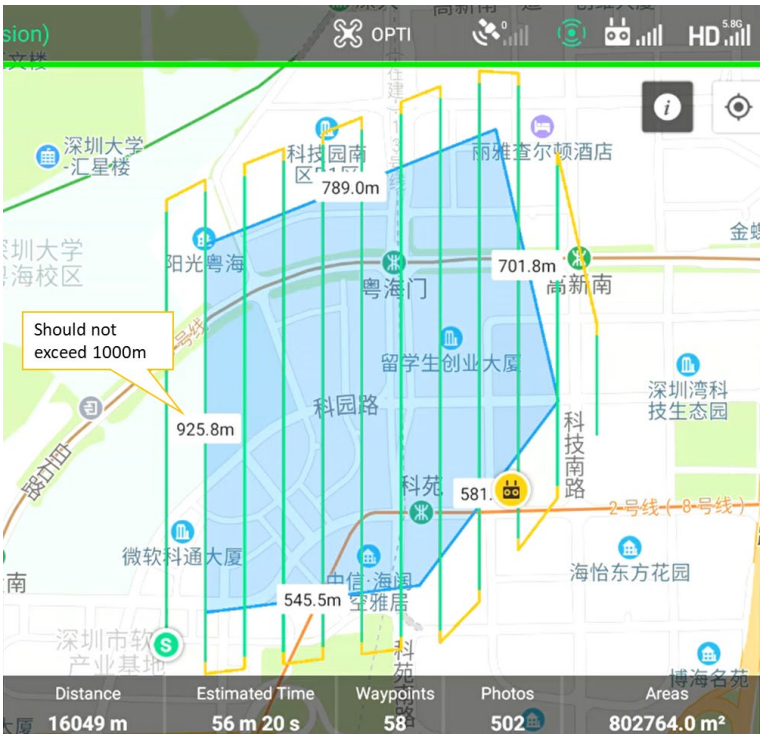
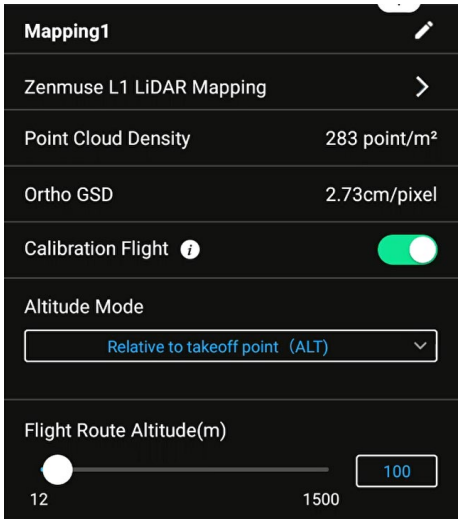
Parameter Recommendations and FAQ for Using DJI L1

1. Use the latest DJI L1 firmware version: v02.04.01.08
2. Plan the target area

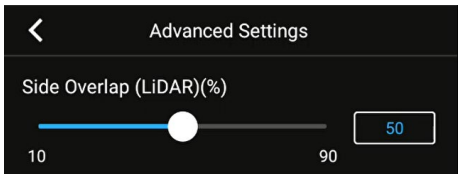
In DJI Pilot App, go to Mission Planning – Create a Route – Mapping, draw the target area on the map. Due to IMU calibration requirement in every 100s, the longest single flight route should **not exceed 1000m** (considering the recommended speed of 10m/s). If you have a large area, please split it into smaller zones.



3. Select Camera: Zenmuse L1 –LiDAR Mapping;
4. Calibration Flight: need to be turned on, in order to perform IMU calibration during the flight.



5. Flight Route Altitude: 50-100m is recommended; for forestry application you may use 100-150m but with lower accuracy.
6. Target Surface to Takeoff Point: you can keep default “0”.
7. Takeoff Speed (speed from the takeoff point to the first waypoint): you can keep the default 10m/s.
8. Speed: 5~10m/s is recommended;
9. Upon Completion: Return To Home is recommended;
10. Advanced Settings:
    - **Side Overlap (Lidar):** 50% is recommended.



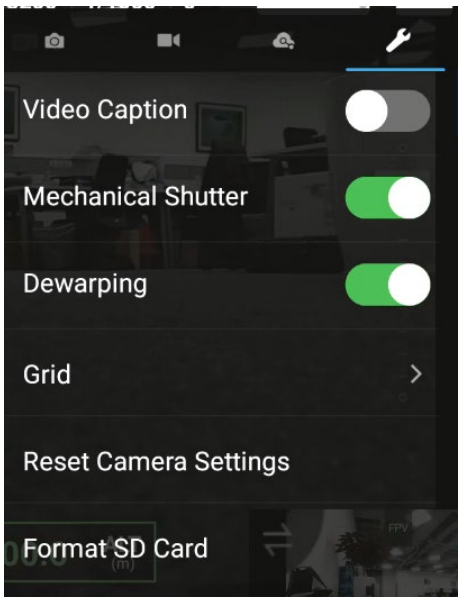
    - Course Angle: you can keep the default;
    - Margin: can be set according to your need.
    - Photo Mode: can keep default “Time Interval Shot”.
11. Payload Settings:

- **Echo Mode**: Use Triple if you are doing topographic survey or forestry application; For the other applications, suggested to use Dual;
- **Sampling Rate**: 160kHz for triple returns; 240kHz for dual returns;
- **Scanning Mode:** Repetitive scan is recommended for higher accuracy;
- **RGB Coloring:** you need to turn this option on to obtain the colorized point cloud.

12. Save the mission;
13. Other settings

    RGB camera setting: S mode (shutter priority) is recommended, you can adjust the parameters according to the environment.

    Mechanical Shutter and Dewarping should be enabled.



RTK: You need to have RTK FIX during the flight to be able to make lidar post-processing

and obtain the point cloud.

14. Pre-flight: Power up the M300 RTK with L1 on the ground to **warm up** the system, wait until the notification pops up: 

15. Execute the mission
16. Post-processing
    Use the latest DJI Terra firmware version: V3.0.4.
    Select the folder with the L1 data.
    Select the Output Coordinate System: you need to select a system with projection such as the UTM system, in order to use the point cloud for processing in other software.
    Optimize Point Cloud Accuracy: you can enable this option if you are using DJI Terra Pro or more advanced versions.
17. Start Processing.

FAQ

1. What are the possible causes for the inaccuracy?

- Please check that IMU calibration is correctly performed before and after the mission, and every 100s during the mission. If the calibration flight is enabled, it will be automatically calibrated during the turn, so please ensure that a single route does not exceed 1km (10m/s speed).
- Please check that point cloud accuracy optimization is enabled when perform reconstruction in the DJI Terra.
- Please check that the parameters are set correctly, and try different parameters combination. Such as altitude is recommended to set from 50 to 100m (the higher the flight, the worse the accuracy, linearly decreasing)
- Please check that RTK is always fixed during flight, or there is base station data that can be used for PPK processing.
- Repeat scanning can improve the quality of model.

2. L1 can't use Terrain follow mode when enabling calibration flight.

At present, terrain follow mode and calibration flight cannot turn on at the same time, so after turning on terrain follow mode, manually calibration flight before and after mapping mission is required. (Press figure 8 on the screen)

3. Does L1 support PPK processing?

L1 support PPK post processing, the work flow is as follow:
Work with D-RTK2

- Set up D-RTK 2 at a known point and keep the measuring rod in contact with the ground. On the M300 RTK settings page, select D-RTK 2 and change its status to Mode 5. Then, pair the drone with D-RTK 2. In the app, go to the Advanced Mode (password is 123456 by default). Modify D-RTK 2's coordinates to the coordinates of the known point. For elevation configuration, it should add 1.8 meters device height to the elevation of the known point on the ground.
- After setting up the D-RTK 2 base station, disable RTK in pilot and switch to GNSS

flight mode. After data collection for the mission is completed, copy .DAT file with the corresponding time slot from D-RTK2 and rename file name to DJI_YYYYMMDDHHMM_XXX.RTB.

- Paste the file in the same folder as the raw point cloud data, then DJI Terra can automatically perform PPK post-processing.

Work with third-party RTK station

- After setting up the third-part RTK station, disable RTK in pilot and switch to GNSS flight mode. After data collection for the mission is completed, copy third party base station's data with the corresponding time slot and rename the file.

Third party base station file format supports: OEM, UBX, Rinex, RTCM.

- Rename the base station observation file name to:
- Oem format: DJI_YYYYMMDDHHMM_XXX.oem
- Ubx format: DJI_YYYYMMDDHHMM_XXX.ubx
- Rinexformat: DJI_YYYYMMDDHHMM_XXX.obs
- Rtcm format: DJI_YYYYMMDDHHMM_XXX.rtcm
- Supported format:

Rinex	V2.1.x	/
	V3.0.x	/
RTCM	V3.0	1004、1012
	V3.2	MSM4、MSM5、MSM6、MSM7
OEM	OEM4	RANGE
	OEM6	RANGE
UBX	/	RAWX

After renaming the file, paste it to paste the file in the same folder as the raw point cloud data, then DJI Terra can automatically perform PPK post-processing.

4. **Is there any difference between figure 8 calibration and backwards/forwards calibration?**

   In terms of effect, there is no difference between the two options. Both the two option can correctly calibrate IMU and it will only remain backwards/forwards calibration in the next firmware version.

5. **What is the rate of degradation of the calibration over the 100 seconds of linear flight?**

   With the increase of flight time, the degradation becomes larger. Over 100s, the degradation is about 5-10cm per 100s, so please avoid it.

6. **Why point cloud suspended in the sky?**

   In a rainy day, the raindrop may reflect enough of the beam back to the receiver, which may cause noise point.

7. **Why Third-party point cloud post-processing software cannot show point cloud generated by Terra?**

Some point cloud software only support viewing under projected coordinate system. If the geodetic coordinate system (such as WGS 84) is selected when generating the point cloud, the error will occur. It needs to be select projected coordinate system (like UTM) in Terra and reconstruct again.