

# MicoAir MTF-02 Setup Guide

Optical Flow + ToF Rangefinder | ArduPilot / PX4 / INAV

The MTF-02 combines optical flow and short-range ToF ranging to provide horizontal velocity and height information to a compatible flight controller. This guide covers typical setup for ArduPilot, PX4 and INAV. Firmware parameters can change between releases, so always check the documentation for the exact firmware version installed on your aircraft.

Before you start

Remove the propellers while configuring the aircraft and save a backup of the existing flight-controller parameters. Optical flow cannot compensate for excessive vibration or an aircraft that does not already fly cleanly. Fix mechanical vibration before tuning the sensor.

## 1. Installation and basic checks

- Mount the MTF-02 securely on the underside of the aircraft with the optical flow camera and rangefinder facing the ground.
- Keep both optical windows unobstructed and ensure the sensor cannot move relative to the flight controller.
- Connect the module to a spare UART. The sensor uses 5V power and a 3.3V LVTTTL UART at 115200 baud.
- For initial testing use a well-lit, textured, non-reflective floor. Optical flow requires visible surface detail and more than 60 lux illumination.
- The MTF-02 rangefinder is specified for approximately 0.02-2.5m under its rated indoor conditions. It is primarily an indoor sensor.

## 2. Sensor protocol

Current-production MTF sensors can automatically detect the connected flight-controller firmware at power-up. Older units, or special installations, can be configured manually using MicoAssistant.

| Flight controller / firmware | MTF protocol |
|------------------------------|--------------|
| ArduPilot                    | mav_apm      |
| PX4                          | mav_px4      |
| INAV                         | mcp          |
| FMT / custom application     | Micolink     |

## 3. ArduPilot setup

Connect the MTF-02 to a spare UART. In the examples below, n represents the serial port used. For example, a sensor connected to SERIAL2 uses SERIAL2\_BAUD, SERIAL2\_PROTOCOL, etc.

### ArduPilot 4.7 and later

```
SERIALn_BAUD = 115200
SERIALn_PROTOCOL = 1
FLOW_TYPE = 5
RNGFND1_TYPE = 10
```

Reboot the flight controller. ArduPilot 4.7 moved the MAVLink 'Don't forward' option from SERIALn\_OPTIONS to the corresponding MAVLink channel:

```
MAVx_OPTIONS = 2
```

MAVx does not necessarily have the same number as SERIALn; MAVLink instances are numbered according to the ports configured for MAVLink.

```
RNGFND1_MIN = 0.01
RNGFND1_MAX = 2.5
RNGFND1_ORIENT = 25
```

On ArduPilot 4.7+, the rangefinder minimum and maximum values are specified in metres.

## ArduPilot 4.6 and earlier

```
SERIALn_BAUD = 115
SERIALn_PROTOCOL = 1
SERIALn_OPTIONS = 1024
FLOW_TYPE = 5
RNGFND1_TYPE = 10
```

Reboot or refresh the parameters, then configure:

```
RNGFND1_MIN_CM = 1
RNGFND1_MAX_CM = 250
RNGFND1_ORIENT = 25
```

MTF-02 range value

Some older MTF-01 instructions show RNGFND1\_MAX\_CM = 800. Do not copy that value to the MTF-02. The MTF-02 is rated to 2.5m, so use 250cm on firmware that uses the \*\_CM parameters.

## ArduPilot 4.5+ detection issue on some older sensor firmware

If the sensor is not recognised, connect it to MicoAssistant and change mav\_id from 1 to another value, such as 200. Also ensure MAVLink forwarding is disabled for the sensor connection using the appropriate setting for your ArduPilot version.

## Verify the sensor before enabling EKF fusion

In Mission Planner, open the Status page and confirm that both optical-flow and rangefinder data are updating. MicoAir specifically references opt\_qua and rangefinder1. Do not proceed to a position-hold test until both sensor functions are reporting.

## EKF - indoor optical flow

```
AHRS_EKF_TYPE = 3
EK3_SRC_OPTIONS = 0
EK3_SRC1_POSXY = 0
EK3_SRC1_POSZ = 2
EK3_SRC1_VELXY = 5
EK3_SRC1_VELZ = 0
EK3_SRC1_YAW = 1
```

This uses the rangefinder for height and optical flow for horizontal velocity.

## GPS outdoors + optical flow indoors (advanced)

Keep GPS configured as EKF Source 1 and configure optical flow as Source 2:

```
AHRS_EKF_TYPE = 3
EK3_SRC_OPTIONS = 0
EK3_SRC2_POSXY = 0
EK3_SRC2_POSZ = 2
EK3_SRC2_VELXY = 5
```

```
EK3_SRC2_VELZ = 0  
EK3_SRC2_YAW = 1  
RC6_OPTION = 90
```

This example assigns RC channel 6 to EKF source selection. Get a basic indoor flow setup working before adding source switching.

## 4. PX4 setup

Use the mav\_px4 sensor protocol and connect the MTF-02 to an available telemetry/UART port.

### PX4 1.12-1.13

```
MAV_1_CONFIG = TELEMn
MAV_1_MODE = Normal
SER_TELn_BAUD = 115200 8N1
SENS_FLOW_ROT = No rotation
EKF2_AID_MASK = Use optical flow
EKF2_RNG_AID = Range aid enable
EKF2_HGT_MODE = Range sensor
```

### PX4 1.14-1.16

```
MAV_1_CONFIG = TELEMn
MAV_1_MODE = Normal
SER_TELn_BAUD = 115200 8N1
EKF2_OF_CTRL = Enabled
EKF2_RNG_CTRL = Enabled
EKF2_HGT_REF = Range sensor
```

Reboot after configuring the telemetry port. SENS\_FLOW\_ROT should normally be set to No rotation.

### PX4 1.17+

PX4 1.17 changed its default MAVLink protocol version. The MTF sensor uses MAVLink 1, so additionally configure the appropriate MAVLink instance:

```
MAV_PROTO_VER = 1
```

## 5. INAV setup

For INAV, the MTF-02 uses the MSP protocol. Connect it to a spare UART and enable the appropriate Optical Flow and Rangefinder functions in INAV Configurator. Current-production sensors may select MSP automatically; older units can be set to msp with MicoAssistant.

INAV version note

Avoid INAV 7.1.1 with this sensor family due to a reported compatibility issue; use a suitable newer or earlier release.

## 6. First-flight procedure

Bring the system up in stages. This makes troubleshooting much easier than enabling everything at once.

- Confirm normal flight first. The aircraft should already fly smoothly before optical flow is introduced.
- Verify range data. Check that height changes are reported sensibly and remain within the MTF-02's usable range.
- Test altitude hold first. Confirm stable height control before adding optical flow as the horizontal velocity source.
- Verify optical-flow direction/orientation. Incorrect axes can produce positive feedback and rapid movement rather than simply poor position holding.
- Then test position hold. Use a clear indoor area with good lighting and a textured floor, starting low and cautiously.

#### Arming in ArduPilot

MicoAir notes that some aircraft may refuse to arm in Loiter when the sensor is very close to the ground. Where appropriate and safe, arm/take off in AltHold and switch to Loiter once airborne. Do not disable arming checks merely to bypass a warning.

## 7. Troubleshooting

### Range data works but there is no optical flow

On an older sensor, check that the protocol matches the flight controller. Also verify data over USB rather than relying only on a low-bandwidth telemetry link.

### Position hold drifts or feels soft

Check lighting, ground texture, sensor cleanliness, mounting, vibration and operating height. Plain glossy floors and featureless surfaces are difficult for optical flow.

### Range is much shorter than 2.5m

The rated range is measured under specified reflectivity and ambient-light conditions. Dark or low-reflectivity surfaces and strong ambient light reduce practical range.

### Can't find an ArduPilot optical-flow parameter

Confirm the firmware version and whether the flight-controller build includes optical-flow support. Feature-limited builds on smaller flash devices may omit it.

### PX4 position estimate resets while disarmed

Optical flow supplies relative velocity rather than an absolute XY position. Re-zeroing the estimate while disarmed can therefore be normal.

## 8. Getting help with firmware-specific setup

Flight-controller parameters evolve between releases. If using an AI assistant for setup help, provide the exact hardware and firmware information and ask it to check the current manufacturer and flight-controller documentation rather than relying on remembered parameter names.

A useful prompt is:

I am setting up a MicoAir MTF-02 optical flow and ToF range sensor. My flight controller is [MODEL], running [ARDUPILOT / PX4 / INAV] version [VERSION]. The sensor is connected to [UART / PORT]. Please use the current MicoAir and flight-controller documentation and guide me through the setup step by step. Check that all parameter names, units and values apply to my exact firmware version. Do not suggest disabling arming checks or failsafes to bypass an error.

## Reference links

[MicoAir](#)

[MicoAssistant](#)

[ArduPilot documentation](#)

[PX4 documentation](#)

Disclaimer: This guide is intended as a practical setup reference. Flight-controller software changes regularly. Always confirm settings against the documentation for the exact firmware version installed and test configuration changes carefully in a safe environment.