> and this PX4 page: https://docs.px4.io/main/en/peripherals/adsb_flarm.html

to be extended.

Status LED

The blue LED can have the following states:

- permanent on: detects nearby RemoteID signals
- flashing: the device is in configuration mode (see the next Chapter)

1.6 Android/iOS app

You can use the free *OpenDroneID OSM* Android app to view the Remote ID signals: https://play.google.com/store/apps/details?id=org.opendroneid.android_osm

Or the Drone Scanner Android app: <https://play.google.com/store/apps/details?id=cz.dronetag.dronesScanner>

iOS

The Drone Scanner app is also available for iOS. <https://apps.apple.com/gb/app/drone-scanner/id1644548782>



1.7 Open Drone ID

DroneScout Bridge uses the Open Drone ID framework to receive and wireless relay Remote ID signals. The framework can be found on this page: <https://www.opendroneid.org/>



2 CONFIGURATION

The DroneScout Bridge be configured via a web-interface. To active the configuration mode follow these steps:

- Power on the DroneScout Bridge (*blue* LED is on).
- Press the configuration button, the *blue* LED is slowly flashing.
- Connect to *DroneScout_Bridge* WLAN network (no password needed)
- Point your browser to <http://192.168.50.1>

New settings will only be applied if the Save button is pressed!

Configuration mode will be exited, by pressing the button again.
The *blue* configuration LED is now permanently on. The device is now in normal operation mode again.



configuration web-page

2.1 Configuration page

After connecting to <http://192.168.50.1> the page in Figure 5 appears.

It has several settings.

Operation

- *mode*: select the operation mode: wireless relay (default), receiver or receiver USB
- *blacklist serial number*: typically your own UAV also transmits RemotelD signals. Enter the RemotelD Serial Number to remove these signals from the output.

Reception

- *RemotelD type*: select which RemotelD technologies you want to receive: Bluetooth, WLAN or all (default, Bluetooth and WLAN)
- *WLAN scanning strategy*: RemotelD signals are typically broadcast on channel 6, but the standard (and some drones) use other channels in the 2.4 GHz. As there is one radio that can listen only to one WLAN channel, a scanning strategy is needed. All 2.4 GHz channels, scans all WLAN channels regardless if a RemotelD signal is found. In the strategy balanced (default), the device will scan/hop all channels. However, if a RID signal is found, it will allocate most radio time (70%) to track that RID signal and the other time it will scan other channels and technologies for other RID signals/drones. Follow mode, is similar to balanced, only in this case, it will only track the RID signal and won't dedicate time to scan/hop to other technologies/channels. Follow mode will give more detections of the found/tracked RID signal as it dedicates all radio time to detect this signal. The data refresh rate in the "all 2.4 GHz channels" will be typically low, every 5 to 10 seconds as you won't receive the RemotelD signal when the device is tuned to other channels. The strategy balanced will typically give every 1 to 2 seconds new data if a drone with RemotelD is within range.
- *WLAN channel scanning range*: different regions in the world allow a different set of WLAN channels in the 2.4 GHz. In the USA, only channel 1 to 11 is allowed. In Europe channel 13 is allowed too and in Japan channel 14. Select start WLAN channel and stop channel. Default it is channel 1 to 11. If you only want to scan a particular channel, set start and stop both to that channel. For instance both to 6, in order to scan only to WLAN channel 6.



- *Insert self ID message*: this setting only works in wireless relay mode. In this mode, the DroneScout Bridge will insert/broadcast an extra selfID message with information about the detection signal: RSSI, transmission mode. You will see this information in the RemotelD app of your phone.
- *Bluetooth legacy detection*: Bluetooth legacy is an optional/extra mode in the RemotelD. Most smartphones can only receive this mode. Bluetooth Long Range has a larger communication range. Untick this setting, to disable Bluetooth legacy detection

Output

These settings only apply if the device is in receiver or receiver USB mode.

- *Message type*: select the MAVLink output format. DroneScout Bridge can output data using the ADSB_VEHICLE message or using OPEN_DRONE_ID_MESSAGE_PACK.
- *Mavlink System Id*: Enter the MAVLink System ID, default 254. Only change if you connect it to a flight controller and need advanced configuration. DroneScout Bridge uses component ID: MAV_COMP_ID_ODID_TXRX_1

self ID message and RemotelD compliance basic checks

When the “*Insert self ID message*” is ticked, DroneScout Bridge will insert a SelfID message in wireless bridge mode.

Messages can be:

DS WIFI B <RSSI> dBm addon

DS WIFI B <RSSI> dBm drone

Here, <RSSI> means the detected signal strength of the RemotelD signal by DroneScout Bridge. In the USA newly produced drones should return the value “drone” and RemotelD add-on devices “add-on”. For other regions, there is not such difference. Here, a newly produced drone can also be classified as add-on device. If the signal is WLAN Beacon, the self message contains *WiFi B*. If it is Bluetooth Long Range, it will be *BT5* instead. *DS* means DroneScout Bridge to indicate the signal is wireless relayed.

If the RemotelD signals has not a GNSS fix, the SelfID message will be *DS WIFI B <RSSI> grounded*

10x RemotelD compliance basic checks

DroneScout Bridge will perform basic checks on the detected RemotelD signal to check if the signal complies to the RemotelD standards. Note, this is a beta-function. RemotelD technical standards and compliance documents contains more than 50 pages with a lot of requirements. DroneScout Bridge will only check the signal (bit stream) for *10 items*. To be more specific: BMG0090, BMG0100, BMG0190, BMG0200, BB50010, BB50030 of ASTM F3411-22a. Basically, is the Serial Number compliant, does the signal have both drone and pilot location and in the European region, does the operatorID meet the basic requirements?

It means that if DroneScout Bridge detects no errors, the device can still be non-compliant.

On the other hand, if DroneScout Bridge detects compliance errors, very likely the drone/add-on is non-compliant. We use the word “very likely” here, because our firmware may have bugs for assessing compliance. In doubt, contact the reseller or manufacturer of the RemotelD equipment (add-on/drone). They need to be able to show certificates of external audits that proof compliance.

If a RemotelD signal has RemotelD errors, the self-ID message will be:

non-compl <errors> DS WIB <RSSI>

where errors is the number of detected errors and RSSI the signal strength of the RemotelD signal.



DroneScout bridge

firmware: 20240421-1926
Serial Number: 123AA

General

Firmware

operation

mode:

Configure what DroneScout bridge should do. Receive RemoteID signals and rebroadcast them as Bluetooth legacy signals (wireless relay; default). Receive RemoteID signals and output them using UART (receiver) to the OUT connector. Or output it to the USB serial interface (receiver USB).

Blacklist serial number:
Enter a serial number to blacklist it from the detection results. This is useful to suppress the RemoteID transmissions of your own drone.

reception

RemoteID type:

Configure what RemoteID signals DroneScout bridge should receive. Most users want to receive all possible signals (Bluetooth, WLAN).

WLAN scanning strategy:

Configure the WLAN scanning strategy. All 2.4 GHz channels means that the device will continuously hop to a different channel. In balanced mode, the device will scan/hop all channels. If a RemoteID signal is found, it will allocate most radio time (70%) to track that RemoteID signal and the other time it will scan other channels and technologies for other RemoteID signals/drones. Follow mode, is similar to balanced, only in this case, it will only track the RemoteID signal and won't dedicate time to scan/hop to other technologies/channels. Follow mode will give more detections of the found/tracked RemoteID signal as it dedicates all radio time to detect this signal.

WLAN channel scanning range
start:
stop:

Advanced setting: configure the range of WLAN channels that will be scanned.

Insert self ID message:

Advanced setting: if enabled, the device will insert/override (in wireless relay mode) a so-called RemoteID self ID message for the detected RemoteID signal to indicate that the RemoteID signal is retransmitted.

Bluetooth legacy detection:

Advanced setting: if enabled, the device will also listen for Bluetooth legacy messages. (Most smartphones can already detect RemoteID messages in Bluetooth legacy format.)

output

Message:

If the receiver is in UART not USB mode, it will output RemoteID detections on a serial interface. This setting determines if the output should be MAVLink OpenDroneID message pack format or MAVLink ADS-B format instead.

MAVLink System Id:
Enter the MAVLink System Id, default 254

Save

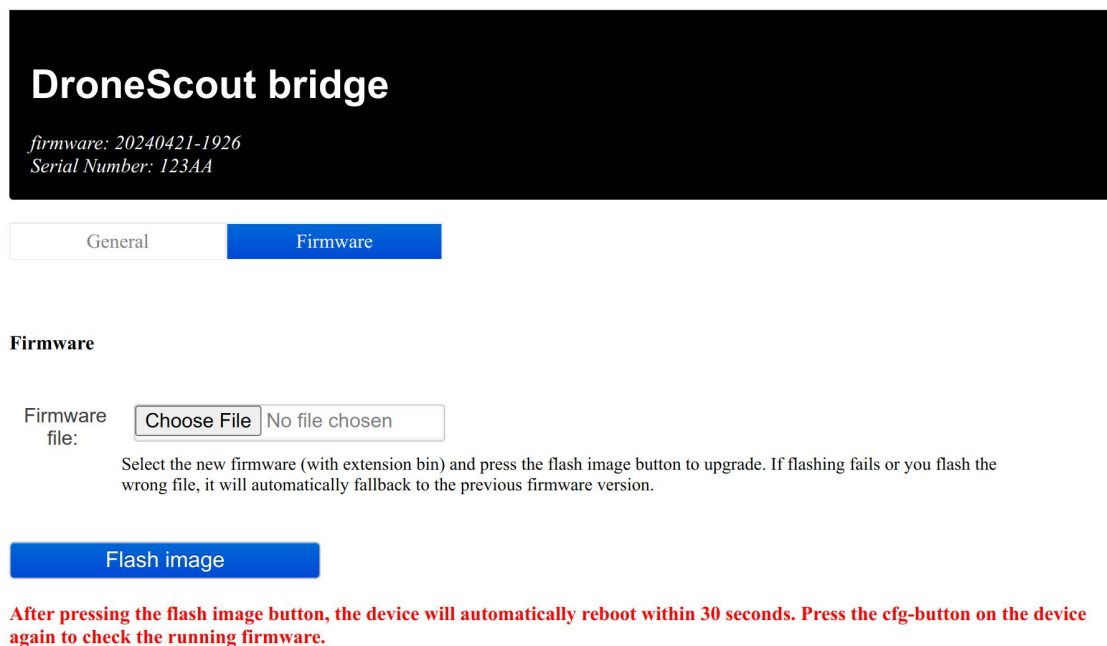
Figure 6 - configuration page

2.2 Firmware

In the firmware tab, you can upgrade the firmware of the DroneScout Bridge.

Firmware files can be found here: <https://dronescout.co/downloads/>

Upload the file and press Flash image to upload new firmware. Upgrading firmware has been tested with Chrome and Firefox. If upgrade fails, please try again or try another browser.



DroneScout bridge

firmware: 20240421-1926
Serial Number: 123AA

General Firmware

Firmware

Firmware file: No file chosen

Select the new firmware (with extension bin) and press the flash image button to upgrade. If flashing fails or you flash the wrong file, it will automatically fallback to the previous firmware version.

After pressing the flash image button, the device will automatically reboot within 30 seconds. Press the cfg-button on the device again to check the running firmware.

Figure 7 - Firmware upgrade page



3 TROUBLESHOOTING

The blue LED is not solid on

If the power supply for the DroneScout Bridge is not powerful enough, the device won't boot. In that case the LED will flicker. Solution: use a better power supply. Also, make sure the configuration button is not pressed when the device boots up; it would prevent starting the firmware. Finally, if the configuration button is pressed during normal operation, it will go to configuration mode. Press it again to exit to normal mode.

How can I increase the detection range?

The short answer is to use a better antenna for the ds100. The antenna of the ds100 has 3 dBi gain. Antennas with better gain will increase the detection range. As a rule of thumb, an increase of 6 dBi in gain will double the detection range.

My drone is not detected?

This can have different causes. First, the drone could not broadcast any RemotelD signals at all. For instance, in the EU legacy drones don't need to broadcast this signal, if they fly outside urban areas. Drones with weight less than 250 gram typically don't have this RemotelD requirement. Also, DroneScout Bridge ds100/ds101 support only detection of RemotelD signals in the 2.4 GHz band. Some drone manufacturers like Skydio use the 5 GHz band for RemotelD signals. DJI drones typically broadcast signals in the 2.4 GHz, but in some (less common) cases, it can broadcast in the 5 GHz. RemotelD signals in the 5 GHz can not be detected by DroneScout Bridge. In the first half of 2025 we intend to launch a dual-band version of DroneScout Bridge. (We need to wait for a specific chip to be available.)



4 WARRANTY

The product has a two-year warranty period, starting at the date of receiving the product. Outside warranty are issues like crash damage, improper use, (extreme) weather conditions that damages the product. The product is eligible for future firmware updates as described in the section 2.2 firmware.

Warranty Service

Please email or call us first with a description of the problem. Typically, the customer is responsible for transportation costs to our office. For post-warranty cases contact us too; we will try to do our best to find a solution.



5 MORE INFORMATION

If you need more information, please contact us at info@bluemark.io or by phone: +31 53 711 2104.

All contact information can be found at the *DroneScout* contact page:
<https://dronescout.co/contact/>

Postal address:

BlueMark Innovations BV
Bruggenmorsweg 10
7521ZV Enschede
the Netherlands

