![uAvionix logo]

tailBeaconX™ TSO

User and Installation Guide

![Aireon COMPATIBLE logo]

UAV-1004270-001
Rev B

Patent uavionix.com/patents

1 Revision History

Revision	Date	Comments
A	1/22/2021	Initial release
B	4/30/2022	Add instructions for setting default (VFR) squawk code. Update specifications and third-party equipment notes.

2 Warnings / Disclaimers

All device operational procedures must be learned on the ground.

uAvionix is not liable for damages arising from the use or misuse of this product.

This equipment is classified by the United States Department of Commerce's Bureau of Industry and Security (BIS) as Export Control Classification Number (ECCN) 7A994.

These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.

3 Limited Warranty

uAvionix products are warranted to be free from defects in material and workmanship for two years from the installation of tailBeaconX on the aircraft. For the duration of the warranty period, uAvionix, at its sole option, will repair or replace any product which fails in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost.

Restrictions: This warranty does not apply to cosmetic damage, consumable parts, damage caused by accident, abuse, misuse, fire or flood, theft, damage caused by unauthorized servicing, or product that has been modified or altered.

Disclaimer of Warranty: IN NO EVENT, SHALL UAVIONIX 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.

Warranty Service: Warranty repair service shall be provided directly by uAvionix. Proof of purchase for the product from uAvionix or authorized reseller is required to obtain and better expedite warranty service.

Please email or call uAvionix support with a description of the problem you are experiencing. Also, please provide the model, serial number, shipping address and a daytime contact number.

You will be promptly contacted with further troubleshooting steps or return instructions. It is recommended to use a shipping method with tracking and insurance.

4 Table of Contents

5 System Information

5.1 Certification

This installation manual provides mechanical and electrical information necessary to install tailBeaconX. It is not equivalent to an approved airframe-specific maintenance manual, installation design drawing, or installation data package. The content of this manual assumes use by competent and qualified personnel using standard maintenance procedures in accordance with Title 14 of the Code of Federal Regulation and other related accepted procedures. The conditions and tests required for approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must determine that the aircraft installation conditions are within the standards which include any accepted integrated functions not specified by the standards. TSO articles, articles approved with 14 CFR Part 21.8(d), and any accepted integrated function(s) not specified in the standard must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR Part 43 or the applicable airworthiness requirements. This is an incomplete system intended to provide the functions identified in, and when installed according to this installation manual.

5.2 TSO Authorizations

5.2.1 tailBeaconX

tailBeaconX complies with the following TSOs when properly installed and interfaced with equipment as detailed in this guide.

Function	TSO/RTCA/SAE	Class/Type
Air Traffic Control Radar Beacon System/Mode Select (ATCRBS / Mode S) Airborne Equipment	TSO-C112e RTCA/DO-181E	Level 2els, Class 1 [1]
Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Service – Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 MHz	TSO-C166b RTCA/DO-260B	Class B1S
Airborne Navigation Sensor Using the Global Positioning System (GPS) Augmented by the Satellite Based Augmentation System (SBAS)	TSO-C145e INCOMP RTCA/DO-229E	Beta 1
Position Light (White)	TSO-C30c SAE/AS8037	Type III

[1] *Anticipating RTCA/DO-181F Level 2 Transponder requirements, tailBeaconX does not support the UM protocol, does not support the Comm-A protocol, and does not have the capability to process and transmit air-initiated Comm-B messages. See Section 5.4 for additional details.*

5.2.2 tailBeaconX Universal Installation Kit

tailBeaconX Universal Installation Kit complies with TSO-C30c INCOMP when properly installed as detailed in this guide.

5.3 System Functions

System Function	TSO	DO-178C DAL	DO-254 DAL
Mode S Transponder	TSO-C112e	C	C
1090ES Transmitter	TSO-C166b	C	C
GPS/SBAS	TSO-C145e	C	C
Wi-Fi *[1]*	N/A	E	E

[1]   Wi-Fi disabled and not intended for use during airborne operation

5.4 TSO Deviations and Incomplete

TSO	Deviation
C112e	uAvionix was granted a deviation from TSO-C112e Paragraphs 3.e and 6.f to use RTCA/DO-178C in place of RTCA/DO-178B.
C112e	uAvionix was granted a deviation to not implement Utility Message (UM Field) support, consistent with anticipated RTCA/DO-181F and FAA/TSO-C112f Level 2 transponder requirements. This impacts the Mode S Level 2 transponder SARPs requirements as contained in ICAO Annex 10 Volume IV §§3.1.2.6.5.3.1, 3.1.2.6.11.3.2.1.3, 3.1.2.6.11.3.4.2.2, and 3.1.2.7.9.2.3.
C112e	uAvionix was granted a deviation to not implement Comm-A support, consistent with anticipated RTCA/DO-181F and FAA/TSO-C112f Level 2 transponder requirements. This impacts the Mode S Level 2 transponder SARPs requirements as contained in ICAO Annex 10 Volume IV §§2.1.5.1.2, 3.1.2.6.11.1.2, and 3.1.2.10.5.2.1.1.
C112e	uAvionix was granted a deviation to not implement broadcast interrogation support, consistent with anticipated RTCA/DO-181F and FAA/TSO-C112f Level 2 transponder requirements. This impacts the Mode S Level 2 transponder SARPs requirements as contained in ICAO Annex 10 Volume IV §§2.1.5.1.2, 3.1.2.6.11.1.2, and 3.1.2.10.5.2.1.1.
C112e	uAvionix was granted a deviation to not implement multi-site message support, as it applies to the Comm-B operation of

	Level 2 transponders, consistent with anticipated RTCA/DO-181F and FAA/TSO-C112f Level 2 transponder requirements. This impacts the Mode S Level 2 transponder SARPs requirements as contained in ICAO Annex 10 Volume IV §§2.1.5.1.2 and 3.1.2.6.11.3.
C112e	uAvionix was granted a deviation to not implement Air-Initiated Comm-B support, consistent with anticipated RTCA/DO-181F Level 2 and FAA/TSO-C112f transponder requirements. Air-initiated Comm-B messages are neither processed nor transmitted. This impacts the Mode S Level 2 transponder SARPs requirements as contained in ICAO Annex 10 Volume IV §§2.1.5.1.2 and 3.1.2.6.11.3.
C112e	uAvionix was granted a deviation to not reply to ATCBRS/Mode S All-Calls, as required by ICAO Annex 10 Volume IV §3.1.2.1.5.1.1.1 on or after January 1, 2020, and consistent with anticipated RTCA/DO-181F and FAA/TSO-C112f requirements.
C166b	uAvionix was granted a deviation from TSO-C166b Paragraphs 3.e and 6.h to use RTCA/DO-178C in place of RTCA/DO-178B.
C166b	uAvionix was granted a deviation to not implement Airborne Velocity Subtypes 3 and 4, consistent with anticipated RTCA/DO-260C and FAA/TSO-C166c requirements.
C145e	uAvionix was granted a deviation from TSO-C145e Paragraph 3.g to use RTCA/DO-160G in place of RTCA/DO-160E.
C145e	uAvionix was granted a deviation from RTCA/DO-229E section 2.1.1.10 to use a GPS antenna that meets uAvionix minimum performance specifications instead of RTCA/DO-301 qualified antennas.
C30c	uAvionix was granted a deviation from TSO-C30c Paragraph a.(2), TSO-C30c Paragraph c.(1).(viii), and SAE/AS8037 Section 4 to use RTCA/DO-160G in place of RTCA/DO-160B.

TSO-C145e Class Beta 1 functionality is incomplete. tailBeaconX does not implement LNAV approach mode, instead operating in En Route/Terminal mode only, as appropriate for ADS-B Out applications.

5.5 FCC ID

Model	FCC ID
tailBeaconX TSO	2AFFTP200S
Contains	2AC7Z-ESPWROOM02U

5.6 Device Marking

5.6.1 tailBeaconX Hardware

5.6.2 tailBeaconX Universal Installation Kit

5.6.3 tailBeaconX ADS-B Software

The ADS-B software contained in the tailBeaconX is identified by electronic marking. Reference Section 9.6 for information on determining the software part number.

5.7 Environmental Qualification Form

Conditions	DO-160G Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Category C4
Low temperature ground survival	4.5.1	-55°C
Low Temperature Short-Time Operating	4.5.1	-45°C
Low Temperature Operating	4.5.2	-45°C
High Temperature Ground Survival	4.5.3	+85°C
High Temperature Short-Time Operating	4.5.3	+70°C
High Temperature Operating	4.5.4	+70°C
Loss of Cooling	4.5.5	Cooling air not required (+70°C operating without cooling)
Altitude	4.6.1	35,000 feet
Decompression	4.6.2	Equipment identified as Category C4 – no test
Overpressure	4.6.3	Equipment identified as Category C4 – no test
Temperature Variation	5.0	Equipment tested to Category A
Humidity	6.0	Equipment tested to Category C
Operation Shocks	7.0	Equipment tested to Category B
Crash Safety	7.0	Equipment tested to Category B Type 5
Vibration	8.0	Aircraft zone 1: Type 4/5 Category S Vibration Test Curve M Aircraft zone 7: Type 1 (Helicopter) to Category U2
Explosion	9.0	Equipment tested to Category H
Waterproofness	10.0	Equipment tested to Category S
Fluids Susceptibility	11.0	Equipment tested to Category F
Sand and Dust	12.0	Equipment tested to Category S
Fungus	13.0	Equipment identified as Category X – no test
Salt Spray	14.0	Equipment tested to Category S
Magnetic Field	15.0	Equipment tested to Category A
Power Input	16.0	Equipment tested to Category BX
Voltage Spike	17.0	Equipment tested to Category B
AF Conducted Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category AC
RF Susceptibility	20.0	Equipment tested to Category T
RF Emissions	21.0	Equipment tested to Category H
Lightning Induced Transient Susceptibility	22.0	Equipment tested to Category A2XXXX
Lightning Direct Effects	23.0	Equipment identified as Category X – no test
Icing	24.0	Equipment identified as Category X – no test
Electrostatic Discharge	25.0	Equipment tested to Category A
Fire, Flammability	26.0	Equipment tested to Category C

5.8 Continued Airworthiness

Maintenance of the tailBeaconX is "on condition" only.

Periodic regulatory function checks must be performed. The aircraft must be returned to service in a means acceptable to the appropriate aviation authority.

Note: *Transponders certified after January 1, 2020 must not respond to ATCRBS/Mode S All-Calls (Long P4 interrogation). This may cause unexpected results to be obtained by transponder test sets.*

Note: *Mode S transponders must only respond to Mode S Only All-Calls when airborne. tailBeaconX can be placed in an airborne state for test purposes by entering "Ground Test Mode" using the installer application, or by using certain compatible control heads. For more details see Section 9.5.*

The rear position light is designed with 2 white LEDs. If any LED fails, the unit must be repaired or replaced.

Note: Use dark glasses or cover the device to ensure eye safety during LED inspection.

5.9 System Limitations

Installation

This article meets the **minimum** performance and quality control standards required by a technical standard order (TSO). Installation of this article requires a separate approval.

SatCom

The tailBeaconX GPS has not been demonstrated as compatible with SatCom equipment and should not be installed on SatCom equiped aircraft.

6 System Specifications

6.1 System Functionality

tailBeaconX is a complete Mode S Extended Squitter (ES) ADS-B OUT transponder, integrated with an internal SBAS/WAAS GPS and all necessary antennas into an LED rear position light. tailBeaconX is designed to meet the transponder and ADS-B requirements for operating in controlled airspace worldwide, while minimizing installation costs.

6.2 Aireon Compatibility

tailBeaconX has been demonstrated to be Aireon-compatible. It has been specifically designed to meet the performance requirements of Air Navigation Service Providers (ANSPs) leveraging the Aireon space-based ADS-B global air traffic surveillance system. This compatibility is not reflected in authorized TSO functions and is not recognized by the FAA TSO authorization, but is instead a performance-based designation awarded by Aireon.

6.3 Wi-Fi

Wi-Fi is intended for on-ground configuration. **Wi-Fi is only enabled in standby (STBY) mode** and disabled when in ALT or ON mode.

To restore Wi-Fi functionality after flight, the device must be set back to STBY mode.

6.4 Call Sign

Your call sign may be adjusted on the ground using the skyBeacon Installer app, or at any time by use of an appropriately featured control head. This allows your call sign to be configured to correspond with ATC communications and flight plans, for use during commercial, medical, or volunteer flight operations. When changing the call sign using skyBeacon Installer, ensure no other installation parameters are adjusted. For typical operations, the call sign should be set to the entire aircraft registration text. For example, U.S. registered aircraft must include the leading "N".

6.5 Suppression Input

The external suppression input can be connected to the suppression output of other L-band equipment, such as DME. Driven high, tailBeaconX will suppress transmissions. The suppression input must be driven to an input voltage of at least 10 VDC. The input must be connected to ground when not in use.

6.6 tailBeaconX TSO Specifications

6.6.1 Physical Specifications

Characteristics	Specifications
Width	43.43mm
Height	110.38mm
Depth	110.75mm
Weight	3.24 oz (92 grams)
Operating temperature range	-45°C to +70°C
Maximum pressure altitude	35,000ft
Input voltage range	9 to 30.3 VDC
14V current	0.2A idle 0.25A typical 0.5A maximum
28V current	0.1A idle 0.125A typical 0.25A maximum
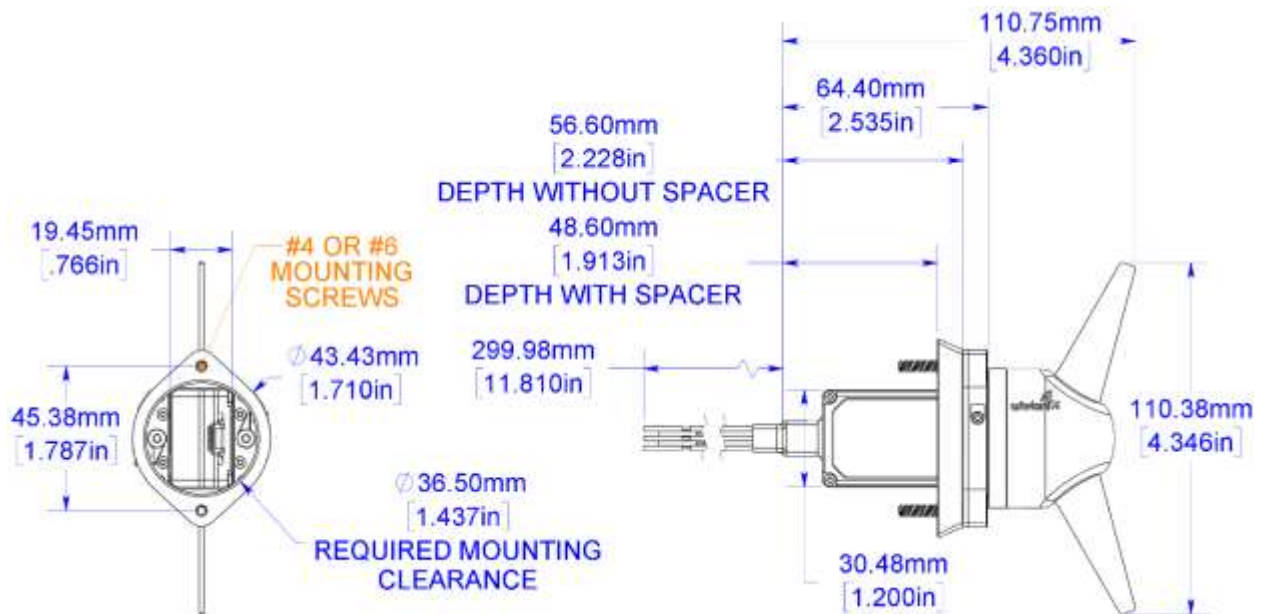
Note: Shown with Universal Installation Kit UAV-1003793-001, including spacer

6.6.2 Mode S Transponder Specifications

Characteristics	Specifications
Transmit frequency	1090 MHz
Transmit power	54dBm (250W)
Receive frequency	1030 MHz
ATCRBS sensitivity	-74 dBm
Mode S sensitivity	-74 dBm

6.6.3 GPS/SBAS Specifications

Characteristics	Specifications
Number of channels	15 (12 GPS and 3 GPS/SBAS)
Frequency	1575.42 MHz L1, C/A code
Sensitivity	
Tracking	-166 dBm
Reacquisition	-160 dBm
Cold Start	-148 dBm
Hot Start	-160 dBm
Horizontal position accuracy	6 m RMS with SBAS
Velocity accuracy	0.05 m/s
Heading accuracy	0.3 degrees
TTFF (Time to First Fix)	58 seconds typical with current almanac and position
Reacquisition	1 second typical
Position update interval	0.2 second (5 Hz)
Time mark	±20 ns of UTC
Datum	WGS-84, HAE

6.6.4 Position Light Specifications

Characteristics	Specifications
Color	Aviation White
Intensity	20 candelas (±70° aft)

6.6.5 Wired Control Interface Specifications

Characteristics	Specifications
Physical	RS-232
Rate and properties	2400 bps 8N1
Protocols	UCP, UCP-HD and Apollo
Suppression Input	10 VDC minimum

For more control interface details, see Appendix A.

6.6.6 Wireless Configuration Interface Specifications

Characteristics	Specifications
Standard	802.11b/g/n Wi-Fi Access Point
Security	WPA2-PSK with unique key
SSID	Beacon-XXXX where XXXX is a hexadecimal 16-bit unique identifier
Frequency	2412 MHz (Channel 1)
Maximum clients	4
Protocol	UCP

6.6.7 System Interfaces
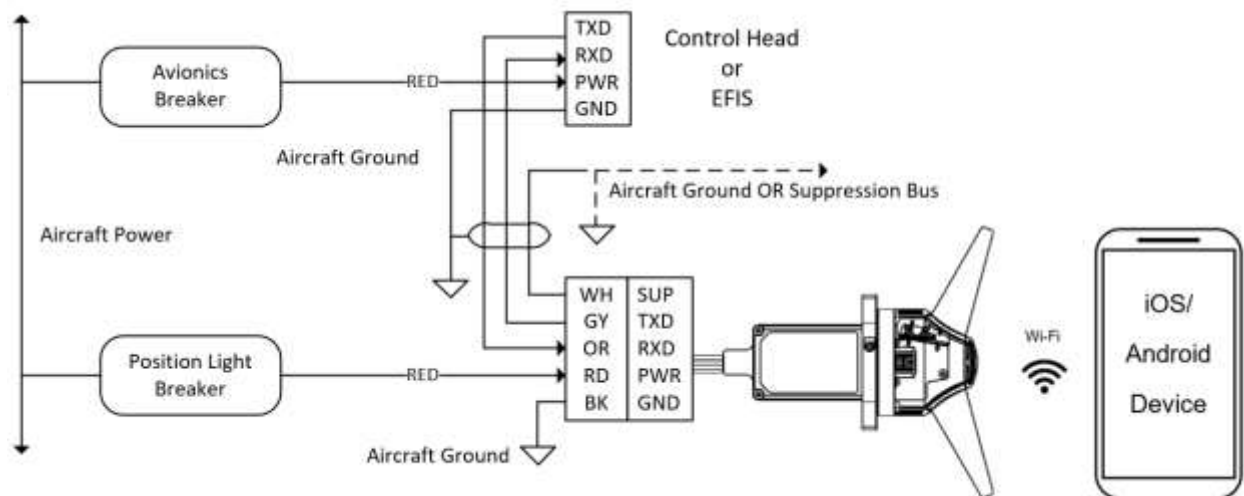
⚠ **WARNING: Do not connect the power wire to a Xenon strobe power pack. This can damage the device and voids the warranty.**

7 Installation

7.1 Unpacking and Inspecting

Carefully unpack the device and make a visual inspection of the unit for evidence of any damage incurred during shipment. If the unit is damaged, notify the shipping company to file a claim for the damage. To justify your claim, save the original shipping container and all packing materials.

7.2 Authorized Part Numbers

tailBeaconX

Item	P/N
tailBeaconX Hardware	UAV-1003648-( )
tailBeaconX / ping200X Software	UAV-1002393-( )

tailBeaconX TSO Installation Kits

Item	P/N
tailBeaconX Universal Installation Kit	UAV-1003793-( )

7.2.1 tailBeaconX Universal Installation Kit UAV-1003793-001

The tailBeaconX Universal Installation Kit consists of the following parts:

#	Item	P/N
1	Mounting Gasket, tailBeacon	UAV-1001756-001
2	Mounting Plate, tailBeaconX	UAV-1003125-001
3	Socket Head Cap Screw, M2 x 4, VT (2)	UAV-1002820-003
4	Flat Head Phillips Screw, 4-40 x 1in (2)	UAV-1002184-001
6	Dome Head Phillips Screw, #6 Coarse Thread (2)	UAV-1003792-001
5	Flat Head Phillips Screw, 6-32 x 1in (2)	UAV-1003563-001
7	tailBeaconX Spacer	UAV-1003562-001
8	Hex L Wrench, 1.5mm	UAV-1002817-001
9	Wire Splice (5)	UAV-1001487-001
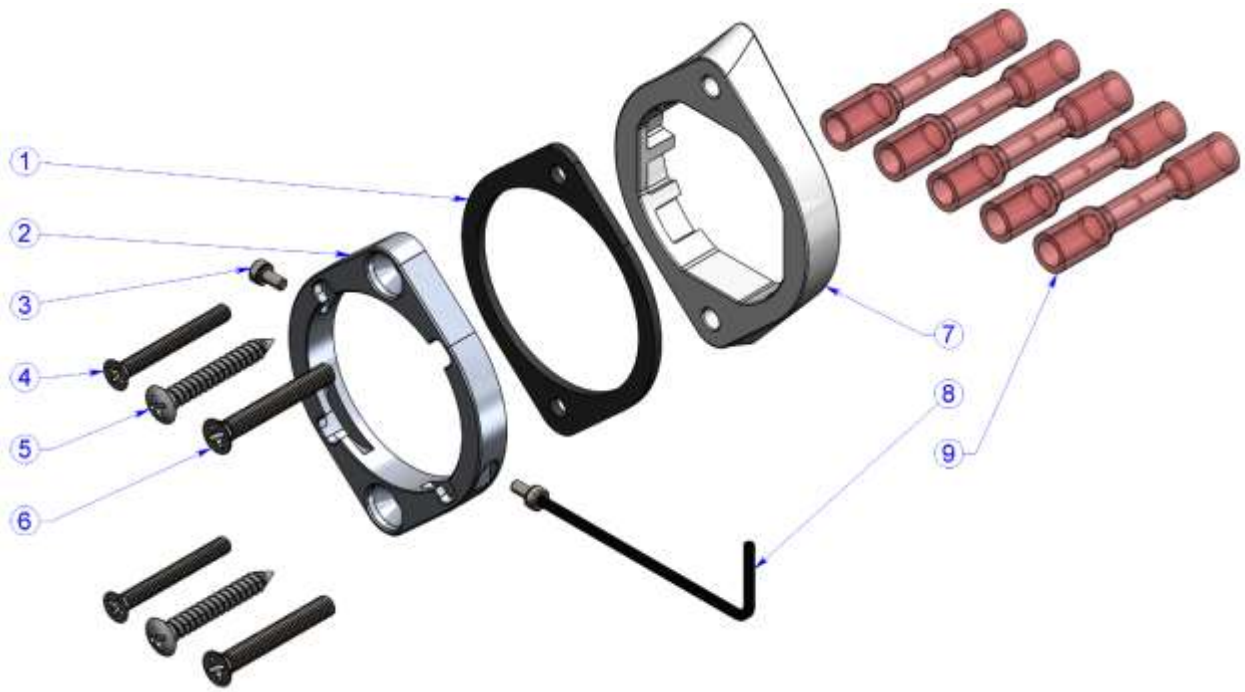
7.3 Installation Materials and Tools

In addition to the available installation kit(s), tailBeaconX may require standard aviation parts for installation. Parts may include:

- Wire
- Shielded wire (2 or 3 conductor)
- Circuit breakers
- Environmental splices
- Ring terminals for grounding
- Thread locking compound (keep away from lenses and antennas of tailBeaconX). We recommend Loctite® 242 or 243 which works well with stainless steel hardware.

Minimally, tailBeaconX installation requires access to the following tools:

- Phillips screwdriver
- 1.5mm hex driver (included)
- Appropriate crimping tool(s)

7.4 Additional Required Equipment

tailBeaconX is a "remote" transponder; to function it requires connection to a controlling device, often referred to as a control head. The following table details what functions are provided directly by tailBeaconX.

Transponder	ADS-B Transmitter	GPS Receiver	Transponder Antenna	GPS Antenna	Control Head w/ Annunciation	Altitude Encoder	Rear Position Light
X	X	X	X	X			X

In typical configurations, the control head provides control, display, annunciation, and pressure altitude information.

For details on compatible equipment and interconnections, refer to Appendix B.

7.5 Mounting

tailBeaconX is a rear, aft position light. Ensure that when mounted, the fins and the top of the assembly are free from obstructions. tailBeaconX requires a clear view of the sky for optimal GPS performance. It may not be suitable for installation on aircraft where aircraft elevators or other structures would block visibility to the sky.

tailBeaconX is NOT designed to replace an existing rotating anti-collision beacon.

Determine if tailBeaconX will be mounted to a fixed surface or a moving control surface. **If installed on a moving control surface, specific attention must be paid to proper balance. Refer to the Manufacturer's Service Manual to determine if balancing is required and for balancing instructions.**
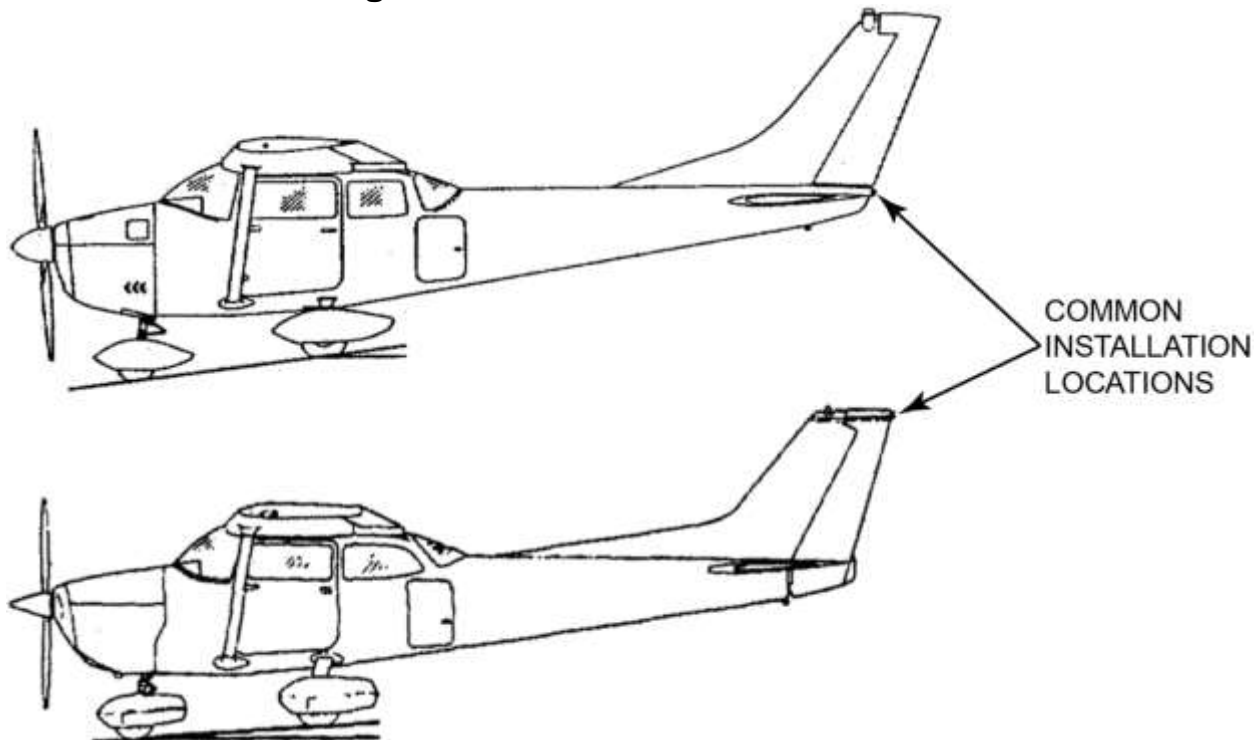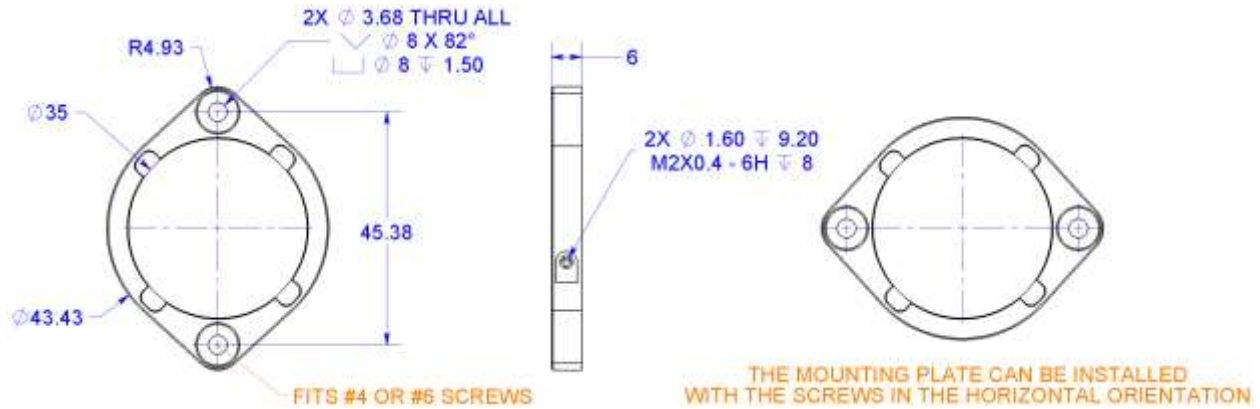
7.5.1 Direct Mounting

COMMON INSTALLATION LOCATIONS

Figure 1: Generic representation of direct mounting

7.5.1.1 Direct Mounting Dimensions
Direct mounting plate UAV-1003125-001 shown.
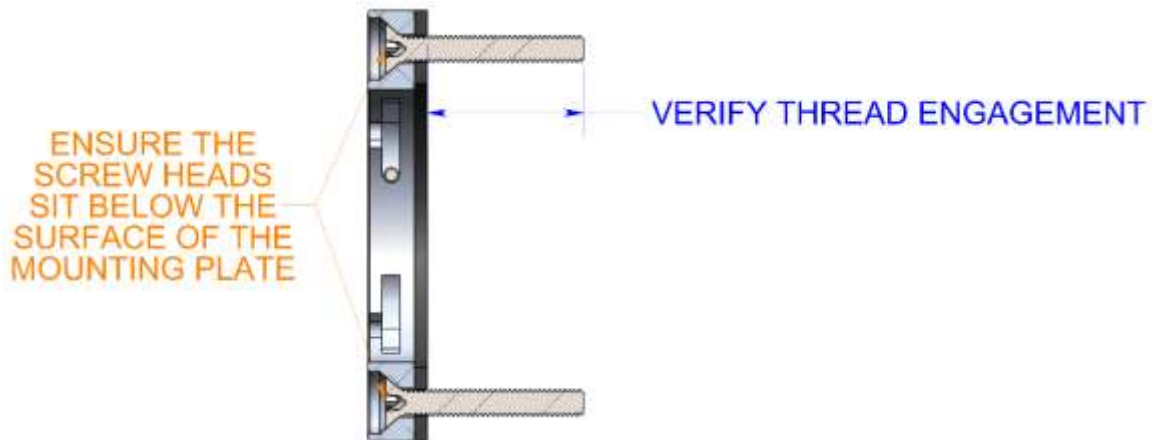

7.5.1.2 Mounting Plate Installation
The mounting plate utilizes either the included #4-40 or #6-32 mounting hardware. The mounting plate can be installed with the screw pattern oriented either vertically or horizontally as shown above. Determine the orientation of the existing aft position light mounting hardware, and install the mounting plate accordingly.

1. Remove the existing aft position light.
2. Detach the power wire(s) and protect them from damage
3. Ensure the thru-hole in the tail cone or rudder is at least 36.5mm in diameter and allows straight passage of the tailBeaconX main body.
4. Peel the backing from the Mounting Gasket and affix to the Mounting Plate.

5. Temporarily align the Mounting Plate to the opening, and ensure the depth of the cavity is sufficient to fully contain the tailBeaconX body. If not, follow the Spacer Mounting installation procedure in Section 7.5.2.
6. Install the Mounting Plate, in the appropriate orientation for your aircraft, using either the supplied #4 or #6 hardware, or as defined below.
    a. If the included hardware does not match the thread type of your aircraft, it is acceptable to use standard aviation hardware compatible with the thread types required, only if when installed, the screw heads do not protrude from the surface of the mounting plate as shown below.
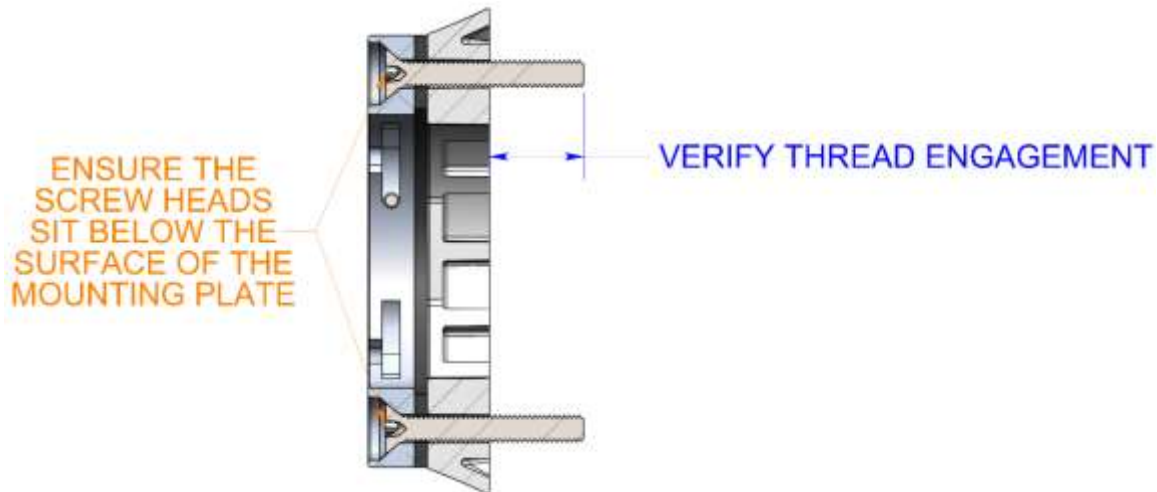

Note: Installation of the tailBeaconX must be in accordance with AC 43.13-2B, Chapter 1.

7.5.2 Spacer Mounting

Aircraft with an installation cavity shallower than required to mount using the Direct Mounting method, or with other mounting interference issues, may use the spacer included with Installation Kit UAV-1003793-001.

Follow instructions in Section 7.5.1, but additionally install the optional spacer between the aircraft surface and Mounting Gasket. Ensure proper engagement of the mounting hardware, considering the additional spacer thickness.

ENSURE THE SCREW HEADS SIT BELOW THE SURFACE OF THE MOUNTING PLATE

VERIFY THREAD ENGAGEMENT

Note: Installation of the tailBeaconX must be in accordance with AC 43.13-2B, Chapter 1.

7.6 Wiring

tailBeaconX requires connections to power, ground, and an RS-232 control interface.

Color	Type	Function
Red	Power	Aircraft Power
Black	Power	Aircraft Ground
Grey	Output	RS-232 Transmit (to control head)
Orange	Input	RS-232 Receive (from control head)
White	Input	Suppression Input

tailBeaconX is designed to use existing position light power wiring. If new power wiring is desired, refer to AC 43.13-1B Chapter 11 for guidance. The wiring should present an impedance of less than 0.5ohm. The following table provides guidance for typical aircraft hook-up wire.

Gauge	ohm/km	Maximum Length for 0.5ohm
20 AWG	35	14.2m
22 AWG	64	7.8m

1. Prepare the aircraft wiring for connection.
   a. Install a shielded 24AWG twisted pair cable from the cockpit to the tailBeaconX installation location. This cable is used for interface control (data). Installations requiring suppression input

should install 3 conductor twisted pair cable. Installations not requiring suppression input require only 2 conductors.


Control Wiring
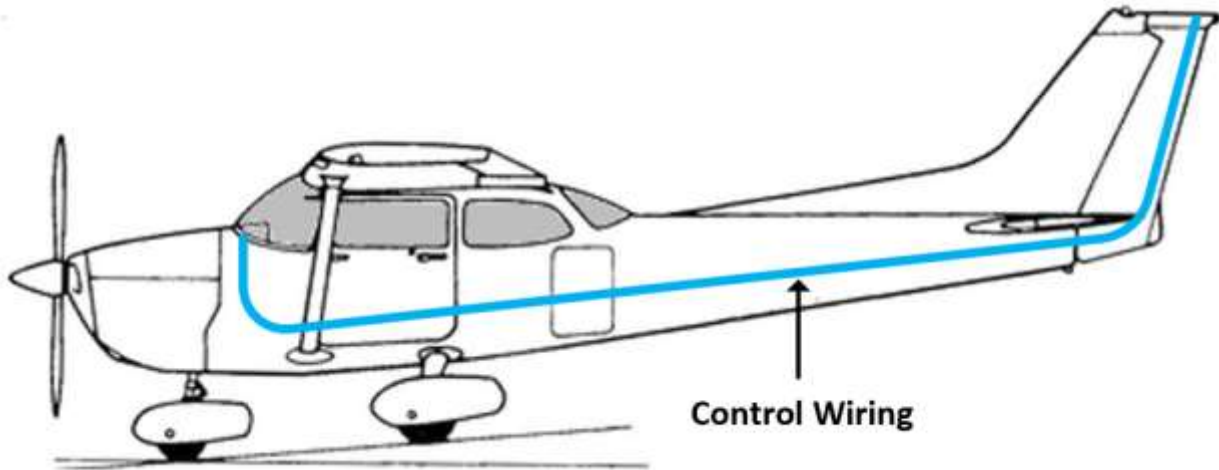
b. Install a ground wire from the aircraft airframe or battery ground.
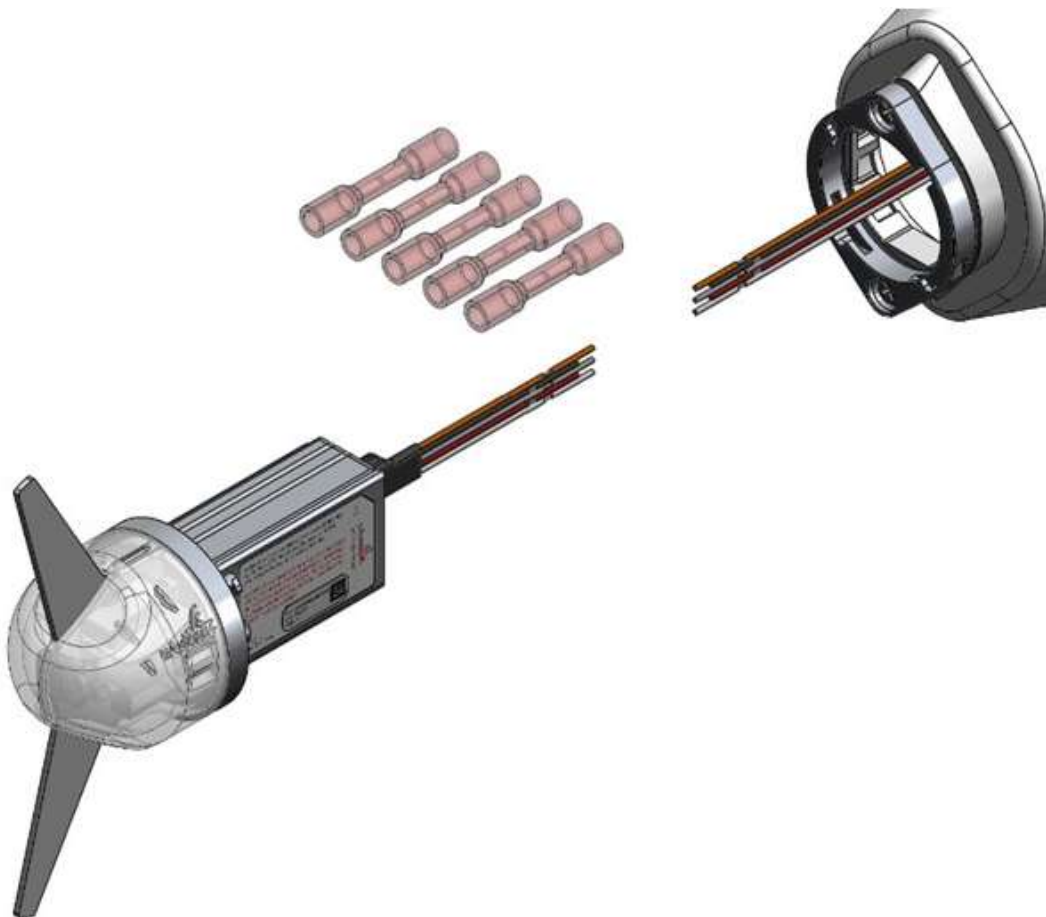
NOTE: Wires shown trimmed to an appropriate length

2. Connect the tailBeaconX red wire to the switched position light power wire using environmental splices or equivalent.
3. Connect the tailBeaconX black wire to the battery or airframe ground.
4. Connect the tailBeaconX orange and grey wires to the 2 twisted pair conductors connected to the control head or equivalent equipment.

    The exposed (non-shielded) portions of the interface conductors AND ground drains are to remain less than 2.5 inches.
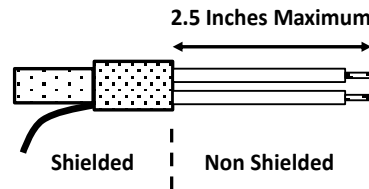

5. Where required, connect the tailBeaconX white wire to the twisted pair conductor connected to the aircraft suppression bus. tailBeaconX implements suppression input only. **If not used, connect the white wire to aircraft ground.**
6. Connect the twisted pair shield to the local airframe ground.
7. Ensure the twisted pair conductors are terminated to the interfaced control head or equivalent equipment in the panel.

7.7 Unit Installation

The tailBeaconX unit must be electrically connected, then installed into the Mounting Plate by aligning the mounting tabs on the tailBeaconX with the cut-outs in the Mounting Plate. This requires you to rotate the unit 5º Counter-Clockwise from vertical before inserting. Once inserted gently, rotate Clockwise to vertical and secure with M2 anti-rotation screws.

> ⓘ **DO NOT FORCE ROTATION; tailBeaconX should rotate with little resistance.**

1. Insert tailBeaconX into the Mounting Plate and twist clockwise to the vertical position.
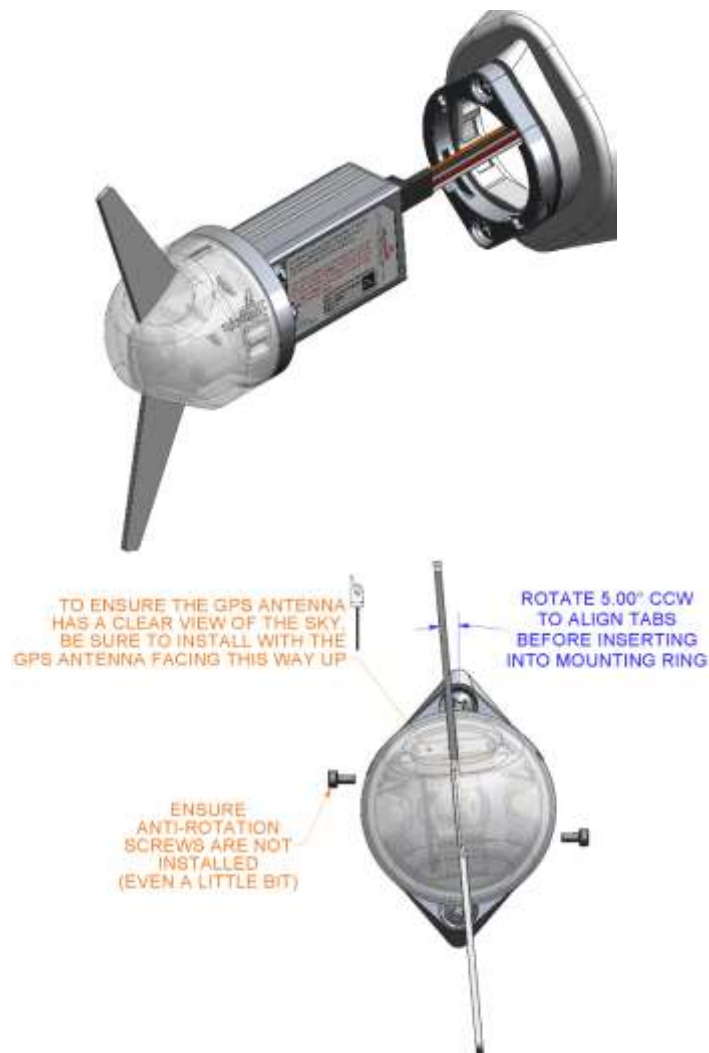
(!) **Ensure that the tailBeaconX is oriented consistent with the installation direction indication on the labels. This ensures the GPS antenna is correctly oriented skyward.**

2. Secure the tailBeaconX to the Mounting Plate using the two supplied M2 anti-rotation screws and the included 1.5mm hex driver. Ensure threads are fully coated in thread locking compound before installation. Tighten the anti-rotation screws until snug (3-4 in-lb). The head of the screw may have some clearance under it; this is okay if the proper torque is achieved.
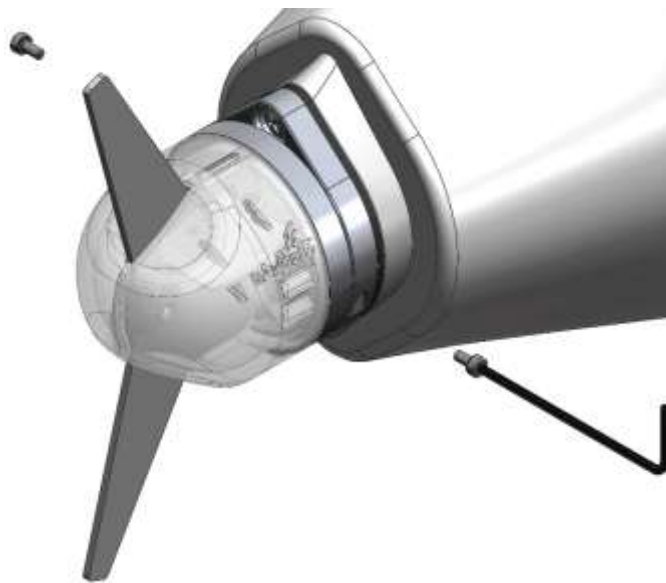
3. If tailBeaconX has been installed on a moving control surface, specific attention must be paid to proper balance. Refer to the Manufacturer's Service Manual to determine if balancing is required and for balancing instructions.

8 Control

tailBeaconX requires serial connection to an appropriate control head or equivalent equipment. tailBeaconX receives transponder control and pressure altitude information from the control head. Status and annunciation information is provided by tailBeaconX to the control head.

For details on the tailBeaconX control interface, refer to Appendix A.

For details on compatible equipment and interconnections, refer to Appendix B.

9   System Configuration

Download the "uAvionix skyBeacon Installer" app from the iOS App Store or Google Play Store. Note: DO NOT use the "uAvionix Ping® Installer" or "uAvionix Echo Installer" apps. The app will guide you through the configuration process.

9.1 Connect to tailBeaconX Wi-Fi

Wi-Fi is intended for on-ground configuration. **Wi-Fi is only enabled in standby (STBY) mode** and disabled when in ALT or ON mode.

Launch the skyBeacon Installer app. **Ensure tailBeaconX is in standby (STBY) mode** and then follow the instructions to connect to the tailBeaconX for configuration.

The SSID of the tailBeaconX is in the form Beacon-XXXX, for example Beacon-7782.

The tailBeaconX Wi-Fi connection is secure. The WPA2 passphrase is written on an inclusion in your package, and should be entered exactly as printed. WPA2 passphrases are case sensitive.

Keep the inclusion containing Wi-Fi information in a safe place, preferably with your aircraft records.
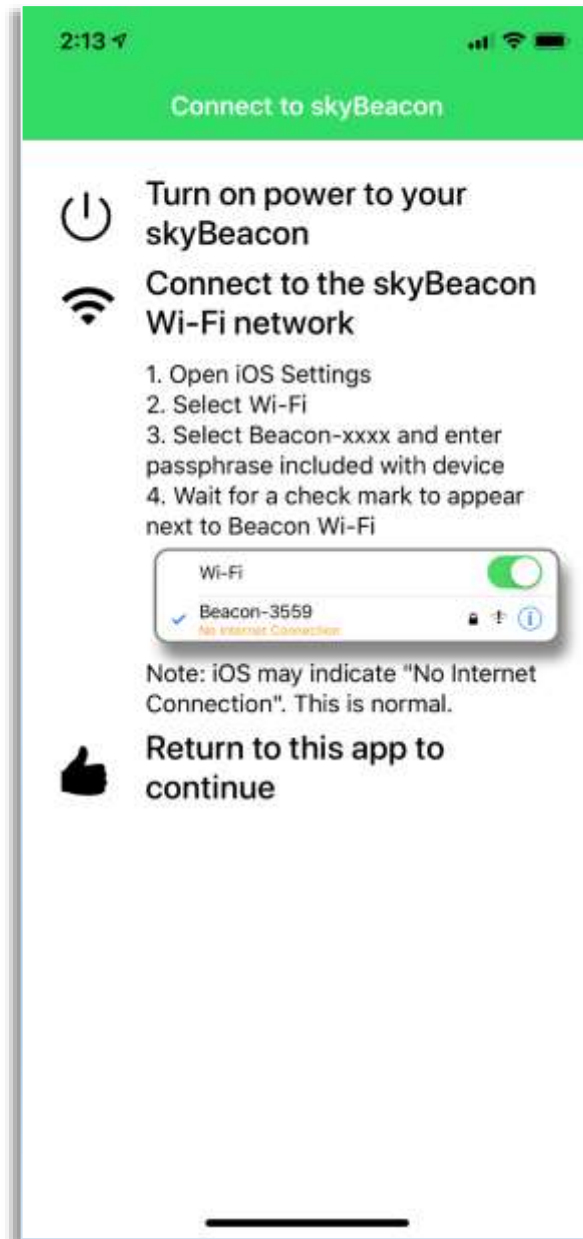
9.2 Configuration - Basic

The "Configure" ⬌ screen allows access to all configuration options. The "Basic" tab contains essential configuration items.

Call Sign:
The Call Sign can be up to an 8-character code that corresponds to the tail number of the aircraft (0-9, A-Z) or ATC assigned call sign. Note: For typical operations, this field should be set to the entire aircraft registration text. For example, U.S. registered aircraft must include the leading "N".

ICAO Number:
The ICAO address is a 24-bit number issued to the aircraft by the registration authority of the aircraft. These addresses are usually written as a 6-digit hexadecimal number.

Maximum Aircraft Speed (knots):
Mode S transponders transmit their maximum airspeed characteristics to aircraft equipped with TCAS. This information is used to identify threats and to plan avoidance action by the TCAS equipped aircraft. The airspeeds are grouped in ranges.
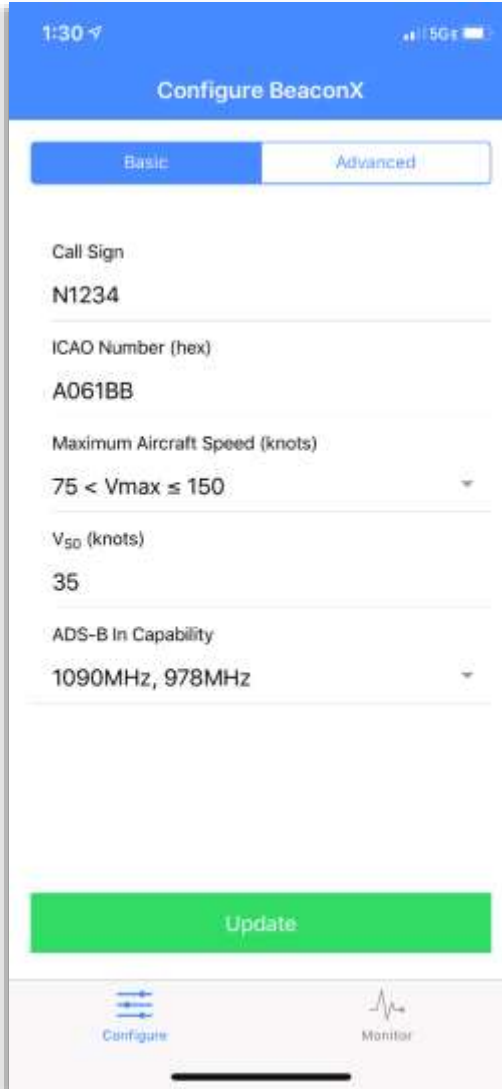
V$_{S0}$ (knots):
This parameter allows tailBeaconX to automatically switch between airborne and ground modes and should be set to the aircraft stall speed. For rotorcraft, set to 0.

ADS-B In Capability:
Sets the ADS-B In equipment capability reporting. This is used to indicate the current aircraft configuration.

Tap "Update" when complete.

9.3 Configuration - Advanced

The "Advanced" tab contains required configuration items that are less likely to need modification from their default values.

Emitter Type:
To assist ATC tracking of aircraft, an aircraft category is transmitted. Select the aircraft category that most closely matches the aircraft. For airplanes, this is typically "Light Airplane".

Aircraft Length:
Enter the aircraft Length in Meters.

Aircraft Width:
Enter the aircraft width in Meters.

Default Squawk:
The default squawk code used at startup and when selected by pressing the 'VFR' button on supported controllers. This field may be country-specific.

GPS Antenna Offset (Lateral):
Enter the position of tailBeaconX relative to the center of the aircraft Roll axis in Meters. For a typical tail mounted light, this is 0m.

GPS Antenna Offset (Longitudinal):
Enter the position of tailBeaconX relative to the nose of the aircraft in Meters. For a typical tail mounted light, this is the distance from the nose to the tail mounting location.

Tap "Update" when complete.
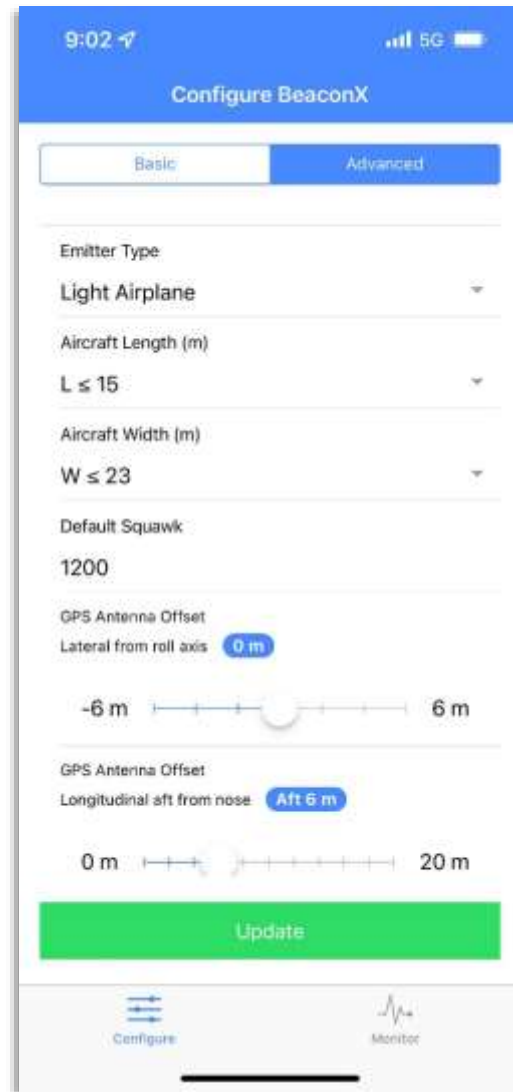
9.4 Post-Installation Checks - Configuration

Configure tailBeaconX before performing system checkouts.

Tab to the "Monitor" ⎍ screen on the Installer App.

Verify that Status is listed as "OK". Verify that the Call Sign matches your aircraft's registration data or configured ATC identification. Verify that the ICAO number is correct as entered. Verify Squawk code, if available from the control head in standby, is correct. Verify that the pressure altitude, if available from the control head in standby, is correct and corresponds to the primary pressure altitude ±125 ft. Annually, confirm the displayed "ADS-B Version" and associated information is current per Service Bulletins listed at: https://uavionix.com/support/tailbeaconx/ If "ADS-B Version" is not current, apply Service Bulletins as appropriate to update the software.	
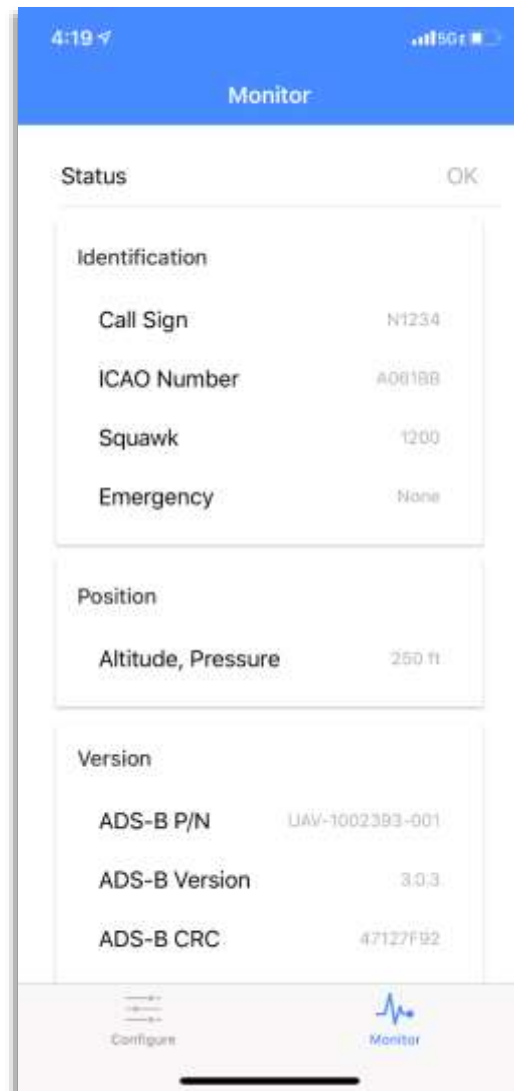
9.5 Post-Installation Checks - Regulatory

Configure tailBeaconX before performing system checkouts.

Tab to the "Monitor" 〰️ screen on the Installer App.

To aid in performance of regulatory compliance checks, Ground Test Mode forces the tailBeaconX into an airborne state until the device is power cycled. This ensures that the device will respond to Mode S Only All-Calls, which occurs only when airborne.

To access Ground Test Mode, scroll to the bottom of the Monitor page and press the "Enable Ground Test Mode" button. A message will appear confirming selection of the mode.

Once enabled, set the transponder the appropriate mode (e.g., ALT) and proceed with ramp testing. When complete, power cycle the tailBeaconX to reset to normal operating mode.

Note: Certain control heads may also be able to initiate Ground Test Mode
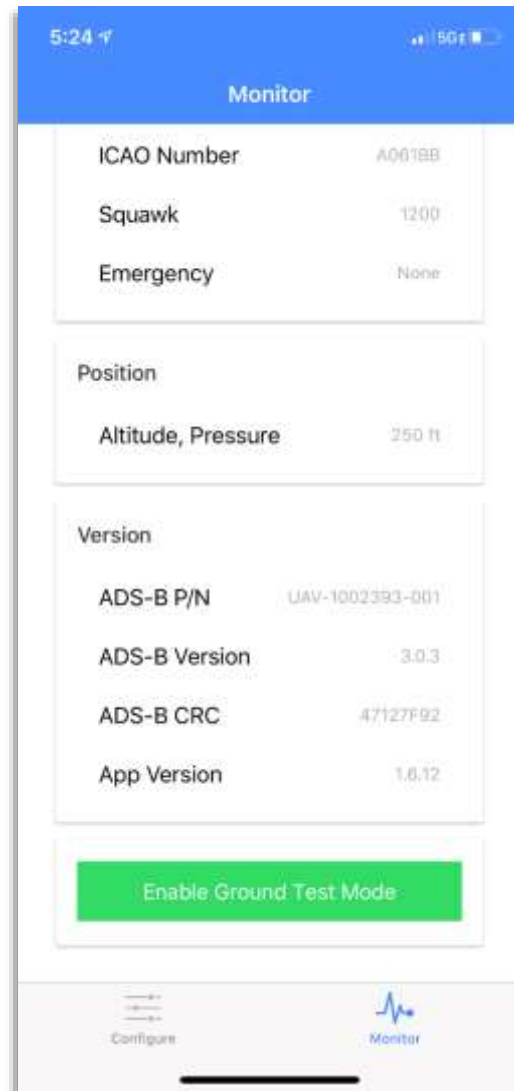
9.6 Software Part Number / Annual Checks

Annually, confirm the displayed "ADS-B P/N" and "ADS-B Version" is current per Service Bulletins listed at:

https://uavionix.com/support/tailBeaconX/
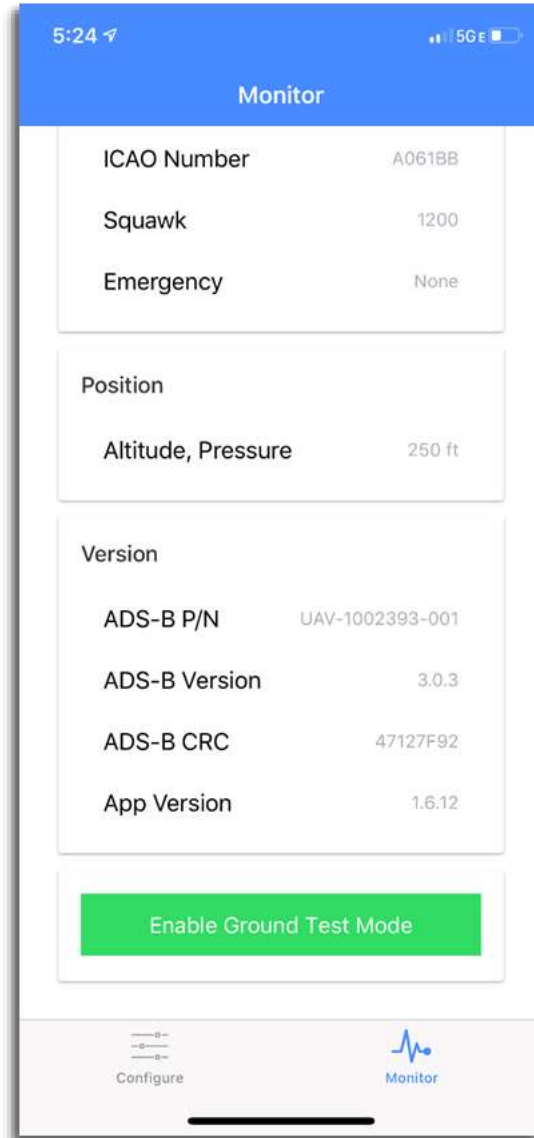
If "ADS-B Version" is not current, apply Service Bulletins as appropriate to update ADS-B software.

10 Normal Operation

tailBeaconX must be enabled, typically in ALT mode, during all phases of flight including surface movement operations.

11 Maintenance

The tailBeaconX is not a user serviceable product. All service must be performed either by uAvionix or an authorized uAvionix repair center.

12 Care and Cautions

The tailBeaconX should be regularly cleaned with warm soapy water and a soft cloth micro-fiber rag to remove accumulated contaminants. Use of chemical cleaners and degreasers should be avoided. If the tailBeaconX is exposed to cleaning chemicals, you should promptly wash off all residue.

DO NOT wax, buff, paint or attempt to polish any part of the tailBeaconX assembly. Doing so may damage the lens or electronics. Avoid any contact with abrasive materials including scrubbing pads.

Never hit, tap on or flex the fin portions the tailBeaconX assembly. Doing so will cause undue stress and could void your warranty.

13 Support

For additional questions or support please visit:

https://www.uavionix.com/support/

Appendix A Control Interface

tailBeaconX is controlled, and optionally configured using the data interface specified below.

Characteristics	Specifications
Physical	RS-232
Data rate	2400 bps
Parity	None
Data bits	8
Stop bits	1
Protocol	UCP-HD (RX/TX enabled by default) UCP (disabled by default) Apollo (RX enabled by default)

UCP-HD and Apollo are both enabled by default for use as input protocols, and messages are processed based on the received data format.

UCP-HD is enabled for use as the output protocol. Additionally, Apollo output is automatically enabled upon receipt of an Apollo input message.

The data rate and protocols can be configured by the UCP/UCP-HD Transponder Configuration message. UCP or UCP-HD input is required to be enabled to allow device configuration.

A.1 UCP-HD

uAvionix Control Protocol (UCP) and uAvionix Control Protocol – Half Duplex (UCP-HD) are documented in *uAvionix UCP Transponder Interface Control Document* UAV-1002375-001. This document is made available to authorized parties, and may be obtained by contacting uAvionix.

UCP and UCP-HD can be used to configure, control, and monitor status of the tailBeaconX.

A.1.1 Control Message

The Control message must be supplied to tailBeaconX as documented in the UCP ICD. Minimally, Mode A (squawk) code, IDENT, emergency state, pressure altitude, and transponder mode are provided in this message.

Mode

To set the transponder operating mode, appropriate enable bits must be set in the Control message. The mapping of traditional transponder modes to required Control message enablement bits follows.

Operating Mode	Mode A	Mode C	Mode S	1090ES
STBY				
ON (suppress altitude)	X		X	X
ALT	X	X	X	X

Flight Identification

If Flight Identification is provided in the Control message, that value is transmitted as Flight ID. If none (all spaces) is provided, the Call Sign/Aircraft Registration value configured in the device is transmitted.

Air-Ground State

Optionally, air-ground state may be provided in the Control message. To use air-ground state from the control message, the device must be configured with a V_{S0} of zero. Air-ground logic is described by the following chart.
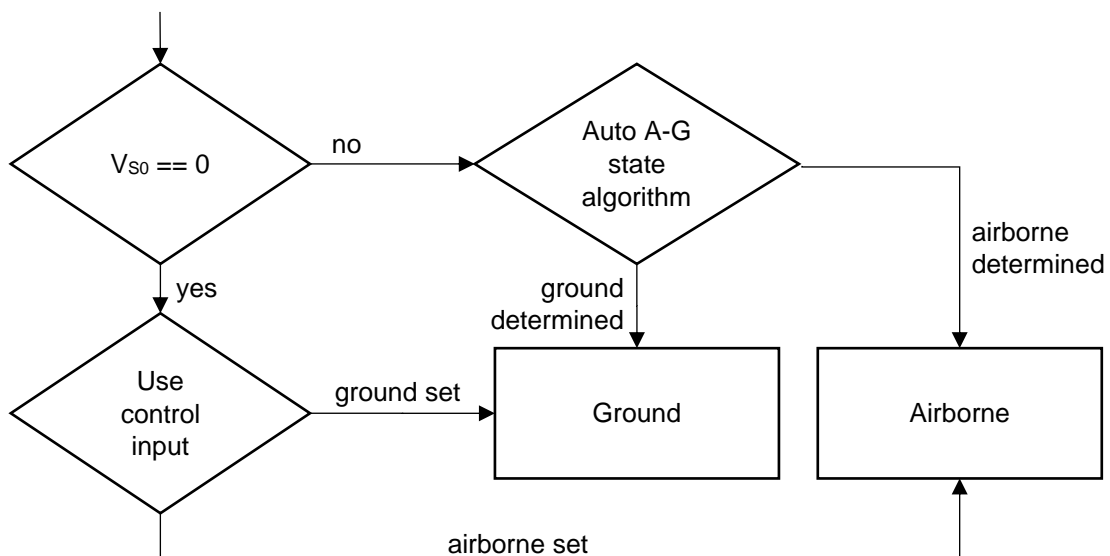
Airborne subsonic and supersonic state is automatically determined by tailBeaconX.

A.1.2 Transponder Status

In UCP-HD, the Transponder Status is sent in response to each Control message, as documented in the ICD.

The presence of a fault to annunciate is delivered by the "Fault or Failure Indicated" bit being set. To determine the specific fault, query the Heartbeat message using a Message Request. The following specific fault indications are available in the Heartbeat message, and should be mapped to annunciations compliant with applicable regulations. TSO-C166b requires annunciations of ADS-B transmission device and function failures (see RTCA/DO-260B §2.2.11.5)

Fault	Description
Maintenance Required	ICAO address not set (RTCA/DO-181E §2.2.10.3) ICAO address not set (RTCA/DO-260B §2.2.11.3.1) Multiple position sources available – check configuration (RTCA/DO-260B §2.2.5.3)
Failure TX System	Transponder replies not enabled or acquisition squitter rate failure (RTCA/DO-181E §2.2.10.4) Transmit not enabled or extended squitter rate failure (RTCA/DO-260B §2.2.11.2.1 and §2.2.11.5.1)
Failure GNSS No 3D Fix	No valid 3D position from GNSS (RTCA/DO-229E §2.1.2.6)
Failure GNSS Unavailable	Unable to communicate with GNSS subsystem (RTCA/DO-260B §2.2.11.6)

A.2 Apollo

Apollo can be used to control and monitor status of the tailBeaconX. In its default configuration, tailBeaconX processes Apollo messages. Once an Apollo message is received, Apollo message output is enabled until device reset.

A.2.1 Supported Input Messages

The following input messages are supported:

Mode (#MD)

The Mode message configures the operating mode, Mode A (squawk) code, and IDENT.

Setting	Description	Mode A	Mode C	Mode S	1090ES
'O'	STBY				
'A'	ON (Altitude Suppress)	X		X	X
'C'	ALT	X	X	X	X

Altitude (#AL)

The altitude message provides pressure altitude information.

Appendix B Equipment Compatibility and Interconnect Drawings

tailBeaconX can be controlled by uAvionix devices such as the AV-20-E, AV-30-E and AV-30-C. The AV-30 series is a 3-inch feature-rich primary display, and the AV-20 series is a 2-inch multi-function display. Learn more about each of these products and download the installation and operation manuals at www.uavionix.com. Additionally, tailBeaconX can be controlled by a variety of third-party EFIS displays.

The installation information below serves as a supplement to the uAvionix AV series and third-party EFIS manuals, and concern basic configuration and wiring of the transponder control functionality only. For further installation and operating instructions, please reference the appropriate installation manual and pilot's guide. The installer should become fully familiar with the installation process for the controlling device. Use of these devices may be limited to non-certified aircraft. These descriptions are informational, and in no way grant an installation approval.

B.1 Compatible Protocols

tailBeaconX is compatible with the UCP-HD and Apollo protocols, as documented in Appendix A.
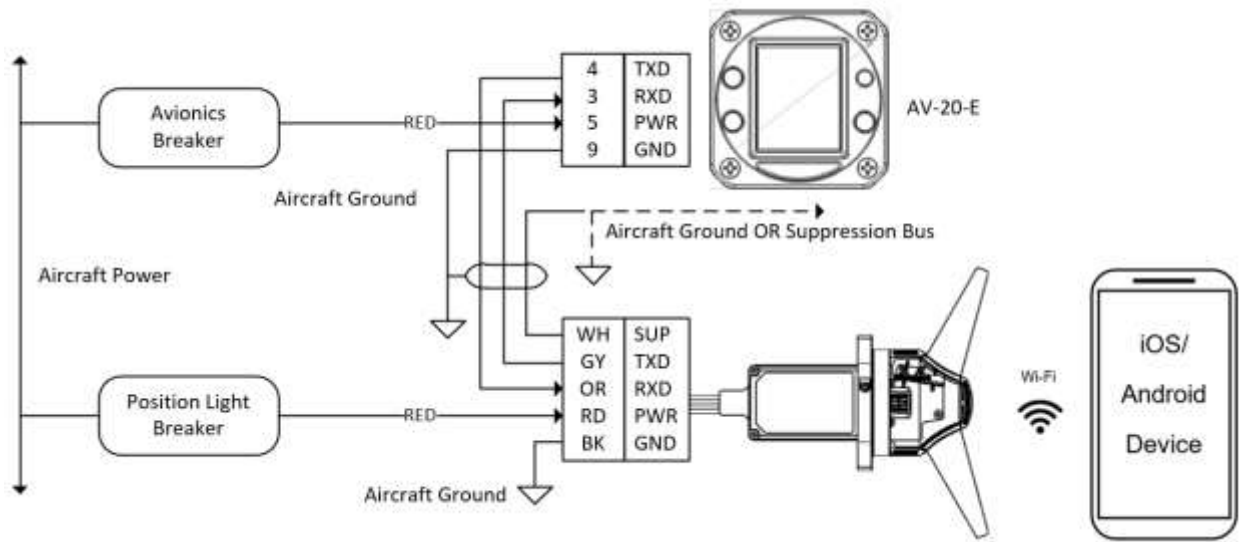
B.2 Compatible Equipment

The following equipment has been shown to be compatible with tailBeaconX, and can serve as a controlling device.

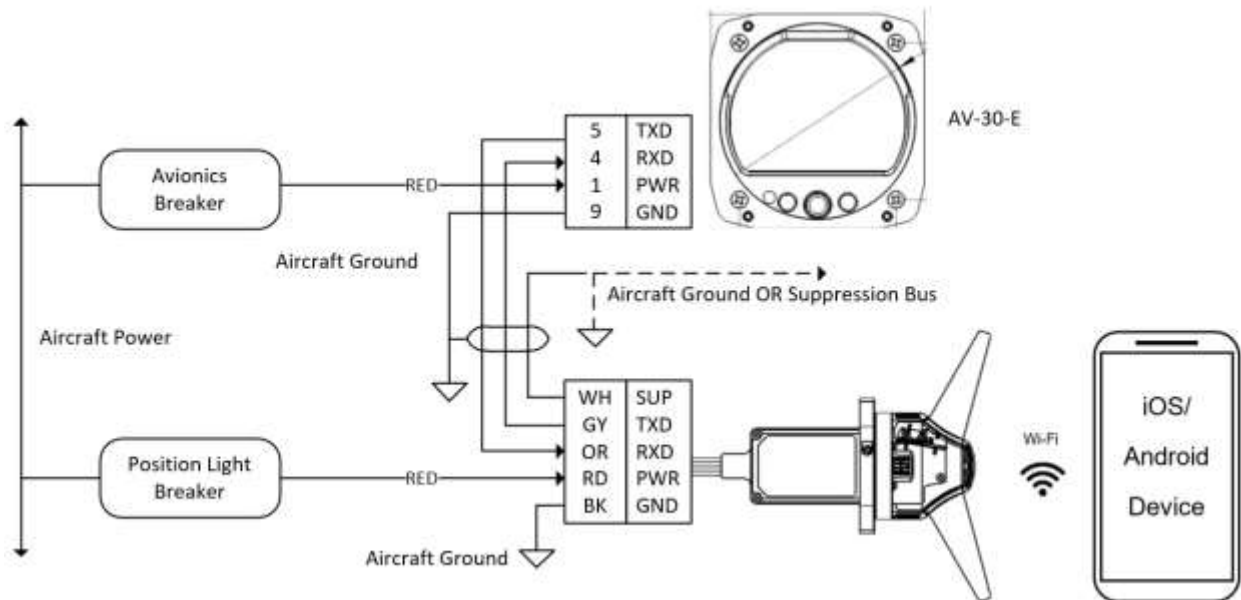| Manufacturer	Model	tailBeaconX Protocol [1]	Controller Configuration
uAvionix	AV-20-E	UCP-HD	Enable "XPDR CTRL" page
	AV-30-E	UCP-HD	SERIAL 2: "BEACON X" GPS NAV SRC: "BEACON X" (optional, enable if GPS track and velocity information desired)
	AV-30-C		

[1] tailBeaconX input/output protocol automatically selected, for information purposes only

See below for example interconnect drawings.

B.2.1 uAvionix AV-20-E

B.2.2 uAvionix AV-30-E / AV-30-C

B.3 Third-party Equipment

The following devices are reported to be compatible with supported tailBeaconX protocols.

Manufacturer	Model	tailBeaconX Protocol *[1]*	Controller Configuration
GRT	MINI-B	Apollo	Serial Output: SL70/STX175 Serial Rate: 2400
	MINI-AP		
	MINI-X		
	Sport EX		
	Horizon EX		
MGL	iEFIS	Apollo	Type: STX165(R) Serial Rate: 2400
	Xtreme EFIS		

[1]   tailBeaconX input/output protocol automatically selected, for information purposes only

Proper operation of the interface and system, with the specific equipment configuration, must be demonstrated at installation time.

B.3.1 Configuration

Certain third-party EFIS displays have the capability to send barometric pressure altitude data and control the mode and squawk functions of the tailBeaconX through an available RS-232 serial output. Position data is not required to be provided by the EFIS, as the tailBeaconX has an integrated GPS function. tailBeaconX configuration must take place through the "skyBeacon Installer" application as guided in Section 9.

Only the EFIS serial OUTPUT is required. If no configuration information is provided in the compatible equipment table above, the parameters should be set as follows.

Characteristics	Specifications
Physical	RS-232
Rate and properties	2400 bps 8N1
Protocol	SL70, STX165R, Apollo, or UCP-HD

B.3.2 Interconnect

Connect the tailBeaconX Orange (RXD) wire to the appropriate EFIS serial port transmit (TXD) line.

Example pinout options for certain compatible EFIS displays are shown below. Please consult the EFIS installation manuals for additional options and information.

GRT Mini-X / Mini-AP	Serial 1	Serial 2
TXD Pin	5	1

GRT Mini-B	Serial 1	Serial 2	Serial 3
TXD Pin	5	1	9

GRT Sport EX / Horizon EX	Serial 1	Serial 2	Serial 3	Serial 4	Serial 5	Serial 6
TXD Pin	A2	A4	A25	A5	A3	A1