CURRENT EDITION



2E0LXY FIELD GUIDE

OPERATION MANUAL

ADS-B / MLAT + MARINE AIS

Installation - configuration - live display - recovery

README-aligned firmware guide

Includes current Map, Radar, Table, Aggregator, own-feed and Marine AIS workings with current product artwork and real display photographs.

CURRENT EDITION

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SECTION 00

What the receiver is

The ESP32 display is a small computer with a screen. It connects to Wi-Fi, asks an aircraft-data service for nearby aircraft, and shows them on its screen and web page.

- **ADS-B** is a radio message many aircraft send. It normally includes position, height, speed and identity.

- **MLAT** is a calculated position. Several ground stations hear the same aircraft and work out where it is.

- **A feed** is a website or service that supplies aircraft positions.

- **An API key** is like a private ticket that lets the display use a service.

- **The local admin page** is the receiver's own settings page on your home network.

- **The Aggregator** is the optional 2E0LXY website that can serve many displays from a shared cache and add route information.

Part	What it means
The ESP32 screen	The physical wall/table display.
Your home Wi-Fi	How the screen reaches the internet.
Aircraft provider	The source of aircraft positions.
Browser admin page	The settings and live map page on the receiver.
Aggregator account	The online dashboard for API keys, own feeds and share links.

Questions you may have

Question while doing this	Plain answer
Do I need to understand aircraft radios?	No. You only need to know that the receiver asks a data source for nearby aircraft and then displays them.
Does the screen receive aircraft by itself?	It shows aircraft from the selected data source. If you also run a physical receiver, that can feed your own aircraft into
What is the most beginner-friendly setup?	Use Wi-Fi, set the receiver location, then choose the 2E0LXY Aggregator as the aircraft provider.

SECTION 01

Before you start

Have these items ready before installing or changing anything.

You need	Why
ESP32-S3 display board	This is the screen that runs the firmware.
Data-capable USB cable	Some USB cables only charge and cannot install firmware.
Desktop Chrome or Edge	The USB installer needs Web Serial, which phone browsers usually do not provide.
2.4 GHz Wi-Fi name and password	ESP32 Wi-Fi normally uses 2.4 GHz, not 5 GHz only networks.
Receiver location	Latitude and longitude let the map and distance figures make sense.
Provider/API details	Some aircraft and marine feeds need a key or login.

- Do the first setup near your Wi-Fi router if possible.

- Do not write passwords or API keys into the printed manual.

- Keep the receiver on your normal private network, not a public guest network.

- For product photos, sales information and the public receiver page, use https://2e0lxy.uk/adsb/7-inch-ESP32-S3-ADSB-MLAT-Receiver-site/index.html.

Questions you may have

Question while doing this	Plain answer
Which USB cable should I use?	Use a cable that can transfer data. If the computer only charges the board and never detects it, try another cable.
Why do I need my location?	The receiver uses latitude and longitude to know what aircraft are nearby and how far away they are.
Should I set everything up before mounting it?	Yes. Install firmware, join Wi-Fi, check the web page, then mount the screen once it is working.

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SECTION 02

Install over USB

Use this for a new display or a complete recovery install. It writes the factory image to the ESP32.



1. Open **https://2e0lxy.github.io/ESP32-ADS-B/** in desktop Chrome or Microsoft Edge.
2. Plug the ESP32 into the computer with a data USB cable.
3. Press **Connect and install firmware**.
4. When the browser lists USB devices, choose the Espressif or USB/JTAG device.
5. Let the install finish. Do not unplug the board while it is writing.
6. Restart the receiver when the installer says it is complete.

- A factory install clears saved Wi-Fi, API keys, location, zoom, display mode and admin password.
- For normal upgrades later, use the receiver's Firmware page instead. That keeps your settings.

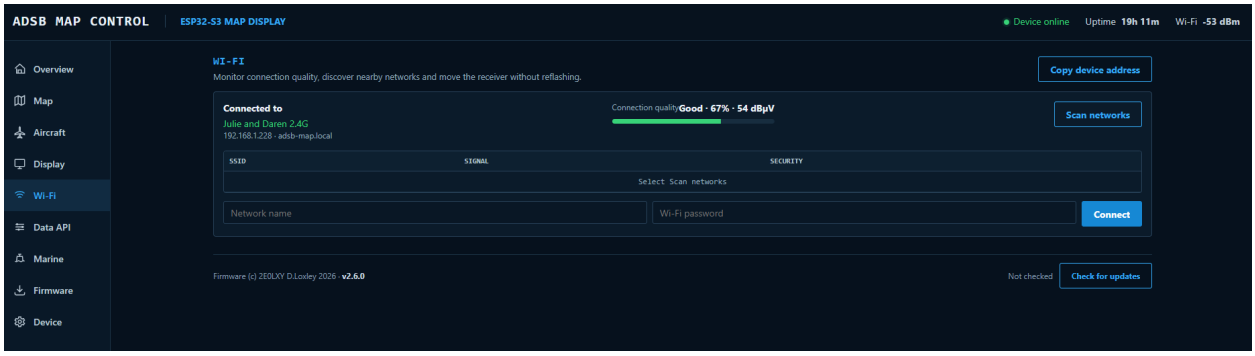
Questions you may have

Question while doing this	Plain answer
What should happen after installing?	The board restarts. If it has no saved Wi-Fi, it shows or creates the ADSB_WIFI setup network.
What if the browser cannot see the board?	Use desktop Chrome or Edge, plug directly into the computer, and try a different data cable or USB port.
Should I use this every time there is an update?	No. Use USB for first install or recovery. Use the Firmware page for normal updates.

SECTION 03

First Wi-Fi setup

When the receiver has no saved Wi-Fi, it creates its own temporary setup network called ADSB_WIFI.



1. On your phone or computer, open Wi-Fi settings.

2. Join the network called **ADSB_WIFI**. It is open and has no password.

3. If a setup page does not open by itself, go to **http://192.168.4.1/**.

4. Press scan or choose your home Wi-Fi from the list.

5. Enter the Wi-Fi password carefully.

6. Wait for the ESP32 screen to show its normal network address.

7. Reconnect your phone or computer back to your normal Wi-Fi.

- The normal address will look something like http://192.168.1.xxx/.

- You can also try http://adsb-map.local/ if your network supports mDNS local names.

- On Windows, http://adsb-map.local/ may only work if Bonjour/mDNS support is installed. If it does not open, use the numbered IP address shown on the receiver screen.

- If you typed the Wi-Fi details incorrectly, the receiver will return to its previous working network when it can.

Questions you may have

Question while doing this	Plain answer
Why can I not see my Wi-Fi?	Many ESP32 boards use 2.4 GHz Wi-Fi. If your router separates 2.4 GHz and 5 GHz, choose the 2.4 GHz network.
What if the setup page closes?	Reconnect to your normal Wi-Fi, look at the address on the receiver screen, then open that address in a browser.
What if I changed router?	Use the setup portal again and enter the new network details.

SECTION 04

First login and password

Once the receiver is on your normal Wi-Fi, open the address shown on the LCD screen.

Setting	Initial value
Username	admin
Password	aircraft
Where to change it	Device page
Minimum password length	8 characters

1. Open the receiver address in a browser.
2. Sign in with username **admin** and password **aircraft**.
3. Open the **Device** page.
4. Enter a new password that you will remember.
5. Save it. The browser may ask you to sign in again.

- The local admin page is meant for your private home network.
- The diagnostic file does not include Wi-Fi passwords, API secrets or the admin password.

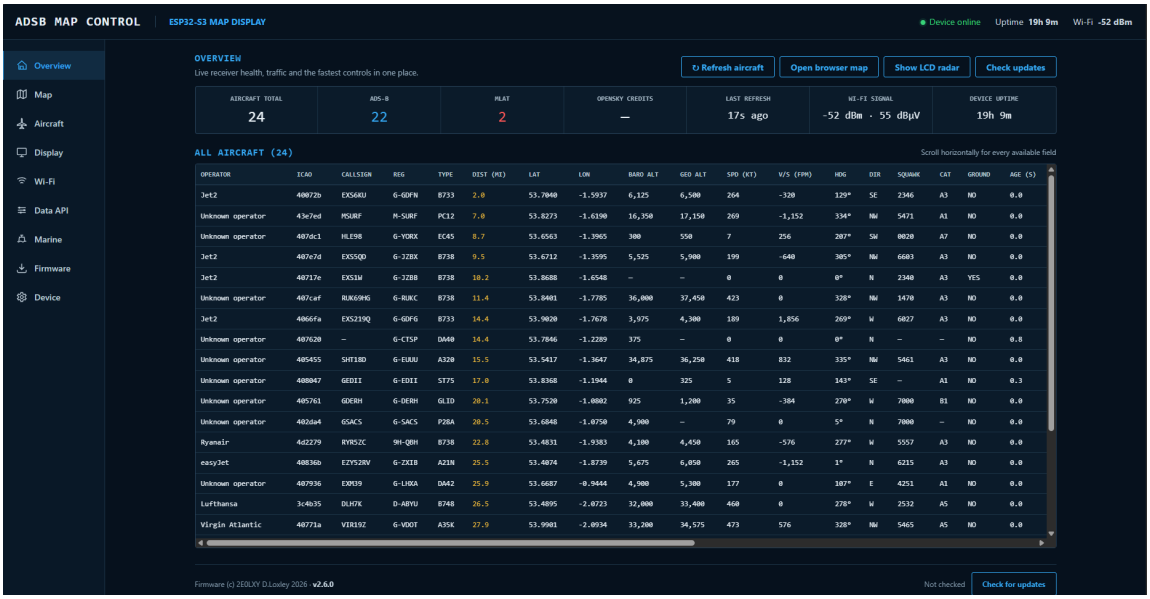
Questions you may have

Question while doing this	Plain answer
Why change the password?	The default password is only for first setup. A personal password keeps the local settings page under your control.
What if I forget it?	Use the USB factory installer to reset the receiver, then set it up again.
Does this password log into the Aggregator?	No. This password is only for the receiver's own local web page.

SECTION 05

Overview page

Overview is the main dashboard. Start here when you want to know whether the receiver is working and what aircraft it can see.



Area	What it tells you
Aircraft total	How many aircraft are currently in the list.
ADS-B / MLAT	How many came from each type of position source.
Last refresh	How long since the last aircraft update.
Wi-Fi signal	How strong the receiver's Wi-Fi signal is.
Uptime	How long the receiver has been running since its last restart.
Aircraft table	The full list of aircraft and details.

- Press **Refresh aircraft** to ask for a new update now.
- Press **Open browser map** to see aircraft on the map.
- Press **Show LCD radar** to put the physical screen into radar mode.
- Press **Check updates** to ask GitHub whether newer firmware is available.

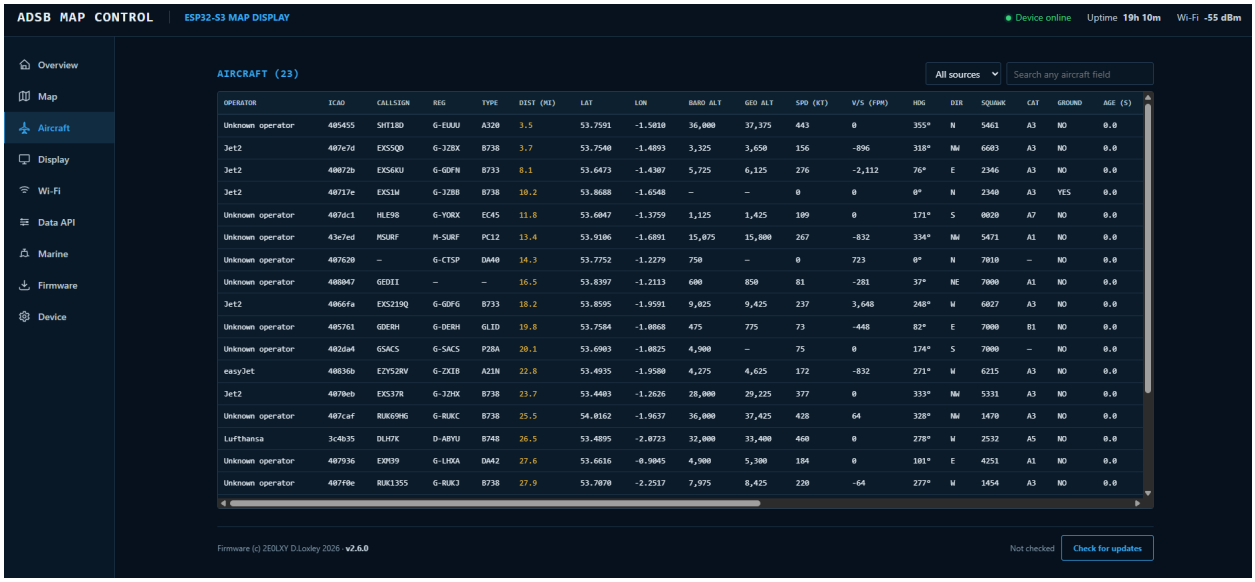
Questions you may have

Question while doing this	Plain answer
How many aircraft should I expect?	That depends on your location, radius, provider and time of day. A larger radius usually shows more aircraft.
What does a recent refresh mean?	It means the receiver is successfully asking for fresh aircraft data.
What if nothing appears?	Open Data API, check the selected provider, press the refresh/test button, and confirm the receiver location is sensib

SECTION 06

Aircraft table

The Aircraft page is the detailed aircraft list. Use it when you want to search, compare or identify aircraft.



- Search by callsign, registration, ICAO hex, operator or route.
- Use the source filter to show all aircraft, ADS-B only, or MLAT only.
- Click an aircraft row to open the Map page and follow that aircraft.
- Operator shows the airline or operator when it can be worked out.
- FROM TO shows the route when route information is available.
- Emergency squawks are highlighted so they are not missed.

Column	Plain-English meaning
ICAO	The aircraft's unique hex identity.
Callsign	The flight identity, often shown by air traffic control.
REG	Aircraft registration painted on the aircraft.
BARO / GEO ALT	Height from pressure and height from satellite/source data.
SPD / HDG	Speed and direction of travel.
AGE	How fresh the last message is.

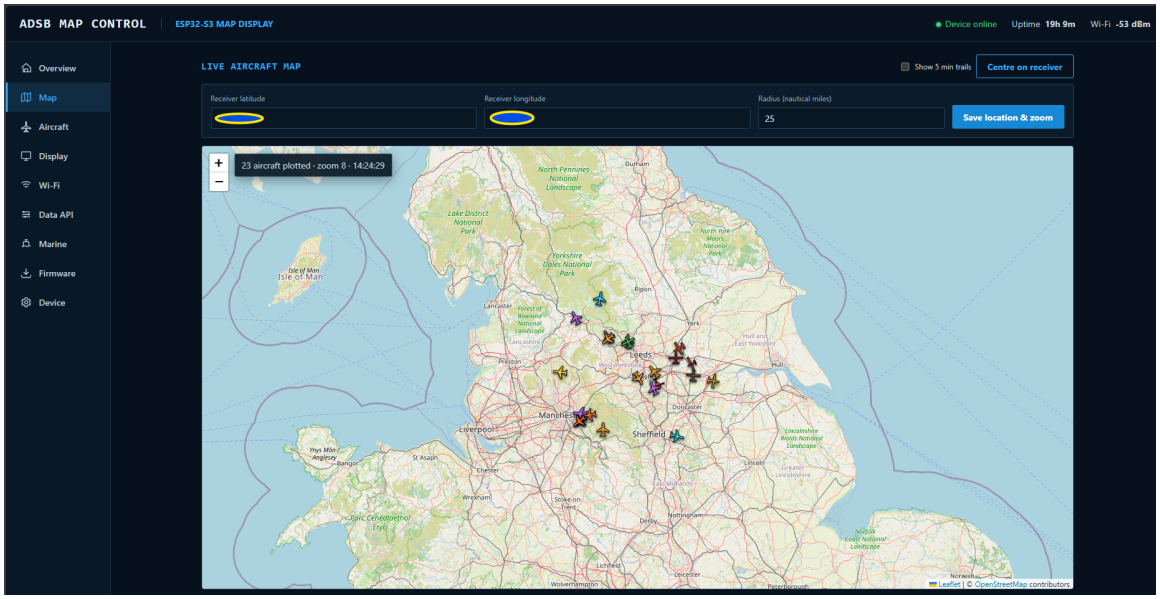
Questions you may have

Question while doing this	Plain answer
Why are some operators unknown?	Not every aircraft has a known airline or owner in the lookup data. The aircraft can still be tracked normally.
Why does AGE matter?	A low age means the position is fresh. A higher age means the aircraft has not updated recently.
Why are some rows MLAT?	MLAT positions are calculated by receivers hearing the same aircraft. They may update differently from ADS-B positi

SECTION 07

Map page

The Map page shows aircraft over an OpenStreetMap background and saves the receiver position and range.



1. Enter the receiver latitude.
2. Enter the receiver longitude.
3. Enter the radius in nautical miles. A small radius is faster and less busy.
4. Move and zoom the browser map until it looks right.
5. Press **Save location and zoom**.

- The same position and radius are used for the LCD map, provider requests and distance calculations.
- Turn on **Show 5 min trails** to draw where aircraft have just been.
- Click a marker to see the aircraft details.
- OpenStreetMap tiles can be cached on microSD when one is fitted.

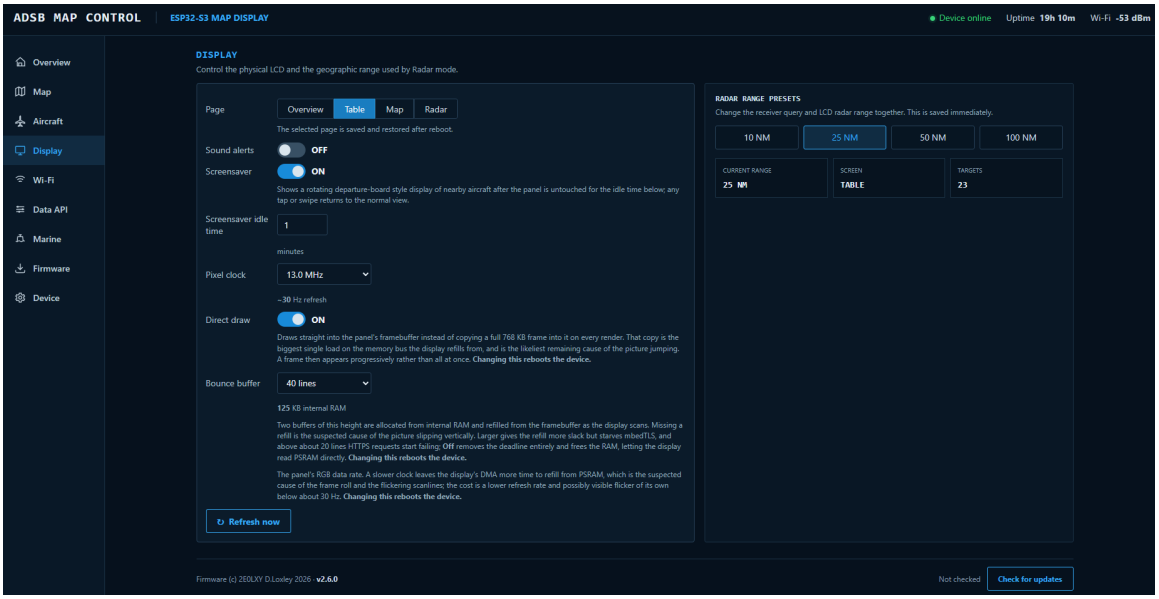
Questions you may have

Question while doing this	Plain answer
What radius should I choose?	Start with 25 nautical miles for a local display. Use 50 or 100 nautical miles if you want a wider view.
Why does the map need saving?	Saving stores the receiver location and zoom so the browser map and physical screen come back the same way late
What if the map opens in the wrong area?	Enter the correct latitude and longitude, press save, then centre the map again.

SECTION 08

Physical screen pages

The receiver can show several pages without leaving a browser open. On touch boards, swipe left or right to move between pages.



Screen page	What it is for
Overview	A quick home screen with a small map and nearest-aircraft list.
Table	A departure-board style aircraft list.
Map	Aircraft on a geographic map.
Radar	A simple radar-style view with range rings.
Marine	AIS vessel positions when Marine is configured.
Screensaver	A quiet idle page showing nearby aircraft in a departure-board style.

- The selected page is saved and restored after restart.
- The 480 x 480 board uses the small square layout.
- The 7-inch and 4.3-inch boards use the 800 x 480 touch layout.
- Brightness depends on the board hardware. Some boards are on/off rather than smooth dimming.

Questions you may have

Question while doing this	Plain answer
How do I change what the physical screen shows?	Use the Display page in the web interface, or swipe on touch boards when the firmware supports it.
Which page is best for daily use?	Overview is best for a quick glance. Table is best for a wall display. Radar is best for a simple aircraft view.
Will the page choice survive restart?	Yes. The selected physical screen page is saved and restored after reboot.

SECTION 09

Display settings explained

These settings are for the physical screen. Most users can leave them alone, but they are useful when tuning an 800 x 480 panel.

Setting	Simple explanation	Beginner advice
Page	Which screen the physical display shows.	Choose the view you like.
Sound alerts	Small buzzer alert for the configured aircraft alert.	Turn on only if you want a sound.
Screensaver	Shows a quiet aircraft information page after no touch input.	Useful for a wall display.
Pixel clock	How fast the screen is driven.	Leave default unless testing.
Bounce buffer	A memory buffer used while drawing the screen.	Leave default unless testing.
Direct draw	Draws directly to the screen memory.	Only change if you are deliberately tuning display behaviour.

- If you are unsure, leave pixel clock, bounce buffer and direct draw at the default values.

- Changing some display settings needs a reboot. The web page will tell you before it does that.

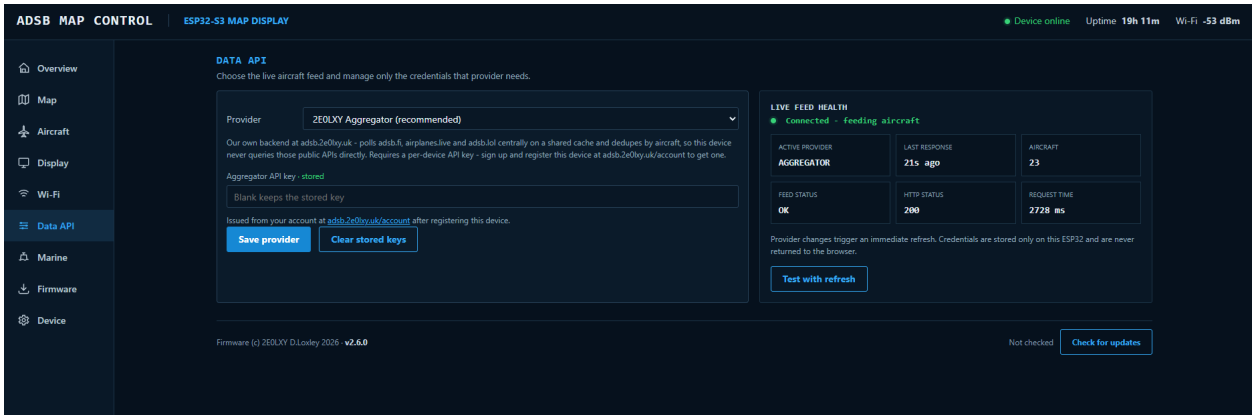
Questions you may have

Question while doing this	Plain answer
Why would I change these settings?	Only change them if you are tuning a display that flickers, draws slowly or behaves oddly.
What is the safest beginner choice?	Leave the defaults, choose your preferred page, and only change the screensaver and sound alert options.
What if I make the display awkward to use?	Open the web interface again and return the settings to their normal values.

SECTION 10

Choose an aircraft data source

Open Data API to choose where aircraft positions come from. After saving a provider, press refresh/test and check that aircraft appear.



Provider	Needs key?	Best use
2E0LXY Aggregator	Yes	Recommended for easy setup, route names and shared backend data.
OpenSky Network	Optional	Can work without credentials, but account details can improve access.
adsb.fi	No	Simple open-data aircraft source.
airplanes.live	No	Community aircraft data source.
adsb.lol	No	Open aircraft data source with permissive use terms.
ADSB One	No	Extra compatible aircraft source.
ADS-B Exchange / RapidAPI	Yes	Use only if you have the RapidAPI subscription/key.
FlyItalyADSB	Yes	Useful European community source with a free issued key.

- If a provider does not need a key, leave the key boxes blank.

- If a provider does need a key, copy it exactly. Extra spaces at the start or end can stop it working.

- The receiver stores keys privately and does not show them back to you later.

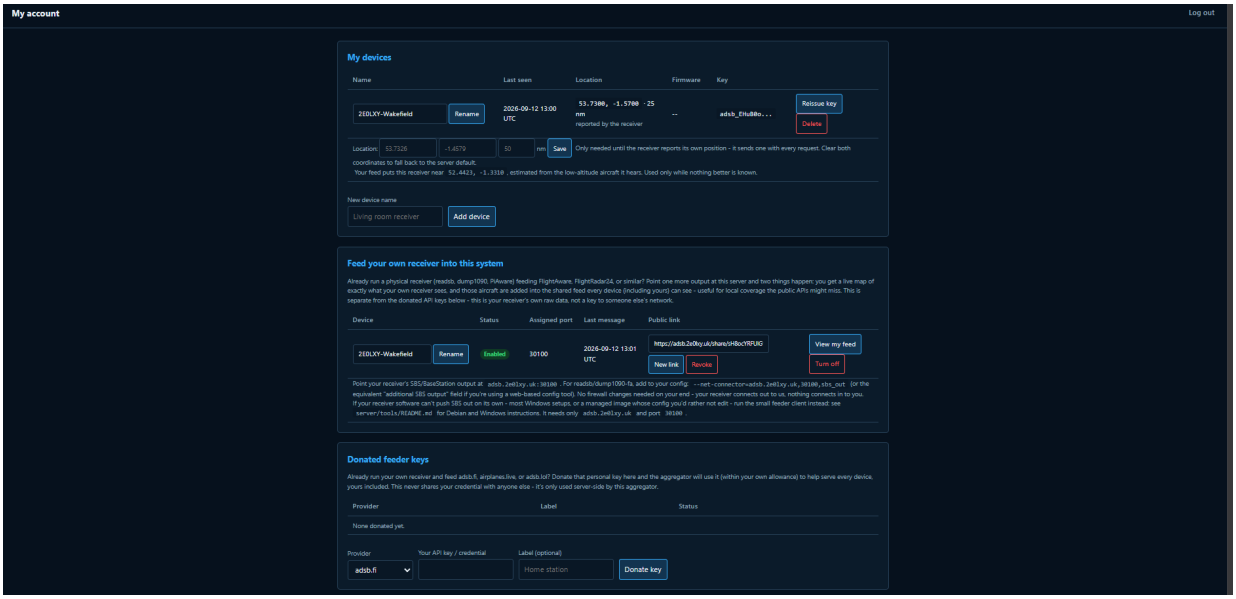
Questions you may have

Question while doing this	Plain answer
Which provider should I choose first?	Choose 2E0LXY Aggregator for the easiest setup and route information.
Why are there several providers?	They give the receiver backup choices and let users pick the service that best suits their location and account.
What if a provider stops showing aircraft?	Choose another provider or use the Aggregator, then press refresh/test to confirm aircraft return.

SECTION 11

Using the 2E0LXY Aggregator

The Aggregator is the easiest route for most users. It provides a single aircraft feed for the ESP32 and can add route information before the data reaches the display. New users start at https://adsb.2e0lxy.uk/signup. Existing users sign in at https://adsb.2e0lxy.uk/login.



1. If you do not already have an Aggregator account, go to **https://adsb.2e0lxy.uk/signup**.
2. If you already have an account, go to **https://adsb.2e0lxy.uk/login**.
3. After signing in, the account dashboard is at **https://adsb.2e0lxy.uk/account**.
4. Add or select your device.
5. Issue an API key for that device.
6. Copy the key once. It is shown only at the time it is issued.
7. Open the receiver's **Data API** page.
8. Select **2E0LXY Aggregator**.
9. Paste the key into **Aggregator API key** and save.
10. Press refresh/test and check that aircraft appear.

Aggregator details

Use this page as a quick check after the account is created and the receiver has been given its Aggregator API key. The important idea is simple: the website manages devices and keys; the receiver uses one saved key to ask for aircraft data.

Aggregator feature	What it does for you
Central aircraft cache	One backend gathers aircraft data instead of every display asking public feeds separately.
Per-device location	Each receiver can get aircraft for its own area.
Route names	Flight routes can be added before the ESP32 receives the data.
Device keys	Each display has its own key, so one can be replaced without changing all devices.
Dashboard	You can rename devices, view activity and manage own-feed options.

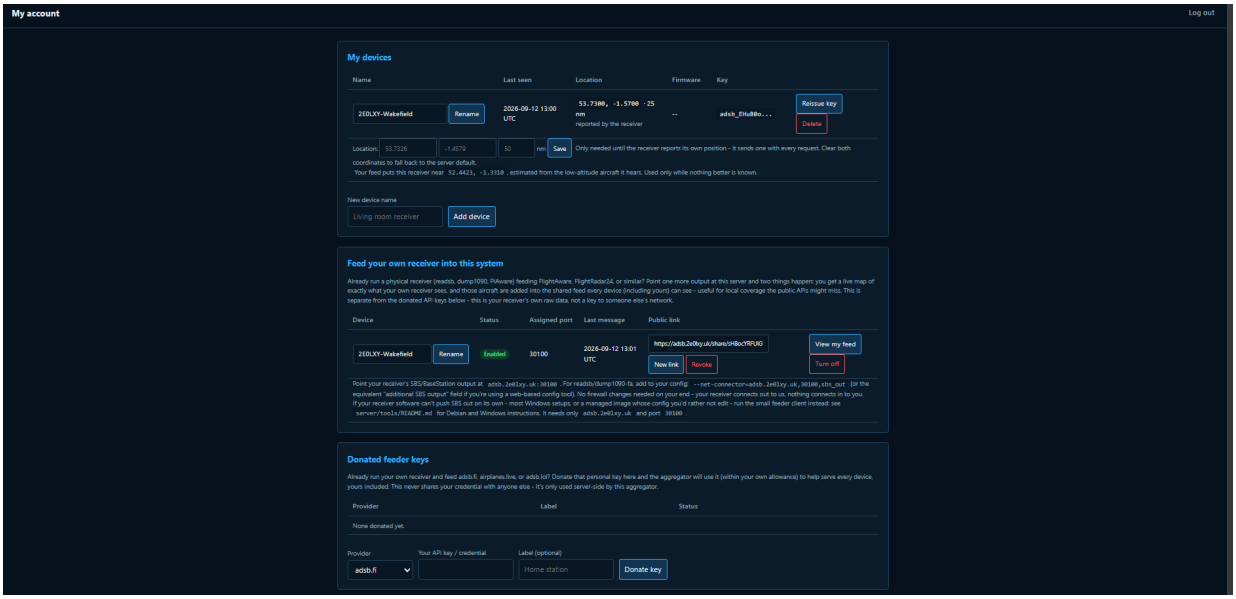
Questions you may have

Question while doing this	Plain answer
Why use an account?	The account lets the server issue a private key for each receiver and manage shared feed options.
Where do I paste the key?	Paste it into the receiver's Data API page after choosing 2E0LXY Aggregator.
What if I lose the key?	Issue a new key for that receiver in the account dashboard, then paste the new key into the receiver.

SECTION 12

Add your own ADS-B receiver feed

If you already run a physical receiver such as readsb, dump1090 or PiAware, you can also feed your own local aircraft to the Aggregator. Sign in at https://adsb.2e0lxy.uk/login, then open the account dashboard.



1. Open the Aggregator account dashboard at **https://adsb.2e0lxy.uk/account**.
2. Find your device.
3. Enable **Feeder** for that device.
4. The dashboard will show a hostname and port, for example **adsb.2e0lxy.uk:30100**.
5. In your receiver software, add an extra SBS/BaseStation output to that host and port.
6. For readsb or dump1090-fa, the line normally looks like **--net-connector=adsb.2e0lxy.uk,30100,sbs_out**.
7. Open **View my feed** to see only the aircraft your own receiver is sending.

- Nothing needs to connect into your home network. Your receiver connects out to the Aggregator.
- The port number identifies your receiver, so treat it as a private setup value.
- This own feed is separate from the ESP32 display provider setting. It is for sharing aircraft heard by your antenna.

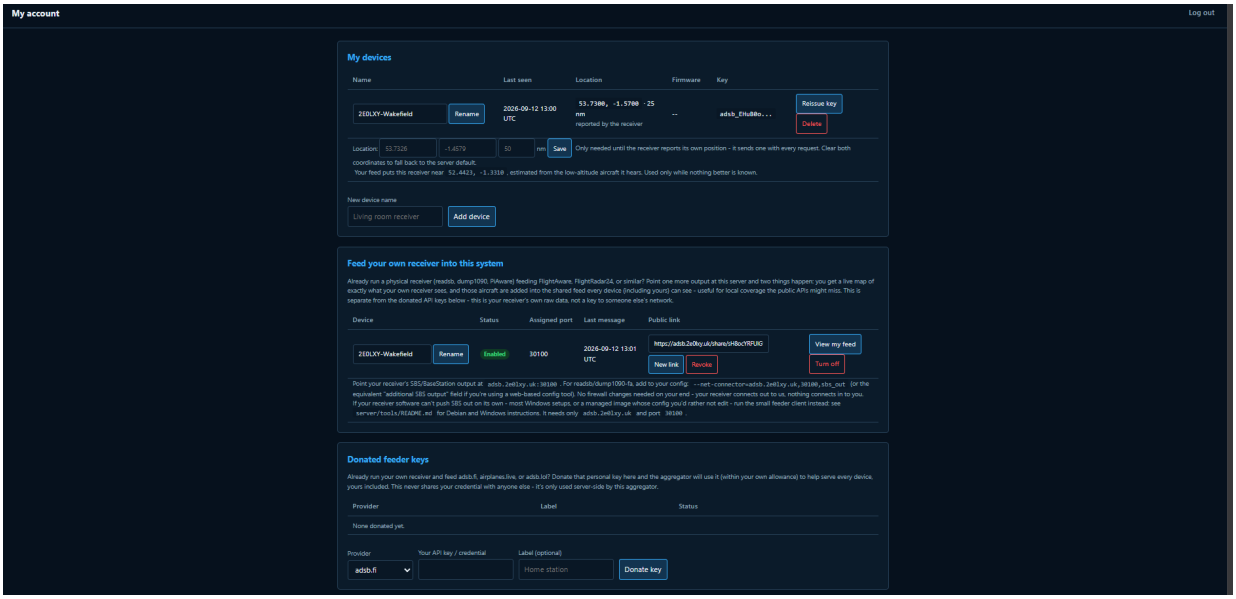
Questions you may have

Question while doing this	Plain answer
Do I need this if I only have the screen?	No. This is only for people who already run a separate ADS-B receiver such as readsb, dump1090 or PiAware.
Does it replace FlightAware or Flightradar24?	No. It is an extra output. Your existing feeds can keep running.
How do I know it is working?	The dashboard shows the last message time, and View my feed shows aircraft from your receiver.

SECTION 13

Share your own feed map

The account dashboard at https://adsb.2e0lxy.uk/account can create a public read-only map link for one receiver.



1. Open the Aggregator account dashboard at **https://adsb.2e0lxy.uk/account**.
2. Find the device with feeder enabled.
3. Press **Create link**.
4. Copy the share URL.
5. Send the link to anyone you want to view that receiver's live map.
6. Use **Revoke** if you want the old link to stop working.
7. Use **New link** if you want to replace it with a different link.

- The share link is unlisted, not a login-protected account page.
- Anyone with the link can see that one receiver's live aircraft map.
- The link shows station name and aircraft only. It does not show your account, API key, port or other devices.

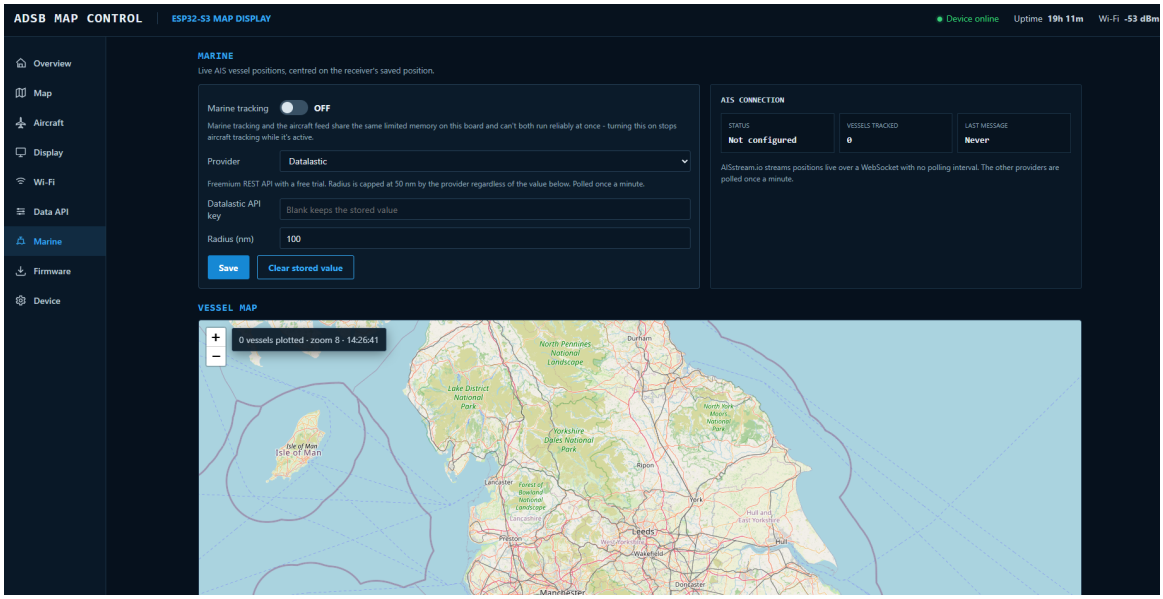
Questions you may have

Question while doing this	Plain answer
Can I send the link to friends?	Yes, if you are happy for them to see the public aircraft map from that receiver.
Can I stop an old link working?	Yes. Use Revoke in the account dashboard.
Does the link allow changes?	No. It is view-only.

SECTION 14

Marine AIS tracking

Marine is for boats and ships. It is separate from aircraft tracking and uses AIS providers.



Provider	What to enter
AISstream.io	API key if required by your account. It uses live WebSocket updates.
AISHub	AISHub username or credential details.
MyShipTracking	API key.
Datalastic	API key.

1. Open the **Marine** page in the receiver web interface.
2. Choose the marine provider.
3. Enter the required credential if the provider needs one.
4. Set the marine radius in nautical miles.
5. Save the settings.
6. Swipe or select the physical LCD Marine page to view vessels on the screen.

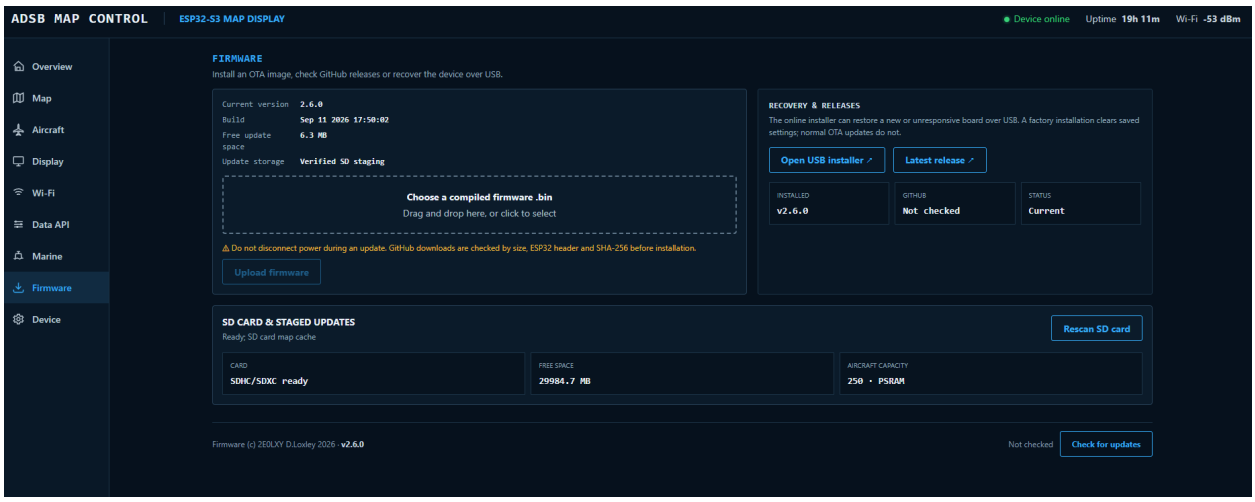
Questions you may have

Question while doing this	Plain answer
Should I turn Marine on?	Only turn it on if you want vessel tracking. Aircraft tracking is usually the main purpose of the receiver.
Why are no boats shown inland?	AIS is mainly useful near the coast, rivers, canals and ports. Inland areas may show very little.
Does Marine use the same location?	Yes. It uses the receiver location and marine radius to decide what vessels to request.

SECTION 15

Firmware updates

Use the Firmware page for normal updates. This keeps saved settings.



- The receiver checks GitHub at startup and then periodically while running.
- When a newer firmware release is available, the update button turns green.
- Press the update button and leave the receiver powered until it has finished and restarted.
- If a microSD card is fitted, the receiver can stage the update on the card first.
- Use a local .bin upload only for firmware you built yourself or trust.
- Use the USB installer for a clean recovery or first-time installation.

Release file	Use
ESP32-ADSB-firmware.bin	Normal OTA or local web update; keeps settings.
ESP32-ADSB-firmware.bin.sig	Signature used by the GitHub update process.
ESP32-ADSB-factory.bin	First installation or complete recovery; clears settings.
SHA256SUMS.txt	Published checksum list for release files.

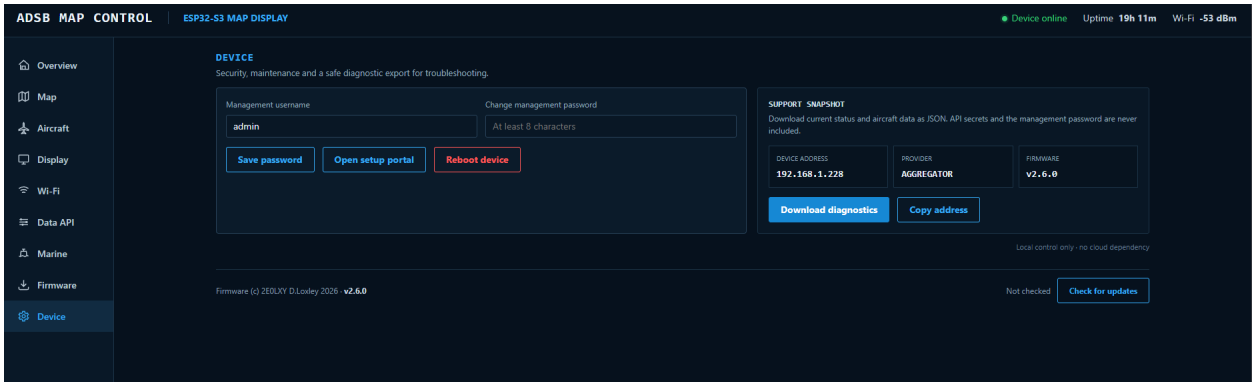
Questions you may have

Question while doing this	Plain answer
What should I press for a normal update?	Use the Firmware page update button when it says a newer version is available.
Will a normal update remove my settings?	No. A normal firmware update keeps Wi-Fi, location, provider and display settings.
When should I use the factory file?	Use the factory file for first installation or complete recovery, because it clears settings.

SECTION 16

Device page and diagnostics

Device is the settings and support page for the receiver itself.



Control	What it does
Change password	Sets the local admin password.
Download diagnostics	Saves a support file without stored secrets.
Open setup portal	Temporarily returns to the ADSB_WIFI setup portal.
Reboot	Restarts the receiver.
SD rescan	Checks the microSD card again.

- Diagnostics are useful when asking for help because they show version, memory, network and provider state.
- Diagnostics do not include Wi-Fi passwords, API keys or the admin password.
- Only reboot when the receiver is not in the middle of an update.

Questions you may have

Question while doing this	Plain answer
When should I download diagnostics?	Download them when asking for support, after setting up a provider, or before making a big change.
What if I changed Wi-Fi network?	Use Open setup portal or the ADSB_WIFI setup process to enter the new network details.
What should I write down?	Write the receiver address, provider, location and firmware version on the configuration record page.

SECTION 17

Common words explained

A quick glossary for people new to aircraft tracking.

Word	Meaning
ADS-B	Aircraft broadcasts its own position and details.
MLAT	Position calculated by several receivers hearing the same aircraft.
ICAO hex	Unique aircraft identity code.
Callsign	Flight identity, such as an airline flight number.
Registration	The aircraft's registration mark.
Squawk	Four-digit transponder code used by air traffic control.
Nautical mile	A distance unit used in aviation and marine navigation.
API	A way one computer asks another computer for data.
API key	A private key that allows access to an API.
OTA	Over-the-air firmware update through the web interface.
SBS/BaseStation	A plain-text aircraft feed format used by many receiver programs.
AIS	Boat and ship tracking messages.

Questions you may have

Question while doing this	Plain answer
Which words matter most at first?	Provider, API key, location, radius and firmware are the main words beginners need during setup.
Do I need to memorise these?	No. Use this page as a quick reference when a screen or setting uses a term you have not seen before.

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SECTION 18

Build and board notes

Most users will not need this page. It is for people building firmware from the GitHub source.

Board	Screen	Touch	PlatformIO environment
Waveshare ESP32-S3-Touch-LCD-4 Rev 4.0	480 x 480	No	waveshare_esp32_s3_lcd_4
Waveshare ESP32-S3-Touch-LCD-7	800 x 480	GT911	ws_lcd_7_app
Waveshare ESP32-S3-Touch-LCD-4.3	800 x 480	GT911	ws_lcd_7_app
800 x 480 bring-up test	800 x 480	GT911	ws_lcd_7_bringup

- Default build: **pio run**.

- 800 x 480 application build: **pio run -e ws_lcd_7_app**.

- Upload to a known Windows port: **pio run -t upload --upload-port COM25**.

- Remote flashing helper: **scripts/flash_remote.ps1**.

Questions you may have

Question while doing this	Plain answer
Do normal users need PlatformIO?	No. Normal users should use the web installer and Firmware page. PlatformIO is for building from source.
Which board setting should I choose?	Choose the environment that matches the physical screen size and board family.
Why are there separate 800 x 480 builds?	The larger touch boards need different display and touch settings from the smaller square board.

SECTION 19

Security in plain English

These points are included so a beginner understands what should and should not be shared.

- Do not share Wi-Fi passwords, API keys or the admin password.

- The receiver's local settings page is for your private network.

- Do not put the receiver's local admin page directly on the public internet.

- A public share link is safe for showing one receiver map, but anyone with the link can view it.

- An Aggregator API key belongs to one device. If it is lost, issue a new key from the dashboard.

- A feeder port is a setup value for your receiver. Do not publish it widely.

Questions you may have

Question while doing this	Plain answer
Can I show someone the public map link?	Yes. That link is intended for viewing aircraft, not changing settings.
Can someone change my receiver from the share link?	No. The share link is view-only.
What information should I keep private?	Keep Wi-Fi passwords, admin passwords, API keys and feeder setup values private.

SECTION 20

Configuration record

Keep this page with the receiver. Do not write passwords or API secrets here.

Item	Write your value here
Receiver LAN address	_____
Receiver latitude / longitude	_____
Selected aircraft provider	_____
Aggregator account/device name	_____
Own-feed host and port	_____
Marine provider	_____
Normal radius / zoom	_____
Installed firmware	_____
microSD fitted	Yes / No
Notes	_____

Local receiver links

- Receiver web page by mDNS name: http://adsb-map.local/

- If the mDNS name does not open, use the numbered address shown on the receiver, for example http://192.168.1.xxx/.

- On Windows, the mDNS name may need Bonjour/mDNS support, such as Apple Bonjour or Bonjour Print Services. Phones, tablets and many Linux/macOS systems usually support mDNS already.

Useful links

- Project and documentation: https://github.com/2E0LXY/ESP32-ADS-B

- USB installer: https://2e0lxy.github.io/ESP32-ADS-B/

- Product and receiver information: https://2e0lxy.uk/adsb/7-inch-ESP32-S3-ADSB-MLAT-Receiver-site/index.html

- Aggregator signup: https://adsb.2e0lxy.uk/signup

- Aggregator login: https://adsb.2e0lxy.uk/login

- Aggregator account dashboard: https://adsb.2e0lxy.uk/account

- Aggregator admin dashboard: https://adsb.2e0lxy.uk/admin/login

- OpenStreetMap attribution: https://www.openstreetmap.org/copyright

API key signup and account links

- 2E0LXY Aggregator device key: https://adsb.2e0lxy.uk/signup

- 2E0LXY Aggregator existing account: https://adsb.2e0lxy.uk/login

- OpenSky Network account/API client credentials: https://opensky-network.org/

- OpenSky API documentation: https://openskynetwork.github.io/opensky-api/

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- ADS-B Exchange API via RapidAPI: https://rapidapi.com/adsbx/api/adsbexchange-com1
- FlyItalyADSB API key request: https://flyitalyadsb.com/dati/api/
- AIS Stream API account: https://aisstream.io/account
- AISHub account and data sharing: https://www.aishub.net/
- Datalastic API key/pricing: https://datalastic.com/pricing/
- MyShipTracking free API key: https://api.myshiptracking.com/

Questions you may have

Question while doing this	Plain answer
Why keep this page?	It saves time later when you need to open the receiver, ask for help, or replace a router.
What should not be written here?	Do not write passwords, API keys or private account secrets on this page.

Document basis: updated from ESP32-ADS-B main commit 8fcf3ce, dated 12 September 2026, the repository README, docs site, server README and current firmware/web UI source.

PRODUCT VISUAL GUIDE

The P4 live-traffic display

These promotional visuals introduce the current P4 product and its aircraft-tracking purpose. The operating screenshots on the following pages show the actual Map and Radar interface in detail.



Main website header. ADS-B / MLAT Flight Tracker artwork used to introduce the aircraft-tracking product. This is promotional artwork rather than a literal device-screen capture.



P4 selling image. The main product artwork used beside the Buy button and in the basket. The current hardware specification is shown on the product page; use the exact board-specific installer or recovery image supplied for the purchased unit.

WHAT TO TRUST FOR OPERATION

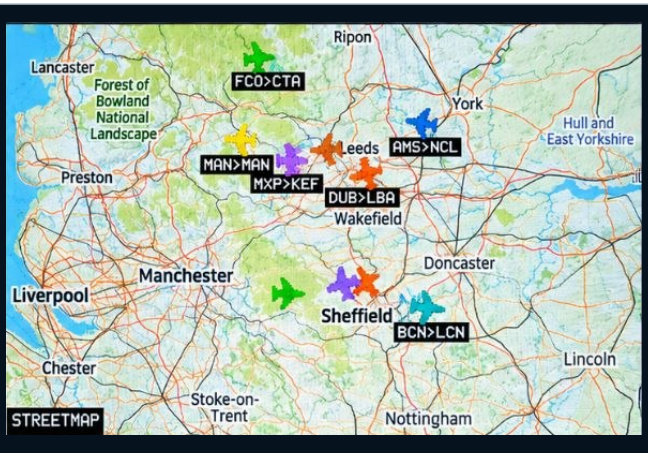
Use the real Map and Radar photographs, the written controls and the Device diagnostics when operating the receiver. Promotional artwork communicates the product purpose but does not define exact live-screen layout or data.

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CURRENT SCREEN REFERENCE 01

Map view and expanded aircraft details

These current display photographs show the colour-coded aircraft silhouettes, route labels and tap-to-open information panel described in the current README.



Map with route labels. Aircraft are plotted around Leeds and West Yorkshire using recognisable silhouettes and distinct colours. Route labels show the available origin and destination information.



Expanded map detail. Tap a target to review callsign, registration, ICAO hex, type, altitude, vertical rate, speed, heading, distance, squawk, category, coordinates, route and ADS-B or MLAT source.

MAP CONTROL

In the browser, selecting an aircraft row opens the Map page, centres and zooms on that aircraft, and opens its full popup. Select the same row again to stop tracking; use Show 5 min trails to draw recent movement.

CURRENT SCREEN REFERENCE 02

Radar view and target inspection

Radar presents the same live traffic by bearing and distance. The current symbols preserve aircraft class, heading and altitude colour instead of using generic arrowheads.



Radar overview. The centre cross marks the saved receiver position. Rings give distance reference, labels identify live routes, and filtered aircraft outside the selected range remain visible at the rim.



Expanded radar detail. Tap a target for the complete available identity, motion, route, squawk, category and position data. Tap anywhere outside the panel to close it and return to the live radar.

RANGE BEHAVIOUR

The selected 10, 25, 50 or 100 nautical mile radar range is saved. Targets outside range are filtered to the rim so nearby traffic remains readable without hiding the existence of more distant aircraft.

CURRENT SCREEN REFERENCE 03

Nearest-aircraft table

The Table and nearest-aircraft views turn the live feed into a compact departure-board layout for quick reading when a map or radar plot is not required.



Nearest Aircraft table. The display lists callsign, distance, ADS-B or MLAT source, direction, altitude and the best available origin and destination information. Alternating rows and concise source markers keep dense traffic readable.

Display item	Meaning
Callsign	Aircraft or flight identifier supplied by the live feed.
Miles and direction	Distance and compass direction calculated from the saved receiver position.
A / M	A is ADS-B; M is MLAT.
Altitude	Barometric altitude when supplied by the provider.
From / To	The richest route description that fits: full airport name, city, abbreviation or raw code.

ROUTE STATUS

A route shown as --- is still waiting for lookup. NO ROUTE or NO RTE means the route service was asked and returned no scheduled route, which is common for private and general-aviation registrations.

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README UPDATE 01

How the current system works

This section aligns the operation manual with the current public README at GitHub commit 8fcf3ce, dated 12 September 2026. It explains the complete path from receiver position to the LCD and browser views.

01	**Position** The saved latitude, longitude and radius define the local aircraft and vessel area. When the 2E0LXY Aggregator is selected, the device reports its own position on every request, so a moved receiver follows itself.
02	**Live source** Select an aircraft provider in Data API. The recommended Aggregator uses a per-device key; alternatively use another supported service or forward SBS/BaseStation output from your own receiver.
03	**Server enrichment** The Aggregator merges and deduplicates live reports, then resolves operator, origin, destination and full airport names server-side. The ESP32 no longer opens a separate TLS route lookup for every callsign.
04	**Display and browser** The enriched result appears in Overview, Table, Map and Radar. The browser can open the complete aircraft popup, jump from a table row to that aircraft, and draw its recent five-minute trail.
05	**Optional Marine and sharing** Marine uses a separately configured AIS provider. Customers forwarding their own SBS feed can view a private own-feed map and create a revocable, unlisted share link.

IMPORTANT

Aircraft and Marine information is network-sourced. The display is not itself a 1090 MHz ADS-B receiver or an AIS radio. A compatible data service and working network connection are required unless a separately installed radio receiver is forwarded through the own-feed facility.

Recommended first setup

- Install the correct factory image using the official Chrome or Edge USB installer, then join the temporary setup network when no saved Wi-Fi is available.
- Change the initial management password, set the receiver position and radius in Map, and select a licensed aircraft-data provider in Data API.
- For the 2E0LXY Aggregator, create an account, register this receiver, copy its one-time per-device key, and save that key in Data API.
- Configure Marine only when you have a supported AIS provider credential; an empty inland Marine view can be normal.

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README UPDATE 02

New display, route and feed behaviour

These are the current operating features an owner is most likely to notice on the panel and in the browser.

Area	What changed	What the owner does
Aircraft graphics	Recognisable silhouettes by aircraft class, with altitude colours and heading retained.	No setup. The icon is selected from live category data.
Nearest and Table	Overview gains route information. Table uses a departure-board layout, full operator names and the richest route name that fits.	Swipe or select the page. Scroll the table rather than tapping to change page.
Routes	Resolved by the Aggregator and cached to SD or LittleFS so repeat flights survive a restart.	Use the Aggregator for server-enriched routes. '---' means pending; 'NO ROUTE' means no scheduled route was found.
Browser map	Complete detail popup, click-to-track from a table row and optional five-minute trails.	Click a row to centre and track it; click the same row again to stop tracking.
Idle board	Configurable rotating overhead-aircraft display, restricted to roughly five miles slant range.	Enable Screensaver and choose 1-120 minutes. Touch, swipe or BOOT dismisses it.
Marine	Dedicated browser and LCD view for live AIS vessels around the saved receiver location.	Choose AISstream.io, AISHub, MyShipTracking or Datalastic and save the required credential.
Updates	Official OTA validates image header, exact size, SHA-256 and RSA signature; SD can stage the image.	Keep power connected. Use local .bin only when you built or trust it because local upload is not signature-checked.

Marine provider notes

- AISstream.io is the recommended default and pushes messages over WebSocket rather than polling.

- AISHub requires a contributing account; MyShipTracking and Datalastic are polled once per minute; Datalastic limits radius to 50 nautical miles.

- Marine uses the same saved receiver position as aircraft. Typical coastal AIS range is roughly 20-40 nautical miles, and quiet water may produce no targets.

Own receiver and public share

- The feeder utility in server/tools forwards raw SBS/BaseStation data on Debian or Windows and offers a --check test mode.

- The account dashboard can rename devices and feeder stations. A public share URL is unlisted, read-only, revocable and replaceable.

- Anyone holding a share URL can view it. The map can imply the approximate receiver location, so do not treat the link as anonymous.

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README UPDATE 03

Compatibility, limits and support

The product sales page and the public firmware repository describe related but distinct layers. Keep the hardware edition and its firmware target together when installing or recovering a receiver.

Layer	Documented status
Public firmware repository	The current README lists Waveshare ESP32-S3 Touch-LCD-4 Rev 4.0 (480 x 480) and ESP32-S3 Touch-LCD-7 / -4.3 (800 x 480) build targets.
Current P4 sales model	The product page identifies ESP32-P4 plus ESP32-C6, a 7-inch 1024 x 600 display, Wi-Fi 6, 32 MB Flash and 32 MB PSRAM. These are product hardware specifications, not a build target stated in the public README.
Installation rule	Use only the factory image explicitly supplied for the exact board revision. Do not install an S3 factory image on P4 hardware unless a release explicitly identifies that target.
This manual	The base pages remain the S3 reference operation manual. The current workflow and services apply where the installed product firmware exposes the corresponding pages and controls.

BEFORE FLASHING

Match the product label, display size and board family to the release asset or installer description. A wrong-board factory image can fail to boot and may require USB recovery.

Known operational limits

- The local administration interface uses Basic authentication and a per-boot change token, but no TLS. Keep it on a trusted local network and never expose it directly to the public internet.

- The 800 x 480 S3 panel can show frame roll or flickering scanlines under PSRAM load. Pixel clock, bounce-buffer and direct-draw controls trade display stability against internal RAM but do not guarantee a complete cure.

- The optional Aggregator backend has pre-commercial limitations documented in server/README.md, including feeder-port authentication, no email verification or password reset, a single-process cache and public OpenStreetMap tiles.

- Diagnostics deliberately exclude Wi-Fi passwords, provider secrets and the management password. Download Device diagnostics before requesting support.

Current official links

Resource	Address
Firmware README and releases	https://github.com/2E0LXY/ESP32-ADS-B
USB installer	https://2e0lxy.github.io/ESP32-ADS-B/
Aggregator signup	https://adsb.2e0lxy.uk/signup
Aggregator account	https://adsb.2e0lxy.uk/account
Product and shop	https://www.2e0lxy.uk/adsb/

Document basis: public main branch commit 8fcf3ce, 12 September 2026. Review the repository release page before every recovery flash because available board targets and filenames can change.

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