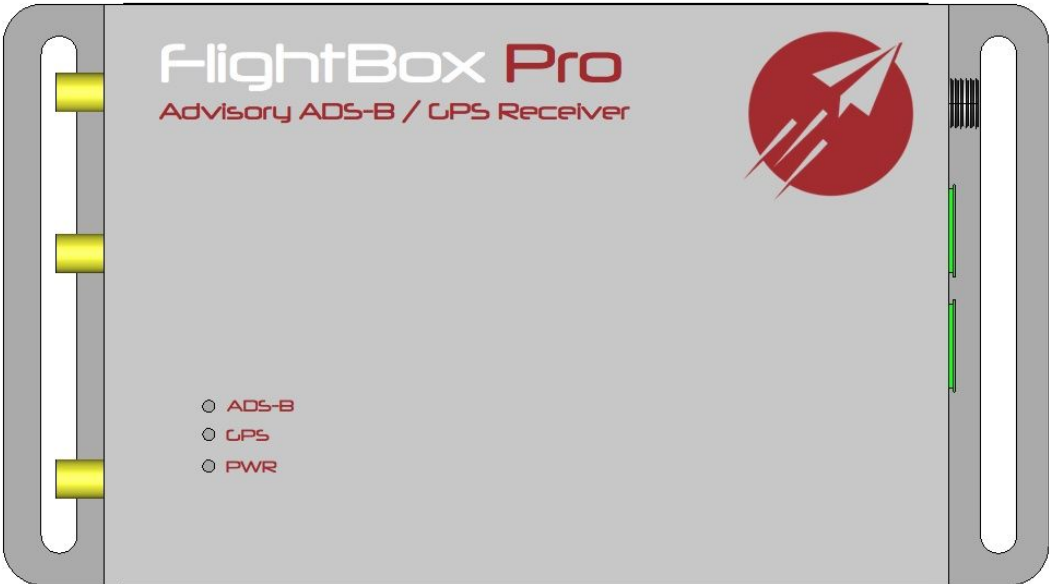


# FlightBox Pro Installation Manual

Revision F - Covers FlightBox Pro v2 (FB1XP2)  
8/27/2018



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## Forward

This installation manual provides general guidelines for the installation of FlightBox pro in general aviation aircraft. The installation must be conducted in accordance with current regulations, guidance, and industry best practices. Due to the wide variation in aircraft, this document only provides a general overview. For additional information, please contact Open Flight Solutions.

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## 1. Description

### 1.1 Intended Function

FlightBox Pro receives ADS-B and GPS signals and translates them into a standard format (GDL-90) usable by most EFB applications to display advisory weather, traffic, and airspace information. In addition, FlightBox collects and forwards barometric, inertial, magnetic, and position data which the application can use to calculate and display advisory location, altitude, and attitude information.

### 1.2 Model and Part Number

FlightBox FB1XP2

FlightBox Pro Advisory ADS-B Receiver v2

## 2. System Parameters

Parameter	Value
<b>Physical</b>	
Dimensions (approximate)	6" x 4" x 2"
Weight	10 oz - 12 oz
Cooling	Integrated 25 mm fan
<b>Electrical</b>	
Input Voltage	14v or 28v
Minimum Input Voltage	12v
Maximum Input Voltage	36v
Current Draw	0.5 A nominal / 0.75 A max (at 13.8v)
Circuit Breaker / Fuse	1 A
<b>Environmental</b>	
Storage High Temperature	+85° C



Storage Low Temperature	-55° C
Operating High Temperature	+65° C
Operating Low Temperature	-20° C
Humidity	10% - 90% Non-Condensing
<b>Wireless 802.11 (Wifi)</b>	
Transmit power	<= 10mW EIRP

### 3. Restrictions and Limitations

This system has been approved for installation in aircraft certified under Part 23 and previous (CAR3) per FAA Policy PS-AIR-21.8-1602 (NORSEE). It is not approved for installation in Part 25 aircraft or Part 27 or Part 29 rotorcraft.

Installation of the FlightBox Pro system is supplemental only; it is not intended as a replacement for or modification to an existing, approved, or required system.

This system *may* be eligible for installation as a minor alteration as it has no appreciable effect on weight, balance, structural strength, reliability, operating characteristics, or other characteristics affecting the airworthiness of the aircraft it is installed in. Ultimate determination of the installation category must be made by the installer.

### 4. Instructions for Continued Maintenance and Operation

FlightBox Pro requires no calibration or maintenance. If the unit fails, return it to Open Flight Solutions for repair.

### 5. Service Facilities

This system can be installed by any FAA approved repair station or certificated A&P mechanic. In the event of a system failure it must be returned to Open Flight Solutions for repair. Failure to adhere to this policy will void the warranty. (See the Warranty section below for details.)



## 6. Recommended Installation Locations

The FlightBox Pro should be installed inside the cabin of the aircraft. Installation behind / beneath the instrument panel is acceptable, as is installation in an avionics bay. Alternate locations include the empennage, storage lockers, or other locations where the device can be securely mounted to secondary structure of the aircraft.

## 7. Installation Instructions

Use the following procedure to install the FlightBox Pro:

### 7.1 Mounting Location

1. Select a location where the system can be mounted securely, does not interfere with any existing aircraft systems, and does not block the pilot's view in any way.
  - a. Be mindful of the ventilation requirements. Do not block the fan or the vents on the FlightBox Pro case.
  - b. Select a location that will provide ample space to run the power and antenna connections.
  - c. Make sure that one axis of the FlightBox case can be aligned to within 1° of either major axis of the airframe. This is required for optimal AHRS output.
2. To avoid having to dismount the system, please note that you should set the system orientation (the "forward" / "direction of flight" for the AHRS) prior to mounting the system. Please see the User Guide for details on setting the orientation.

### 7.2 Electrical

1. Install a 1 amp circuit breaker on a non-essential buss. This will ensure that in the event of a loss of power, the FlightBox Pro does not drain the aircraft battery.
  - a. If no discrete non-essential buss is available, make use of a circuit breaker that can be manually disabled by the user (e.g. Klixon-style).
2. Connect the power input (+ / red lead) on the FlightBox Pro wiring harness to the 14v or 28v output from the circuit breaker using 20 gauge MIL-W- 22759/16 or equivalent wire.
3. Connect the ground (- / black) on the FlightBox pro to a suitable point on the aircraft structure or to a grounding buss using 20 gauge MIL-W- 22759/16 or equivalent wire.
4. Insert the barrel connector on the wiring harness into the barrel jack on the FlightBox Pro and tighten the locking collar.



5. All wiring must be completed in accordance with AC 43.13-1B, 2A, acceptable methods, techniques and practices.

## 7.3 Antennas

### 7.3.1 ADS-B Antennas

Installers have several ADS-B antenna options. The FlightBox Pro can be connected to a set of tuned ADS-B antennas built for mounting inside the aircraft cabin (“interior” antennas) or to a set of antennas built for mounting on the aircraft’s belly and/or dorsal structure.

#### 7.3.1.1 Interior ADS-B Antennas

Interior antennas must be mounted such that they have a line-of-sight link to the source of the ADS-B transmissions. For composite aircraft (without integrated static mesh) and for fabric covered aircraft, this can be virtually anywhere in the cabin. For aluminum aircraft the mounting location will typically need to be in a window or on the glare shield.

The Open Flight Solutions remote antenna mount kit allows the antennas to be mounted either using suction cups or permanent fasteners. The mount and antennas should be located such that they do not obscure the pilot’s field of view.

##### 7.3.1.1.1 Installation

- 1) Assemble the remote antenna mount kit. You may substitute more permanent hardware for the suction cups if desired. For assistance see the video tutorial available here: <https://www.openflightsolutions.com/remote-antenna-kit-tutorial/>
- 2) Connect the antenna marked “978” to the SMA jack on the FlightBox Pro marked “978” (the center SMA jack on the left-hand side of the box) using the included SMA male-to-female extension cable or a similar cable fabricated for the installation.
- 3) Connect the antenna marked “1090” to the SMA jack on the FlightBox Pro marked “1090” (the 3rd SMA jack on the left-hand side of the box) using the included SMA male-to-female extension cable or a similar cable fabricated for the installation.

#### 7.3.1.2 Exterior ADS-B Antennas

Exterior antenna options include any L-band aircraft antenna. The most common option is a traditional DME / Transponder “stick and ball” antenna mounted on the belly of the aircraft. Other options include various L-band blade antennas.

A single antenna may be used with a splitter / combiner dividing the signal to the two ADS-B antenna ports. It should be noted that this will decrease the available signal by approximately 3.3 dBi. This will reduce the reception range for both the 1090 and 978 MHz frequencies.



Installers may also chose to use two independent L-band antennas. This configuration provides the maximum possible signal on each band.

**CAUTION:** Externally mounted antennas must be located at least 36 inches and preferably 48+ inches from any L-band transmission source. This includes Mode A / C / S transponders and DME systems. Failure to mount the external receiver antenna at an appropriate distance from a transmitting antenna will damage the receiver and void your warranty.

**WARNING:** Under no circumstances may the FlightBox be connected to an antenna which is also used for transmission. This violates the separation requirements for NORSEE equipment and will destroy the receiver.

FlightBox Pro uses SMA (*not* RP-SMA) connectors. The typical installation will require coaxial cable with an SMA male connector at the FlightBox end and a connector compatible with the L-band antenna (frequently BNC male) at the antenna end. SMA to BNC adapters are available from various vendors.

#### 7.3.1.2.1 Installation

- 1) Connect the FlightBox Pro's SMA port marked "978" to the L-band antenna intended for receiving UAT signals. This should generally be mounted on the belly of the aircraft to facilitate better reception from ground towers.
- 2) Connect the FlightBox Pro's SMA port marked "1090" to the L-band antenna intended for receiving 1090-ES signals. This may be mounted on either the belly or the dorsal (top) of the aircraft.

#### 7.3.2 GPS Installation

Each FlightBox Pro v2 system includes a GPS receiver module suitable for mounting on the glare shield or elsewhere on the aircraft.

The included USB GPS receiver module should be securely mounted on the glare shield or in another interior location with a clear view of the sky.

If the glare shield is made of a radio-transparent material (composite, fiberboard, etc.) the GPS receiver module may be mounted below the glare shield on secondary structure.

The mounting can be accomplished using 3M Dual Lock fastener material, velcro or similar.

The cable should be connected to one of the two available USB ports on the FlightBox. Any excess cable should be bundled and tied off. Cutting the cable will violate the warranty.



Note that the GPS receiver module includes a magnet for mounting on metal surfaces. Be sure to keep the antenna away from magnetic compasses. The magnet can be removed by removing the sticker on the bottom and taking the magnet out of the small circular metal tray.

#### 7.3.2.1.1 Installation

- 1) Secure the GPS receiver module on the glare shield or in another location where it has a clear view of the sky.
- 2) Connect the USB plug from the GPS antenna to an available USB jack on the FlightBox Pro.

## 7.4 Securing The System

1. Secure the FlightBox Pro to secondary aircraft structure using AN3-3A fasteners in accordance with AC 43.13-1B. You may wish to create a paper pattern to properly locate the holes. This can be done by tracing the FlightBox Pro case.

## 8. Post-Installation Checks

Following installation, use the following procedure to verify that the FlightBox Pro is operating:

1. Prior to connecting the FlightBox Pro, conduct a continuity check of the wiring added during the installation.
2. Prior to connecting the FlightBox Pro, conduct a power test (voltage) of the wiring added during the installation.
3. Power on the aircraft using the master switch.
4. Close the breaker that feeds the FlightBox Pro.
5. Observe the LED indicators on the FlightBox Pro. The green power indicator should come on immediately. Within three minutes the orange GPS indicator should begin blinking, indicating that the GPS is seeking satellites. (If it achieves a lock the indicator will stop blinking and be solid.) The blue indicator may or may not light depending on the system's ability to receive ADS-B signals.

Refer to the FlightBox Pro User's Guide for further information.

**NOTE:** The cooling fan is controlled by an onboard thermostat and may not immediately spin up depending on the temperature.





## 9. Maintenance

FlightBox Pro does not require any scheduled maintenance.

## 10. Weight and Balance

The FlightBox Pro and its associated antennas weigh approximately 10 oz. There is negligible impact on aircraft balance. Reference the aircraft weight and balance manual for moment arm if change is required.

## 11. Limitations

FlightBox Pro is not intended to replace any instrument or indicator required by the type design or operating limits.

No operational credit may be taken for installation of FlightBox Pro.

Modification or update of system operating software by the end user is prohibited.

## 12. Performance

The installation and operation of FlightBox Pro v2 has no appreciable impact on aircraft performance.

## 13. Unit Failure Conditions

No visual or aural failure indication is available. Connected client devices will stop receiving data, including heartbeat / health information, from the FlightBox Pro.

## 14. Warranty

WARRANTY COVERAGE: OPEN FLIGHT SOLUTIONS WARRANTS TO THE ORIGINAL CONSUMER PURCHASER, THAT THIS SYSTEM WILL BE FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM DATE OF PURCHASE. THE MANUFACTURER'S LIABILITY HEREUNDER IS LIMITED TO REPLACEMENT OF THE PRODUCT, REPAIR OF THE PRODUCT OR REPLACEMENT OF THE PRODUCT WITH A REPAIRED PRODUCT AT THE DISCRETION OF THE MANUFACTURER. THIS WARRANTY IS VOID IF THE PRODUCT HAS BEEN DAMAGED BY



ACCIDENT, UNREASONABLE USE, NEGLIGENCE, TAMPERING OR OTHER CAUSES NOT ARISING FROM DEFECTS IN MATERIAL OR WORKMANSHIP. THIS WARRANTY EXTENDS TO THE ORIGINAL CONSUMER PURCHASER OF THE PRODUCT ONLY.

Warranty Disclaimers: Any implied warranties arising out of this sale, including but not limited to the implied warranties of description, merchantability and fitness for a particular purpose, are limited in duration to the above warranty period. In no event shall the Manufacturer be liable for loss of use of this product or for any indirect, special, incidental or consequential damages, or costs, or expenses incurred by the consumer or any other user of this product, whether due to a breach of contract, negligence, strict liability in tort or otherwise. The manufacturer shall have no liability for any personal injury, property damage or any special, incidental, contingent or consequential damage of any kind resulting from gas leakage, fire or explosion.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

Some states do not allow the exclusion or limitation of consequential or incidental damages, so the above limitations or exclusions may not apply to you.

Remedies: This warranty gives you specific legal rights and you may also have other rights that vary from state to state.

Performance: During the above warranty period, your product will be replaced with a comparable product if the defective product is returned, postage prepaid, to Open Flight Solutions, 10649 Nathanson Ave., Cupertino CA 95014, together with proof of purchase date. Please include a note describing the problem when you return the unit. The replacement product will be in warranty for the remainder of the original warranty period or for six months whichever is longer. Other than the cost of postage, no charge will be made for replacement of the defective product. Important: Do not attempt to open unit. If unit is opened, warranty will be void. Appropriate insurance coverage is your responsibility. Consult your insurance agent.