tailBeaconX™ EXP

User and Installation Guide

Aireon COMPATIBLE

UAV-1003598-001 Rev D

1 Revision History

Revision	Date	Comments
A	1/19/2020	Initial release
B	5/21/2020	Updates to Control Head Installation sections
C	9/14/2020	Updating Control references to GDL90+; Minor edits
D	8/21/2023	Updated MGL/EFIS configuration guidance

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-EXP on the aircraft. For the duration of the warranty period, uAvionix, at its sole discretion, 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-EXP. 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. This is an incomplete system intended to provide the functions identified in, and when installed according to, this installation manual.

5.2 Minimum Performance Standards

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

5.3 Applicable P/Ns

Description	P/Ns
skyBeacon PF007 Boot Program Firmware	UAV-1001758-( )
tailBeaconX PF007 Operating Program Firmware	UAV-1002393-( )
skyBeacon GNSS Operating Program Firmware	UAV-1002029-( )
skyBeacon Wi-Fi Operating Program Firmware	UAV-1001761-( )
beaconX FPGA	UAV-1002392-( )

5.4 System Functions

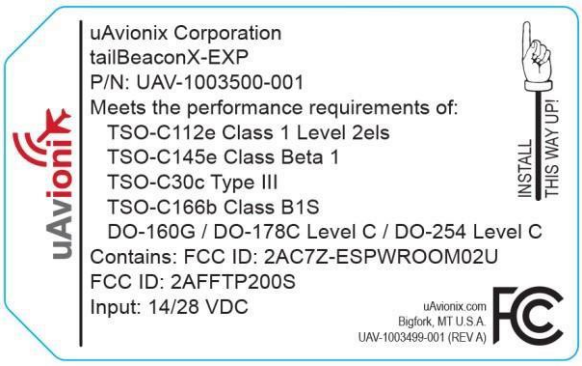
System Function	DO-178C DAL	DO-254 DAL
GPS/SBAS	C	C
Mode S transponder	C	C
Wi-Fi [1]	E	E

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

5.5 FCC ID

Model	FCC ID
tailBeaconX-EXP	2AFFTP200S
Contains	2AHMR-ESP12S

5.6 Device Marking



5.7 Environmental Qualification Form

Conditions	DO-160G Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Category B2
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 Operating	4.5.4	+70°C
High Temperature Short-Time Operating	4.5.3	+70°C
High Temperature Ground Survival	4.5.3	+85°C
Loss of Cooling	4.5.5	Cooling air not required (+70°C operating without cooling)
Altitude	4.6.1	25,000feet
Decompression	4.6.2	Equipment identified as Category B2 – no test
Overpressure	4.6.3	Equipment identified as Category B2 – 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 type 5: zone 1 (Single Engine) to Category S level M Aircraft type 4: zone 1 (Multi Engine) to Category S level L Aircraft type 1: zone 7 (Helicopter) to Category R level J
Explosion	9.0	Equipment identified as Category X – no test
Waterproofness	10.0	Equipment identified as Category S
Fluids Susceptibility	11.0	Equipment identified as Category X – no test
Sand and Dust	12.0	Equipment identified as Category S
Fungus	13.0	Equipment identified as Category X – no test
Salt Spray	14.0	Equipment identified as Category S
Magnetic Field	15.0	Equipment identified as Category B
Power Input	16.0	Equipment identified as Category BX
Voltage Spike	17.0	Equipment identified as Category B
AF Conducted Susceptibility	18.0	Equipment identified as Category B
Induced Signal Susceptibility	19.0	Equipment identified as Category AC
RF Susceptibility	20.0	Equipment identified as Category TT
RF Emissions	21.0	Equipment identified as Category H
Lightning Induced Transient Susceptibility	22.0	Equipment installed as Category XXXX – no test
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 identified as Category X – no test
Fire, Flammability	26.0	Equipment identified as Category C

5.8 Continued Airworthiness

Maintenance of the tailBeaconX-EXP is "on condition" only. For regulatory periodic functional checks, refer to the approved aircraft maintenance manuals or manual supplements. The aircraft must be returned to service in a means acceptable to the appropriate aviation authority.

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.

6 System Specifications

6.1 System Functionality

tailBeaconX-EXP is an Aireon Compatible complete system Mode S Extended Squitter (ES) ADS-B OUT transponder, integrated with an internal WAAS GPS into a LED rear position light. tailBeaconX-EXP is designed to meet the transponder and ADS-B requirements for operating in controlled airspace worldwide, while minimizing installation costs. tailBeaconX-EXP includes an internal GPS/SBAS receiver. This receiver allows the unit to function as its own position source.

6.2 Wi-Fi

Wi-Fi is intended for on-ground configuration. **WiFi is only enabled in standby (STBY) mode** and disabled five minutes after startup, or when in ALT or ON mode, whichever occurs first. Connecting the tailBeaconX-EXP to the Installer app will prevent the five-minute shutdown from occurring.

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

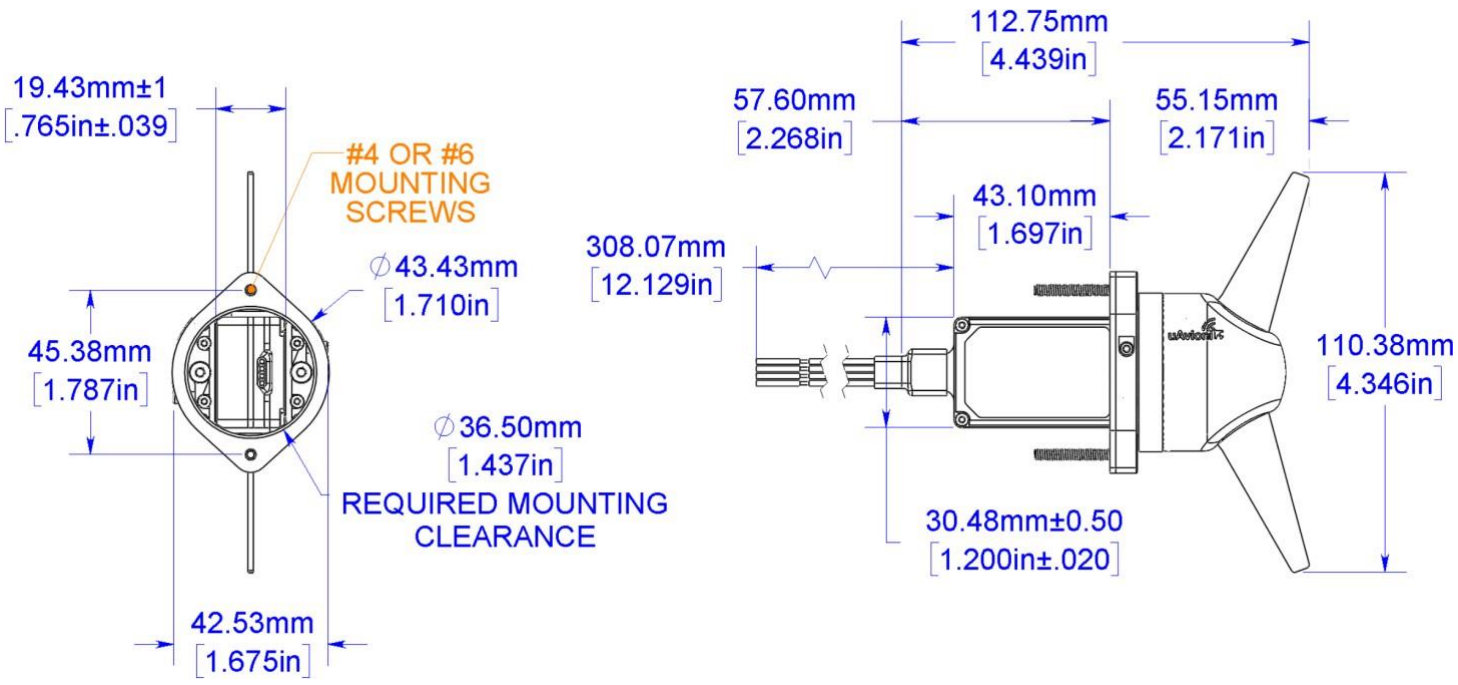
6.3 Call Sign

Your call sign may be adjusted on the ground using the skyBeacon Installer app. It may not be adjusted in flight. 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 ensure no other installation parameters are adjusted. For typical operations, the call sign should be set to the aircraft registration or Tail Number.

6.4 tailBeaconX-EXP Specifications

6.4.1 Physical Specifications

Characteristics	Specifications
Width	42.53mm
Height	110.38mm
Depth	112.75mm
Weight	3.5 oz (100 grams)
Operating Temperature Range	-45°C to +70°C
Maximum Pressure Altitude	60,000ft
Input Voltage Range	9 to 33 VDC
14V Current	0.5A Max
28V Current	0.25A Max



6.4.2 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 Reacquisition Cold Start Hot Start	 -166 dBm -160 dBm -148 dBm -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 nsec of UTC
Datum	WGS-84

6.4.3 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

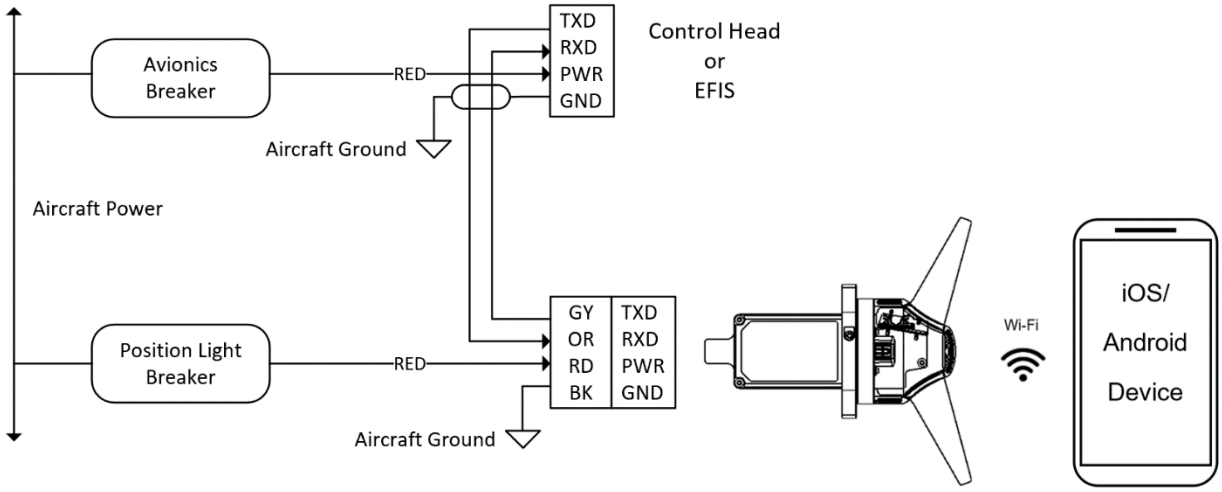
6.4.4 Position Light Specifications

Characteristics	Specifications
Color	Aviation White
Intensity	20 candelas

6.4.5 Control Interface Specifications

Characteristics	Specifications
Physical	RS-232
Baudrate	2400 bps 81N
Protocols	GDL90+, SL-70, STX165R

6.4.6 System Interfaces



7 Installation

7.1 Part Numbers

Item	P/N
tailBeaconX-EXP	UAV-1003500-( )

7.2 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 help justify your claim, save the original shipping container and all packing materials.

7.3 Mounting Location

tailBeaconX-EXP is a rear, aft position light. Ensure that when mounted, the fins and the top of the assembly are free from obstructions. tailBeaconX-EXP 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.

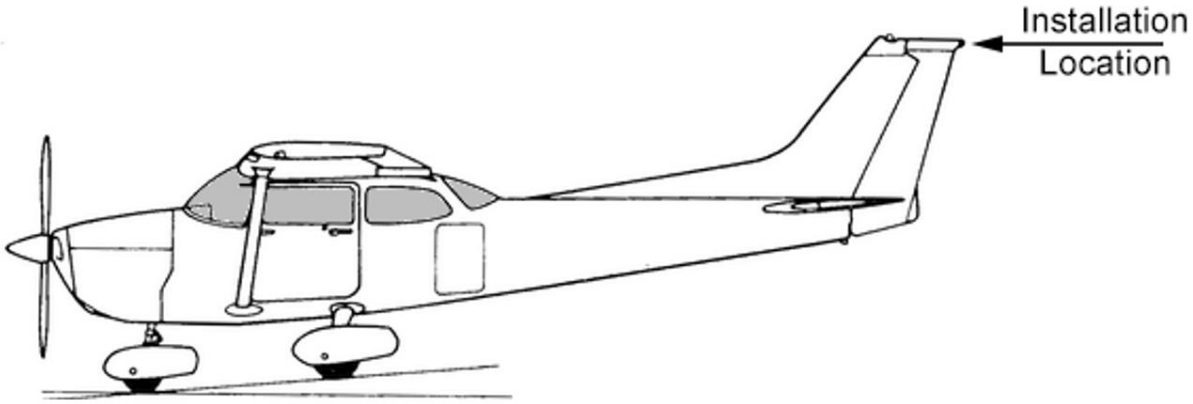
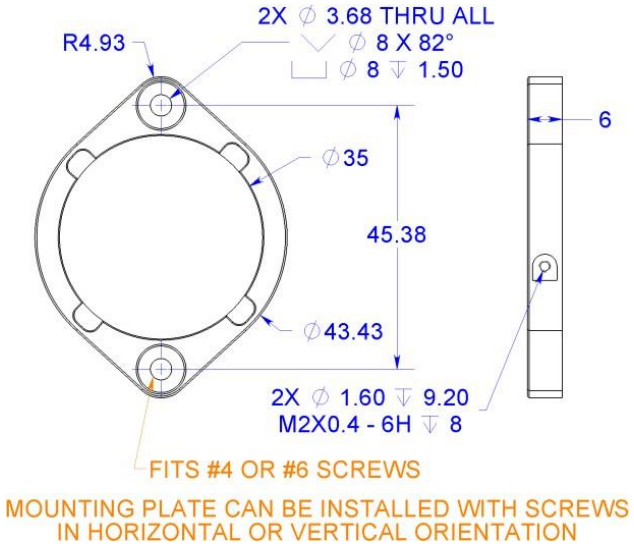


Figure 1: Generic representation of direct mounting

7.4 Mounting Plate Installation

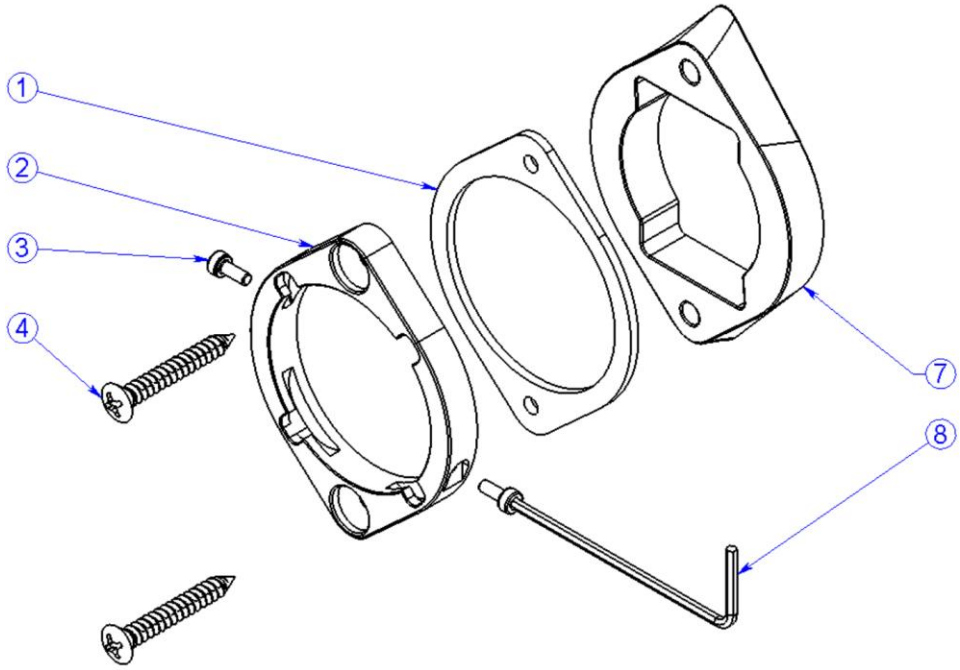
The default installation utilizes #4-40 hardware however there are some installations that require #6-18 mounting hardware. Be sure to use the correct Installation Kit for your aircraft.

The Mounting Plate can be installed with the screws aligned either vertically or horizontally.

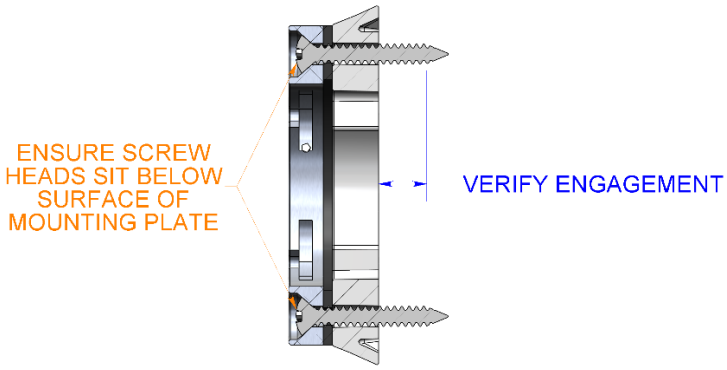


Mounting Kit

#	Item	P/N
1	tailBeaconX Mounting Plate	UAV-1003125-001
2	tailBeacon Mounting Gasket	UAV-1001756-001
3	Socket Head Cap Screw, M2x4mm, SS (2)	UAV-1002820-002
4a	Flat Head Phillips Screw, 4-40 x 1in, SS (2)	UAV-1002184-001
4b	Flat Head Phillips Screw, 6-1832 x 1in, SS (2)	UAV-1003563-001
7	Optional spacer	UAV-1003562-001
8	Hex L Wrench, 1.5mm	UAV-1002817-001



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 is at least 31mm in diameter and allows straight passage of the tailBeaconX-EXP main body.
4. Peel the backing from the Mounting Gasket and affix to the Mounting Plate.
5. 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 the 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.



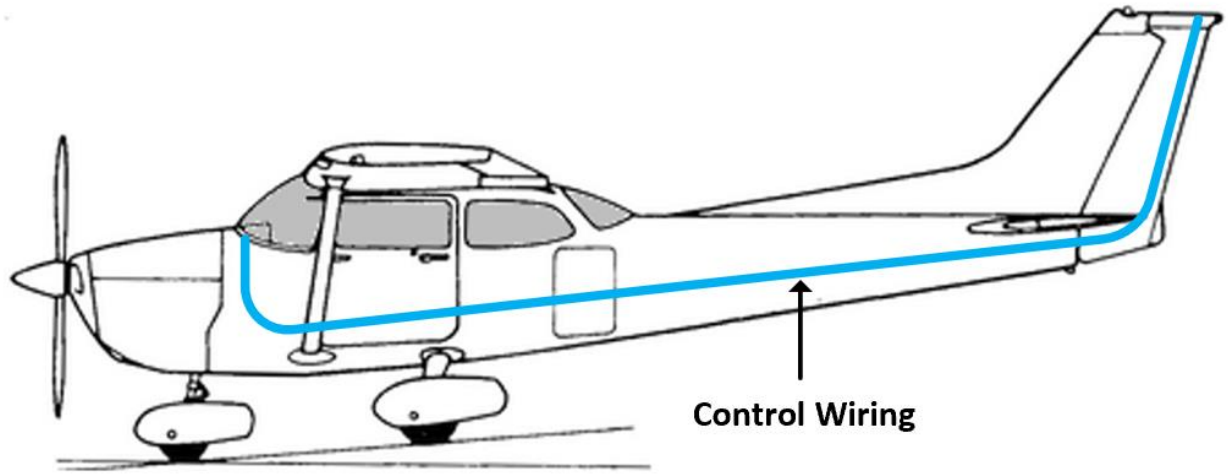
Note: Installation of the tailBeaconX-EXP must be in accordance with AC 43.13-2B, Chapter 1.

7.5 Wiring

tailBeaconX-EXP is designed to use existing position and/or anti-collision light wiring. If new wiring is required, refer to AC 43.13-1B Chapter 11 for guidance. The power should present a resistance of less than 0.5ohm. The ground wire should present a resistance of less than 250 milliOhm's. 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 tail.

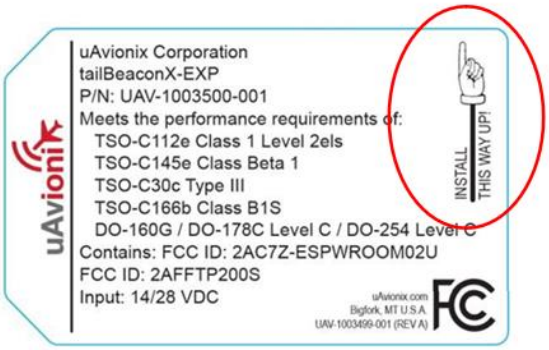


    b. Install a ground wire from the aircraft airframe or battery ground
2. Connect the red wire to the switched position light power wire using environmental splices or equivalent.
3. Connect the black wire to the battery or airframe ground.
4. Connect the twisted pair conductors to the Orange and Grey wires
5. Connect one end of the twisted pair shield to the local airframe ground.

7.6 Mounting Unit

The tailBeaconX-EXP unit must be electrically connected, then installed into the Mounting Plate by aligning the mounting tabs on the tailBeaconX-EXP with the cut-outs in the Mounting Plate. This requires you to rotate the unit 12deg from vertical before inserting. Once inserted fully, rotate Clockwise to vertical and secure with M2 anti-rotation screws. **DO NOT FORCE ROTATION, tailBeaconX will rotate with little resistance**

6. Insert tailBeaconX-EXP into the Mounting Plate and twist clockwise to the vertical position, ensuring that the tailBeaconX-EXP is oriented consistent with the installation arrow on the label.



7. Secure the tailBeaconX-EXP to the Mounting Plate using the two supplied M2 anti-rotation screws and a 1.5mm hex driver.

7.7 Control Head Installation

tailBeaconX-EXP can be controlled by either an EFIS, the uAvionix AV-20-E or AV-30-E. The AV-30-E is a 3-inch feature-rich EFIS display, and the AV-20-E 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.

The installation information below are supplements to the AV-20-E and AV-30-E installation manual and concern wiring and operation of transponder control functionality only. The installer should become fully familiar with the installation process for the control head.

7.7.1 EFIS

The following EFIS displays have the capability to send barometric pressure altitude data and control the mode and squawk functions of the tailBeaconX through any available RS-232 serial output.

List of Compatible EFIS's	
GRT	MINI-B
	MINI-AP
	MINI-X
	Sport EX
	Horizon
MGL	iEFIS

Only the serial OUTPUT is required. It should be set to the following parameters.

Characteristics	Specifications
Physical	RS-232
Baudrate	2400 bps 81N
Protocol	GDL90+ or SL-70 or STX165R

*For MGL EFIS displays, the baud rate on the tailBeaconX must be changed to 9600. See Appendix A for more information on configuring tailBeaconX for an MGL EFIS.

Example pinout options for compatible EFIS displays are shown below.

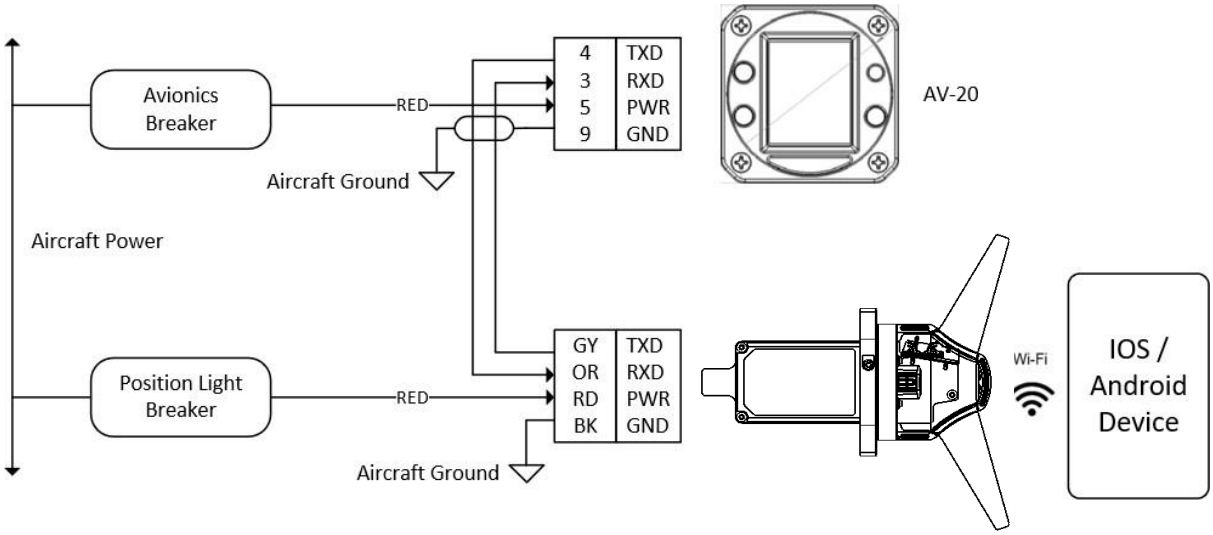
GRT Mini-X/AP	Serial 1	Serial 2
Orange (RXD)	5	1

GRT Mini-B	Serial 1	Serial 2	Serial 3
Orange (RXD)	5	1	9

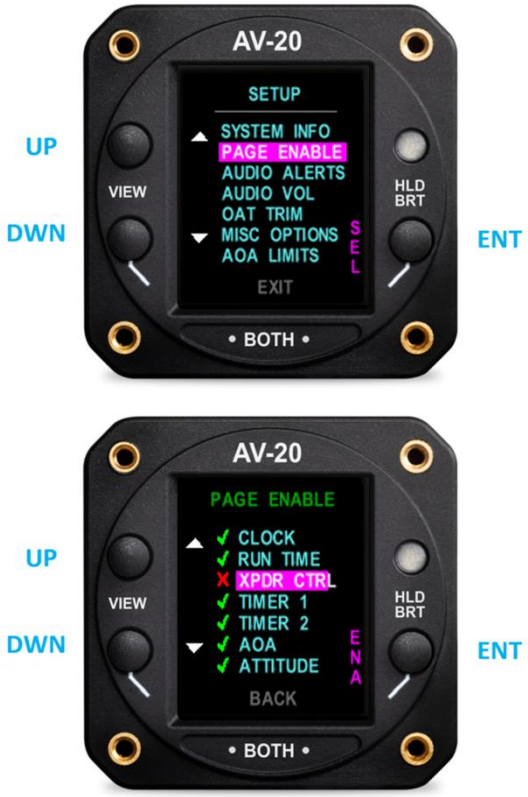
GRT Sport EX/HorizonEX	Serial 1	Serial 2	Serial 3	Serial 4	Serial 5	Serial 6
Orange (RXD)	A2	A4	A25	A5	A3	A1

7.7.2 AV-20-E Control Head

7.7.2.1 Wiring

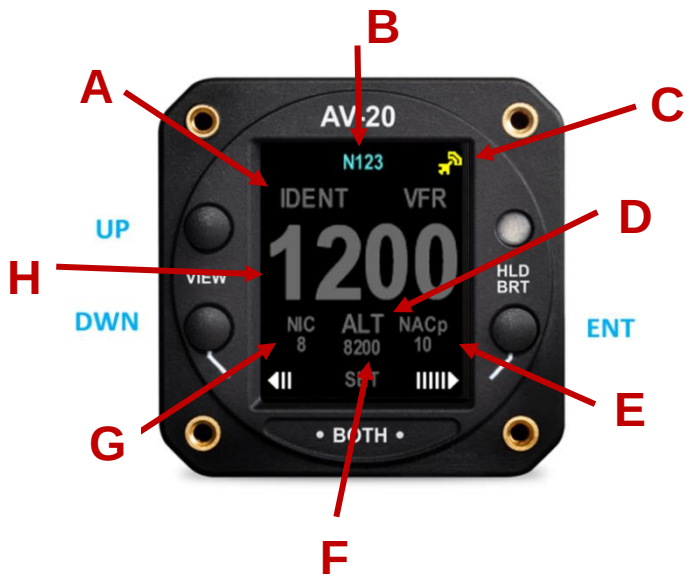


7.7.2.2 Setup



In the *Page Enable* sub menu of the *Setup Menu*, Activate the *XPDR CTRL* page (green check box). Power cycle the AV-20 after any setting changes are made for them to take effect.

7.7.2.3 Operation



A	IDENT Status will illuminate blue if active
B	Configured Callsign
C	Radar interrogation status
D	Mode Selection (STBY, ON, ALT)
E	GPS NACp
F	Pressure Altitude
G	GPS NIC
H	Current Squawk Code

To Change Squawk

- Select *SET* by pressing both bottom buttons
- Navigate highlighted cursor to desired digit by pressing the right button
- Press either Up or Down buttons to change
- Press both bottom buttons to set new code

To Change Mode

- Select *SET*
- Press right button to navigate cursor to mode selection
- Press Up or Down buttons to change
- Press both bottom buttons to set mode

To Ident

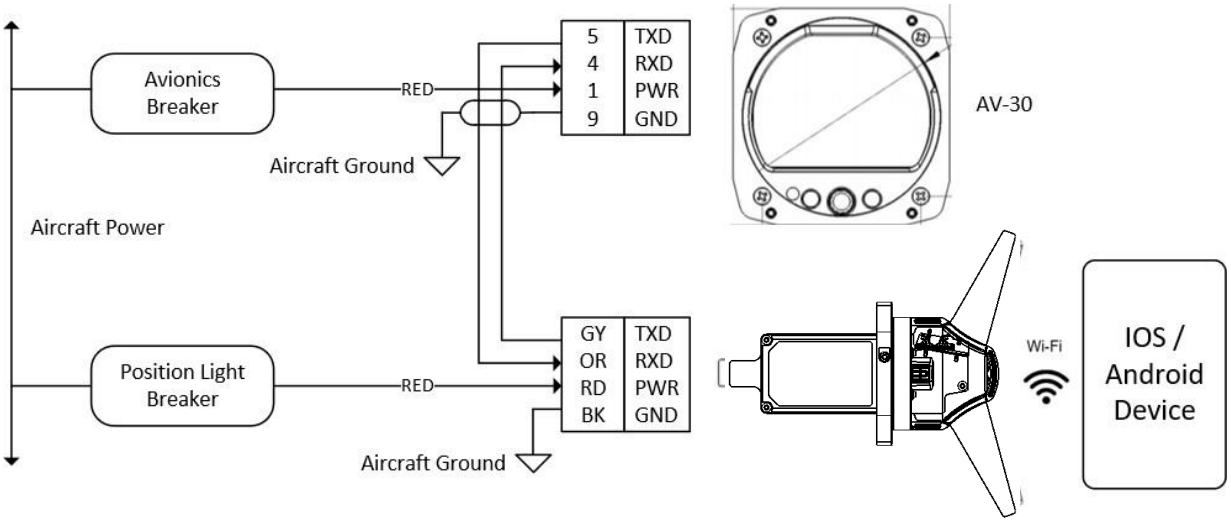
- Press the top button

Quick Squawk 1200

- Press and hold the top button

7.7.3 AV-30-E Control Head

7.7.3.1 Wiring



7.7.3.2 Setup

From any screen on the AV-30, Press the *MENU* button (left button) three times or until the *INSTALL* menu is visible.

Rotate the center knob until the *SERIAL 2* setup is shown.

Press down the center knob to activate then rotate to select *BEACON X* then press the center knob again to accept.

Press the *MENU* button again to complete setup.

Power cycle the AV-30 anytime a setting has been changed.

7.7.3.3 Operation

A	Configured Callsign
B	Current Squawk Code
C	Mode Selection (STBY, ON, ALT)
D	GPS NIC
E	GPS NACp
F	Pressure Altitude, Yellow indicates radar interrogation, Will change to IDT if IDENT is active
G	Communication status (OK, TMOUT)

To Change Squawk

- Press in the center knob
- Navigate highlighted cursor to desired digit by rotating the knob
- Press in the center knob to select the desired digit
- Rotate the center knob to change the squawk digit
- Press in the center knob to accept the change
- Press the left button (*DONE*) to finish

To Change Mode

- Press in the center knob
- Press the right button to cycle through each Mode selection (STBY, ON, ALT)
- Press the left button (*DONE*) to finish

To Ident

- Press the left button

Quick Squawk 1200

- Press in the center knob
- Press in the center knob to select a squawk digit
- Press the right button to quick squawk 1200
- Press the left button (*DONE*) to finish

7.7.3.4 Optional Configuration

tailBeaconX has the capability to provide the AV-30 with GPS information. In the *INSTALLATION* Menu, select *BEACON X* as the *GPS NAV SRC* option. tailBeaconX will provide GPS Groundspeed and GPS Track.

8 Maintenance

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

9 Care and Cautions

The tailBeaconX-EXP should be regularly cleaned with warm soapy water and a soft cloth micro-fiber rag. Use of chemical cleaners and degreasers should be avoided. If the tailBeaconX-EXP 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-EXP assembly. Doing so may damage the housing. Avoid any contact with abrasive materials including scrubbing pads.

Never hit, tap on or flex the fin portions of a properly mounted tailBeaconX-EXP assembly. Doing so will cause undue stress in the assembly and could void your warranty.

10 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.

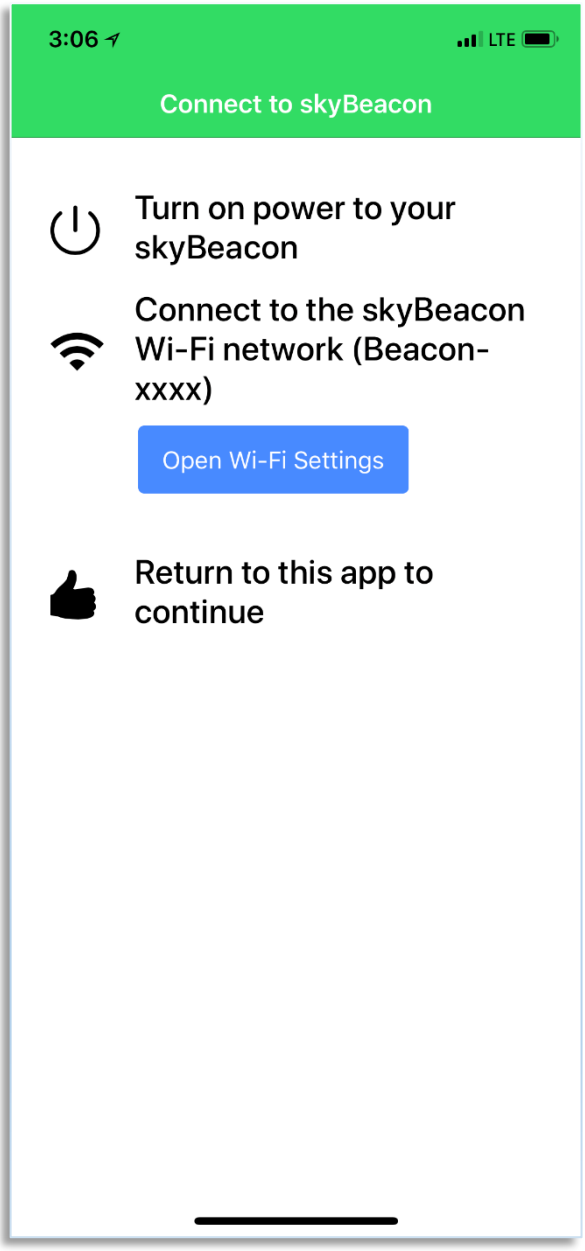
10.1 Connect to tailBeaconX-EXP Wi-Fi

Wi-Fi is intended for on-ground configuration. **Wi-Fi is only enabled in standby (STBY) mode** and disabled five minutes after startup, or when in ALT or ON mode, whichever occurs first.

Launch the skyBeacon Installer app and follow instructions to connect to the tailBeaconX-EXP for configuration.

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

The tailBeaconX-EXP Wi-Fi connection is secure but does not require a password.



10.2 Configuration

The configure screen provides all configuration options.

Call Sign:
The CALL SIGN can be up to an 8 digit code that corresponds to the Tail Number of the aircraft (0-9, A-Z) or FAA or ATC assigned Callsign.

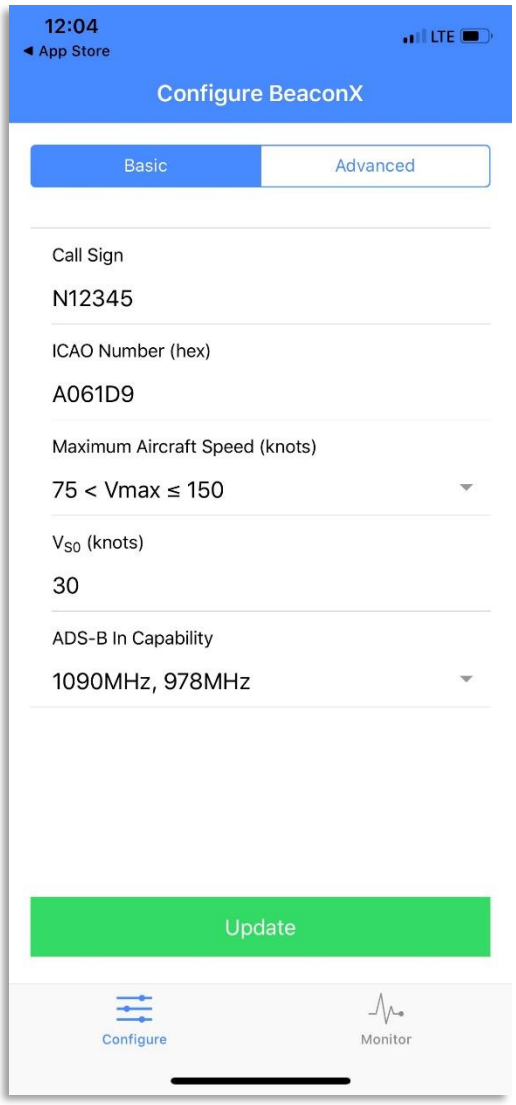
ICAO Number:
The ICAO address is a 24-bit number issued to the aircraft by the registration authority of the aircraft. These addresses are usually written as a 6-digit hexadecimal number.

Maximum Aircraft Speed (knots):
Mode S transponders can transmit their maximum airspeed characteristics to aircraft equipped with TCAS. This information is used to identify threats and to plan avoiding action by the TCAS equipped aircraft. The airspeeds are grouped in ranges.

Vso (knots):
This parameter allows tailBeaconX-EXP to automatically switch between airborne and ground modes and should be set to the aircraft stall speed.

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.



Emitter Type:
To assist ATC tracking of aircraft, an aircraft category can be transmitted. Select the aircraft category that most closely matches the aircraft.

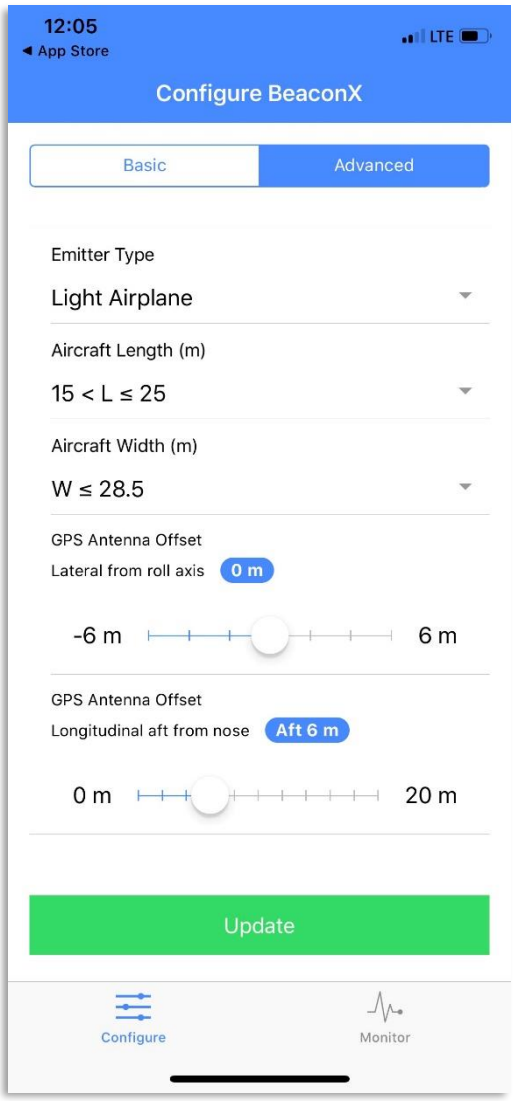
Aircraft Length:
Enter the aircraft Length in Meters.

Aircraft Width:
Enter the aircraft width in Meters.

GPS Antenna Offset (Lateral):
Enter the position of tailBeaconX-EXP relative to the center of the aircraft Roll axis in Meters.

GPS Antenna Offset (Longitudinal):
Enter the position of tailBeaconX-EXP relative to the nose of the aircraft in Meters.

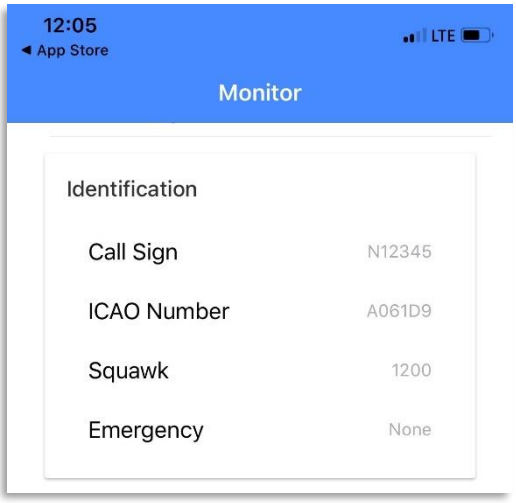
Tap “Update” when complete.



10.3 Post-Installation Checks

Configure tailBeaconX-EXP before performing system checkouts.

Tab to the “Monitor” screen on the Installer App.

Verify that Status is listed as “OK”. Information on status annunciations described in Section 11 can be found here. Verify that the Call Sign matches your aircraft’s Tail Number. Verify that the ICAO number is correct as entered. Verify Squawk code matches the squawk input on the control EFIS or AV-20-E or AV-30-E.	

Note: You may need to power cycle the tailBeaconX after configuration for the correct Monitor information to populate.

11 Normal Operation

tailBeaconX-EXP must be enabled (turned to ALT) during all phases of flight including surface movement operations.

12 Support

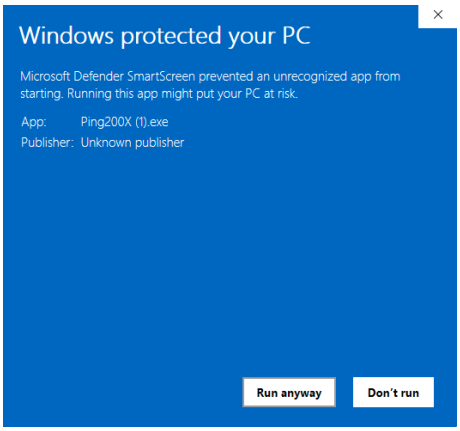
For additional questions or support please visit:

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

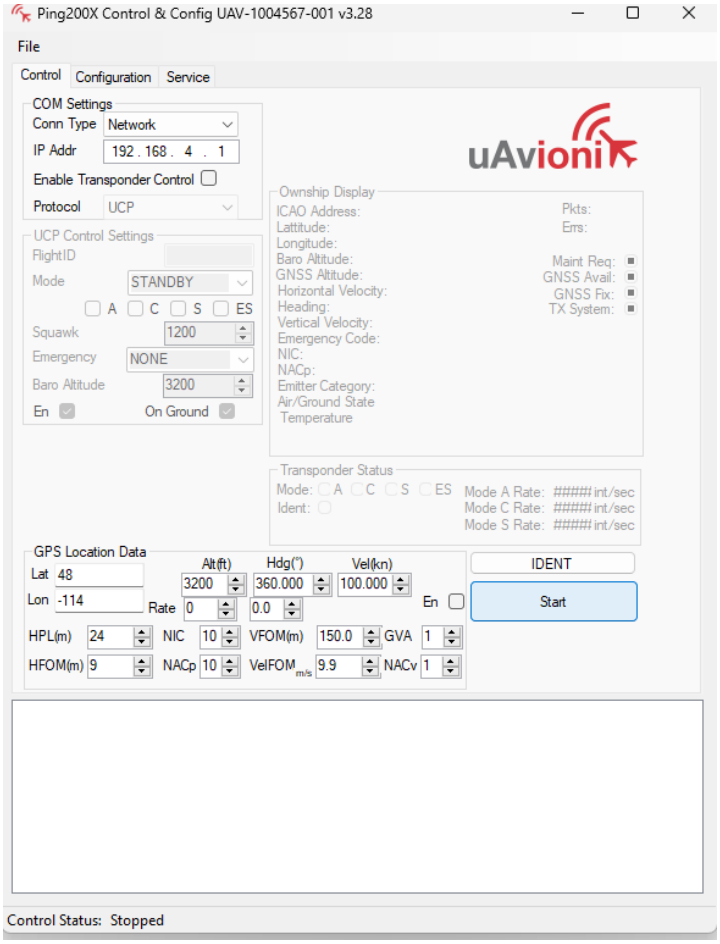
Appendix A – Advanced Configuration

Apollo/MGL Configuration

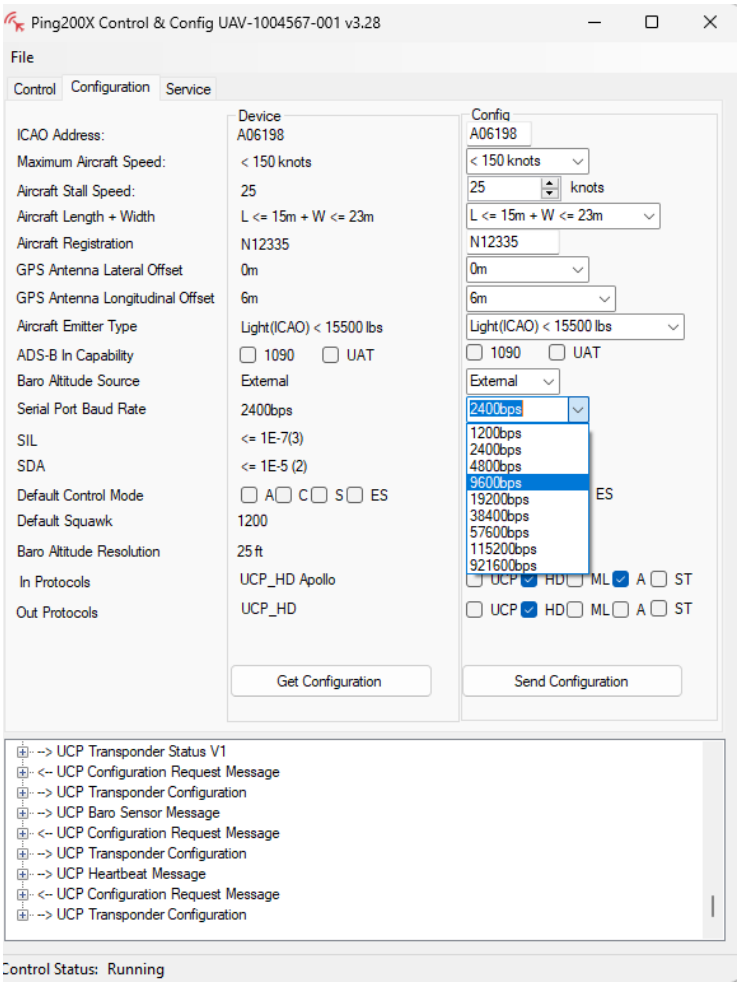
A. Download the ping200X Control & Config Application (PCCA) here.
B. Power ON the tailBeaconX.
C. From your Windows PC, connect to the tailBeaconX Wi-Fi “Beacon-XXXX”. If Wi-Fi is not available, ensure the tailBeaconX is in Standby.
D. Run the PCCA app that you just downloaded. Windows Defender may present a blue box warning. Click More Info and click “Run Anyway”



E. From the PCCA tool, “Conn Type” change from Serial to Network.



F. Press the Start button (highlighted blue above) to connect to the tailBeaconX.
G. At this point you should see messages sending back and forth in the lower white dialog window.
H. Once connected, click on the “Configuration” tab. This tab allows for advanced configuration not available in the skyBeacon Smartphone App.
I. Change the “Serial Port Baud Rate” from 2400bps to the desired baud rate, typically 9600 or 115,200bps depending on your EFIS configuration.



J. Ensure the “In Protocols” and “Out Protocols” are set as shown above.
K. Set any additional configuration required, such as ICAO, Aircraft Registration (typically N-number), Max Aircraft Speed, etc.
L. Press “Send Configuration” to set the configuration on the tailBeaconX.
M. Power cycle the tailBeaconX, at this point, your EFIS should be communicating with the tailBeaconX at the desired baud rate.