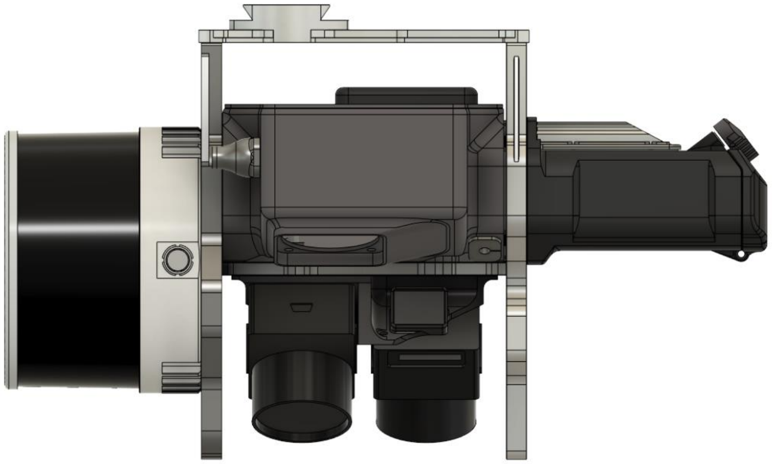
True View 515 Hardware User Guide

GeoCue Group, Inc
10/26/2021
Version 1.0.2



Updated for Firmware Version 3.0.7.1

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About GeoCue Group, Inc.

GeoCue Group was founded in 2003 by a group of engineers with extensive experience in developing hardware and software solutions for primary remote-sensed data acquisition. Our initial products were aimed at reducing schedule and cost risk in geospatial production workflows by providing organizational, productivity and data management tools for base geospatial data production. These tools have been realized as the GeoCue product family. Today GeoCue workflow management tools are used by a majority of North American geospatial production shops. In 2005, GeoCue began selling and supporting Terrasolid tools for kinematic LIDAR data production. This was followed in 2009 by our acquisition of QCoherent Software LLC, the creator of the point cloud exploitation toolset, LP360. Today GeoCue is the largest supplier of kinematic LIDAR processing tools in North America and LP360 is the world's most widely used tool for exploiting point cloud data. In 2014, GeoCue Group started a division focused on using small Unmanned Aerial Systems for high accuracy mapping. Leveraging our expertise in production, risk reduction, and point cloud processing tools, we are continuing to bring new services and products to market to provide surveyors and other geomatics professionals exciting tools for geospatial data extraction using low cost drones including Loki, our plug-and-play PPK direct positioning system, and now our new True View LIDAR/Imagery fusion sensors. To learn more, visit www.geocue.com.

About True View® 515

The True View® 515 is GeoCue's latest addition to our LIDAR/camera fusion platform designed from the ground up to generate high accuracy 3D colorized LIDAR point clouds. Featuring dual GeoCue Mapping Cameras, Hesai PandarXT-32 laser scanner and Applanix Position and Orientation System (POS), the result is a true 3D imaging sensor (3DIS). With its wide 120° fused field of view, the True View 515 provides high efficiency 3D color mapping and will redefine LIDAR wire extraction and dense vegetation penetration applications for all- purpose grade sensors.

A True View Cycle

All True View sensors write their various data streams to a standard file folder structure called a "Cycle." The original meaning of *cycle* was an on/off cycle of the sensor. It is possible to have multiple collections (flights, in the case of a drone) in a single Cycle, so it is not necessarily correct to think of cycle as being synonymous with a flight.

True View Hardware Integration Kit (M600)

The True View 3DIS was designed to be used with the GeoCue True View Integration kit, which includes an antenna mounting plate and a DJI Ronin gimbal mount with vibration dampeners. If your True View 3DIS and M600 were purchased through GeoCue, the antenna mounting plate and Ronin mount were installed by a GeoCue technician. If you purchased your M600 from a third party, you will need to install these components before using your True View system. The following steps explain how to install your True View integration kit.

Installing the Top Plate and Controller Box

1. To install the top plate and controller box you will need the following components:
    a. Top plate with antenna mast. (Figure 1)

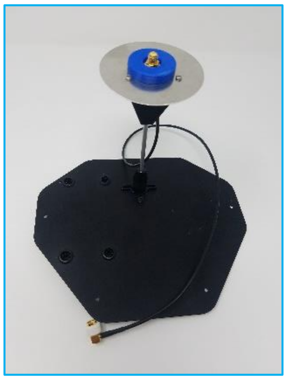


Figure 1 – Top Plate with Antenna Mast

    b. Controller box without LED Readout (Figure 2) or with LED readout (Figure 3)

Figure 2 – Controller box without readout display

Figure 3 - Controller Box with readout display

c. Set Screw (4) (Figure 4)

Figure 4 – Set Screws

d. 50mm Spacer (4) (Figure 5)

Figure 5 - Spacers

e. Hex Driver – 1.5mm & 2mm (Figure 6)

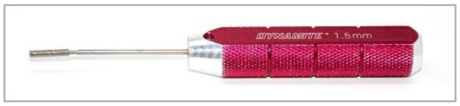


Figure 6 – Hex Driver

2. On the drone, remove the 4 screws indicated below (Figure 7). These screws will be used to attach the mounting plate later, so save them for step 5.

Figure 7 – Prepare for mounting

3. Apply Loctite to the 4 Set Screws and install in the empty screw spaces from *Step 2* using a 1.5mm hex driver (Figure 8). WARNING - Do not overtighten. If screws are too tight, they will press into the plastic plate below and could cause the plate to crack.

Figure 8 – Install set screws

4. Install the four 50mm spacers on top of the set screws (Figure 9).

Figure 9 – Install spacers

5. Line the plate up on top of the spacers. Apply Loctite to the 4 screws removed in *Step 2* (Figure 10) and secure the plate to the top of the spacers (Figure 11).

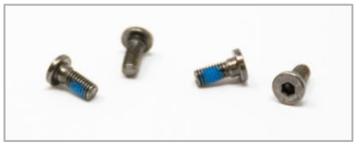


Figure 10 – Loctite the removed screws

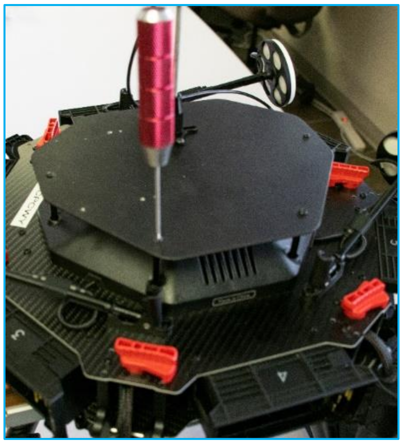


Figure 11 – Install the controller box

6. Install the controller box on to the top plate with the LEDs facing out away from the center of the drone. The controller box is designed to fit into the antenna mounting plate without the need for additional hardware.

Installing the Ronin Mount

1. On the drone, remove the 3 screws on each leg of the stock mount (Figure 12). Keep the screws, they will be used again.

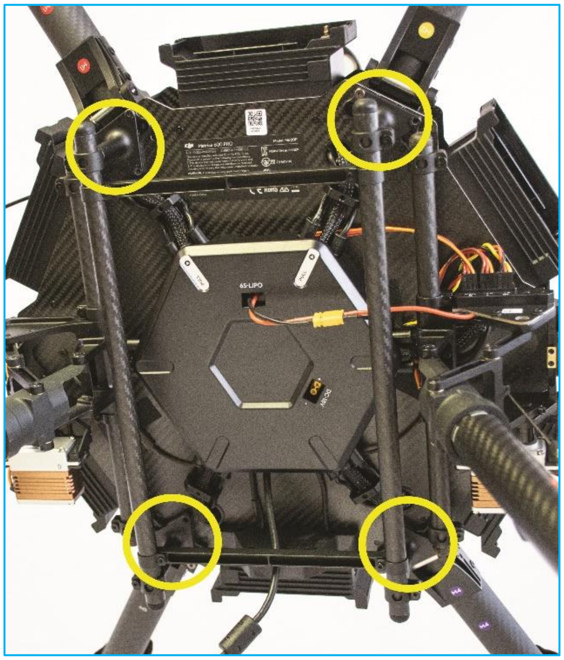


Figure 12 – Remove stock mount screws

2. On the Ronin Mount, loosen the screws that hold the legs to the rails enough so that they can be rotated (Figure 13).

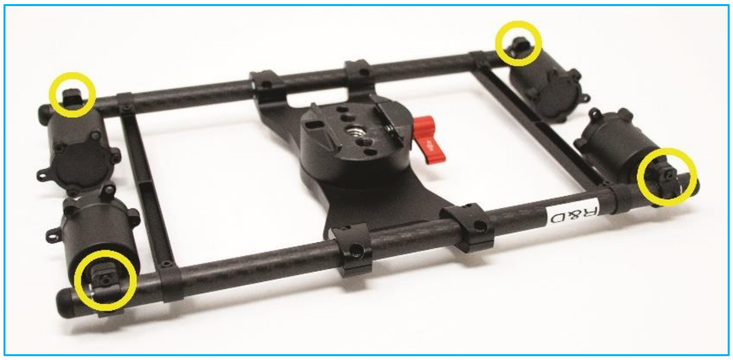


Figure 13 – Loosen leg screws

3. Rotate legs so that the mount stands off the drone (Figure 14).

Figure 14 – Rotate Legs

4. Using the screws removed from the drone in *Step 1*, apply Loctite to each screw and install the mount with the red lever facing the back of the aircraft (Figure 15).

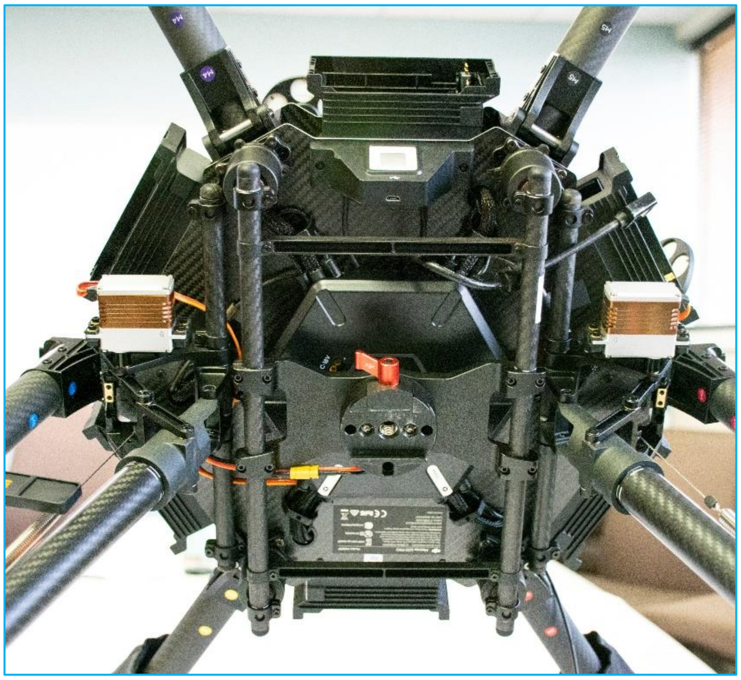


Figure 15 – Install mount

True View Hardware Integration Kit (M300)

The True View 3DIS was designed to be used with the GeoCue True View Integration kit, which includes an antenna mast base and a True View mounting bracket for M300 with vibration dampeners. If your True View 3DIS and M300 were purchased through GeoCue, the antenna mast base and True View mounting bracket were installed by a GeoCue technician. If you purchased your M300 from a third party, you will need to install these components before using your True View system. The following steps explain how to install your True View integration kit.

Installing the Controller Plate, Antenna Mast Base

1. To install the controller plate and antenna mast base you will need the components listed below.
    a. (1) Antenna Mast Base (**Figure 16**)

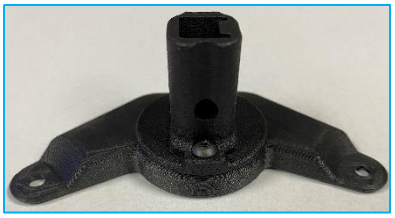


Figure 16 – Antenna Mast Base

    b. (1) Controller Plate (**Figure 17**)

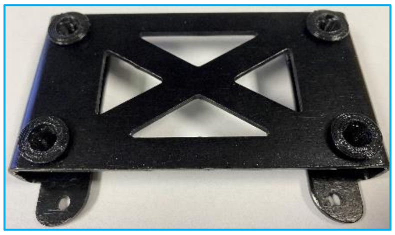


Figure 17 – Controller Plate

    c. Torque screwdriver set to 5.7 Inch-Pounds (INLB) (Figure 18)

Figure 18

d. Threadlocker – Removeable Blue 242.
e. (2) M3 x 0.5 - 8mm length screw
f. (2) M3 x 0.5 - 10mm length screw
g. (2) 4mm Spacer

Apply Threadlocker to all screws and tighten to 5.7 inch pounds. Figure 19 shows the installation diagram.

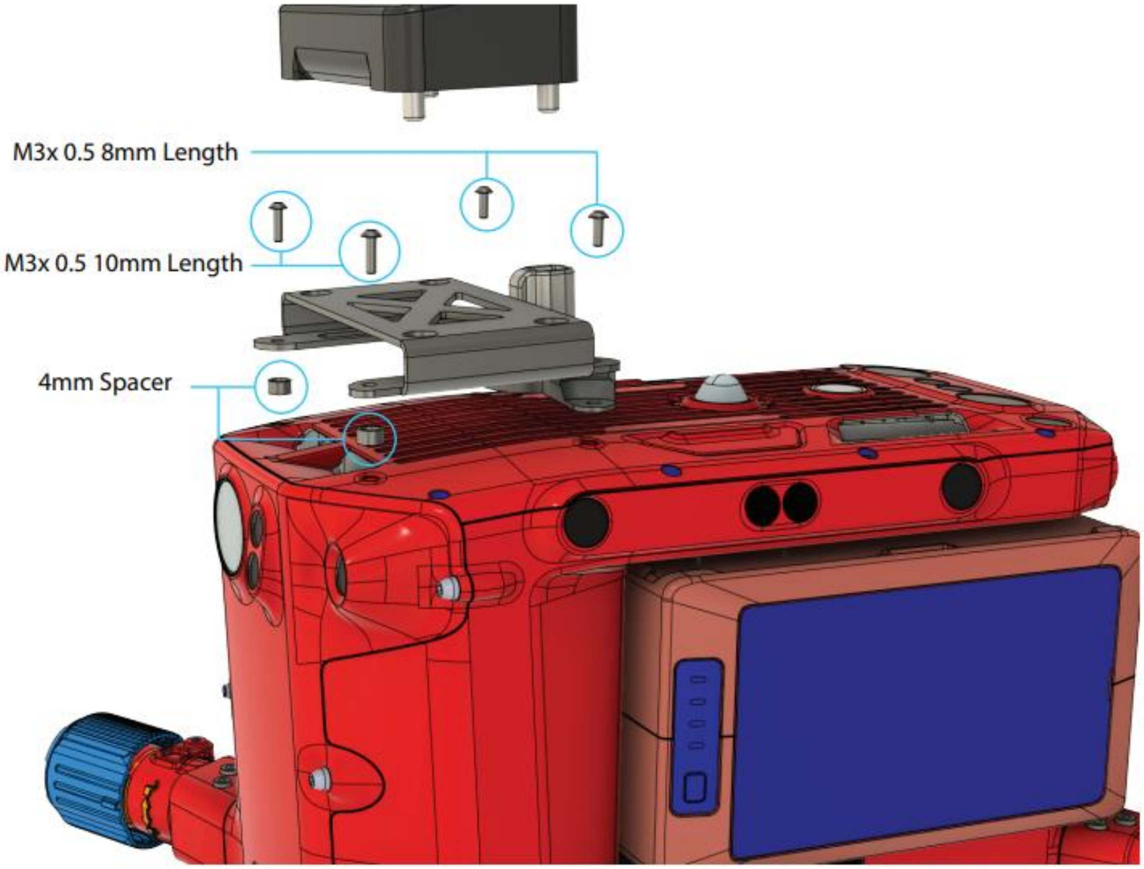


Figure 19

Installing M300 True View Mounting Bracket

i. M300 True View mounting bracket (Figure 20) with slanted TPU spacer (Figure 22) attached.

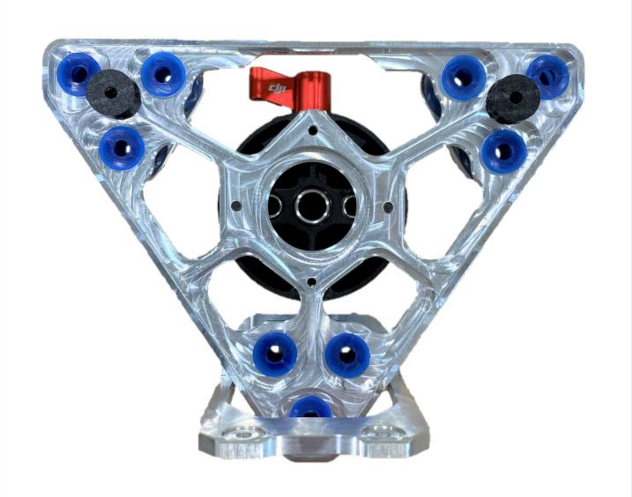


Figure 20 – M300 True View bracket

j. (2) M3 x 0.5 - 10mm length screw
k. (2) M3 Nylon Washer
l. (2) M3 x 0.5 – 20mm length screw
m. (2) Slanted TPU Spacer

1. Invert the drone so the bottom is facing up.
2. Apply threadlocker to the M3 x 0.5 – 10mm length screws and install on the front two hole of the bracket and aircraft body. The M3 nylon washers go between the M300 body and the True View bracket (Figure 21). Tighten screws with torque wrench using 5.7 inch-pounds of torque.

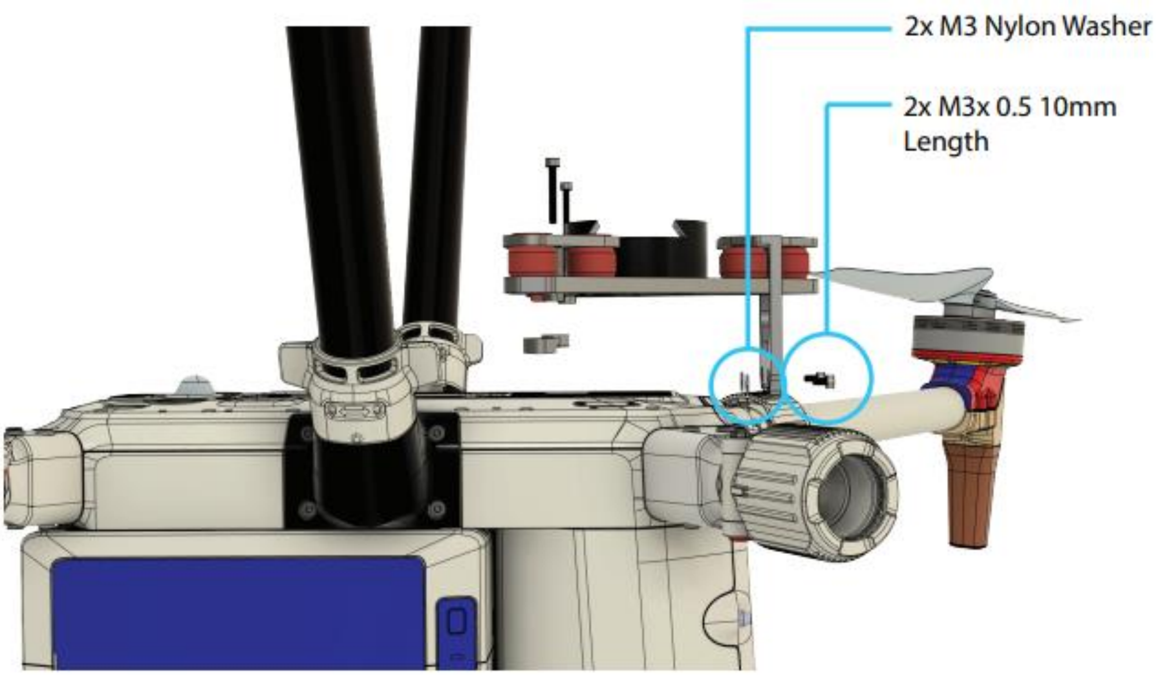


Figure 21

3. Place TPU spacers between the bottom of the aircraft and the True View bracket. The angle of the spacers match the aircraft body (Figure 22).

4. Apply thread locker to the M3 x 0.5 – 20mm screws and install the screw into the True View mounting bracket and aircraft body (Figure 22). Tighten screws with torque wrench to 5.7 inch-pounds.

** Note that the angle of the spacers match the drone body. **

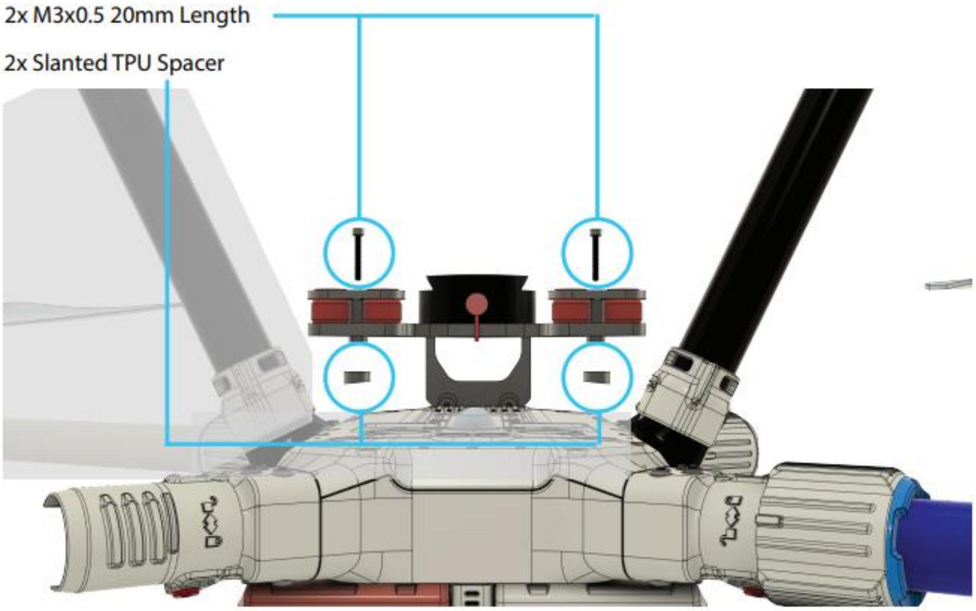


Figure 22

True View 3DIS Installation

The True View 3DIS mounts using a standard DJI Ronin mount on the DJI M600. The instructions below describe how to install the True View 410 on the M600 when you are ready to use the system to collect data.

1. Place the drone on a stable surface with the landing gear down.
2. Turn the red lever (Figure 23) on the Ronin mount until it is loose, but do not remove it completely.

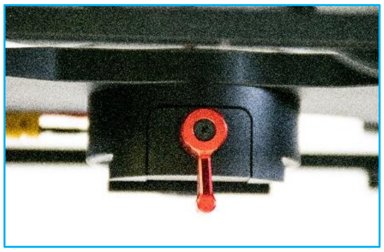


Figure 23 – Ronin mount locking lever

3. Align True View so that the battery compartment is facing forward on the drone and the laser scanner is towards the back.
4. From the back of the drone, lift the True View up to the mount from the left side and slide the True View mount into the Ronin mount (Figure 24). Slide until the True View dove tail is in the center of the Ronin mount (Figure 25).

Figure 24 – Ronin mount

Figure 25 – True View 410 in Ronin mount

5. Tighten the red lever until the True View is tightly locked in place.
6. Loop the safety lanyard through the upper metal plate of the True View and around one of the bars of the payload mount and close the safety lanyard (Figure 26).

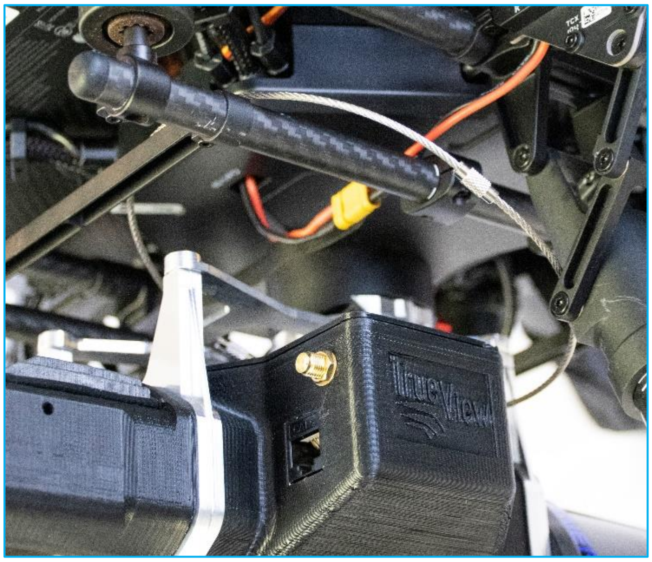


Figure 26 – Safety lanyard

7. Connect the USB or CAT6 cable to the controller box (Figure 27) and route it down to the True View unit. Be sure to secure any excess cable but leave enough slack to prevent tension on the connector. The cable type depends on your controller firmware.

Figure 27 – Control box cable

8. Attach the USB or CAT6 cable to the True View unit (Figure 28). Be sure to secure any excess cable but leave enough slack to prevent tension on the connector.

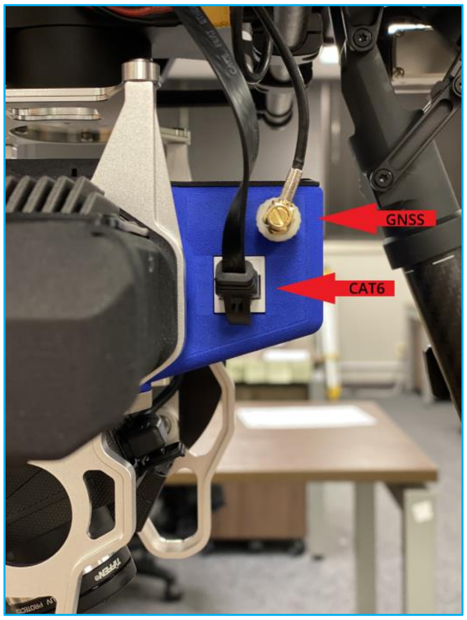


Figure 28 – Control box cable into True View

9. Attach the GNSS antenna cable to the True View unit (Figure 28) and screw the antenna onto the antenna mount (Figure 29) or insert into the revision 2 antenna mount. **Do not use** the integral mount on the readout controller box if your control box has one as this feature has been deprecated. Be sure to secure any excess cable but leave enough slack to prevent tension on the connector.

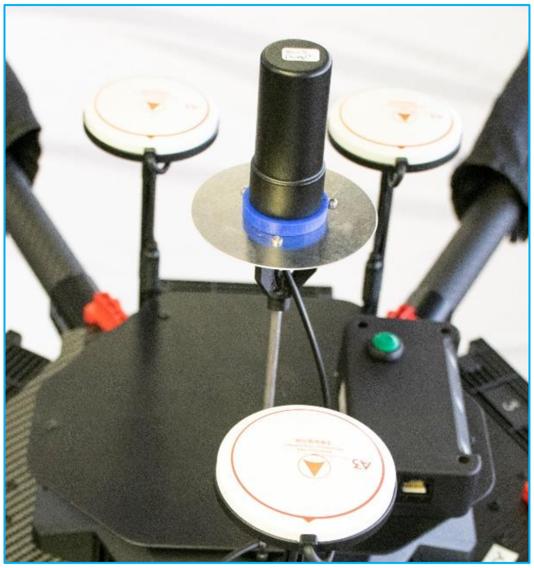


Figure 29 – GNSS antenna

True View Battery

The True View 3DIS is powered by its own 3200 mAh removable lithium-ion battery. The True View power system was designed to be standalone and does not use power from the aircraft's power system. This ensures that True View does not interfere with critical flight functions. You can expect to get about 90 minutes from each battery under normal conditions, but cold temperatures can significantly reduce battery life.

Figure 30 – Removeable battery

The True View 3DIS comes with two RRC2054 batteries (Figure 30), which have built-in charge status indicators, and a charging station.

True View Data Storage Devices

UMS

The True View UMS (USB mass storage) device is the media attached to the True View sensor on which A True View Cycle will be written during flight operations and system wind-down.

Figure 31 - UMS

The UMS should meet the following requirements to be used on the system.

1. USB-C connection (USB 3.1)
2. Format:
    a. ExFAT after updating firmware to v3.0.7.1 or later.
    b. NTFS after updating firmware to v2.0.3 through v3.0.5.2.
    c. FAT32 format for firmware pre v2.0.3.
3. 114 GB minimum capacity
4. Need "SystemConfiguration.json" and "CoreConfiguration.json" files on the drive during operation.

Camera SD Cards

1. Format:
    a. 32GB card – FAT32
    b. 64GB or larger card – ExFAT
2. Minimum recommended read speed: 270 MB/s
3. Minimum recommended write speed: 70 MB/s
4. SD Cards should be formatted using the built in format option in the CCF for CCU firmware v3.0.7.1 or later with camera firmware v00.72.01. Review CCF Section 8 of this document for instructions to use the built in format tool.
    a. The next best formatting option is to use the SD Card Formatter Utility from the SD Association. It is ***not*** recommended to use the Windows OS formatting utility.

System Configuration File (SCF)

The System Configuration file (SCF), SystemConfiguration.json, must reside on the True View USB Mass Storage and is copied into the Cycle\System folder upon creation of each Cycle. The SCF contains information on the calibration parameters of all components for each True View system and is used by True View EVO to process True View data. The latest calibration file for each sensor is stored on the True View Reckon portal.

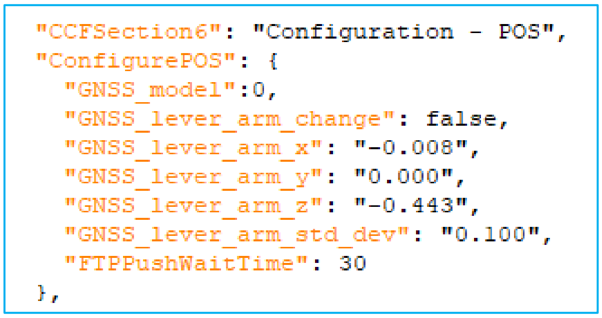
Core Configuration File (CCF)

True View System settings are stored internally to the system, but can be changed by modifying the CoreConfiguration.json file on the UMS. The system identifies if the file has been modified, then operates accordingly. Features may be turned on or off by using a true or false Boolean in the Core Configuration file. Other fields can be configured with a numeric value, such as the Battery Status Percentage or Proximity Mode Distance.

Note: It is recommended to open and modify the Core Configuration file with Notepad++.

The following sections describe the most common sections of the Core Configuration file that a user may wish to modify.

CCFSection6 – POS



```
"CCFSection6": "Configuration - POS",
"ConfigurePOS": {
  "GNSS_model":0,
  "GNSS_lever_arm_change": false,
  "GNSS_lever_arm_x": "-0.008",
  "GNSS_lever_arm_y": "0.000",
  "GNSS_lever_arm_z": "-0.443",
  "GNSS_lever_arm_std_dev": "0.100",
  "FTPPushWaitTime": 30
},
```

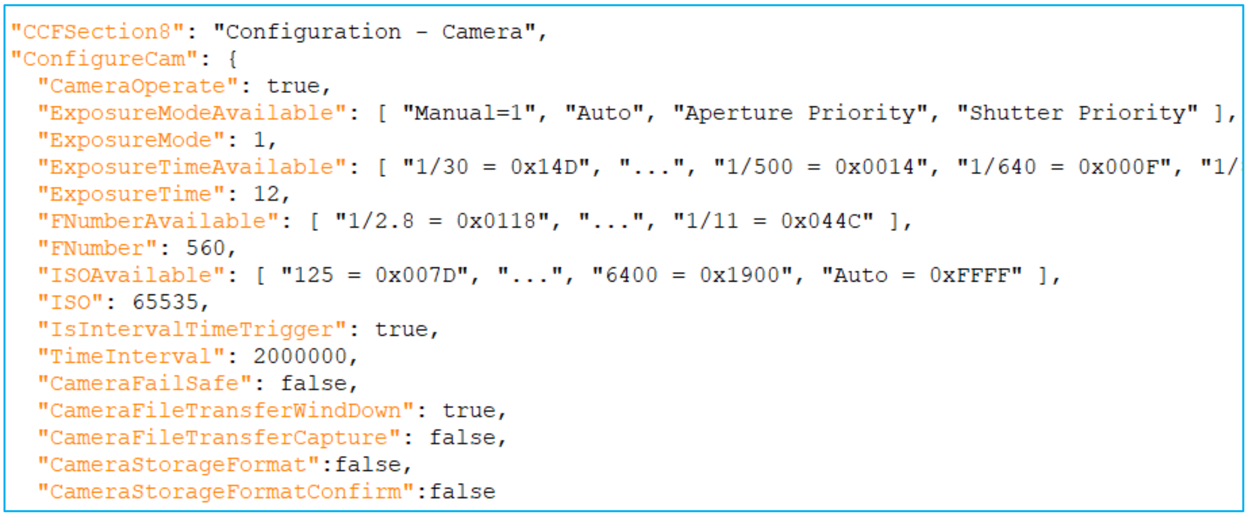
Figure 32 - Core Configuration - POS

This section is applicable for CCU firmware v2.1.7 and later.

If the "GNSS_lever_arm_change" is *true*, the True View is configured to update the lever arms in the APX unit to the values ascribed in this section. A user should only modify "GNSS_lever_arm_x", "GNSS_lever_arm_y", or "GNSS_lever_arm_z" if they are not using the system on a drone integrated by GeoCue. Updating the lever arms using this section of the Core Configuration file replaces the need to log into the APX-15 to update those values. See Measuring GNSS Lever Arm Offsets in this guide.

The values shown in Figure 32 are the standard True View 410 mounted on an M600 with the GNSS antenna secured on the top mounting plate not integral to the control box with an LED readout.

CCFSection8 – Camera



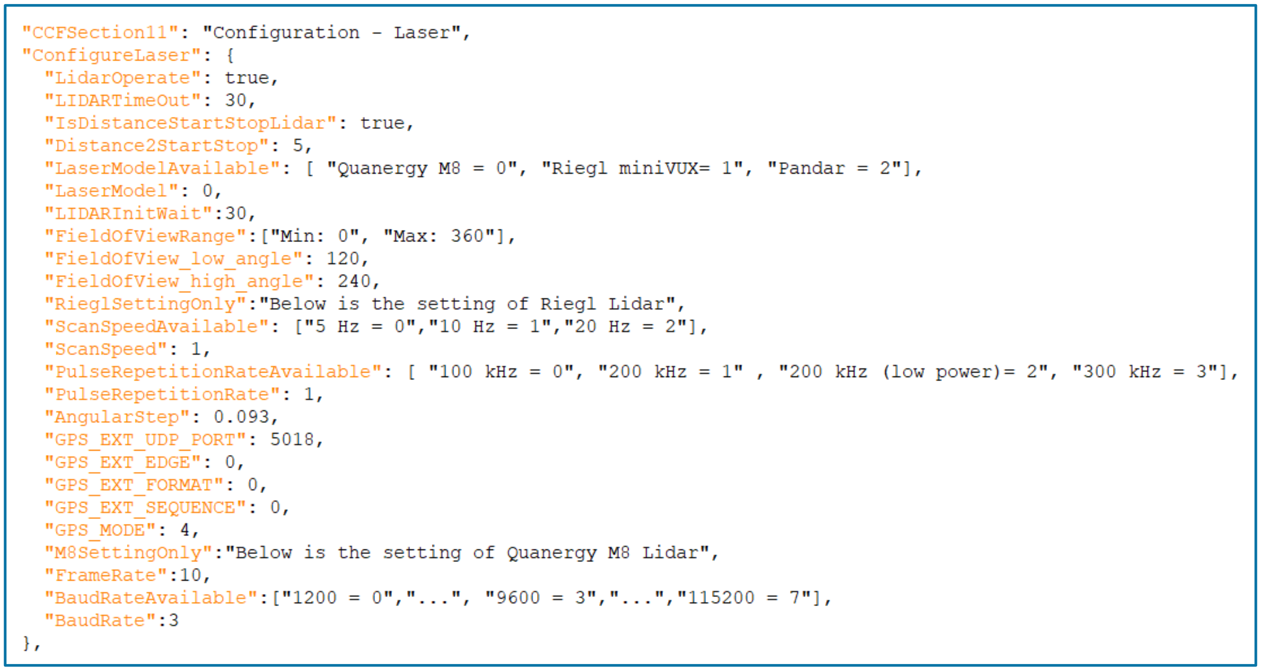
```
"CCFSection8": "Configuration - Camera",
"ConfigureCam": {
  "CameraOperate": true,
  "ExposureModeAvailable": [ "Manual=1", "Auto", "Aperture Priority", "Shutter Priority" ],
  "ExposureMode": 1,
  "ExposureTimeAvailable": [ "1/30 = 0x14D", "...", "1/500 = 0x0014", "1/640 = 0x000F", "1/
  "ExposureTime": 12,
  "FNumberAvailable": [ "1/2.8 = 0x0118", "...", "1/11 = 0x044C" ],
  "FNumber": 560,
  "ISOAvailable": [ "125 = 0x007D", "...", "6400 = 0x1900", "Auto = 0xFFFF" ],
  "ISO": 65535,
  "IsIntervalTimeTrigger": true,
  "TimeInterval": 2000000,
  "CameraFailSafe": false,
  "CameraFileTransferWindDown": true,
  "CameraFileTransferCapture": false,
  "CameraStorageFormat":false,
  "CameraStorageFormatConfirm":false
```

Figure 33 - Core Configuration – Camera

This section is applicable for CCU firmware v2.2.1 and later.

- Set "CameraOperate" to *false* if you do not wish to use the cameras for a mission. For example, a late evening flight.
- If the "CameraFileTransferWindDown" is *true*, the True View is configured to operate in Standard mode and the images will get transferred to the UMS drive during the wind-down sequence. **This field is *true* by default and is recommended not to be changed**.
    - If it is *false*, the True View is configured to operate in Extended mode and the images will not get transferred during wind-down and they will have to be manually downloaded from each camera SD card and placed in the Camera 1 and Camera 2 folders in the cycle folder.
    - The image transfer process takes about 5 minutes for a 15 minutes flight. For aircraft that can fly for extended periods of time (greater than 30 minutes of flight), it is recommended to set this field to false, and transfer the images manually.
- "CameraStorageFormat" and "CameraStorageFormatConfirm" are used to format the camera SD cards. If both values are set to True, the True View system will format the camera SD cards the next time the system is powered on. The True View system will set these value back to false after the format is complete. If only one of these values is set to True, the format will not occur.

CCFSection11 – Configuration Laser



```
"CCFSection11": "Configuration - Laser",
"ConfigureLaser": {
  "LidarOperate": true,
  "LIDARTimeOut": 30,
  "IsDistanceStartStopLidar": true,
  "Distance2StartStop": 5,
  "LaserModelAvailable": [ "Quanergy M8 = 0", "Riegl miniVUX= 1", "Pandar = 2"],
  "LaserModel": 0,
  "LIDARInitWait":30,
  "FieldOfViewRange":["Min: 0", "Max: 360"],
  "FieldOfView_low_angle": 120,
  "FieldOfView_high_angle": 240,
  "RieglSettingOnly":"Below is the setting of Riegl Lidar",
  "ScanSpeedAvailable": ["5 Hz = 0","10 Hz = 1","20 Hz = 2"],
  "ScanSpeed": 1,
  "PulseRepetitionRateAvailable": [ "100 kHz = 0", "200 kHz = 1" , "200 kHz (low power)= 2", "300 kHz = 3"],
  "PulseRepetitionRate": 1,
  "AngularStep": 0.093,
  "GPS_EXT_UDP_PORT": 5018,
  "GPS_EXT_EDGE": 0,
  "GPS_EXT_FORMAT": 0,
  "GPS_EXT_SEQUENCE": 0,
  "GPS_MODE": 4,
  "M8SettingOnly":"Below is the setting of Quanergy M8 Lidar",
  "FrameRate":10,
  "BaudRateAvailable":["1200 = 0","...", "9600 = 3","...","115200 = 7"],
  "BaudRate":3
},
```

Figure 34 - Configuration Laser

This section is applicable for CCU firmware v3.0.5 and later.

Set "LIDAROperate" to *false* if you do not wish to use the laser scanner for a mission. For example, an imagery only mission.

LIDARTimeOut is used to signal via a red SYS light that the laser scanner did not properly start within this time frame. We recommend 30 seconds as the default.

Laser Model must match the scanner being used. A true View 410 should be 0, True View 600 series should be 1, True View 515 should be 2.

The FrameRate should be left as 10 and not be changed.

FieldOfViewRange is informational only and provides the user with the lowest and highest values that can be used for *FieldOfView_low_angle* and *FieldOfView_high_angle*. LIDAR data will only be collected between the low and high angle.

FieldOfView_low_angle is set to 120° by default (Figure 35).

FieldOfView_high_angle is set to 240° by default (Figure 35).

The BaudRate should be left as 3 and not be changed.

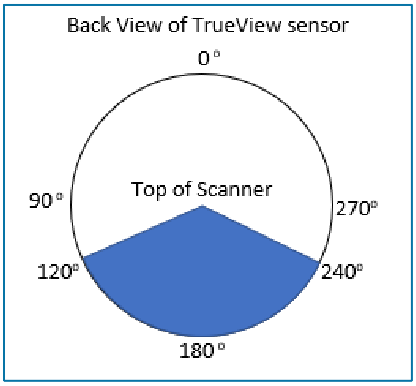
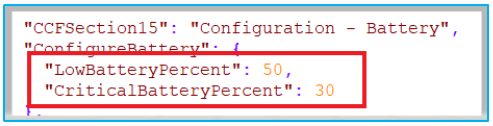


Figure 35 - Field of View

CCFSection15 – Battery



```
"CCFSection15": "Configuration - Battery",
"ConfigureBattery": {
  "LowBatteryPercent": 50,
  "CriticalBatteryPercent": 30
},
```

Figure 36 - Core Configuration - Battery

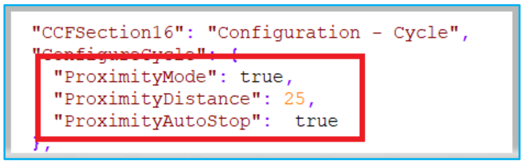
This section is applicable for CCU firmware v1.2.3 and later.

The Battery Status Light (BAT) on the True View controller box will be colored based on the percentage entered in the “LowBatteryPercent” and “CriticalBatteryPercent” fields. The BAT light will be green if the battery is above the “LowBatteryPercent” value. **It is 50 by default.** The BAT light will be yellow if the battery is between the “LowBatteryPercent” and the “CriticalBatteryPercent” value. The BAT light will be red if it is below the “CriticalBatteryPercent” value. **It is 30 by default.**

Figure 37

CCFSection16 - Cycle

Section 16 of the Core Configuration file determines if Proximity Mode is active, and how Proximity Mode will operate. This section is applicable for CCU firmware v2.0.x and later.



```
"CCFSection16": "Configuration - Cycle",
"ConfigureCycle": {
  "ProximityMode": true,
  "ProximityDistance": 25,
  "ProximityAutoStop":  true
},
```

Figure 38 - Core Configuration - Cycle

If “ProximityMode” is *true* (**default and highly recommended**), proximity mode is active, and a home point is created within the sensor where it was powered on. The SYS light will flash green when the system is ready to take off. It will automatically start recording data when the sensor travels more than the “ProximityDistance” (in meters X, Y and Z) from the home point.

Figure 39 - Controller Box SYS LED

If “ProximityMode” is *false*, proximity mode is disabled. The SYS light will turn solid yellow when the system is ready to start recording. The user must press and hold the green button on the controller box until the SYS light turns solid green, indicating the system is recording data and ready for takeoff.

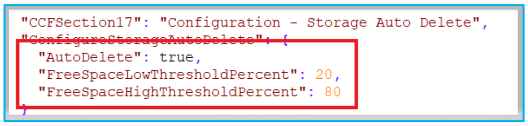
“ProximityAutoStop” determines if the system will automatically begin wind-down when the sensors enters the “ProximityDistance” (X, Y and Z) from the home point.

If “ProximityAutoStop” is *true*, the system will automatically begin wind-down and start transferring files to the UMS drive when the sensor is within the “ProximityDistance” (X, Y, and Z).

> The SYS light will be flashing yellow when the aircraft lands. Wait until the SYS light is solid yellow (file transfer complete) to power off the system.
>
> If the system has not landed within the “ProximityDistance” or the SYS light is still solid green after landing, the user must press and hold the green button on the controller box until the SYS light starts flashing yellow. Wait until the SYS light is solid yellow before powering off the system.

If “ProximityAutoStop” is false, the system will not start wind-down until the user presses and holds the green button on the controller box and the SYS lights starts flashing yellow. Wait until the SYS light is solid yellow before powering off the system.

CCFSection17 – Storage Auto Delete



```
"CCFSection17": "Configuration - Storage Auto Delete",
"ConfigureStorageAutoDelete": {
  "AutoDelete": true,
  "FreeSpaceLowThresholdPercent": 20,
  "FreeSpaceHighThresholdPercent": 80
}
```

Figure 40 - Configuration - Storage Auto Delete

This section is applicable for CCU firmware v2.0.x and later.

If "AutoDelete" is *true* **(default)**, True View automatically deletes data from the UMS or camera SD cards when the storage percentage reaches the "FreeSpaceHighThresholdPercent". Folders will be deleted until the "FreeSpaceLowThresholdPercent" is reached. Older files will be deleted first.

If "AutoDelete" is *false*, the user must manually delete data from the UMS or SD cards. **If storage space is full, flight data will not be stored**.

True View 515 Field Operations

1. Base Station

The True View 3DIS records GNSS signals during flight which will be corrected later in EVO. This type of system is known as a PPK system. Base station processing methods should be considered during the planning process because the user will need to determine how they plan to correct their flight data before collecting. True View GNSS signals can be corrected by one of three methods:

1. **Single base** – Single base, as the name implies, is a static recording from one single base station which is close in proximity to the flight area. Corrections are computed at the base station, then applied to the data collected by True View. CORS stations can also be used for single base processing if they are within 12 miles of the flight area and record static data at 1Hz. The base station must also record both L1 and L2 signals and must be during the same time as the flight. Single base is the only processing method if you plan to process with the local option selected.
2. **SmartBase** – SmartBase is a cloud processing option that uses multiple CORS stations to compute base corrections for your flight. Smart base processing allows for longer baselines from the flight area and the user does not have to setup a base station or download CORS data from a nearby station. This option still requires an existing CORS network in the area of flight.

Users can go online to the [Applanix SmartBase website]() and determine if their flight location is covered by the SmartBase network and estimate the quality of the results.

3. **PP-RTX –** PP-RTX is a cloud processing option that does not require a base station or CORS network. PP-RTX corrections can be computed anywhere. Accuracy is reduced using this method, but can be used as a last resort option in the event of base station failure or lack of CORS network.

More information can be found in our knowledge base articles:
https://support.geocue.com/positioning-options-in-true-view-workflows/
https://support.geocue.com/single-base-vs-smartbase-vs-pp-rtx

2. Pre-Flight

1. Ready the drone for flight and insert the battery into the True View unit (Figure 41).

Figure 41 – Insert True View Battery

2. Lift all antennas up and if using the foldable GNSS True View antenna, tighten the nut (Figure 42). If using the square tubing mast, insert the mast into the mast port and press until firmly seated.

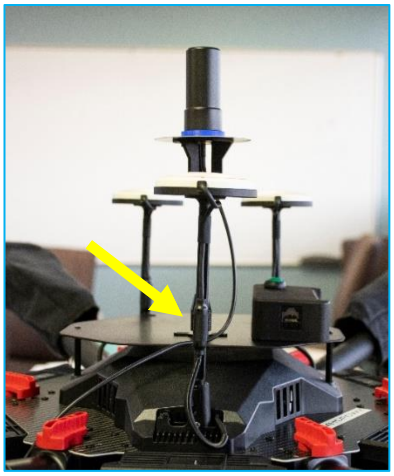


Figure 42 – True View Antenna

3. Place the drone in an open area where you intend to takeoff. True View will need an unobstructed view of the sky. Avoid placing the drone near large metal objects such as buildings or vehicles to avoid signal disturbance.
4. Insert the USB drive.

VERY IMPORTANT

MAKE SURE THAT ALL CABLES ARE SECURED TO

PREVENT CONTACT WITH PROPS DURING FLIGHT.

5. Turn on the True View unit with the switch located in the battery compartment (Figure 43).

Figure 43 – True View Power Switch

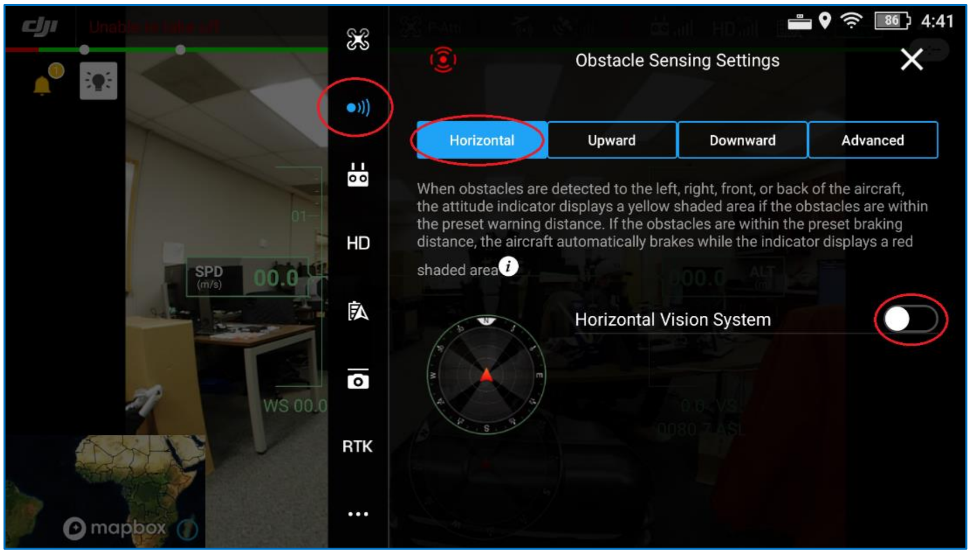
6. Close the battery compartment door and lock the latch.
7. The True View will now cycle through the power up procedures.

3. Disable Obstacle Avoidance

IMPORTANT M300 Only

The integration of the True View 3DIS system will cause disruption to the M300's built-in obstacle avoidance detection systems. If these systems are not disabled, they can cause erratic and potentially dangerous behavior including loss of control of the drone. To disable obstacle avoidance, perform the following steps:

1. Launch the DJI Pilot application, open a mission, or go into manual view.
2. Tap the Ellipsis menu (...) on the top right corner of the screen.
3. Tap the second icon from the top Obstacle Sensing Settings
4. Tap each tab for Horizontal, Upward, and Download tap the toggle button off for each category. (Figure 44)



When obstacles are detected to the left, right, front, or back of the aircraft, the attitude indicator displays a yellow shaded area if the obstacles are within the preset warning distance. If the obstacles are within the preset braking distance, the aircraft automatically brakes while the indicator displays a red shaded area

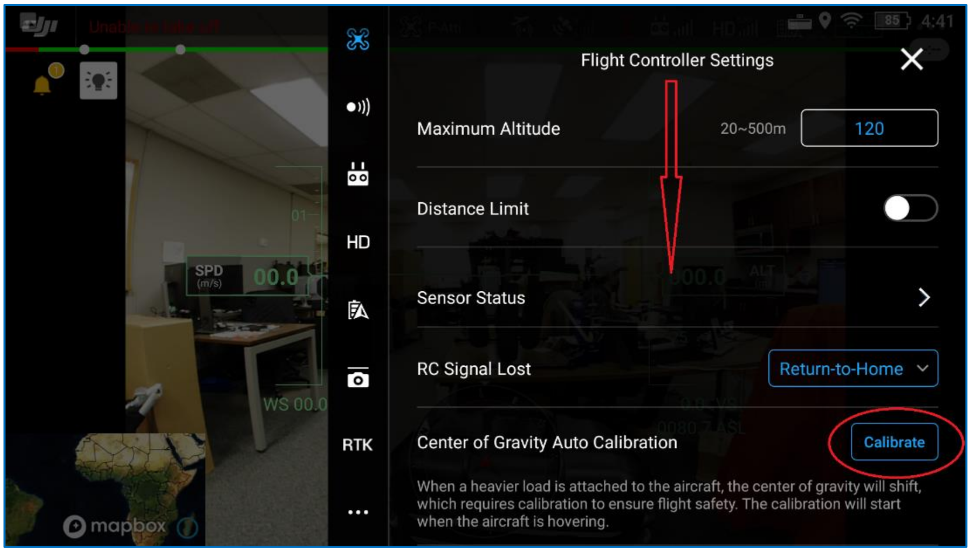
Figure 44 – DJI Pilot, Obstacle Sensing Settings Menu

4. Center of Gravity (GC) Calibration

IMPORTANT M300 Only

When heavy payloads are carried on the M300 platform a center of gravity (GC) calibration must be performed there is any change to the payload. This would include if you switch from a True View 410 to a True View 515 or DJI P1 or even switch to flying without a payload. The aircraft must be in flight and hovering to start the calibration. It is ideal to perform this calibration in a wind free environment. To perform the GC calibration, perform the following steps:

1. Launch the DJI Pilot application, open a mission, or go into the manual view.
2. Tap the Ellipsis menu (…) on the top right corner of the screen.
3. Stay within the Flight Controller Settings tab and scroll to the bottom of this screen.
4. Tap the Center of Gravity Auto Calibration Button and follow the instructions. (Figure 45)



Flight Controller Settings

Maximum Altitude 20~500m 120

Distance Limit

Sensor Status

RC Signal Lost: Return-to-Home

Center of Gravity Auto Calibration: Calibrate

When a heavier load is attached to the aircraft, the center of gravity will shift, which requires calibration to ensure flight safety. The calibration will start when the aircraft is hovering.

Figure 45 – DJI Pilot, Flight Controller Settings Menu

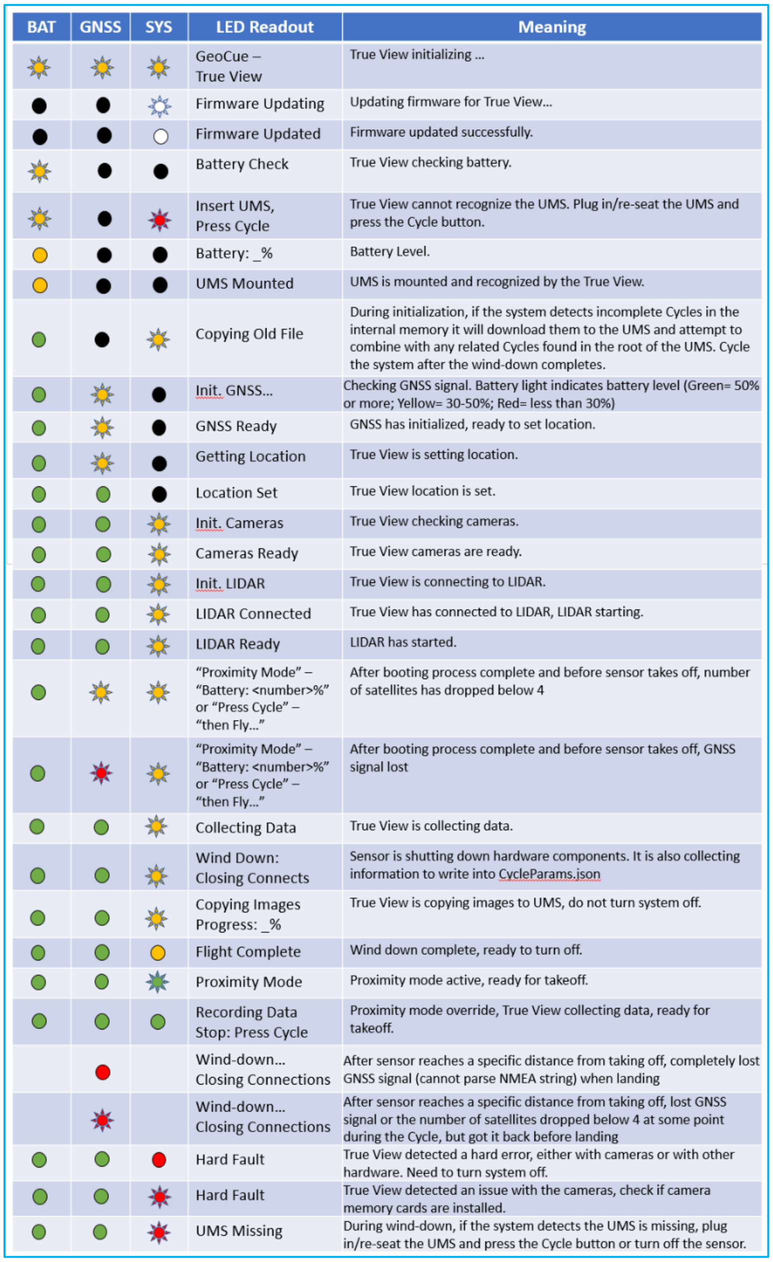
5. Controller Box LEDs

8. When the power switch is turned on, the system will go through its startup procedure and all lights (Figure 46) on the controller box will flash yellow. After a few seconds, each LED light will begin to show a sequence of colors indicating status.
    a. BAT: Flashes until the battery percentage is known, then turns a solid color.
        i. Green LED indicates battery is above 50%.
        ii. Yellow LED indicates battery is between 30 and 50%.
        iii. Red LED indicates battery is below 30%.
    b. GNSS: This LED will flash yellow until GNSS signal is received, then turn solid green.
    c. SYS: The system light will flash yellow until the system is ready for operation. When the system is ready, it will begin flashing green if proximity mode is active.
        i. Proximity mode is a feature added in firmware version 2.0.3. When the system is powered on, its position is recorded, and this position is used as the home point for the system. Once the sensor travels a specified distance (25 meters by default) from the home point, the system automatically begins recording data. This feature can be disable by setting the "ProximityMode" flag to false in the Core Configuration file on the UMS. If the feature is disabled, you will have to manually start recording data by pressing and holding the green button until the SYS light turns solid green.

Figure 46

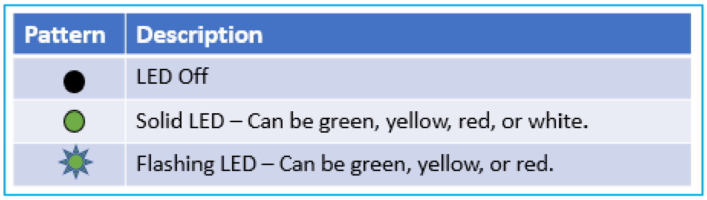
9. When the SYS LED is flashing green, this means the proximity mode is active and you are ready for takeoff.
    a. If proximity mode was disabled by the user, wait for a solid yellow SYS light then press and hold the green button until the SYS light turns solid green.
10. Turn the drone and transmitter on and connect to the drone on the iPad.
11. Arm the drone and take off and climb to the mission altitude.
12. Once the system travels 25 meters from takeoff (X,Y, and Z), it will begin recording data.

Figure 47 shows all the lighting sequences, LED messages, and their meanings. Figure 48 shows how to interpret the symbols in the table.



BAT	GNSS	SYS	LED Readout	Meaning
🔆	🔆	🔆	GeoCue – True View	True View initializing …
⚫	⚫	✳	Firmware Updating	Updating firmware for True View…
⚫	⚫	⚪	Firmware Updated	Firmware updated successfully.
🔆	⚫	⚫	Battery Check	True View checking battery.
🔆	⚫	🚨	Insert UMS, Press Cycle	True View cannot recognize the UMS. Plug in/re-seat the UMS and press the Cycle button.
🟡	⚫	⚫	Battery: _%	Battery Level.
🟡	⚫	⚫	UMS Mounted	UMS is mounted and recognized by the True View.
🟢	⚫	🔆	Copying Old File	During initialization, if the system detects incomplete Cycles in the internal memory it will download them to the UMS and attempt to combine with any related Cycles found in the root of the UMS. Cycle the system after the wind-down completes.
🟢	🔆	⚫	Init. GNSS…	Checking GNSS signal. Battery light indicates battery level (Green= 50% or more; Yellow= 30-50%; Red= less than 30%)
🟢	🔆	⚫	GNSS Ready	GNSS has initialized, ready to set location.
🟢	🔆	⚫	Getting Location	True View is setting location.
🟢	🟢	⚫	Location Set	True View location is set.
🟢	🟢	🔆	Init. Cameras	True View checking cameras.
🟢	🟢	🔆	Cameras Ready	True View cameras are ready.
🟢	🟢	🔆	Init. LIDAR	True View is connecting to LIDAR.
🟢	🟢	🔆	LIDAR Connected	True View has connected to LIDAR, LIDAR starting.
🟢	🟢	🔆	LIDAR Ready	LIDAR has started.
🟢	🔆	🔆	"Proximity Mode" – "Battery: <number>%" or "Press Cycle" – "then Fly…"	After booting process complete and before sensor takes off, number of satellites has dropped below 4
🟢	🚨	🔆	"Proximity Mode" – "Battery: <number>%" or "Press Cycle" – "then Fly…"	After booting process complete and before sensor takes off, GNSS signal lost
🟢	🟢	🔆	Collecting Data	True View is collecting data.
🟢	🟢	🔆	Wind Down: Closing Connects	Sensor is shutting down hardware components. It is also collecting information to write into CycleParams.json
🟢	🟢	🔆	Copying Images Progress: _%	True View is copying images to UMS, do not turn system off.
🟢	🟢	🟡	Flight Complete	Wind down complete, ready to turn off.
🟢	🟢	❇️	Proximity Mode	Proximity mode active, ready for takeoff.
🟢	🟢	🟢	Recording Data Stop: Press Cycle	Proximity mode override, True View collecting data, ready for takeoff.
	🔴		Wind-down… Closing Connections	After sensor reaches a specific distance from taking off, completely lost GNSS signal (cannot parse NMEA string) when landing
	🚨		Wind-down… Closing Connections	After sensor reaches a specific distance from taking off, lost GNSS signal or the number of satellites dropped below 4 at some point during the Cycle, but got it back before landing
🟢	🟢	🔴	Hard Fault	True View detected a hard error, either with cameras or with other hardware. Need to turn system off.
🟢	🟢	🚨	Hard Fault	True View detected an issue with the cameras, check if camera memory cards are installed.
🟢	🟢	🚨	UMS Missing	During wind-down, if the system detects the UMS is missing, plug in/re-seat the UMS and press the Cycle button or turn off the sensor.

Figure 47 – Controller Box LEDs



Pattern	Description
⚫	LED Off
🟢	Solid LED – Can be green, yellow, red, or white.
❇️	Flashing LED – Can be green, yellow, or red.

Figure 48 – Controller BOX LED Legend

6. Heading Alignment Maneuver

The heading alignment maneuver needs to be done after takeoff, before flying the mission, and after the mission prior to landing for each flight. This maneuver is critical for getting accurate heading corrections for the IMU and will impact the results of the data if not performed.

1. Before takeoff, identify a safe direction to perform the heading alignment maneuver. Avoid areas with people, bodies of water, and obstacles.
2. After takeoff, once at mission altitude, let the drone hover in place for two seconds.
3. Push the right stick all the way forward quickly and hold until the drone accelerates to 10m/s. This should take about four seconds. Do not provide any other input. The drone should be accelerating in a straight line.
4. After reaching 10m/s, about four seconds of forward flight, release the stick and leave it centered. The drone will quickly stop. **Note: Speeds beyond 12-14 m/s may yield poorer results.**
5. Wait two seconds, then use the left stick to turn (yaw) the aircraft about 15-20 degrees, then wait a second. (This is for safety; it's intended to prevent the drone from returning directly overhead when you do step 5. Yaw the drone in a direction so that its return path will be clear of people below, and when it returns, it will be at least 15-20m away, and in front of you.)
6. Pull the right stick all the way back quickly and hold until the drone accelerates to 10m/s. This should take about four seconds. Do not provide any other input. The drone should be accelerating in a straight line backwards.
7. After reaching 10m/s, about four seconds of backward flight release the stick and leave it centered. The drone will quickly stop. Wait at least two seconds after it stops before starting the mission. **Note: Speeds beyond 12-14 m/s may yield poorer results.**
8. Fly the mission you have planned.
9. At the end of the mission allow the drone to return to home, but do not let it descend, a final heading alignment maneuver needs to be done.
10. To take back manual control over the drone.
11. Repeat steps 1-6 again. Make sure that when repeating step 4) that you turn the drone sufficiently that it will be several meters (>5) away from the takeoff location at the end of its backwards travel. This is needed so that when returning automatically, the drone will properly navigate to above the takeoff location before beginning its automatic descent. If you're closer than 5m, it will likely begin descending without aligning with the original takeoff location
12. After the drone has been stationary for two seconds, hold the (Home) button to begin the automatic return and landing. Watch the drone carefully to be certain it's landing in the intended spot. Otherwise, make the necessary adjustments or take manual control to complete a safe landing.

NOTE: On windy days, avoid starting the maneuver into a headwind, as the drone may not be able to achieve high enough accelerations. Try doing the maneuver crosswind if possible.

Figure 49 - Heading Alignment Maneuver

7. After Landing

1. After landing the SYS LED should be flashing yellow, indicating the system is transferring data. Do not power off the system during this time or it will interrupt the data transfer.
    a. If proximity mode is disabled or the aircraft does not land within 25 meters of the home point, the SYS LED will be solid green after landing. Press and hold the green button on the True View controller box until the system LED changes from solid green to flashing yellow.
2. The flashing yellow light indicates the True View is writing data to the USB drive. Be sure not to power off the True View or remove the USB drive during this period.
3. When the system LED changes to solid yellow, the flight data has been transferred to the USB drive.
4. Power off the True View with the power switch in the battery compartment.
5. For missions requiring multiple flights, repeat these steps from the "pre-flight" section of this document. The system should be completely powered off between flights (battery swaps) after the data has been successfully written.
6. Check the data for errors before leaving the field.
7. Field check your data to verify all data has been collected. The Field check instructions can be found in the True View EVO Users Guide.

True View EVO

True View Evo is a 64-bit Windows® desktop application used for processing and exploiting True View sensor data. It is GeoCue's LP360 point cloud exploitation product with the addition of a collection of tools for True View sensor data workflows. Currently, True View Evo is available in two licensing levels:

- True View Evo – This is equivalent to LP360 Advanced with the addition of the True View workflow tools. It is limited to product areas of no more than 4 km^2 of LIDAR data
- True View Evo Unlimited – this is the same functionally as True View EVO but the size limit is removed.

True View EVO is the software used to post-process your raw flight data. EVO will generate a 3D LIDAR point cloud in LAS format, colorize the point cloud, geotag the images collected, etc… It is based on GeoCue's LIDAR point cloud exploitation software, LP360, and comes with all the same tools as LP360 Advanced. Tools such as accuracy assessment, automatic and manual ground classification, and contour/ surface exporting.

See the True View EVO User Guide for more information.

Logging in To APX15

It may be necessary to log in to the APX-15 to change settings such as lever arm offsets, or other settings if advised by GeoCue Group Support. The instructions below explain how to configure the True View Wi-Fi network and connect to the APX-15. Note that for firmware version3.0.5 and higher, Wi-Fi is disabled by default. To turn Wi-Fi on , unplug the UMS drive from True View, then power on the True View system.

Configure True View Wi-fi

1. Unplug the UMS from the True View 515.
2. Power on the True View 515 and wait for 30 seconds, or until "Trueview515" appears in your list of Wi-Fi networks.
    a. If you cannot find the network, turn off the True View 515, connect the UMS to laptop and delete the file "TV_hostapd.conf"
3. If this network exists, connect to it with password "TrueView515."
4. Click Properties (Figure 50) of the TrueView515 Network

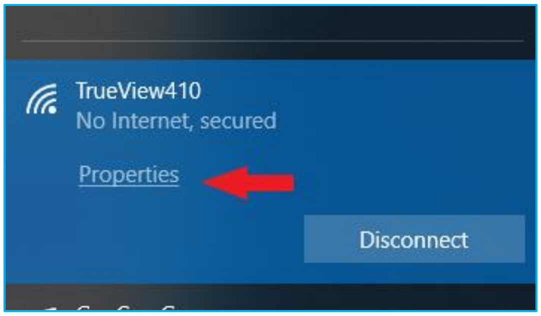
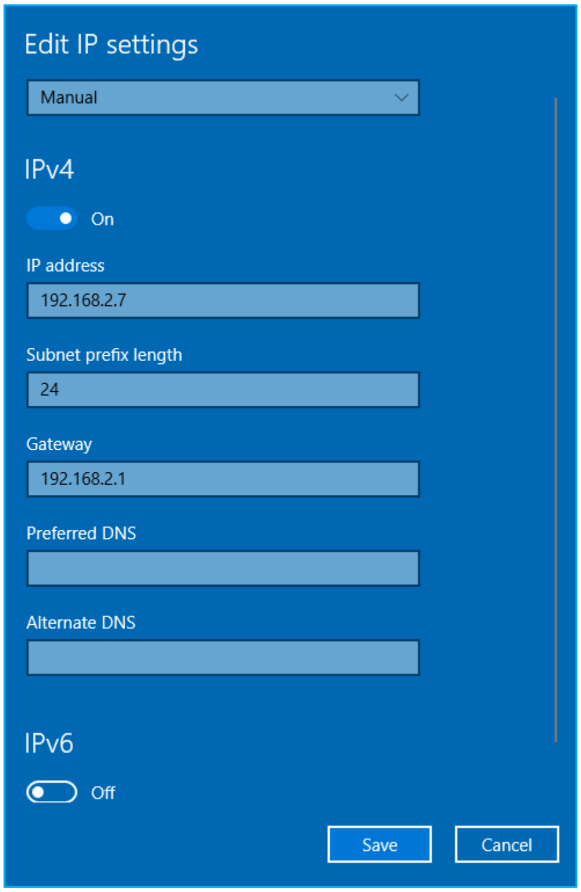

TrueView410
No Internet, secured

Figure 50 – TrueView515 WiFi network

5. Scroll down to "IP Settings" and click edit.
6. Change setting to "Manual".
7. Turn on IPv4.
8. Set the following settings (Figure 51):


Edit IP settings

Manual

IPv4

On

IP address
192.168.2.7

Subnet prefix length
24

Gateway
192.168.2.1

Preferred DNS

Alternate DNS

IPv6

Off

Figure 51 – IP Settings

9. Click save. You may need to restart your computer after making these changes.
10. You should now be able to connect to the APX-15.

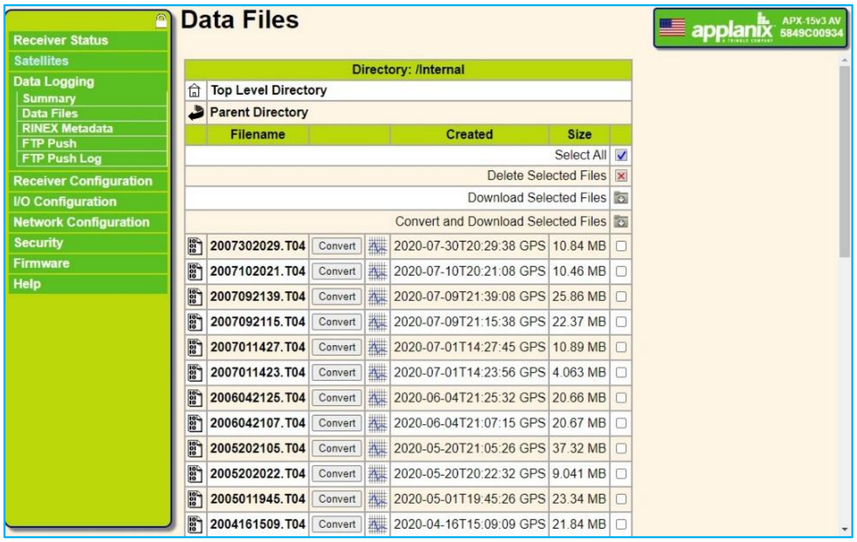
Log in to APX-15

The instructions below explain how log in to the APX-15. Be sure the True View Wi-Fi has been previously configured before attempting to connect to the APX-15.

1. Power on the True View 515 and wait for 30 seconds.
2. Connect to Trueview515 Wi-Fi network.
    a. If the TrueView515 Wi-Fi network has not been configured on your machine, see Configure True View Wi-fi.
3. Open a web browser (Google chrome, Explorer, Edge, etc.)
4. Enter 192.168.2.160 into the address bar.
    a. When Applanix screen is visible, enter username and password and press enter.
        i. UN: admin
        ii. PW: password
5. You should now be logged in to the APX-15.

Download T04 Files

1. After you Log in to APX-15, on the left side menu select **Data Logging -> Data Files -> Internal**
2. Select the applicable T04 file(s). T04 files are named YYMMDDHHMM.T04.
3. Select Download Selected Files.
4. Place the T04 file in the system folder of the corresponding cycle.



Data Files

Directory: /Internal

Top Level Directory

Parent Directory

Filename		Created	Size	
			Select All	☑
			Delete Selected Files	☒
			Download Selected Files	
			Convert and Download Selected Files	
2007302029.T04	Convert	2020-07-30T20:29:38 GPS	10.84 MB	☐
2007102021.T04	Convert	2020-07-10T20:21:08 GPS	10.46 MB	☐
2007092139.T04	Convert	2020-07-09T21:39:08 GPS	25.86 MB	☐
2007092115.T04	Convert	2020-07-09T21:15:38 GPS	22.37 MB	☐
2007011427.T04	Convert	2020-07-01T14:27:45 GPS	10.89 MB	☐
2007011423.T04	Convert	2020-07-01T14:23:56 GPS	4.063 MB	☐
2006042125.T04	Convert	2020-06-04T21:25:32 GPS	20.66 MB	☐
2006042107.T04	Convert	2020-06-04T21:07:15 GPS	20.67 MB	☐
2005202105.T04	Convert	2020-05-20T21:05:26 GPS	37.32 MB	☐
2005202022.T04	Convert	2020-05-20T20:22:32 GPS	9.041 MB	☐
2005011945.T04	Convert	2020-05-01T19:45:26 GPS	23.34 MB	☐
2004161509.T04	Convert	2020-04-16T15:09:09 GPS	21.84 MB	☐

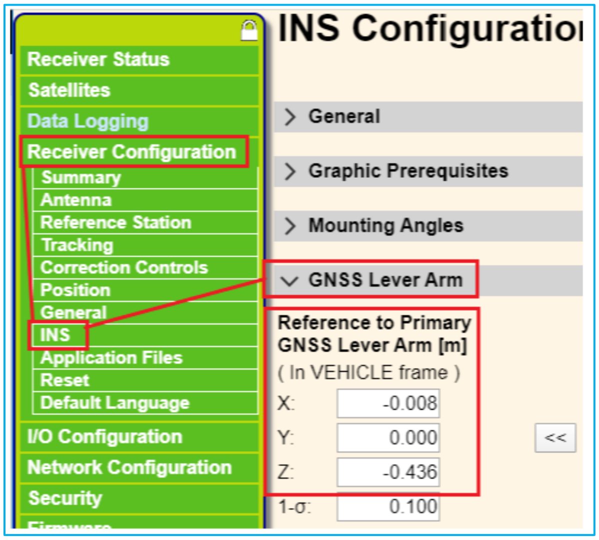
Figure 52 - APX Data Files

Measuring GNSS Lever Arm Offsets

To accurately position your LIDAR data, the position from the GNSS antenna must be transferred to the onboard positioning system. This is done by using lever arm offsets. If your system is mounted on an M600 with the GeoCue integration kit, the offsets have been preset by a GeoCue technician and should not need to be modified. If you are not using the GeoCue integration kit, or are installing the True View on a different aircraft, you will need to measure the offsets, then log in and enter them into the APX-15 (Figure 53), or use CCFSection6 – POS to update the values in the APX using the Core Configuration file (CCF).

The position is referenced to the APX-15, which is enclosed inside of the housing and cannot be physically measured to. Therefore, you must measure to a physical point on the True View frame, then add or subtract offsets to the APX-15. The instructions below explain the physical reference points to measure to, and the offsets between those points and the APX-15.

An assumption is made that the True View sensor will be aligned with the heading of the aircraft, and the aircraft will fly forward during data collection. The True View battery compartment is the front of the LIDAR sensor, so it should face the heading (front of aircraft).



Reference to Primary GNSS Lever Arm [m]
(In VEHICLE frame)
X: -0.008
Y: 0.000
Z: -0.436
1-σ: 0.100

Figure 53 – GNSS Lever Arm

Z Offset

The Z offset is the distance from the APX-15 to the GNSS antenna phase center in the up/down direction. If the GNSS antenna is above the APX-15, the offset is negative. If the antenna is below the APX-15, the offset is positive. The reference point for Z will be the top of the bottom aluminum mounting plate (Figure 54) where the cameras are attached. The APX-15 is 1.644cm above this plate.

A tip for measuring Z is to install the True View and GNSS antenna on the aircraft and place it on a table. Measure from the bottom of the antenna (Figure 55) to the table, then add 3.7cm to this measurement. 3.7cm is the offset from antenna phase center to the bottom of the antenna. Then measure up from the table to the aluminum plate. Subtract the distance from the table to the plate, then subtract 1.644cm to get the distance from antenna phase center to the APX-15.

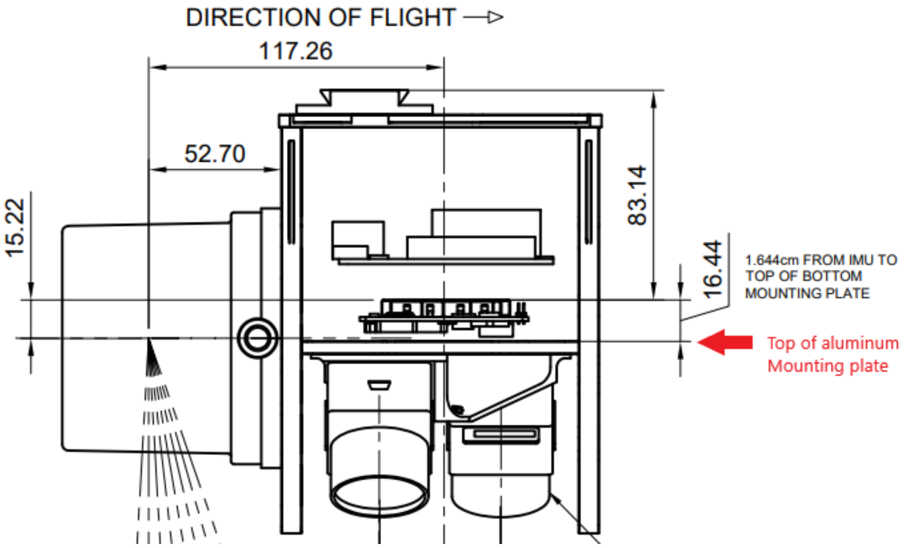


Figure 54 – True View 515 measurements

Figure 55 – Bottom of GNSS antenna

X Offset

The X offset is the distance from the APX-15 to the GNSS antenna, in the direction of the heading of the aircraft. If the antenna is forward of the APX 15, the X offset is positive. If the antenna is behind the APX-15, the offset is negative. The reference point is the rear aluminum mounting plate (Figure 56). Measure to the reference point and add or subtract 6.456cm to the offset to get the measurement from your antenna to the APX-15.

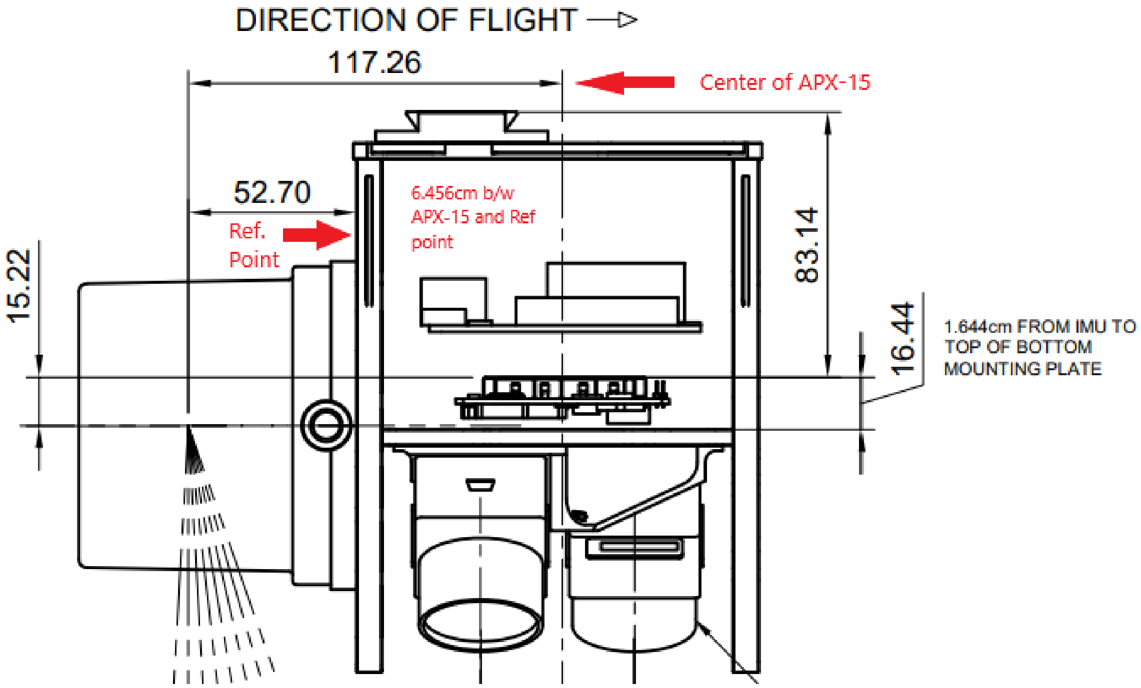


Figure 56 – Ture View 515 measurements

Y Offset

The Y offset is the distance from the APX-15 to the GNSS antenna, perpendicular to the heading of the aircraft. If you are standing behind the aircraft looking in the direction of the heading, the offset will be negative if the antenna is left of the centerline of the APX-15. The offset will be positive if the antenna is to the right of the centerline of the APX-15. The APX-15 is aligned with the centerline of the True View 515 aluminum mounting frame (Figure 57).

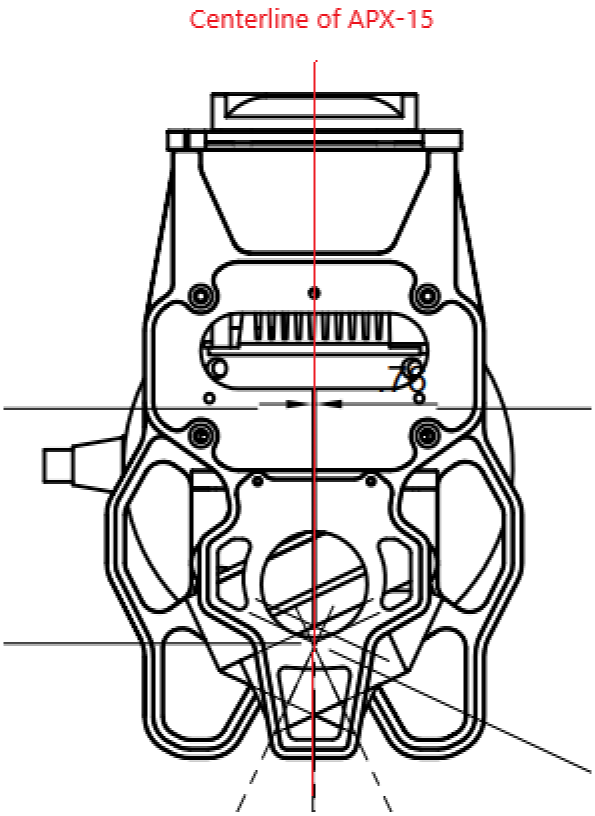


Figure 57 – APX-15 centerline

True View 3DIS/M600 Pro – Mission Checklist

Step	Action	Notes
1.	Setup base station and turn ON.	
2.	Check mission plan; modify if necessary.	
3.	Complete a safety briefing and flight plan review with field crew.	
4.	Install True View on drone mount. Lidar “top hat” at the back.	
5.	Verify Ronin red lever is fully tightened.	
6.	Verify safety cable attached between True View and drone rails.	
7.	Install fully charged True View battery pack. Do <u>not</u> turn the unit ON.	
8.	Check all drone GPS antennas upright and secured.	
9.	Verify True View CAT 6 and antenna cables are plugged into the unit and Controller box.	
10.	Verify parachute attached and set to locked position and attach clips.	
11.	Verify the True View UMS memory stick is inserted.	
12.	Move drone/True View to take-off location.	
13.	Unfold and secure drone arms, lock in place.	
14.	Unfold drone propellers, visually inspecting for any problems.	
15.	Install fully charged drone batteries. Do <u>not</u> turn the unit ON.	
16.	Double-check all cabling is secure and won’t interfere with the props.	
17.	Remove True View lens caps; clean lenses/sensor if necessary.	
18.	Power on True View using main power button located just above the battery pack (door must be open to toggle).	
19.	Monitor the True View Controller status lights waiting for: 1. PWR - Solid Green/Yellow/Red 2. GNSS - Solid Green – Valid date/time stamp received. 3. SYS – Flashing Green - True View has initialized, ready for takeoff.	
20.	Turn on drone controller then power on the drone as per normal operations.	
21.	Wait for drone to initialize and verify there are no errors showing.	
22.	Parachute LED is solid blue (If Applicable)	
23.	Safety Check: Area clear of individuals and flight space is clear to fly.	
24.	Manually take-off and ascend to mission altitude. Verify good LOS to drone and planned flight area.	
25.	Manually preform IMU in-air heading alignment maneuver.	
26.	Initiate mission via flight planning tool.	
27.	Monitor drone/True View during flight as per normal operations.	
28.	Upon completion of last flight line in the mission plan, allow the drone to start the Return to Home sequence, but do not let it descend at the Home point. Toggle drone to manual control (P->A->P) instead.	
29.	Manually preform IMU in-air heading alignment maneuver again.	
30.	Ensure landing area is still clear; complete the landing via Return to Home or manually as preferred.	
31.	After landing, turn off drone.	

32.	Verify SYS light is flashing yellow (transferring data).	
33.	Monitor the True View SYS LED; flashing Yellow means data is being copied to USM; solid Yellow data copy is complete. Wait for solid Yellow.	
34.	Power True View OFF using main power switch in battery compartment (door must be open to toggle). Never power OFF while SYS LED is still blinking indicating a copy operation is in progress; data loss will occur.	
35.	Remove USM memory stick and pass to post-processing.	

Hardware Maintenance

Dust Filter

Your True View 3DIS has a built-in fan to help to cool the internal processors. A filter is needed to prevent dust from entering the system and this filter will need to be changed periodically. A spare filter is included with your sensor spare parts. The steps below explain how to change this filter.

1. First locate the dust cover on your sensor. For True View 400 and 500 series, the dust cover is located on top of the sensor, beneath the aluminum mounting frame (Figure 58). For True View 600 Series, the dust cover is located on the front of the sensor above the battery compartment (Figure 59)

Figure 58 - True View 400/500 Series

Figure 59 - True View 600 Series

2. Remove the dust cover by placing the thumb on the thumb indentation (Figure 60) of the dust cover, apply upward pressure, then lift out to remove.

Figure 60

3. Remove the old filter from the dust cover.
4. Replace the old filter with a new filter (Figure 61).
    a. It is advised to replace this filter with a new filter, but it can be washed and used again if you are in immediate need. Be sure it is completely dry before re-installing. Do not use a wet filter or moisture could be pulled in by the fan and cause damage to the processors.

Figure 61

5. Re-Install the dust cover.

FAQ

- **Question** – What is the max distance I can setup my base station from the Flight area?

  Answer – It is recommended that the base station be within 20 kilometers (12 miles) of the flight area. It is very important for the base to be in an open flat area if possible. Placing the base station close to buildings, trees, or vertical relief can cause issues with PPK processing and accuracy. The base station should be configured to record at 1Hz.

- **Question** - What are the base station requirements for the True View 3DIS?

  Answer - The minimum requirement base station must include:

  - Static observations recorded to some media
  - Dual frequency L1/L2
  - Ability to transform the observation file to the RINEX format

- **Question** - Which GNSS Constellations are used by the True View 3DIS?

  Answer - The Position and Orientation System (POS) and supplied GNSS antenna simultaneously supports:

  - (NAVSTAR) Global Positioning System (GPS - USA)
  - GLONASS (Russia)
  - BeiDou (China)
  - Galileo (European Union)

Support

Our searchable support knowledge base contains information on workflows, tips, hints, and probable resolutions to error messages or commonly encountered situations.

https://support.geocue.com/

Normal support business hours are **Monday - Friday, 8 AM — 5 PM** USA Central Time.

Our GeoCue Support website contains general workflow information, in addition to specific issue and error messages that you may encounter. Click on the link and search for information contained in the knowledge base.

If a support request is sent during business hours a representative will typically get back to you within 4 hours. If received after hours, a response will be sent the following day. To speed response time please include the following information in your request:

- Contact information - please include e-mail address and phone number
- Company name
- Product name and version number
- True View Model and Serial Number

If your request includes problems pertaining to a specific error message, please include a screen shot of the error message.

For hardware and software support contact: support@geocue.com