

DJI Mavic 2 Enterprise Dual Test Guideline

For Measuring Body Temperature

The Mavic 2 Enterprise Dual (M2E DUAL), DJI's leading portable enterprise platform, is equipped with a dual visual and infrared imaging sensor. While it has mainly been applied for public safety missions and electrical inspections, DJI is hoping to help combat the global spread of the 2019-nCoV (commonly known as Coronavirus) by utilizing the M2E DUAL and a calibration bracket for measuring body temperatures. Compared to the commonly used infrared thermometers, this drone solution allows the proper authorities to measure temperatures from afar, reducing risk to medical and security personnel.

To create this solution, a newly developed calibration bracket is installed on the M2E DUAL, which can hold a reference object in the field of view of the infrared camera. Using this reference object, users can calibrate the M2E Dual thermal sensor by matching it with readings of a commonly-used infrared thermometer. After testing and verification, the temperature measurement accuracy of this solution is estimated to be within $\pm 0.5^{\circ}\text{C}$ without interference from sunlight.

DJI hopes this solution can be used to more easily and safely measure temperatures and keep societies safe during this tumultuous period. While the solution's calibration does keep the test relatively accurate, please note that this solution is not designed for professional medical application scenarios. The temperature measurement results should therefore be treated as a reference and not be used as a standard for medical evaluation.

Preparations before testing

1. Hardware Needed

- 1) M2E DUAL

We suggest flying with installed prop guards to improve operation safety when flying in close proximity to people.

- 2) Remote Controller (Remote Controller with screen , or not)
- 3) Calibration bracket



3D Printing Download Link:

<https://pan-sec.djicorp.com/s/WC9gW6YAwQi3cir>

Extraction code: 1234@dji

- 4) Cotton swab (The handle material is wooden, with diameter 2.2-2.5mm, and length 7-10cm)



- 5) Commonly-used infrared thermometer

2. Firmware and APP Needed

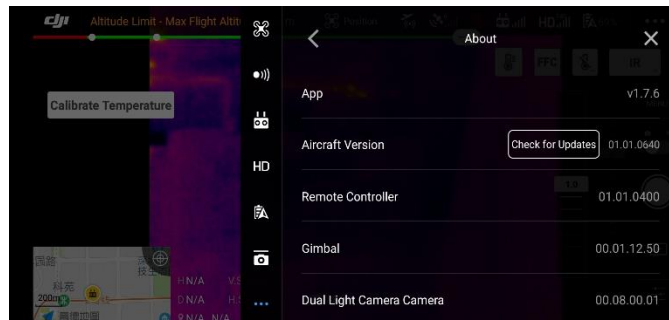
- 1) M2E DUAL (Mavic 2 Enterprise Dual), Firmware is V01.01.0640. (It should be the official latest firmware).
- 2) Remote Controller without screen (V01.01.0410); Remote Controller with screen (V01.00.0650). (It should be the official latest firmware).
- 3) Android Pilot APP (Version: v1.7.6)

Download link:

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All the above version information can be checked in Pilot APP, as below figure shows.



Testing process

1. Install calibration bracket

- 1) Install the calibration bracket above the camera



- 2) Start the aircraft, finish the gimbal calibration, insert cotton swab into the circular slot of the developed calibration bracket, and make sure the swab is

tightly fixed. If it is not tight, thicken the cotton swab with tape and then reinsert the swab into the circular calibration bracket slot.



Notes:

- When installing the cotton swab, place the aircraft on a workbench or table. When inserting the cotton swab, be sure to do so quickly, as if the gimbal is pressed on for any extended period you will receive a gimbal overload protection warning, which will affect the gimbal stability. If gimbal overload protection warning triggers, please restart the aircraft.
- During the installation process, avoid touching the cotton part of cotton swab as this can impact the accuracy of the body measurements.

2. Check camera settings and prepare the aircraft

- 1) Open the DJI Pilot APP, confirm it is set as below figure shows.
 - Disable “MSX display mode”, and display the infrared image only.



- Set the gain mode as “High Gain Mode”
- Enable “FCC calibration”



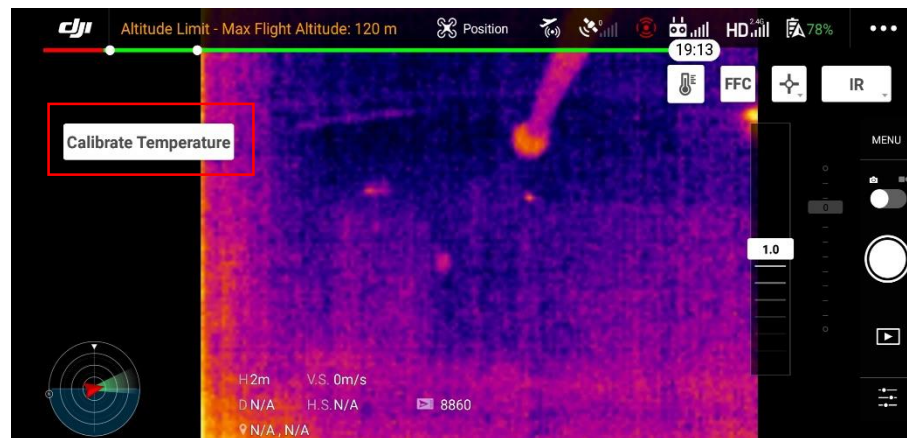
- Disable “Isotherm”



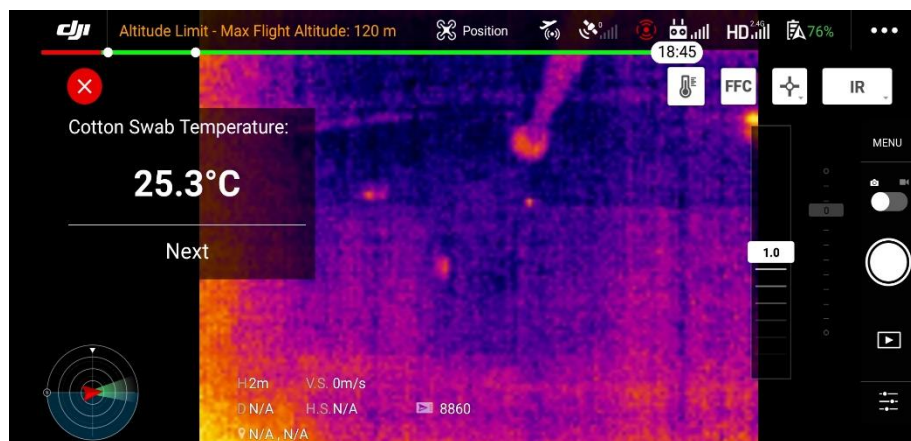
- 2) If this is the first time the aircraft has been powered on in a while, you need to first warm up the aircraft for more than 3 minutes. If it is powered on just after a battery is replaced, warming up is not needed, and the aircraft can be operated immediately.

3. Calibration for measurement

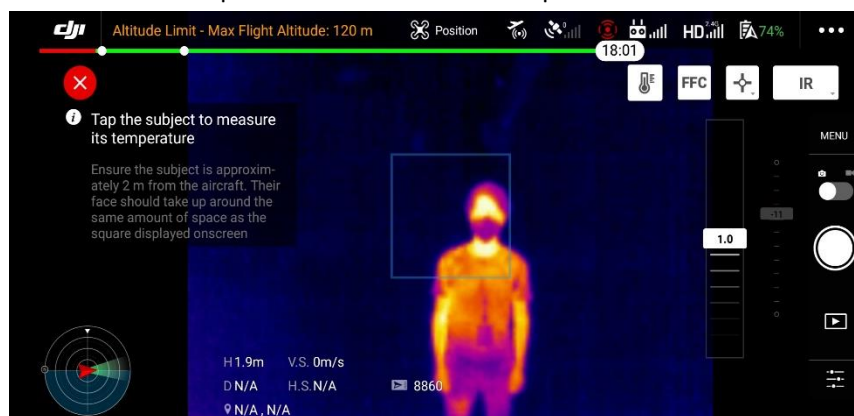
- 1) Power up the propellers and take off, hover in the open area, about 1.5-2 meters above the ground. The aircraft can be set to “T” mode to improve the stability of the aircraft.
- 2) Click the "calibration " on the upper left corner of the screen to start calibration.

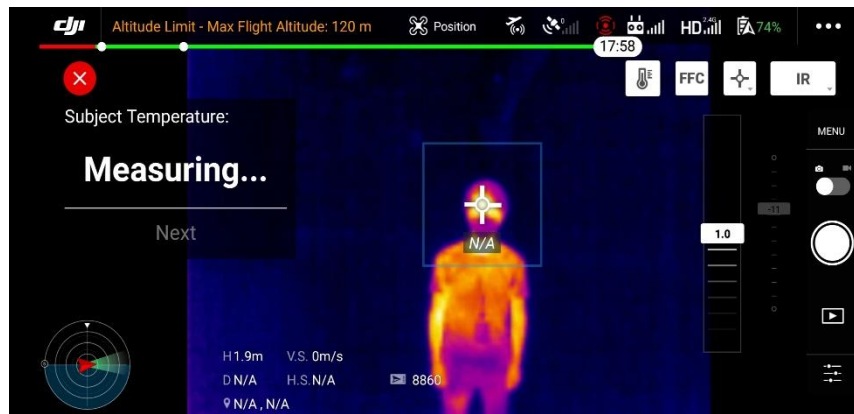


- 3) Click the cotton swap on the screen displaying the infrared imagery, and the system will automatically obtain the temperature of it. Click “Next Step”



- 4) Body measurement calibration: people who are being tested should stand 2-3m away from the aircraft, with their forehead exposed. The drone operated clicks the forehead on the screen and the system will automatically obtain the forehead temperature. Click the "Next Step" button.





- 5) The test subject's forehead temperature should be similarly measured several times with a commonly used infrared thermometer, to be sure an accurate value is known. Input the measured value from the commonly used infrared thermometer into the DJI Pilot app as a reference, and then click the calibration button to complete the calibration.





- 6) Once the above calibration steps are completed, keep the test subject still to run one last measurement for verification. If the measured temperature body on the DJI Pilot app is consistent with the previous test results from the commonly used infrared thermometer, the calibration has been completed successfully. You can now use the modified M2E DUAL for measuring body temperatures. If you suspect the measured temperature is wrong in a future measurement, click the “temperature measurement calibration button” on the upper left corner of the screen to calibrate again.

7) Critical Information:

- The cotton swap should be kept dry. It is recommended to pack it in sealed bags before and after use.
- If the cotton swap cannot be seen clearly during calibration, you can switch the color palette or open the isotherm function so it is viewable.
- When measuring the temperature of the cotton swap and forehead of people from the DJI Pilot app screen, you can click the screen several times until the appropriate position is selected, wait for about five seconds, and then the temperature will be measured.

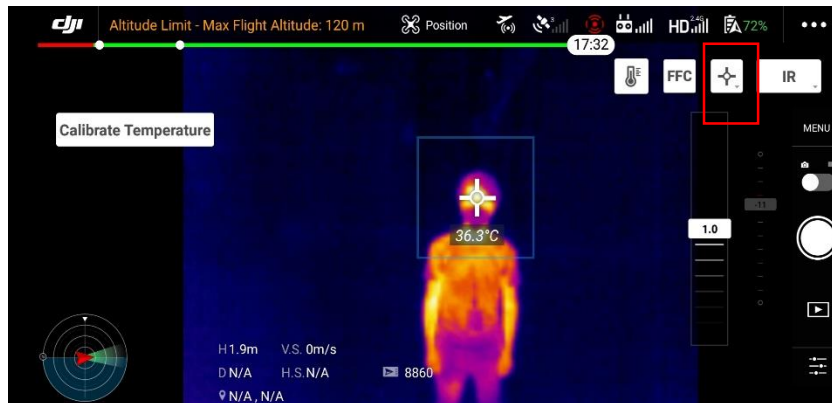
4. Body temperature measurement

After calibration, temperature measurement can be carried out:

- 1) Body temperature measurement can be carried out by both area measurement mode and point measurement mode.
- 2) In area measurement mode, select the forehead area of the target human body on the screen, and take the value of the highest temperature as the forehead temperature.



- 3) In point measurement mode, multiple points can be selected to ensure that the measurement position is on the forehead.



- 4) In point measurement mode, it is recommended to keep the distance from the subject's forehead at about 2-3 meters. In the area measurement mode, the distance can be increased appropriately.

Attention:

- Avoid using this solution under direct sunshine. Sunshine will cause a significant interference to the temperature measurement results, and the infrared sensor is easy to burn out in this environment.
- The temperature of the cotton swab should be as consistent as possible during the calibration and active use. Please calibrate it in the actual scenario. In addition, if the ambient temperature fluctuates greatly (for example, from indoor to outdoor), please fix the cotton swab on the aircraft for 5 minutes and wait for the temperature to stabilize before re-calibration.
- During the measurement, please pay attention to whether the position of the cotton swap moves. If it moves, please calibrate it again.
- It is recommended that the aircraft hovers at the same height as the subject's forehead, to improve the accuracy of temperature measurement.
- In case of abnormal deviations of the measured temperature value, click "FFC" at the upper right corner of the screen to refresh.
- In order to ensure flight safety, it is recommended to install propeller guards for the M2E DUAL, especially when operations are conducted near people.

If the measurement result is too high, it is recommended to check if the following issues are the cause:

- If the M2E DUAL moves from a low temperature environment to a high temperature environment (say from an air conditioned office to outside), the measurement results may be high, so it is recommended to recalibrate in the actual environment where the operation will be conducted..
- If the M2E DUAL is always exposed to sunlight, the measurement results may be high as the sensor takes on increasing amounts of solar radiation, so it is recommended to avoid direct sunlight on the drone.

If the measurement result is too low, it is recommended to check if the following issues

are the cause:

- If the subject being measured has recently exercised or is sweating, the skin temperature will be lower. It is recommended that the individual wipes off their perspiration and wait for 30 minutes before getting measured.
- When a person has just entered a warm room during a cold day, please wait until the forehead warms up before measuring.
- Check which area of the person was measured, it might have been another place other than the forehead. Measure again and make sure you are capturing data from their forehead.
- When the M2E DUAL moves from a high temperature environment to a low temperature environment, the measurement result may be low, so it is recommended to recalibrate in the new environment where the operating will occur.
- When the M2E DUAL is in a windy, high altitude environment, the temperature of the cotton swab may fluctuate greatly, so it is recommended to recalibrate it in this environment.