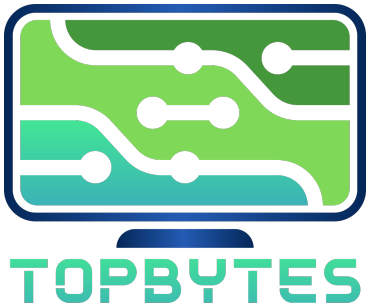

TopBytes FlightRadar https://flightradar.topbytes.net

Release 1.0.8

User Manual

Nov 07, 2026

FLIGHTRADAR

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Welcome to the FlightRadar user manual.

FlightRadar is a standalone desktop flight-radar display from TopBytes Ltd. A 7-inch capacitive touchscreen driven by an ESP32-S3 shows a green "military radar" scope of the aircraft currently overhead on the left, and a live detail panel for any aircraft you tap on the right — callsign, altitude, speed, heading, range and bearing, plus the aircraft type, operator and route where they can be looked up.

FlightRadar needs nothing more than a 2.4 GHz WiFi network and a USB-C power supply. Live aircraft positions are fetched over the internet from the community adsb.fi open-data network, so there is no receiver, antenna or Raspberry Pi to set up — power it on, join it to your WiFi on the screen, tell it where "home" is, and the scope fills with traffic.

CHAPTER

ONE

INTRODUCTION

1.1 What is FlightRadar?

FlightRadar is a dedicated desktop flight-radar display. A 7-inch capacitive touchscreen driven by an ESP32-S3 renders a green "military radar" scope of the aircraft currently overhead, and a live detail panel for any aircraft you tap. It is designed to sit on a desk, shelf or windowsill and show local air traffic at a glance — no computer, phone or radio receiver required.

Unlike a traditional ADS-B receiver, FlightRadar has no SDR dongle, antenna or Raspberry Pi to configure. It pulls live aircraft positions over your WiFi from the community adsb.fi open-data network, centred on a home location that you set on the screen. Aircraft type, operator and route are then looked up on demand from adsbdb.com and shown in the detail panel.

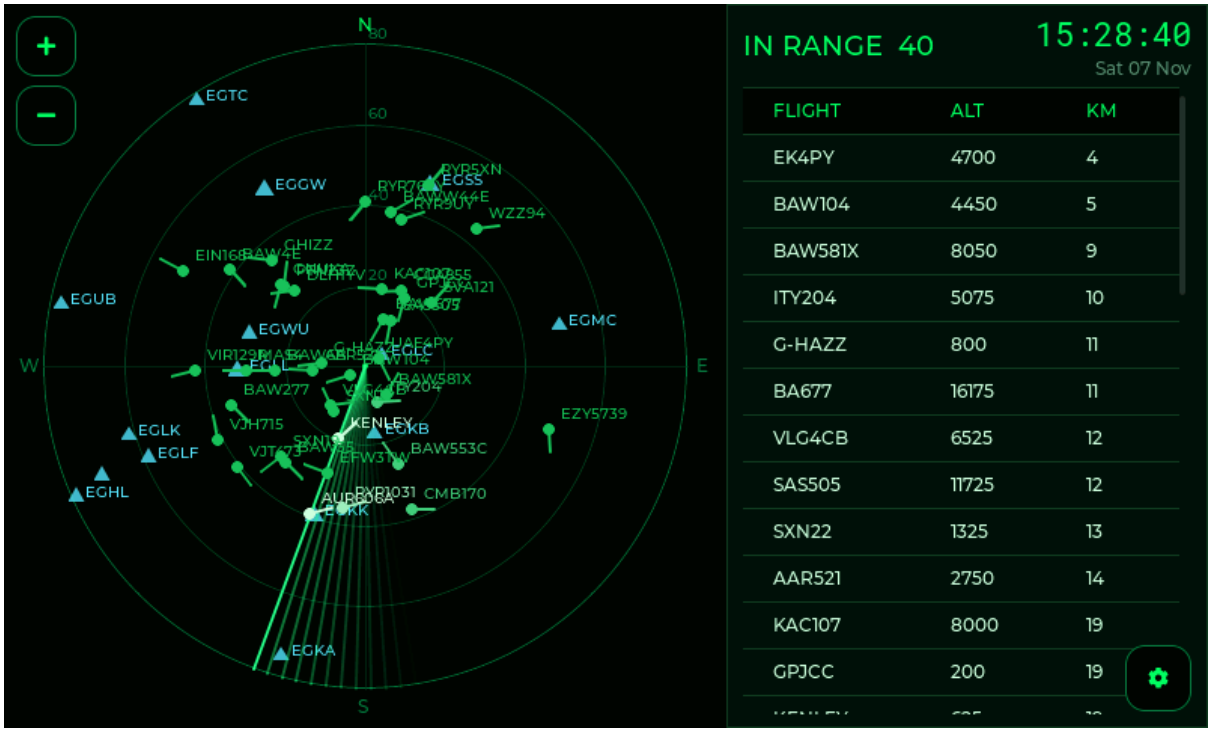

Fig. 1: FlightRadar centred on Greenwich, London, with an 80 km range.

1.2 Key Features

1.2.1 7-inch Colour Touchscreen

- 800 x 480 pixel full-colour IPS LCD
- Capacitive multi-touch panel drives the entire UI
- Phosphor-green "radar scope" aesthetic, readable across the room
- Optional 180° screen rotation for upside-down or shelf mounting
- Overnight screen-off schedule (Night Mode) with touch-to-wake

1.2.2 Live Radar Scope

- Square radar scope on the left half of the screen
- Concentric range rings with kilometre labels and N/E/S/W compass marks
- Rotating sweep line with a fading afterglow trail (classic radar look)
- Aircraft shown as green blips with a short heading vector and a callsign label
- Freshly-swept contacts brighten, then fade as they age — just like a real scope
- Tap any blip to open its full detail panel

1.2.3 Aircraft Detail Panel

- **In-range list:** every aircraft within range, sorted nearest-first, with flight, altitude and distance
- **Selected aircraft:** callsign / flight number, ICAO24 hex, altitude, ground speed, heading, vertical rate, distance and bearing from home, squawk code, and Maidenhead grid square
- **Emergencies:** aircraft squawking 7500, 7600 or 7700 flash red and yellow on the scope and are marked in the list
- **Enriched data** (looked up automatically): aircraft type, registration, operator, origin → destination route, and an estimated time of arrival

1.2.4 No Receiver Required

- Positions come from the internet — just a 2.4 GHz WiFi network and USB-C power
- No SDR, antenna, Raspberry Pi or *dump1090* to install
- Range/zoom is adjustable from 5 km out to 250 km with the on-scope **+** / **−** buttons

1.2.5 Home Location Your Way

- Set the radar centre as a **Maidenhead grid locator** (e.g. `IO91wm`) or as raw **latitude / longitude**
- Entered on-screen and saved — no re-flashing to move the device

1.2.6 Flight Alerts

- Watch for up to **6** callsign, ICAO or flight-number prefixes (e.g. `BAW`, `VIR`, `BA109`)
- Matching aircraft are highlighted on the scope so you don't miss them

1.2.7 WiFi Connectivity

- Store up to **3** WiFi networks; the device connects to the best one in range on boot
- On-screen WiFi setup with a network scanner and touch keyboard
- Access-point setup fallback with a web page for phone/laptop configuration
- Captive-portal setup page at `http://192.168.4.1`

1.2.8 Over-The-Air Updates

- Automatic firmware update check shortly after boot, then hourly
- Secure HTTPS download from the TopBytes update service
- Full-screen update page while it installs
- Manual "check for update" from the on-screen settings

1.3 Requirements

1.3.1 To Run FlightRadar

- A 2.4 GHz WiFi network with internet access (the ESP32-S3 does **not** support 5 GHz)
- A quality 5 V USB-C power supply rated at 1 A or more

That's it — no amateur-radio licence, receiver or antenna is needed.

1.4 How It Works

FlightRadar operates in a few concurrent stages:

1. **Power On**: The 7-inch LCD lights up and the device loads its saved settings from non-volatile storage.
2. **Setup or Connect**: If no WiFi is configured, an on-screen WiFi setup takes over (or the device offers an access-point setup page for your phone). Otherwise it joins your saved network.
3. **Locate**: The scope is centred on your configured home location (Maidenhead grid or latitude/longitude).
4. **Fetch & Plot**: The device polls the adsb.fi network for aircraft within range of home, converts each position to a range and bearing, and plots it on the scope.
5. **Interact**: Tap a blip to open its detail panel; the device looks up the aircraft type, operator and route in the background and fills them in.

1.5 Typical Use Cases

1.5.1 Desk Ornament with a Purpose

Keep FlightRadar on your desk or windowsill and watch the traffic overhead — a living, glowing radar scope of your local sky.

1.5.2 Near an Airport or Flight Path

If you live under an approach or a busy corridor, set a short range (5–20 km) and watch aircraft line up on final. Tap one to see the operator and route.

1.5.3 Plane-Spotting Companion

Add the airlines or flights you're watching for as alerts. Matching aircraft are highlighted on the scope, and the detail panel gives you the type, registration and route.

1.5.4 Learning Tool

A simple, tangible way to see how ADS-B, bearings and ranges work — and which airlines and aircraft types pass over you at different times of day.

1.6 Design Philosophy

1.6.1 Zero-Fuss

The device should work out of the box with nothing but WiFi and USB-C power. No receiver, no antenna, no companion computer.

1.6.2 Touch-First

Every common task — WiFi, location, range, alerts, timezone, night mode — is doable on the screen. There is no "configuration mode" to enter; just tap what you want to change.

1.6.3 Readability

The radar aesthetic is chosen for glance-ability: a bright sweep, fading contacts, clear rings and a high-contrast detail panel readable from across the room.

1.6.4 Reliability

The device recovers automatically from WiFi drops and feed hiccups, and keeps the scope alive without user intervention.

1.7 What's Next?

Now that you know what FlightRadar is and what it does, proceed to *Getting Started* to power it on and complete the first-time setup.

CHAPTER

TWO

GETTING STARTED

This section walks you through the first-time setup of your FlightRadar. The whole process happens on the touch-screen — no laptop or phone is required, though a phone can be used for the access-point fallback if you prefer.

2.1 Unboxing and First Power-On

2.1.1 What's in the Box

Your FlightRadar package should contain:

- FlightRadar device
- USB-C power cable

2.1.2 Initial Power-Up

1. Connect the USB-C cable to the FlightRadar's USB-C port
2. Connect the other end to a USB power source (5 V wall adapter, computer, or a quality power bank)
3. The 7-inch LCD lights up and the radar scope appears

Note: Use a quality 5 V USB-C power supply rated at 1 A or more. Insufficient power may cause boot loops or display instability.

2.2 First Boot Sequence

When FlightRadar powers on for the first time (with no WiFi saved), the following happens:

1. **Display comes up**: The radar scope and detail panel are drawn.
2. **Configuration check**: The device looks for saved WiFi credentials in non-volatile storage.
3. **WiFi setup takes over**: Because no network is configured, the device starts its own setup access point and shows the on-screen **WiFi Setup** panel.

2.3 The On-Screen WiFi Setup

When no WiFi is configured, a full-screen **WiFi Setup** panel appears with two ways to get online:

```
WiFi Setup

No WiFi configured.

Option A  -  Join the hotspot "FlightRadar Setup" from a phone/laptop,
then open a browser to set up WiFi.

Option B  -  Scan for a network here on the screen:

[ Scan for networks ]
```

Most people use **Option B** and do everything on the screen.

2.3.1 Option B — Set Up WiFi on the Screen

1. **Tap "Scan for networks"**

   The device scans for nearby 2.4 GHz networks and shows a **Select network** list. Each row shows the network name, a WiFi icon, and a keyboard icon if the network needs a password. The status line shows how many were found (e.g. `6 found`, `none found`, or `scan failed - tap Rescan`). Scroll the list to see more.

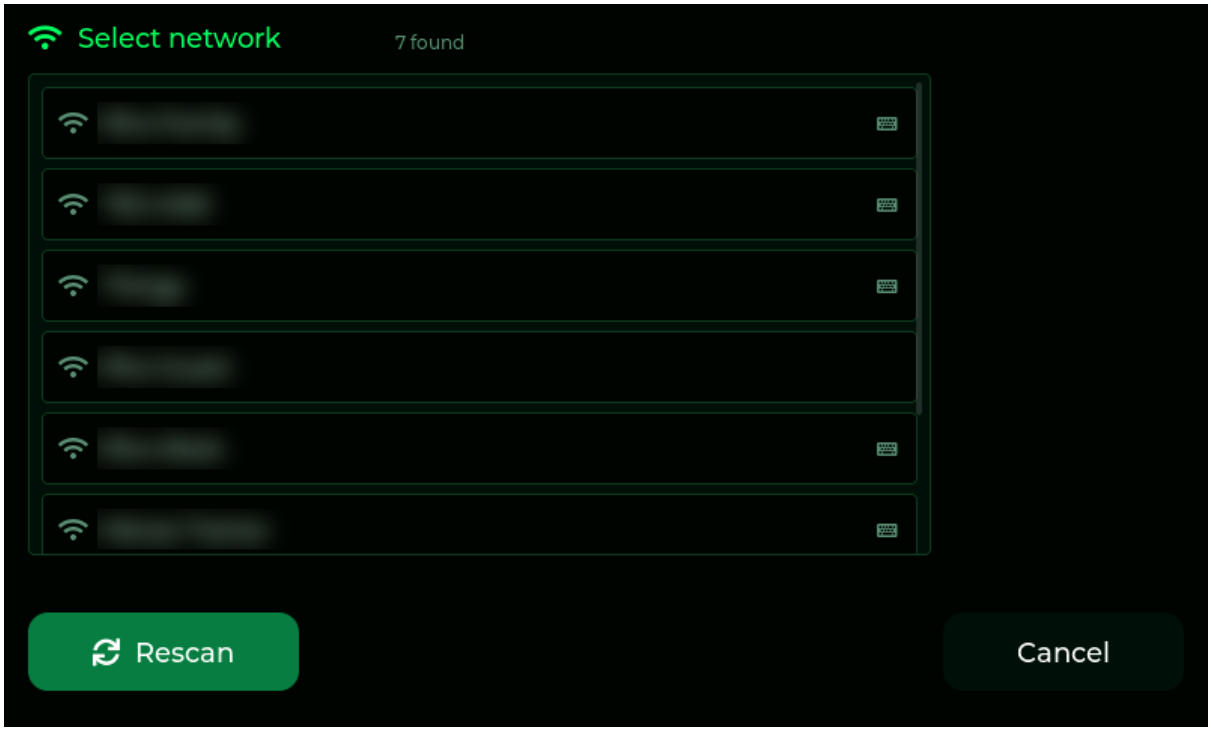

Fig. 1: The scan list (network names blurred here).

> **Note:** FlightRadar does not support 5 GHz networks. Make sure your router has 2.4 GHz enabled.

2. **Tap your network**

   Tap the name of your home or office WiFi. If your network is hidden, tap **Other (enter manually)** to type the name yourself.

3. **Enter the details**

   A setup panel opens with:

   - **Network name (SSID)** — pre-filled if you picked it from the scan
   - **Password** — tap the field and type your WiFi password on the on-screen keyboard
   - **Add network** button to save
   - **Cancel** button to back out

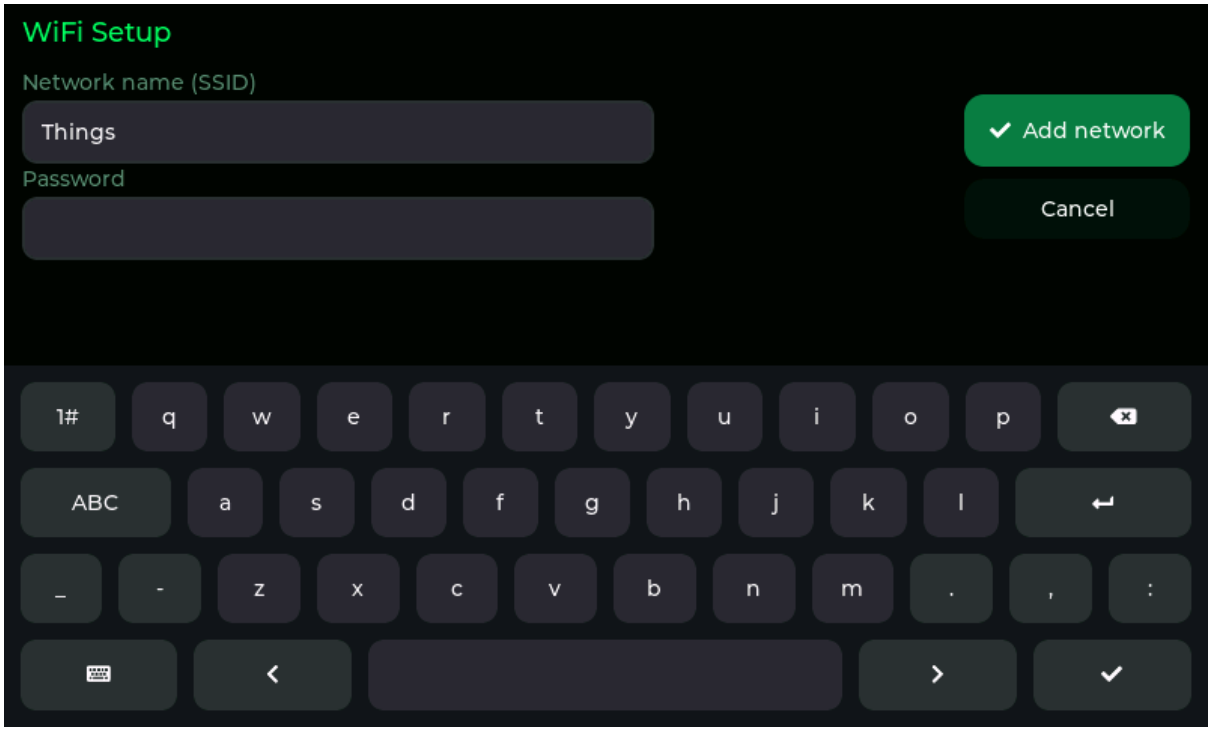

Fig. 2: Entering the password for a network picked from the scan.

4. **Tap "Add network"**

   The network is saved and the device begins connecting. Once connected, the WiFi setup panel closes and the radar begins fetching aircraft.

2.3.2 Option A — Set Up WiFi From a Phone or Laptop

If you'd rather type on a real keyboard, use the access-point fallback:

1. On your phone or laptop, open WiFi settings and join the open network named `FlightRadar Setup`.
2. A configuration page should open automatically (captive portal). If it doesn't, open a browser and go to `http://192.168.4.1`.
3. Enter your **WiFi network name** and **password** in the form and submit.
4. The page confirms:

   ```
   Saved. FlightRadar is connecting to your network. This hotspot will close.
   ```

5. The device joins your network and the setup hotspot shuts down.

Note: On some phones you may see a warning that "this network has no internet access." That's expected — the `FlightRadar Setup` hotspot exists only for configuration.

2.4 After WiFi Connects

Once FlightRadar is online it automatically:

- Synchronises its clock over NTP (`pool.ntp.org` / `time.google.com`)
- Begins polling the adsb.fi network for aircraft near your home location
- Checks the TopBytes update service for newer firmware (about 30 seconds after WiFi comes up)

Within a few seconds, aircraft near your home location start appearing as blips on the scope.

2.5 Setting Your Home Location

The scope is centred on your **home location**. Out of the box this is a default near London; set your own so the ranges and bearings are correct.

1. Tap the **gear** button (bottom-right) to open the settings menu, then tap **LOCATION**.
2. The location panel shows your current home, e.g. `HOME 51.4779, -0.0015 (IO91xl)`.

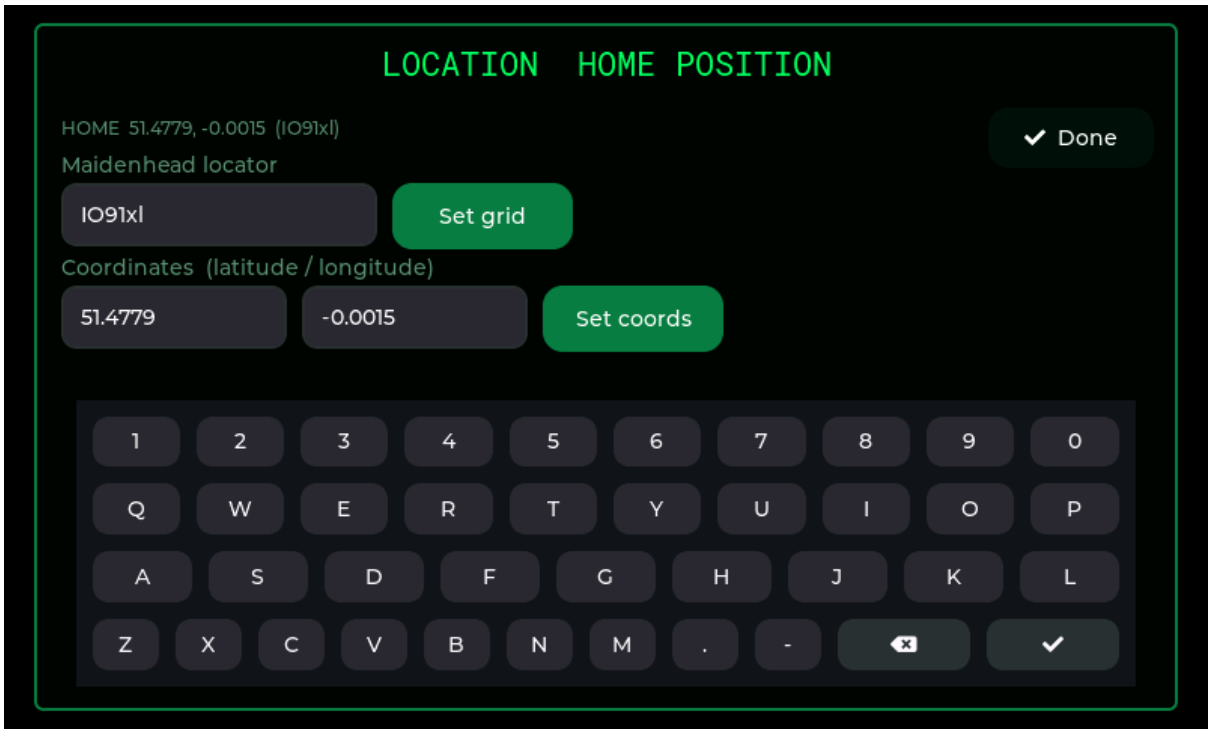

Fig. 3: The Location page.

3. Set it one of two ways:
   - **Maidenhead locator** — type a 4-, 6- or 8-character grid square (e.g. `IO91wm`) and tap **Set grid**. This is the quickest method and is accurate to about 2 km at 6 characters.
   - **Coordinates** — type your **latitude** (−90…90) and **longitude** (−180…180) in decimal degrees and tap **Set coords**.
4. The scope re-centres immediately on the new location and the setting is saved. Tap **Done** to close the page.

Tip: You can find your Maidenhead grid square from your latitude/longitude using any online "grid square locator" tool, or read it off a GPS app.

Note: If you enter an invalid grid or out-of-range coordinates, the panel shows an error (`Invalid grid (e.g. IO91wm)` or `Lat -90..90, Lon -180..180`) and keeps your previous location.

2.6 Verifying Successful Setup

You'll know setup was successful when:

- The clock in the top-right shows the correct local time
- The radar scope shows range rings, a rotating sweep, and (if there's traffic overhead) green aircraft blips
- Tapping a blip opens a detail panel that fills in with altitude, speed, heading and — after a moment — the aircraft type and route

If the scope stays empty, first check that aircraft are actually within your configured range (try increasing the range, or during quiet periods simply wait), then see *Troubleshooting*.

2.7 Serial Monitor Messages

If you connect FlightRadar to a computer via USB-C, you can watch the boot process on a serial terminal at **115200 baud**:

```
FlightRadar 1.0.0 booting...
[net] scanning...
[net] connecting to 'MyHomeWiFi'
[net] online: MyHomeWiFi ip=192.168.1.42 rssi=-60
[feed] home = 51.4779, -0.0015  (grid IO91xl, range 40 km)
[feed] adsb.fi: 24 aircraft  (int_largest=56308)
[clock] NTP synced
```

Note: The serial port is mainly for status logging. It also accepts a few service commands (type `help`), which support may ask you to run, but all configuration is done on the touchscreen.

2.8 What's Next?

Now your FlightRadar is set up and running, you can:

- Learn to read every part of the screen in *Operation*
- Adjust range, sweep, brightness, night mode, timezone, rotation and alerts in *Configuration*
- Explore firmware updates and networking detail in *Advanced Features*
- If something isn't working, jump to *Troubleshooting*

CHAPTER

THREE

OPERATION

This section covers day-to-day operation of FlightRadar — every region of the screen, what each tap does, and how to interpret what you see.

3.1 Screen Layout

The 800 x 480 screen is split into two regions:

- **Radar scope** — a 480 x 480 square on the **left**
- **Detail panel** — the remaining **right**-hand strip (320 x 480)

The current local time and date are shown in the top-right corner, and the **settings** button (gear icon) sits in the bottom-right corner.

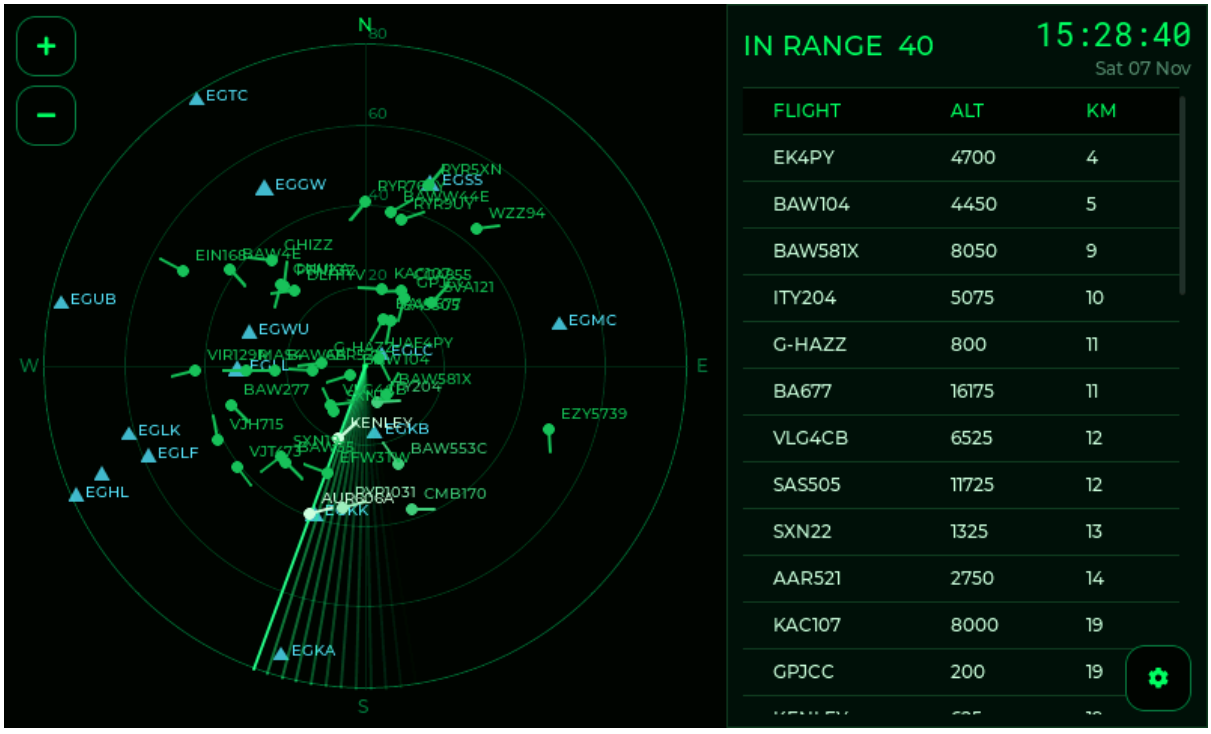

Fig. 1: The main screen: radar scope on the left, in-range list on the right.

3.2 The Radar Scope

The scope is a top-down "military radar" view centred on your home location, with north at the top.

3.2.1 Scope Elements

- **Range rings**: Four concentric rings mark equal distance steps out to the configured maximum range. Each ring is labelled with its distance in kilometres.
- **Compass marks**: `N` (top), `E` (right), `S` (bottom), `W` (left). North is always up. Cross-hairs run through the centre.
- **Centre dot**: A bright dot at the centre marks your home location.
- **Sweep line**: A bright line rotates clockwise, with a fading afterglow trail behind it — the classic radar sweep. One full revolution takes the configured sweep period (default 8 seconds).
- **Aircraft blips**: Each aircraft in range is a green dot with a short line pointing in its direction of travel and a label (callsign, or the ICAO24 hex if no callsign is known).
- **Zoom buttons**: The **+** and **−** buttons in the top-left corner of the scope zoom in and out through the range presets (see *Choosing a Range*).

3.2.2 Reading the Blips

- **Distance from centre** = how far the aircraft is from you. A blip near the centre is closer overhead; a blip near the outer ring is near the edge of your range.
- **Angle around the scope** = the compass bearing to the aircraft (north up).
- **The short vector** off each blip points the way the aircraft is heading.

3.2.3 Blip Colour and Brightness

- **Bright/near-white**: The aircraft has just been passed by the sweep — a fresh contact.
- **Green, dimming**: A known contact fading as time since the last sweep passes; it brightens again on the next sweep.
- **Amber**: The aircraft you have **selected**.
- **Orange-red**: The aircraft matches one of your **flight alerts** (see *Configuration*).

Contacts that stop being reported by the feed fade out and are removed, so aircraft that have left the area don't linger on the scope.

If the feed itself stops updating (for example the adsb.fi service is unreachable), the last known aircraft stay on the scope but turn **grey**, and the list heading changes to `NO DATA` with how long it has been since the last update. They return to normal at the next successful update.

3.2.4 Selecting an Aircraft

- **Tap a blip** to select it. The blip turns amber and the detail panel switches to show that aircraft.
- **Tap an empty part of the scope**, or the **List** button at the bottom of the detail panel, to deselect and return to the in-range list.

Tip: Blips are small, so tapping is forgiving — a tap near a blip snaps to the nearest aircraft within a generous touch radius.

3.3 The Detail Panel

The right-hand panel has two modes: the **in-range list** (nothing selected) and the **aircraft detail** view (something selected).

3.3.1 In-Range List (Nothing Selected)

The default view. It shows:

- A heading: `IN RANGE N` where *N* is the number of aircraft currently within range (or `NO DATA` in amber while the feed is unreachable)
- A table sorted **nearest first**, with columns:
  - **FLIGHT** — the flight number once it has been looked up (e.g. `BA116`), otherwise the callsign (`BAW116`) or ICAO24 hex
  - **ALT** — altitude in feet
  - **KM** — distance from home in kilometres

Tap any row in the list to select that aircraft (the same as tapping its blip).

3.3.2 Aircraft Detail (Something Selected)

When an aircraft is selected, the panel shows its full details:

- **Callsign / flight number** in large text at the top
- **Identity line**: ICAO24 hex, flight number, and class (Commercial / General Aviation)
- **Aircraft line**: type/model, registration and operator — e.g. `777 300ER • G-STBP • British Airways` — or `unknown aircraft` if it can't be looked up
- **Route line**: origin → destination — e.g. `LHR London` → `JFK New York` — or `route unknown` / `no scheduled route`
- **ETA line**: estimated time of arrival, minutes remaining and distance to go, when a destination and a usable ground speed are known
- **List** button (bottom) to return to the in-range list
- **Stats grid** of eight values:
  - **ALT ft** — altitude
  - **SPD kt** — ground speed in knots
  - **TRK** — track / heading (0–359°)
  - **V/S fpm** — vertical rate in feet per minute (climb/descent)
  - **RNG km** — range from home

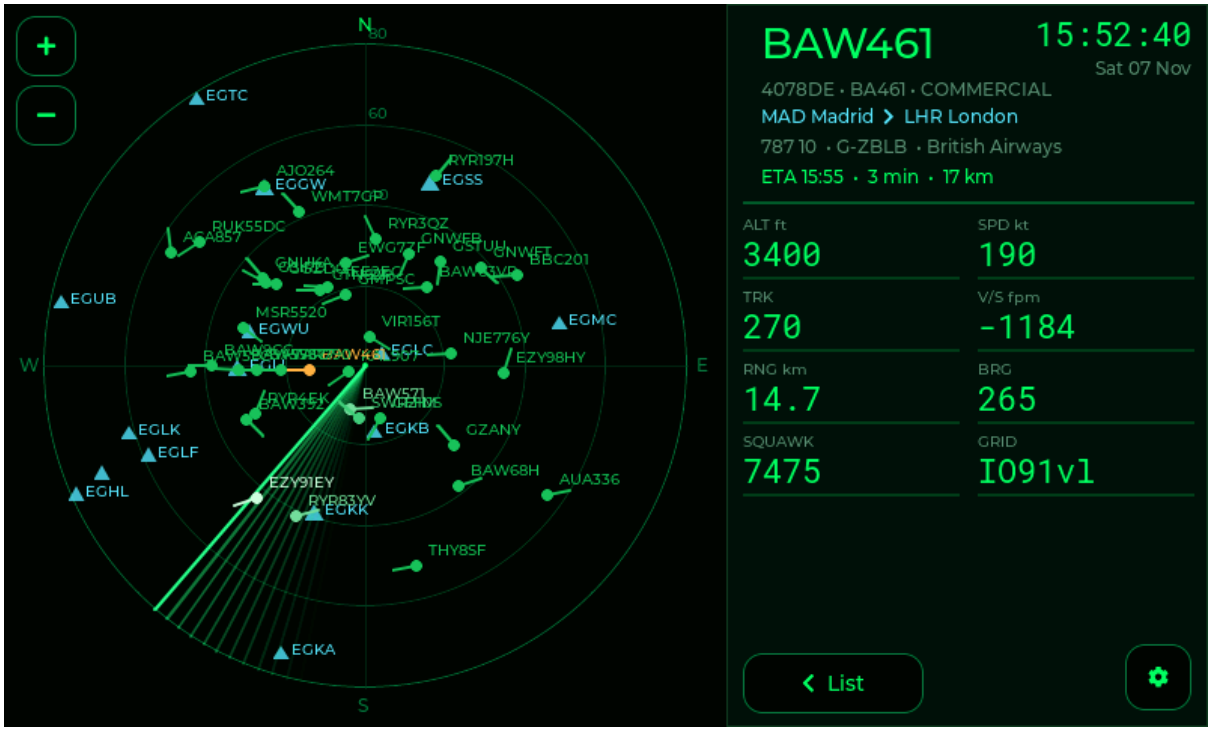

Fig. 2: A selected aircraft: amber on the scope, full details on the right.

- **BRG** — bearing from home (0–359°)
- **SQUAWK** — transponder code. Emergency codes (7500 hijack, 7600 radio failure, 7700 general emergency) are shown in red with a `!`, and the aircraft flashes red and yellow on the scope
- **GRID** — Maidenhead grid square of the aircraft's position

The core ADS-B fields (altitude, speed, heading, position, squawk), plus the registration and type code, come straight from the feed and appear immediately. The enriched fields (full type name, operator, route, ETA) are looked up in the background — while they load you'll briefly see `looking up aircraft...` and `looking up route...`.

3.4 The Clock (Top-Right)

The top-right corner shows the current local time (`HH:MM:SS`) and date (`Mon DD Mon`).

- Synchronised over NTP and adjusted for your configured timezone (with automatic daylight-saving where applicable)
- **Long-press the clock** to open the timezone picker

3.5 The Settings Menu

Tap the **gear** button in the bottom-right corner to open the settings menu, styled like an aircraft control-display unit. Settings are laid out in two columns; tap a row to change it, and tap **<RETURN** to go back to the radar.

It lists:

Fig. 3: The settings menu. Each row shows its current value.

Item	What it does
SWEEP	Each tap cycles the sweep: Off, Fast (5 s), Normal (8 s), Slow (12 s)
LOCATION	Set your home location by Maidenhead grid or latitude/longitude
WIFI	View and manage saved WiFi networks (up to 3)
TIMEZONE	Pick your local timezone from ~18 worldwide zones
ALERTS	Manage the flight watch-list (callsign / ICAO / flight-number prefixes)
NIGHT MODE	Schedule the screen to switch off overnight
SCREEN	Each tap toggles between normal and 180°-flipped orientation
SW UPDATE	Shows the current firmware version; tap to check for an update now
GROUND	Each tap cycles: show all, hide vehicles and tower beacons, or hide all ground traffic including parked aircraft
AIRPORTS	Each tap cycles the airfield markers: Off, Large, Large + Medium, All
ABOUT	Firmware version, Device ID (MAC), WiFi network, IP address, signal and home location

Each of these is covered in detail in *Configuration*.

3.6 Normal Operation Sequence

3.6.1 Power-On

1. **Display up** (~1–2 s): scope and panel drawn, settings loaded
2. **WiFi connect** (5–30 s): joins the best saved network in range
3. **NTP sync** (1–3 s): the clock populates with local time
4. **Feed polling**: the device begins fetching aircraft near home (about every 30 s)
5. **Update check**: an OTA check runs ~30 s after WiFi comes up, then hourly

If no WiFi is configured, the on-screen WiFi setup takes over instead — see *Getting Started*.

3.6.2 Steady State

- The clock ticks every second
- Aircraft positions refresh roughly every 30 seconds; blips update in place
- The sweep rotates continuously (unless turned off)
- Selecting an aircraft triggers its type/route lookup in the background

3.6.3 Auto-Recovery

- **WiFi drop**: the device retries automatically and resumes when the network returns
- **Feed hiccup**: contacts are kept briefly and the poll retries; a prolonged, healthy network dry spell simply keeps retrying, while a genuinely stuck secure connection is recovered by an automatic restart

3.7 Tips for Daily Use

3.7.1 Choosing a Range

- **Under an airport / flight path**: a short range (5–20 km) fills the scope with the aircraft nearest you
- **Wide-area watching**: a longer range (80–250 km) shows distant traffic but packs blips near the centre
- Use the **+** / **−** buttons at the top-left of the scope to change the range; the ring labels update to match (see *Configuration*)

3.7.2 Placement

- Keep the device on a desk, shelf or windowsill within good 2.4 GHz WiFi range
- Avoid direct sunlight, which washes out the LCD
- Use **180° rotation** (Settings → SCREEN) if you mount it with the USB-C socket at the top

3.7.3 Power

- FlightRadar can run 24/7 on USB-C
- Use a quality 5 V supply rated 1 A or more
- Works from a USB-C power bank for portable use
- Use **Night Mode** to switch the screen off overnight and save power/wear

3.8 What's Next?

- Adjust every setting in *Configuration*
- Firmware updates and networking detail: *Advanced Features*
- If something isn't working: *Troubleshooting*

CHAPTER

FOUR

CONFIGURATION

This section documents every configurable setting on FlightRadar. Almost everything is set on the touchscreen; the only thing the web page does is initial WiFi setup.

4.1 Where Settings Live

- **On-screen settings menu** — the primary way to configure the device. There is no "configuration mode": the settings menu is always available and changes apply immediately.
- **Web setup page** — only used to enter WiFi credentials when the device is in access-point setup mode (see *Getting Started*).
- **Compile-time defaults** — the factory defaults below live in the firmware; the live values are stored in non-volatile storage (NVS) and survive reboots and firmware updates.

4.2 Device Information

4.2.1 Device ID (MAC Address)

Every FlightRadar has a unique **Device ID**, which is its WiFi MAC address.

Type
: Read-only

Format
: `XX:XX:XX:XX:XX:XX` (hexadecimal)

Example
: `A4:CF:12:34:56:78`

It appears in **Settings** → **ABOUT**.

The About page also shows the WiFi network, IP address and signal strength, your home location and the support email address. The TopBytes update service uses the Device ID to identify your unit for firmware updates. Have it ready if you contact support.

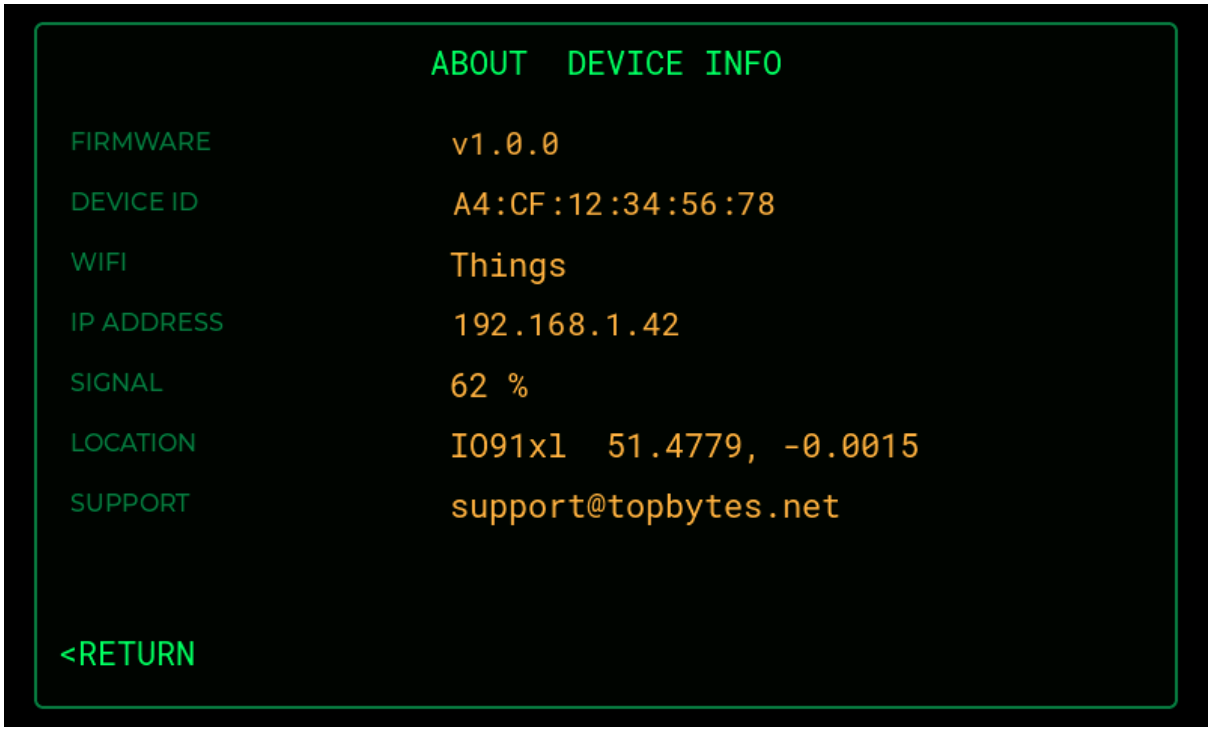

Fig. 1: Settings → ABOUT (example Device ID and IP address shown).

4.2.2 Firmware Version

The current firmware version is shown in **Settings** → **ABOUT** and in **Settings** → **SW UPDATE**. It is also sent to the update service on every check.

4.3 Home Location

The radar scope is centred on your **home location**. Set it in **Settings** → **LOCATION**.

Configurable via
: Settings → LOCATION (Maidenhead grid **or** latitude/longitude)

Default
: `51.4779, -0.0015` (near London)

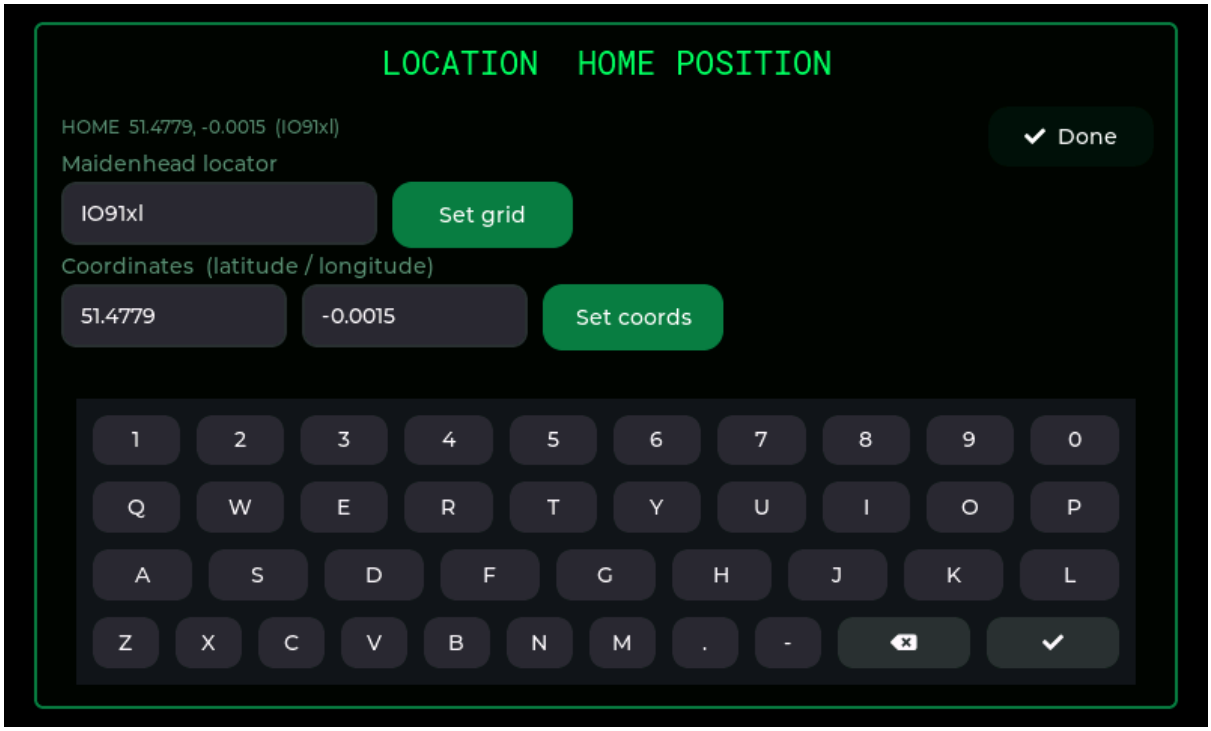

Fig. 2: Settings → LOCATION. Tap **Done** when finished.

4.3.1 Maidenhead Locator

Type a **4-, 6- or 8-character** grid square (e.g. `IO91wm`) and tap **Set grid**. Input is case-insensitive and displayed in canonical form. A 6-character grid resolves to roughly 2 km, which is more than accurate enough for a radar whose rings are kilometres apart.

4.3.2 Latitude / Longitude

Type your **latitude** (−90…90) and **longitude** (−180…180) in decimal degrees and tap **Set coords**.

Note: Invalid input is rejected with an error (`Invalid grid (e.g. IO91wm)` or `Lat -90..90, Lon -180..180`) and your previous location is kept. When you set a valid location the scope re-centres immediately and the value is saved.

Note: FlightRadar has no GPS receiver. Location is set manually by grid or coordinates.

4.4 Range / Zoom

The outer ring marks the maximum range — the "overhead" cutoff. Aircraft beyond it are not shown.

Configurable via
: the **+** (zoom in) and − (zoom out) buttons at the top-left of the scope

Default
: `40` km

Presets
: 5, 10, 20, 40, 80, 160, 250 km

Each tap steps to the next preset. The ring labels update to match, and the range is saved, so it survives a restart.

Lower ranges zoom in on the traffic closest to you; higher ranges show a wider area but crowd distant blips toward the centre.

4.5 Sweep

The rotating radar sweep is configurable in **Settings** → **SWEEP**. Each tap on the row cycles through the options:

Option	Meaning
OFF	No sweep line (blips still update)
FAST 5s	One revolution every 5 seconds
NORMAL 8s	One revolution every 8 seconds (default)
SLOW 12s	One revolution every 12 seconds

A slower sweep looks smoother and gives a longer afterglow trail; a faster sweep refreshes each blip's brightness more often.

4.6 Brightness

Default
`90` %

FlightRadar detects the backlight type automatically at boot:

- **Dimmable** hardware is driven with PWM at the default brightness.
- **On/off-only** hardware simply switches the backlight on.

Note: This release has no on-screen brightness control. Use **Night Mode** to turn the screen off overnight.

4.7 Screen Rotation

Configurable via
Settings → SCREEN (each tap toggles)

Options
`NORMAL` or `180 FLIP`

Default
NORMAL

Flips both the display **and** the touch input by 180°, for mounting the device upside-down (for example, hanging from a shelf with the USB-C socket at the top). Taps stay aligned with what's on screen.

4.8 Ground Traffic

Configurable via
Settings → GROUND (each tap cycles)

Options
`SHOW ALL`, `HIDE VEHICLES` or `HIDE ALL`

Default
HIDE VEHICLES

Near an airport, much of what transmits is on the ground:

- `SHOW ALL` — everything the feed reports, including airside service vehicles and fixed beacons such as the control tower
- `HIDE VEHICLES` — leaves out vehicles and fixed beacons, so they don't take slots from real traffic. Aircraft parked or taxiing are still shown (with altitude 0), but airborne aircraft take priority over them when the scope is full
- `HIDE ALL` — also leaves out aircraft on the ground, so only airborne traffic is shown. An aircraft squawking an emergency code is always shown

The change applies from the next feed poll (within about 30 seconds).

4.9 Airports

Configurable via
Settings → AIRPORTS (each tap cycles)

Options
`OFF`, `LARGE`, `LRG+MED` or `ALL`

Default
LRG+MED

Marks airfields within range on the scope with a small cyan triangle (△) and their ICAO code (for example `EGLL`). Larger triangles are larger airports.

- `LARGE` — major airports only (e.g. Heathrow, Gatwick)
- `LRG+MED` — adds medium airports and military airfields (e.g. London City, Biggin Hill, RAF Northolt)
- `ALL` — adds small airfields and private strips, shown dimmer

The airfield list covers the whole world and is built into the firmware, so no internet lookup is needed. When you set your location, FlightRadar picks out the airfields within 250 km (the widest zoom). At wide zooms, larger airports take priority: at most 80 markers are drawn, and a code is left off when it would overlap another.

4.10 Night Mode (Overnight Screen-Off)

Configurable via
Settings → NIGHT MODE

Default
Disabled; window 23:00 → 07:00

When enabled, the screen backlight turns off between the **start** and **end** times you set (in local time). Touching the screen wakes it for about 5 minutes, then it returns to off.

- Tap the **ENABLED / DISABLED** button to switch the schedule on or off.
- Scroll the **Turn OFF at** and **Turn ON at** rollers to set the hour and minute (minutes move in 5-minute steps).

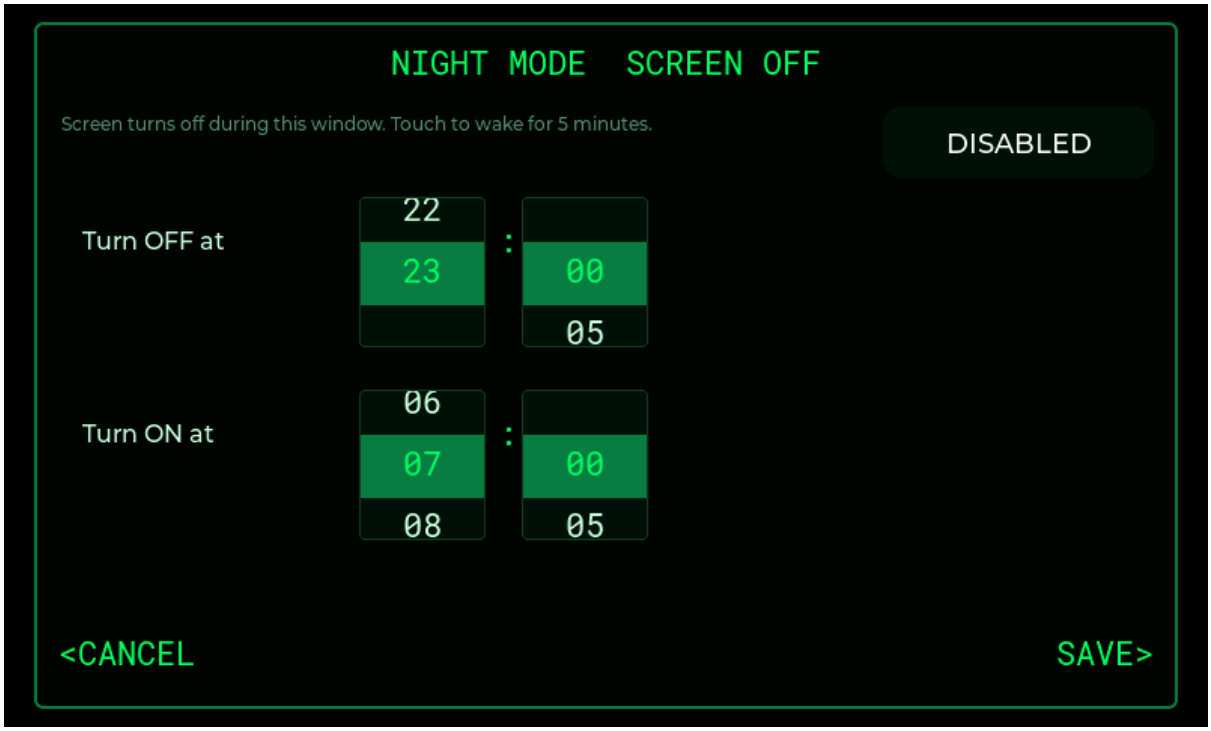

Fig. 3: Settings → NIGHT MODE.

- Tap **SAVE>** to keep the changes, or **<CANCEL** to discard them.

4.11 Timezone

Configurable via
Settings → TIMEZONE (or long-press the clock)

Default
`UTC`

The timezone controls the clock in the top-right corner. Scroll the list to your zone and tap **SET>** (or **<CANCEL** to keep the current one). The change applies immediately (no reboot) and daylight-saving is handled automatically where the zone uses it.

Available timezones:

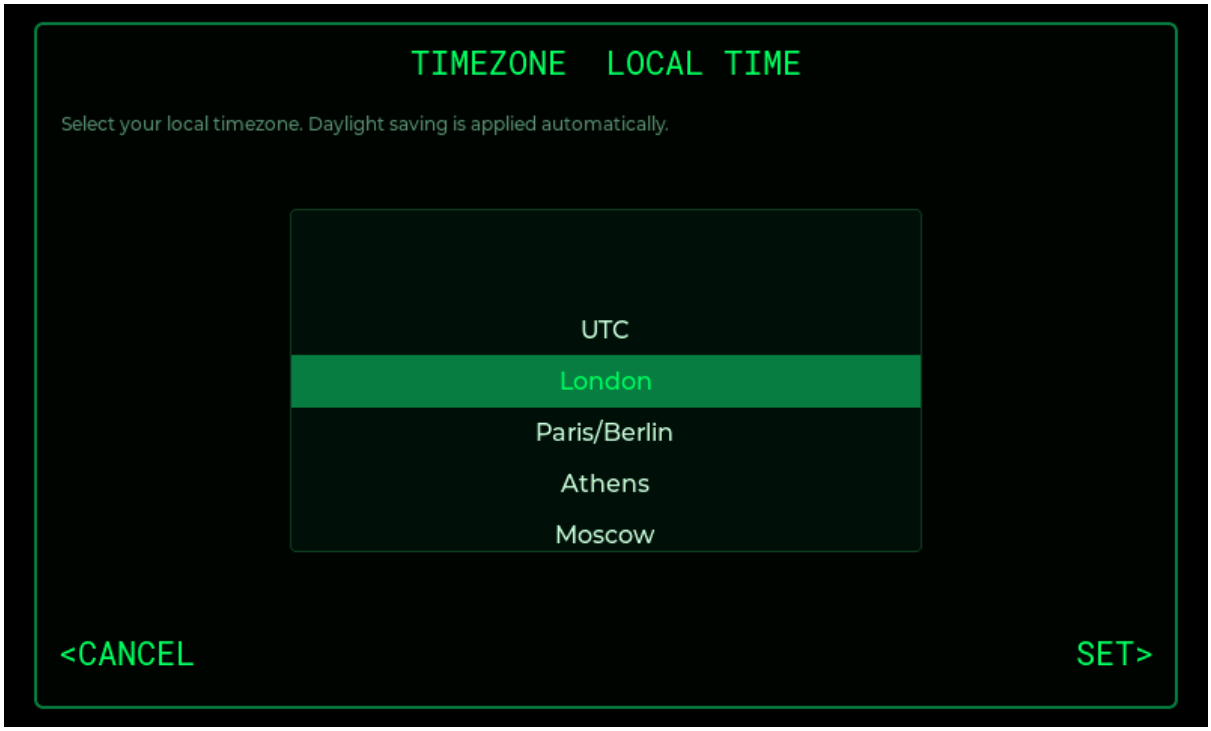

Fig. 4: Settings → TIMEZONE.

Timezone	Notes
UTC	Coordinated Universal Time (default)
London	UK, with daylight saving
Paris / Berlin	Central European Time, with daylight saving
Athens	Eastern European Time, with daylight saving
Moscow	Moscow Time (no daylight saving)
Dubai	Gulf Standard Time (no daylight saving)
Mumbai	India Standard Time (no daylight saving)
Bangkok	Indochina Time (no daylight saving)
Singapore	Singapore Time (no daylight saving)
Tokyo	Japan Standard Time (no daylight saving)
Sydney	Australian Eastern Time, with daylight saving
Auckland	New Zealand Time, with daylight saving
New York	US Eastern Time, with daylight saving
Chicago	US Central Time, with daylight saving
Denver	US Mountain Time, with daylight saving
Los Angeles	US Pacific Time, with daylight saving
Honolulu	Hawaii Time (no daylight saving)
Sao Paulo	Brasília Time (no daylight saving)

4.12 WiFi Networks

Configurable via
Settings → WIFI, the on-screen WiFi setup, or the AP web page

Maximum stored networks
3

FlightRadar stores up to **3** WiFi networks. On boot it scans and connects to the best saved network in range. The most recently added network becomes the highest priority.

- **Add a network** — via the on-screen WiFi setup (scan + touch keyboard) or the access-point web page (see *Getting Started*)
- **View / remove networks** — in **Settings** → **WIFI**, where the currently-connected network is marked `current`; tap the red bin button to remove one, or **Add network** to scan for another

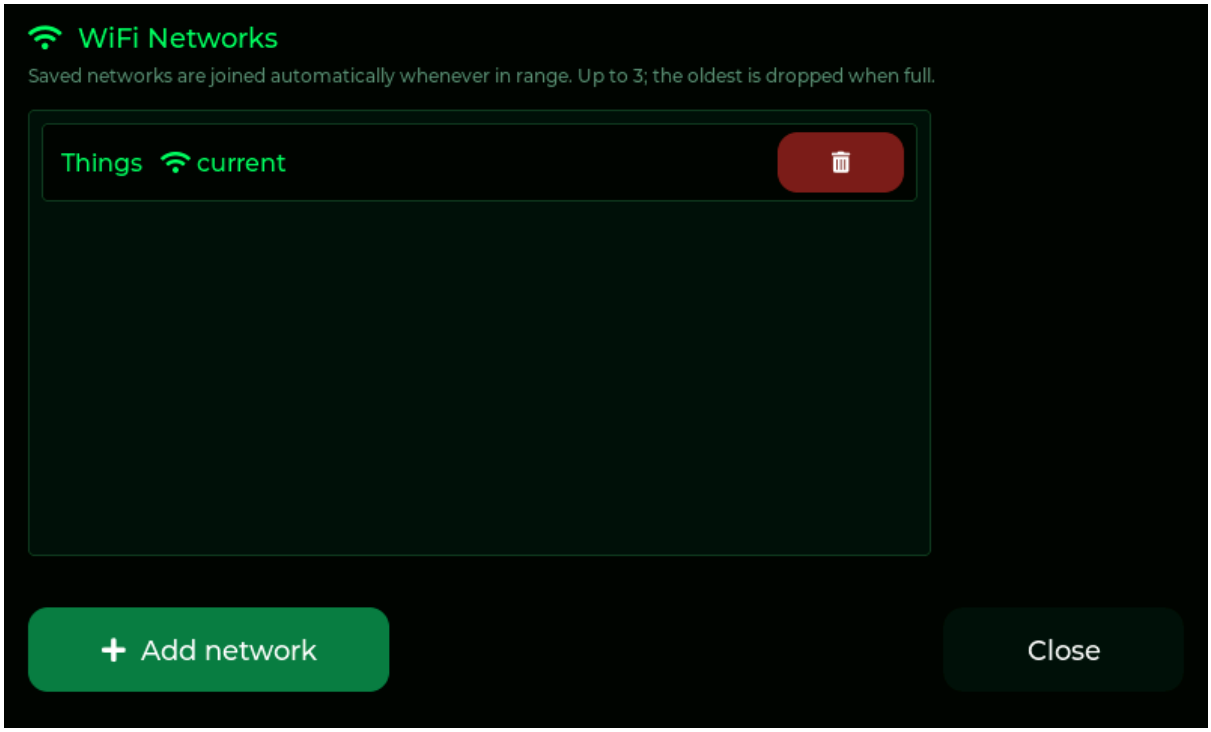

Fig. 5: Settings → WIFI.

- Passwords are stored in NVS and never shown back on screen

Note: Only 2.4 GHz networks are supported. 5 GHz networks will not appear in the scan and cannot be joined.

4.13 Flight Alerts

FlightRadar can highlight aircraft that match a watch-list of prefixes.

Configurable via
Settings → ALERTS

Maximum entries
6

4.13.1 How Matching Works

Each alert entry is matched **case-insensitively** as a *prefix* against an aircraft's **callsign**, **ICAO24 hex**, or (once looked up) its **IATA flight number**. So:

Alert entry	Aircraft	Match?
`BAW`	`BAW117`	Yes (callsign prefix)
`VIR`	`VIR3`	Yes (callsign prefix)
`BA109`	flight `BA109`	Yes (flight-number prefix)
`BAW`	`DLH441`	No (different prefix)

4.13.2 Managing Alerts

In **Settings** → **ALERTS**:

- Type a callsign / ICAO / flight-number prefix (e.g. `BAW`, `VIR`, `BA109`) and tap **Add watch**
- Existing entries are listed under **WATCHING**, each with a delete button
- If the list is empty, the panel shows `No alerts. Add a prefix to watch for.`
- Tap **Done** to close the page

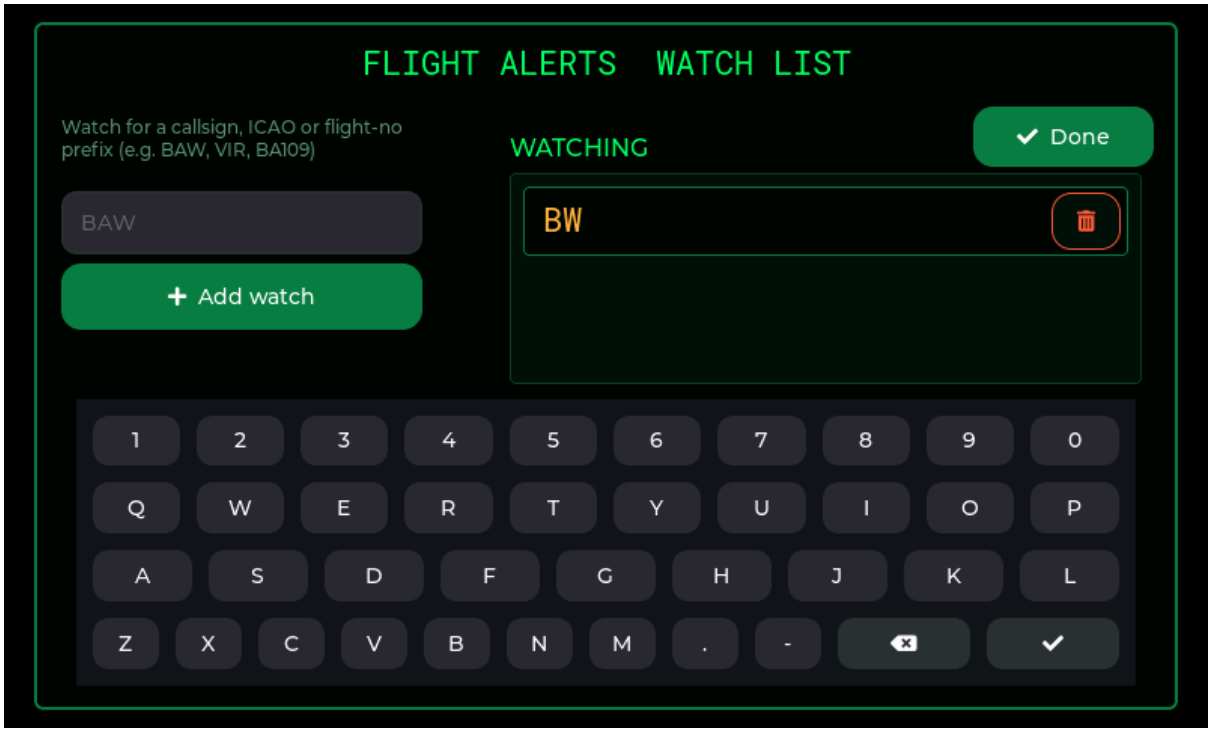

Fig. 6: Settings → ALERTS.

4.13.3 What an Alert Looks Like

Aircraft matching any alert entry are drawn in **orange-red** on the scope, so they stand out from ordinary green contacts. Select one to see its full details.

Tip: Use a broad prefix (e.g. an airline's ICAO prefix like `BAW`) to catch every flight from that operator, or a full flight number to watch one specific service. Avoid single letters, which would match almost everything.

4.14 Factory Reset

FlightRadar does not currently expose a one-tap factory reset in the on-screen menu.

- To remove a WiFi network, delete it individually in **Settings** → **WIFI**.
- A full erase of all saved settings requires re-flashing / erasing the device over USB from a computer and is intended for service use. Contact support@topbytes.net if you need to fully reset a unit.

4.15 What's Next?

- Daily operation and reading the screen: *Operation*
- Firmware updates and networking detail: *Advanced Features*
- Solving problems: *Troubleshooting*

CHAPTER

FIVE

TROUBLESHOOTING

This section provides solutions to common issues with FlightRadar.

5.1 Quick Diagnostic Checklist

Before drilling in, check the basics:

- [ ] Is the LCD lit? (If not, check USB-C power and the cable)
- [ ] Does the clock (top-right) show the correct local time? (If not, WiFi/NTP hasn't synced)
- [ ] Is the device on your WiFi? (No traffic + wrong clock usually means it's offline)
- [ ] Is your home location correct? (Settings → LOCATION)
- [ ] Is the range sensible for your area? (the **+** / **−** buttons on the scope)

5.2 WiFi and Setup Issues

5.2.1 The WiFi Scan Shows No Networks

Possible causes and solutions:

- **5 GHz only** — FlightRadar supports only 2.4 GHz. Enable 2.4 GHz on your router.
- **Out of range** — move the device closer to your access point.
- **Hidden SSID** — hidden networks don't appear in the scan. Tap **Other (enter manually)** and type the name.
- **Scan still running** — give it a few seconds, or tap **Rescan**.

5.2.2 Can't Connect to the WiFi Network

- **Wrong password** — re-enter it; passwords are case-sensitive. Delete the network in **Settings** → **WIFI** and add it again.
- **2.4 GHz disabled / band steering** — ensure the 2.4 GHz band is enabled; some routers hide it behind a single combined SSID.
- **Special characters** — very unusual characters in the SSID or password can cause problems; a simpler guest network is a good test.

5.2.3 Can't Reach the Setup Page (Access-Point Mode)

If you're using the phone/laptop fallback:

- Make sure you joined the open network named `FlightRadar Setup`.
- If the captive portal doesn't pop up, open a browser and go to `http://192.168.4.1`.
- Temporarily disable mobile data / "auto-switch to mobile" so the phone stays on the setup hotspot (which has no internet).

5.3 No Aircraft on the Scope

Symptoms: WiFi is connected and the clock is correct, but the scope shows no blips.

Possible causes and solutions:

1. **No traffic in range right now**
   - During quiet periods there may genuinely be nothing overhead.
   - Zoom out with the − button on the scope to a wider range (e.g. 80–250 km) to see distant traffic.
2. **Wrong home location**
   - If the scope is centred on the wrong place, real traffic falls outside your range.
   - Check **Settings** → **LOCATION** and set your correct grid or coordinates.
3. **No internet access**
   - The feed needs outbound HTTPS. If your network blocks it, no positions arrive.
   - Confirm the device is truly online (the clock will be correct after NTP) and that outbound HTTPS to `opendata.adsb.fi` is allowed. See *Advanced Features*.
4. **Feed service temporarily unavailable**
   - The adsb.fi network is a community service and can occasionally be slow or down. While it is, the scope keeps the last known aircraft in grey and the list heading shows `NO DATA`.
   - The device retries automatically (every 30 s, backing off to once a minute while it keeps failing). If nothing gets through for 10 minutes it restarts itself.
   - adsb.fi limits how often one internet connection may request data. Several FlightRadars on the same connection (for example a shop demo shelf) share that limit, so the feed may drop out more often there.

5.4 Detail Panel Missing Type / Route

Symptoms: A selected aircraft shows altitude, speed and heading, but the type, operator or route stay as `unknown aircraft` / `route unknown`.

- The core fields come from the position feed and are always present. The type/operator and route are looked up from `adsbdb.com` and depend on that database having the aircraft or the flight number.
- **General-aviation and military** aircraft often aren't in the route database.
- A brief `looking up aircraft...` / `looking up route...` is normal while the lookup runs; give it a few seconds.
- If **every** aircraft is missing enrichment, the device may be unable to reach `api.adsbdb.com` — check outbound HTTPS (see *Advanced Features*).

5.5 Clock Is Wrong or Shows `--:--:--`

- The clock is set by NTP after WiFi connects. A wrong or blank clock almost always means the device isn't online yet.
- Fix the WiFi connection first; the clock corrects itself once NTP syncs.
- Check the timezone in **Settings** → **TIMEZONE** if the time is offset by whole hours.

5.6 Display Issues

5.6.1 Screen Is Blank / Dark

- **Power** — verify the USB-C cable is fully seated and the supply provides at least 1 A. Try a different cable/adapter (some cables are charge-only or too thin).
- **Night Mode** — if the screen goes dark on a schedule, it's Night Mode. Touch the screen to wake it for a few minutes, or disable the schedule in **Settings** → **NIGHT MODE**.
- **Boot loop** — an underpowered supply can cause repeated restarts. Use a known-good 1 A+ USB-C supply.

5.6.2 Everything Is Upside-Down

- The screen rotation is set to 180°. Change it in **Settings** → **SCREEN** to `NORMAL`.

5.6.3 Touch Doesn't Line Up

- Rotation flips the display and touch together, so taps should always align. If they don't, toggle **Settings** → **SCREEN** between NORMAL and 180° once to resync, or power- cycle the device.

5.7 Firmware Update Issues

- **Update won't start / "check failed"** — confirm the device is online and can reach `u.topbytes.net` over HTTPS. Retry from **Settings** → **SW UPDATE**.
- **Update fails partway** — the device shows `Update failed. Resuming.` and keeps the existing firmware. Check WiFi stability and try again; updates resume cleanly.
- **Beta prompt appears unexpectedly** — a pre-release build was offered. Tap **CANCEL** to stay on your current firmware.

5.8 Getting Help

5.8.1 Gathering Information for Support

Before contacting support, note:

- **Device ID** (MAC) — from **Settings** → **ABOUT**
- **Firmware version** — from **Settings** → **ABOUT**
- Your **WiFi** type (confirm it's 2.4 GHz) and whether the device shows as online
- A clear description: what you did, what you expected, and what actually happened

Serial log output (115200 baud over USB-C) can also help — it shows the boot, WiFi, NTP and feed activity. Typing `stat` on the serial port prints a one-screen status summary (version, time, WiFi, home, aircraft in range and memory).

5.8.2 Contact Support

- **Website:** https://www.topbytes.net
- **Product page:** https://flightradar.topbytes.net
- **Email:** support@topbytes.net

5.9 Emergency Recovery

If a firmware update fails badly or the device stops functioning, you can re-flash it directly from a computer.

You will need a USB-C cable that carries **data** (not charge-only). Plug FlightRadar into your computer.

Note: Use the Google Chrome web browser to perform the recovery flash.

Click the "Connect" button above and select the USB serial port associated with your FlightRadar, then follow the prompts.

CHAPTER

SIX

ADVANCED FEATURES

This section covers firmware updates, how the data feed and enrichment work, network administration — for users who want to understand what's happening under the hood.

6.1 Over-The-Air (OTA) Firmware Updates

FlightRadar checks for firmware updates automatically and installs them securely over HTTPS from the TopBytes update service.

6.1.1 How OTA Works

- About **30 seconds** after WiFi comes up, the device asks the update service whether a newer release is available for this unit (identified by its Device ID / MAC).
- After the first check, it re-checks **every hour** for the rest of uptime.
- Production units automatically install only **strictly newer** released firmware.

6.1.2 Manual Update Check

You don't have to wait for the hourly cadence. In **Settings** → **SW UPDATE**, the row shows the current firmware version; tapping it runs an immediate check. While checking it shows `CHECKING...`; if you're already current it shows `UP TO DATE` briefly, or `CHECK FAILED` if the update service couldn't be reached (try again in a minute).

6.1.3 Beta / Pre-Release Builds

If the update service offers a pre-release **beta** build for your unit, installing it is never automatic. FlightRadar shows a confirmation dialog first:

```
!  Beta version X.Y.Z

This is a pre-release beta build and may be unstable. Install it now?

[ CANCEL ]   [ INSTALL ]
```

Only if you tap **INSTALL** does the beta firmware download.

6.1.4 The Update Progress Screen

As soon as an update starts (straight after you tap **INSTALL**), a full-screen page takes over the LCD with the title `Installing update` and a status line:

- `Connecting to the update server...` while it connects (with the attempt number if it has to retry)
- `Downloading. Do not power off. The device restarts when done.` once the download is running. There is no progress bar; the screen stays still while the download runs

On success the device shows `Update complete. Restarting...` and reboots into the new firmware. If the download fails it shows `Update failed. Resuming.`, waits a moment, and returns to normal operation — your existing firmware is untouched.

> **Warning:** Do not remove power during an update. Because the previous firmware is only replaced once the new image has fully downloaded and verified, a power loss mid-download simply leaves the existing firmware running — but it's still best to let it finish.

6.2 How the Data Feed Works

6.2.1 Aircraft Positions

FlightRadar polls the community adsb.fi open-data network for aircraft within range of your home location:

- **Endpoint:** `https://opendata.adsb.fi/api/v2/lat/<lat>/lon/<lon>/dist/<radius>` (HTTPS), centred on home, with the radius derived from your configured range
- **Poll interval:** about **30 seconds** in steady state. Until the first successful poll it retries quickly (from 1.2 s), backing off up to 15 s if the service keeps failing. Once running, repeated failures back off to 60 s, and a rate limit response (HTTP 429) pauses polling for 60 s
- **Timeouts:** 5 s to connect, 8 s for the TLS handshake and 10 s for the response, so an unreachable service is detected quickly. Position and enrichment requests run on their own task and never hold up the display or the rest of the firmware
- Each aircraft record provides the ICAO24 hex, callsign, position, altitude, ground speed, track, vertical rate, squawk, emitter category, and the registration and type code from the network's aircraft database

Positions are kept in an in-memory table (up to 40 contacts) keyed by ICAO24, so blips update in place across polls rather than flickering. Contacts that stop being reported fade and are removed.

When more aircraft are in range than the table holds (common near a large airport), each poll keeps the most relevant ones, in this order:

1. Aircraft squawking an emergency code (7500, 7600, 7700)
2. Aircraft matching your alert watch list
3. Airborne aircraft
4. Aircraft on the ground

Within each group the nearest come first. Airside vehicles and fixed transmitters such as tower beacons are left out unless **Settings** → **GROUND** is set to `SHOW ALL`, and `HIDE ALL` also leaves out aircraft on the ground.

6.2.2 Aircraft & Route Enrichment

When you select an aircraft, FlightRadar looks up extra details from adsbdb.com (a free service — no key required):

- **Aircraft** (by ICAO hex): type/model, registration, operator. The registration and type code from the position feed are shown first and take precedence: if adsbdb's record is for an older registration, its operator isn't shown
- **Route** (by callsign): IATA flight number, origin and destination, and the destination coordinates used to estimate an ETA

Lookups are **cached** per aircraft, **prioritised** for the aircraft you've selected, and **throttled** in the background so they never block the UI. If a lookup fails or the aircraft isn't in the database, the panel simply shows what it has (`unknown aircraft`, `route unknown`) and the scope keeps working.

Note: Both the position feed and enrichment need internet access over HTTPS. If your network blocks outbound HTTPS, the scope and detail panel will have little or no data.

6.3 Network Administration

6.3.1 Ports Used

Port	Protocol	Purpose
80	TCP (HTTP)	Web setup page (inbound, **AP setup mode only**)
53	UDP (DNS)	DNS resolution (outbound; also the captive-portal DNS in AP mode)
123	UDP (NTP)	Time synchronisation (outbound)
443	TCP (HTTPS)	Aircraft feed (adsb.fi), enrichment (adsbdb.com), and firmware updates (u.topbytes.net) — all outbound

6.3.2 Firewall Considerations

For normal operation, allow outbound:

- **HTTPS (443)** to `opendata.adsb.fi`, `api.adsbdb.com` and `u.topbytes.net`
- **NTP (123)** to `pool.ntp.org` / `time.google.com`
- **DNS (53)**

The inbound web page on port 80 only runs while the device is in access-point setup mode; it is not exposed on your home network during normal operation.

> **Warning:** The setup web page has no password protection. Only use it on the device's own `FlightRadar Setup` access point; never expose it to the public internet.

6.4 Time Synchronisation

FlightRadar synchronises its clock via NTP shortly after WiFi comes up.

- **NTP servers:** `pool.ntp.org` and `time.google.com`
- **Timezone:** set in **Settings** → **TIMEZONE**; daylight-saving is applied automatically
- **Format on screen:** `HH:MM:SS` plus a `Mon DD Mon` date line

If NTP hasn't completed yet (or the device is offline), the clock will be inaccurate until a sync succeeds.

6.5 Power Consumption

- **Typical:** ~2–4 W at 5 V (dominated by the LCD backlight)
- **Peak** (during an OTA flash): up to ~1 A at 5 V
- Use a quality 5 V / 1 A or higher USB-C supply
- USB-C power banks work for portable use; a 10,000 mAh bank runs the device for many hours
- Use **Night Mode** to switch the backlight off overnight and reduce power and panel wear

6.6 Security Notes

1. Use a **WPA2/WPA3** WiFi network; avoid open networks.
2. Keep firmware up to date — the OTA check runs hourly.
3. The setup web page is unauthenticated by design and only runs in AP setup mode; don't route it to the internet.

6.7 What's Next?

- Hardware and network specifications: *Technical Specifications*
- Regulatory and safety information: *Compliance*
- Return to daily operation: *Operation*

CHAPTER

SEVEN

TECHNICAL SPECIFICATIONS

This section provides detailed technical specifications for the FlightRadar device.

7.1 Hardware Specifications

7.1.1 Wireless Connectivity

WiFi Standard
IEEE 802.11 b/g/n

Frequency Band
2.4 GHz only (5 GHz not supported)

WiFi Modes
Station (STA), Access Point (AP)

Security
WPA, WPA2, WPA2/WPA3 mixed

Antenna
On-board PCB antenna

Note: FlightRadar does **not** support 5 GHz WiFi networks. Ensure your router has 2.4 GHz enabled.

7.1.2 Display

Type
7-inch IPS colour LCD (RGB parallel)

Resolution
800 x 480 pixels

Backlight
White LED (dimmable on supported hardware)

Touch Panel
Capacitive multi-touch

Surface
Glass

7.1.3 Power Requirements

Input Voltage
5 V DC ±5% (via USB-C)

Input Current
500 mA typical, ~1 A peak

Power Consumption
2–4 W typical

Connector
USB-C

Battery Support
Via USB-C power bank (not included)

> **Warning:** Use only a quality 5 V USB-C power supply rated for at least 1 A. Insufficient power may cause boot loops, display flicker, or instability.

7.1.4 Physical Specifications

Form factor
7-inch landscape tablet-style enclosure

Mounting
Desktop or shelf; supports 180° screen rotation for inverted mounting

Environmental Rating
Indoor use only

7.1.5 Operating Environment

Operating Temperature
0 °C to 40 °C (32 °F to 104 °F)

Storage Temperature
−20 °C to 60 °C (−4 °F to 140 °F)

Humidity
20% to 80% RH non-condensing

Altitude
Up to 2000 m

> **Caution:** Do not operate in direct sunlight, high humidity, or extreme temperatures. Avoid exposing to moisture.

7.2 Network Specifications

7.2.1 Supported Protocols

Aircraft Feed
HTTPS (TCP port 443) to `opendata.adsb.fi`

Enrichment
HTTPS (TCP port 443) to `api.adsbdb.com`

Firmware Updates
HTTPS (TCP port 443) to `u.topbytes.net`

Web Setup Page
HTTP (TCP port 80, AP setup mode only)

Time Sync
NTP (UDP port 123)

DNS
UDP port 53

7.2.2 Aircraft Data Feed

Source
adsb.fi open-data ADS-B network

Protocol
HTTPS REST (bounded by lat/lon and radius around home)

Poll Interval
~30 seconds (steady state)

Contacts Tracked
Up to 24 in range

Range
5–250 km (configurable)

7.2.3 Aircraft / Route Enrichment

Source
adsbdb.com (free, no API key)

Aircraft Lookup
type/model, registration, operator (by ICAO24 hex)

Route Lookup
IATA flight number, origin, destination, destination coordinates (by callsign)

Caching
Per-aircraft, prioritised for the selected contact

7.2.4 Time Synchronisation

Protocol
NTP (Network Time Protocol)

Servers
`pool.ntp.org`, `time.google.com`

Timezone
Configurable (~18 worldwide zones, automatic DST)

Time Format
24-hour `HH:MM:SS` with `Mon DD Mon` date

7.2.5 Configuration Limits

Max WiFi Networks
3 (priority-ordered)

Max Alert Prefixes
6

Max Aircraft in Range
24

Range Presets
5, 10, 20, 40, 80, 160, 250 km

Sweep Periods
Off, 5 s, 8 s, 12 s

Brightness
90% (dimmable hardware; no on-screen control)

7.3 Radar Scope

Scope Area
480 x 480 pixels (square, left half of the display)

Detail Panel
320 x 480 pixels (right)

Range Rings
4 concentric, kilometre-labelled

Orientation
North up; N/E/S/W compass marks

Sweep
Rotating line with fading afterglow trail

7.4 Performance Specifications

7.4.1 Boot Time

Cold Boot
~1–2 seconds to UI ready

WiFi Connection
5–30 seconds (network dependent)

NTP Sync
1–3 seconds after WiFi

First Aircraft
Typically within a few polls of coming online

7.4.2 Reliability

Watchdog Timer
Yes

Automatic Recovery
WiFi and feed disconnections

OTA Failure Handling
Failed updates leave the running firmware untouched

7.5 Compatibility

7.5.1 WiFi Router Compatibility

Compatible With

- All 2.4 GHz 802.11 b/g/n routers
- WPA / WPA2 / WPA2-WPA3 mixed
- Most home and portable routers (including phone hotspots)

Not Compatible With

- 5 GHz only networks
- WPA3-only networks (use WPA2/WPA3 mixed-mode)
- Enterprise WiFi with 802.1X
- Captive portals requiring web-form authentication after joining

7.5.2 Power Source Compatibility

Compatible With

- USB-C wall adapters (5 V, $\geq$1 A)
- USB-C ports on computers
- USB-C power banks
- USB-C car chargers

Not Recommended

- Charge-only USB-C cables (won't expose serial / recovery over USB)
- Supplies under 1 A — display flicker likely

7.6 Data Sources

FlightRadar relies on third-party community services for its data:

- **Aircraft positions:** adsb.fi
- **Aircraft type / registration / operator / route:** adsbdb.com

These are independent services not affiliated with TopBytes Ltd. Availability and coverage are subject to those projects.

7.7 Support and Documentation

7.7.1 Resources

- **User Manual:** This document
- **Product Website:** https://flightradar.topbytes.net
- **Company Website:** https://www.topbytes.net
- **Support Email:** support@topbytes.net

CHAPTER

EIGHT

COMPLIANCE

This product complies with the essential requirements of the following EU directives:

Directive	Title
2014/53/EU	Radio Equipment Directive (RED)
2011/65/EU	Restriction of Hazardous Substances (RoHS), as amended by 2015/863
2012/19/EU	Waste Electrical and Electronic Equipment (WEEE)

8.1 Radio Equipment Information

Per RED Article 10(10)

8.1.1 WiFi Operating Parameters

Technology	IEEE 802.11 b/g/n (WiFi)
Operating frequency band	2400–2483.5 MHz
Maximum transmit power	<100 mW (20 dBm) EIRP
Number of channels	13 (EU)
Channel bandwidth	20 MHz
Antenna	Internal (PCB trace, non-removable)

8.2 EU Declaration of Conformity

Per Radio Equipment Directive 2014/53/EU, Article 10(9)

Hereby, **TopBytes Ltd** declares that the radio equipment type **FlightRadar** (Model: FLTRDR-01) is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available on request from `support@topbytes.net`.

8.3 UKCA Declaration of Conformity

FlightRadar (Model: FLTRDR-01) complies with the relevant UK statutory instruments:

- Radio Equipment Regulations 2017
- Electrical Equipment (Safety) Regulations 2016
- Electromagnetic Compatibility Regulations 2016
- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

8.4 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

Note: Changes or modifications not expressly approved by TopBytes Ltd could void the user's authority to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

8.5 RF Exposure Information

8.5.1 General Statement

This device complies with EU and US/UK requirements for limiting exposure of the general public to electromagnetic fields, as assessed in accordance with EN 62311:2020.

FlightRadar is a low-power device that transmits at a maximum of 100 mW EIRP in the 2.4 GHz band. It is designed for tabletop / desktop use and is not intended to be worn on the body or held against the head.

8.5.2 Usage Distance

This device has been evaluated for RF exposure compliance at a minimum separation distance of **20 cm** between the device and the user's body. At this distance and power level, the electromagnetic field exposure is well below the limits set by Council Recommendation 1999/519/EC (based on ICNIRP guidelines).

8.5.3 Recommendations

- Use the device on a desk, table, or shelf — not directly against the body
- Do not modify the antenna or connect external antennas
- If co-locating with other radio equipment, maintain reasonable separation

8.6 Safety Warnings

8.6.1 Power Supply

- **Use only a USB-C power supply that complies with applicable safety standards** (e.g. IEC 62368-1, CE / UKCA / FCC marked). Using a non-compliant power supply may create safety hazards.
- The device requires a 5 V DC power supply providing at least 1 A, connected via a USB-C cable that supports data (not charge-only).
- Do not exceed the rated input voltage of 5 V DC.
- Disconnect the USB-C cable before cleaning the device.
- Do not use damaged cables or power supplies.

8.6.2 Operating Environment

- **Indoor use only.** This device is not designed for outdoor or weatherproof use.
- Operating temperature: 0 °C to +40 °C.
- Storage temperature: −20 °C to +60 °C.
- Humidity: 20% to 80% relative humidity, non-condensing.
- Do not expose the device to moisture, rain, or liquids.
- Do not use the device in dusty, dirty, or excessively hot or cold environments.
- Do not block ventilation openings or place the device in enclosed spaces without airflow.
- Maximum operating altitude: 2000 m above sea level.

8.6.3 General Safety

- **This device is not a toy.** Keep out of reach of small children.
- Do not disassemble, modify, or attempt to repair the device. There are no user-serviceable parts inside.
- Do not expose the device to strong magnetic fields, excessive vibration, or mechanical shock.
- If the device emits unusual smells, sounds, or smoke, disconnect the power immediately and contact the manufacturer.
- This device is intended for general consumers and hobbyists. It is not intended for use in safety-critical, aviation-operational, medical, or life-support applications.

8.6.4 LCD Display and Touch Panel

- The capacitive touch panel responds to bare-finger touches; gloves and styluses without conductive tips will not register.
- Do not press the LCD with sharp objects, fingernails, or excessive force — this can permanently damage the panel.
- Clean the screen with a soft, dry, microfibre cloth. If liquid is required, use a small amount of distilled water on the cloth and never spray directly onto the screen.
- The LCD contains no mercury and uses LED backlighting.
- Avoid leaving high-contrast static images on the screen for extended periods to minimise the risk of image retention. The overnight **Night Mode** schedule can help.

8.7 Intended Use

FlightRadar is a WiFi-enabled, touchscreen display device that shows the position of nearby aircraft on a radar-style scope, using publicly-available ADS-B data fetched over the internet from third-party community services.

Intended users: General consumers, aviation enthusiasts, and hobbyists.

Intended environment: Indoor domestic or office environments.

Important: FlightRadar is an **informational novelty display only**. The aircraft data it shows is sourced from third-party community networks, may be incomplete, delayed or inaccurate, and is **not** suitable for any operational, navigational or safety-of-life purpose. Do not rely on it for aviation, air-traffic, or emergency use.

The device is not intended for:

- Outdoor installation
- Use in explosive or hazardous atmospheres
- Aviation-operational, navigational, medical or safety-critical applications
- Use as a source of authoritative or real-time air-traffic information

8.8 WEEE — Waste Disposal Information

Per WEEE Directive 2012/19/EU, Article 14

8.8.1 Disposal Instructions

This product is marked with the crossed-out wheelie bin symbol, indicating that it must **not** be disposed of with unsorted household waste when it reaches the end of its life.

Correct disposal: Take the product to a designated collection facility for the recycling of waste electrical and electronic equipment (WEEE). Contact your local authority or retailer for information on your nearest collection point.

8.8.2 Why Separate Collection Matters

Separate collection and recycling of waste electrical and electronic equipment helps to:

- Conserve natural resources
- Ensure hazardous substances are handled safely
- Protect the environment and human health

8.8.3 Batteries

This product does not contain an internal battery. If powered from a USB-C power bank, dispose of the power bank separately in accordance with Directive 2006/66/EC (Battery Directive) or its successor Regulation (EU) 2023/1542.

8.8.4 Producer Information

Producer	TopBytes Ltd
WEEE category	Category 3 — IT and telecommunications equipment

8.9 Manufacturer

Name	TopBytes Ltd
Model number	FLTRDR-01
Address	55 Kings Ride, HP10 8BP, UK
Website	https://www.topbytes.net
Product support	https://flightradar.topbytes.net
Email	support@topbytes.net

8.10 Firmware Updates

FlightRadar supports over-the-air (OTA) firmware updates via WiFi. Firmware updates may include:

- Bug fixes and performance improvements
- New features
- Updates to maintain regulatory compliance

The device checks for updates automatically when connected to the internet. Updates are downloaded securely via HTTPS from the TopBytes update service.

Note: Firmware updates do not change the radio parameters (frequency, power) beyond the limits declared in this documentation.

CHAPTER

NINE

CHANGELOG

This page documents the changes in each FlightRadar firmware release.

9.1 Version 1.0.8

- **Software updates:** the update page now appears as soon as you tap **INSTALL** and shows what it is doing. Previously it could take minutes to appear, and if the network was busy the update could be skipped without any message. A check that can't reach the update service now shows `CHECK FAILED` instead of `UP TO DATE`.
- **Hiding ground traffic takes effect straight away:** changing **Settings** → **GROUND** now updates the scope immediately, and aircraft that start taxiing or land are removed at the next update. Previously hidden aircraft could stay on screen for several minutes.
- **Gentler on the data service:** aircraft positions are now fetched every 30 seconds instead of 15 (positions still move smoothly in between). This halves each unit's share of adsb.fi's per-connection limit, which several units on one internet connection share. `NO DATA` now appears only after about 90 seconds without an update.
- **Ground traffic:** the GROUND VEHICLES setting is now **Settings** → **GROUND**, with a third option, `HIDE ALL`, that also hides aircraft on the ground (shown with altitude 0). Emergencies are always shown. Your existing choice is kept.
- **Feed outages:** when the aircraft feed can't be reached, the last known aircraft now stay on the scope in grey and the list shows `NO DATA` with how long it has been, instead of everything disappearing after 5 minutes.
- **Faster recovery and fewer stalls:** feed and lookup requests now run on their own task with shorter timeouts. A slow or refused connection used to hold up everything else for 40 seconds or more.
- **Rate limiting:** when adsb.fi says the connection is making too many requests, the device waits a minute before trying again, and repeated failures back off to once a minute.

9.2 Version 1.0.3

- **Busy airports:** the scope now holds up to 40 aircraft, and when more are in range it keeps emergencies, watch-list matches and airborne aircraft first, nearest first. Previously aircraft parked at the gates could fill every slot.
- **Ground vehicles:** airside vehicles and tower beacons are hidden by default (new **Settings** → **GROUND VEHICLES** option).
- **Squawk codes:** the detail panel shows the squawk code. Aircraft squawking 7500, 7600 or 7700 flash on the scope and are marked in the list. The panel's latitude/longitude cells are replaced by squawk and Maidenhead grid square.
- **More current registrations:** registration and type now come from the position feed's aircraft database, which is kept more up to date than the enrichment service.

- **Stability:** fixed data races between the network and display tasks that could cause stutters, wrong details on the panel, or crashes. Enrichment lookups for aircraft still on the scope are no longer dropped, and they are fetched more often.
- **Airports:** airfields within range are marked on the scope with their ICAO code. A new **Settings** → **AIRPORTS** option chooses large, large + medium, or all airfields (or off). The airfield list covers the whole world.
- **Updates:** the update screen no longer shows a progress bar, and the radar is paused while the update downloads, to stop the screen flickering during the update.
- **Recovery:** if the feed stops updating for 10 minutes, the device now restarts itself instead of needing a power cycle.

9.3 Version 1.0.0

First release.

CHAPTER

TEN

QUICK LINKS

- genindex
- search

CHAPTER

ELEVEN

ABOUT THIS MANUAL

This manual covers:

- Powering on and the on-screen WiFi setup
- Setting your home location (Maidenhead grid or latitude/longitude)
- Reading the radar scope and the aircraft detail panel
- Range/zoom, sweep, night mode, timezone and screen rotation
- Flight alerts (watch a callsign, ICAO or flight-number prefix)
- Troubleshooting connectivity and display issues
- Firmware updates (OTA) and technical specifications

CHAPTER

TWELVE

DATA SOURCES AND CREDITS

FlightRadar displays data provided by third-party community services:

- **Aircraft positions** are provided by the adsb.fi open-data ADS-B network.
- **Aircraft type, registration, operator and route** information is provided by adsbdb.com.
- **Airfield locations** come from OurAirports (public domain), built into the firmware.

All credit for the underlying data belongs to those projects. FlightRadar is a display for this information and is not affiliated with any of them.

CHAPTER

THIRTEEN

REGULATORY AND SAFETY INFORMATION

Per Radio Equipment Directive 2014/53/EU, Article 10(9)

Hereby, **TopBytes Ltd** declares that the radio equipment type **FlightRadar** (Model: FLTRDR-01) is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at *Compliance*.

CHAPTER

FOURTEEN

SUPPORT

For additional support, please visit:

- Website: https://www.topbytes.net
- FlightRadar Portal: https://flightradar.topbytes.net
- Support email: support@topbytes.net

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