

How to replace the IMU from a Yuneec Typhoon H flight controller

Recently, we hear more often about Yuneec Typhoon H, which can no longer be started and are stuck in the status "Acquiring". We found out that this problem is caused by a defective (aged) IMU MPU6050.

Diagnosis

The five main symptoms are:

1. GPS status stuck in "Acquiring". The drone cannot be armed anymore.
2. Motors will also not start when GPS was switched off. This unusual behavior can be used as quick test to identify the fault.
3. Altitude on ST16 shows some meters below zero and did not initialize. The pressure sensor's height estimate is OK, near zero at this time.
4. The "Yaw" output in the GUI is slowly rotating while sensor values from accelerometer and gyroscope do not change constantly in one direction as Yaw is doing.
5. Accelerometer Z-axis in Typhoon H GUI has a value far below 1000mG. This is wrong because we have 1G on earth. This indicates the root cause of the problem: ACCEL_ZOUT of MPU < 1000mG.

The screenshot displays the Typhoon H GUI interface. On the left, a sidebar contains navigation options: Sensor Information (selected), Settings, GPS Information, and Device Information. The main panel is titled 'Sensor and Motor Speed Controller Status' and is divided into two columns. The left column lists sensors: Orientation Sensor(IMU) (green check), Pressure Sensor (green check), Compass (green check), and GPS (green check). The right column lists speed controllers: Speed Controllers(ESC) (green check), Sonar (green check), IPS (red X, 'Not Installed'), and Real Sense (red X, 'Not Installed'). To the right of this panel is a 'Speed Controller Status and Testing' section with an 'Enable Testing' checkbox and a diagram of the drone with a red circle around the yaw motor. Below these panels, the 'Battery' section shows Voltage (V) at 15.1 and 53.6% charge. The 'Accelerometer(mG)' section shows X: -43, Y: -22, Z: -768 (highlighted with a red box and a red note 'Should be ~1000'), and Magnitude: 769.52. The 'Gyroscope(°/s)' section shows X: 7, Y: -10, and Z: 20. The 'Orientation(°)' section shows Roll: -2.7, Pitch: -3.6, and Yaw: 129.1, with three drone diagrams illustrating these angles. The 'Compass (raw value)' section shows X: -148, Y: -264, and Z: 390. The 'Pressure Sensor' section shows Pressure (Pa) at 972.71, Temperature(°C) at 24.35, and Height Estimate (m) at -0.06. At the bottom left, a status bar indicates 'SerialPort is opened.'

Sensor and Motor Speed Controller Status	
Orientation Sensor(IMU)	✓
Pressure Sensor	✓
Compass	✓
GPS	✓
Speed Controllers(ESC)	✓
Sonar	✓
IPS	✗ Not Installed
Real Sense	✗ Not Installed

Battery
Voltage (V): 15.1, 53.6%

Accelerometer(mG)
X: -43, Y: -22, Z: -768 (Should be ~1000), Magnitude: 769.52

Gyroscope(°/s)
X: 7, Y: -10, Z: 20

Orientation(°)
Roll: -2.7, Pitch: -3.6, Yaw: 129.1

Compass (raw value)
X: -148, Y: -264, Z: 390

Pressure Sensor
Pressure (Pa): 972.71, Temperature(°C): 24.35, Height Estimate (m): -0.06

SerialPort is opened.

Repair

In case of smaller deviations of the Z-axis values from the accelerometer, you can try to get further with the tips from this document:

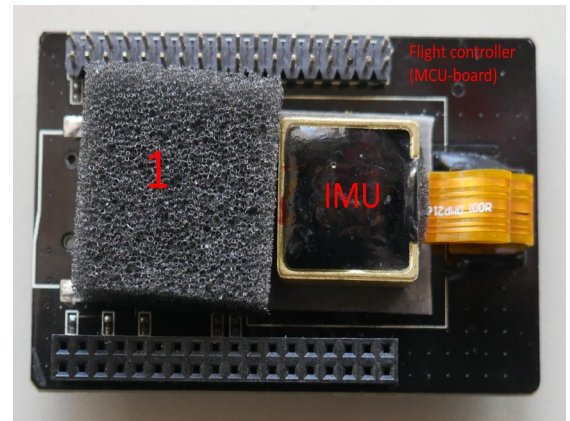
http://h-elsner.mo00.com/pdf/GPS_acquiring_problem.pdf

Usually, only the exchange of the flight controller (MCU-board) will help. But since this is quite expensive, you could try to replace only the IMU (make-one-out-of-two-method). This procedure will be described here.

By the way, the IMU is the black encapsulated brass block. It contains MPU6050 and an IMU heater.

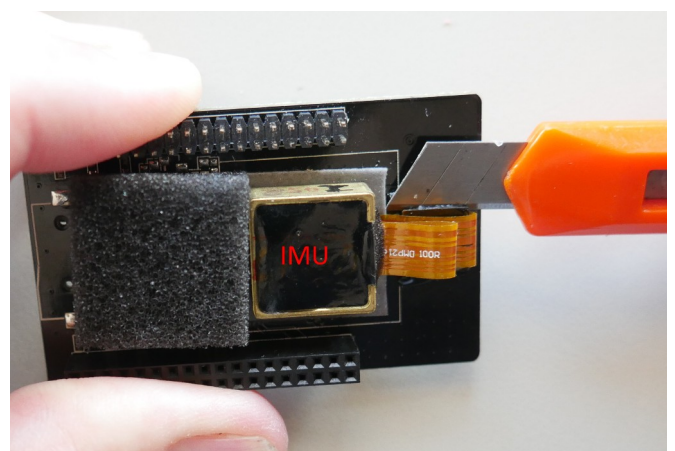
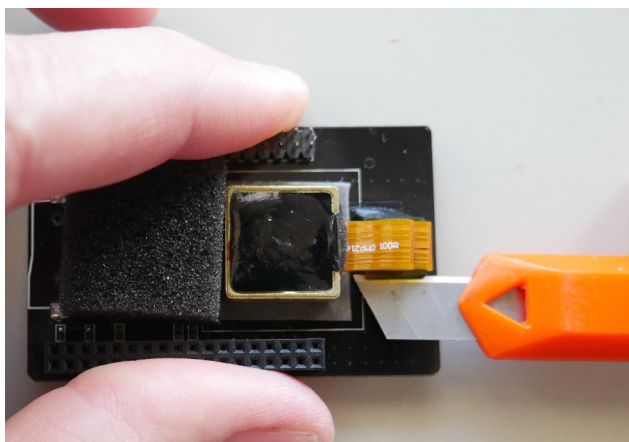
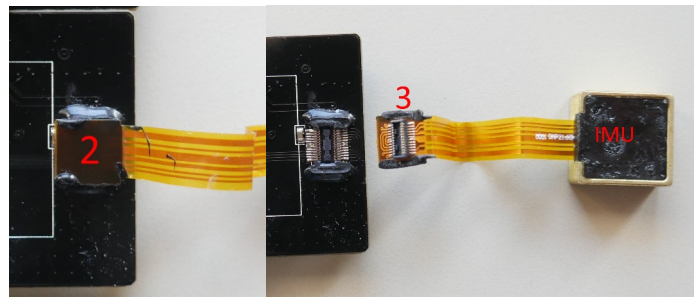
1. Removal of the flight controller:

The FC is only plugged in and can easily be removed from the main board (ESC board). Disconnect the USB connection cable. Then carefully loosen the foam (1) that belongs to the barometer and put it aside.



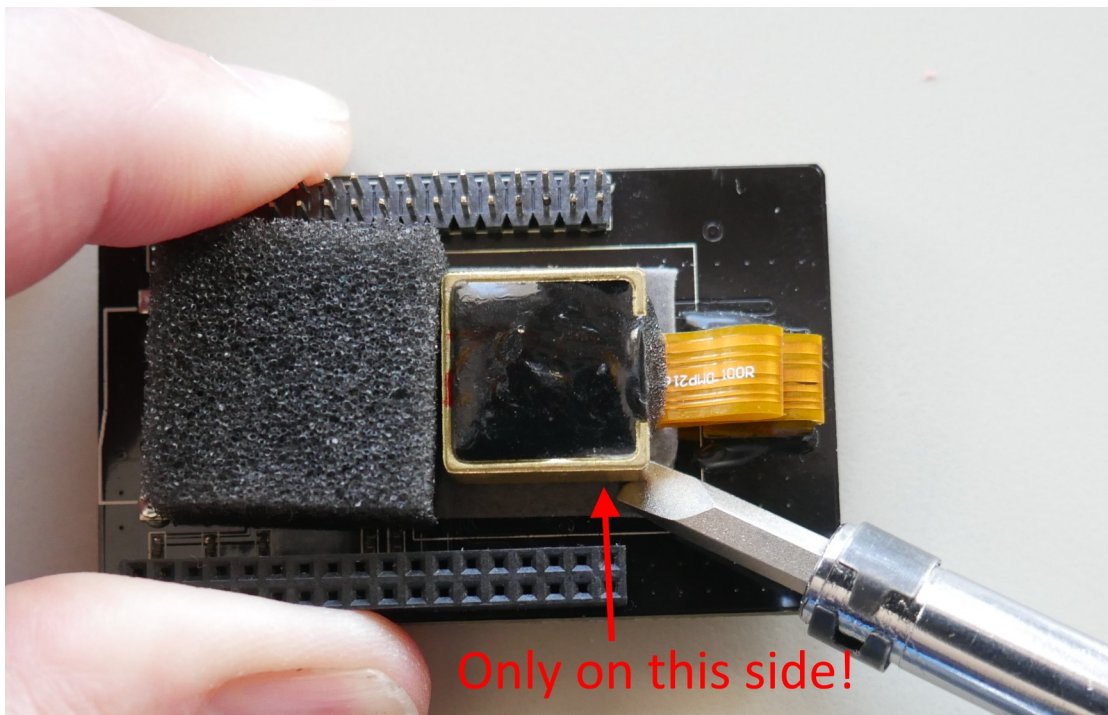
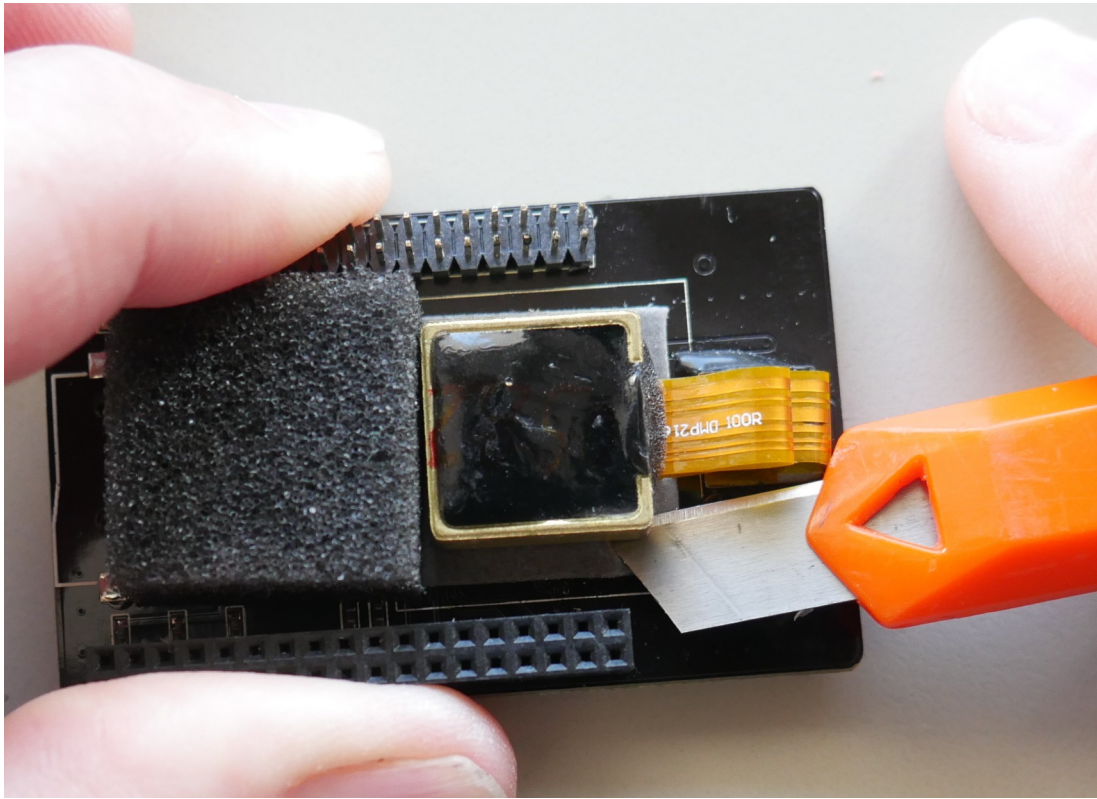
2. Disconnect the IMU connector:

The plug is connected to the flex cable via a small square plate (2). We cut the black silicone directly under the small plate on the left and right with a sharp cutter knife and can now pull the plug (3) upwards.



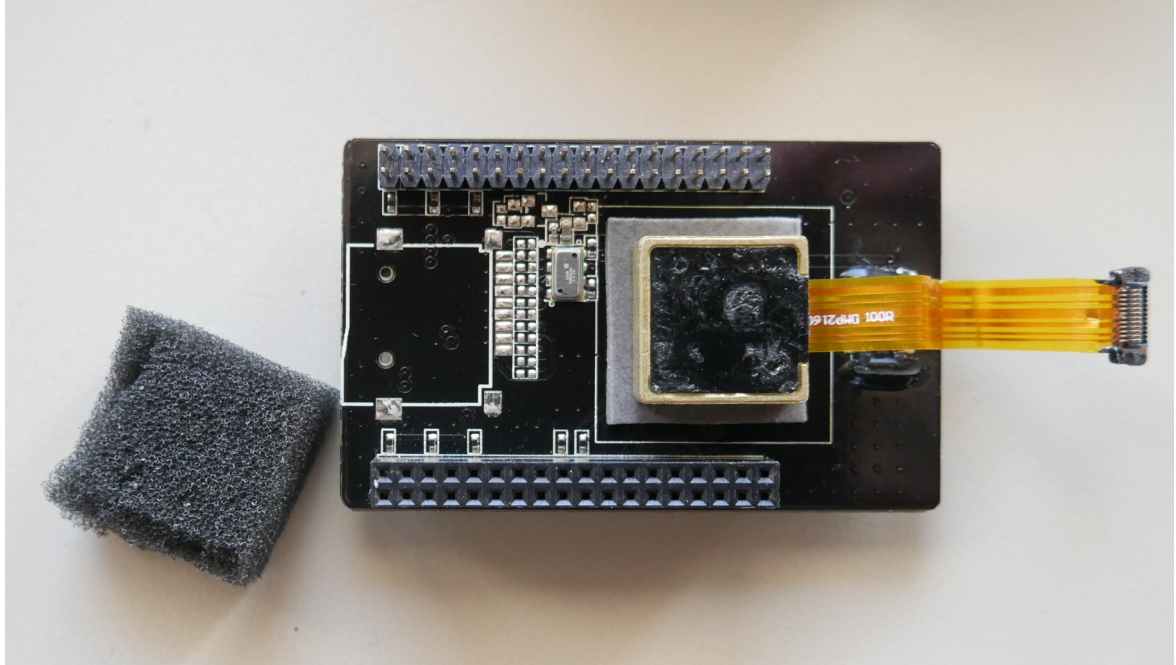
3. **Detach the IMU from the FC:**

We cut into the adhesive pad with the cutter knife and then carefully lever the IMU upwards piece by piece with a screwdriver. Take your time, the adhesive pad only yields slowly. **It is important to work only from the left side** to avoid damaging conductive paths. There is a large ground area on the left side that can withstand quite a bit.



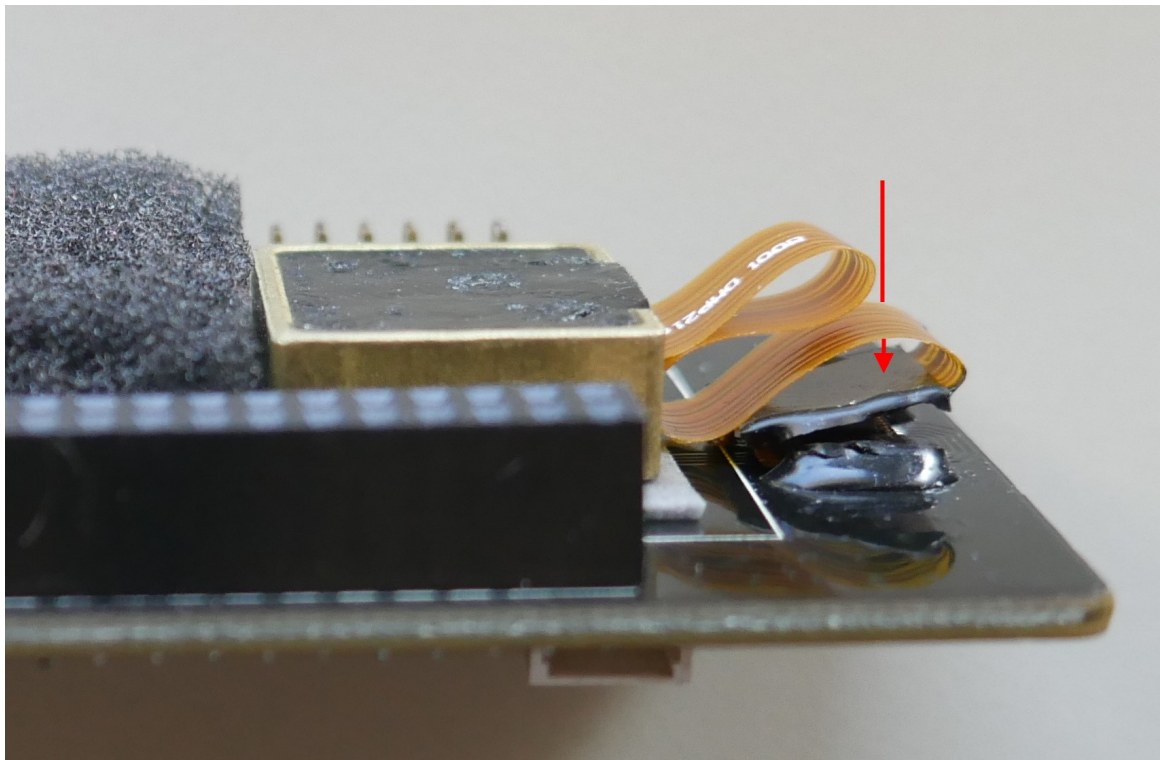
4. **Replace the new IMU:**

The IMU will be glued with the brass plate facing down using a square piece of double-sided adhesive pad. It should sit exactly in the center of the white square and be neatly aligned. The adhesive pad should protrude a little on all four sides, because in the back we stick the foam rubber over the barometer and in the front you can secure the flex cable a little.



5. **Reconnect the IMU:**

The flex cable must be put together again as shown below. Then you can press the plug to the connector. It snaps into place with a perceptible click.

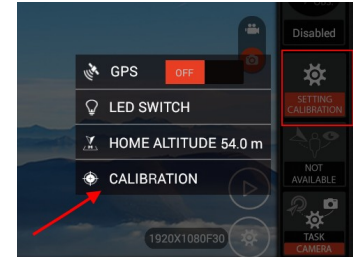


6. **Test the flight controller:**

Now we put the flight controller back to the main board and test the function. To do this, insert the flight battery and power up the drone. Then connect the drone to the Typhoon H GUI and check all sensors. We take a look at the values of the accelerometer. Here we should now see about 1000mG for Z-axis and Magnitude, at least if we are on Earth, on other planets it may look different.

7. **Check if the accelerometer can be calibrated successfully:**

We start a first accelerometer calibration from the calibration menu of the ST16 and check if we get an acknowledgment tone after calibration and the drone starts up again afterwards. If all worked, then we have a usable flight controller again - we are lucky.



8. **Post processing:**

We remove the flight controller again and now press the IMU hard onto the adhesive pad. Then we secure the connector on the left and right with a tiny drop of silicone. Before reassembling, we should visually check if everything fits and is tight. Then calibrate compass and accelerometer and do a first test flight, better without camera. We pay attention to whether the flight behavior meets our expectations and check "Altitude" on the display. On the ground, you should see values around zero before takeoff and after landing.



Abbreviations:

FC	Flight controller
IMU	Intertial measurement unit
MEMS	Micro electro-mechanical system
MCU	Main control board
MPU	Motion processing unit
MPU-6050	Six-Axis (Gyro + Accelerometer) MEMS MotionTracking™ Device