



2020

# D-0020 iLevil 3 AP Installation Instructions

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<b>iLevil 3 AP Installation Instructions</b>						
<b>Effective Date</b>	8/11/2021					Page 2 of 14
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020	

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<b>iLevil 3 AP Installation Instructions</b>				
<b>Effective Date</b>	8/11/2021	Page 3 of 14		
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b> D-0020

**AMENDMENT RECORD**

This procedure is reviewed to ensure its continuing relevance to the systems and processes that it describes. A record of contextual additions or mission is given below:

<b>Revision No.</b>	<b>Date</b>	<b>Responsible Person</b>	<b>Description of Change</b>
1	8/11/2021	Ananda Leon	Initial release

**Warranty**

Levil Aviation warrants this product to the original purchaser to be free from defects in material and workmanship for a period of one year from the date of the original purchase. The following are not covered: software, damage resulting from accident, neglect, misuse, fire, or flood, improper voltage supply, or failure to follow operational guidelines supplied with this product. An extended warranty is available for purchase on our website.

Please register your product online at: [www.levilaviation.com](http://www.levilaviation.com)

IN NO EVENT SHALL LEVIL AVIATION BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.



<b>iLevil 3 AP Installation Instructions</b>						
<b>Effective Date</b>	8/11/2021					Page 4 of 14
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020	

## 1. Introduction

This document is a guideline for installing the necessary components. For complete operating guidelines, refer to the iLevil 3 AP Pilot's Guide available online.

The iLevil 3 AP is an all-in-one avionics solution, integrating several sensor modules to provide ADS-B weather and traffic information, GPS navigation, AHRS, and Data Recording. The Autopilot feature uses the AHRS data to determine aircraft attitude and controls small trim tabs to maintain wings level or maneuver the aircraft smoothly to desired heading and altitude. The iLevil AP can be used as a portable or permanent-mount instrument. It integrates static and dynamic pressure transducers, which make available accurate indicated airspeed and pressure altitude obtained from the pitot-static system, ultimately offering a "six-pack" solution displayed on a tablet. The iLevil AP facilitates installation with remote GPS and ADS-B antennas and power inputs for 12V and 28V systems. Compatibility with a wide range of Apps and mobile devices makes the AP the ideal all-in-one solution for a wide variety of aircraft where weight, space, and cost are important. The iLevil 3 AP features 3 serial ports that can be used for data transfer between tablets and other avionics in the cockpit. The new Data Recording feature allows you to insert an SD Card, record all of your flight data (position, airspeed, altitude, attitude, etc.), and display the information on various platforms.

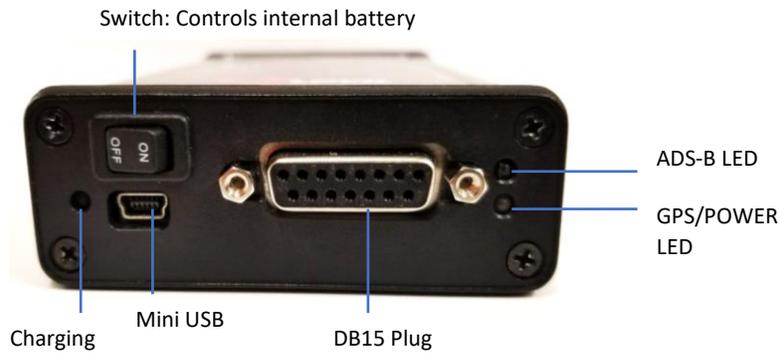
The iLevil AP is intended for:

- Experimental and Light-Sport aircraft
- Aircraft that do not exceed 230 Kts
- Wireless connection with an iPad/iPhone or Levil's control display
- Primary or backup instrumentation for VFR only
- AutoPilot capabilities on smooth air (minimal turbulence)
- AutoPilot capabilities during cruise (no Approaches or slow flight)

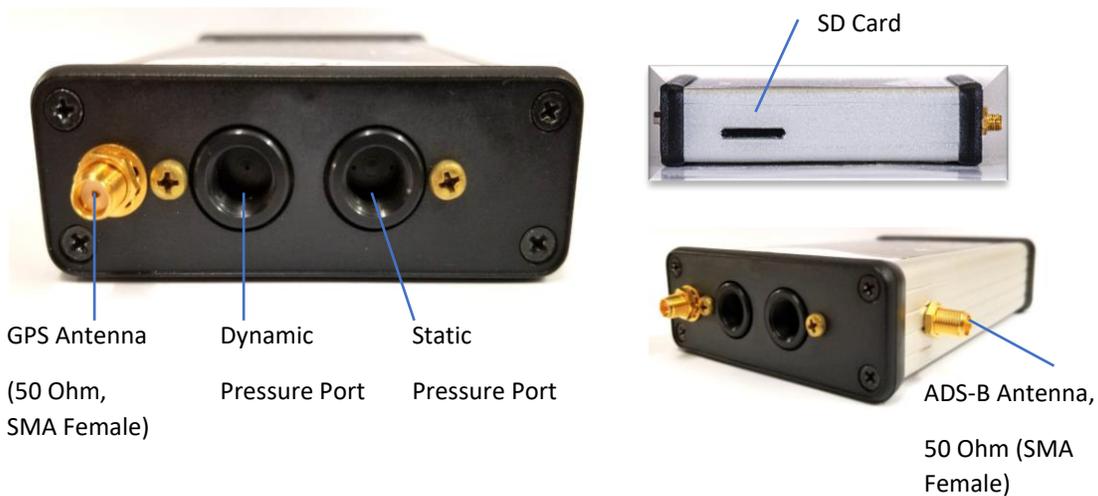
iLevil 3 AP Installation Instructions					
Effective Date	8/11/2021	Page 5 of 14			
Document No.	45	Revision	1	Code Number	D-0020

## 2. Installation

### I. Layout



**Figure 1. iLevil 3 AP Front view**



**Figure 2. iLevil 3 AP Back and side view**

### II. Charge before use

When using the iLevil 3 AP as a portable device, you must first charge the internal batteries using a USB cable. The LED next to the USB port indicates when the device is charging.



iLevil 3 AP Installation Instructions					
Effective Date	8/11/2021	Page 6 of 14			
Document No.	45	Revision	1	Code Number	D-0020

When the LED goes off, the internal battery is fully charged. This process can take up to 4 hours. A fully charged battery supplies power for 3.7 hours. When connected to aircraft power (12-28V) through the DB15 Plug (PIN 15), the batteries will be charged automatically with the external power.

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*NOTE:*

*DO NOT use AutoPilot features when working solely on battery power. If the servos are directly connected to the iLevil AP for power, the iLevil must be connected to an external source (12V or USB power) since the batteries do not have enough capacity to control the servos.*

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### III. Positioning

- Align the airplane icon on the iLevil's top label with the roll axis of your aircraft. It does not have to be centerline but parallel with the roll axis.



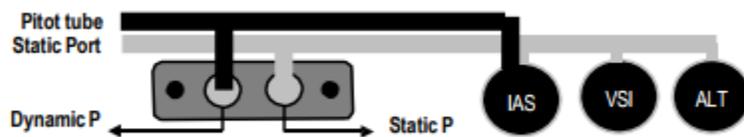
- ON/OFF switch should face the back of the aircraft.
- Pressure ports and Antenna connectors should face the front.
- Install iLevil on a surface that WILL BE LEVEL with the horizon DURING un-accelerated, straight and level flight. It is ok if the surface is not level on the ground (i.e., in tail draggers).
- For optimal magnetic heading, install iLevil as far away from ferrous metals as possible. (i.e., magnetic compass, cell phones, steel airframe)
- Caging capability is available to offset roll and pitch errors after installation, using our proprietary software AHRS Utility App (Apple devices)
- The structure must be able to sustain a 6G pull test in the vertical axis when installed. This is equivalent to a 0.75lbs x 6Gs = 4.5lb of pull. Side forces should be at least 2lbs of pull.
- When choosing a location to install the iLevil 3 AP, consider the following:
  - The iLevil must not obstruct the pilot's view or any avionics
  - Install away from the landing lights wiring and instruments such as the magnetic compass that may affect the iLevil's internal heading gyro
  - Do not install within an enclosed container to allow WiFi signal to propagate

<b>iLevil 3 AP Installation Instructions</b>					
<b>Effective Date</b>	8/11/2021	Page 7 of 14			
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020

- The iLevil connects with external systems (the pitot-static, a GPS antenna, and an ADS-B antenna), which need to be considered when choosing an installation location
- If installed on a surface that has significant vibration, it is recommended to dampen the vibration by using a cushion between the surface and the iLevil brackets

#### IV. Pitot-Static Connection

- To connect to the pitot-static system, you need two 1/8 NPT hose fittings for your specific hose size.
- Connect the static line to the "static P" port and the dynamic line to the "Dynamic D" port. Teflon is recommended when installing the fittings to prevent any leaks in the system.



**Figure 3. Pitot-static connection diagram**

- A leak check must be performed after modifying the Pitot-static system of the aircraft. The new modification must not interfere with the performance of existing avionics connected to the same line

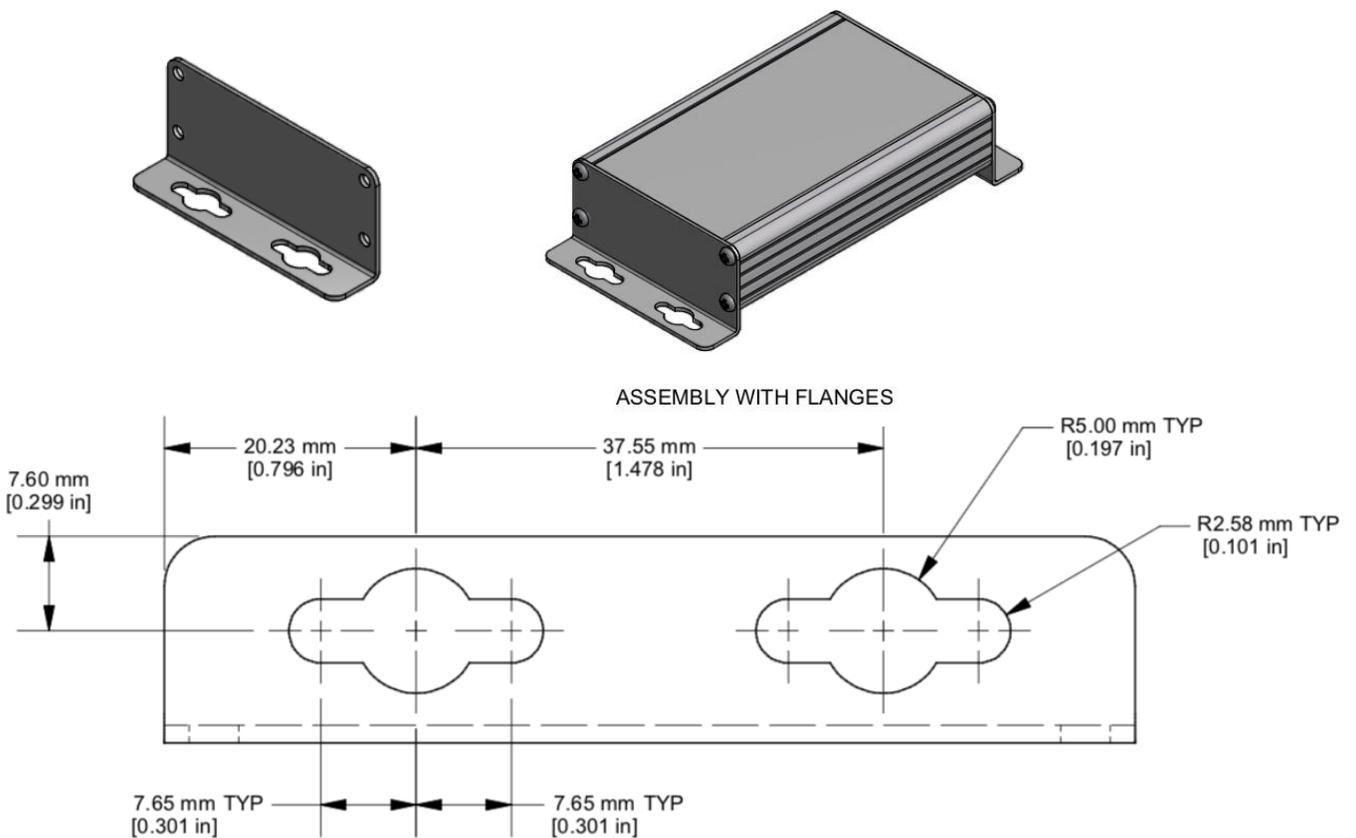
#### V. Antennas

- Attach the supplied ADS-B antenna and GPS antenna. See the top label for reference or refer to Figure 2 on this document. When using antennas other than the ones provided, verify the required specifications for each:
  - GPS: Active 3.3V antennas recommended, tuned for the proper frequency (1575.42 MHz) and match for 50 Ohm Impedance
  - ADSB: Tuned for 978 MHz and/or 1090 MHz
- Install the end of the GPS antenna with a clear view of the sky
- Install the ADS-B antenna with the line of sight to ground towers and nearby aircraft.

<b>iLevil 3 AP Installation Instructions</b>					
<b>Effective Date</b>	8/11/2021				Page 8 of 14
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020

## VI. Installation Brackets

- To secure the iLevil after locating a suitable surface, you may use the flanges supplied. To use the flange, remove the front and back screws that hold the forward and rear black lids. Then, without removing the lids, install the flanges using the same screws provided.
- The structure must be able to sustain a 6G pull test in the vertical axis when installed. This is equivalent to a 0.75lbs x 6Gs = 4.5lb of pull. Side forces should be at least 2lbs of pull.



**Figure 3. iLevil 3 AP Installation Bracket**

iLevil 3 AP Installation Instructions					
Effective Date	8/11/2021				Page 9 of 14
Document No.	45	Revision	1	Code Number	D-0020

## VII. DB15 Pin Description

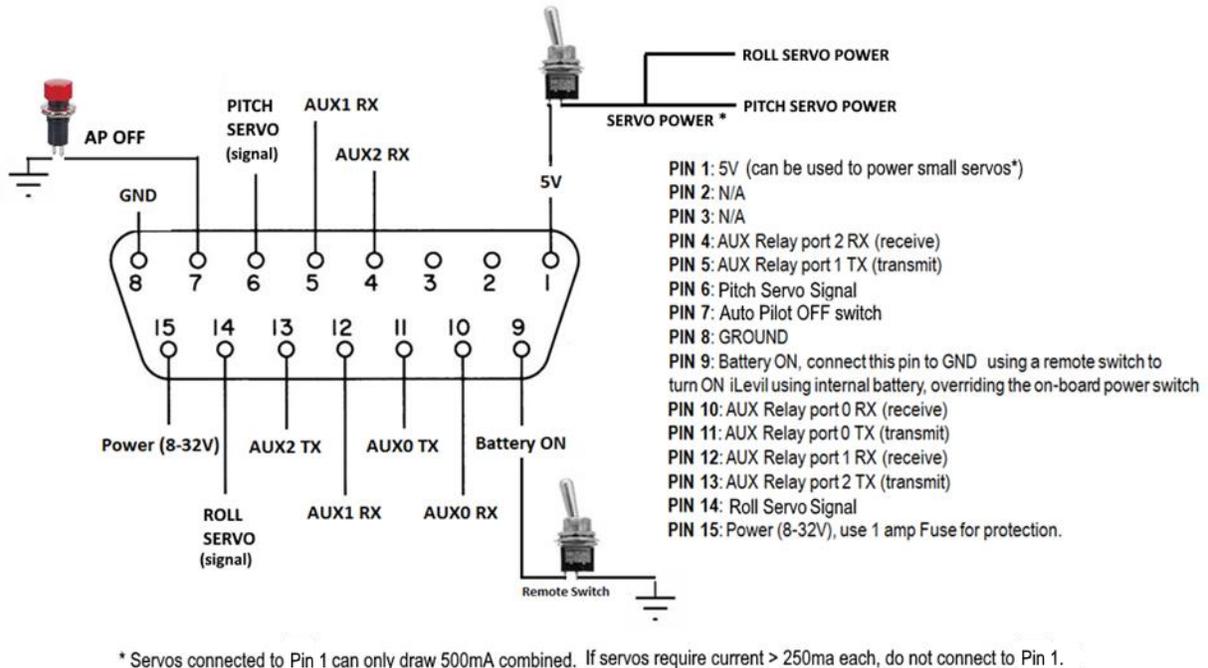


Figure 4. iLevil 3 AP Pin Description

## VIII. Power Supply

### If using an external power supply (DB15 connector):

1. Connect PIN8 to GND.
2. Connect PIN15 to aircraft power (8-32V)
3. Install inline fuse of 1 amp between device and power supply
4. Make sure the ON/OFF switch is OFF. Leaving the switch ON will cause the battery to be continuously drained after the flight and then recharged on the next flight, reducing battery life.
5. For power emergencies, if the battery ON/OFF switch on the iLevil is not easily accessible, it is recommended to install a remote switch that overrides the ON/OFF switch on the iLevil. A normally open switch must connect PIN9 (Remote Switch) to GND, as seen in Figure 4 above. When Pin9 is grounded, it will Turn ON the iLevil using the internal batteries. The switch can be installed on the panel for easy access.

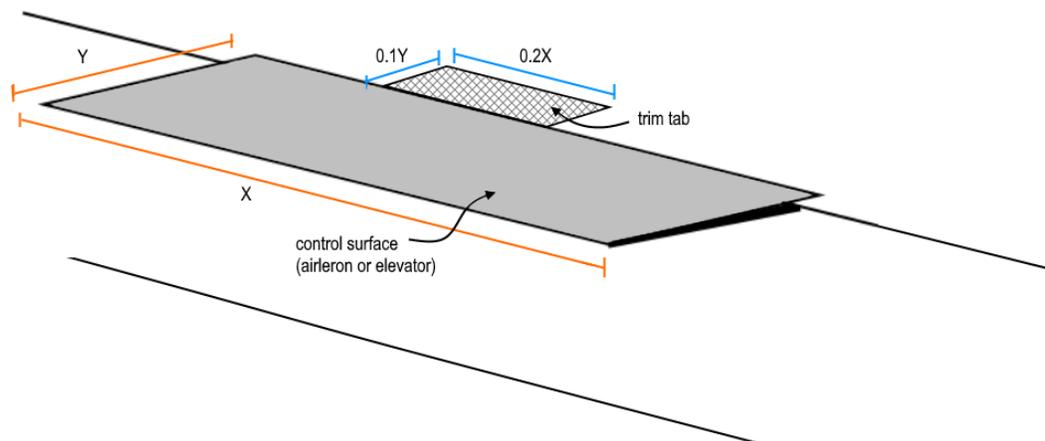
iLevil 3 AP Installation Instructions					
Effective Date	8/11/2021	Page 10 of 14			
Document No.	45	Revision	1	Code Number	D-0020

## IX. Trim tabs

### 1. Size

Trim sizing is important for the effectiveness of the autopilot. Before activating the Auto-pilot functionalities on the AP, the pilot must verify the responsiveness of the trim tabs installed. In addition, the aircraft must be able to be trimmed to all orientations (pitch up - down, roll left-right) using the trim tabs, yet must be able to be overpowered by the pilot's input on the controls.

As a rule of thumb, we recommend the length of the roll trim tab to be 20% that of the aileron and the width of the trim tab to be 10% the width of the aileron. The same applies to the pitch trim tab.



**Figure 5. Trim tab size guide**

The size relations above can vary depending on the cruising speed of each aircraft. For example, aircraft cruising above 180 kts might need a smaller trim size, and vice versa for aircraft cruising at speeds lower than 80 kts.

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*NOTE: iLevil AP is NOT designed to control existing trim tabs.*

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## iLevil 3 AP Installation Instructions

<b>Effective Date</b>	8/11/2021	Page 11 of 14			
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020

### 2. Location

The best position for the trim tab is the center of the aileron for the roll trim and the center of the elevator for the pitch trim. This is where the airflow is most effective and will yield better performance.

### 3. Balancing

Both the aileron and elevator **MUST** be balanced after installing your trim-tab and servo components. If you are manufacturing your own trim-tabs, they must be balanced as well to prevent any flutter. If your iLevil AP bundle included Trim Tabs, and the manufacturer is Aircraft Automation, these trim-tabs have been already balanced, and only the aileron and elevator must be balanced.

## X. AP Servos

### 1. Type

Compatible servos include RC servos with PWM input. Pulses 1 to 2 ms every 20 ms. It is recommended to use metal gears and waterproof housing.

### 2. Power

The iLevil AP has a maximum output of 500 mA at 5V on Pin 5. Therefore, you can use this pin to provide power to the servos if the combined power consumption of both servos does not exceed this limit.

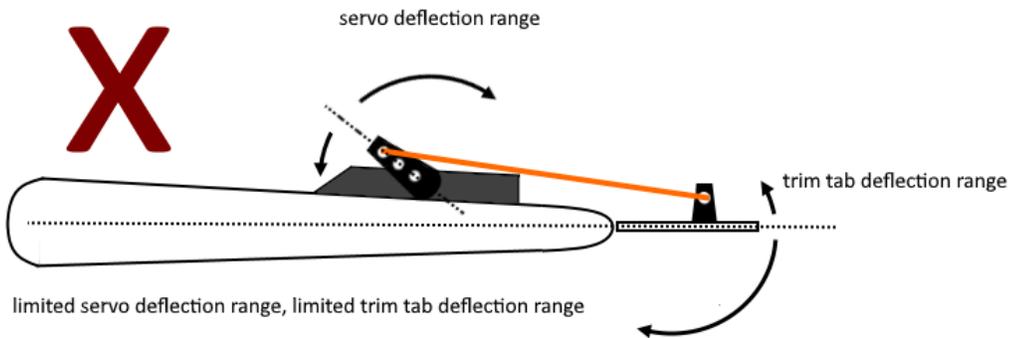
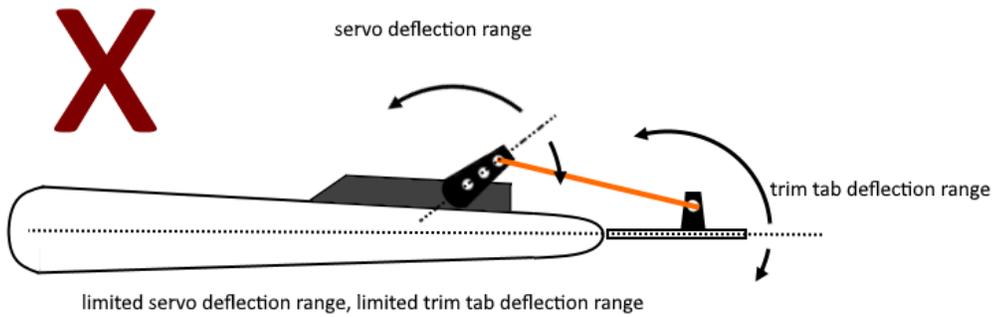
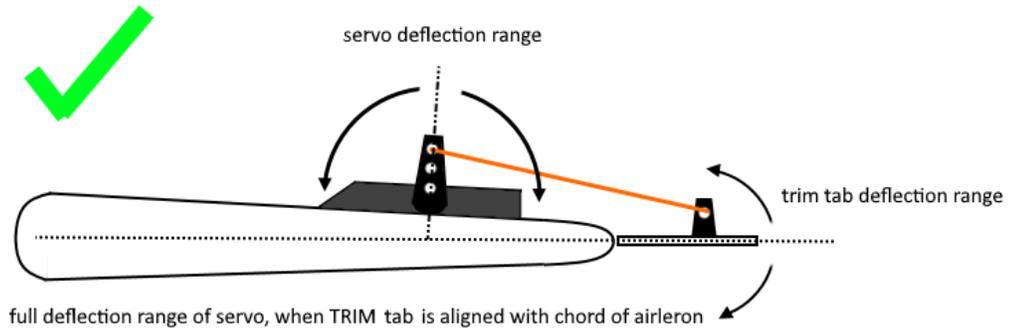
If you require more powerful servos, you must supply the voltage from an external source.

### 3. Installation

When installing your servo and trim tab components, it is important to align the pushrod connecting the trim-tab and control horn of the servo to obtain maximum deflection on both sides.

## iLevel 3 AP Installation Instructions

<b>Effective Date</b>	8/11/2021	Page 12 of 14			
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020





## iLevil 3 AP Installation Instructions

<b>Effective Date</b>	8/11/2021	Page 13 of 14			
<b>Document No.</b>	45	<b>Revision</b>	1	<b>Code Number</b>	D-0020

### 4. Direction

Before flight, depending on your servo installation and orientation, the iLevil AP MUST be configured with the proper servo direction.

As a rule, if the trim tab moves up, the wing or tail will move up. Thus, the servo direction will change depending on which aileron the servo is installed (left or right).

Using the Levil Aviation App and the iLevil AP Pilot's Guide, you can configure the iLevil AP's registry for both pitch and roll servos to match the following criteria:

#### Roll servo:

- If the servo is installed on the LEFT aileron, your trim-tab should move down when you trim LEFT. (If it doesn't, change the servo direction on the App)
- If the servo is installed on the LEFT aileron, when you trim RIGHT, your trim-tab should move up
- If the servo is installed on the RIGHT aileron, your trim-tab should move up when you trim LEFT. (If it doesn't, change the servo direction on the App)
- If the servo is installed on the RIGHT aileron, when you trim RIGHT, your trim-tab should move down

#### Pitch servo:

- When you trim UP, your trim-tab should move down. (If it doesn't, change the servo direction on the App)
- When you trim DOWN, your trim-tab should move up

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#### NOTE:

*-For Canard-type aircraft, the pitch direction is reversed.*

*- iLevil AP is not designed for V-tail aircraft*

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iLevil 3 AP Installation Instructions					
Effective Date	8/11/2021	Page 14 of 14			
Document No.	45	Revision	1	Code Number	D-0020

### 3. AUX Relay Ports

These are standard serial ports RS232 that can be used to extract data such as ADS-B, GPS, AHRS, etc. When using any Transmit or Receive Pins, make sure there is a common ground between the iLevil and the external Hardware.

### 4. Operating Limitations

- a) The iLevil 3 AP system is not a required system and may not be used as a substitution for the certificated aircraft system.
- b) No operational credit may be taken for the installation of the iLevil 3 AP system.
- c) No operational credit may be taken for such items as reduced approach speed and shorter landing distances.
- d) The iLevil 3 AP can only report speeds higher than 30 kts and of up to 320 kt.
- e) Although the iLevil 3 AP transmits, AHRS Data is not to be used as a substitution for the certified AHRS instrumentation of the airplane. The AHRS supplied by the iLevil 3 AP is to be used only as supplemental information to the pilot.
- f) Levil Aviation does not provide or endorse any carry-on device that displays the information sent by the iLevil 3 AP.
- g) Ferrous Materials near the iLevil 3 AP may affect the compass reading.
- h) When transporting or temporarily storing in an airplane or vehicle, the temperature range should be no less than 20 ° F (-12 ° C) and not more than 150 ° F (65 ° C)
- i) Storing our device at temperatures higher than 170 ° F for extended periods of time (more than 2 hrs.) may cause damage to the battery and possible fire.
- j) DO NOT disassemble, remodel, drop or modify the iLevil 3 AP as this will invalidate the unit's warranty.
- k) Do not use the iLevil 3 AP as an anti-collision system. Not all traffic is displayed using ADS-B in. Aircraft not currently equipped with ADS-B Out will not be detectable by the iLevil 3 AP.
- l) Levil Aviation does not provide a display for this unit. Any display the pilot chooses to integrate Should comply with FAA certification requirements or qualify as a carry-on device. Under no circumstances should any display be placed in any way that it will obstruct the pilot's views of the aircraft flight instruments or the external view, which may be detrimental to the ability of the pilot to fight the aircraft.