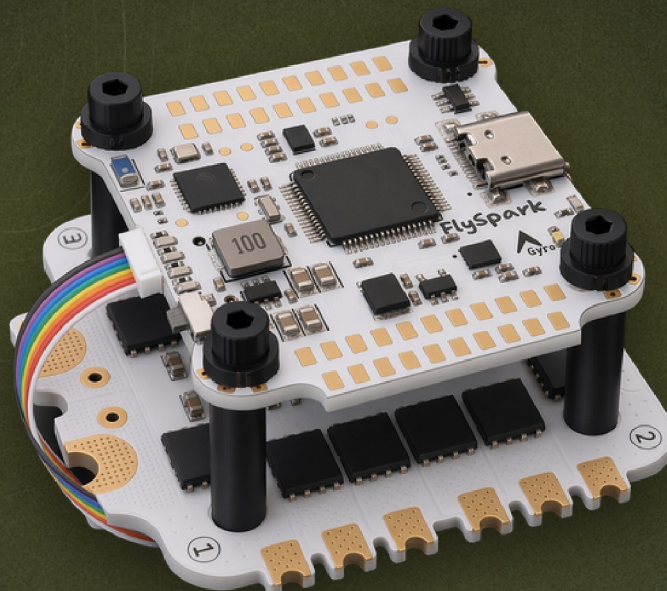
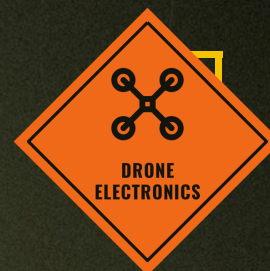




**FIELD SERIES**

BATCH FS-FC-024 · PN F4B60-V2



# FLIGHT CONTROL STACK

**F4 V2**

**BLS 60A**

3S-6S LiPo

**V2.0**

## USER MANUAL **V2.0**

FlySpark F4 V2 BLS 60A Stack · Rev A · FS-MAN-F4B60-V2



Betaflight · INAV · ArduPilot

DOCUMENT FS-MAN-F4B60-V2 • REV A • OCTOBER 2026

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DOCUMENT FS-MAN-F4B60-V2 · REV A · OCTOBER 2026

# ABOUT THIS MANUAL

## DOCUMENT INFORMATION

|                  |                                                  |
|------------------|--------------------------------------------------|
| DOCUMENT         | FS-MAN-F4B60-V2                                  |
| REVISION · DATE  | Rev A · October 2026                             |
| PRODUCT          | F4 V2 BLS 60A Stack · PN F4B60-V2                |
| BETAFLIGHT       | 2026.6.2 <span>✓ <b>HARDWARE VERIFIED</b></span> |
| INAV             | 9.1.0 <span>SUPPORTED</span>                     |
| ARDUPILOT        | Copter / Plane 4.7.1 <span>SUPPORTED</span>      |
| BLUETOOTH BRIDGE | V12                                              |
| ESC FIRMWARE     | BLHeLi_S J_H_40 16.7                             |



**LATEST MANUAL & FIRMWARE**  
github.com/flyspark015/FlySpark →  
FC/FlySpark-F4-V2

## HOW TO USE THIS MANUAL

Experienced builders: follow the **Quick path** box at the start of each setup chapter. Everyone else: read the numbered steps that follow. Read chapter 01 before you solder or power the stack.

|                |                              |
|----------------|------------------------------|
| <b>DANGER</b>  | Risk of injury or fire.      |
| <b>WARNING</b> | Risk of damage to equipment. |
| <b>TIP</b>     | A better or faster way.      |
| <b>NOTE</b>    | Useful information.          |

**Hardware verified** = tested on FlySpark hardware. **Supported** = official firmware target; bench validation in progress.

## CONVENTIONS

- **Pad names** are shown in monospace, exactly as printed on the board (for example T2, 4V5, BZ+).
- **Tn / Rn** pads are UARTn transmit / receive. A device's TX always goes to an FC **R** pad.
- **Menu paths** are in italics with arrows, for example *Configuration → Board and Sensor Alignment*.
- **Units:** millimetres (mm), grams (g), volts (V), amperes (A). Copper weight is in ounces (oz) per square foot.
- **Directions** (front, rear, left, right, clockwise) are seen from above, with the forward arrow pointing to the front of the aircraft.
- References such as **T-04** (table), **FIG-09** (figure) and **section 5.3** point to other parts of this manual.

All trademarks are the property of their respective owners. Specifications may change without notice; the latest revision of this manual is on GitHub.

# 01

## SAFETY & WARNINGS

Read this chapter before you solder, power or configure the stack. It covers propellers, LiPo batteries, voltage limits, polarity, static electricity, soldering and heat.



### IN THIS CHAPTER

1. Before you begin
2. Electrical safety
3. Handling and static electricity
4. Soldering safety
5. Heat
6. Children and pets
7. Radio and Bluetooth

## 1.1 · BEFORE YOU BEGIN

# SAFETY FIRST

The FlySpark F4 V2 BLS 60A Stack is a flight controller and electronic speed controller (ESC) set for multirotor and fixed-wing unmanned aircraft. It controls motors that spin propellers at high speed and draws high current from lithium-polymer (LiPo) batteries. Used incorrectly, it can cause serious injury, fire or property damage.



FIG-01 The five main hazards. Each one is explained in this chapter.

## READ THIS MANUAL FIRST

Read this manual completely before installation. Keep it with the aircraft documentation.

**Intended use.** The stack is intended for building, configuring and operating unmanned aircraft by people with suitable skills in electronics assembly and drone operation. Professional integrators are responsible for validating the stack in their own airframe, payload and operating environment.

**Your responsibility.** You are responsible for flying safely and legally. In India, follow the Drone Rules, 2021 and the Digital Sky platform requirements (registration, airspace zones, remote pilot certificate where required). In other countries, follow your national aviation authority's rules.

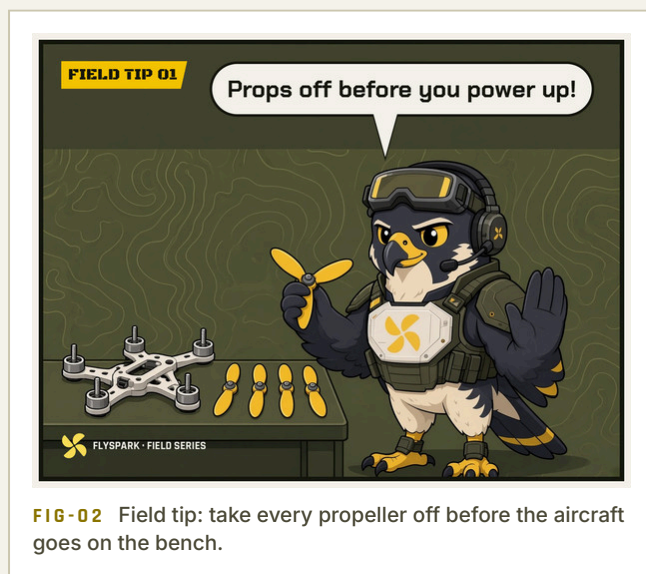


FIG-02 Field tip: take every propeller off before the aircraft goes on the bench.

### ▲ DANGER

**Propellers.** Remove all propellers whenever the aircraft is on the bench, connected to a computer or phone, being configured, or having firmware updated.

A motor can start unexpectedly during setup, motor tests or firmware changes.

### ▲ DANGER

**LiPo batteries.** LiPo batteries can catch fire if they are punctured, short-circuited, over-charged or over-discharged.

- Charge only with a balance charger, on a non-flammable surface.
- Never leave a charging battery unattended.
- Keep a LiPo-safe bag or sand bucket nearby.

## 1.2 • ELECTRICAL SAFETY

## ELECTRICAL SAFETY

Stay inside these limits at all times. Most stack failures come from over-voltage, reversed polarity or a missing capacitor, and none of these is covered by the warranty.

## T-01 ABSOLUTE LIMITS

|                     |                                                              |
|---------------------|--------------------------------------------------------------|
| BATTERY INPUT       | 3S-6S LiPo<br>(max 25.2 V fully charged)                     |
| ESC CONTINUOUS      | 60 A per motor                                               |
| ESC BURST           | 80 A per motor, max 10 s                                     |
| 5 V REGULATOR (BEC) | 3 A max total                                                |
| 9 V REGULATOR (BEC) | 3 A max total                                                |
| USB-C               | 5 V, configuration only.<br>Do not run motors from USB power |

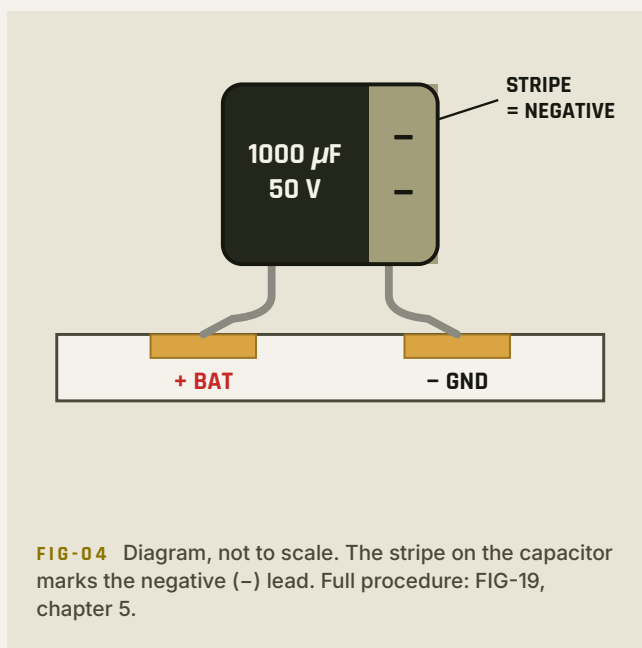
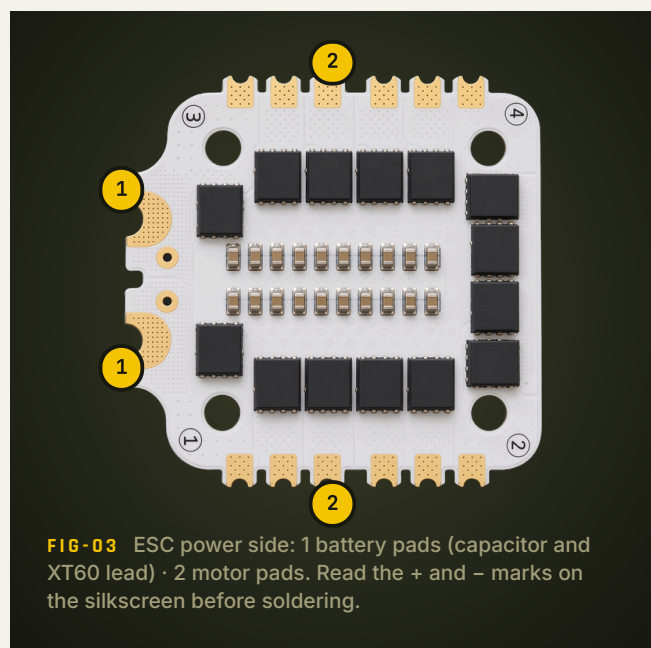
**⚠ WARNING**

**Maximum voltage.** Never connect a battery larger than 6S. Higher voltage will destroy the ESC and the flight controller and is not covered by the warranty.

**⚠ WARNING**

**Use a smoke stopper.** For the first power-up after any soldering work, connect the battery through a smoke stopper (a current-limiting fuse or bulb) or a current-limited bench power supply.

## THE CAPACITOR AND BATTERY POLARITY

**⚠ WARNING**

**Install the capacitor.** Always solder the supplied 1000  $\mu$ F 50 V low-ESR capacitor to the ESC battery pads, with the correct polarity, before the first power-up. It absorbs voltage spikes from the motors. Flying without it can damage the ESC and the flight controller.

**⚠ DANGER**

**Polarity.** Reversing the battery connection, or installing the capacitor backwards, can cause instant failure, burning components or an exploding capacitor. Check red (+) and black (–) twice before connecting a battery.

## 1.3 - 1.7 · HANDLING, SOLDERING, HEAT AND RADIO

# HANDLING & SOLDERING

## 1.3 · HANDLING AND STATIC ELECTRICITY

The boards contain sensitive electronic components that can be damaged by electrostatic discharge (ESD).

- Handle the boards by their edges. Do not touch the components or the pads.
- Work on an ESD-safe mat and wear a grounded wrist strap where possible.
- Keep the boards in their foam tray or an antistatic bag until you install them.
- Do not flex the boards. Do not press on the components when you tighten screws.



**FIG-05** Temperature-controlled iron, ventilation, no battery connected.

## 1.4 · SOLDERING SAFETY

- Use a temperature-controlled soldering iron. The ESC power board uses 6 oz copper and is 2.0 mm thick, so it draws heat away quickly. Use an iron of at least 60 W with a large chisel tip for the battery and motor pads.
- Work in a ventilated area. Flux fumes are harmful.
- Never solder while a battery is connected.
- Do not keep the iron on one pad for more than 5 seconds. If solder does not flow, increase the tip size or temperature instead of the time.

### NOTE

The white solder mask makes dirt, flux residue and damage easy to see. Inspect the boards under good light before installation and after every crash.

### WARNING

**Lifted pads.** Excessive heat or force can lift pads from the board. Damage caused by soldering is not covered by the warranty.

## 1.5 · HEAT

The ESC and the voltage regulators get hot in normal operation. Allow airflow over the ESC. Do not touch the ESC immediately after a flight. Do not wrap the stack in foam or tape.

## 1.6 · CHILDREN AND PETS

This product is not a toy. Keep it, its small parts (screws, nuts, grommets) and LiPo batteries away from children and pets.

## 1.7 · RADIO AND BLUETOOTH

The flight controller contains a Bluetooth Low Energy radio. Switch off the aircraft where radio transmitters are not allowed. Bluetooth is for configuration on the ground. Do not rely on it as a control or telemetry link in flight.

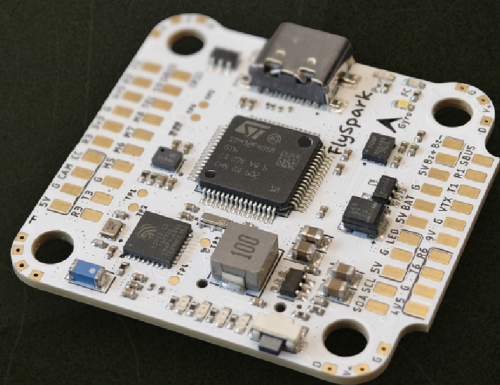
### NOTE

**Professional users.** The Bluetooth bridge accepts connections from any nearby phone while the aircraft is powered. For sensitive operations, see section 12.7, "Disabling Bluetooth".

# 02

## WHAT'S NEW IN V2

The same proven F405 layout, pinout and firmware as V1, rebuilt on white boards to IPC Class 3 with heavy copper, 170 Tg laminate and 100 % electrical test.



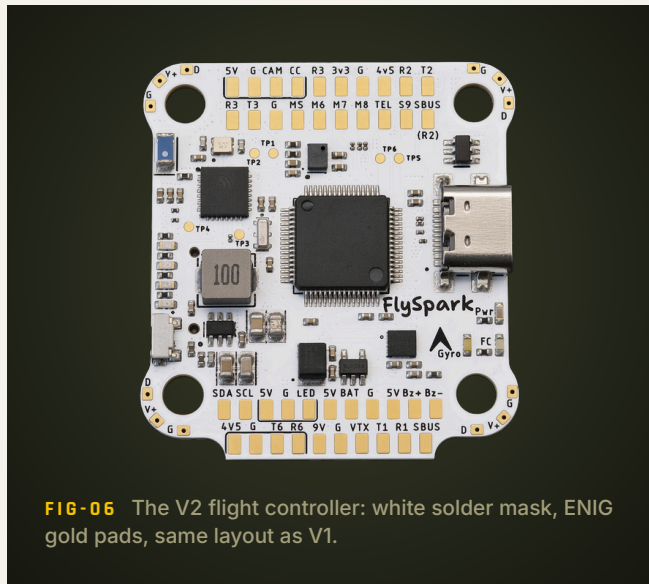
### IN THIS CHAPTER

1. V2 at a glance
2. IPC Class 3
3. Heavy copper
4. High-Tg laminate
5. ENIG 2  $\mu$ " gold finish
6. 100 % electrical test
7. White solder mask
8. Traceability

## 2.1 · V2 AT A GLANCE

## WHAT'S NEW IN V2

The FlySpark F4 V2 keeps everything that worked on V1 (the same proven STM32F405 layout, pinout, connectors, mounting and firmware) and rebuilds the boards themselves to a higher standard.



**FIG-06** The V2 flight controller: white solder mask, ENIG gold pads, same layout as V1.

## NOTE

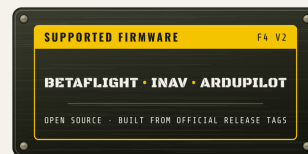
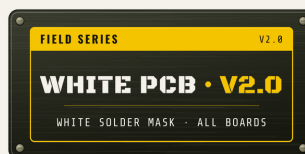
**V1 owners.** Every V1 guide, wiring diagram and firmware file works on V2.

**BETAFLIGHT** FLYSPARKF4

**INAV** FlySparkF4v1

**ARDUPILOT** FlysparkF4

These target names come from the upstream projects and are correct for V2.



## T-02 V1 COMPARED WITH V2

| ITEM                                     | V1                 | V2                                                                         |
|------------------------------------------|--------------------|----------------------------------------------------------------------------|
| Solder mask                              | Black              | White (all boards)                                                         |
| Flight controller copper (outer / inner) | 1 oz / 0.5 oz      | 4 oz / 2 oz                                                                |
| ESC control board copper                 | 2 oz / 1.5 oz      | 4 oz / 2 oz                                                                |
| ESC power board copper                   | 3 oz / 2 oz        | 6 oz / 4 oz (6 layers)                                                     |
| ESC power board thickness                | 1.6 mm             | 2.0 mm                                                                     |
| Laminate                                 | 135 Tg             | 170 Tg (Shengyi S1170G)                                                    |
| PCB quality class                        | IPC Class 2        | IPC Class 3                                                                |
| Surface finish                           | ENIG               | ENIG, 2 μ" gold                                                            |
| Bare-board electrical test               | Not specified      | 100 % flying-probe + 4-wire Kelvin                                         |
| Bluetooth name                           | FlySpark F4 v1     | FlySpark F4 v2                                                             |
| Bluetooth bridge firmware                | Earlier bridge     | FlySpark V12: MSP + MAVLink pass-through, live battery gauge               |
| Factory firmware                         | Earlier Betaflight | Betaflight 2026.6.2, flashed and tested on the FlySpark production station |
| Pinout, pads, connectors, mounting       | —                  | Identical to V1                                                            |

## 2.2 • THE V2 BUILD STANDARD

# BUILT TO IPC CLASS 3

IPC is the international association that writes the quality standards for printed circuit boards (PCBs). It defines three classes. All three V2 boards are fabricated to the highest one.

## CLASS 1

### GENERAL ELECTRONICS

Function matters, but cosmetic defects are acceptable.

## CLASS 2

### DEDICATED SERVICE

Most consumer flight controllers are built to this class.

## CLASS 3 V2

### HIGH RELIABILITY

Electronics that must work every time: aerospace, defence and life-critical equipment.



## WHAT CLASS 3 CHANGES

Class 3 tightens the requirements a buyer cannot see:

- more copper plating inside every via (the small holes that connect layers);
- tighter rules for how a drilled hole may sit inside its pad;
- stricter limits on voids and defects;
- more inspection.

All three V2 boards (flight controller, ESC control board and ESC power board) are fabricated to IPC Class 3.

### i NOTE

IPC Class 3 describes the fabrication of the bare printed circuit boards. It is not a certification of the assembled product.

## HEAVY COPPER

### T-03 BOARD BUILD

| BOARD             | LAYERS | COPPER OUT / IN | THICKNESS |
|-------------------|--------|-----------------|-----------|
| Flight controller | 4      | 4 oz / 2 oz     | —         |
| ESC control board | 4      | 4 oz / 2 oz     | —         |
| ESC power board   | 6      | 6 oz / 4 oz     | 2.0 mm    |

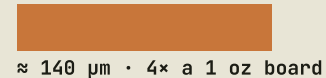
Copper weight is measured in ounces per square foot: 1 oz is about 35  $\mu\text{m}$  thick. More copper means lower resistance in the power paths, cleaner supply rails for the sensors, and better heat spreading away from hot components. The 2.0 mm, 6-layer ESC power board also makes the stack stiffer and flatter.

### OUTER COPPER THICKNESS

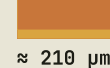
TYPICAL F4  
1 oz



V2 FC + ESC  
CONTROL  
4 oz



V2 ESC POWER  
6 oz



**FIG-07** Illustrative; bar length is proportional to copper weight. "Typical F4" is a generic market board, not a specific product.

## 2.2 - 2.3 · BUILD STANDARD AND TRACEABILITY

## INSIDE THE BOARD



FIG-08 Illustrative cross-section of the 6-layer V2 ESC power board. Diagram, not to scale.

## HIGH-TG LAMINATE

Tg (glass-transition temperature) is the temperature at which the board material starts to soften. V2 uses **170 Tg** Shengyi S1170G laminate (V1: 135 Tg). A higher Tg keeps the board dimensionally stable through lead-free soldering and hot running conditions, which protects the vias and solder joints.

## ENIG 2 μ" GOLD FINISH

All pads use ENIG (electroless nickel, immersion gold) with 2 μ" (micro-inch) gold. ENIG pads are flat, which suits fine-pitch parts, and they solder reliably after storage.

## 100 % ELECTRICAL TEST

Every bare board is tested before assembly with a **flying-probe tester** (which checks every net for opens and shorts) and a **4-wire Kelvin test** (which measures resistance precisely enough to find a weak via).

## WHITE SOLDER MASK

The white finish is more than a new look. It makes contamination, flux residue, heat discolouration and physical damage easier to see during inspection and maintenance.



## 2.3 · TRACEABILITY

Each retail box carries a **part number** and a **batch number**. Please quote the batch number in any support or warranty request.

PART NO. PN F4B60-V2  
BATCH e.g. FS-FC-024

# 03

## BOX CONTENTS

Everything that ships in the Field Series kit: the two boards in the foam tray and the mounting, power and cable parts in the separate Accessories box.



### IN THIS CHAPTER

1. Check the contents on arrival
2. Contents list
3. What is not included
4. Keep the packaging

## 3.1 · CHECK ON ARRIVAL

## WHAT'S IN THE BOX

Check the contents when you open the box. If anything is missing or damaged, contact FlySpark within **7 days** of delivery with a photo of the contents and your batch number.

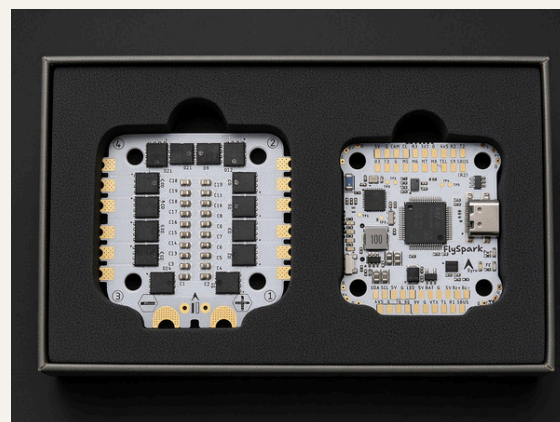
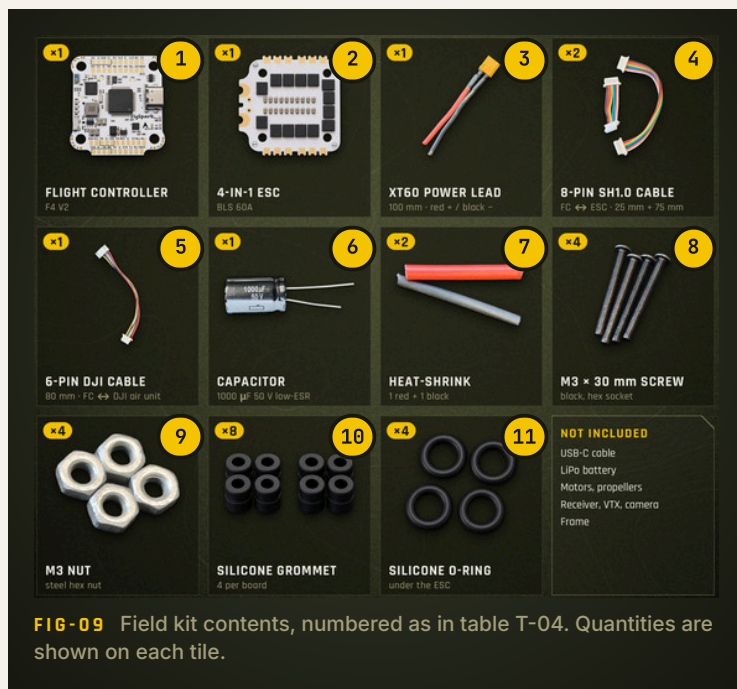


FIG-10 Main box: the ESC (power side up) and the flight controller sit in the black foam tray.

## TWO BOXES

The flight controller and the ESC are in the **foam tray** of the main box. All cables, the capacitor and the mounting hardware are in the separate **Accessories** box.

Quote the **batch number** printed on the box (for example FS-FC-024) in any support or warranty request.

## T-04 BOX CONTENTS

| #  | ITEM                                                   | QTY | USE                                                                                       |
|----|--------------------------------------------------------|-----|-------------------------------------------------------------------------------------------|
| 1  | FlySpark F4 V2 flight controller                       | 1   | Top board of the stack                                                                    |
| 2  | FlySpark BLS 60A 4-in-1 ESC                            | 1   | Bottom board of the stack, power side up                                                  |
| 3  | XT60 power lead (100 mm)                               | 1   | Battery connection, soldered to the ESC battery pads                                      |
| 4  | 8-pin SH 1.0 mm cable: 1 short (25 mm), 1 long (75 mm) | 2   | FC to ESC. Short cable for a standard stack, long cable when the boards are mounted apart |
| 5  | DJI 6-pin cable (80 mm)                                | 1   | FC to a DJI air unit (section 9.4)                                                        |
| 6  | 1000 µF 50 V low-ESR electrolytic capacitor            | 1   | Soldered to the ESC battery pads. <b>Required</b>                                         |
| 7  | Heat-shrink tube (1 red, 1 black)                      | 2   | Insulates the capacitor leads                                                             |
| 8  | M3 × 30 mm black hex-socket screws                     | 4   | Stack mounting                                                                            |
| 9  | M3 steel nuts                                          | 4   | Stack mounting, on top of the flight controller                                           |
| 10 | Silicone grommets (soft-mount)                         | 8   | 4 for the flight controller, 4 for the ESC                                                |
| 11 | Silicone O-rings                                       | 4   | Spacers and vibration isolation between the frame and the ESC                             |

## NOTE

**Not included:** USB-C cable, LiPo battery, motors, propellers, receiver, VTX, camera and frame.

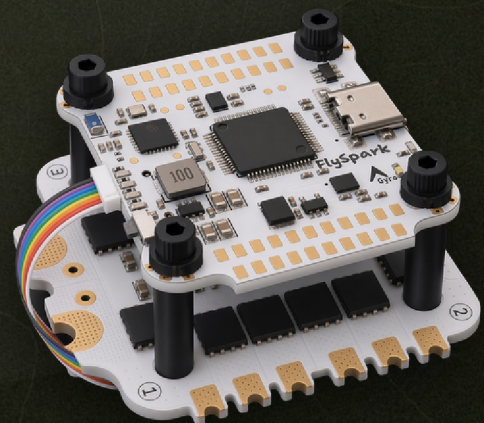
## TIP

Keep the foam tray and the box. They are the safest way to store or ship the stack.

# 04

## SPECIFICATIONS

Full technical data for the stack, the F4 V2 flight controller and the BLS 60A 4-in-1 ESC, plus a clear list of what this stack does not have.



### IN THIS CHAPTER

1. Stack
2. Flight controller: FlySpark F4 V2
3. ESC: FlySpark BLS 60A 4-in-1
4. What this stack does not have

## 4.1 · STACK

## STACK SPECIFICATIONS

The FlySpark F4 V2 BLS 60A Stack pairs an STM32F405 flight controller with a 60 A BLHeli\_S 4-in-1 ESC on a standard 30.5 × 30.5 mm mount.



**FIG-11** The assembled stack: F4 V2 flight controller on top, BLS 60A ESC below with the power side up.

## BATTERY INPUT

3S–6S LiPo

## ESC CURRENT

60 A · 80 A burst

## PROCESSOR

STM32F405

## MOTOR OUTPUTS

8 (M1–M8)

## MOUNTING

30.5 × 30.5 mm

## REGULATORS

5 V + 9 V · 3 A

## WIRELESS

Bluetooth LE

## PCB STANDARD

IPC Class 3

## T-05 STACK SPECIFICATIONS

|                        |                                                                |
|------------------------|----------------------------------------------------------------|
| PRODUCT                | FlySpark F4 V2 BLS 60A Stack (Field Series)                    |
| PART NUMBER            | F4B60-V2                                                       |
| COMPONENTS             | FlySpark F4 V2 flight controller + FlySpark BLS 60A 4-in-1 ESC |
| BATTERY INPUT          | 3S–6S LiPo                                                     |
| MOUNTING               | 30.5 × 30.5 mm, Ø4 mm holes (M3 with silicone grommets)        |
| STACK SIZE (L × W × H) | 47.8 × 47.5 × 18.3 mm (approx.)                                |
| STACK WEIGHT           | approx. 35 g (without cables and capacitor)                    |
| FC-ESC CONNECTION      | 8-pin SH 1.0 mm cable or direct solder                         |
| CONNECTIVITY           | USB-C, Bluetooth Low Energy                                    |
| WARRANTY               | 1 year, against manufacturing defects                          |
| ORIGIN                 | Designed and made in India                                     |

## NOTE

Weights and the stack height are approximate. Full dimensions and the mounting drawing are in chapter 5.

## FIRMWARE COVERED BY THIS MANUAL

## BETAFLIGHT 2026.6.2

Factory firmware · FLYSPARKF4

✓ HARDWARE VERIFIED

## INAV 9.1.0

Target FlySparkF4v1

SUPPORTED

## ARДУPILOT 4.7.1

Copter / Plane · FlysparkF4

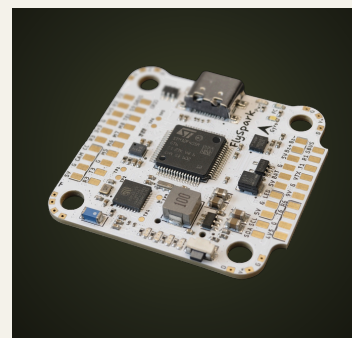
SUPPORTED

Bluetooth bridge firmware V12 · ESC firmware BLHeli\_S J\_H\_40, revision 16.7. The flight-controller firmware files are published at [github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark).

## 4.2 · FLIGHT CONTROLLER

## FLYSPARK F4 V2

An STM32F405 flight controller with an ICM-42688-P gyro, barometer, analog OSD, microSD blackbox, built-in Bluetooth and eight motor outputs, on a 4-layer, 4 oz copper board built to IPC Class 3.



## T-06 FLIGHT CONTROLLER SPECIFICATIONS

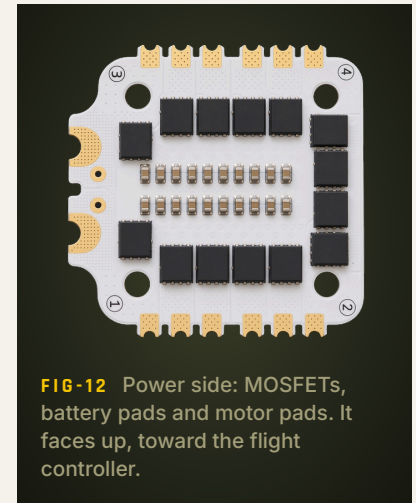
| PROCESSOR AND SENSORS     |                                                                                                                          |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------|
| MCU                       | STM32F405RGT6, 168 MHz, 1 MB flash                                                                                       |
| GYROSCOPE / ACCELEROMETER | ICM-42688-P (SPI1)                                                                                                       |
| BAROMETER                 | DPS310 (I <sup>2</sup> C1, address 0x76)                                                                                 |
| MAGNETOMETER (COMPASS)    | Not on board. External compass on I <sup>2</sup> C1 (SCL / SDA pads)                                                     |
| OSD                       | MAX7456 analog OSD (SPI2) + MSP DisplayPort for DJI / HD systems (UART1 / DJI plug)                                      |
| BLACKBOX                  | microSD card slot (SPI3)                                                                                                 |
| WIRELESS AND INDICATORS   |                                                                                                                          |
| BLUETOOTH                 | ESP32-C3 bridge on UART4 at 115200 baud; device name FlySpark F4 v2 ; bridge firmware V12 (MSP and MAVLink pass-through) |
| BATTERY GAUGE             | 4 on-board LEDs; works with Betaflight, INAV and ArduPilot                                                               |
| INTERFACES                |                                                                                                                          |
| UARTS                     | 6: UART1, UART2, UART3, UART6 on pads; UART4 internal (Bluetooth); UART5 RX only (TEL pad)                               |
| SBUS                      | Dedicated SBUS pad with hardware inverter to UART2 RX                                                                    |
| MOTOR OUTPUTS             | 8 (M1-M8)                                                                                                                |
| OTHER OUTPUTS             | LED strip (WS2812), buzzer (BZ+ / BZ-), camera control (CC)                                                              |
| OTHER INPUTS              | Analog RSSI, PPM, external current sensor (CUR pad), battery voltage                                                     |
| CONNECTORS                | USB-C, DJI 6-pin (SH 1.0 mm), 8-pin ESC (SH 1.0 mm)                                                                      |
| BUTTONS                   | BOOT (DFU)                                                                                                               |
| POWER                     |                                                                                                                          |
| REGULATORS (BEC)          | 5 V 3 A · 9 V 3 A (VTX / DJI) · 3.3 V · 4.5 V (also powered from USB)                                                    |
| VOLTAGE SENSING           | 10 kΩ / 1 kΩ divider: Betaflight vbat_scale 110, ArduPilot BATT_VOLT_MULT 11.0                                           |
| PROTECTION                | TVS diode on the battery input                                                                                           |
| BOARD AND FIRMWARE        |                                                                                                                          |
| BOARD SIZE (L × W)        | 41.6 × 39.4 mm                                                                                                           |
| MOUNTING                  | 30.5 × 30.5 mm, Ø4 mm holes                                                                                              |
| PCB                       | 4 layers, 4 oz / 2 oz copper, 170 Tg, IPC Class 3, ENIG 2 μ", white solder mask                                          |
| FACTORY FIRMWARE          | Betaflight 2026.6.2, target FLYSPARKF4                                                                                   |
| SUPPORTED FIRMWARE        | INAV 9.1.0 ( FlySparkF4v1 ); ArduCopter and ArduPlane 4.7.1 ( FlysparkF4 , board ID 1361)                                |

## 4.3 - 4.4 · ESC AND LIMITS

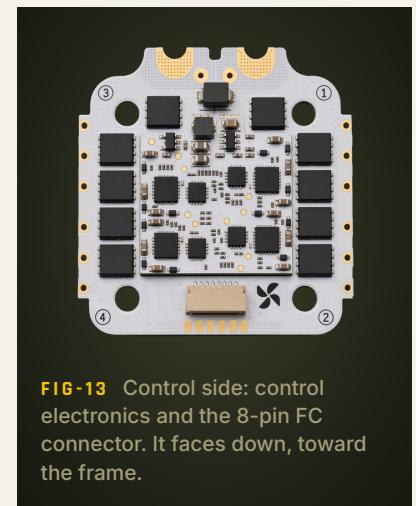
## FLYSPARK BLS 60A ESC

## T-07 ESC SPECIFICATIONS

|                                  |                                                                                                                                     |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| CONTINUOUS CURRENT               | 60 A per motor (×4)                                                                                                                 |
| BURST CURRENT                    | 80 A per motor, 10 s maximum                                                                                                        |
| BATTERY INPUT                    | 3S-6S LiPo                                                                                                                          |
| PROTECTION                       | TVS diode                                                                                                                           |
| MCU                              | SiLabs EFM8BB21                                                                                                                     |
| FIRMWARE                         | BLHeli_S J_H_40, revision 16.7                                                                                                      |
| PROTOCOLS                        | DSHOT150 / DSHOT300 / DSHOT600, Oneshot125, PWM ( <b>DSHOT300 recommended</b> )                                                     |
| BIDIRECTIONAL DSHOT / RPM FILTER | Not supported by BLHeli_S J_H_40 (keep OFF)                                                                                         |
| CURRENT SENSOR                   | None                                                                                                                                |
| ESC TELEMETRY                    | None                                                                                                                                |
| POWER STAGE                      | 24 MOSFETs (6 per motor)                                                                                                            |
| FC CONNECTION                    | 8-pin SH 1.0 mm (GND, VBAT, M1-M4, CUR, TEL) or direct solder                                                                       |
| EXTERNAL CAPACITOR               | 1000 µF 50 V low-ESR (supplied)                                                                                                     |
| BOARD SIZE (L × W)               | 47.8 × 47.5 mm                                                                                                                      |
| MOUNTING                         | 30.5 × 30.5 mm, Ø4 mm holes                                                                                                         |
| PCB                              | Control board: 4 layers, 4 oz / 2 oz. Power board: 6 layers, 6 oz / 4 oz, 2.0 mm. 170 Tg, IPC Class 3, ENIG 2 µ", white solder mask |
| WEIGHT                           | approx. 24 g                                                                                                                        |



**FIG-12** Power side: MOSFETs, battery pads and motor pads. It faces up, toward the flight controller.



**FIG-13** Control side: control electronics and the 8-pin FC connector. It faces down, toward the frame.

## 4.4 · WHAT THIS STACK DOES NOT HAVE

- **No current sensor** on the ESC. Battery **voltage** is measured; current and mAh consumed are not. Set the current meter to OFF (the FlySpark firmware builds do this already). To measure current, connect an external analog current sensor to the **CUR** pad.
- **No ESC telemetry.** The TEL pad on the flight controller (UART5 RX) is available for an ESC that provides telemetry, but the BLS 60A does not.
- **No on-board compass.** Add an external GPS + compass module for GPS flight modes in INAV and ArduPilot.
- **No wireless firmware flashing.** Flight-controller firmware is flashed over USB-C.

## T-08 RECOMMENDED OPERATING SETTINGS

| SETTING             | USE                                   |
|---------------------|---------------------------------------|
| Battery             | 3S-6S LiPo (max 25.2 V fully charged) |
| Motor protocol      | <b>DSHOT300</b>                       |
| Bidirectional DShot | OFF                                   |
| Current meter       | OFF / NONE                            |
| Capacitor           | 1000 µF 50 V on the ESC battery pads  |

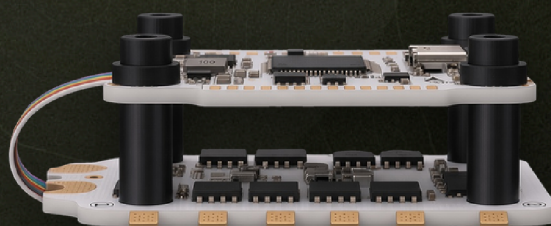
**WARNING**

**Burst current.** 80 A per motor is a 10-second limit, not a continuous rating. Size your motors and propellers so that sustained current stays at or below 60 A per motor. The absolute limits are in table T-01 (chapter 1).

# 05

## DIMENSIONS, MOUNTING & ASSEMBLY

Board outlines, orientation, the order of parts on the M3 screws, and how to fit the capacitor, power lead and motor wires to the ESC.



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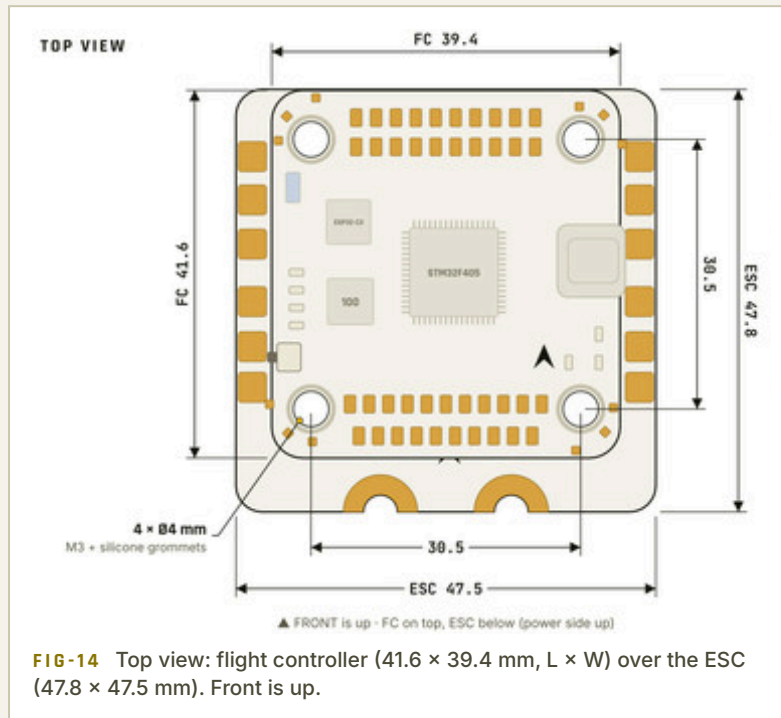
### IN THIS CHAPTER

1. Dimensions
2. Orientation
3. Stack assembly
4. Capacitor and power lead
5. Motor wires

## 5.1 · DIMENSIONS

## DIMENSIONS

Both boards use the standard 30.5 × 30.5 mm mounting pattern with Ø4 mm holes for M3 screws in silicone grommets. All dimensions are in millimetres.



## STACK OUTLINE

**47.8 × 47.5 mm**

## STACK HEIGHT

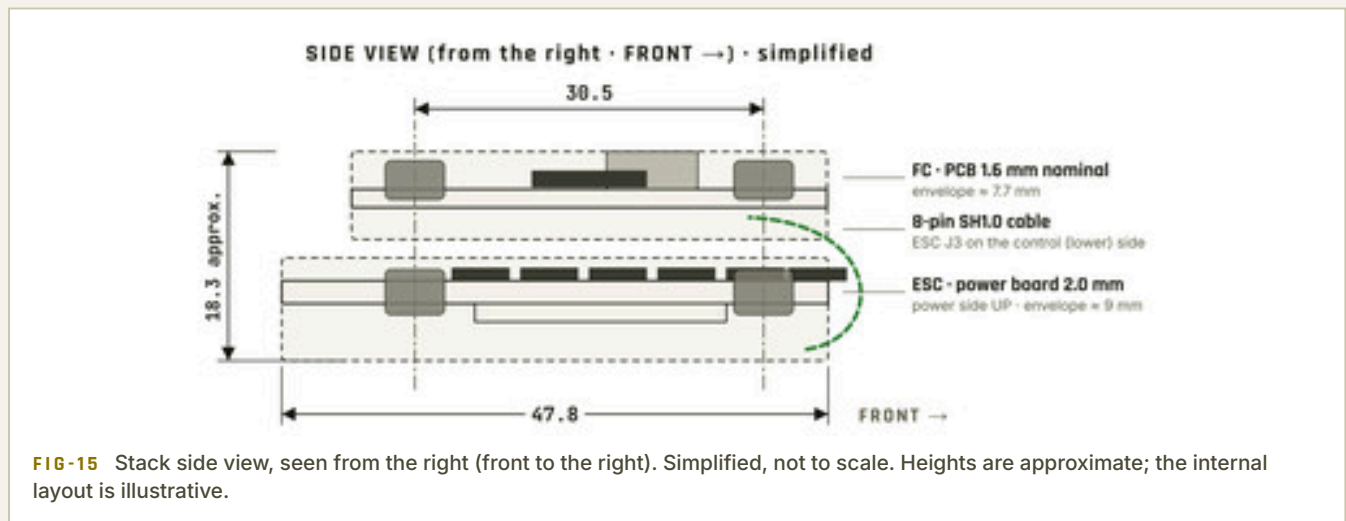
**approx. 18.3 mm**

## HOLE PATTERN

**30.5 × 30.5 mm · Ø4**

**NOTE**

**V2 power board.** The V2 ESC power board is 2.0 mm thick, 0.4 mm thicker than V1. If you are replacing a V1 stack, check that your screws are still long enough (section 5.3).



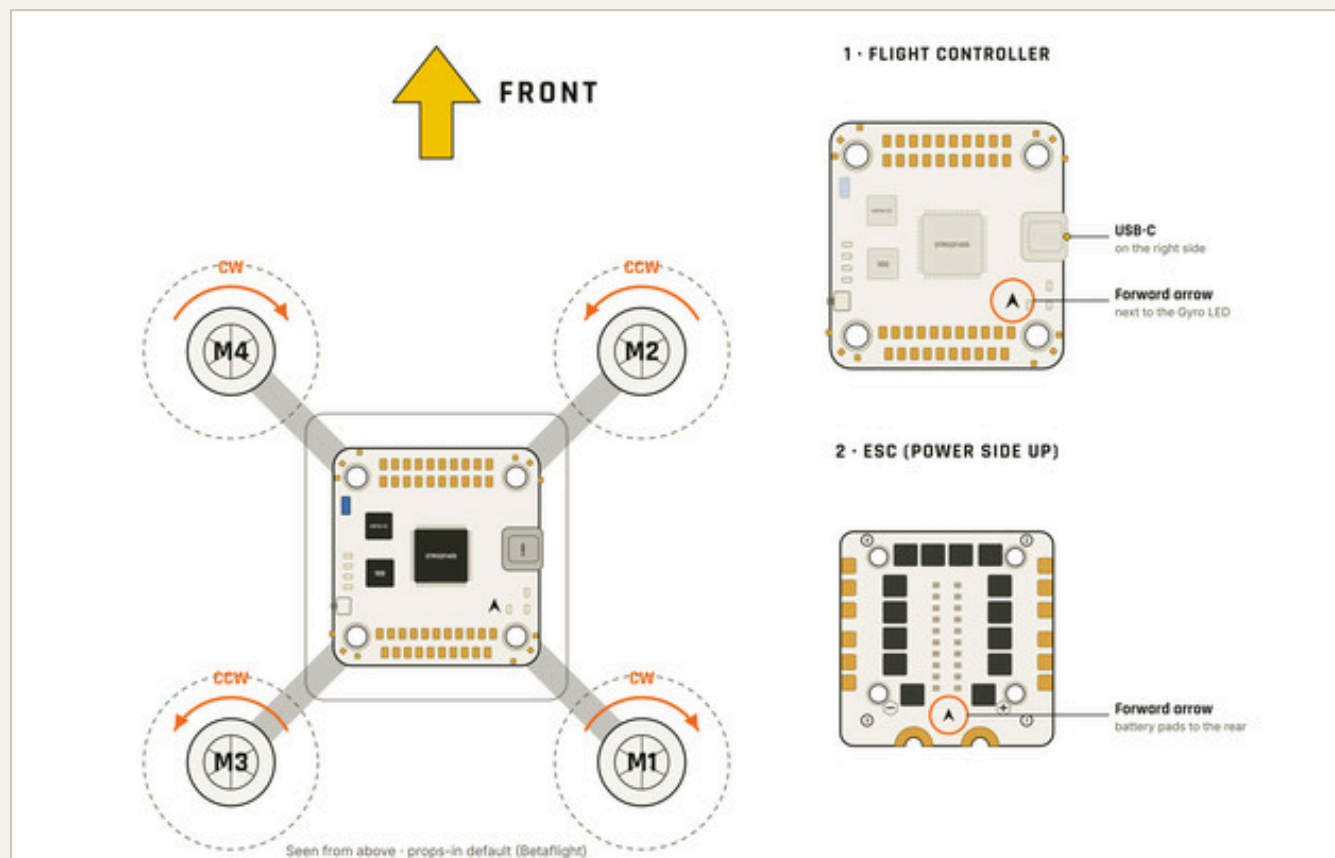
## T-09 BOARD DIMENSIONS

| DIMENSION              | FLIGHT CONTROLLER     | ESC                   | STACK           |
|------------------------|-----------------------|-----------------------|-----------------|
| Outline (L × W)        | 41.6 × 39.4 mm        | 47.8 × 47.5 mm        | 47.8 × 47.5 mm  |
| Mounting holes         | 30.5 × 30.5 mm, Ø4 mm | 30.5 × 30.5 mm, Ø4 mm | 30.5 × 30.5 mm  |
| Height with components | approx. 7.7 mm        | approx. 9 mm          | approx. 18.3 mm |
| PCB thickness          | 1.6 mm                | power board 2.0 mm    | —               |

## 5.2 • ORIENTATION

# ORIENTATION

Both boards have a **forward arrow** printed on the top side. Mount them so that both arrows point to the front of the aircraft.



**FIG-16** Both forward arrows point to the front of the aircraft. Motor order shown is the Betaflight quad-X default, seen from above. Diagram, not to scale.

### FLIGHT CONTROLLER

The arrow next to the “Gyro” LED points to the front of the aircraft. The USB-C port is on the right side when the arrow points forward.

### ESC

The arrow on the ESC points forward. The battery pads face the rear. The **power side** (MOSFETs and capacitors) faces **up**, toward the flight controller.

### MOUNTED ROTATED?

Mount the flight controller with the arrow pointing forward. If you must mount it rotated, set the board alignment in the configurator (Betaflight / INAV: *Configuration* → *Board and Sensor Alignment*; ArduPilot: `AHRS_ORIENTATION`).

### YOU NEED

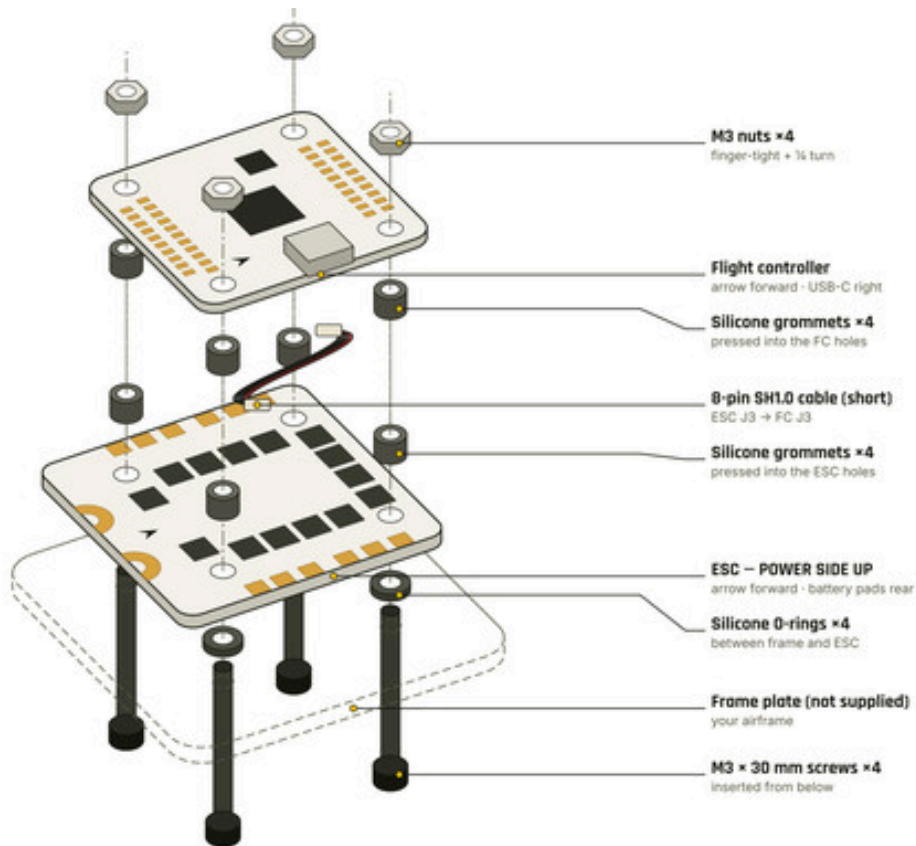
- ☐ The frame
- ☐ 4 × M3 × 30 mm screws and 4 × M3 nuts
- ☐ 8 × silicone grommets and 4 × O-rings
- ☐ The short 8-pin cable
- ☐ A hex driver that fits the supplied screws

### NOTE

**Screw stack height.** Total length needed = frame plate + O-ring + ESC grommet + ESC + gap + FC grommet + FC + nut. Dry-fit the stack on your frame and check the screw length before you solder (section 5.3).

## 5.3 · STACK ASSEMBLY

## STACK ASSEMBLY



**FIG-17** Exploded stack: screws from below, O-rings, ESC (power side up), grommets, 8-pin cable, flight controller, nuts. Diagram, not to scale.

**01 PREPARE THE ESC FIRST**

Solder the capacitor, the XT60 lead and the motor wires to the ESC before you mount it (section 5.4). It is much easier on the bench.

**02 FIT THE GROMMETS**

Press 4 grommets into the ESC holes and 4 into the FC holes. They isolate the boards from vibration and keep the screws off the board.

**03 INSERT THE SCREWS**

From below, through the frame bottom plate (or as your frame requires).

**04 FIT THE O-RINGS**

Over the screws, on top of the frame plate. They lift the ESC off the frame and add damping.

**05 PLACE THE ESC**

Arrow forward, **power side up** (MOSFETs and capacitors facing the flight controller).

**06 CONNECT THE 8-PIN CABLE**

To the ESC connector, then to the underside of the FC. Do not stretch or pinch it.

**07 PLACE THE FLIGHT CONTROLLER**

Over the screws, arrow forward.

**08 FIT THE NUTS**

Tighten them **finger-tight plus a quarter turn**. The grommets should be gently compressed, not crushed.

**⚠ WARNING**

**Do not over-tighten.** Crushed grommets transmit vibration to the gyro, which causes poor flight performance. Over-tightening can also crack the board around the holes.

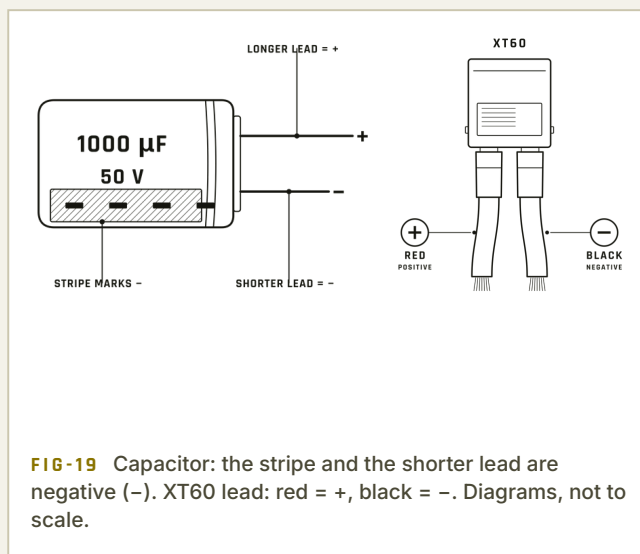
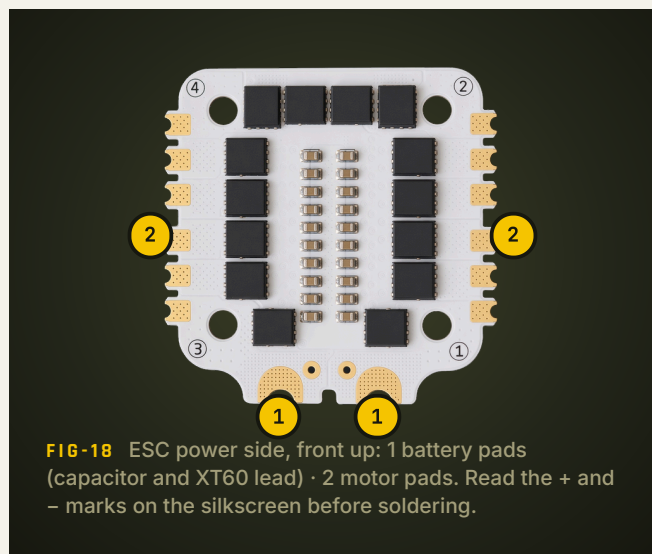
**⚠ WARNING**

**Screw length.** Each screw must pass fully through the nut with at least 1 mm of thread showing, and must not touch any component. If your frame plates are thick, use longer screws.

5.4 - 5.5 • POWER INPUT AND MOTORS

# CAPACITOR & POWER LEAD

The supplied 1000  $\mu\text{F}$  50 V low-ESR capacitor protects the electronics from voltage spikes generated by the motors. It is **required**.



## 01 IDENTIFY THE POLARITY

The **stripe** on the sleeve marks the **negative** (-) lead, which is also the shorter one.

## 02 KEEP THE LEADS SHORT

Trim them so the capacitor sits as close as possible to the ESC battery pads, ideally under 20 mm.

## 03 FIT THE HEAT-SHRINK

Slide it over the leads, leaving the ends exposed.

## 04 TIN PADS AND WIRES

Tin the ESC battery pads (+ and -) and the XT60 lead wires.

## 05 SOLDER TOGETHER

**Red and capacitor (+) to "+"; black and capacitor stripe (-) to "-".**

## 06 INSULATE AND SECURE

Shrink the heat-shrink. Fix the capacitor to the frame with a cable tie or tape so it cannot vibrate.

## ⚠ DANGER

**Polarity.** A capacitor installed backwards can burst violently when the battery is connected. Check twice.

## ✓ TIP

**Soldering heavy copper.** The 6 oz / 2.0 mm power board absorbs a lot of heat. Use an iron of 60 W or more, a large chisel tip, around 380–420 °C for lead-free solder, and plenty of flux. Pre-tin pads and wires separately, then join them quickly. A good joint is shiny and concave.

## 5.5 • MOTOR WIRES

Solder the three wires of each motor to the three pads of the matching ESC output (the circled numbers ① to ④ on the ESC mark the motor numbers). The order of the three wires only changes the motor direction, which you can reverse in software (sections 13.5 and 17.3), so you do not need to re-solder.

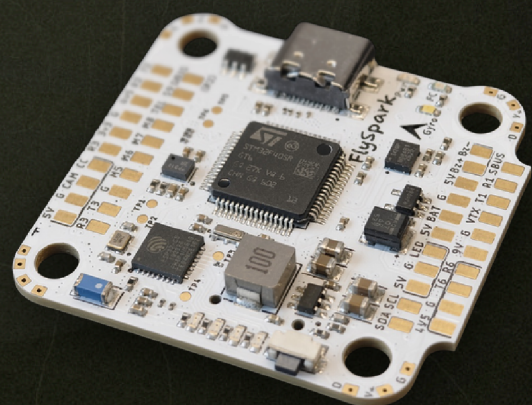
## ⚠ WARNING

Do not let motor wires touch each other or the frame. Trim excess wire and cover exposed copper.

## 06

FLIGHT CONTROLLER  
LAYOUT

Every component, pad and connector on both sides of the F4 V2 flight controller, with the pad functions you need for wiring.



## IN THIS CHAPTER

1. Top side
2. Top-side pads
3. Pad reference
4. Underside and connectors

## 6.1 • TOP SIDE

## FC TOP SIDE

Orientation for all top-side views in this manual: forward arrow up, USB-C on the right.

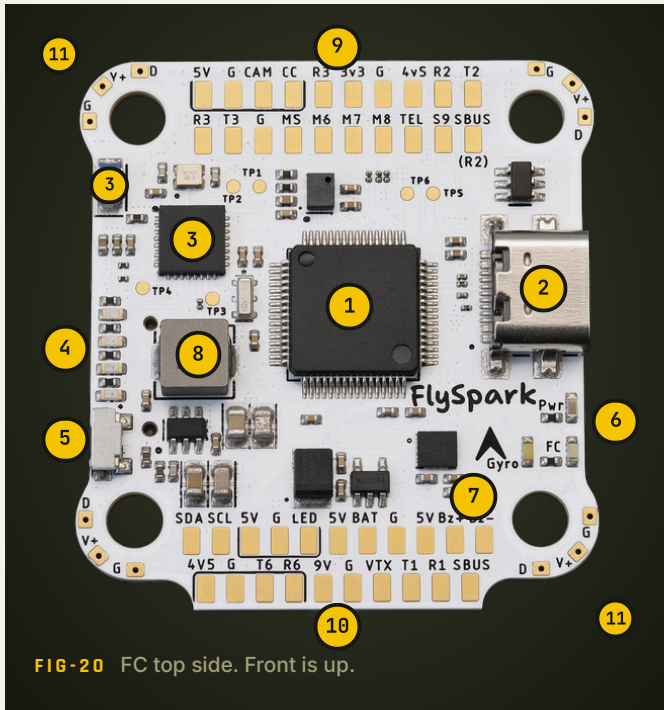


FIG-20 FC top side. Front is up.

T-10 FIG-20 KEY

| #  | COMPONENT                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <b>STM32F405 MCU.</b> Main processor, 168 MHz, 1 MB flash                                                                                               |
| 2  | <b>USB-C port.</b> Configuration, firmware updates, blackbox download. Powers the FC and the 4.5 V rail                                                 |
| 3  | <b>Bluetooth module (ESP32-C3) and antenna.</b> Bridge on UART4. Keep the antenna area (top-left corner) clear of carbon fibre and wires where possible |
| 4  | <b>Battery gauge LEDs (4).</b> Left edge. Show the battery level (chapter 11)                                                                           |
| 5  | <b>BOOT button.</b> Left edge. Hold while plugging in USB-C to enter DFU mode (chapter 16)                                                              |
| 6  | <b>Status LEDs: Pwr, FC, Gyro.</b> Power present · FC status (blue) · gyro power                                                                        |
| 7  | <b>Forward arrow.</b> Points to the front of the aircraft                                                                                               |
| 8  | <b>Power inductor ("100") and regulators.</b> 5 V / 9 V BEC area. Gets warm in normal operation                                                         |
| 9  | <b>Top pad rows.</b> Two rows along the top edge (T-11)                                                                                                 |
| 10 | <b>Bottom pad rows.</b> Two rows along the bottom edge (T-11)                                                                                           |
| 11 | <b>Corner LED pads (×4).</b> V+ / D / G at each corner for WS2812 arm LEDs                                                                              |

T-11 FC TOP-SIDE PADS, LEFT TO RIGHT

| EDGE · ROW     | PADS (AS PRINTED ON THE BOARD)                                |
|----------------|---------------------------------------------------------------|
| Top · outer    | 5V · G · CAM · CC · R3 <sup>1</sup> · 3V3 · G · 4V5 · R2 · T2 |
| Top · inner    | R3 · T3 · G · M5 · M6 · M7 · M8 · TEL · S9 · SBUS (R2)        |
| Bottom · inner | SDA · SCL · 5V · G · LED · 5V · BAT · G · 5V · BZ+ · BZ-      |
| Bottom · outer | 4V5 · G · T6 · R6 · 9V · G · VTX · T1 · R1 · SBUS             |

<sup>1</sup> The fifth pad of the top outer row is printed "R3", the same text as the UART3 RX pad on the inner row. It is documented as the analog RSSI input (MCU pin PC5); this is still to be confirmed. Pad functions are explained on the next page.

## ✓ TIP

All **G** pads are common ground, and all **5V** pads share one regulator. Use the pad nearest to each device to keep wires short.

## 6.1 · TOP SIDE (CONTINUED)

## PAD REFERENCE

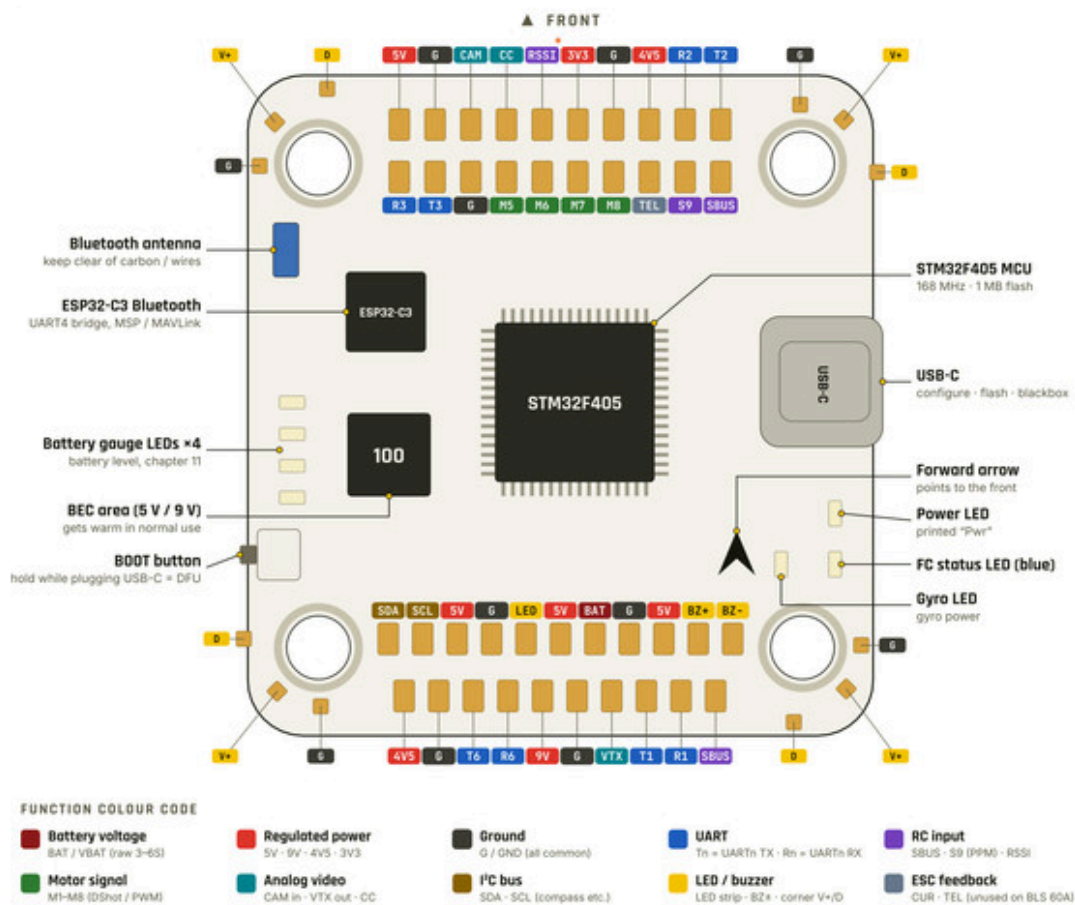


FIG-21 FC top-side pinout, seen from above, front up. Pad colours show the function group. Diagram, not to scale.

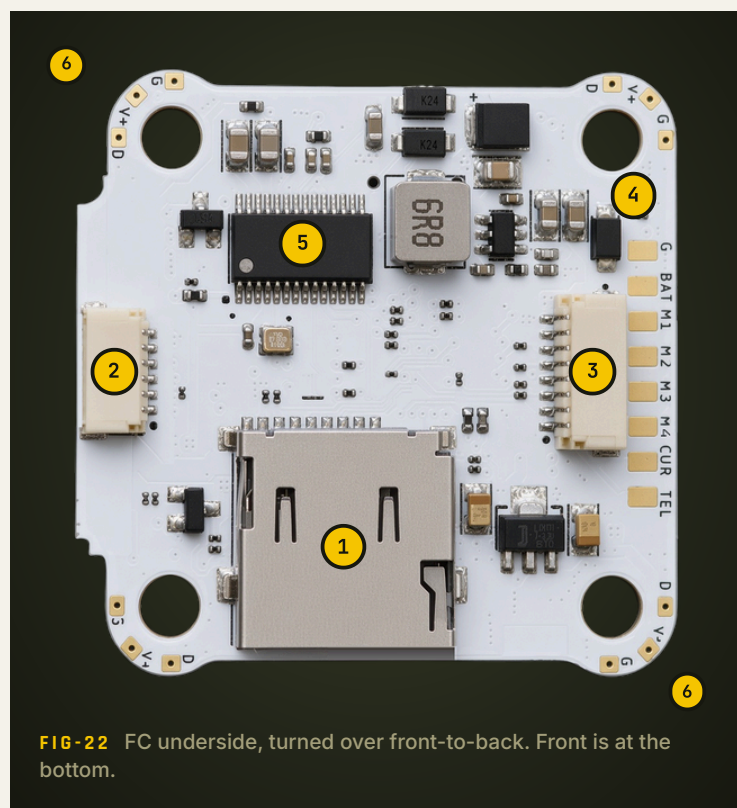
| PAD     | FUNCTION AND NOTES                                                                                                  |
|---------|---------------------------------------------------------------------------------------------------------------------|
| 5V      | <b>5 V OUT</b> From the 5 V 3 A regulator (shared by all 5V pads)                                                   |
| 9V      | <b>9 V OUT</b> From the 9 V 3 A regulator, for VTX or DJI air unit                                                  |
| 4V5     | <b>4.5 V OUT</b> Powered from the battery <b>and</b> USB. Use it for GPS and receiver so they work during USB setup |
| 3V3     | <b>3.3 V OUT</b> Low current only (sensors)                                                                         |
| BAT     | <b>BATTERY</b> Raw battery voltage (3-6S). Only for devices rated for the full battery voltage                      |
| G       | <b>GROUND</b> All G pads are common ground                                                                          |
| T1 / R1 | <b>TX</b> <b>RX</b> UART1. Also routed to the DJI 6-pin plug                                                        |
| T2 / R2 | <b>TX</b> <b>RX</b> UART2. Default receiver port (CRSF / ELRS / GHST)                                               |
| SBUS    | <b>SBUS IN</b> Through the on-board inverter to UART2 RX. Do not use together with R2                               |
| T3 / R3 | <b>TX</b> <b>RX</b> UART3. Free                                                                                     |
| T6 / R6 | <b>TX</b> <b>RX</b> UART6. Recommended for GPS                                                                      |

| PAD       | FUNCTION AND NOTES                                                                           |
|-----------|----------------------------------------------------------------------------------------------|
| TEL       | <b>UART5 RX</b> ESC telemetry input (not used with the BLS 60A)                              |
| SDA / SCL | <b>I<sup>2</sup>C1</b> External compass, rangefinder, airspeed sensor                        |
| CAM       | <b>VIDEO IN</b> Analog camera video signal                                                   |
| VTX       | <b>VIDEO OUT</b> Analog video to the VTX (with OSD overlay)                                  |
| CC        | <b>CAM CONTROL</b> Camera OSD menu control (PB14)                                            |
| RSSI      | <b>ANALOG IN</b> Analog RSSI input (PC5). Printed "R3" on the top outer row; to be confirmed |
| S9        | <b>PPM / PWM IN</b> PB15                                                                     |
| M5-M8     | <b>MOTOR OUT</b> Motor outputs 5-8: hexa, octo, X8 / Y6, or servos                           |
| LED       | <b>LED DATA</b> LED strip, WS2812 (PA8)                                                      |
| BZ+ / BZ- | <b>BUZZER</b> 5 V active buzzer                                                              |

## 6.2 · UNDERSIDE

## FC UNDERSIDE

The underside carries the microSD slot, the OSD chip and the two connectors. The board is shown turned over front-to-back, so the front of the aircraft is at the bottom of this view.



**FIG-22** FC underside, turned over front-to-back. Front is at the bottom.

**T-12** FC UNDERSIDE

| # | COMPONENT                                                                                                            |
|---|----------------------------------------------------------------------------------------------------------------------|
| 1 | <b>microSD card slot.</b> Blackbox logging (chapter 18)                                                              |
| 2 | <b>DJI 6-pin connector.</b> Plug-and-play connection to DJI air units (UART1 for OSD, SBUS for the receiver)         |
| 3 | <b>8-pin ESC connector (J3).</b> Connects to the BLS 60A ESC with the supplied cable                                 |
| 4 | <b>Direct-solder ESC pads.</b> Same signals as J3, for soldered connections: G · BAT · M1 · M2 · M3 · M4 · CUR · TEL |
| 5 | <b>MAX7456 OSD chip.</b> Analog on-screen display                                                                    |
| 6 | <b>Corner LED pads (×4).</b> V+ / D / G, same as the top side                                                        |

**T-13** DJI 6-PIN CONNECTOR SIGNALS

| PIN      | 9V                        | G      | T1                     | R1                     | G      | SBUS (R2)                                     |
|----------|---------------------------|--------|------------------------|------------------------|--------|-----------------------------------------------|
| Signal   | 9 V                       | GND    | TX                     | RX                     | GND    | SBUS                                          |
| Function | 9 V power to the air unit | Ground | UART1 TX → air unit RX | UART1 RX ← air unit TX | Ground | SBUS from the DJI receiver → UART2 (inverted) |

**T-14** 8-PIN ESC CONNECTOR (J3)

| PIN    | 1   | 2       | 3  | 4  | 5  | 6  | 7    | 8   |
|--------|-----|---------|----|----|----|----|------|-----|
| Signal | TEL | CURRENT | M4 | M3 | M2 | M1 | VBAT | GND |

### NOTE

With the BLS 60A ESC, **TEL** and **CURRENT** are not used: the ESC has no telemetry and no current sensor. They are shown as unused (outline) in T-14. The 9 V pin of the DJI plug comes from the 9 V 3 A regulator; check your air unit's input rating first.

## 7.1 · SERIAL PORTS PER FIRMWARE

## UART MAP

The pinout is identical on the F4 V1 and F4 V2. The defaults below are those of the FlySpark firmware builds: Betaflight 2026.6.2, INAV 9.1.0 and ArduPilot 4.7.1.

## T-15 UART MAP PER FIRMWARE

| UART  | PADS                 | BETAFLIGHT DEFAULT                      | INAV DEFAULT         | ARDUPILOT (SERIALN)       |
|-------|----------------------|-----------------------------------------|----------------------|---------------------------|
| UART1 | ● T1 / R1 + DJI plug | Free (set MSP DisplayPort for DJI / HD) | Free                 | SERIAL1 · MSP DisplayPort |
| UART2 | ● R2 / T2 · SBUS     | Serial RX                               | Serial RX (SBUS)     | SERIAL2 · RC input        |
| UART3 | ● T3 / R3            | Free                                    | Free                 | SERIAL3 · free            |
| UART4 | Internal (Bluetooth) | Bluetooth MSP 115200                    | Bluetooth MSP 115200 | SERIAL4 · MAVLink2 115200 |
| UART5 | ● TEL (RX only)      | ESC telemetry                           | ESC telemetry        | SERIAL5 · ESC telemetry   |
| UART6 | ● T6 / R6            | Free (GPS)                              | Free (GPS)           | SERIAL6 · GPS             |

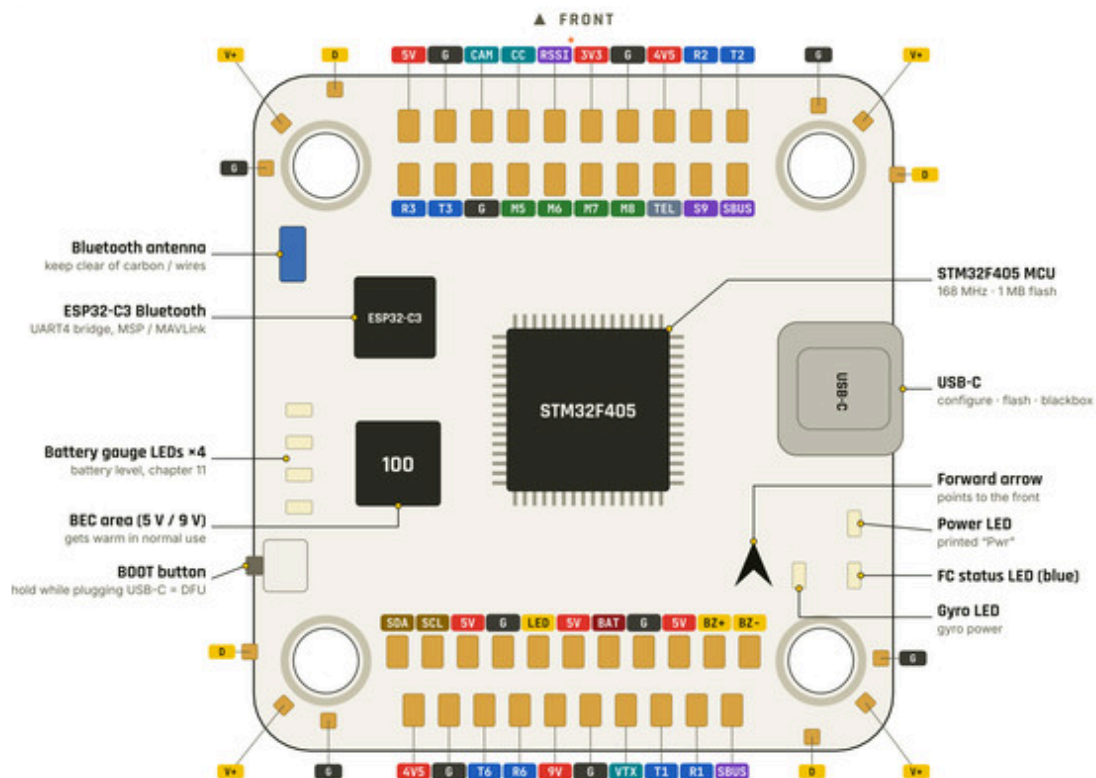
Firmware status: Betaflight **✓ HARDWARE VERIFIED** INAV 9.1.0 **SUPPORTED** ArduPilot 4.7.1 **SUPPORTED**. Pads named T<sub>n</sub> are UART<sub>n</sub> TX; pads named R<sub>n</sub> are UART<sub>n</sub> RX. UART5 (TEL) is for ESC telemetry, which the BLS 60A does not provide.

## NOTE

**SBUS.** Solder an SBUS receiver to the **SBUS** pad (or use the SBUS pin of the DJI plug). It passes through an on-board inverter into UART2 RX. For **CRSF / ELRS / GHST**, use **T2 / R2**. Never connect SBUS and R2 at the same time.

## WARNING

**UART4.** UART4 is wired to the on-board Bluetooth bridge. Keep it set to MSP at 115200 (Betaflight / INAV) or MAVLink2 at 115200 (ArduPilot). If you disable it, the FlySpark app and the battery gauge stop working.



**FIG-23** FC top side, seen from above with the forward arrow up. Blue chips are UART pads, purple chips are RC inputs. Drawing, not to scale. \*Pad printed "R3" on the V2 silkscreen; documented as the RSSI input (PC5), to be confirmed. drawing TG-01

## 7.2 - 7.5 · MOTORS, TIMERS AND OTHER I/O

## MOTORS, TIMERS &amp; OTHER I/O

## 7.2 · MOTOR OUTPUTS AND TIMERS

T-16 MOTOR OUTPUTS, MCU PINS AND TIMERS

| OUTPUT   | M1                                                 | M2  | M3   | M4  | M5   | M6                  | M7   | M8   | LED     |
|----------|----------------------------------------------------|-----|------|-----|------|---------------------|------|------|---------|
| Pin      | PB6                                                | PB7 | PB0  | PB1 | PC8  | PC9                 | PB10 | PA15 | PA8     |
| Timer    | TIM4                                               |     | TIM3 |     | TIM8 |                     | TIM2 |      | TIM1    |
| Location | J3 8-pin connector and underside pads (to the ESC) |     |      |     |      | Top-side pads M5–M8 |      |      | LED pad |

**⚠ WARNING**

**Timer groups.** Outputs on the same timer must use the same protocol and update rate: M1 + M2, M3 + M4, M5 + M6, M7 + M8. On INAV or ArduPilot planes, plan servos and motors in these pairs (for example, do not put a DShot motor and a 50 Hz servo on M5 and M6).

## 7.3 · OTHER INPUTS AND OUTPUTS

T-17 OTHER INPUTS AND OUTPUTS

| FUNCTION          | MCU PIN   | PAD                 | NOTES                                                                                                                            |
|-------------------|-----------|---------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Battery voltage   | PC0       | Internal, from VBAT | 10 kΩ / 1 kΩ divider · scale <b>110</b> (Betaflight) · <b>1100</b> (INAV) · <b>11.0</b> (ArduPilot <code>BATT_VOLT_MULT</code> ) |
| Current sensor    | PC1       | ● <b>CUR</b>        | Underside pad and J3 pin 2, for an external sensor. The BLS 60A ESC has none                                                     |
| RSSI (analog)     | PC5       | ● <b>RSSI*</b>      | 0–3.3 V analog input                                                                                                             |
| Buzzer            | PC15      | ● <b>BZ+ / BZ-</b>  | 5 V active buzzer                                                                                                                |
| Status LED        | PC13      | —                   | Blue “FC” LED                                                                                                                    |
| LED strip         | PA8       | ● <b>LED</b>        | WS2812                                                                                                                           |
| Camera control    | PB14      | ● <b>CC</b>         | Camera OSD menu                                                                                                                  |
| PPM / PWM input   | PB15      | ● <b>S9</b>         | See section 9.1                                                                                                                  |
| I <sup>2</sup> C1 | PB8 / PB9 | ● <b>SCL / SDA</b>  | Compass, rangefinder, airspeed sensor (PB8 = SCL, PB9 = SDA)                                                                     |

## 7.4 · INTERNAL BUSES

T-18 FOR REFERENCE

| BUS               | DEVICE                                     |
|-------------------|--------------------------------------------|
| SPI1              | ICM-42688-P gyro / accelerometer           |
| SPI2              | MAX7456 OSD                                |
| SPI3              | microSD card                               |
| I <sup>2</sup> C1 | DPS310 barometer (0x76) + external devices |

\*The pad documented as RSSI is printed “R3” on the V2 silkscreen (the same text as the UART3 RX pad). Confirm on the schematic before you wire an analog RSSI input.

## 7.5 · ARDUPILOT SERIAL TABLE

T-19 ARDUPILOT SERIAL PORTS SUPPORTED

| SERIAL | PORT               | DEFAULT PROTOCOL           |
|--------|--------------------|----------------------------|
| 0      | USB                | MAVLink2                   |
| 1      | UART1 / DJI plug   | MSP DisplayPort            |
| 2      | UART2 / SBUS pad   | RC input                   |
| 3      | UART3              | Free                       |
| 4      | UART4 (internal)   | Bluetooth, MAVLink2 115200 |
| 5      | UART5 RX (TEL pad) | ESC telemetry              |
| 6      | UART6              | GPS                        |

## 8.1 · METHOD 1: 8-PIN CABLE

# CONNECTING THE FC TO THE ESC

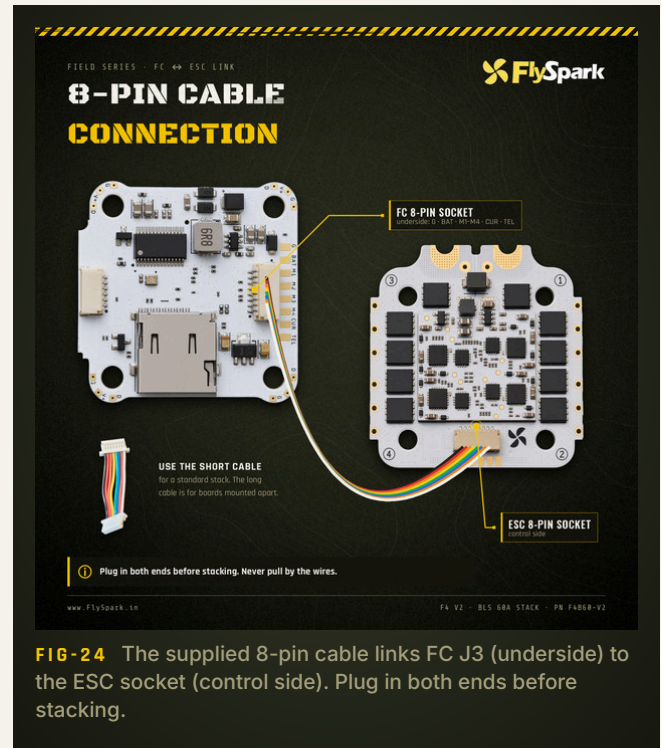
The flight controller and the ESC are connected by eight signals: ground, battery voltage, four motor signals, current and telemetry. Choose one of the two methods in this chapter.

## METHOD 1 · 8-PIN CABLE (RECOMMENDED)

- 01 CHOOSE THE CABLE**  
Use the **short 8-pin SH 1.0 mm cable (25 mm)** for a normal stack. Use the **long cable (75 mm)** if the flight controller and ESC are mounted apart.
- 02 PLUG IN BOTH ENDS**  
Plug one end into the 8-pin connector on the ESC (control side) and the other into the 8-pin connector **J3** on the underside of the flight controller. Do this before you stack the boards.
- 03 SEAT THE PLUGS FULLY**  
Push each plug in straight until it seats fully. To remove it, do not pull on the wires; use your fingernail or tweezers on the plug body.

### ⚠ WARNING

**Check the cable before first power-up.** The supplied cable is wired pin-to-pin for the FlySpark ESC. If you use a third-party ESC or cable, check every pin against T-14. A wrong VBAT pin can destroy the flight controller.



**FIG-24** The supplied 8-pin cable links FC J3 (underside) to the ESC socket (control side). Plug in both ends before stacking.

FC CONNECTOR J3 (8-PIN SH 1.0 MM) · REPEATED FROM T-14, CHAPTER 6

| PIN    | 1       | 2       | 3       | 4       | 5       | 6       | 7         | 8      |
|--------|---------|---------|---------|---------|---------|---------|-----------|--------|
| Signal | TEL     | CURRENT | M4      | M3      | M2      | M1      | VBAT      | GND    |
| Use    | Unused* | Unused* | Motor 4 | Motor 3 | Motor 2 | Motor 1 | Battery + | Ground |

### ① NOTE

**\*TEL and CURRENT are unused with the BLS 60A.** The BLS 60A has no current sensor and no ESC telemetry. The pins are there for compatible third-party ESCs.

### Pin 1 position

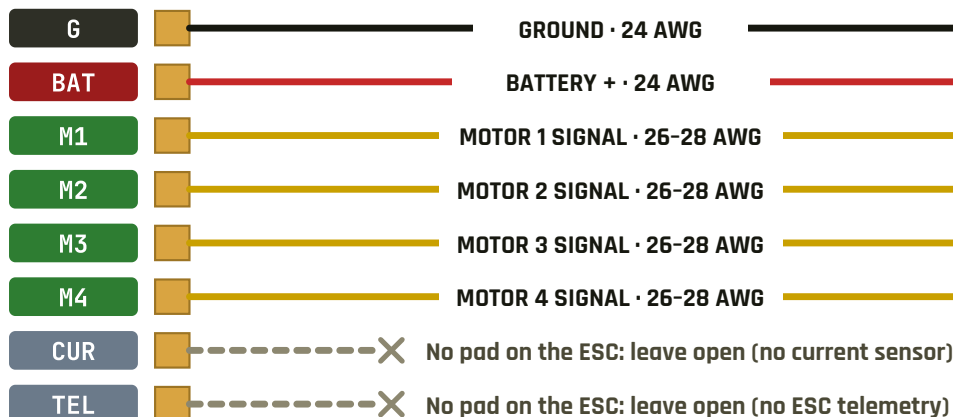
The ESC end of the cable is wired pin-to-pin with FC J3. The physical pin-1 end of each connector is not marked in this manual (to be confirmed). With the supplied cable, you do not need to identify pin 1.

## 8.2 • METHOD 2: DIRECT SOLDERING

## DIRECT SOLDERING

For the most robust connection, for example in high-vibration airframes, solder wires between the direct-solder pads on the flight controller underside and the matching pads on the ESC control side. Match the signals by name, not by position.

## FC UNDERSIDE • DIRECT-SOLDER PADS



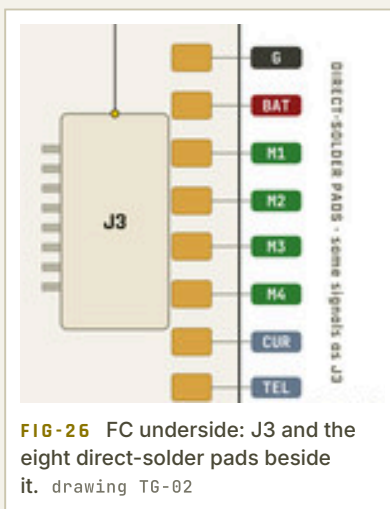
## ESC CONTROL SIDE • AS PRINTED



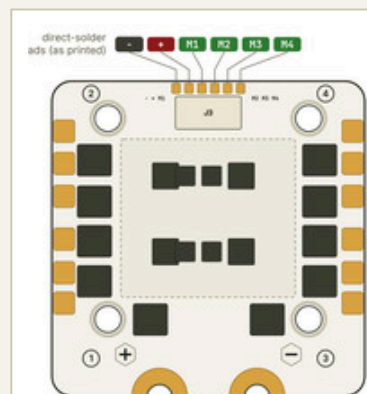
**FIG-25** Direct-solder map. Pad names as printed on each board. Diagram, not to scale: the physical pad order and spacing differ between the boards.

## T-20 DIRECT-SOLDER MAP

| FC PAD | ESC PAD | SIGNAL                              |
|--------|---------|-------------------------------------|
| ● G    | ● -     | Ground                              |
| ● BAT  | ● +     | Battery + (feeds the FC regulators) |
| ● M1   | ● M1    | Motor 1 signal                      |
| ● M2   | ● M2    | Motor 2 signal                      |
| ● M3   | ● M3    | Motor 3 signal                      |
| ● M4   | ● M4    | Motor 4 signal                      |
| ● CUR  | —       | Not used: no current sensor         |
| ● TEL  | —       | Not used: no ESC telemetry          |



**FIG-26** FC underside: J3 and the eight direct-solder pads beside it. drawing TG-02



**FIG-27** ESC control side, seen from below: pads - + M1 M2 M3 M4 next to J3. drawing TG-03

## ✓ TIP

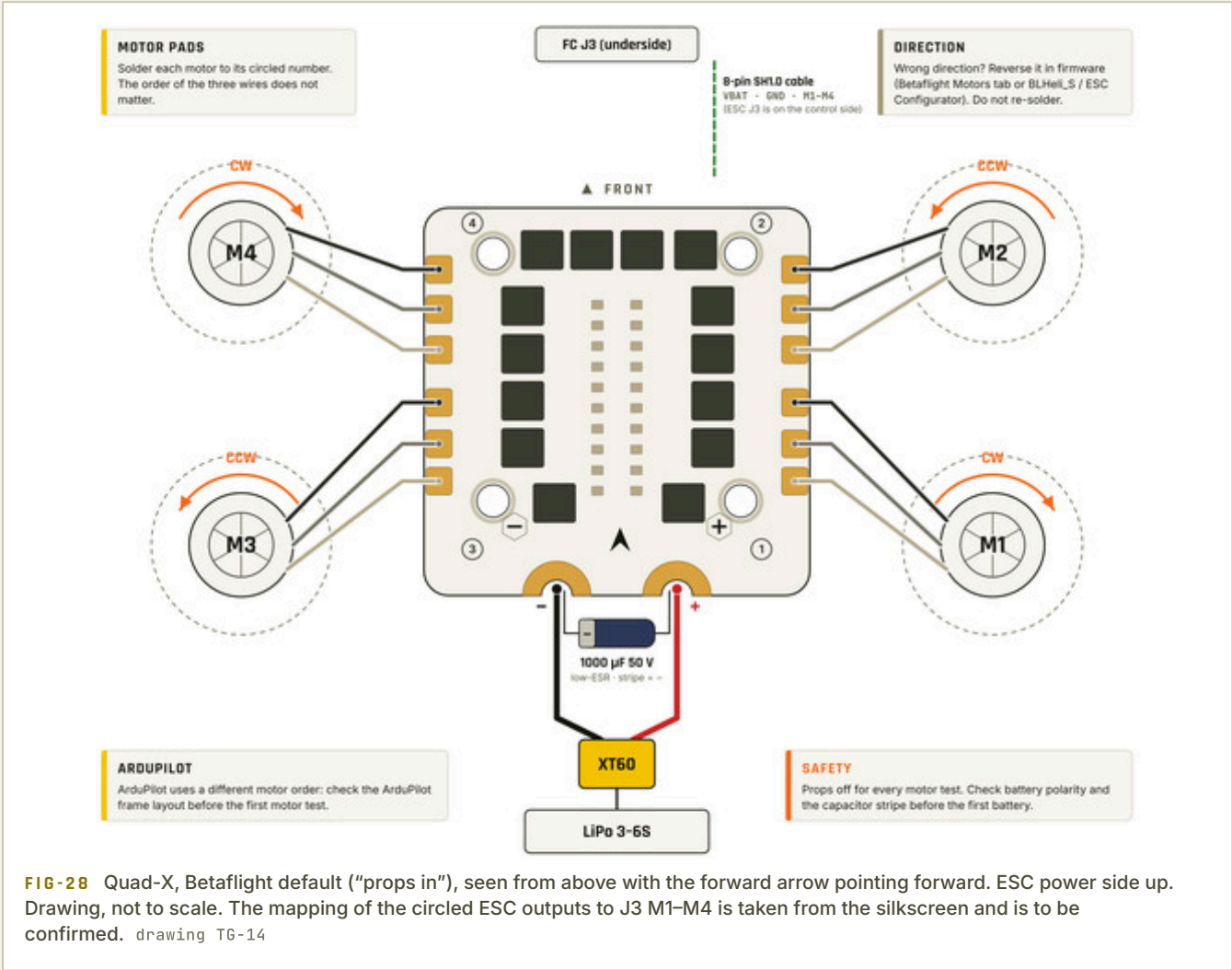
Use 26–28 AWG silicone wire for the signals and a slightly heavier wire (24 AWG) for ground and battery voltage. Twist the motor signal wires together with the ground wire to reduce noise.

The ESC pad order is shown as printed on the silkscreen and is still to be confirmed against the schematic. Check each pad name on your board under a magnifier before soldering.

8.3 - 8.4 · MOTORS AND EXTRA OUTPUTS

MOTORS

Solder each motor to the ESC output with the same number (circled ① to ④ on the ESC). The ESC power side faces up, toward the flight controller, with the battery pads at the rear.



T-21 DEFAULT MOTOR LAYOUT (BETAFLIGHT QUAD-X)

| MOTOR | POSITION    | DEFAULT DIRECTION ("PROPS IN") |
|-------|-------------|--------------------------------|
| M1    | Rear right  | Clockwise                      |
| M2    | Front right | Counter-clockwise              |
| M3    | Rear left   | Counter-clockwise              |
| M4    | Front left  | Clockwise                      |

Directions are seen from above. If you enable *Motor direction is reversed* ("props out") in Betaflight, all four directions are reversed. The order of the three wires on each motor does not matter.

If a motor is in the wrong position, either move its wires or remap it in software (section 13.5). If it spins the wrong way, reverse it in software (sections 13.5 and 17.3); do not re-solder.

*i* **NOTE**

**ArduPilot uses a different motor numbering.** See section 15.6 before your first ArduPilot motor test.

8.4 · USING M5-M8 (HEXA, OCTO, X8, Y6)

Outputs M5-M8 are on the top-side pads of the flight controller (second row at the front edge, see FIG-23). For an X8 or octocopter, connect a second 4-in-1 ESC to M5-M8 (signal wires) and to a common ground. Power the second ESC directly from the battery. Select the matching mixer in your firmware.

## 9.1 · RECEIVERS ON UART2

## WIRING PERIPHERALS

## SIGNALS CROSS OVER

Device TX goes to the FC **R** pad; device RX goes to the FC **T** pad.

## CHECK THE VOLTAGE

Receivers and GPS: 5V or 4V5. VTX and DJI units: 9V or BAT (check the device rating).

## SHARE GROUND

Every device needs a **G** (ground) connection to the flight controller.

## ASSIGN THE PORT

After wiring, set the UART function in the configurator (chapters 13–15).

## EXPRESSLRS (ELRS), CROSSFIRE (CRSF), GHST OR SBUS

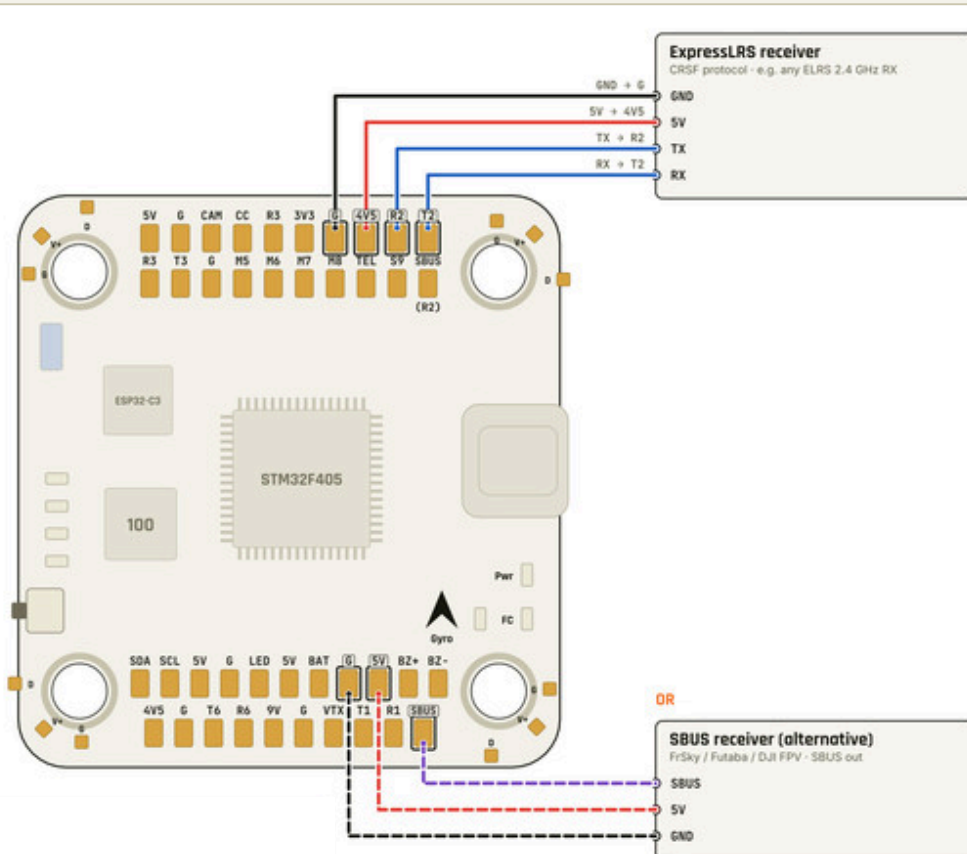


FIG-29 Serial receiver on UART2 (top) or SBUS receiver (bottom). Wire one or the other, never both. Drawing, not to scale.

## T-22 ELRS / CRSF / GHST (UART2)

| RECEIVER | FC PAD                                  |
|----------|-----------------------------------------|
| TX       | ● R2                                    |
| RX       | ● T2                                    |
| 5V       | ● 4V5 (works on USB, recommended) or 5V |
| GND      | ● G                                     |

Configurator: UART2 = *Serial RX*; receiver provider **CRSF** (also used for ELRS) or **GHST**.

## ✓ TIP

Powering an ELRS receiver from **4V5** lets you bind it and update it over Wi-Fi with only USB connected, with no battery needed.

## T-23 SBUS (FRSKY, FUTABA, DJI FPV RECEIVER)

| RECEIVER | FC PAD                    |
|----------|---------------------------|
| SBUS     | ● SBUS (either SBUS pad*) |
| 5V       | ● 5V or 4V5               |
| GND      | ● G                       |

Configurator: UART2 = *Serial RX*; provider **SBUS**. The on-board inverter handles the inverted SBUS signal. **Do not connect anything to R2 when you use the SBUS pad.**

\*The FC has two pads printed SBUS (top-side front row, marked "(R2)", and rear row). Both are documented as the same inverted UART2 input; this is still to be confirmed.

## 9.1 - 9.2 · OTHER RECEIVERS, GPS AND COMPASS

## OTHER RECEIVERS &amp; GPS

## T-24 SPEKTRUM SRXL2

| RECEIVER   | FC PAD     |
|------------|------------|
| Signal (S) | ● T2       |
| +          | ● 5V / 4V5 |
| -          | ● G        |

Single wire, half-duplex. Provider **SRXL2**; Betaflight sets half-duplex mode automatically.

## T-25 IBUS AND FPORT

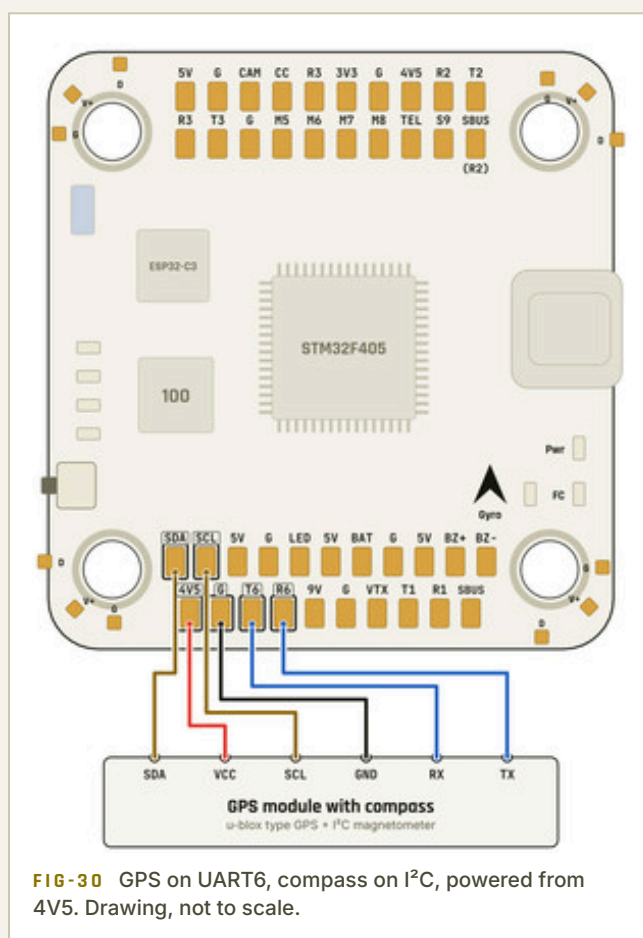
| RECEIVER       | FC PAD   |
|----------------|----------|
| iBUS out       | ● R2     |
| FPort (1 wire) | ● T2     |
| 5V / GND       | ● 5V / G |

Provider **IBUS** or **FPORT**. For FPort, Betaflight enables half-duplex and inversion; follow the receiver maker's guide.

## T-26 PPM (LEGACY)

| RECEIVER | FC PAD                |
|----------|-----------------------|
| PPM      | ● R2 Betaflight       |
|          | ● S9 INAV / ArduPilot |
| 5V / GND | ● 5V / G              |

Receiver mode **PPM RX input**. PPM is slow and has limited channels: use a serial receiver wherever possible.\*

9.2 · GPS AND COMPASS: UART6 + I<sup>2</sup>C

## T-27 GPS MODULE WIRING

| GPS MODULE    | FC PAD |
|---------------|--------|
| TX            | ● R6   |
| RX            | ● T6   |
| VCC (5 V)     | ● 4V5  |
| GND           | ● G    |
| SDA (compass) | ● SDA  |
| SCL (compass) | ● SCL  |

- **Betaflight:** UART6 → *Sensor input: GPS*, auto-baud. Enable GPS in *Configuration*. A compass is optional.
- **INAV:** UART6 → GPS, protocol UBLOX. A compass on I<sup>2</sup>C is strongly recommended for navigation modes.
- **ArduPilot:** SERIAL6 is GPS by default. A compass is **required** for most GPS flight modes on multirotors.

## ✓ TIP

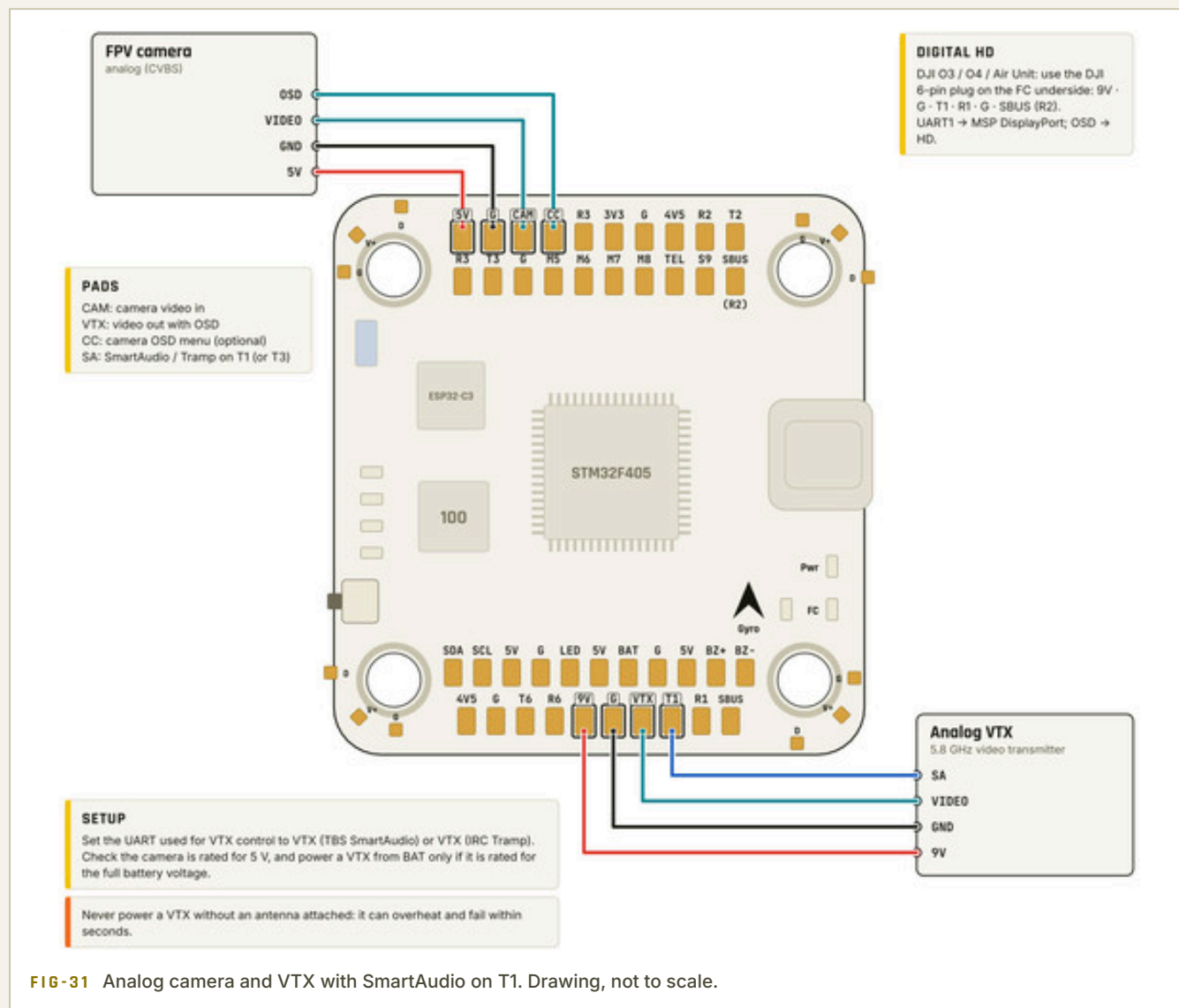
The **4V5** pad is powered from USB, so the GPS gets a satellite fix on the bench without a battery. Mount the GPS at least 5 cm away from the ESC, battery leads and VTX antenna to avoid compass interference.

\*PPM input on R2 (Betaflight) and S9 (INAV / ArduPilot) is taken from the firmware configuration and is still to be bench-tested on V2.

## 9.3 · ANALOG FPV CAMERA AND VTX

## ANALOG CAMERA &amp; VTX

The on-board MAX7456 adds the OSD to the video signal between the **CAM** input and the **VTX** output.



## T-28 CAMERA AND VTX WIRING

| DEVICE | WIRE                   | FC PAD              |
|--------|------------------------|---------------------|
| Camera | Video                  | ● CAM               |
|        | 5V                     | ● 5V (check rating) |
|        | GND                    | ● G                 |
|        | OSD control (optional) | ● CC                |
| VTX    | Video in               | ● VTX               |
|        | Power                  | ● 9V or BAT**       |
|        | GND                    | ● G                 |
|        | SmartAudio / Tramp     | ● T1 (or T3)        |

**Configurator:** set the UART you used for VTX control to *Peripherals: VTX (TBS SmartAudio) or VTX (IRC Tramp)*.

\*\*Use **BAT** only if the VTX is rated for the full battery voltage.

**⚠ WARNING**

**Antenna first.** Never power a VTX without an antenna attached. It can overheat and fail within seconds.

## 9.4 · DJI 03 / 04 / AIR UNIT AND OTHER HD SYSTEMS

## DIGITAL HD VIDEO

The **DJI 6-pin connector** on the FC underside carries 9 V power, UART1 for the OSD (MSP DisplayPort) and SBUS from the DJI receiver (if used) to UART2.

## USING THE DJI 6-PIN PLUG

**01** CONNECT THE AIR UNIT

Use the cable that came with your air unit, or the supplied DJI 6-pin cable for older Air Units. Check that the pin order on both ends matches T-13 (chapter 6).

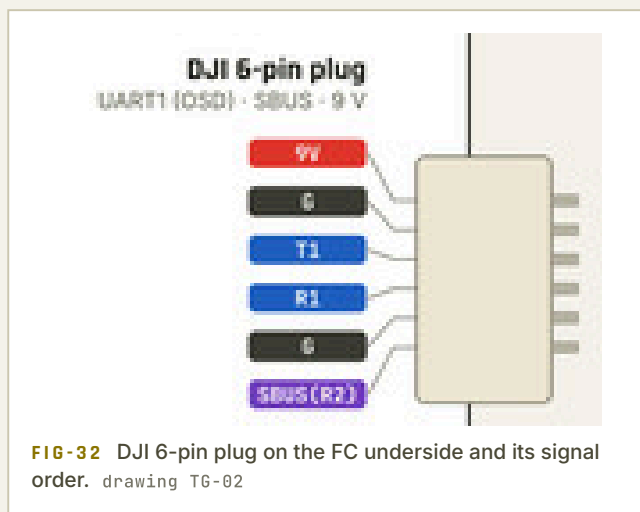
**02** SET UART1

Betaflight: UART1 → *MSP ON* and *Peripherals: VTX (MSP + DisplayPort)*.

**03** SET THE OSD

OSD tab → *HD*. In the goggles, enable custom OSD (canvas mode).

If you use an ELRS / CRSF receiver with a DJI system, leave the SBUS wire unused and wire the receiver to T2 / R2.



**FIG-32** DJI 6-pin plug on the FC underside and its signal order. drawing T6-02

## T-29 DJI PLUG PINS

| PIN         | FUNCTION                           |
|-------------|------------------------------------|
| ● 9V        | Air-unit power                     |
| ● G         | Ground                             |
| ● T1        | UART1 TX → air unit RX             |
| ● R1        | UART1 RX ← air unit TX             |
| ● G         | Ground                             |
| ● SBUS (R2) | DJI SBUS output → UART2 (inverted) |

**⚠ WARNING**

**Check your air unit's power rating.** Confirm the input voltage range of your DJI or HD unit in its own specification before connecting it. The plug supplies 9 V from the 9 V 3 A regulator. If your unit must be powered from battery voltage, power it from **BAT** and use the plug for UART1 and SBUS only.

## 9.5 · POWER BUDGET

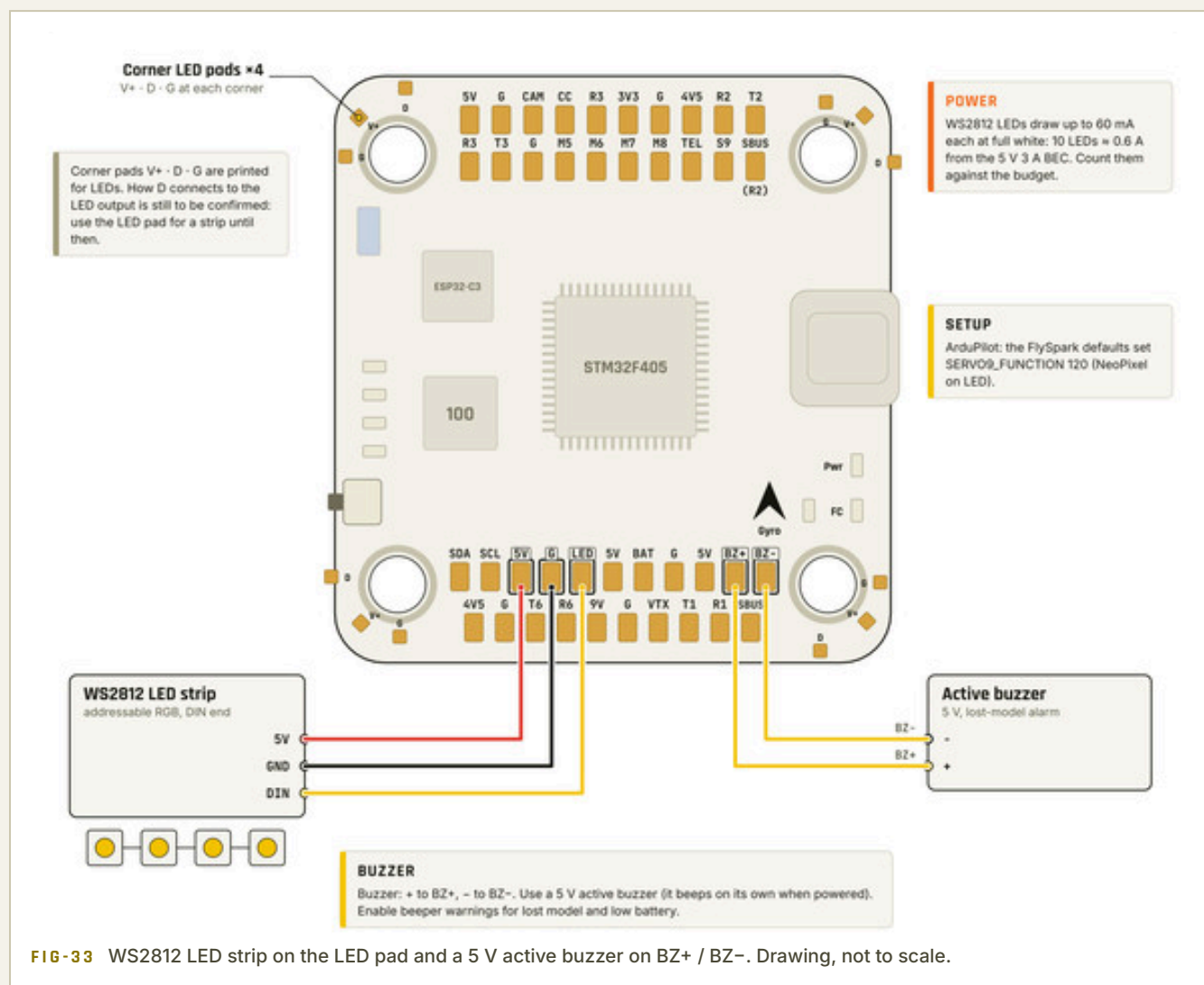
## T-30 REGULATED RAILS AND BATTERY OUTPUT

| RAIL  | LIMIT                        | TYPICAL LOADS                                             |
|-------|------------------------------|-----------------------------------------------------------|
| ● 5V  | 3 A total                    | Receiver, camera, LED strip, buzzer                       |
| ● 4V5 | Shared with USB; low current | GPS, receiver                                             |
| ● 9V  | 3 A total                    | Analog VTX, DJI air unit                                  |
| ● BAT | Battery-limited              | High-power VTX or air unit rated for the battery voltage* |

\*The current limit of the top-side BAT pad is still to be confirmed. Feed high-current loads directly from the battery leads if in doubt.

## 9.6 - 9.7 • LED STRIP AND BUZZER

## LED STRIP &amp; BUZZER



## 9.6 • LED STRIP

| LED STRIP     | FC PAD |
|---------------|--------|
| DIN (data in) | LED    |
| 5V            | 5V     |
| GND           | G      |

Configure LEDs in the Betaflight / INAV *LED Strip* tab. In ArduPilot, the FlySpark defaults set SERVO9\_FUNCTION 120 (NeoPixel on the LED pad).

The four corner LED pads (V+ / D / G at each corner) let you connect short arm-LED strips directly.\*

\*The corner pads are documented from the silkscreen. Whether they share the LED data line (PA8) and in which order they are chained is still to be confirmed.

## 9.7 • BUZZER

Connect a 5 V active buzzer: + to BZ+, - to BZ-. Use it for the lost-model alarm and low-battery warnings.

## NOTE

WS2812 LEDs draw up to 60 mA each at full white. Ten LEDs can draw 0.6 A from the 5 V regulator. Count your LEDs against the 3 A budget (section 9.5).

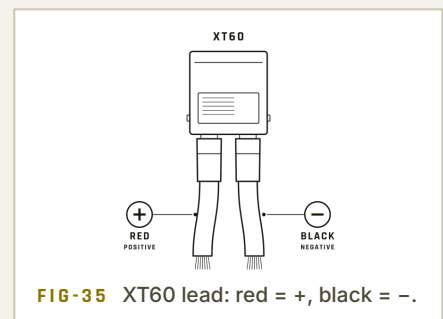
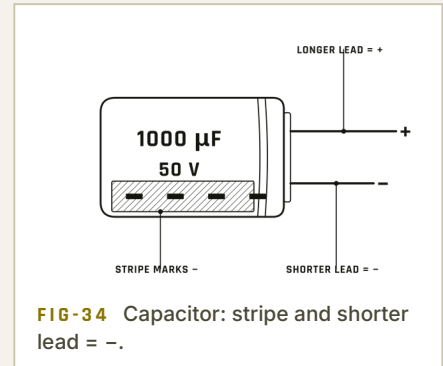
## 10.1 - 10.2 · INSPECTION AND USB CHECK

# FIRST POWER-UP CHECKLIST

Follow this checklist for the first power-up of a new build and after any soldering work. Tick each box.

## 10.1 · BEFORE CONNECTING A BATTERY

- ☐ **Propellers are removed.**
- ☐ The capacitor is installed on the ESC battery pads with the **stripe (-) on the - pad.**
- ☐ The XT60 lead is **red to +, black to -.**
- ☐ No solder bridges between neighbouring pads (inspect with a magnifier; the white board makes bridges easy to see).
- ☐ No stray wire strands or solder balls on either board.
- ☐ The 8-pin cable is fully seated on both boards.
- ☐ Use a multimeter (continuity mode) to confirm there is **no short** between the battery + and - pads.
- ☐ Stack screws are tight but the grommets are not crushed.



## 10.2 · USB-ONLY CHECK

### 01 CONNECT USB ONLY

Connect the flight controller to your computer or phone with a **data** USB-C cable (no battery).

### 02 CHECK THE LEDS

The **Pwr** LED is on and the blue **FC** LED shows normal status (chapter 11).

### 03 CONNECT THE CONFIGURATOR

Open the Betaflight App, INAV Configurator or Mission Planner and connect.

### 04 CHECK THE ATTITUDE

Tilt the aircraft: the 3D model or horizon must follow the movement correctly (nose down, roll right).

### 05 CHECK 4V5 DEVICES

If you wired a GPS or receiver to **4V5**, check that it powers up.

## ▲ DANGER

**Props off.** Keep all propellers removed until every check in this chapter has passed. A motor can start unexpectedly during setup and motor tests.

## 10.3 - 10.5 • BATTERY, MOTORS AND FIRST FLIGHT

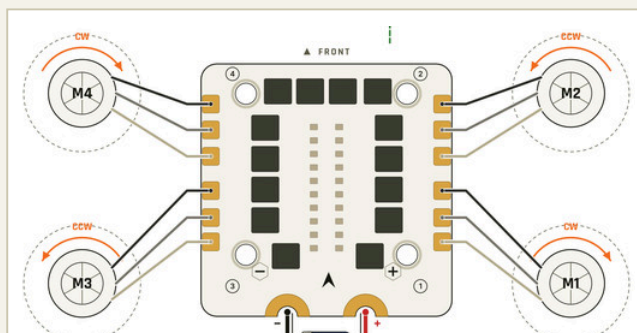
## BATTERY, MOTORS &amp; PRE-FLIGHT

## 10.3 • FIRST BATTERY CONNECTION

- 01 USE A SMOKE STOPPER**  
Connect the battery **through a smoke stopper** (fuse or bulb) or a current-limited bench supply.
- 02 LISTEN**  
Listen for the ESC start-up tones (section 11.3).
- 03 CHECK FOR HEAT**  
Check that nothing gets hot or smells. If anything smokes, disconnect immediately.
- 04 CHECK THE VOLTAGE**  
In the configurator, the **battery voltage** must match a multimeter reading within  $\pm 0.1$  V. If not, adjust the voltage scale (section 13.4, 14.4 or 15.7).
- 05 CHECK THE GAUGE**  
The 4 battery LEDs show the expected level (section 11.2).
- 06 REMOVE THE SMOKE STOPPER**  
Only after these checks pass.

## 10.4 • MOTOR CHECK (PROPS OFF)

- 01 ENABLE MOTOR TEST**  
In the Motors tab (Betaflight / INAV) or Motor Test (Mission Planner), enable motor testing and accept the warning.
- 02 SPIN EACH MOTOR**  
Spin each motor individually at low throttle.
- 03 CHECK POSITION**  
The **position** of each motor matches the layout for your firmware.
- 04 CHECK DIRECTION**  
Reverse any motor that spins the wrong way in software (sections 13.5 and 17.3).



**FIG-36** Betaflight quad-X default, props in (detail of FIG-28). ArduPilot numbering differs: see section 15.6.

## 10.5 • BEFORE THE FIRST FLIGHT

- |                                                                                                                                                                                              |                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Receiver channels move correctly in the Receiver tab; the arm switch works.                                                                                         | <input type="checkbox"/> OSD shows voltage and flight mode.                              |
| <input type="checkbox"/> Flight modes are set and tested on the switches.                                                                                                                    | <input type="checkbox"/> Propellers are fitted in the correct direction and tightened.   |
| <input type="checkbox"/> <b>Failsafe</b> is configured and tested: switch off the transmitter with props off and confirm that the aircraft disarms (or enters the configured failsafe mode). | <input type="checkbox"/> First hover in an open area, away from people, at low altitude. |
| <input type="checkbox"/> Accelerometer is calibrated on a level surface.                                                                                                                     |                                                                                          |

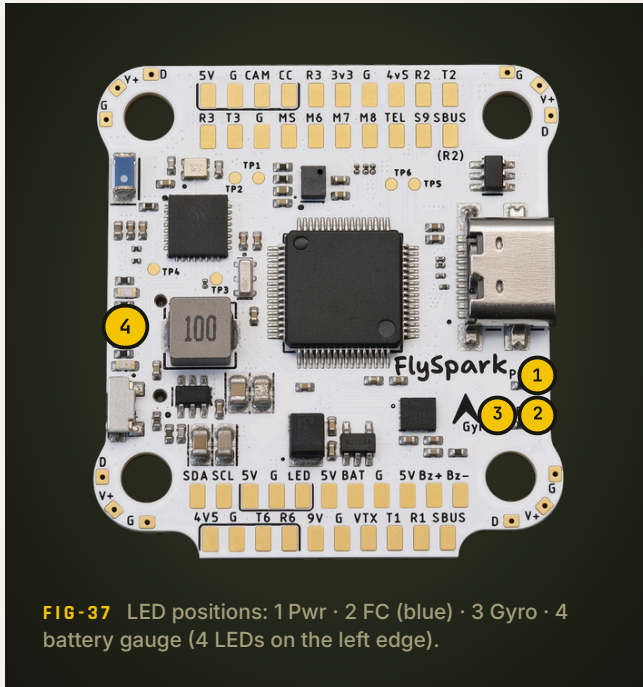
## ✓ TIP

**Save a configuration backup now.** Betaflight / INAV: CLI `diff all`. ArduPilot: *Config* → *Full Parameter List* → *Save to file*.

## 11.1 - 11.2 · STATUS LEDS AND THE 4-LED BATTERY GAUGE

## LEDS &amp; BATTERY GAUGE

The flight controller has three status LEDs next to the forward arrow and a four-LED battery gauge on its left edge. The gauge works with Betaflight, INAV and ArduPilot.



**FIG-37** LED positions: 1 Pwr · 2 FC (blue) · 3 Gyro · 4 battery gauge (4 LEDs on the left edge).

## 11.1 · FLIGHT-CONTROLLER LEDS

## T-31 LED STATES

| LED               | LOCATION                        | MEANING                                                                                                                                                                    |
|-------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 · Pwr           | Next to the FlySpark logo       | The flight controller is powered (USB or battery)                                                                                                                          |
| 2 · FC            | Blue, next to the forward arrow | Flight-controller status. Betaflight / INAV: blinks during start-up and calibration, stays on or blinks slowly when ready. ArduPilot: follows the ArduPilot status pattern |
| 3 · Gyro          | Next to the forward arrow       | The gyro / IMU power supply is on                                                                                                                                          |
| 4 · Battery gauge | Left edge, 4 LEDs               | Battery level and Bluetooth bridge status (below)                                                                                                                          |

## 11.2 · THE 4-LED BATTERY GAUGE

The four LEDs on the left edge are driven by the Bluetooth bridge (firmware V12). The bridge reads the battery state from the flight controller (MSP battery state on Betaflight / INAV, MAVLink `SYS_STATUS` on ArduPilot), so the gauge works with all three firmwares.

## T-32 BATTERY GAUGE

| LEDS LIT | APPROXIMATE BATTERY LEVEL*                                |
|----------|-----------------------------------------------------------|
| ● ● ● ●  | 75–100 %                                                  |
| ● ● ● ○  | 50–75 %                                                   |
| ● ● ○ ○  | 25–50 %                                                   |
| ● ○ ○ ○  | <b>Below 25 %:</b> land and replace or charge the battery |

The level is estimated from the cell voltage, so it reads lower under load and recovers when the aircraft is idle. Use it as a quick pre-flight and post-flight check; use the OSD voltage in flight.

## i NOTE

The battery gauge needs UART4 enabled with MSP (Betaflight / INAV) or MAVLink2 (ArduPilot) at 115200. The FlySpark firmware builds have this set by default.

\*Thresholds as published for the gauge; the exact per-cell voltage thresholds of bridge firmware V12 and the LED colours are still to be confirmed.

## 11.2 - 11.3 • SPECIAL PATTERNS AND ESC SOUNDS

## PATTERNS &amp; ESC SOUNDS

## SPECIAL LED PATTERNS

## T-33 BATTERY-GAUGE SPECIAL PATTERNS

| PATTERN                 | MEANING                                                                       | ACTION                                                                                           |
|-------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| All 4 LEDs blinking     | The STM32 is not running flight firmware (empty, or in DFU / bootloader mode) | Flash Betaflight, INAV or ArduPilot (chapter 16). If you are flashing on purpose, this is normal |
| Link LED blinking*      | A phone or computer is connected over Bluetooth                               | Normal                                                                                           |
| No battery LEDs, Pwr on | The bridge has no battery data yet, or UART4 is disabled                      | Wait a few seconds after boot; check the UART4 settings (section 7.1)                            |

\*Which LED shows the Bluetooth link is still to be confirmed.

## 11.3 • ESC SOUNDS

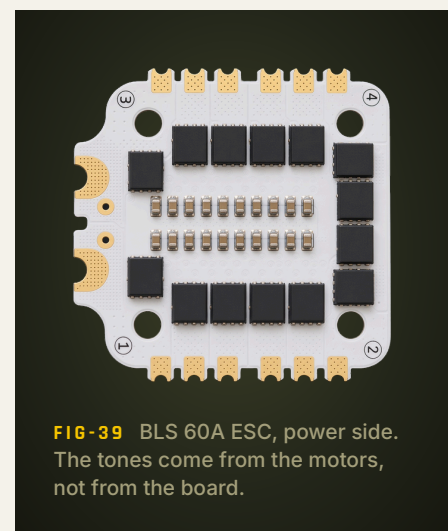
The BLS 60A ESC uses the motors as speakers. Listen for these sounds when you connect the battery (props off).



FIG-38 Start-up sequence heard through the motors (props off). Bar height shows the relative pitch of each tone.

## T-34 ESC TONES

| SOUND                                                              | MEANING                                                                                                               |
|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Three rising tones after power-up                                  | The ESCs have started                                                                                                 |
| Two further tones (low, then high)                                 | A valid signal from the FC has been detected; the ESC is ready                                                        |
| Start-up tones only, no further tones                              | No valid signal from the FC: check the 8-pin cable, the motor protocol (DShot300) and that the FC firmware is running |
| Beeping every few seconds after about 10 minutes idle on the bench | ESC <b>beacon</b> (no signal for 10 minutes). Normal: arm or disconnect the battery                                   |



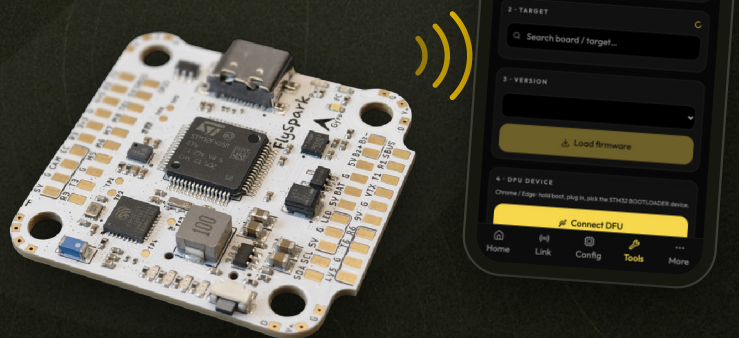
## ✓ TIP

The ESC beacon helps you find a crashed aircraft in tall grass. Its strength is set by *Beacon strength* (factory: 80) and the delay by *Beacon delay* (factory: 10 min). See chapter 17.

# 12

## BLUETOOTH & FLYSPARK STATION

Bluetooth is built into every F4 V2. Link your Android phone to the flight controller with no adapter and no pairing code, then check, tune and configure the aircraft in the field.



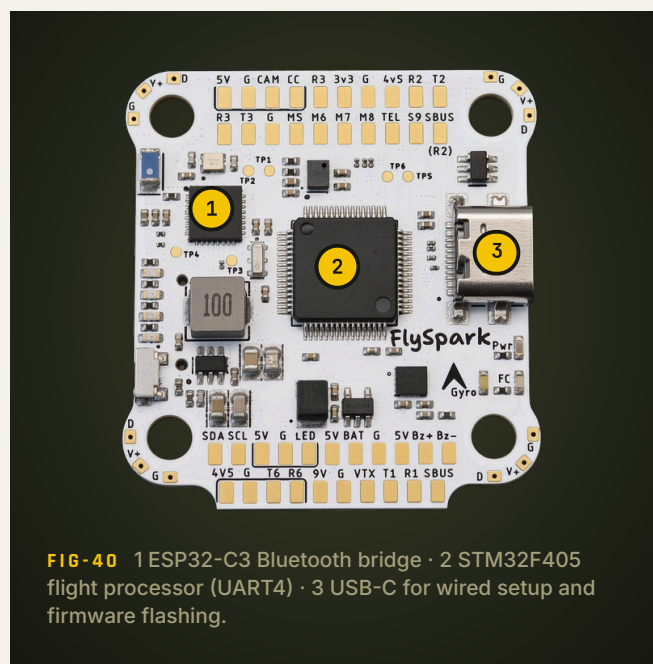
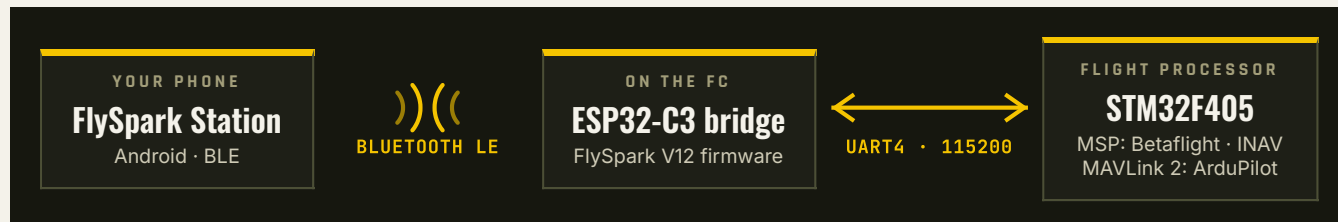
### IN THIS CHAPTER

1. About the Bluetooth bridge
2. Install FlySpark Station
3. Connect
4. Live dashboard
5. Configurators inside the app
6. Motors, ESC and firmware tools
7. Disabling Bluetooth
8. Bridge firmware (service only)

## 12.1 • ABOUT THE BLUETOOTH BRIDGE

# BLUETOOTH BUILT IN

Every F4 V2 has a Bluetooth Low Energy (BLE) bridge on the flight controller. It is installed and set up at the factory. Your phone talks straight to the flight controller: no adapter, no extra wiring and no pairing code.



**FIG-40** 1 ESP32-C3 Bluetooth bridge · 2 STM32F405 flight processor (UART4) · 3 USB-C for wired setup and firmware flashing.

## T-35 BLUETOOTH BRIDGE

|                   |                                                                |
|-------------------|----------------------------------------------------------------|
| DEVICE NAME       | FlySpark F4 v2                                                 |
| CHIP              | ESP32-C3, on the flight controller                             |
| FC CONNECTION     | UART4 · 115200 baud                                            |
| PROFILE           | HM-10 / CC2541-style serial service FFE0 · characteristic FFE1 |
| BRIDGE FIRMWARE   | FlySpark V12                                                   |
| BETAFLIGHT / INAV | MSP pass-through                                               |
| ARDUPILOT         | MAVLink 2 pass-through                                         |
| BATTERY GAUGE     | Drives the 4-LED gauge on all three firmwares (chapter 11)     |
| PAIRING           | None. No pairing code is needed                                |

## APPS YOU CAN USE

|                                                                                                                                                                  |                                                                                                                                                |                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>FLYSPARK STATION</b><br>RECOMMENDED · ALL FIRMWARES<br>Betaflight, INAV and ArduPilot. Live dashboard, the official configurators and field tools in one app. | <b>BETAFLIGHT APP &amp; MSP APPS</b><br>BETAFLIGHT · INAV<br>Choose Bluetooth and the HM-10 / CC2541 adapter type, then select FlySpark F4 v2. | <b>MAVLINK GROUND-CONTROL APPS</b><br>ARDUPILOT<br>Any ground-control app that supports BLE serial (HM-10 type) links over MAVLink 2. |
| <b>FIRMWARES</b><br>Betaflight · INAV · ArduPilot                                                                                                                | <b>PROTOCOLS</b><br>MSP + MAVLink 2                                                                                                            | <b>EXTRA HARDWARE</b><br>None: built in                                                                                               |

### NOTE

**On the ground only.** Bluetooth is for configuration and live telemetry checks on the ground. It is not a flight-control or in-flight telemetry link, and its range is short (typically a few metres).

## 12.2 - 12.3 · INSTALL AND CONNECT

## INSTALL &amp; CONNECT

## 12.2 · INSTALL FLYSPARK STATION



## FLYSPARK STATION · ANDROID

[www.flyspark.in/app](http://www.flyspark.in/app)

Package `in.flyspark.station`. Google Play listing coming soon; the link above always has the current download. For iOS availability, check the same page.

## 01 DOWNLOAD

Scan the QR code (also on the box and on the back cover), or open [www.flyspark.in/app](http://www.flyspark.in/app) on your Android phone.

## 02 INSTALL

Install **FlySpark Station** and open it.

## 03 ALLOW PERMISSIONS

**Nearby devices / Bluetooth** to find the flight controller, and **Location** on older Android versions (Android requires it for BLE scanning). Allow USB access when you use a cable.

## 04 UNLOCK

Unlock the app with your fingerprint, face or device PIN when it asks.

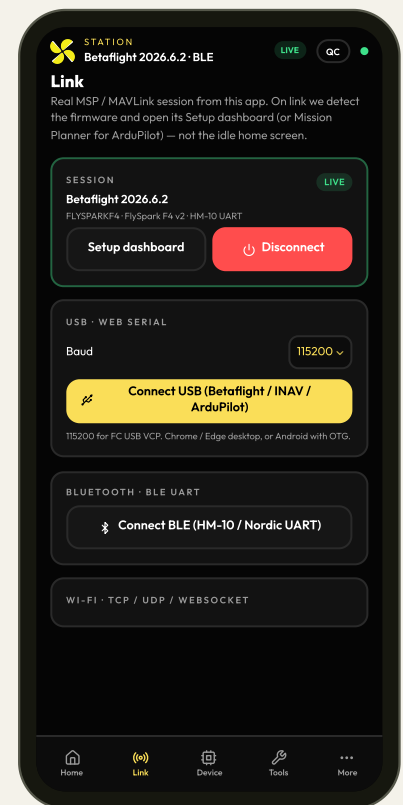


FIG-41 SCREEN ILLUSTRATION Link screen with a live Bluetooth session.

## 12.3 · CONNECT

## 05 POWER THE FLIGHT CONTROLLER

Connect a battery (propellers off) or a USB-C cable.

## 06 OPEN LINK

Tap **Link** in the bottom bar, then **Connect BLE** in the *Bluetooth · BLE UART* card.

## 07 SELECT FLYSPARK F4 V2

Pick FlySpark F4 v2 from the list. No pairing code is needed.

## 08 AUTOMATIC DETECTION

The app tries **MSP** first (Betaflight, INAV), then **MAVLink 2** (ArduPilot). When the link is live, a green **LIVE** badge appears and the app opens the device dashboard.

## ① NOTE

**Wired link.** You can also connect a USB-C to USB-C cable (or a USB OTG adapter) from the phone to the flight controller and tap **Connect USB**. Firmware flashing always uses USB.

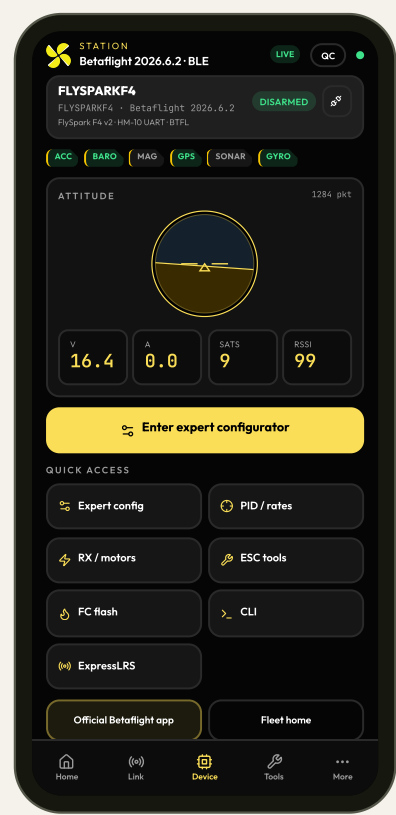
## ✓ TIP

**One connection at a time.** Only one app can use the flight controller link. Tap **Disconnect** in FlySpark Station before you connect from another app, and close other apps first.

12.4 · DASHBOARD

# LIVE DASHBOARD

When the link is live, the **Device** tab shows who the flight controller is and what it is doing right now. Check sensors, attitude and battery before every session, without a laptop.



**FIG-42** SCREEN ILLUSTRATION Device dashboard, Betaflight over Bluetooth. Values are examples.

## NOTE

The top bar always shows the firmware, version and link type (BLE or USB). The FlySpark mark turns while a flight controller is linked.

## T-36 WHAT THE DASHBOARD SHOWS

| ITEM       | WHAT YOU SEE                                                                                                |
|------------|-------------------------------------------------------------------------------------------------------------|
| Identity   | Target (FLYSPARKF4), firmware and version, and the link in use (FlySpark F4 v2 · HM-10 UART or USB)         |
| Sensors    | Acc, Baro, Mag, GPS, Sonar, Gyro. Green means detected                                                      |
| Status     | Armed state (DISARMED / ARMED) or the ArduPilot flight mode                                                 |
| Attitude   | Artificial horizon with live roll and pitch                                                                 |
| Battery    | Pack voltage. Current (A) and mAh read zero: the BLS 60A has no current sensor                              |
| Link & GPS | RSSI and GPS satellites. The <b>Home</b> tab adds altitude, speed and loop time (MSP) or CPU load (MAVLink) |

## QUICK ACCESS

|                           |                                                  |
|---------------------------|--------------------------------------------------|
| EXPERT CONFIGURATOR       | FlySpark quick-config tabs (section 12.5)        |
| OPEN MISSION PLANNER      | Shown instead for ArduPilot                      |
| PID / RATES · RX / MOTORS | Quick tuning and receiver check                  |
| ESC TOOLS · FC FLASH      | Section 12.6                                     |
| CLI · EXPRESSLRS          | Command line; ELRS over Wi-Fi                    |
| OFFICIAL ... APP          | Opens the in-app Betaflight or INAV configurator |

## TIP

**Demo mode.** No hardware yet? Tap **Link** → **Open demo FC** to explore every screen against a simulated flight controller. Nothing is written to real hardware.

## PRE-SESSION CHECK (PROPS OFF)

- ☐ The header shows **LIVE** and the firmware and version you expect.
- ☐ **Gyro**, **Acc** and **Baro** are green (**GPS** too, if fitted).
- ☐ Tilt the aircraft: the horizon follows the nose and the roll.
- ☐ Pack voltage agrees with a multimeter to within 0.1 V.
- ☐ Status reads **DISARMED** with the arm switch off.
- ☐ RSSI rises when you switch the transmitter on.

12.5 · CONFIGURATORS INSIDE THE APP

CONFIGURATORS IN YOUR POCKET

FlySpark Station includes the official Betaflight and INAV configurators, built from the upstream projects and laid out for phones, plus a ground-control station for ArduPilot and FlySpark’s own quick-config panel.



FIG-43 SCREEN ILLUSTRATION Tools: field tools and the official configurators.

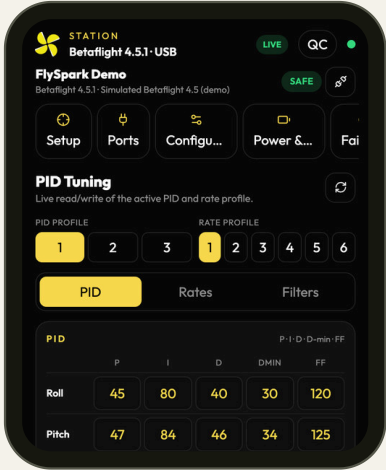


FIG-44 REAL APP SCREEN FlySpark quick config, PID Tuning tab, in demo mode (simulated Betaflight flight controller). Values are examples.

OFFICIAL CONFIGURATORS

Open **Tools** → **Betaflight Configurator** or **INAV Configurator**, or tap **Official ... app** on the device dashboard. FlySpark Station hands its link to the configurator automatically. Tap the floating FlySpark mark to return to the dashboard.

ARDUPILOT

With ArduPilot linked over MAVLink, the dashboard button reads **Open Mission Planner** and opens the in-app ground-control station.

FLYSPARK QUICK CONFIG

Tap **Enter expert configurator** (or **Tools** → **FlySpark quick config**). It shares the live link, so telemetry keeps running while you change settings in the field. FIG-44 shows its PID Tuning tab.

T-37 FLYSPARK QUICK-CONFIG TABS

| TAB             | WHAT YOU CAN DO                                                  | TAB                | WHAT YOU CAN DO                                            |
|-----------------|------------------------------------------------------------------|--------------------|------------------------------------------------------------|
| Setup           | Live attitude, sensors, calibration, craft name, reboot          | Modes              | Add modes, set switch ranges with a live marker            |
| Ports           | UART functions and baud rates                                    | Motors             | Props-off motor test, motor direction (section 12.6)       |
| Configuration   | ESC protocol, DShot idle, bidirectional DShot, alignment, arming | OSD                | Elements, preview grid, video system, alarms               |
| Power & Battery | Meter sources, cell voltages, voltage scale                      | Video TX           | Band, channel, power, pit mode                             |
| Failsafe        | Stage 1 / stage 2 procedure, GPS Rescue                          | GPS                | Fix, satellites, protocol                                  |
| PID Tuning      | PIDs, profiles, rates, filters                                   | Sensors · Blackbox | Live graphs; log settings and card status                  |
| Receiver        | Live channel bars, protocol, channel map                         | CLI                | Full CLI; one-tap <b>Backup</b> of diff all to a .txt file |

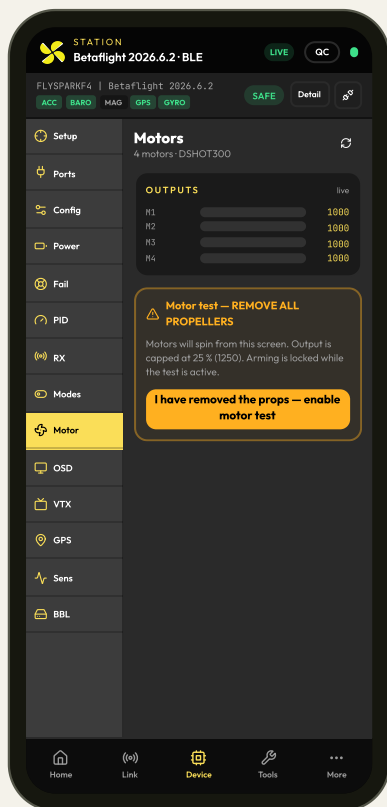
INAV flight controllers show the tabs that INAV supports. ArduPilot uses the ground-control station instead. The real screens in this chapter come from an earlier app build, where the **Device** tab was labelled **Config**.

## 12.6 • BATTERY, MOTOR TEST, ESC AND FIRMWARE TOOLS

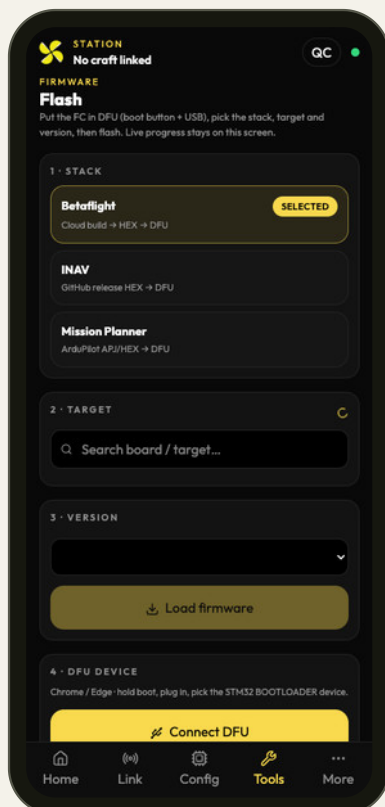
## MOTORS, ESC &amp; FIRMWARE

**▲ DANGER**

**Propellers off.** Remove all propellers before you use the motor test, the ESC tools or firmware flashing. Motors can start from these screens.



**FIG-45** SCREEN ILLUSTRATION Expert configurator, Motors tab: the props-off lock.



**FIG-46** REAL APP SCREEN Firmware flash. On Android, step 4 asks you to hold BOOT and plug in USB OTG.

**BATTERY**

Live pack voltage and cell count in **Power & Battery**, where you also set the cell warning and minimum voltages.

**MOTOR TEST**

Open the **Motors** tab and confirm the props-off lock. Output is capped at **25 %**, arming is blocked during the test, and **STOP ALL** stops every motor. The direction buttons reverse a stopped motor over DShot and save it in the ESC.

**ESC TOOLS**

One-tap **BLHeli passthrough**, then **ESC Configurator** to read or change the ESC settings (chapter 17).

**EXPRESSLRS**

Configure an ELRS receiver or transmitter over its own Wi-Fi.

**FIRMWARE FLASH (USB ONLY)****01****CONNECT OVER USB OTG**

Hold **BOOT** on the FC while you plug in the cable.

**02****TOOLS → FC FIRMWARE FLASHER**

Choose Betaflight, INAV or ArduPilot.

**03****TARGET AND VERSION**

For example FLYSPARKF4, then **Load firmware**.

**04****CONNECT DFU, THEN FLASH**

Keep the cable still until the progress bar completes.

**▲ WARNING**

Firmware cannot be flashed over Bluetooth. The app loads the official upstream build: apply the FlySpark defaults afterwards (sections 13.2 and 14.2). See chapter 16.

## 12.7 - 12.8 · DISABLING BLUETOOTH AND BRIDGE SERVICE

# BLUETOOTH SECURITY & SERVICE

The bridge accepts a connection from any nearby phone while the flight controller is powered, without a pairing code. For sensitive or professional operations you can switch it off in the firmware.

## 12.7 · DISABLING BLUETOOTH

## T-38 SWITCHING THE BLUETOOTH LINK OFF AND ON

| FIRMWARE          | DISABLE                                                                        | RESTORE                                                                                                  |
|-------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Betaflight / INAV | Ports tab: switch off <b>MSP</b> on <b>UART4</b> , then <b>Save and Reboot</b> | Over USB: switch MSP on UART4 back on at 115200. Betaflight CLI:<br>serial UART4 1 115200 57600 0 115200 |
| ArduPilot         | SERIAL4_PROTOCOL = -1 (none), then reboot                                      | SERIAL4_PROTOCOL = 2 (MAVLink 2), then reboot                                                            |

### ⚠ WARNING

With UART4 switched off, FlySpark Station and the 4-LED battery gauge stop working until you switch it back on over USB.

### 📘 NOTE

This stops the flight controller from communicating over Bluetooth. The radio module may still be powered and advertising. For applications that need no radio on board, contact FlySpark about build options.

## BLUETOOTH TROUBLESHOOTING

| SYMPTOM                                        | CHECK                                                                                                                                                               |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FlySpark F4 v2 is not in the list              | Is the FC powered? Is another phone or app already connected (one link at a time)? Allow <b>Nearby devices</b> (and <b>Location</b> on older Android). Move closer. |
| Connects, but stays on "Detecting firmware..." | MSP may be off on UART4 (ArduPilot: SERIAL4_PROTOCOL not 2). Re-enable it over USB.                                                                                 |
| "Flight controller is in CLI mode"             | MSP pauses while the CLI is open. Type exit or save in the CLI tab, then reconnect from <b>Link</b> .                                                               |
| All 4 battery LEDs blink                       | The flight controller is not running flight firmware (for example, it is in DFU mode). Flash firmware over USB (chapter 16).                                        |

## 12.8 · BLUETOOTH BRIDGE FIRMWARE (SERVICE ONLY)

The bridge firmware is installed at the factory and does not normally need updating. Re-flashing needs the FlySpark ESP32 programming fixture, or a UART adapter on the ESP pads. Download FlySpark\_BLE\_V12.bin from the FlySpark GitHub firmware page.



**FIRMWARE & GUIDES**  
[github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark)

```
# flash the merged image at address 0x0,
115200 baud
pip install esptool
esptool --chip esp32c3 -p <PORT> -b 115200 \
  write-flash 0x0 FlySpark_BLE_V12.bin
```

### ✓ TIP

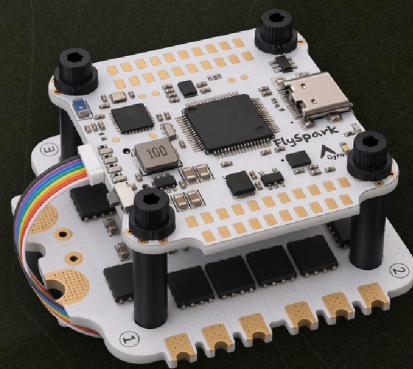
Use 115200 baud; higher speeds are unreliable on the fixture. If you are unsure, contact FlySpark support instead.

# 13

## BETAFLIGHT SETUP

✓ **HARDWARE VERIFIED**

Betaflight 2026.6.2, target FLYSPARKF4, is flashed and tested at the factory. Apply the FlySpark defaults, set the ports, check the motors and you are ready to fly.



### IN THIS CHAPTER

1. Connect
2. Apply the FlySpark defaults
3. Orientation and calibration
4. Ports and configuration
5. Motor order and direction
6. Receiver and modes
7. OSD, failsafe and blackbox
8. Back up your configuration

## 13.1 - 13.2 · CONNECT AND APPLY DEFAULTS

## CONNECT &amp; APPLY DEFAULTS

✓ **HARDWARE VERIFIED**

BETAFLIGHT 2026.6.2

TARGET FLYSPARKF4

FACTORY INSTALLED

**QUICK PATH**

1. Connect with the Betaflight App or Configurator over USB-C (or Bluetooth).
2. CLI: paste the FlySpark defaults (section 13.2), then **save**.
3. Ports: UART2 Serial RX · UART4 MSP 115200 (leave on) · UART1 MSP + DisplayPort for DJI / HD · UART6 GPS.
4. Configuration: DShot300, bidirectional DShot OFF; current meter NONE.
5. Motors: check order and direction (props off).
6. Receiver, modes, OSD, failsafe, then a **diff** all backup. Fly.

## 13.1 · CONNECT

**01 INSTALL**

Install the **Betaflight App** ([app.betaflight.com](http://app.betaflight.com), runs in Chrome or Edge) or Betaflight Configurator.

**02 PLUG IN**

Connect the flight controller with a **data** USB-C cable. Windows 10 / 11 recognises the virtual COM port automatically.

**03 CONNECT**

Click **Connect**. The header must show BTFL 2026.6.2 and board FLYSPARKF4.

**NOTE**

Your stack ships with Betaflight 2026.6.2 already flashed and tested. Flash firmware only to update it or to switch firmware (chapter 16). You can also do every step in this chapter over Bluetooth with FlySpark Station (chapter 12).

## 13.2 · APPLY THE FLYSPARK DEFAULTS

Open the **CLI** tab, paste these lines and press Enter. The board saves and reboots.

```
set motor_pwm_protocol = DSHOT300
set dshot_bidir = OFF
set current_meter = NONE
serial UART4 1 115200 57600 0 115200
save
```

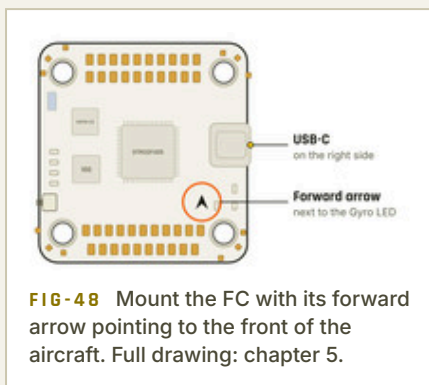
**FIG-47** Betaflight CLI defaults. The same lines are in `flyspark_cli_defaults.txt` on the FlySpark GitHub firmware page.

**T-39 WHY EACH LINE IS THERE**

| LINE                                       | WHY                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------|
| <code>motor_pwm_protocol = DSHOT300</code> | Recommended protocol for the BLHeli_S J_H_40 ESC                              |
| <code>dshot_bidir = OFF</code>             | BLHeli_S J_H_40 does not support bidirectional DShot or RPM filtering         |
| <code>current_meter = NONE</code>          | The BLS 60A has no current sensor                                             |
| <code>serial UART4 1 115200 ...</code>     | Enables MSP at 115200 on UART4 for the Bluetooth bridge and the battery gauge |

## 13.3 - 13.4 · SETUP TAB, PORTS AND CONFIGURATION

## PORTS &amp; CONFIGURATION



## 13.3 · SETUP TAB: ORIENTATION AND CALIBRATION

01

## CHECK THE 3D MODEL

Tilt the aircraft nose down, then roll it right. The model must follow both movements. If it does not, check that the FC arrow points forward, or set *Board and Sensor Alignment* in the Configuration tab.

02

## CALIBRATE

Place the aircraft on a level surface and click **Calibrate Accelerometer**.

## 13.4 · PORTS TAB

## T-40 BETAFLIGHT PORTS

| UART    | SETTING                                             | USE                                                                                                                                              |
|---------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| USB VCP | MSP ON                                              | Configurator. Do not change                                                                                                                      |
| UART1   | MSP ON + Peripherals <b>VTX (MSP + DisplayPort)</b> | DJI / HD OSD via the DJI plug. Analog builds: Peripherals <b>VTX (TBS SmartAudio)</b> or <b>VTX (IRC Tramp)</b> if the VTX control wire is on T1 |
| UART2   | <b>Serial RX</b> ON                                 | Receiver (CRSF / ELRS / SBUS / GHST / SRXL2)                                                                                                     |
| UART3   | Free                                                | Spare (for example VTX control on T3)                                                                                                            |
| UART4   | <b>MSP ON, 115200</b>                               | <b>Bluetooth bridge. Do not disable</b>                                                                                                          |
| UART5   | ESC sensor OFF                                      | The BLS 60A has no telemetry                                                                                                                     |
| UART6   | Sensor input <b>GPS</b> , AUTO                      | GPS module                                                                                                                                       |

Click **Save and Reboot**.

## CONFIGURATION TAB

- **ESC / Motor protocol:** DSHOT300. **Bidirectional DShot:** OFF.
- **Motor idle throttle:** 5.5 % (default) is a good start.
- **Board and sensor alignment:** default unless the FC is rotated.
- **Features:** enable **GPS** if fitted and **LED\_STRIP** if used. **OSD** is on by default.

## POWER &amp; BATTERY TAB

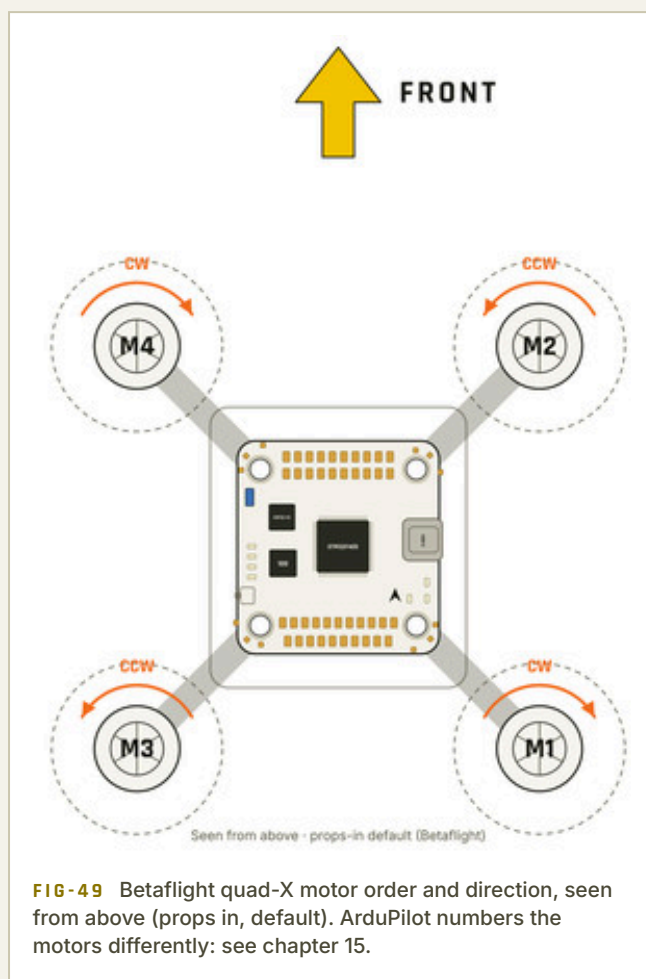
- Voltage meter source: **Onboard ADC**. Scale **110** (default).
- Compare with a multimeter. If the reading is off by more than 0.1 V, adjust the scale: a higher value gives a higher reading.
- Current meter source: **None**.
- Cell min / warning / max for LiPo: **3.3 / 3.5 / 4.3 V**.

## ⚠ WARNING

**Keep MSP on UART4.** Switching it off disconnects the Bluetooth bridge, FlySpark Station and the 4-LED battery gauge until you switch it back on over USB.

## 13.5 - 13.7 · MOTORS, RECEIVER AND MODES

## MOTORS, RECEIVER &amp; MODES



**FIG-49** Betaflight quad-X motor order and direction, seen from above (props in, default). ArduPilot numbers the motors differently: see chapter 15.

## 13.5 · MOTOR ORDER AND DIRECTION

**▲ DANGER**

Remove all propellers before you open the Motors tab.

**01** ENABLE THE TEST

Connect a battery (props off), open the **Motors** tab and enable *I understand the risks*.

**02** CHECK EACH POSITION

Raise each slider (M1–M4) briefly. The spinning motor must match the diagram: **M1** rear right, **M2** front right, **M3** rear left, **M4** front left.

**03** WRONG POSITION?

Use **Reorder motors** in the Motors tab, or swap the motor wires.

**04** WRONG DIRECTION?

Use **Motor direction** in the Motors tab. It changes the direction over DShot and saves it in the ESC, so no re-soldering is needed.

**05** PROPS OUT?

Choose **Motor direction is reversed** in the Configuration tab only if you deliberately fly props-out.

## 13.6 · RECEIVER

**01** SELECT THE PROVIDER

In the **Receiver** tab choose *Serial (via UART)* and the provider: **CRSF** (Crossfire and ExpressLRS), **SBUS**, **GHST**, **SRXL2**, **IBUS** or **FPORT**.

**02** CHECK THE CHANNELS

Save, then move your sticks. Check the channel map (AETR1234 by default) and that each bar moves the right way.

**03** CHECK THE RANGE

The bars rest at about 1500  $\mu$ s at centre and reach about 1000  $\mu$ s and 2000  $\mu$ s at the ends.

## 13.7 · MODES

## T-41 RECOMMENDED MINIMUM (MODES TAB)

| MODE                  | PURPOSE                                 |
|-----------------------|-----------------------------------------|
| ARM                   | Arms the motors. Use a dedicated switch |
| ANGLE                 | Self-levelling mode for beginners       |
| BEEPER                | Lost-model alarm                        |
| FLIP OVER AFTER CRASH | Turtle mode (DShot)                     |
| GPS RESCUE            | Return-home failsafe mode (needs a GPS) |

## 13.8 - 13.11 • OSD, FAILSAFE, BLACKBOX AND BACKUP

## OSD, FAILSAFE &amp; BACKUP

## 13.8 • OSD

## T-42 OSD SET-UP BY VIDEO SYSTEM

| VIDEO SYSTEM               | CONNECTION                                | SETTINGS                                                                                                                                                                |
|----------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog (MAX7456)           | Camera and VTX pads (chapter 9)           | OSD tab: video format <b>Auto</b> (or PAL / NTSC to match your camera). Drag the elements you need: battery voltage, flight mode, RSSI / link quality, timer, warnings. |
| DJI / HD (MSP DisplayPort) | DJI plug on UART1, set as in section 13.4 | OSD tab: choose the <b>HD</b> video format. In DJI goggles, enable <i>Custom OSD / Canvas mode</i> .                                                                    |

## 13.9 • FAILSAFE

In the **Failsafe** tab, set the stage 2 procedure:

- **Drop** (default): the safest choice for small FPV aircraft.
- **GPS Rescue**: only with a GPS fitted, configured and showing a good fix.

**⚠ WARNING**

**Test it, props off.** Arm, switch off the transmitter, and confirm that the motors stop (or that GPS Rescue activates).

## 13.10 • BLACKBOX

Blackbox logs to the **microSD** card by default. Card choice, settings and reading logs: chapter 18.

## 13.11 • BACK UP YOUR CONFIGURATION

Open the CLI, type `diff all` and click **Save to File**. Keep the file with your aircraft records.

```
# backup
diff all
# restore: same firmware version only
# paste the saved file into the CLI, then
save
```

FlySpark Station can do the same in one tap: CLI tab, **Backup**.

## BETAFLIGHT SET-UP COMPLETE?

- |                                                                                  |                                                                             |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <input type="checkbox"/> Header shows BTFL 2026.6.2 • FLYSPARKF4                 | <input type="checkbox"/> Motor order and direction match FIG-49 (props off) |
| <input type="checkbox"/> FlySpark defaults pasted and saved                      | <input type="checkbox"/> Receiver channels and ranges correct               |
| <input type="checkbox"/> 3D model follows the aircraft; accelerometer calibrated | <input type="checkbox"/> ARM, ANGLE, BEEPER and turtle mode on switches     |
| <input type="checkbox"/> UART2 Serial RX, UART4 MSP 115200, GPS / DJI ports set  | <input type="checkbox"/> OSD shows battery voltage and warnings             |
| <input type="checkbox"/> DShot300, bidirectional DShot OFF, current meter NONE   | <input type="checkbox"/> Failsafe tested with props off                     |
| <input type="checkbox"/> Voltage checked against a multimeter                    | <input type="checkbox"/> <code>diff all</code> backup saved                 |

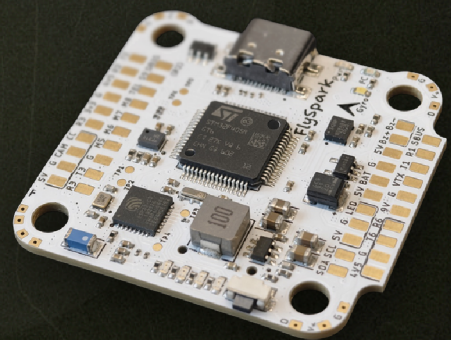
Then work through the first power-up and pre-flight checklist in chapter 10.

# 14

## INAV SETUP

SUPPORTED

INAV 9.1.0, target FlySparkF4v1, for GPS navigation on multirotors, wings and planes: position hold, return to home and waypoint missions.



### IN THIS CHAPTER

1. Flash INAV
2. FlySpark defaults
3. Setup wizard and ports
4. Calibration and battery
5. Outputs and motors
6. Modes and failsafe

## 14.1 - 14.2 · FLASH INAV AND THE FLYSPARK DEFAULTS

## INAV 9.1.0 SETUP

SUPPORTED

INAV 9.1.0

TARGET FLYSPARKF4V1 (V1 AND V2)

**NOTE**

**Validation status.** The FlySpark INAV build is made from the official 9.1.0 release tag, and its pins, timers and UARTs have been checked against the schematic. On-board bench validation (flashing, sensors, orientation, Bluetooth) is in progress. Check the FlySpark GitHub INAV page for the latest status before mission use.

**QUICK PATH**

- Flash `inav_9.1.0_FlySparkF4v1.hex` with INAV Configurator (Full chip erase; hold BOOT if needed).
- Run the setup wizard: mixer, receiver, outputs.
- Ports: UART2 Serial RX · UART4 MSP 115200 · UART6 GPS.
- Calibrate the accelerometer (6 positions) and the compass, if fitted.
- Modes: ARM, ANGLE, NAV POSHOLD, NAV RTH. Failsafe: RTH.

## 14.1 · FLASH INAV

01

**INSTALL THE CONFIGURATOR**

Install **INAV Configurator 9.x** ([github.com/iNavFlight/inav-configurator/releases](https://github.com/iNavFlight/inav-configurator/releases)).

02

**DOWNLOAD THE FIRMWARE**

Download `inav_9.1.0_FlySparkF4v1.hex` from the FlySpark GitHub firmware page.

03

**LOAD IT**

Open **Firmware Flasher**, then **Load Firmware [Local]** and select the file.

04

**FLASH**

Enable **Full chip erase**, then **Flash Firmware**. If the board does not enter DFU on its own (for example, when coming from ArduPilot), hold **BOOT** while you plug in USB-C, then flash.

## T-43 THE FLYSPARK INAV BUILD

|                       |                                                           |
|-----------------------|-----------------------------------------------------------|
| FIRMWARE              | INAV 9.1.0                                                |
| TARGET                | FlySparkF4v1                                              |
| FILE                  | <code>inav_9.1.0_FlySparkF4v1.hex</code>                  |
| BUILT FROM            | Official release tag 9.1.0, source change published (GPL) |
| PINS / TIMERS / UARTS | Checked against the schematic                             |
| ON-BOARD BENCH TEST   | In progress                                               |

**FIRMWARE FILES**

[github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark)

## 14.2 · FLYSPARK DEFAULTS (ALREADY IN THE FLYSPARK .HEX)

```
set motor_pwm_protocol = DSHOT300
feature -CURRENT_METER
save
```

**TIP**

INAV Configurator also offers the target **FlySparkF4v1** online. That is the plain upstream build: if you use it, paste the lines on the left once in the CLI.

## 14.3 - 14.4 · SETUP WIZARD, PORTS, CALIBRATION AND BATTERY

## PORTS, GPS &amp; CALIBRATION

## 14.3 · SETUP WIZARD AND PORTS

## 01 RUN THE SETUP WIZARD

Connect, then choose the mixer (for example *Multirotor* → *Quad X*, or your wing / plane type), the receiver type and the outputs.

## 02 CHECK THE PORTS TAB

Use the defaults below and set UART6 to GPS.

## 03 CONFIGURATION

GPS protocol **UBLOX** (or **MSP** for MSP GPS modules). Enable the magnetometer if a compass is connected to SDA / SCL.

## T-44 INAV PORTS

| UART  | DEFAULT                                                                        |
|-------|--------------------------------------------------------------------------------|
| UART2 | Serial RX. The SBUS pad has the on-board inverter; use T2 / R2 for CRSF / ELRS |
| UART4 | <b>MSP 115200: Bluetooth bridge, FlySpark Station</b>                          |
| UART5 | ESC telemetry (TEL pad, not used with the BLS 60A)                             |
| UART6 | Free: set to <b>GPS</b>                                                        |

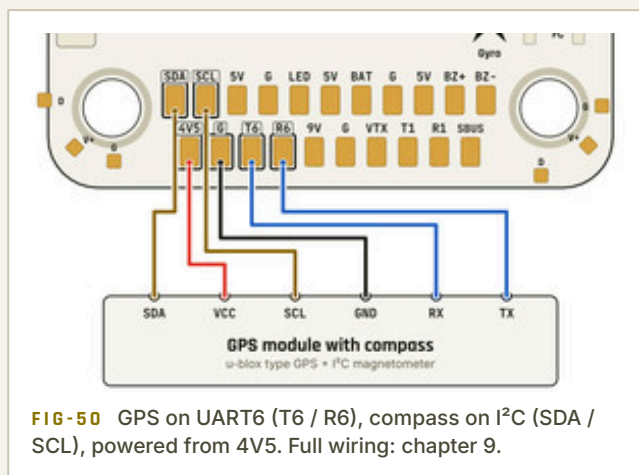


FIG-50 GPS on UART6 (T6 / R6), compass on I<sup>2</sup>C (SDA / SCL), powered from 4V5. Full wiring: chapter 9.

## 14.4 · CALIBRATION AND BATTERY

## 01 ACCELEROMETER

INAV uses a 6-position calibration. Follow the pictures on screen.

## 02 COMPASS

Calibrate outdoors, away from metal, by rotating the aircraft through all axes.

## 03 BATTERY

Configuration → Battery: voltage scale **1100**. Check the reading against a multimeter. Current sensor: **disabled**.

## T-45 VOLTAGE SCALE FOR THIS BOARD

| FIRMWARE   | SETTING    | VALUE |
|------------|------------|-------|
| Betaflight | vbat_scale | 110   |
| INAV       | vbat_scale | 1100  |

## NOTE

INAV counts the scale in units ten times smaller than Betaflight, so **1100** in INAV equals 110 in Betaflight. If you see 110 quoted for INAV, it is the Betaflight value.

## 14.5 - 14.6 · OUTPUTS, MODES AND FAILSAFE

# OUTPUTS, MODES & FAILSAFE

## 14.5 · OUTPUTS AND MOTORS

- The FlySpark build uses **DShot300** by default.
- Check motor order and direction in the **Outputs / Mixer** tab with the propellers off.
- Fixed wing: assign servos and motors with the timer groups in mind. Outputs that share a timer must use the same protocol and rate (section 7.2).

## T-46 OUTPUT TIMER GROUPS

| GROUP | OUTPUTS | TYPICAL USE            |
|-------|---------|------------------------|
| 1     | M1 + M2 | Motors                 |
| 2     | M3 + M4 | Motors                 |
| 3     | M5 + M6 | Servos or extra motors |
| 4     | M7 + M8 | Servos or extra motors |

## FAILSAFE

Set the failsafe procedure to **RTH** for GPS-equipped aircraft, or **Drop / Land** otherwise.

Test it with the propellers off: arm, switch off the transmitter, and confirm the response.

## 14.6 · MODES

## T-47 RECOMMENDED MODES

| MODE               | PURPOSE                   |
|--------------------|---------------------------|
| <b>ARM</b>         | Arm the motors            |
| <b>ANGLE</b>       | Self-level                |
| <b>NAV ALTHOLD</b> | Altitude hold (barometer) |
| <b>NAV POSHOLD</b> | Position hold (GPS)       |
| <b>NAV RTH</b>     | Return to home (GPS)      |
| <b>NAV WP</b>      | Waypoint mission          |

### ⚠ WARNING

**GPS navigation modes** need a good GPS fix (6+ satellites, ideally 8+), a calibrated compass on multirotors, and a home point recorded at arming. Test position hold at a safe altitude before you use RTH or waypoints.

## INAV SET-UP COMPLETE?

- |                                                                                         |                                                                        |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <input type="checkbox"/> INAV 9.1.0 FlySpark .hex flashed with Full chip erase          | <input type="checkbox"/> Voltage scale 1100, checked with a multimeter |
| <input type="checkbox"/> Setup wizard done: mixer, receiver, outputs                    | <input type="checkbox"/> Motor order and direction checked (props off) |
| <input type="checkbox"/> UART2 Serial RX, UART4 MSP 115200, UART6 GPS                   | <input type="checkbox"/> ARM, ANGLE and NAV modes on switches          |
| <input type="checkbox"/> Accelerometer (6 positions) and compass (if fitted) calibrated | <input type="checkbox"/> Failsafe set and tested with props off        |
|                                                                                         | <input type="checkbox"/> Position hold tested before RTH or waypoints  |
|                                                                                         | <input type="checkbox"/> CLI <code>diff all</code> backup saved        |

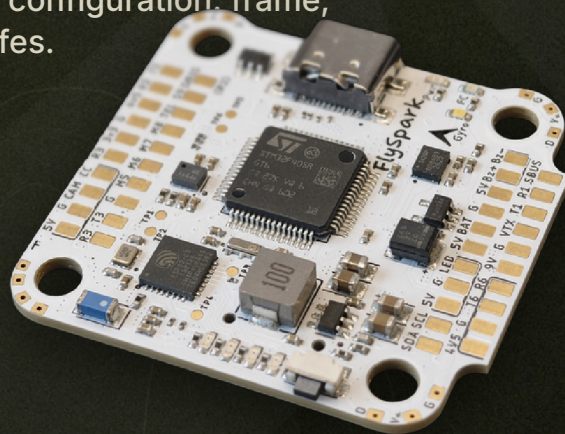
### ✓ TIP

**INAV in the field.** Over Bluetooth, FlySpark Station opens the official INAV Configurator inside the app and has a **Mission Control** waypoint map for INAV missions (chapter 12). Firmware flashing still uses USB-C.

# 15

## ARDUPILOT SETUP

Install ArduCopter or ArduPlane 4.7.1 on the FlySpark F4 V2, connect Mission Planner, and complete the mandatory configuration: frame, sensors, radio, motor order, battery and failsafes.



### IN THIS CHAPTER

1. Firmware files
2. First install over DFU
3. Updates with .apj files
4. FlySpark defaults
5. Serial ports
6. Mandatory configuration
7. Battery monitor
8. Failsafes
9. Bluetooth with ArduPilot

## 15.1 - 15.2 • FILES AND FIRST INSTALL

## FIRST INSTALL &amp; CONNECTION

**SUPPORTED** ArduCopter / ArduPlane 4.7.1 • board FlysparkF4 • APJ board ID 1361 • Mission Planner or QGroundControl

## QUICK PATH

1. First install: hold **BOOT** + plug in USB-C (DFU), flash `arducopter_4.7.1_FlysparkF4_with_bl.hex` (or ArduPlane) with Full chip erase.
2. Replug USB-C. Mission Planner: connect at **115200**.
3. Frame type, accelerometer, compass (external), radio calibration.
4. Props off: check orientation and the **ArduPilot motor order** with Motor Test.
5. Set the battery and radio failsafes. Later updates: `.apj` via *Load custom firmware*.

## NOTE

**Validation status.** The FlySpark ArduPilot builds are made from the official `Copter-4.7.1` and `Plane-4.7.1` tags, with the FlySpark defaults embedded. On-board bench validation (flashing, sensors, orientation, Bluetooth) is in progress. Check the FlySpark GitHub ArduPilot page for the latest status before mission use.

## 15.1 • FIRMWARE FILES

T-48 ARDUPILOT FILES FOR THE FLYSPARK F4 (SAME FILES FOR V1 AND V2)

| VEHICLE          | UPDATES (MISSION PLANNER / QGC)              | FIRST INSTALL FROM BETAFLIGHT / INAV (DFU)           |
|------------------|----------------------------------------------|------------------------------------------------------|
| ArduCopter 4.7.1 | <code>arducopter_4.7.1_FlysparkF4.apj</code> | <code>arducopter_4.7.1_FlysparkF4_with_bl.hex</code> |
| ArduPlane 4.7.1  | <code>arduplane_4.7.1_FlysparkF4.apj</code>  | <code>arduplane_4.7.1_FlysparkF4_with_bl.hex</code>  |

Download from the FlySpark GitHub firmware page and verify the SHA256 checksum (section 16.1).

## 15.2 • FIRST INSTALL (THE BOARD RUNS BETAFLIGHT OR INAV)

The stack ships with Betaflight. ArduPilot needs its own bootloader, which is included in the `_with_bl.hex` file.

## 01 ENTER DFU MODE

Hold **BOOT** while you plug in USB-C. All 4 battery LEDs blink. **Windows:** the device appears as *STM32 BOOTLOADER* and needs the WinUSB driver once (ImpulseRC Driver Fixer, Zadig, or the Betaflight App driver installer).

## 02 FLASH THE \_WITH\_BL.HEX

**Betaflight App / Configurator:** Firmware Flasher → *Load Firmware [Local]* → enable *Full chip erase* → *Flash Firmware*. Or **STM32CubeProgrammer:** USB (DFU), open the file, start address `0x08000000`, *Download*.

## 03 REPLUG

Unplug and replug USB-C. A new COM port appears.

## 04 CONNECT

Open **Mission Planner**, select the new COM port at **115200** and click **Connect**.



**FIG-51** All flashing is done over the USB-C port. Use a data cable, not a charge-only cable.

## 15.3 - 15.6 · UPDATES, DEFAULTS AND CONFIGURATION

## CONFIGURATION

## 15.3 · UPDATES

When the board already runs ArduPilot: Mission Planner → *Setup* → *Install Firmware* → **Load custom firmware** → select the `.apj` file. Parameters are kept.

**NOTE**

Mission Planner's own firmware list also includes board **FlysparkF4**. That is the plain upstream build without the FlySpark defaults. If you use it, set the parameters in section 15.4 manually.

## 15.4 · FLYSPARK DEFAULTS (BUILT IN)

```
BATT_MONITOR      3  # voltage only
SERIAL4_PROTOCOL  2  # Bluetooth: MAVLink2
SERIAL4_BAUD      115 # 115200
MOT_PWM_TYPE      5  # DShot300 (Copter)
Q_M_PWM_TYPE      5  # DShot300 (QuadPlane)
SERVO9_FUNCTION   120 # LED strip (NeoPixel)
OSD_TYPE2         5  # MSP DisplayPort, UART1
```

Voltage only, because the BLS 60A ESC has no current sensor. DShot300 suits the BLHeli\_S J\_H\_40 ESC; bidirectional DShot is not supported, so leave it off.

## 15.5 · SERIAL PORTS

## T-49 ARDUPILOT SERIAL PORTS

| SERIAL | PORT               | DEFAULT                                                          |
|--------|--------------------|------------------------------------------------------------------|
| 0      | USB-C              | MAVLink2                                                         |
| 1      | UART1 / DJI plug   | MSP DisplayPort (DJI / HD OSD)                                   |
| 2      | UART2 / SBUS pad   | RC input                                                         |
| 3      | UART3              | Free, e.g. telemetry radio: SERIAL3_PROTOCOL 2 , SERIAL3_BAUD 57 |
| 4      | UART4 (internal)   | Bluetooth bridge, MAVLink2 at 115200                             |
| 5      | UART5 RX (TEL pad) | ESC telemetry: not used with the BLS 60A                         |
| 6      | UART6              | GPS                                                              |

## 15.6 · MANDATORY CONFIGURATION

**01 FRAME**

*Setup* → *Mandatory Hardware* → *Frame Type*: select your frame class and type (for example Quad, X).

**02 ORIENTATION CHECK**

In the Mission Planner HUD, tilt the board nose down and roll it right. The HUD must follow. Board default: `AHRS_ORIENTATION 0`.

**03 ACCELEROMETER**

*Accel Calibration* → *Calibrate Accel* (6 positions), then *Calibrate Level*.

**04 COMPASS**

There is **no compass on the board**. Connect a GPS + compass module (UART6 + SDA / SCL) and run the compass calibration outdoors. GPS flight modes on multirotors need a compass.

**05 RADIO**

*Radio Calibration*: move all sticks and switches to their limits.

**06 FLIGHT MODES**

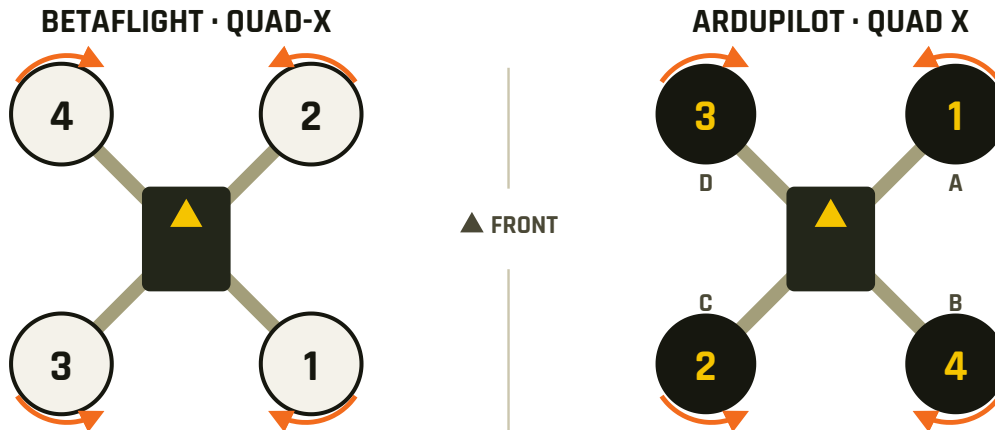
For example Stabilize, AltHold, Loiter and RTL on a 6-position switch.

## 15.6 - 15.9 · MOTORS, BATTERY, FAILSAFES AND BLUETOOTH

## MOTOR ORDER &amp; FAILSAFES

**⚠ WARNING**

ArduPilot numbers the motors differently from Betaflight. The FC outputs M1-M4 are ArduPilot outputs 1-4. If you wired the stack for Betaflight (FIG-49), the motors will be in the wrong positions in ArduPilot. Remap them with `SERV01_FUNCTION` ... `SERV04_FUNCTION` (33 = Motor 1, 34 = Motor 2, 35 = Motor 3, 36 = Motor 4) or re-wire.



**FIG-52** Motor numbers seen from above, front at the top. Spin directions (orange) are the same in both layouts; only the numbers change. A-D = Mission Planner Motor Test order. Diagram, not to scale.

**T-50** REMAP FOR A STACK WIRED AS THE BETAFLIGHT LAYOUT

| PARAMETER                    | VALUE | POSITION    |
|------------------------------|-------|-------------|
| <code>SERV01_FUNCTION</code> | 36    | Rear right  |
| <code>SERV02_FUNCTION</code> | 33    | Front right |
| <code>SERV03_FUNCTION</code> | 34    | Rear left   |
| <code>SERV04_FUNCTION</code> | 35    | Front left  |

**Motor test (props off).** *Setup → Optional Hardware → Motor Test.* Test motors **A, B, C, D**: Mission Planner tests them clockwise from the front right. Confirm the position and direction of each motor.

**Wrong direction?** Reverse it in the ESC settings (chapter 17), not by re-soldering. ESC settings are stored in the ESC, so you can set them with Betaflight before you install ArduPilot.

**15.7 · BATTERY**

- `BATT_MONITOR` 3 (voltage only) is set by default.
- `BATT_VOLT_MULT` 11.0. Compare with a multimeter and adjust in *Battery Monitor*.
- Set `BATT_LOW_VOLT` (e.g. 3.5 V × cells) and `BATT_FS_LOW_ACT` (RTL or Land).

**15.8 · FAILSAFES**

- **Radio:** `FS_THR_ENABLE` (Copter) / `THR_FAILSAFE` (Plane). Check that the receiver stops sending, or sends a failsafe throttle, when the link is lost.
- **Battery:** section 15.7.
- **GCS:** only with a telemetry link.

**15.9 · BLUETOOTH**

UART4 runs **MAVLink2 at 115200**. Connect FlySpark Station over Bluetooth for live attitude, battery, GPS and mode, and to drive the battery gauge. Bluetooth is a short-range ground link: for telemetry in flight, add a radio on UART3.

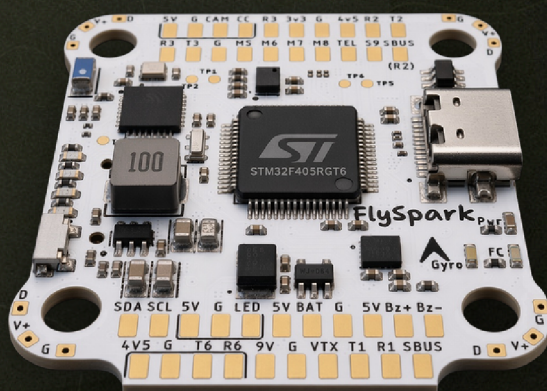
**NOTE**

The BLS 60A has no current sensor, so mAh-based failsafes are not available. Use voltage-based failsafes, or add an external current sensor on the CUR pad.

# 16

## FIRMWARE & RECOVERY

Update or switch between Betaflight, INAV and ArduPilot, verify every download, and recover a board that will not boot. The STM32 DFU bootloader cannot be erased, so the board can always be brought back over USB-C.



### IN THIS CHAPTER

1. Where to get firmware
2. Updating within the same firmware
3. Switching firmware
4. DFU mode and the BOOT button
5. Drivers
6. Recovery

## 16.1 - 16.3 • FILES, UPDATES AND SWITCHING

# UPDATING & SWITCHING FIRMWARE

All FlySpark firmware is published on GitHub and built from the official release tags of each project. The F4 V1 and F4 V2 use the same files.

## 16.1 • WHERE TO GET FIRMWARE

[github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark) → *FC* → *FlySpark-F4-V1* → *firmware*. FlySpark's changes (stack defaults only) are published as `.patch` files next to each binary.

**FIRMWARE & GUIDES**

[github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark)

**T-51 FIRMWARE FILES FOR THE FLYSPARK F4 V2**

| FIRMWARE         | VERSION  | FILE                                             | FLASH WITH                                       |
|------------------|----------|--------------------------------------------------|--------------------------------------------------|
| Betaflight       | 2026.6.2 | betaflight_2026.6.2_FLYSPARKF4.hex               | Betaflight App / Configurator                    |
| INAV             | 9.1.0    | inav_9.1.0_FlySparkF4v1.hex                      | INAV Configurator                                |
| ArduCopter       | 4.7.1    | arducopter_4.7.1_FlysparkF4.apj<br>*_with_bl.hex | Mission Planner / QGC; DFU for the first install |
| ArduPlane        | 4.7.1    | arduplane_4.7.1_FlysparkF4.apj<br>*_with_bl.hex  | Mission Planner / QGC; DFU for the first install |
| Bluetooth bridge | V12      | FlySpark_BLE_V12.bin                             | esptool (service only)                           |

### VERIFY THE DOWNLOAD

Compare the file's SHA256 checksum with `SHA256SUMS.txt` on the firmware page.

```
# Windows (PowerShell)
Get-FileHash .\file.hex -Algorithm SHA256
# macOS / Linux
shasum -a 256 file.hex
```

## 16.2 • UPDATING THE SAME FIRMWARE

- **Betaflight:** Firmware Flasher → board `FLYSPARKF4` online, or *Load Firmware [Local]* → **Full chip erase** → *Flash Firmware*. The board enters DFU by itself. Then re-apply your `diff all` backup (check it for renamed settings first) or the FlySpark defaults.
- **INAV:** Firmware Flasher → *Load Firmware [Local]* → **Full chip erase** → *Flash Firmware*.
- **ArduPilot:** *Install Firmware* → *Load custom firmware* → `.apj`. Parameters are kept.

**⚠ WARNING**

**Back up first.** Save your configuration before any update (Betaflight / INAV: `diff all`; ArduPilot: save the parameter file). Full chip erase deletes all settings.

## 16.3 • SWITCHING FIRMWARE

**T-52 FIRMWARE SWITCHING**

| FROM → TO                     | PROCEDURE                                                                                                               |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Betaflight ⇄ INAV             | Flash the <code>.hex</code> of the other firmware in its configurator, with <b>Full chip erase</b> ON.                  |
| Betaflight / INAV → ArduPilot | Flash <code>*_with_bl.hex</code> <b>once</b> in DFU mode (section 15.2). Use <code>.apj</code> files for later updates. |
| ArduPilot → Betaflight / INAV | Hold <b>BOOT</b> while plugging in USB-C (DFU), then flash the <code>.hex</code> with Full chip erase.                  |

16.4 - 16.6 · DFU, DRIVERS AND RECOVERY

DFU RECOVERY & DRIVERS

DFU (Device Firmware Update) is the STM32’s built-in bootloader. It is stored in read-only memory and cannot be erased, so you can always recover the board.

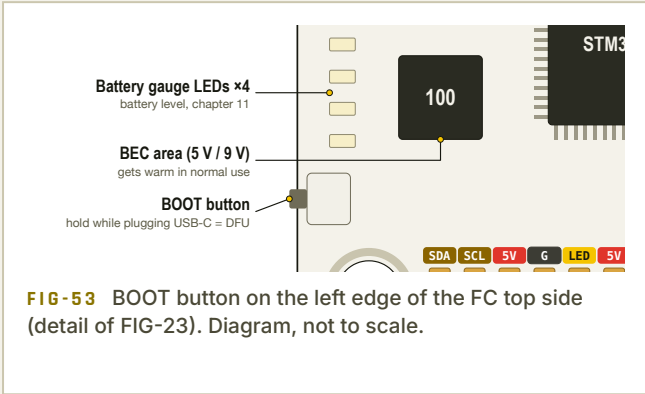


FIG-53 BOOT button on the left edge of the FC top side (detail of FIG-23). Diagram, not to scale.

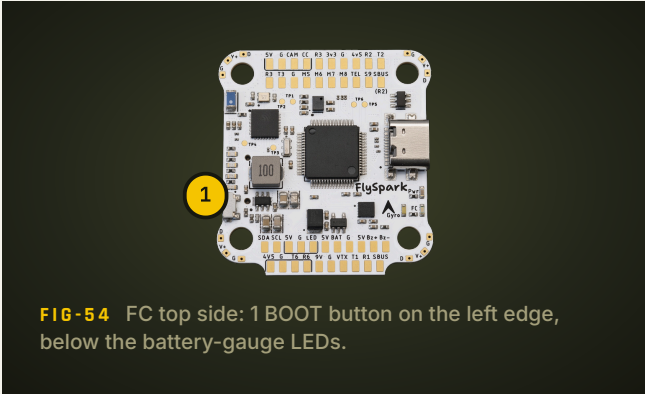


FIG-54 FC top side: 1 BOOT button on the left edge, below the battery-gauge LEDs.

16.4 · ENTER DFU MODE

- 01 DISCONNECT**  
Unplug the battery and the USB cable.
- 02 HOLD BOOT, PLUG IN USB-C**  
Hold the **BOOT** button on the left edge of the flight controller while you plug in the USB-C cable. Release it after 2 seconds.
- 03 CHECK**  
All 4 battery LEDs blink, and the computer detects *STM32 BOOTLOADER* (or *DFU in FS Mode*).
- 04 FLASH**  
Flash the firmware with **Full chip erase**.

16.6 · RECOVERY

- If the board does not boot, does not connect, or all 4 battery LEDs keep blinking:
- 01 FLASH BETAFLIGHT IN DFU**  
Enter DFU mode (section 16.4) and flash Betaflight 2026.6.2 with **Full chip erase**.
  - 02 APPLY DEFAULTS**  
Paste the FlySpark CLI defaults (section 13.2).
  - 03 STILL NO DFU?**  
Try another cable and USB port, re-install the driver and check that the **Pwr** LED lights. If it still fails, contact support (chapter 21).

16.5 · DRIVERS

| SYSTEM          | WHAT TO DO                                                                                                                                                                                                                                                                                               |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows 10 / 11 | Normal mode (virtual COM port) needs no driver. <b>DFU mode needs the WinUSB driver once:</b> use the Betaflight App driver installer, <b>ImpulseRC Driver Fixer</b> or <b>Zadig</b> (select <i>STM32 BOOTLOADER</i> → WinUSB → <i>Replace Driver</i> ). STM32CubeProgrammer also installs a DFU driver. |
| macOS           | No driver needed. Use Chrome or Edge for the Betaflight App.                                                                                                                                                                                                                                             |
| Linux           | Add udev rules for STM32 DFU ( <code>0483:df11</code> ) and add your user to the <code>dialout</code> group, then log out and in again.                                                                                                                                                                  |
| Android         | FlySpark Station → <i>Tools</i> → <i>Firmware flash</i> with a USB OTG cable to the USB-C port; hold BOOT while connecting. The Betaflight App on Android also supports DFU flashing.                                                                                                                    |

✓ **TIP**

Use a short, good-quality **data** USB-C cable plugged directly into the computer, not into a hub. Many flashing problems are caused by charge-only cables.

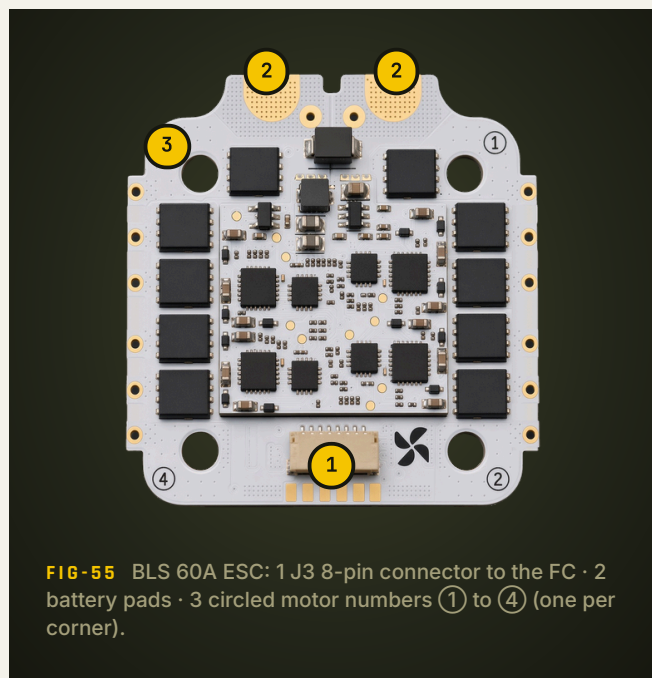
i **NOTE**

Flight-controller firmware cannot be flashed over Bluetooth. **Always flash over USB-C.**

## 17.1 • BLHELI\_S PASSTHROUGH

## ESC CONFIGURATION

The FlySpark BLS 60A ESC is configured through the flight controller (“passthrough”). No separate programmer is needed.



**FIG-55** BLS 60A ESC: 1 J3 8-pin connector to the FC • 2 battery pads • 3 circled motor numbers ① to ④ (one per corner).

## BLS 60A FIRMWARE

|                            |                                                    |
|----------------------------|----------------------------------------------------|
| FIRMWARE                   | BLHeli_S J_H_40 rev 16.7                           |
| MCU                        | SiLabs EFM8BB21                                    |
| PROTOCOL                   | DShot300 recommended<br>(DShot150 / 600 supported) |
| BIDIRECTIONAL DSHOT        | Not supported: keep OFF                            |
| CURRENT SENSOR / TELEMETRY | None                                               |
| ALTERNATIVE FIRMWARE       | Bluejay-flashable (17.5)                           |

## ▲ DANGER

**Props off.** ESC configuration needs the battery connected, and motors can spin during reads, writes and beeps. Remove every propeller first.

## 17.1 • CONNECT WITH ESC CONFIGURATOR

01

## REMOVE ALL PROPELLERS

Every propeller, every time.

02

## POWER THE ESC

Connect the flight controller by USB-C, then connect the **battery**. The ESC needs battery power.

03

## CHECK THE FC FIRMWARE

The flight controller must run **Betaflight** or **INAV** (passthrough is easiest with Betaflight).

04

## OPEN THE CONFIGURATOR

**esc-configurator.com** in Chrome or Edge (or BLHeliSuite 16).

05

## CONNECT

**Select Port** → choose the flight controller → **Connect** → **Read Settings**.

06

## CHECK

All four ESCs appear, named FlySpark ESC M1 ... M4.

## ✓ TIP

From a phone: FlySpark Station → *Motors* → **ESC passthrough** opens ESC Configurator.

## i NOTE

**ArduPilot users.** Configure the ESCs while the board still runs Betaflight. The settings are stored in the ESC and stay in place after you install ArduPilot (chapter 15).

## 17.2 - 17.5 · SETTINGS, DIRECTION AND FIRMWARE

## SETTINGS &amp; FIRMWARE

## 17.2 · FACTORY SETTINGS

T-53 BLS 60A FACTORY SETTINGS (BLHELI\_S J\_H\_40 16.7)

| SETTING                | VALUE              | SETTING                | VALUE                  |
|------------------------|--------------------|------------------------|------------------------|
| Startup power          | 0.50               | Motor direction        | Normal                 |
| Programming by TX      | ON                 | Motor timing           | Medium                 |
| PPM min / max / center | 1148 / 1832 / 1488 | Demag compensation     | Low                    |
| Beep strength          | 40                 | Beacon strength        | 80                     |
| Beacon delay           | 10 min             | Temperature protection | 140 °C                 |
| Low RPM power protect  | ON                 | Brake on stop          | OFF                    |
| LED control            | OFF                | Names                  | FlySpark ESC M1 ... M4 |

## ✓ TIP

Leave the factory settings unless you have a specific reason to change them. If motors stutter at low throttle with large propellers, try *Demag compensation: High*.

## 17.3 · REVERSING MOTOR DIRECTION

Motor direction is set in **software**. The order of the three motor wires does not matter, so you never need to re-solder a motor to change its direction.

- **Easiest:** Betaflight *Motors* tab → **Motor direction** (DShot commands, section 13.5), or FlySpark Station → *Motors* → reverse.
- **ESC Configurator:** set *Motor direction* to **Reversed** for that ESC and click **Write Settings**.

The direction is stored in the ESC, so it stays the same if you change the flight-controller firmware.

## 17.4 · RESTORING THE FACTORY FIRMWARE

## 01

## DOWNLOAD

J\_H\_40\_REV16\_7.HEX from the FlySpark GitHub ESC page.

## 02

## FLASH

ESC Configurator (or BLHeliSuite 16) → **Read Settings** → **Flash Local** (or *Flash all* with a local file) → select the file.

## 03

## RESTORE SETTINGS

Write the factory settings from T-53.

## ⚠ WARNING

**Do not interrupt the battery or USB during ESC flashing.** Flash one ESC first and check it before you flash all four.

## 17.5 · BLUEJAY (OPTIONAL)

The BLS 60A hardware can run **Bluejay**, an open-source BLHeli\_S replacement that adds bidirectional DShot and RPM filtering in Betaflight. In ESC Configurator, select Bluejay and the layout that matches **J-H-40**.

FlySpark ships and tests the stack with BLHeli\_S J\_H\_40 16.7. Bluejay is a community firmware: use it at your own discretion.

With Bluejay, set `dshot_bidir = ON` in Betaflight, then confirm that the Motors tab shows RPM for all four motors before you enable RPM filtering or fly. You can always restore BLHeli\_S (17.4).

## 18.1 - 18.4 • FLIGHT DATA ON THE MICROSD CARD

## BLACKBOX LOGGING

The flight controller records flight data (gyro, PID, motor outputs, receiver, battery and more) to a microSD card. Logs help you tune the aircraft, investigate a crash and document test flights.



FIG-56 FC underside: 1 microSD slot for blackbox logging (SPI3).

## 18.1 • CHOOSING AND PREPARING A CARD

- Use a good-quality **microSD / microSDHC card, 4-32 GB**, Class 10 / U1 or better.
- Format it as **FAT32**. Betaflight can also format it: Blackbox tab → *Erase / Format*.
- Insert the card with the contacts facing the board until it clicks.

## NOTE

Very large or very cheap cards can be slow and cause missed log frames. A 16 GB branded card is a good choice.

## 18.2 • BETAFLIGHT AND INAV

## 01 LOGGING DEVICE

Blackbox tab → **SD card** (default on this board).

## 02 LOGGING RATE

Start with **1 kHz** (Betaflight) for tuning. Higher rates fill the card faster.

## 03 ARM TO RECORD

Logging starts when you arm and stops when you disarm. Optionally assign a **BLACKBOX** switch in the Modes tab.

## 04 DOWNLOAD

Blackbox tab → **Activate Mass Storage Device Mode**. The FC reboots as a USB drive. Copy the **.BBL** files.

## 05 REVIEW

Open the logs in **Betaflight Blackbox Explorer** (INAV Blackbox Explorer for INAV).

## 18.3 • ARDUPILOT

ArduPilot writes **.BIN** dataflash logs to the microSD card automatically when armed ( **LOG\_BACKEND\_TYPE** default: file). Download them with Mission Planner → *DataFlash Logs* → *Download DataFlash Log Via Mavlink*, or remove the card and copy the **APM/LOGS** folder. Review them with *Review a Log* or UAV Log Viewer.

## FLYSPARK STATION

*Expert configurator* → *Blackbox* shows the card status and the logging settings. To copy logs from the microSD card, use Mass Storage Device Mode on a computer or a card reader.

## 18.4 • GOOD PRACTICE

- Keep the logs from acceptance tests and first flights of each aircraft, with the configuration backup and the stack's **batch number**.
- After any incident, copy the logs **before** you power the aircraft again.

## T-54 LOG FILES AT A GLANCE

| FIRMWARE   | FILE | DOWNLOAD                            | REVIEW WITH                                          |
|------------|------|-------------------------------------|------------------------------------------------------|
| Betaflight | .BBL | Mass Storage Device Mode            | Betaflight Blackbox Explorer                         |
| INAV       | .BBL | Mass Storage Device Mode            | INAV Blackbox Explorer                               |
| ArduPilot  | .BIN | MAVLink download or <b>APM/LOGS</b> | Mission Planner <i>Review a Log</i> · UAV Log Viewer |

19 · SYMPTOM → CAUSE → FIX

# TROUBLESHOOTING

Find the symptom, check the likely cause, then apply the fix. Work through the causes in the order listed: the first one is the most common.

## DANGER

**Props off for every bench test.** Remove all propellers before you connect a battery for motor tests, ESC configuration or troubleshooting.

## WARNING

**Disconnect the battery before soldering.** If you see smoke or a part gets hot, disconnect the battery at once and do not power the stack again until it has been inspected.

### T-55 TROUBLESHOOTING (1 OF 2): USB, FLASHING, POWER AND MOTORS

| SYMPTOM                                         | LIKELY CAUSE                                                         | FIX                                                                                                                                                 |
|-------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>USB &amp; FLASHING</b>                       |                                                                      |                                                                                                                                                     |
| <b>Board not detected on USB</b>                | Charge-only cable; USB hub; driver                                   | Use a data USB-C cable plugged directly into the computer. Windows: install the drivers (Betaflight App driver installer / ImpulseRC Driver Fixer). |
| <b>Cannot flash / flashing stops</b>            | Board not in DFU; DFU driver missing                                 | Hold <b>BOOT</b> while plugging in USB-C, then flash again with <b>Full chip erase</b> (chapter 16).                                                |
| <b>POWER &amp; LEDS</b>                         |                                                                      |                                                                                                                                                     |
| <b>All 4 battery LEDs blinking</b>              | No flight firmware, or the board is in DFU mode                      | Flash Betaflight, INAV or ArduPilot. Normal while flashing.                                                                                         |
| <b>Pwr LED off</b>                              | No power; damaged cable or regulator                                 | Try another USB cable; check the battery and the 8-pin cable. Contact support if it stays off.                                                      |
| <b>MOTORS &amp; ESC · PROPS OFF</b>             |                                                                      |                                                                                                                                                     |
| <b>Motors do not spin in the Motors tab</b>     | No battery; wrong protocol; bidirectional DShot ON; cable not seated | Connect the battery (props off). Set <b>DSHOT300</b> and <b>bidirectional DShot OFF</b> . Re-seat the 8-pin cable.                                  |
| <b>ESC plays start-up tones only</b>            | No valid signal from the FC                                          | Check the protocol and the cable. Make sure the FC has booted the flight firmware.                                                                  |
| <b>ESC beeps every few seconds on the bench</b> | ESC beacon after 10 minutes without a signal                         | Normal. Arm, or disconnect the battery.                                                                                                             |
| <b>One motor stutters or will not start</b>     | Bad motor solder joint or damaged motor                              | Disconnect the battery, then re-flow the three motor pads. Swap motors to find the faulty one.                                                      |
| <b>Motor in the wrong position</b>              | Motor numbering (especially ArduPilot)                               | Betaflight: <i>Reorder motors</i> . ArduPilot: <i>SERVOon_FUNCTION</i> remap (section 15.6).                                                        |
| <b>Motor spins the wrong way</b>                | Direction setting                                                    | Reverse it in software (sections 13.5 and 17.3). No re-soldering is needed: the order of the three motor wires does not matter.                     |

## TIP

Before you change anything, save a backup ( `diff all` or the ArduPilot parameter file) and the blackbox log. Change one thing at a time, then test again.



## 19 • SYMPTOM → CAUSE → FIX (CONTINUED)

## TROUBLESHOOTING (CONT.)

## T-55 TROUBLESHOOTING (2 OF 2): BATTERY, RADIO, OSD, BLUETOOTH, GPS AND FLIGHT

| SYMPTOM                              | LIKELY CAUSE                                                      | FIX                                                                                                                                             |
|--------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BATTERY MONITORING</b>            |                                                                   |                                                                                                                                                 |
| Battery voltage wrong                | Voltage scale                                                     | Betaflight vbat_scale 110 , INAV vbat_scale 1100 , ArduPilot BATT_VOLT_MULT 11.0 ; then fine-tune against a multimeter.                         |
| Current / mAh shows nonsense         | No current sensor on the BLS 60A                                  | Betaflight current meter <b>NONE</b> ; INAV feature - CURRENT_METER ; ArduPilot BATT_MONITOR 3 .                                                |
| <b>RECEIVER</b>                      |                                                                   |                                                                                                                                                 |
| Receiver shows no channels           | Wrong UART or provider; TX/RX swapped; SBUS and R2 both connected | UART2 = Serial RX; correct provider; receiver TX → <b>R2</b> ; use either SBUS or R2, not both.                                                 |
| ELRS receiver not bound              | Bind phrase or version mismatch                                   | Match the ELRS major version and the bind phrase on the transmitter and receiver.                                                               |
| <b>OSD</b>                           |                                                                   |                                                                                                                                                 |
| No analog OSD                        | Wrong video format; camera / VTX wiring                           | OSD tab: video format Auto / PAL / NTSC. Camera video → <b>CAM</b> , VTX video → <b>VTX</b> .                                                   |
| No DJI / HD OSD                      | UART1 not set to MSP + DisplayPort; goggles setting               | Ports: UART1 MSP ON + VTX (MSP + DisplayPort); OSD tab: HD; goggles: custom OSD on.                                                             |
| <b>BLUETOOTH &amp; APP</b>           |                                                                   |                                                                                                                                                 |
| Bluetooth device not found           | FC not powered; UART4 disabled; phone permissions                 | Power the FC. UART4 MSP 115200 (Betaflight / INAV) or SERIAL4_PROTOCOL 2 (ArduPilot). Allow Bluetooth, Nearby devices and Location permissions. |
| Connected, but the app shows no data | Another app owns the link; wrong baud rate                        | Disconnect other apps. UART4 must be 115200.                                                                                                    |
| No battery LEDs                      | UART4 disabled; bridge waiting for data                           | Enable UART4 as above. Wait a few seconds after boot.                                                                                           |
| <b>GPS, SENSORS &amp; FLIGHT</b>     |                                                                   |                                                                                                                                                 |
| GPS has no fix                       | Indoors; interference; wrong port or baud rate                    | Go outdoors with a clear sky. Move the GPS away from the VTX and ESC. UART6 = GPS, auto-baud.                                                   |
| Compass errors (INAV / ArduPilot)    | Interference; not calibrated; wrong orientation                   | Mount the compass away from power wires, set its orientation and recalibrate outdoors.                                                          |
| Gyro / accelerometer not detected    | Hardware fault or damage                                          | Re-flash with Full chip erase. If it is still missing, contact support.                                                                         |
| Aircraft drifts in Angle mode        | Accelerometer not calibrated; board not level                     | Calibrate on a level surface and check the mounting.                                                                                            |
| Oscillation or hot motors            | Vibration; crushed grommets; tune                                 | Loosen the stack nuts slightly, replace damaged grommets, check the propellers and review the blackbox logs.                                    |
| SD card not detected                 | Card format or size                                               | Use a FAT32 card of 32 GB or less, or format it in the Blackbox tab (chapter 18).                                                               |

## STILL STUCK?

Contact FlySpark support (section 21.3). Include the board name and batch number, the firmware and version, what you expected and what happened, a configurator screenshot or your `diff all` / parameter file, and a photo of your wiring.



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## 20.1 - 20.6 · KEEP THE STACK MISSION-READY

# MAINTENANCE & STORAGE

A few minutes of inspection after each flight day finds most problems before they become failures. The white V2 boards make burn marks, residue and cracked joints easy to see.



**FIG-57** ESC power side. Inspect the MOSFETs, the gold battery and motor pads and the capacitor joints after every flight day.

## 20.1 · AFTER EVERY FLIGHT DAY

- ☐ Disconnect the battery. Let the ESC cool before handling.
- ☐ Inspect the stack under good light for burn marks or discolouration near the MOSFETs, regulators or pads.
- ☐ Look for cracked or lifted solder joints on the motor, battery and capacitor pads.
- ☐ Look for chafed wires, loose connectors or a bulging capacitor.
- ☐ Check that the stack nuts are still snug and the grommets are intact.
- ☐ Remove dirt, grass and sand with a soft dry brush.

## 20.2 · AFTER A CRASH

- 01 DISCONNECT THE BATTERY**  
Do it immediately, before you pick up the aircraft.
- 02 INSPECT FOR DAMAGE**  
Check both boards and the capacitor for physical damage.
- 03 CHECK THE WIRING**  
Check the motor wires and the 8-pin cable.
- 04 USE A SMOKE STOPPER**  
Power up through a smoke stopper before the next flight.
- 05 CHECK THE SENSORS**  
In the configurator, confirm that the gyro, accelerometer and barometer are detected and the attitude display is correct.
- 06 SAVE THE LOGS**  
Copy the blackbox logs before you fly again.

## 20.3 · CLEANING

- Clean flux residue and dirt with **isopropyl alcohol (IPA, 99 %)** and a soft brush. Let the board dry for at least 30 minutes before connecting power.
- Keep IPA out of the USB-C port, the microSD slot and the connectors.
- Never use water or solvents containing acetone. Do not hold compressed air close enough to damage components.

### ⚠ WARNING

**Moisture.** The stack is **not waterproof** and has no protective coating. If it gets wet, disconnect the battery at once, remove the stack, clean it with IPA and let it dry for 24 hours before testing.

## 20.4 · CONNECTORS & GROMMETS

- Unplug the SH 1.0 mm connectors by the plug body, never by the wires.
- Replace silicone grommets when they become hard, cracked or flattened: typically after heavy crashes or about every 6 months of regular flying.

## 20.5 · STORAGE

|             |                                                                             |
|-------------|-----------------------------------------------------------------------------|
| TEMPERATURE | 10–30 °C                                                                    |
| HUMIDITY    | Below 60 % RH, non-condensing                                               |
| PACKAGING   | Original foam tray or an antistatic bag                                     |
| LIGHT       | Away from direct sunlight                                                   |
| BATTERIES   | Store LiPo batteries separately at 3.80–3.85 V per cell, in a LiPo-safe bag |

## 20.6 · TRANSPORT

- Remove LiPo batteries from the aircraft for transport.
- Protect the stack from impact and from pressure on the USB-C port and connectors.
- For air transport, follow the airline and IATA rules for lithium batteries.

## 21.1 - 21.2 • 1-YEAR WARRANTY

## WARRANTY

The FlySpark F4 V2 BLS 60A Stack comes with a **1-year warranty against manufacturing defects** from Anushakti Infotech Pvt. Ltd. ("FlySpark").

### WHAT IS COVERED

Manufacturing defects only. FlySpark provides a manufacturing warranty and no other warranty.

### WHAT IS NOT COVERED

Damage that is not a manufacturing defect, for example:

**NOT A MANUFACTURING DEFECT**

Crash damage

Physical damage

Water damage

Wiring or soldering damage

### WARRANTY REQUESTS

Contact FlySpark on WhatsApp **+91 63757 29997** or by email at **info@flyspark.in**, and quote the **batch number** printed on the box.

**NOTE**

Keep the box: the batch number on it identifies your boards.



FLYSPARK F4 V2 BLS 60A STACK • PN F4B60-V2

## 1-YEAR WARRANTY

### Against manufacturing defects

Manufacturing warranty from Anushakti Infotech Pvt. Ltd., Gandhinagar, India. Quote the batch number on the box in every warranty request.

## 21.3 - 21.6 · SUPPORT · COMPLIANCE · DISPOSAL

## SUPPORT &amp; COMPLIANCE

Support comes directly from the engineering team that designed the stack.

## T-56 TECHNICAL SUPPORT CHANNELS

|          |                                                                     |
|----------|---------------------------------------------------------------------|
| WHATSAPP | +91 63757 29997 · wa.me/916375729997                                |
| PHONE    | +91 63757 29997                                                     |
| EMAIL    | info@flyspark.in · contact@flyspark.in                              |
| WEBSITE  | www.FlySpark.in ·<br>www.flyspark.in/contact                        |
| GITHUB   | github.com/flyspark015/FlySpark<br>Firmware, pinout, guides, issues |



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## FOR A FASTER ANSWER, INCLUDE

- ☐ The board name (*FlySpark F4 V2*) and the batch number
- ☐ The firmware and version (for example *Betaflight 2026.6.2*)
- ☐ What you expected and what happened
- ☐ A configurator or Mission Planner screenshot, or your CLI `diff all` / parameter file
- ☐ A photo of your wiring for hardware questions

## 21.4 · COMPLIANCE STATEMENT

|                 |                                                                                                                                                                                                                 |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PRODUCT TYPE    | Electronic sub-assembly (flight controller and ESC) for integration into unmanned aircraft by the user or a professional integrator. The integrator is responsible for the compliance of the complete aircraft. |
| PCB FABRICATION | Bare boards are fabricated to IPC Class 3 and are 100 % electrically tested (flying-probe + 4-wire Kelvin). This is a fabrication standard, not a certification of the finished product.                        |
| RADIO           | The flight controller contains a 2.4 GHz Bluetooth Low Energy module (ESP32-C3).                                                                                                                                |
| NOT CLAIMED     | Not certified to any military standard, not waterproof, not conformal coated.                                                                                                                                   |
| AVIATION RULES  | Operate the aircraft in accordance with the Drone Rules, 2021 (India) or the rules of your country.                                                                                                             |

## 21.5 · DISPOSAL



Do not dispose of this product with household waste. Recycle it through an authorised e-waste collection or recycling centre, in line with the E-Waste (Management) Rules, 2022 (India) or your local regulations. Dispose of LiPo batteries separately at a battery collection point, fully discharged.

## 21.6 · MANUFACTURER

## MANUFACTURED &amp; MARKETING BY

**ANUSHAKTI INFOTECH PVT. LTD.**

E-317, Siddhraj Z-Square, Podar International School Road, Kudasani, Gandhinagar, Gujarat – 382421, India

+91 63757 29997 · contact@flyspark.in ·  
www.FlySpark.in

FlySpark F4 V2 BLS 60A Stack · PN F4B60-V2 ·  
Designed and made in India.

All trademarks are the property of their respective owners. Betaflight, INAV and ArduPilot are open-source projects licensed under GPL-3.0.

## 22.1 • TERMS USED IN THIS MANUAL

## GLOSSARY

## T-57 GLOSSARY (A-F)

| TERM                       | MEANING                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>4-in-1 ESC</b>          | One board containing four electronic speed controllers, one per motor                                                       |
| <b>4-wire Kelvin test</b>  | Precise resistance measurement with separate current and voltage wires, used to find weak vias and connections in bare PCBs |
| <b>ArduPilot</b>           | Open-source autopilot firmware for copters, planes, VTOL and more (ArduCopter, ArduPlane)                                   |
| <b>BEC</b>                 | Battery Eliminator Circuit: a regulator that supplies a fixed voltage (5 V, 9 V) from the battery                           |
| <b>Betaflight</b>          | Open-source flight-control firmware focused on FPV multirotors                                                              |
| <b>Bidirectional DShot</b> | DSHOT variant in which the ESC returns motor RPM to the FC (not supported by BLHeli_S J_H_40)                               |
| <b>Blackbox</b>            | Flight data logging to the microSD card                                                                                     |
| <b>BLE</b>                 | Bluetooth Low Energy                                                                                                        |
| <b>BLHeli_S</b>            | ESC firmware for 8-bit ESCs such as the BLS 60A                                                                             |
| <b>Bluejay</b>             | Open-source alternative firmware for BLHeli_S ESCs, with RPM telemetry                                                      |
| <b>BOOT button</b>         | Button that starts the STM32 in DFU mode for firmware recovery                                                              |
| <b>Burst current</b>       | Higher current the ESC can supply for a short time (80 A for 10 s)                                                          |
| <b>CLI</b>                 | Command-line interface in Betaflight / INAV for text commands                                                               |
| <b>CRSF</b>                | Crossfire serial protocol, also used by ExpressLRS                                                                          |
| <b>DFU</b>                 | Device Firmware Update: the STM32's built-in USB bootloader                                                                 |
| <b>DisplayPort (MSP)</b>   | Protocol that sends OSD data to digital video systems (DJI, HD)                                                             |
| <b>DSHOT</b>               | Digital motor protocol between FC and ESC (DSHOT150 / 300 / 600)                                                            |
| <b>ELRS</b>                | ExpressLRS, an open-source radio control link                                                                               |
| <b>ENIG</b>                | Electroless Nickel Immersion Gold: a flat, gold PCB surface finish                                                          |
| <b>ESC</b>                 | Electronic Speed Controller: drives a brushless motor                                                                       |
| <b>Failsafe</b>            | What the aircraft does when the radio link is lost                                                                          |

## T-57 GLOSSARY (F-V, CONTINUED)

| TERM                          | MEANING                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------|
| <b>Flying-probe test</b>      | Automated test that checks every net of a bare PCB for opens and shorts with moving probes |
| <b>FPV</b>                    | First-Person View flying with video goggles                                                |
| <b>Grommet</b>                | Silicone damper that isolates the board from vibration                                     |
| <b>GPS Rescue / RTH / RTL</b> | Return-home modes in Betaflight / INAV / ArduPilot                                         |
| <b>I<sup>2</sup>C</b>         | Two-wire bus (SCL / SDA) for compass and sensors                                           |
| <b>INAV</b>                   | Open-source flight-control firmware focused on GPS navigation                              |
| <b>IPC Class 3</b>            | The highest IPC quality class for PCB fabrication, used for high-reliability electronics   |
| <b>LiPo</b>                   | Lithium-polymer battery; "6S" = six cells in series (25.2 V full)                          |
| <b>MAVLink</b>                | Communication protocol used by ArduPilot and ground-control stations                       |
| <b>Mission Planner</b>        | Ground-control software for ArduPilot (Windows)                                            |
| <b>MSP</b>                    | MultiWii Serial Protocol, used by Betaflight and INAV configurators                        |
| <b>OSD</b>                    | On-Screen Display: flight data shown in the video feed                                     |
| <b>oz (copper)</b>            | Copper weight per square foot of PCB; 1 oz ≈ 35 μm thickness                               |
| <b>Passthrough</b>            | Using the FC to talk to the ESCs for configuration                                         |
| <b>PID</b>                    | The control loop that keeps the aircraft stable                                            |
| <b>QGroundControl</b>         | Cross-platform ground-control software for ArduPilot and PX4 (QGC)                         |
| <b>SBUS</b>                   | Inverted serial receiver protocol                                                          |
| <b>Smoke stopper</b>          | Fuse or current limiter used for the first power-up                                        |
| <b>Tg</b>                     | Glass-transition temperature of the PCB material; higher is more heat-stable               |
| <b>TVS diode</b>              | Transient Voltage Suppressor: protects against voltage spikes                              |
| <b>UART</b>                   | Serial port (TX / RX) for receivers, GPS, VTX and other devices                            |
| <b>VTX</b>                    | Video transmitter                                                                          |

## 22.2 · APP · FIRMWARE · SUPPORT

## GET THE APP &amp; QUICK LINKS

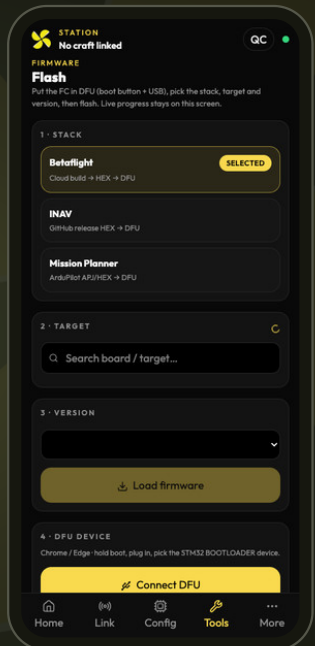


COMPANION APP

## FLYSPARK STATION

Connect to the stack over USB-OTG, Bluetooth LE or Wi-Fi. Live dashboard, battery view, ESC and motor tools, and the official Betaflight and INAV configurators on your phone.

- MSP (Betaflight / INAV) and MAVLink (ArduPilot)
- Built-in Bluetooth: **FlySpark F4 v2**
- Android (Google Play listing coming soon) · download and iOS status: [www.flyspark.in/app](http://www.flyspark.in/app)



## SCAN FOR SETUP, FIRMWARE &amp; SUPPORT



**FLYSPARK STATION**  
[www.flyspark.in/app](http://www.flyspark.in/app)



**FIRMWARE & PINOUT**  
[github.com/flyspark015/FlySpark](https://github.com/flyspark015/FlySpark)



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**WEBSITE**  
[www.FlySpark.in](http://www.FlySpark.in)

## QUICK START

1. Solder the capacitor (stripe = -), the XT60 lead and the motors to the ESC.
2. Stack: grommets → ESC → 8-pin cable → FC, arrows forward.
3. Props off → USB-C → configurator → check orientation.
4. Paste the FlySpark defaults; set receiver, modes and failsafe.
5. Battery through a smoke stopper → check voltage → motor test.
6. Fit the props. Fly safe.

## RECORD YOUR STACK

FLYSPARK F4 V2 BLS 60A STACK · FIELD SERIES · PN F4B60-V2

BATCH

PURCHASE DATE



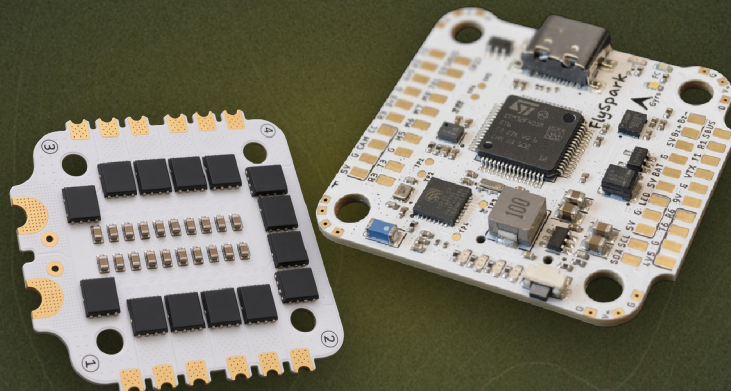
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FS-MAN-F4B60-V2 · REV A  
OCTOBER 2026