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AIR Commander
ENTIRE

Wired Geotagging

USER'S MANUAL

Before using this product, carefully read all product documentation and retain it for future reference.

GeoTagging overview

GeoTagging mode is enabled via MENU -> Logging mode, where you can select "SD Card" option for saving GPS/RTK data to the SD card in the Entire's microSD slot, or "Direct (EXIF)" for direct upload of coordinates into the EXIF of photos in the camera. In "Direct (EXIF)" mode.

No USB camera control is available (only Infra-Red commanding) in geotagging modes.

Direct (EXIF) mode & SD Card mode

- Camera must be set up into "Mass storage" USB mode, WiFi control is not available in this mode.
- Photo triggering available via MavLink bus for the Pixhawk drones, or via PWM for DJI drones.
- IR commands are also available for cameras with IR port (whole Sony A7 series)
 - o ISO, Exposure correction, MENU (and navigation), Photo review, Zoom, Video start/stop
- No matter if "Direct(EXIF)" or "SD Card" mode is selected, text backup version is copied to SD card of the Entire (if inserted). If "Direct(EXIF)" mode is selected, backup TXT file is also copied to SD card of the Camera. Third copy of geotag data is available for download in the Entire's web configuration (CONTROL -> "Download GeoTag backup file").

Capture detection

Accuracy of the exact capture time is highly important. AIR Commander Entire triggers the capture via multiport USB or IR commands (user selectable). Even the trigger is highly reliable, in the real world there is still option of failure of camera AF or other system, which causes missing photo in the log row. Missing photo will cause overrun and wrong information on all next photos. We have two options for the user.

- **“HotShoe sync”** mode - suggested option. Additional bracket is used to sense the photo trigger from the Flash connector on the camera body. Extremely accurate in time precision and also avoids missed captures.
- **“Predefined delay”** mode - less accurate option, which actually does not sense if the real capture has happen. However especially for the multiport triggering the time accuracy is pretty good.

GPS / RTK selection

AIR Commander Entire selects automatically the RTK coordinates if they are available at the DJI API input. If they are not available, GPS is used automatically.

Wired GeoTagging connection - DJI

For the GeoTagging mode the AIR Commander Entire must be connected to the Camera via Sony Multiport Cable (this is frequently mismatched, please check photos at the end of the manual), and also must be connected to the DJI Flight Controller API connector. Cable set for API connection is available at the Shop. There are few options about triggering of the camera during mission.

- a) *Using DJI Remote (RSS) (suggested)* - in this option you **MUST use the HotShoe** sensor and you can skip lines marked *.
- b) Using the Entire's internal functions of timed triggering or distance trigger functions (also suggested). You can skip lines marked *.
- c) Using F port triggering. In this mode you have to follow all lines of bottom process.

- Step 1(DJI) - Wiring

- o Remove the top plastic cover of DJI M600 Center Frame
- o *Connect SBUS cable to the F3 port of your A3/N3
- o Connect API cable to the API connector of your A3/N3

SEE THE PICTURES→

- Step 1 (PixHawk) – Wiring

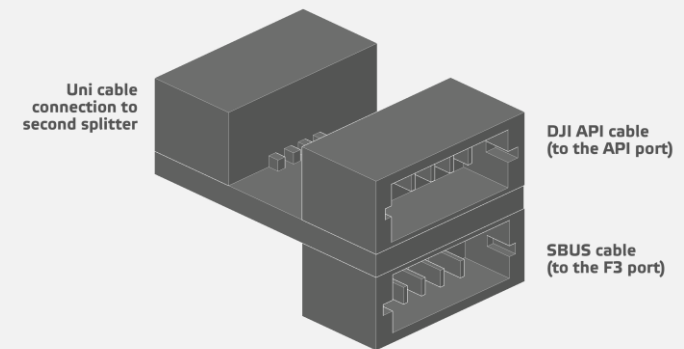
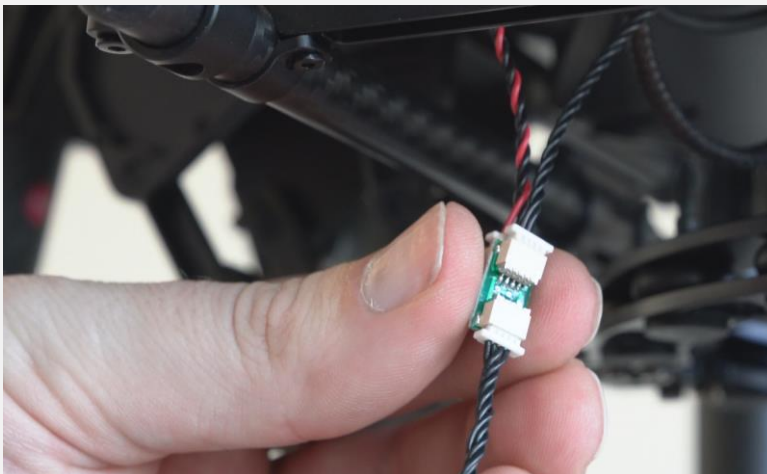
- o Connect the PixHawk cable to the Cube Telem 1 or 2



- Step 1a - Wiring
 - o Thread the cables down through the body of the drone

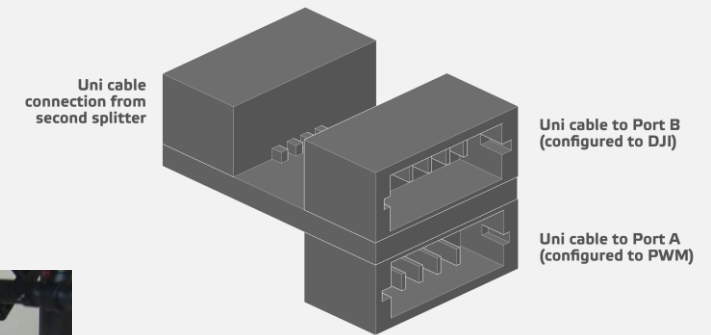
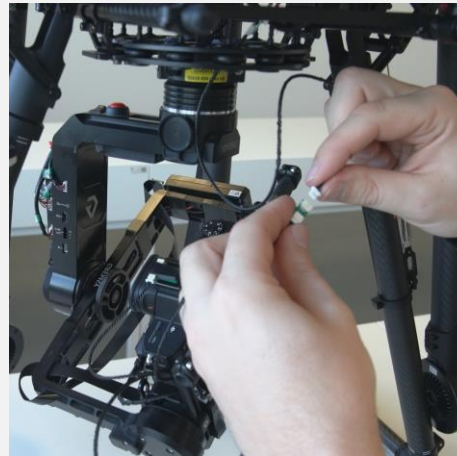


- Step 2 - Wiring
 - o SBUS and API Cables threaded through the center frame now must be connected into the "upper" splitter
 - o Splitter must be connected exactly as described



Step 3 - Wiring

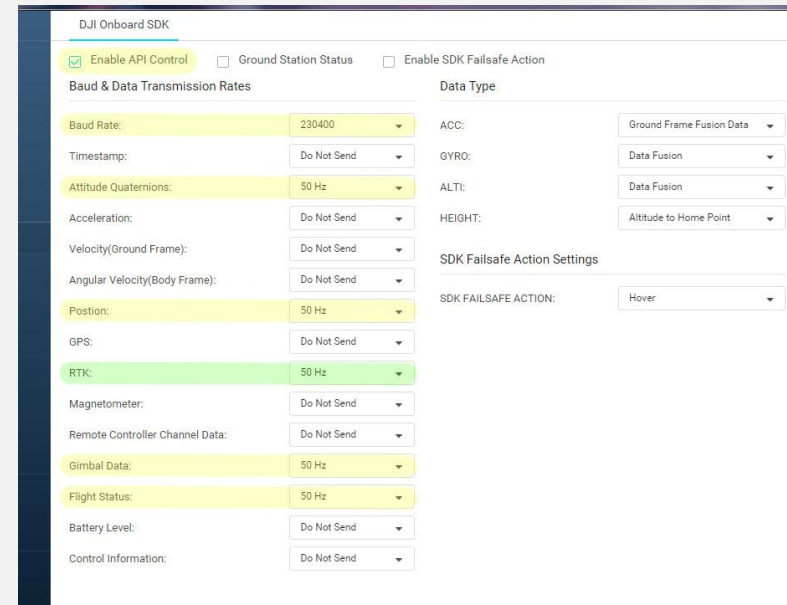
- Connect the "Uni cable" (long 4 pin) to second "bottom" splitter
- From the splitter now connect second two Uni cables to the Entire Port A & B (*PORT A connection can be skipped when non-Fport triggering is used)
- Splitter must be connected exactly as described

**Step 4 - HotShoe sync (optional)**

- Insert HotShoe connector into hotshoe of your Camera
- Connect HotShoe cable to EXT port of the Entire
- Other end of the cable insert into HotShoe connector (left or right)
- Resting plug on the HotShoe connector can be used for IR cable connection
- Remember to turn ON the HotShoe sensing in the Entire's configuration



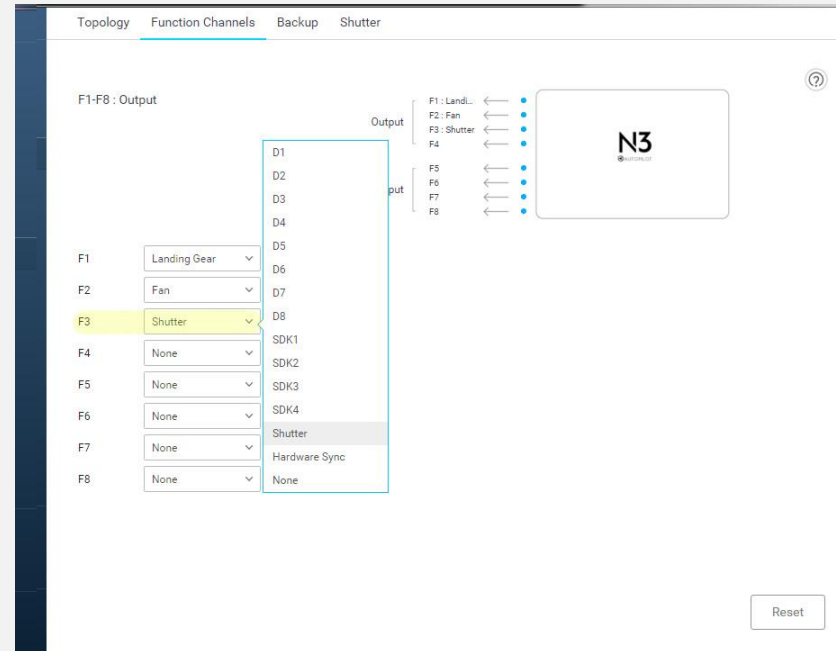
- **Step 5 (DJI) – Configure SDK**
 - o Connect the drone via USB to DJI Assistant
 - o Select A3 / N3 unit
 - o In the MENU select “SDK”
 - o Configure Baud rate 230400 (default)
 - o Attitude Quaternions 100Hz
 - o Position 100Hz
 - o RTK 100Hz (If RTK is used)
 - o Gimbal Data 100Hz
 - o Flight Status 100Hz
 - o All other fields set as “Do Not Send”
 - o Click to Enable API if not enabled



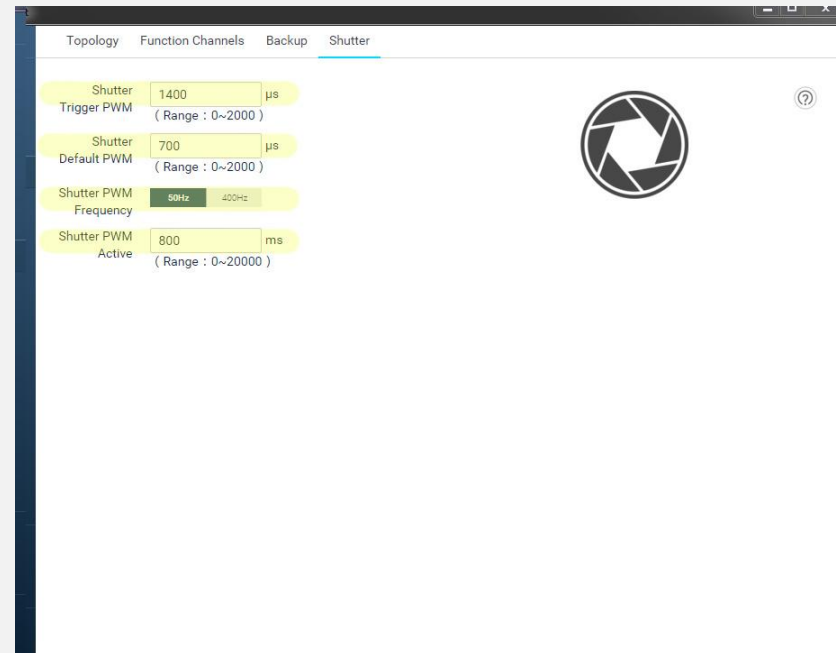
- **Step 5 (PixHawk) – Configure Telem port**
 - o Configure proper Telemetry port to the budrate of 115200bps
 - o Configure proper Telemetry port to the MavLink1 protocol
 - o See page 11 for optional (suggested) configuration (GeoTagging conenction – Pixhawk)

SERIAL1_BAUD	115	1:1200 2:2400 4:4800 9:9600 19:19200 38:38400 57:57600 111:111100 115:115200 256:256000 500:500000 921:921600 1500:1500000
SERIAL1_OPTIONS	0	
SERIAL1_PROTOCOL	1	-1:None 1:MAVLink1 2:MAVLink2 3:Frsky D 4:Frsky SPort 5:GPS 7:Alexmos Gimbal Serial 8:SToRM32 Gimbal Serial 9:Rangefinder 10:FrSky SPort Passthrough (OpenTX) 11:Lidar360 13:Beacon 14:Volz servo out 15:SBus servo out 16:ESC Telemetry 17:Devo Telemetry 18:OpticalFlow 19:RobotisServo 20:NMEA Output 21:WindVane 22:SLCAN 23:RCIN

-
- **Step 6 (DJI)** - *Assign F port for Shutter
 - *In the MENU select "Tools"
 - *Switch to "Function Channels"
 - *Select port F3 as Shutter



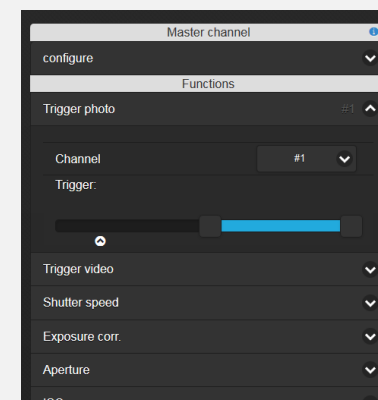
- **Step 7 (DJI)** – *Configure Shutter
 - o *Switch to “Shutter” page
 - o *Configure
 - Shutter Trigger PWM to 1400
 - Shutter Default PWM to 700
 - Shutter PWM frequency 50Hz
 - Shutter PWM Active 800ms



- **Step 8** - Check the connection
 - o Connect the Entire's WiFi
 - o Open configuration page
 - o Open MENU -> Miscellaneous
 - o From the list select "DJI API data preview"
 - o In the popup you should get similar data if the GPS / RTK has enough signal.
 - o Data preview popup is real-time and should change as drone / gimbal moves.

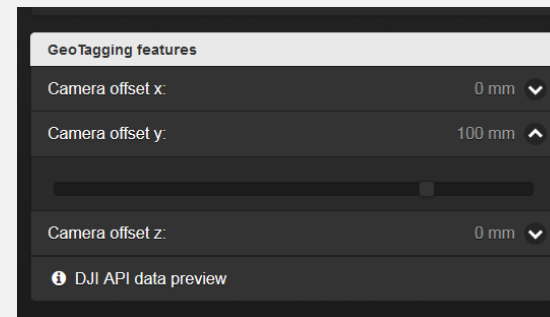
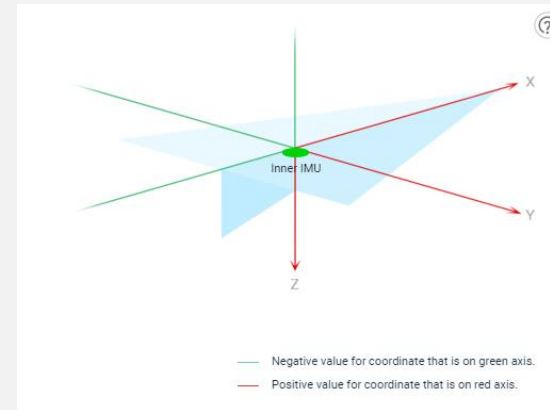


- **Step 9** – Configure Entire
 - o Switch Port B to DJI mode
 - o *Switch Port A to PWM mode
 - o *Open Menu – SBUS mapping
 - o *Select "Trigger photo" in "Functions" section
 - o *Assign Channel to #1 (channel one is PWM input)
 - o *Configure trigger to upper half of range
 - o *White arrow will move slightly. When shutter button on DJI Transmitter is pressed, Entire should now trigger photo.



Step 10 - Calibration

- Optionally you can preset the offset of the camera
- Open the MENU -> Miscellaneous
- Scroll down to GeoTagging features
- And insert X, Y, Z offsets.
- When GPS is used, offset is counted from body center (if correct offset is configured in the FC)
- When RTK is used, offset must be counted from Antenna A
- Offset is in millimeters!



GeoTagging connection – Pixhawk - Connection issues

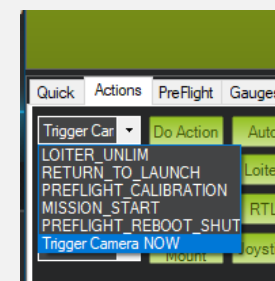
The Entire needs GPS data stream from the Pixhawk for geotagging purposes. Entire is able to request GPS data stream from the Pixhawk automatically per each session. This process is however sometimes problematic. Instead of automatic communication establishment, you can setup GPS data stream manually. This is most reliable solution for Entire GeoTagging.

- Connect your Pixhawk to PC and connect it via Mission Planner
- Open **Settings Bookmark**
- From left MENU select **FULL PARAMETER LIST**
- Re-configure baudrate to **500 000 bps** (SERIALx_BAUD value 500)
- Change the MavLink baudrate option in the Entire's menu to **500 000bps**.
- **Find** item named **SR1_POSITION** or **SR2_POSITION** depending on telemetry port of your choose and **enter value of 50 ***
- **Find** item named **SR1_EXTRA1** or **SR2_ EXTRA1** depending on telemetry port of your choose and **enter value of 10**
- **All other SR1_xxx or SR2_xxx items must be set to 0 for reliable communication**
- Confirm by enter and click to **WRITE VALUE** on the right
- From this time, GPS stream is enabled for all future flights
- Optionally you can check your MavLink connection by manual action Trigger Camera NOW. Clicking to "Do Action" should trigger photo on the Entire if all wiring and configuration is OK. (Camera trigger is not GPS data stream dependent). If you have proper GPS coordinates in the Entire, but no trigger, check if port is configured as **MavLink1!**

Command	Value	Units	Options
SERIAL1_BAUD	500		1:1200 2:2400 4:4800 9:9600 19:19200 38:38400 57:57600 111:111100 115:115200 256:256000 500:500000 921:921600 1500:1500000

Mavlink baudrate:

Command	Value	Unit
SR1		
SR1_EXTRA1	10	Hz
SR1_PARAMS	0	Hz
SR1_POSITION	50	Hz
SR1		
SR1_ADSB	0	Hz
SR1_EXT_STAT	0	Hz
SR1_EXTRA2	0	Hz
SR1_EXTRA3	0	Hz
SR1_RAW_CTRL	0	Hz
SR1_RAW_SENS	0	Hz
SR1_RC_CHAN	0	Hz

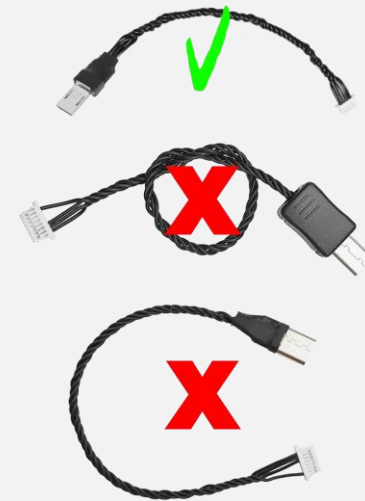


* (Mission Planner can give you warning that value is out of range, confirm that by OK)

GeoTagging process

Once all setup is done, you are ready for first tests. You can use a Simulator feature in the DJI Assistant application to check if all works all expected.

1. Presumptions:
 - a. Sony Camera is connected to the Entire via Multi-Port cable ->
 - b. Control Mode is set up to USB
 - c. Logging Mode is configured as Direct (EXIF)
 - d. Camera is turned into Mass Storage USB connection mode.
 - e. If the camera has two memory card slots, use only one.
 - f. Configure the camera for saving JPG or RAW, Not both.
2. Default STATUS LED color in this configuration is **BLUE** and camera disconnected.
3. Immediately after takeoff, Entire will start **blinking WHITE**- Active GeoTagging session initialization.
4. Entire will automatically trigger photo capture and connect the via USB to scan actual SD folder/files order
5. Once the process of starting GeoTagging session is correctly done, STATUS LED will start blinking **GREEN slowly**, camera will be disconnected and you are ready to go. If RED blinking appears, GeoTagging has failed.



6. During the flight:
 - a. You can trigger photos automatically (in planned Mission mode) or manually via DJI trigger (PWM) or via AIR Commander Link or via SBUS. If you use HotShoe sync, you can also trigger camera by any other third-party trigger (DJI Remote RSS).
 - b. Received command makes STATUS LED blink shortly white
 - c. Recognized camera capture is signaled by short blink of blue.

7. In the moment of landing, Entire STATUS LED will start blinking **GREEN fast** -> Process of Coordinates download has begun.

8. Camera will be connected via USB and new photos will be tagged by appropriate coordinates / gimbal angles.

9. Once process is done successfully, STATUS LED turns into **BLUE solid**. This means, that there were no errors during the flight or download. If STATUS LED turns to blink RED, there were one or more errors.

10. In the "Direct EXIF" mode, the Entire will try to save backup GPS log to the Entire's SD card if inserted. Another backup GPS log file can be downloaded via Entire's web configuration. Format of the GPS log file is:
"File name, Latitude, Longitude, Altitude, gimbal roll, gimbal pitch, gimbal yaw"

GeoTagging accuracy

Accuracy of whole process has been kept in each step of the creation process.

- Capture sensing accuracy
HotShoe sensor has maximum delay of 5ms. If the drone flies at speed 5m/s, error will be approx. 2,5cm (1 inch).
- GPS / RTK receiving
RAW RTK or GPS update is received by drone only 5-10 times per second. Drone Flight controller uses smart algorithms to estimate drone position in time between real measurements. We are reading data from the Flight controller 100 times per second (each 10ms). Also Entire applies smart post process using history positions and future positions (positions received after the capture) to estimate real capture coordinates.
- EXIF accuracy
EXIF is written with extremely high accuracy of 0.00000001 degree, which is approx. 1mm accuracy in the distance. Altitude is saved with 0.1mm accuracy.
- Real-time GPS post process
Our filtering methods is available in three stiffness steps. Post process is aimed to linearize all the movement of drone. Algorithm uses history GPS positions and future positions (measured after the capture) to estimate real capture position. Higher stiffness is good for long straight flights without changing of flight direction. High stiffness is also great for flights, where photographs are made while drone is hovering. For flights in rounds with small radius or other non-straight flight please use low stiffness or disable the filter.

MavLink control

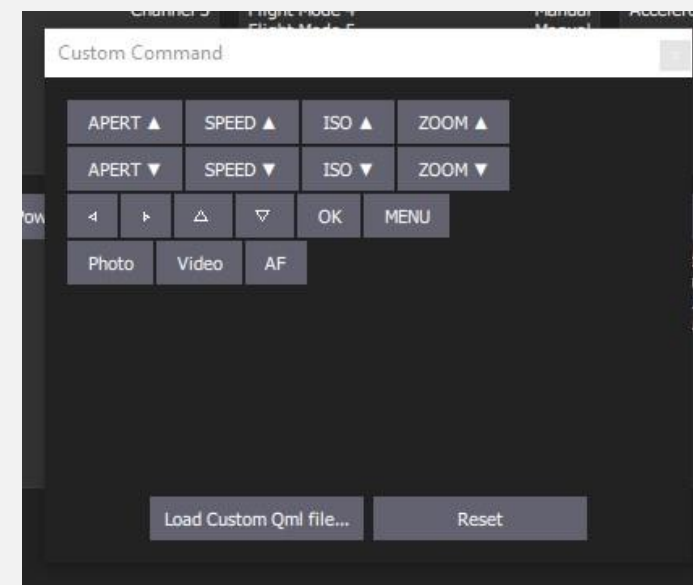
Instead of AIR Commander Link system and SBUS input for controlling of the Entire you can also use MavLink.

If you have PixHawk as drone flight controller, you can use MavLink telemetry channel for remote commanding of the Entire (and Camera). Our plugins are compatible with QGroundControl and Mission Planner application.

Aperture and Shutter-Speed control are not accessible during geotagging session. ISO is available only as custom key shortcut mapped to the arrows Left/Right/Down. Once GeoTagging is disabled all features can be used for camera control.

QGroundControl

1. [Download](#) our QGroundControl plugin
2. open QGroundcontrol application
3. in the top menu click to "Widgets"
4. select "Custom commands"
5. at the bottom of new window select "Load Custom Qml file"
6. select file "entire_qgc.qml" included in this ZIP
7. Plugin will be loaded as per image, click to the button will now be executed on your camera.



The Entire must be updated to the minimum FW 1.079 for this feature.

Mission Planner

1. [Download](#) our Mission Planner plugin
2. Unzip and copy all files to Mission Planner program path
3. open Mission Planner application
4. in the left bottom part of program select tab named "Scripts"
5. click to "Select Script" and pick file "camera_control.py"
6. click to "Run Script"
7. our camera control console will pop up in few seconds



Console is set as "always on top" in default, so you are free to use the Mission Planner as usually and the console will be always visible. You can also set the console semi-transparent to see information under.

The Entire must be updated to the minimum FW 1.079 for this feature.

Cables for wired geotagging

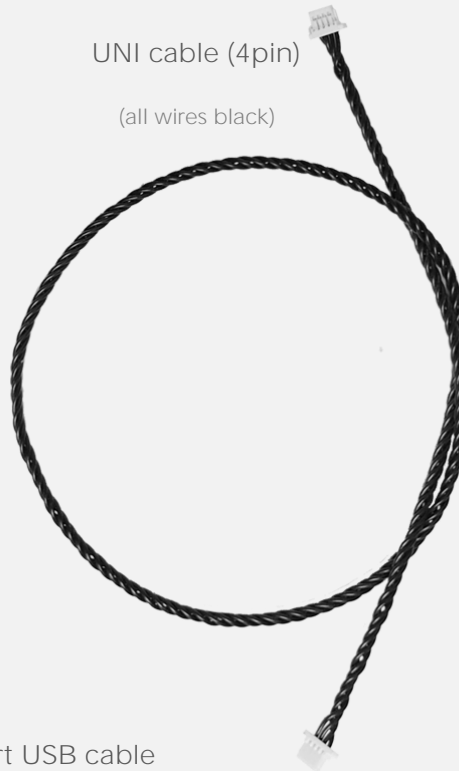
DJI API cable
(only 3pin connected)



PixHawk cable
(only 3pin connected)



UNI cable (4pin)
(all wires black)



HotShoe cable (3pin)



SBUS/PWM cable (4pin)



HotShoe connector



Multiport USB cable



IR Cable



FAQ

- **GeoTagging starts properly (Entire is blinking green slow), however after landing the Entire turns to error (red blinking)**

This kind of issue is mostly related to the file name and folder naming in the camera. The Entire is prepared to the default setting with folder name DCIM/100MSDCF and photo name in format "DSC1234.ARW" or "_DSC1234.JPG". If your camera does not name folders and files in this format, please reconfigure it back to the default.

If previous suggestion does not help, check if the SD card is formatted (sometimes SD cards contains files from another cameras which makes troubles).

- **WiFi hotspot disappear after few minutes**

The Entire's WiFi is extremely sensitive to input power stability. If you have issues with hotspot disappearing, your power input is most probably too weak. You have to take in mind, that once USB is connected to the camera, power consumption of the Entire can be as high as 1.8A! (depending on your camera model) If you have no other option to power the Entire, you can disable the USB camera charging (via the Camera menu).

- **All my configuration seems to be correct but camera is still "Disconnected".**

In the geotagging mode, the camera is disconnected for most of time. Camera is shortly connected via USB multiport only after takeoff and after landing. Even during USB connection, camera is not highlighted as "Connected". You can still get basic control of IR commands (MENU/arrows/OK) and LANC commands (ZOOM/video trigger), because these are enabled by default for all the cameras.

- **GeoTagging works, but some photos has wrong GPS or missing GPS information at all.**

This issue is mostly caused by wrong API SDK configuration in the DJI Assistant. Double check if all fields remarked at page 6 are configured properly (even these "Do not send"). Wrong API configuration leads into mismatch in data receiving or mistakenly recognized drone landing situation.

Most of users checks the GPS information, or RTK when not installed. GPS must be set as "Do not send" and also RTK if not installed.

- (PixHawk question) TriggerCameraNOW command does not work even the Entire has PixHawk(MavLink) connection as active and GPS coordinates in the Entire's preview are correct.

This issue is usually related to telemetry protocol configuration. The Entire is able to read GPS data from both MavLink1 and 2. However, the TriggerCameraNOW feature is supported only with MavLink1 protocol. Please check your PixHawk configuration for proper Telemetry port:

SERIAL0_PROTOCOL	1	1:MAVlink1 2:MAVLink2	Control what protocol to use on the console.
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This MANUAL is not complete.

If you are missing some information please feel free to write us to:

Info@airpixel.cz

Warranty

All warranty and post-warranty service provides manufacturer at www.airpixel.cz. If any malfunction or non-usual behavior occur, stop using device and contact manufacturer at info@airpixel.cz.

Manufacturer

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