



## User and Installation Guide

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# 1 Revision History

Revision	Date	Comments
A	2/27/2017	Initial release
B	3/6/2017	
C	3/28/2017	GTX Protocol Support
D	5/25/17	Export Control
E	5/31/2017	Traffic on COM1
F	8/14/2017	Aligns with Echo Installer App Updates
G	8/17/2017	Added Garmin GTN and GRT SafeFly app notes
H	11/24/2017	Added AFS traffic app note
I	12/21/2017	Updated Apollo SL70 app note with TX setting
J	2/19/2018	echoUATmux harness/Navworx Retrofit
K	4/2/2018	Update transponder language
L	10/10/2018	Update Legacy Transponder wiring diagram C-1
M	7/20/2020	Update with clarification plus MGL configuration
N	5/25/2023	Updates for Echo Installer App
O	12/11/2023	Updates for echoALT

## **2 Warnings / Disclaimers**

All device operational procedures must be learned on the ground.

Received weather and traffic information is to be used as an aid to situational awareness, and is merely supplemental and advisory in nature.

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 one year from the of installation in 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, water, fire or flood, 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 warrant service.

Please email or call uAvionix with a description of the problem you are experiencing. Also, please provide the model, serial number (if applicable), 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.

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## 4 Introduction

The echoUAT is a remotely mountable ADS-B transceiver that incorporates a dual-link (1090 MHz and 978 MHz) receiver and 978 MHz UAT Class B1S transmitter.

### 4.1 Features

The echoUAT performs the following functions:

- UAT ADS-B out transmission (978 MHz)
  - Transmits ADS-B Out data on the 978 MHz frequency.
    - Selectable anonymous Mode when squawking VFR (1200)
- UAT ADS-B reception (978 MHz)
  - Receives ADS-B In data from other UAT transmitters, including aircraft, vehicles, and ground stations. This includes ADS-B, ADS-R, TIS-B and FIS-B data.
- 1090ES ADS-B reception (1090 MHz)
  - Receives ADS-B In data from aircraft equipped with 1090 MHz Extended Squitter transmitters.
- Transponder interface
  - The power transcoder allows monitoring of existing Mode A/C transponders via the aircraft electrical system. **No connection to the transponder is required.**
  - An Optional Direct serial connection for some transponders or EFIS integration is provided via a serial communications port.
- Traffic correlation
  - Traffic information from both UAT and 1090ES signals are correlated to provide a coherent view of nearby aircraft.
- GDL 90 output
  - Traffic and FIS-B data is translated to a standard GDL 90 format for use via the integrated Wi-Fi connection or via wired connection from a serial port.
- Wi-Fi EFB connection
  - GDL 90 ADS-B “in” data is transmitted over the integrated Wi-Fi interface for reception by standards compliant Electronic Flight Bag (EFB) applications.



## 4.2 Regulatory Compliance

The echoUAT meets the Minimum Operational Performance Standards of DO-282B Class B1S. It complies with the ADS-B Final Rule Technical Amendment, dated 2/9/2015, affecting 14 CFR 91.225 (b)(1)(ii) which permits ADS-B Out in the National Airspace System for devices meeting the performance requirements of TSO-C154c. Accordingly, when installed in accordance with the installation instructions of this guide, the device complies with the aircraft requirements of 14 CFR 91.227.

**(Per the February 9, 2015 rule change to 14 CFR 91.225 (b)(1)(ii))  
(A letter of authorization from the aircraft manufacturer is needed for installation in LSA aircraft)**

### 4.2.1 FCC Grant of Equipment Authorization

This equipment has been issued an FCC Grant of Equipment Authorization.

The equipment contains FCC ID 2AFFTUAT016 and is marked on the equipment nameplate.

The equipment also contains FCC ID 2ADUIESP-12 and is marked on the equipment nameplate.

## 4.3 Interfaces

The echoUAT provides the following standard interfaces:

- RF Transmit and Receive via a single SMA antenna connection.
- Molex 6-pin interface connector for power, device I/O and control.
- Integrated Wi-Fi adapter for connection to external Wi-Fi devices.

## 4.4 Software and Airborne Electronic Hardware Configuration.

Part	Part Number	Revision
Software	UAV-1001007-001	A
Airborne Electronic Hardware	UAV-1001008-001	A

## 4.5 Supplied Accessories

Part	Part Number	Revision
echoUAT Transceiver	UAV-1000957-001	A
SMA-BNC Adapter RF cable	UAV-1001011-001	
Wiring Harness with Molex plug	UAV-1001010-001	
978 MHz Monopole Antenna	UAV-1001009-001	A
echoALT	UAV-1007460-001	
echoALT Wire Harness	UAV-1007532-001	

## 5 Technical Specifications

Specification	Characteristics
Compliance	Meets the performance requirements of TSO-C154c
FCC ID	2AFFTUAT016
FAA Transmit License	Manned and un-manned aircraft.
Power Requirements	11 – 33VDC. Typical 2W On/Alt, 0.1W Standby DO-160G Category Z
Altitude	18,000ft
Operating Temperature	-45°C to +70°C
Transmit Frequency	978MHz ±1MHz
Transmit Power	20W nominal
Transmitter Modulation	1M29G1D
Receiver Frequency	978MHz 1090MHz
Receiver Sensitivity	978MHz: -90 to -3dBm 1090MHz: -79 to 0dBm
Weight	60grams
Height	19mm
Length	55mm
Width	65mm

- An internal power transcoder detects pressure altitude and ATC squawk codes from Mode A/C transponders by decoding the radar replies via the aircraft electrical system. No direct connection wiring to the transponder is required. Mode C pressure altitude data is used for barometer correspondence only.
  - The echoUAT may be “hard-wired” to a few specific Garmin transponder/encoder combinations using an optionally procured multiplexer cable, echo Mux, to transfer Squawk code and pressure altitude directly to the echoUAT. Mode C pressure altitude data is used for barometer correspondence only.

- The echoUAT may be “hard-wired” to Trig TT20/22 systems, Sandia STX 165/r, Funke TRT800H and Apollo SL-70 transponders with no procured equipment to transfer Squawk code and pressure altitude directly to the echoUAT. Mode C pressure altitude data is used for barometer correspondence only.
- The echoUAT may be interfaced to and controlled by a GRT or MGL EFIS via the TMAP protocol.
- Based on updated FAA guidance in 2024, the echoUAT cannot report altitude solely on Mode C transponder replies. Instead, echoUAT installations require a barometric pressure source capable of data rates specified in TSO-C154c.
  - Most echoUAT installations will require inclusion of the uAvionix echoALT barometric pressure source and a software update.
  - Some transponders/altitude encoders can provide altitude data at a sufficient rate via a hard-wired interface. See table below for list of approved altitude encoders.

Approved Altitude Encoders	Software Versions
echoALT	1.0.2+
Funke TRT800H	6.5

- The echoUAT requires a WAAS enabled ADS-B compliant GPS source. The GPS system that are compatible with the echoUAT are comprised of the following systems;
  - uAvionix SkyFYX/SkyFYX Ext
  - GRT SafeFly 2020
  - Garmin GNS 4XX, 5XX, 6XX, 7XX series with ADS-B +
  - Avidyne GNS replacements
  - Trig TT series transponders providing GPS data via the TMAP protocol

- The echoUAT provides integrated Wi-Fi capability that is used to configure the unit as well as providing an ADS-B “in” GDL 90 interface for use by mobile device EFB applications.
- The echoUAT provides a GDL 90 ADS-B “in” interface via a serial port that integrates with a variety of existing, non-proprietary interface, EFIS/MFD systems

The echoUAT is designed to meet the performance requirements of TSO-C154c and is compliant with FAR 91.225 and FAR 91.227 for operation in the National Airspace System.

**The echoUAT system is for use in Experimental and LSA aircraft only.**

## 5.1 Markings



## 6 Equipment Limitations

### 6.1 Installation

#### 6.1.1 TCAS/ACAS System

echoUAT does not support installation on aircraft with an active TCAS II system.

#### 6.1.2 Modifications and Use Outside of Intended Scope

This device has been designed and tested to conform to all applicable standards in the original form and when configured with the components shipped with the device. It is not permissible to modify the device, use the device for any use outside of the intended scope.

#### 6.1.3 Deviations

The following deviations were implemented.

TSO	Deviation
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.4.5.2.5.1.e to allow an algorithm with multiple sources of data to determine the Vertical Status of light aircraft.
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.12 to not provide a suppression bus output.
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.7.1.a Table 2-63 Line 1 to not provide a Barometric Vertical Rate Input.
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.7.1.a Table 2-63 Line 24 to not provide a SIL Supplement Flag input.
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.7.1.a Table 2-63 Line 29 to not provide a TCAS/ACAS Operational Input.
C154c	uAvionix deviates from RTCA/DO-282B section 2.2.4.5.4.2 and 2.2.7.2.5 to use an initial Flight Plan ID of 0000 prior to data availability, and update the Flight Plan ID data lifetime from 60 seconds to N/A.

### **6.1.4 Configurable Options**

Accessing or altering configurable options not intended to be operated in-flight may cause pilot distraction.

### **6.1.5 Approvals**

Approvals do not cover adaptations to the aircraft necessary to accommodate ancillary equipment such as power provisions, mounting devices or external antennas; such items must still be approved under existing minor modification/change processes applicable to the aircraft.

## **7 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.

## **8 Mounting**

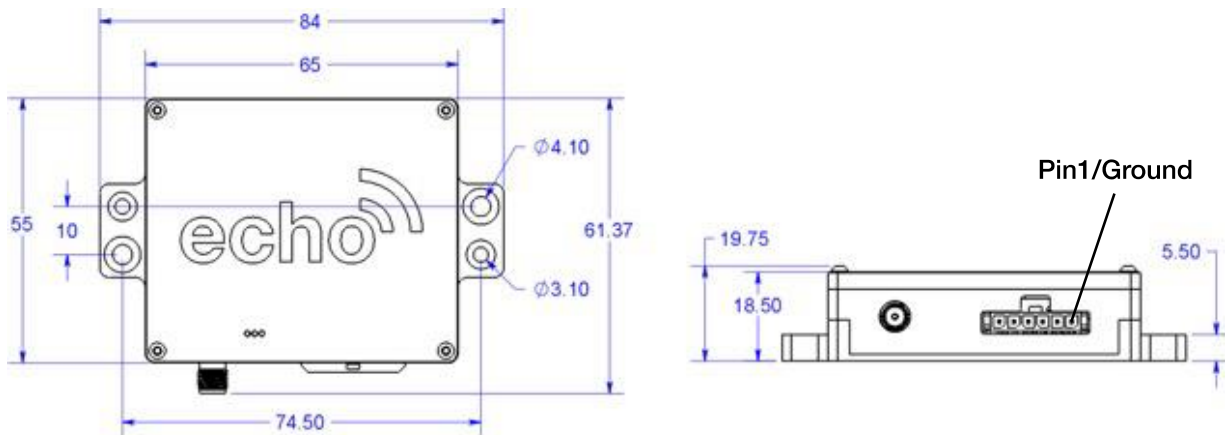
The echoUAT is designed to be mounted in any convenient location in the cockpit, the cabin, or an avionics bay.

The following installation procedure should be followed, remembering to allow adequate space for the installation of cables and connectors.

- Select a position in the aircraft that is not too close to any external heat source.
- Avoid sharp bends in the wiring and placing the wires close to the aircraft flight control systems.
- Secure the transceiver to the aircraft via at least two (2) of the four (4) mounting holes. It should be mounted on a flat surface either vertical or horizontal.
- It is desirable, but not required, to mount the EchoUAT in a location where the top cover of the unit is visible for initial or periodic inspection of the LED status indicators.

**Note:** Installation of the echoUAT must be in accordance with AC43.13-2B, Chapter 1

## 9 Connections



### Warnings:

Whenever power is supplied to the transceiver, a 50 ohm load must be connected to the output of the Echo Transceiver. You can use the supplied antenna or a commercially available 50ohm load connected to the supplied pigtail cable to terminate the output correctly.

The SMA RF connection of the echoUAT is easily damaged and should not be over tightened. The torque specification for the connector is 7 inch pounds, which is the equivalent to hand tightening. Over tightening will damage the unit and void the warranty.



## 9.1 Molex Connector Pin Assignments

Pin	Type	Physical Characteristics	Function
1	Ground	-	-
2	Aircraft Power	11-33V	-
3	Serial Transmit Port 1 (Com 1)	RS232 Out RS485 A(-)	ADS-B “in” data to EFIS/MFD Configuration data to EFIS
4	Serial Receive Port 1 (Com 1)	RS-232 In RS485 B(+)	Configuration Data from EFIS Squawk/Baro data from optional multiplexer cable
5	Serial Transmit Port 2 (Com 2)	RS-232 Out	ADS-B “in” data to EFIS or MFD
6	Serial Receive Port 2 (Com 2)	RS-232 In	GPS/echoALT data
Mating Connector Part Numbers: Molex 0436450600 or 0436450608 Pins: 0462350001			

## 9.2 Power and Indicators

The DC power and ground is provided to the echoUAT via the Molex connector using the red and black wires that connect to pin one and two. The echoUAT operates on a voltage of 11 to 33VDC.

The top cover of the echoUAT is drilled with two small holes to allow a visual inspection of the status LED indicators. The table below provides the status condition of the echoUAT based on the indications provided by the LED indicators.

LED Indicator	LED Indication "Solid"	LED Indication "Flashing"
Red	Fault	Transmitting
Green	Powered	Receiving

### 9.3 Cooling Requirements

The echoUAT is designed to meet all applicable requirements **without** forced-air cooling. Attention should be given to the location of the installation in order to avoid the transfer of heat into the unit from other electronic devices to avoid damage to the echoUAT device and voiding the warranty.

### 9.4 Wiring Considerations

#### 9.4.1 Power Wiring

There are technical benefits for using twisted, shielded wiring for the echoUAT installation including improved electromagnetic emissions and susceptibility. Aviation grade wire is recommended to interface the echoUAT to the aircraft systems. A 3A circuit breaker may be used when echoUAT, echoALT and SkyFYX power inputs are combined on the same circuit.

The maximum distance between the echoUAT and the DC power source is determined by the wire resistance; IE the voltage drop across the power source to the EchoUAT unit. The echoUAT requires a resistance of less than 0.5 ohms in the power line for satisfactory operation. The following table provides guidance for a typical aircraft wiring.

Gauge	ohm/km	Length for 0.5ohm
20 AWG	35	14.2m
22 AWG	64	7.8m
24 AWG	99	5.0m

### 9.4.2 Connecting the echoALT Retrofit

As of April 2024, all echoUAT installations require the addition of an echoALT altitude encoder. Exceptions to this retrofit are transponder/echoUAT pairings listed in the table below that have demonstrated altitude reporting performance acceptable by TSO-C154c. The vast majority of echoUAT installations will require an echoALT retrofit.

echoALT utilizes a simple “pass-through” cable design, allowing for existing installations to simply *plug and play* the echoALT altitude encoder. echoALT auto-senses the GPS message (blue wire below) and “appends” additional altitude data to the echoUAT transceiver (yellow wire below).

#### Step 1: Software Updates

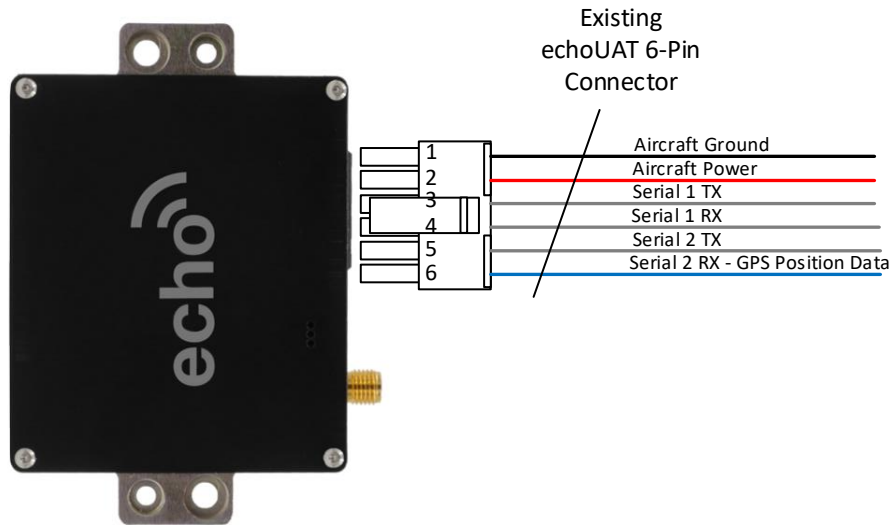
Ensure the echoUAT has the latest software versions to support the echoALT, by visiting the echoUAT webpage. Software is free to download:

echoUAT CPU	Software Version	Download Site
protocolConverter	0.4.5 or later	<a href="https://uavionix.com/support/echouat/">https://uavionix.com/support/echouat/</a>
pingTransceiver	2.4.66 or later	<a href="https://uavionix.com/support/echouat/">https://uavionix.com/support/echouat/</a>
Echo Smartphone App	1.9.11 or later	Apple App Store or Google Play

Follow software update instructions found in the latest echoUAT Service Bulletin UAV-1007864-001 located on the uAvionix support website.

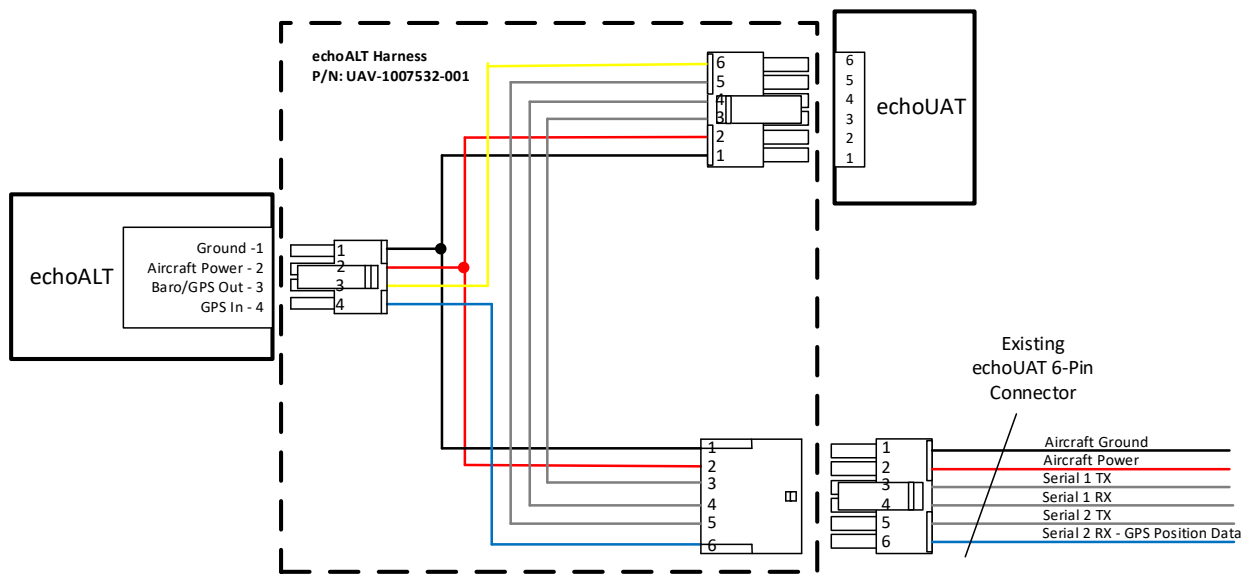
#### Step 2: Wiring – Disconnect existing 6-pin

With the echoUAT power off, disconnect the 6-pin echoUAT wire connector.



### Step 3: Wiring – Connect echoALT retrofit harness

Connect the same 6-pin connector (from Step 2) to the female 6-pin connector on the echoALT Harness UAV-1007532-001. Then connect the echoALT harness male 6-pin connector to the echoUAT. Finally, connect the 4-pin connector to the echoALT.



### Step 4: Secure all hardware and wiring.

Secure all wiring and connect echoALT static port to aircraft static system (if so equipped).

## echoALT Retrofit Installation Notes

- For installations that utilize COM 1 RX for GPS position, set the COM2 Rate to 115,200 and COM2 Input Protocol to NMEA, for echoALT compatibility.
- The following table outlines transponder/echoUAT pairings that do NOT require an echoALT. Ensure latest software and configuration details in Appendix A.

Transponder Make	Transponder Model	Comments
Funke	TRT800H	Tested with TRT800H software version 6.5

### 9.4.3 Antenna Installation with UAT Transceiver Antenna

#### 9.4.3.1 Antenna

**Note: The supplied UAT antenna or an RF equivalent must be connected to the echoUAT in order for the system to be operable.**

The following considerations should be taken into account when determining an acceptable location for the antenna.

- The UAT antenna should be separated from any projections, the engine(s) and propeller(s). The antenna should also be separated from landing gear doors, access doors or other openings which will interrupt the ground plane of the antenna field.
- The antenna should be mounted on the bottom surface of the aircraft and in a vertical position when the aircraft is in level flight.
- Avoid mounting the antenna within 1 meter of an existing transponder antenna, ADF sense antenna or any COMM antenna and 2 meters from the DME antenna.
- Where practical, plan the antenna location to minimize the cable length between the echoUAT unit and the antenna. Avoid sharp bends in the cable to minimize signal distortion or signal loss between the echoUAT unit and the antenna.

The RF coaxial cable connection to the antenna should be protected from exposure to liquids and moisture as well as edges of material that may damage the cable.

The echoUAT mono-pole antenna relies on a ground plane for correct RF propagation characteristics and pattern. For ideal performance, the ground plane should be large relative to the wavelength of the transmission. When mounted in a metal skinned aircraft the metal skin serves as the ground plane. For a composite or fabric covered aircraft a metallic ground plane should be fabricated, and the antenna mounted in the center of the ground plane.

The ground plane should be as large as practical but the smallest practical ground plane for correct operation is 8x8 inches. The thickness of the material used to construct the ground plane is not critical, providing it is conductive. A variety of mesh, grid and foil products are available for use as a ground plane. The ground plane should be connected to the airframe ground bus using a braided cable.

*9.4.3.2 Antenna Cable*

The echoUAT is designed to meet ADS-B TSO Class B1S requirements and excessive loss in the cable and connectors will degrade the transmitter output power. Since the cable is used for transmit and receive signals, excessive loss in the cable will result in degraded ADS-B receive capability.

The installed cable should exhibit the following characteristics:

- 1.5 dB maximum loss between the echoUAT and the UAT antenna
- Impedance of 50 ohms,
- Contains double braided shields or has foil and braid shield.

The following table is a guide to the maximum usable lengths of some common cable types. Actual cable loss varies between manufacturers. There are many variants, and the table is based on typical data. Use it as a guide only and refer to the manufacturer’s data sheet for your specific chosen cable for accurate values.

Length (meters)	Insertion Loss (dB/m)	MIL-C 17	Specialists	SSB Electronic
2.54	0.59	M17/128		
2.54	0.59	RG400		

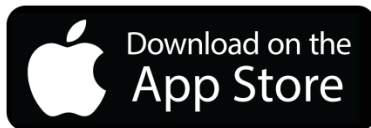
3.16	0.47		3C142B	
3.81	0.39	RG304		
4.5	0.33			Aircell 5
5.25	0.29	RG393	311601	
6.42	0.23		311501	
6.81	0.18			Aircell 7
8.22	0.18		311201	
12.59	0.12		3108801	

When routing the cable:

- Route the cable away from any significant heat sources
- Route the cable wiring away from potential interference sources such as ignition wiring, 400Hz generators, fluorescent lighting and electric motors
- Allow a minimum separation of 12 inches from an ADF antenna cable
- Minimize the cable length
- Avoid routing the cable around tight bends
- Avoid kinking the cable, even temporarily, during installation
- Secure the cable so that it cannot interfere with other systems

## 10 Installation Setup

Download the “uAvionix Echo Installer” app from the iOS App store or Google Play. Note: Do not use the “uAvionix Ping Installer” app by mistake.

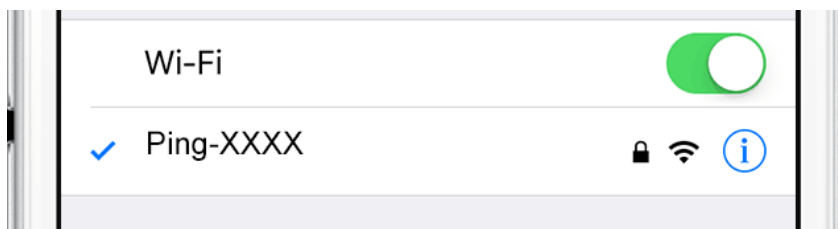


### 10.1.1 Connecting to the echoUAT via Wi-Fi

To connect to the echoUAT, join a device to the wireless network named “Ping-XXXX” using the procedure for your device. iOS is shown below:

1. Go to **Settings > Wi-Fi**, and make sure that Wi-Fi is turned on.
2. Tap the SSID **Ping-XXXX** where XXXX is a random string. i.e. Ping-6A8E.
3. No WPA Password is required.\*

\*Some early software builds require a WPA password... Enter **uavionix** as the WPA password for the secure Wi-Fi network, then tap join. Note: **The No Internet Connection** message is normal when iOS is connected to echoUAT.





4. Launch the Echo App on your tablet or smartphone.

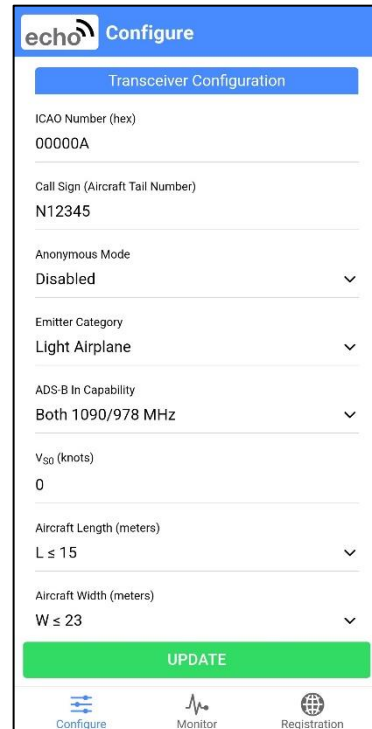


Verify that “echoUAT” is the Selected Device Type.

## 10.2 Configuration

The configuration section will set the following parameters:

- Control
- ICAO Number
- Call Sign (Typically set to aircraft’s tail number)
- Anonymous Mode
- Emitter Category
- ADS-B In Capability
- V<sub>SO</sub> (Stall Speed)
- Aircraft Length and Width
- GPS Antenna Offset



### 10.2.1 Control

Select the desired control type. This setting configures the echoUAT for Transmit, Receive or Standby.

- UAT TX Enabled: Enables both transmit and receive functions. This is the recommended setting for all GA installations.
- Receive Only: Disables transmission but continues to receive and provide ADS-B data to a GDL90 compatible display or application.
- Standby: Disables both the transmit and receive functions. GDL90 position data (GPS) is still available from the device.

### 10.2.2 Aircraft Address Programming

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, although you may also encounter one written as an 8-digit octal number. The echoUAT understands the hexadecimal format, so you must first convert an octal number to hexadecimal before entering.

**Tip:** Using the N-Number Look Up function on <https://www.faa.gov> aircraft registry information, locate and enter the “Mode S Code (base 16 / hex)” value.

### 10.2.3 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-F). You must include the “N”.

Note: This is typically your aircraft N-number, unless otherwise advised by the FAA or ATC.

### 10.2.4 Anonymous Mode

When enabled, the EchoUAT transmits a self-assigned ICAO and sets the Call Sign to “VFR”. **Note** : Anonymous mode is only active when the echoUAT has a GPS position fix and is squawking VFR (1200).

**Tip:** Anonymous Mode must be “DISABLED” when certifying the unit with either a flight test or a test set test (ramp tester).

### 10.2.5 Emitter Category

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

Emitter Category	
Light Airplane (most GA aircraft)	Rotorcraft
Small Airplane	Glider / Sailplane
Large Airplane	Lighter Than Air
Large Airplane with High Vortex	Parachute
Heavy Airplane	Ultralight
Highly Maneuverable Airplane	UAV
	Space Craft

**Tip:** Fixed wing aircraft with a maximum takeoff weight less than 15,000 lbs are *Light Airplane*. Most experimental aircraft equipped with echoUAT fall under the *Light Airplane* emitter type.

### 10.2.6 ADSB-In Capability

Sets the ADS-B in equipment capability reporting. The echoUAT is capable of receiving *both* ADS-B frequencies, 978Mhz UAT and 1090Mhz. The recommended setting is “Both UAT and 1090”.

### 10.2.7 V<sub>so</sub> (knots)

This parameter allows the echoUAT to automatically determine air and ground state. Enter the V<sub>so</sub> value for your aircraft. *Setting V<sub>so</sub> to 0 passes control of the Air/Ground state to the EFIS when connected to a compatible EFIS.*

Airspeed (in kts) that the aircraft typically flies after take-off.
0 – 999 knots

**Tip:** It is suggested that the value be the aircraft rotation speed. echoUAT uses ground speed to determine Ground and Air state and does not account for headwind or tailwinds, that might affect the Air/Ground state.

### 10.2.8 Aircraft Length and Width in Meters

When on the ground, ADS-B transmits encoded aircraft size information which is used by ATC to identify taxiing routes and potential conflicts. Enter the length and width (wingspan) fields and the appropriate size codes will be calculated for transmission.

Aircraft Length in Meters	Aircraft Width (wing span) in Meters
L ≤ 15	W ≤ 72.5
15 < L ≤ 25	72.5 < W ≤ 80
25 < L ≤ 35	
35 < L ≤ 45	
45 < L ≤ 55	
55 < L ≤ 65	
65 < L ≤ 75	
75 < L ≤ 85	
L > 85	

### 10.2.9 GPS Antenna Offset

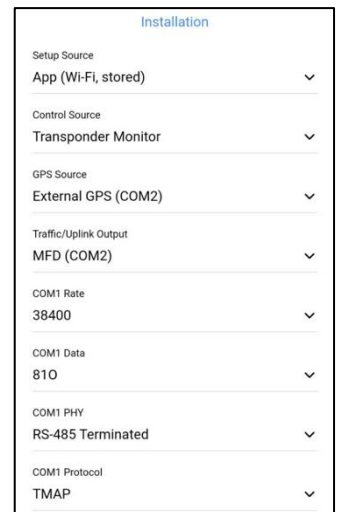
The GPS antenna offset is used in conjunction with the length and width to manage taxiway conflicts. A typical GPS does not report the geographic position of the center of the aircraft, or even the tip of the nose of the aircraft; instead, it usually reports the location of the actual GPS antenna (not the GPS receiver). In normal flight operation, this distinction is of no importance at all, but if ADS-B is used to manage taxiway conflicts, a significant offset in antenna position could mean the aircraft footprint is not in the same place as the ADS-B reported position. Although the GPS Antenna Offset is primarily intended for position correction on large transport aircraft, General Aviation aircraft can also have a significant offset. For example, if the aircraft has a long tail boom and the GPS antenna is on top of the tail, the GPS position could be 4 meters or more from the nose of the aircraft.

GPS Antenna Lateral Offset from roll axis (Meters)	GPS Antenna Longitudinal Offset from aircraft nose (Meters)
0	0 to 60 Meters in 2 Meter increments
Left 2	
Left 4	
Right 2	
Right 4	
Right 6	

## 10.3 Installation

The installation section will set the following parameters:

- Setup Source
  - App Wi-Fi stored (typical) unless connected to an EFIS
  - EFIS Com 1 if connected to an EFIS
- Control Source
  - Transponder monitor (typical)
  - EFIS for Transponder direct connection or EFIS Control
    - Funke TRT800H
- GPS Source
  - Com 2 for SkyFYX, GNS, Safe Fly 2020, Avidyne (typical)
  - Com 1 for EFIS with Trig Transponder (TMAP)



- Traffic/Uplink Output
  - None: ADS-B in via Wi-Fi to EFB mobile device (typical)
  - MFD Com2 if Pin 5 of echoUAT is connected to MFD/EFIS
  - EFIS Com 1 required for Special Comm 2 configuration (not typical)
- COM1 Rate, Data and Phy
  - Typically N/A (Not Applicable) if system not connected to EFIS or optional mux cable
  - See Table below for custom configurations
- COM1 Protocol
  - Typically N/A
    - See Table below for custom configurations
- COM2 Rate
  - If connected using SkyFYX GPS
    - See table below and appendix for other GPS configurations
    - If COM2 is not in use, set to echoALT default of 115,200.
- COM2 Protocol
  - NMEA if using SkyFYX GPS
    - See table below for other GPS Configurations
  - If COM2 is not in use, set to echoALT default of NMEA.

COM2 Rate	115200	▼
COM2 Input Protocol	NMEA	▼

Other GPS Serial Receive Port 2 (Com 2) configurations.

Equipment	COM2 Rate	COM2 Protocol
Safe Fly 2020 direct connect	115200	NMEA
Accord Micro-i	115200	NMEA
Garmin GPS-20A	9600	ADS-B+
Garmin GNS 4xxW/5xxW/6xxW/7xxW	9600	ADS-B+

### 10.3.1 Custom Serial Port Setup

The following parameters configure the echoUAT to interface with a supported with supported devices. The Appendices in this document define the specifics of a particular device interface configurations.

Supported Parameters

Parameter	Source	Port	Baud Rate	Data	Interface	Protocol
SETUP	APP	NA	NA	NA	NA	NA
	Serial 1 (COM1)	COM1	PROG	PROG	PROG	PROG

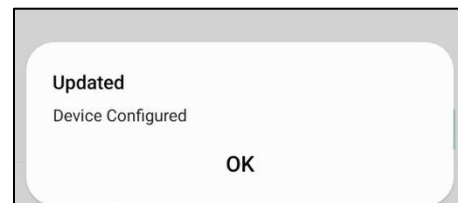
CONTROL	Serial 1 (COM1)	COM1	PROG	PROG	PROG	PROG
	XPDR MONITOR	NA	NA	NA	NA	NA
GPS	Serial 1 (COM1)	COM1	PROG	PROG	PROG	PROG
	Serial 2 (COM2)	COM2	PROG	PROG	PROG	PROG
TRAFFIC	Serial 1 (COM1)	COM1	PROG	PROG	PROG	GDL90
	Serial 2 (COM2)	COM2	PROG	PROG	PROG	GDL90

\*PROG – User Programmable. Confirm the selection matches the supported device settings. Example EFIS Baud Rate should match EchoUAT setting and EFIS settings.

**Tip:** If it says NA (Not Applicable), then it does not matter what is selected on the each app for that category

### 10.3.2 Update and Confirm Configuration

1. After verifying you are still connected to the echoUAT via Wi-Fi (green box at the top of the app says “Connected to device”), enter the correct information for all fields and press Update. You should receive a message confirming the configuration. Tap OK.



2. Tap “Monitor” at the bottom of the screen. Confirm the ICAO, Callsign and Emitter shown are the correct values for your aircraft.
3. Programming of the echoUAT is now complete.

**Tip:** You may need to be in “Airplane mode” on some smart devices if the information did not program correctly. This will usually turn your devices’ Wi-Fi off so be sure to turn it back on when enabling Airplane mode. Verify you are connected to the Ping-XXXX network.

### **10.3.3 Transponder Monitor Mode Explanation**

An internal power transcoder detects pressure altitude and ATC squawk codes from Mode A/C transponder by decoding the radar replies via the aircraft electrical system. No direct connection wiring to the transponder is required.

The most common and most simple installation of the ADS-B system is using the Transponder Monitor control mode of the echoUAT. In this operations mode, the echoUAT only requires:

- Power and ground connections
- Approved ADS-B WAAS GPS source
- Approved altitude encoders such as echoALT

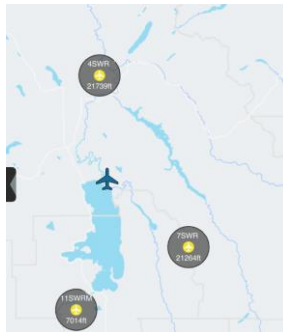
# 11 Normal Operation

## 11.1 Electronic Flight Bag Application

Launch your GDL 90 compatible Electronic Flight Bag (EFB) application.

Configure your EFB Wi-Fi settings as necessary to access the echoUAT device. In most applications, it will be automatically detected. If you do not see a device connection for the echo, ping, or uAvionix, please contact your EFB provider for additional support. ADS-B traffic and flight information should begin streaming to the application when in range. Depending on the proximity to the nearest ADS-B ground station, FIS-B data (METARs, TAFs, TFRs, etc) may not be available while on the ground.

Typical iOS application displaying ADS-B traffic from echoUAT is shown below.



Altitude must be pre-flight cross-checked by comparing the aircraft's altimeter with the GPS altitude displayed on the EFB application.

For additional questions or support please visit <http://uavionix.com/support>

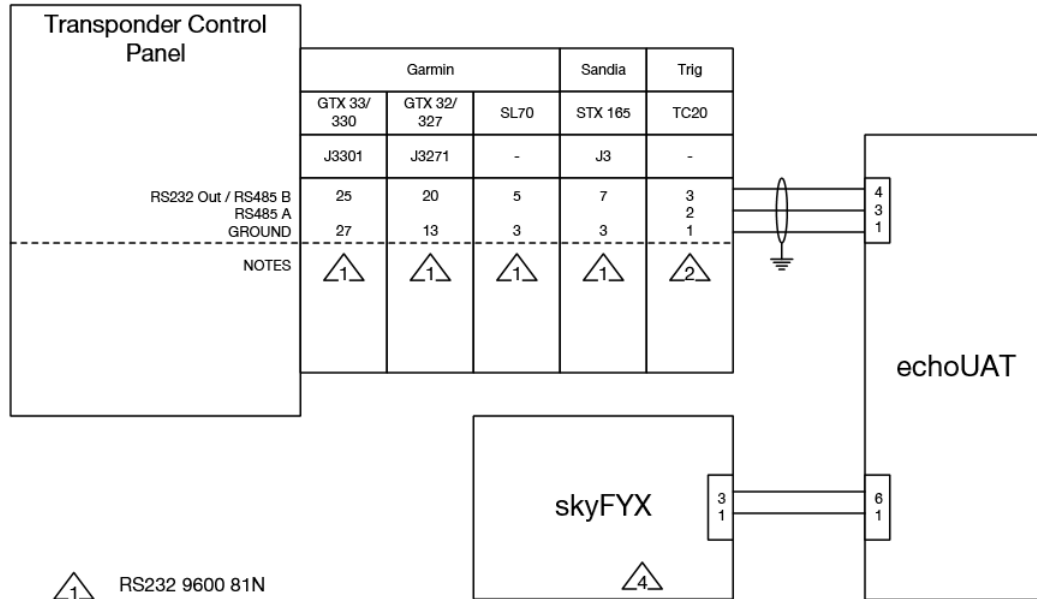


# 12 Environmental Qualification Forms

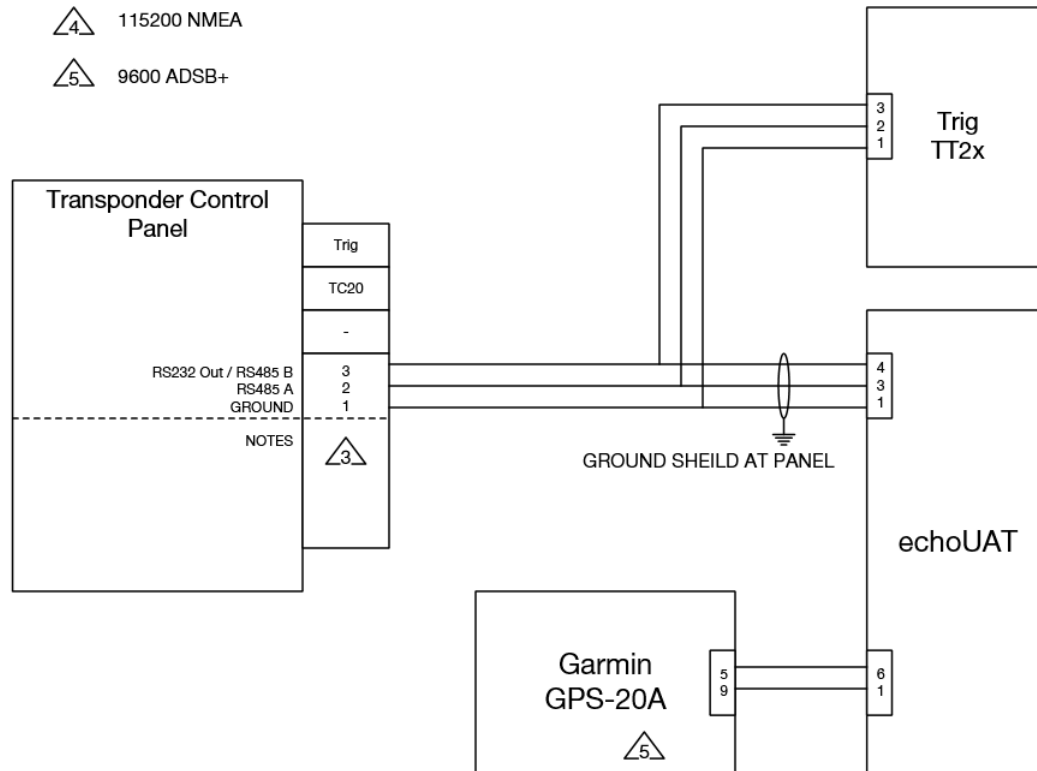
Nomenclature	echoUAT ADS-B Transceiver	
Part No: UAV-1000957-001		
Manufacturer	uAvionix Inc	
Address	300 Pine Needle Lane, Big Fork, MT 59911	
Conditions	DO-160G Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Category B2
Low temperature ground survival	4.5.1	-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	35,000feet
Decompression	4.6.2	Equipment designed as Category B2 – no test
Overpressure	4.6.3	Equipment designed as Category B2 – no test
Temperature Variation	5.0	Equipment designed to Category B2
Humidity	6.0	Equipment designed to Category B2
Operation Shocks	7.2	Equipment designed to Category B
Crash Safety	7.3	Equipment designed to Category B type 5
Vibration	8.0	Equipment designed for use in Aircraft zone 2: type 3, 4, 5 to Category S level M, type 1 (Helicopters) to Category U level G
Explosion	9.0	Equipment identified as Category X – no test
Waterproofness	10.0	Equipment identified as Category X – no test
Fluids Susceptibility	11.0	Equipment identified as Category X – no test
Sand and Dust	12.0	Equipment identified as Category X – no test
Fungus	13.0	Equipment identified as Category X – no test
Salt Spray	14.0	Equipment identified as Category X – no test
Magnetic Field	15.0	Equipment identified as Category Z
Power Input	16.0	Equipment identified as Category ZX
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 B
Lightening Induced Transient Susceptibility	22.0	Equipment identified as Category XXXXXX – no test
Lightening 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

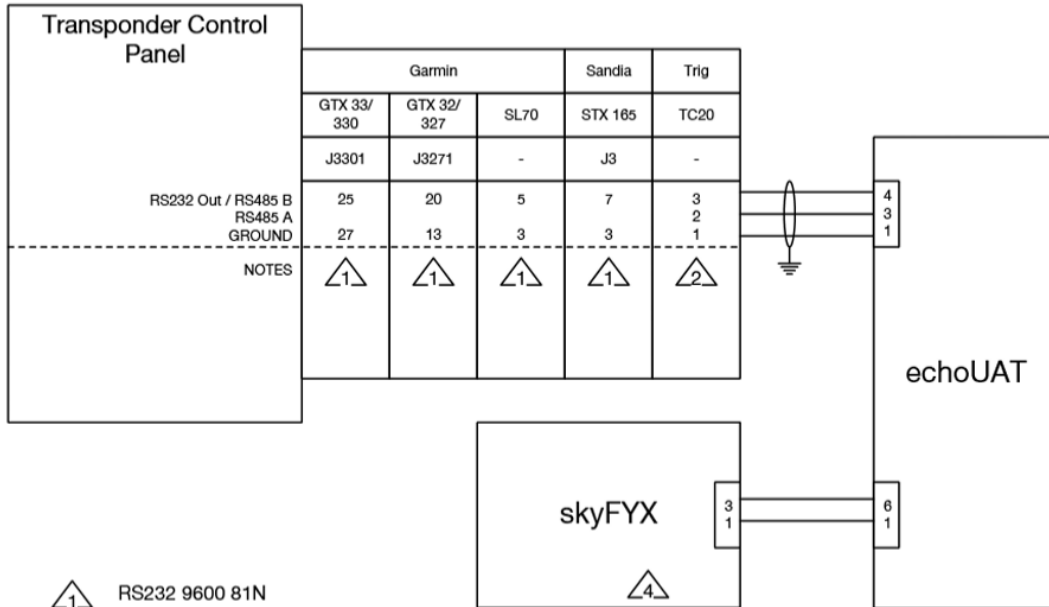
## Appendix A – Interconnect Diagrams

**As of April 2024, the following installations require an echoALT retrofit. See section 9.4.2 for installation details.**

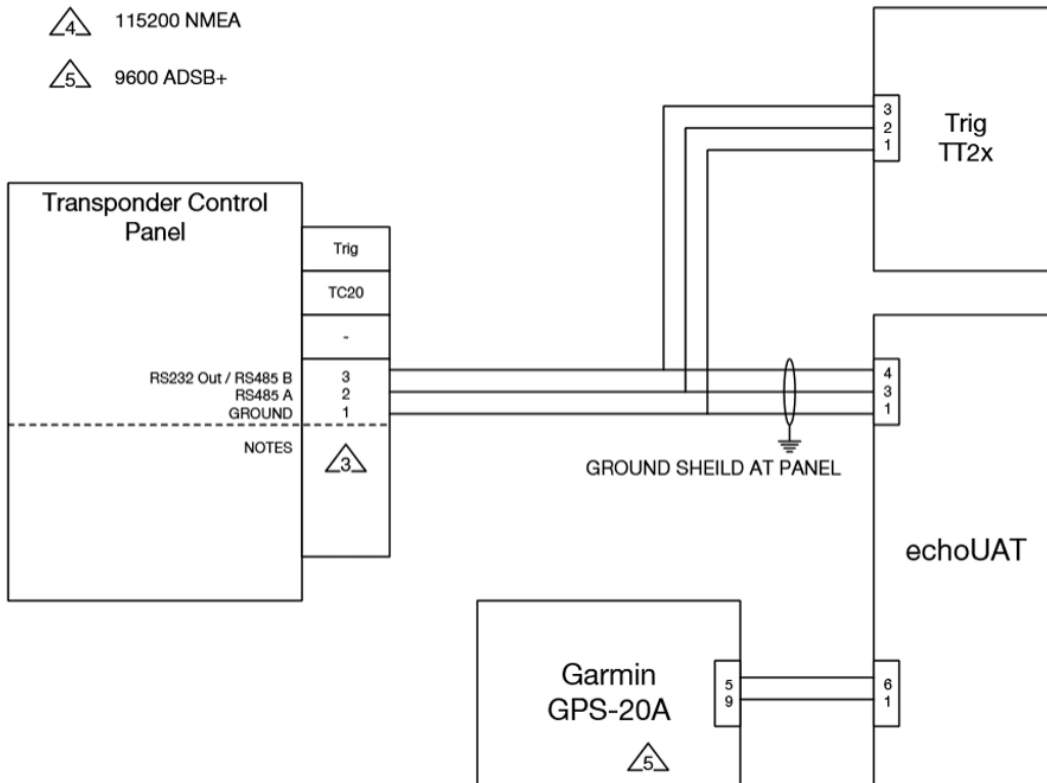


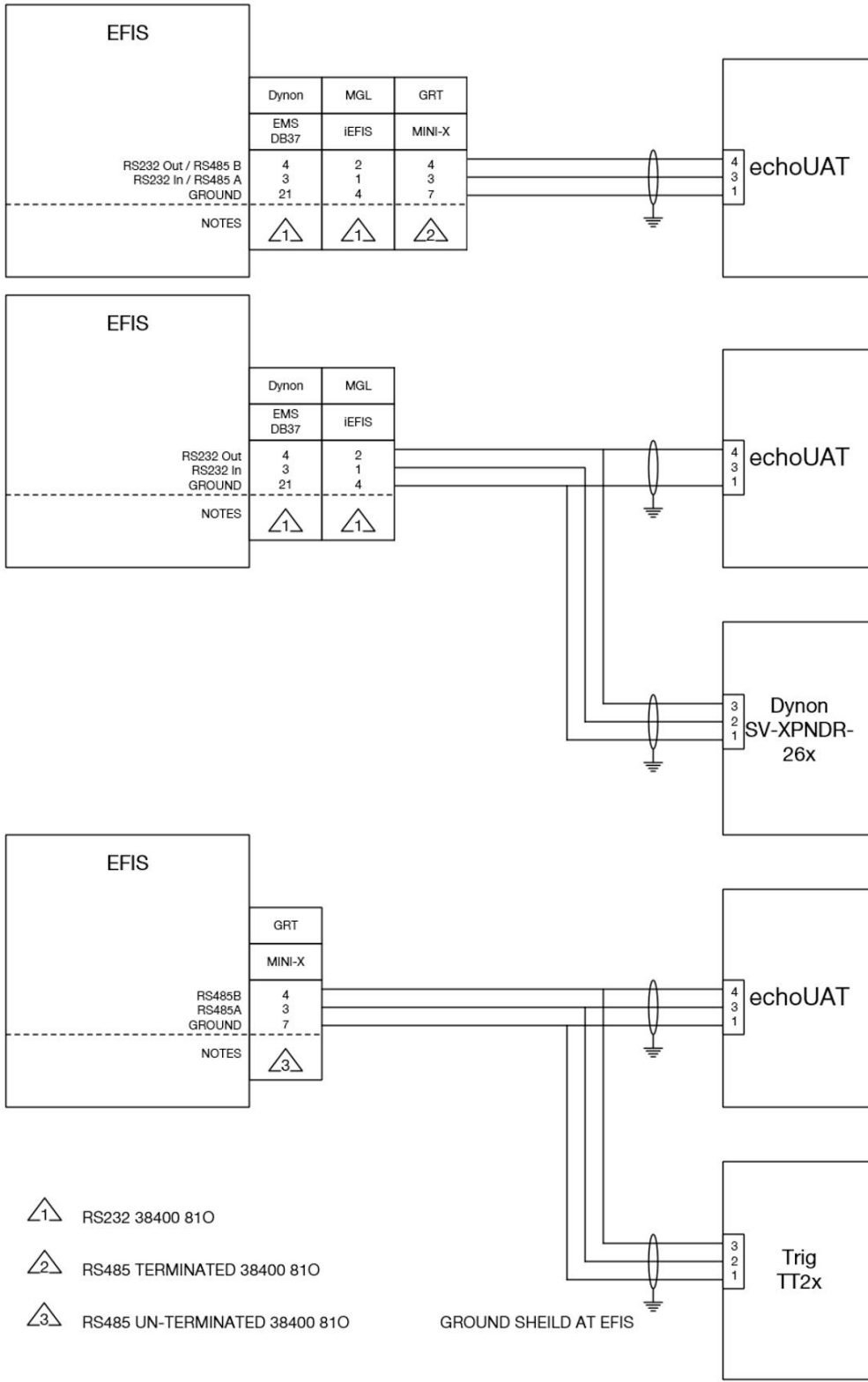
- △1 RS232 9600 81N
- △2 RS485 TERMINATED 38400 81O
- △3 RS485 UN-TERMINATED 38400 81O
- △4 115200 NMEA
- △5 9600 ADSB+

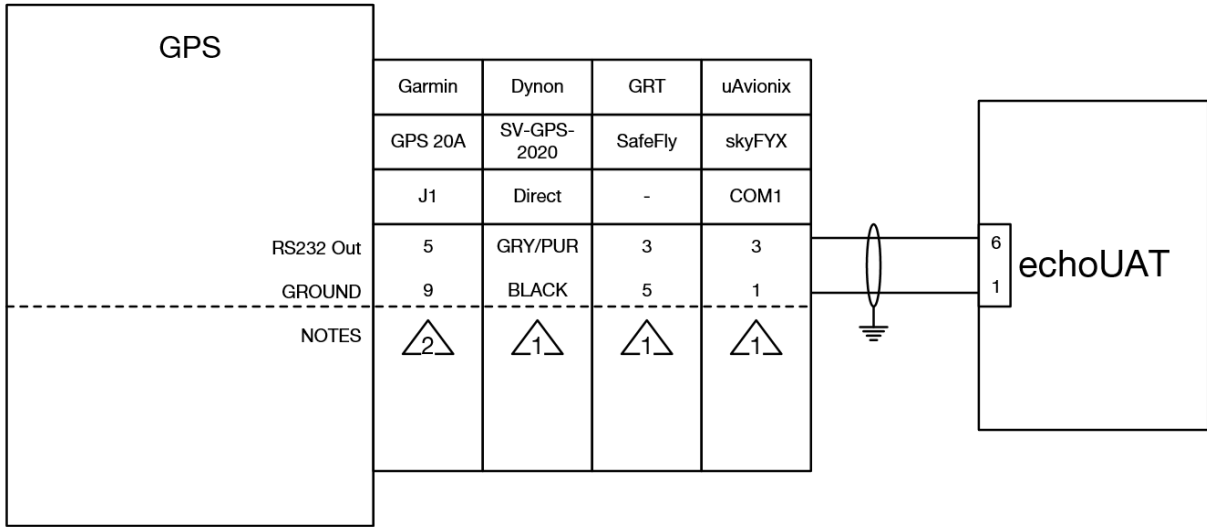




- △1 RS232 9600 81N
- △2 RS485 TERMINATED 38400 81O
- △3 RS485 UN-TERMINATED 38400 81O
- △4 115200 NMEA
- △5 9600 ADSB+







- △<sub>1</sub> NMEA 115200bps
- △<sub>2</sub> Garmin ADS-B+ 9600bps

## Appendix B - Acronyms

ADF	Automatic Direction Finder
ADS-B	Automatic Dependent Surveillance Broadcast
ADS-R	Automatic Dependent Surveillance Rebroadcast
ATC	Air Traffic Control
DME	Distance Measuring Equipment
EFB	Electronic Flight Book
EFIS	Electronic Flight Information System
FCC	Federal Communications Commission
FAA	Federal Aviation Administration
FIS-B	Flight Information Services Broadcast
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
LSA	Light Sport Aircraft
RTCA	Radio Technical Commission for Aeronautics
TIS-B	Traffic Information Services Broadcast
TSO	Technical Standard Order
UAT	Universal Access Transceiver
VSO	Minimum Flight Speed in Landing Configuration
VSWR	Voltage Standing Wave Ratio

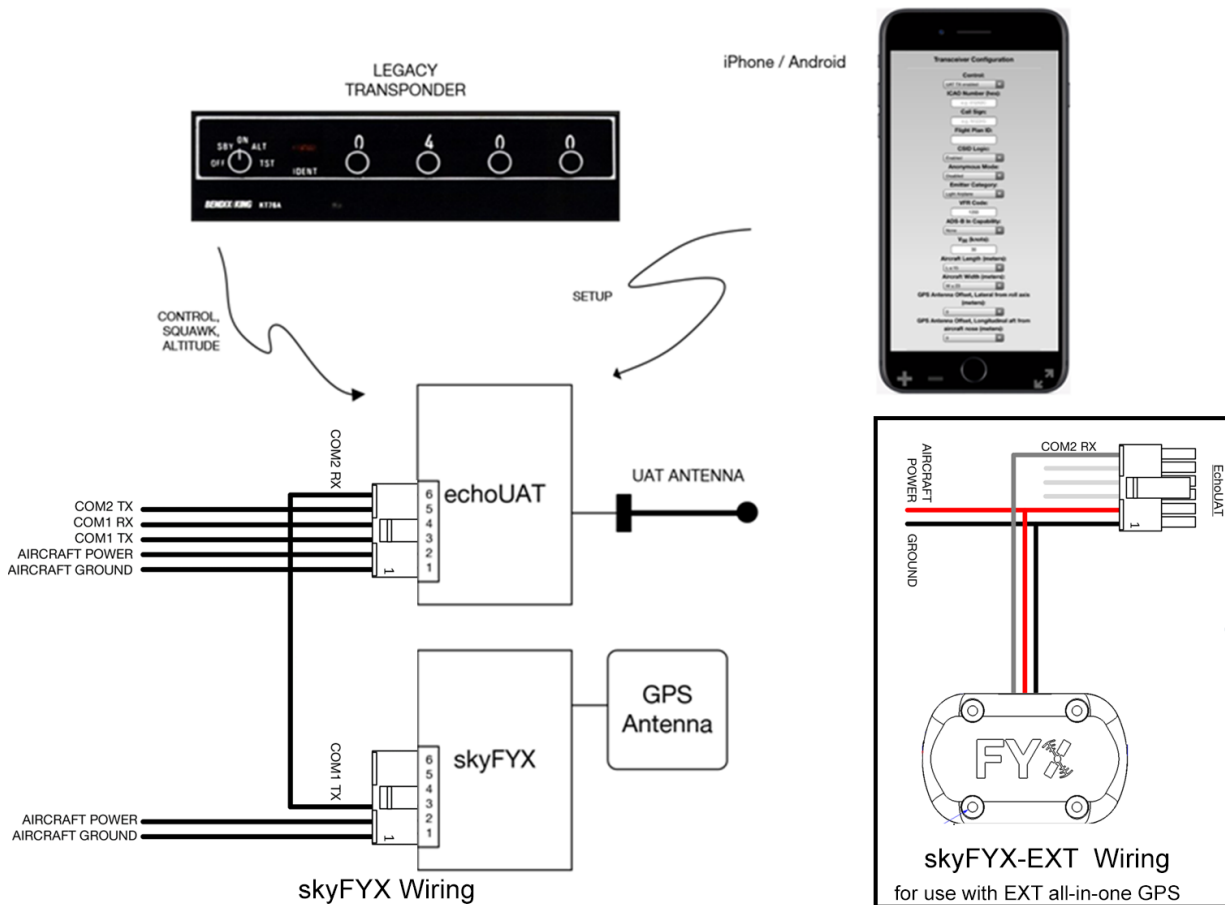
## Appendix C-1 Transponder Monitor Mode Installation Note

The Transponder Monitor mode is the simplest and most common installation configuration for the echoUAT. Squawk and Barometric altitude are decoded from the Transponder interrogation replies through the aircraft electrical system and there are no connections required between the transponder and the echoUAT.

The echoUAT is supplied power, ground and GPS data via the Molex connector. The unit is configured via Wi-Fi with a mobile device and outputs ADS-B 'IN' data via the WiFi to a mobile device hosting an EFB application. In this configuration, Pin 5 of the Molex connector outputs ADS-B 'IN' signals for connection to an MFD or EFIS in GDL format.

Setup Source	Control Source	GPS Source	Traffic	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol	COM2 Rate	COM2 Protocol
APP	Transponder Monitor	External COM2	MFD COM2	N/A	N/A	N/A	N/A	115200	NMEA

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**



## Appendix C-2 GRT EFIS

### GRT EFIS with SafeFly 2020 GPS App Note

The GRT EFIS exchanges Setup, Control and GPS data with the echoUAT. The echoUAT can also send ADS-B traffic and uplink data to GRT EFIS.

#### EchoUAT settings:

If your transponder is controlled by the GRT EFIS:

Setup Source	Control Source	GPS Source	Traffic	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol	COM2 Rate	COM2 Protocol
EFIS	EFIS	EFIS COM1	MFD COM2	38400	81O	RS232	TMAP	115200 Note 1	NMEA Note 1

Note 1 – If COM2 is not used, set to echoALT default 115,200/NMEA.

If your transponder is panel mounted:

Setup Source	Control Source	GPS Source	Traffic	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol	COM2 Rate	COM2 Protocol
EFIS	Transponder Monitor	EFIS COM1	MFD COM2	38400	81O	RS232	TMAP	115200 Note 1	NMEA Note 1

Note 1 – If COM2 is not used, set to echoALT default 115,200/NMEA.

#### GRT EFIS Settings:

General Setup:

Serial Port X\* In: Safe-Fly GPS and SPC  
 Serial Port X\* Out: Safe-Fly GPS and SPC  
 Serial Port X\* Rate: 115,200  
 SAVE

\*Serial port “X” refers to the serial port on the EFIS that is wired to the “Serial Control In/Out” of the Safe-Fly GPS module.

SPC Serial Port 1 Rate: 38400  
 SPC Serial Port 1 Output: EchoUAT/TMAP  
 SPC Serial Port 1 Input: EchoUAT/TMAP

Serial Port Y\* In ADS-B  
 Serial Port Y\* Rate 38,400 if connected to SafeFlySPC or 115,200 if connected to EFIS  
 SAVE

Serial port “Y” refers to the serial port used to receive ADS-B data into the EFIS. For best performance the ADS-B In (Pin 5) on the EchoUAT should be wired directly to a high speed port on the EFIS and not connected to the serial combiner on the SafeFly GPS. If wiring through the



SafeFly we recommend a baud rate of 38,400. If wiring directly to the GRT EFIS we recommend 115,200.

**GRT EFIS Setup Continued:**

**General Setup: Flight ID and Address**

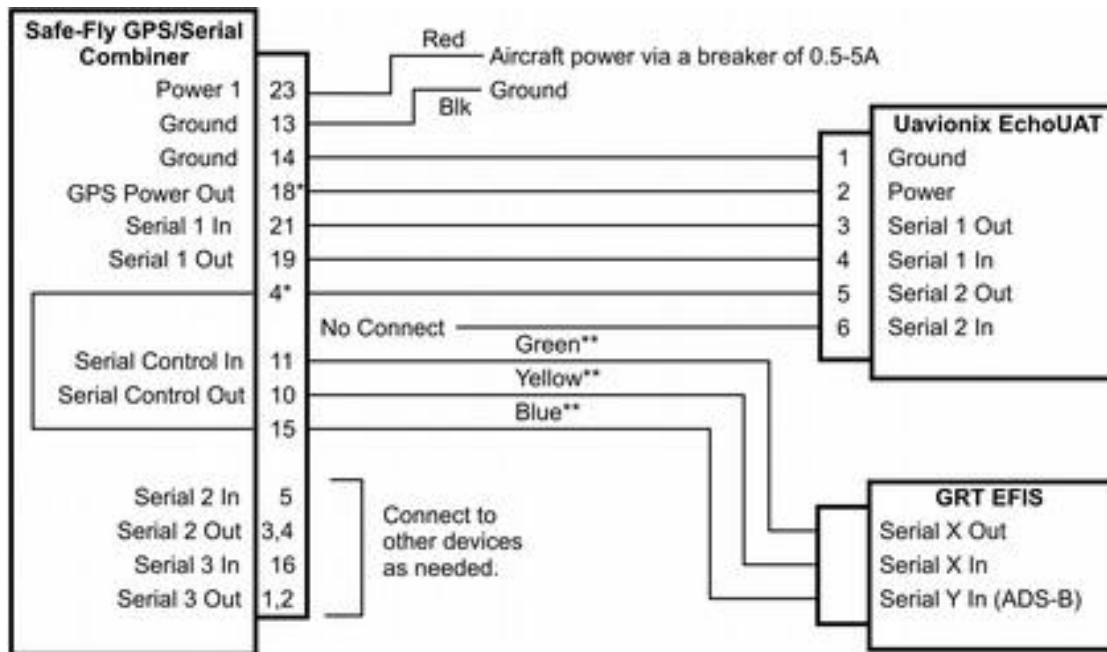
Flight ID: (leave blank)  
Mode S Code: Enter ICAO code or six digit Mode S code from registration  
SAVE

**General Setup: TT22/EchoUAT**

Aircraft Category: Light Aircraft (less than 15,000lbs takeoff weight)  
Aircraft Width: Enter width in meters  
Aircraft Length: Enter length in meters  
VFR ID: Enter Tail or N-Number  
GPS Input: Compliant TMAP  
GPS Rate: 9600  
Test Squitters: Never  
TIS Output: Off  
UAT/978 Receiver: Yes  
1090ES Receiver: Yes  
GPS Antenna Offset Linear: Enter GPS longitudinal offset in meters from nose  
GPS Antenna Offset Lateral: Enter GPS lateral offset in meters  
SAVE

Once all settings are complete the Echo App monitor screen should display the same parameters as entered into the GRT. Verify all fields are populated prior to flight.

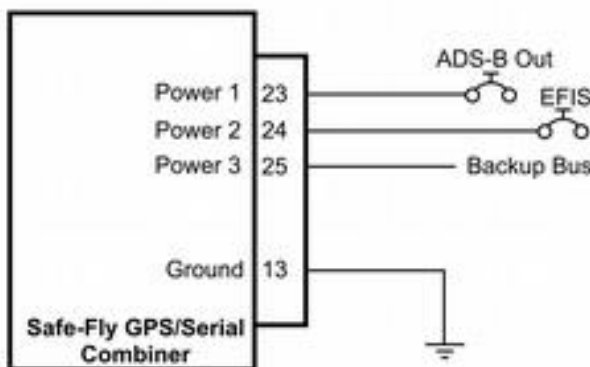
## GRT Example Wiring:



\*Rev A Safe-Fly, identified with red on label, does not support these connections. Connect EchoUAT pin 2 to aircraft power, and pin 5 directly to EFIS serial input.

\*\*For GRT Sport and Horizon HS/WS EFIS, the green wire is not connected. The yellow wire is connected if you wish to supply the EFIS with the Safe-Fly GPS position data. The blue wire must connect to the high-speed serial input, which is serial port 4 for these units to display ADS-B weather and traffic data.

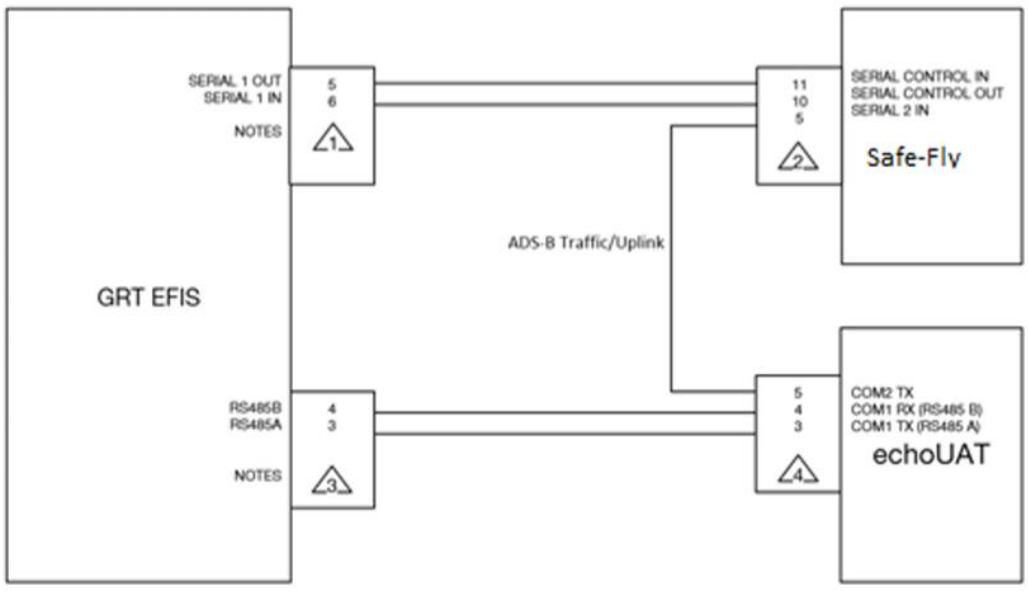
## Safe-Fly to EchoUAT Pre-Wired Cable



This method of powering the Safe-Fly GPS (and EchoUAT) provides power to them whenever any power input is active.

Safe Fly to EchoUAT wiring diagram Rev C.cdr

## Typical use of multiple power inputs



- △1 Serial Port 1 Input: GRT Safe-Fly GPS and SPC  
Serial Port 1 Output: GRT Safe-Fly GPS and SPC  
Serial Port 1 Rate: 115200
- △2 SPC Serial Port 2 Input: ADS-B  
SPC Serial Port 2 Rate: 115200
- △3 TT22 A/B Port: On

- △4 Setup Source: EFIS (COM1)  
Control Source: EFIS/Panel (COM1)  
Traffic/Uplink Output: MFD (COM2)  
COM1 Rate: 38400  
COM1 Data: 810  
COM1 Phy: RS-484 Terminated  
(use RS485 Un-Terminated if a TT2x is installed)  
COM1 Protocol: TMAP  
COM2 Rate: 115200

## Appendix C-3 Dynon Skyview EFIS Note

The Skyview exchanges Setup, Control and GPS data with the echoUAT. Note: **The Skyview will not display echoUAT ADS-B Weather and Traffic (GDL-90) data and at this time really makes no sense to use it for control vs. using the echoUAT app since you only use it initially for setup.**

Equipment	Setup Source	Control Source	GPS Source	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol	COM2 Rate	COM2 Protocol
Dynon Skyview	EFIS	EFIS	EFIS COM1	38400	810	RS232	TMAP	115200 Note 1	NMEA Note 1

Note 1 – If COM2 is not used, set to echoALT default 115,200/NMEA.

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

### Setup / Control

#### SYSTEM SETUP

##### SERIAL PORT SETUP

##### SERIAL PORT 1 SETUP

##### SERIAL IN DEVICE

SELECT: DYNON SV-XPNDR-262

#### TRANSPONDER SETUP

GPS DATA: DYNON SV-GPS-2020

TRANSPONDER HEX CODE: enter the ICAO hex number of the aircraft

VFR CODE: enter the default VFR squawk code (1200 for the US)

AUTO ALT/GND: AUTOMATIC (AIR DATA)

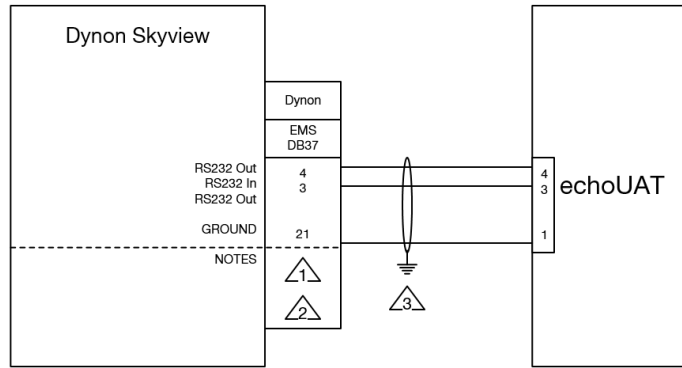
AIRCRAFT CATEGORY: select the appropriate aircraft category

AIRCRAFT LENGTH: the length of the aircraft in ft

AIRCRAFT WIDTH: the width of the aircraft in ft

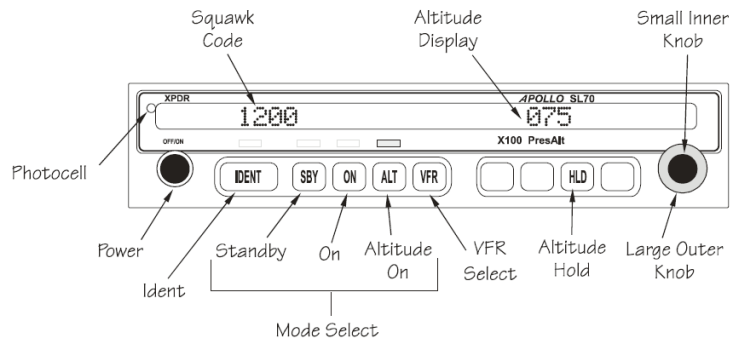
MAXIMUM CRUISE SPEED: select the appropriate cruise speed range

TIS TRAFFIC: OFF



- △1 WIRING TO BE 22 AWG
- △2 THE SKYVIEW HAS 5 RS232 CHANNELS. ANY OF THESE CAN BE USE TO CONNECT TO THE echoATU
- △3 GROUND AT THE EFIS

## Appendix C-4 Apollo SL70 Note



The Apollo SL70 outputs Altitude, Mode, Squawk and Mode C code over RS232. The configured baud rate needs to be determined and programmed into the echo app.

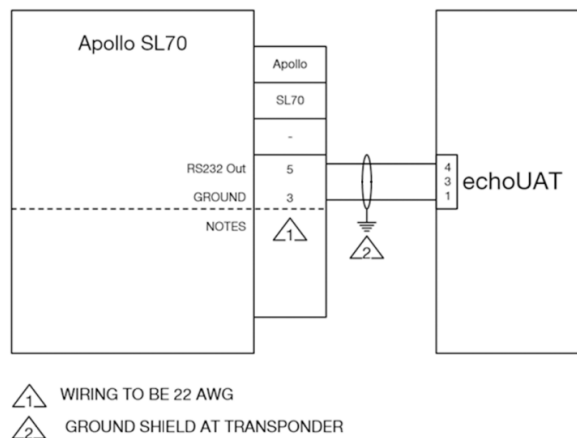
Determine the baud rate of the serial port as follows:

The SL70 has a built-in setup mode to simplify the checkout. To operate the SL70 in the setup mode, hold down the “IDENT” and “ALT” buttons while switching on the power. To return to normal operation, switch the power off, then back on.

To view the baud rate: In test mode, rotate the LARGE knob to the “SL70 CONF” (SL70 Configuration) page, then rotate the SMALL knob to the “BAUD” (baud rate) page. The baud rates available are 1200, 2400, 4800, 9600, and 19200. The TX setting must be configured to EXT for squawk to pass to the echoUAT.

Equipment	Setup Source	Control Source	GPS Source	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol
SL70	APP	Panel	COM2	9600	81N	RS232	GDL

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**



**Tip:** You do not need the ground wire since the units share the same ground already

## Appendix C-5 Sandia STX165/R Note

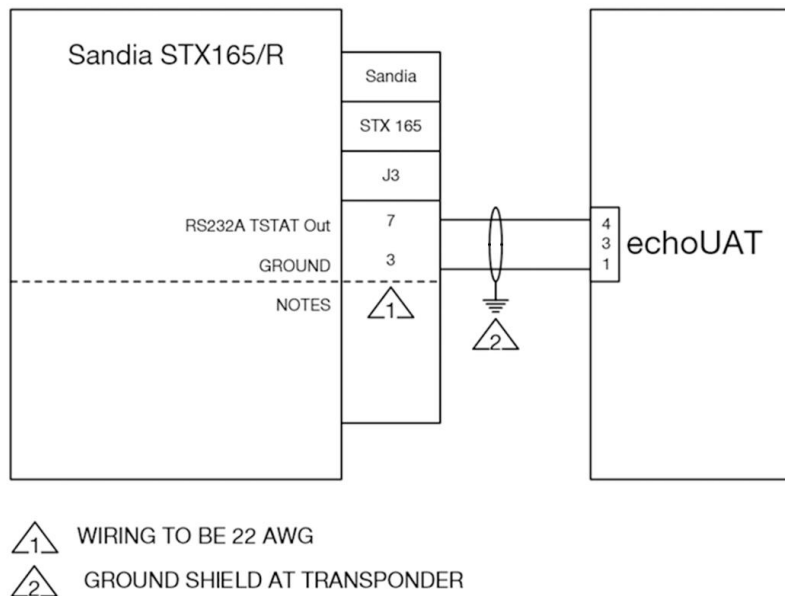


The STX165 outputs Altitude, Mode, Squawk and Mode C code over RS232. The baud rate, if fixed, and needs to be programmed into the echo app.

The example shows the typical 9600 baud.

Equipment	Setup Source	Control Source	GPS Source	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol
STX165	APP	Panel	COM2	9600	81N	RS232	GDL

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**



**Tip:** You do not need the ground wire since the units share the same ground already

## Appendix C-6 MGL EFIS Note

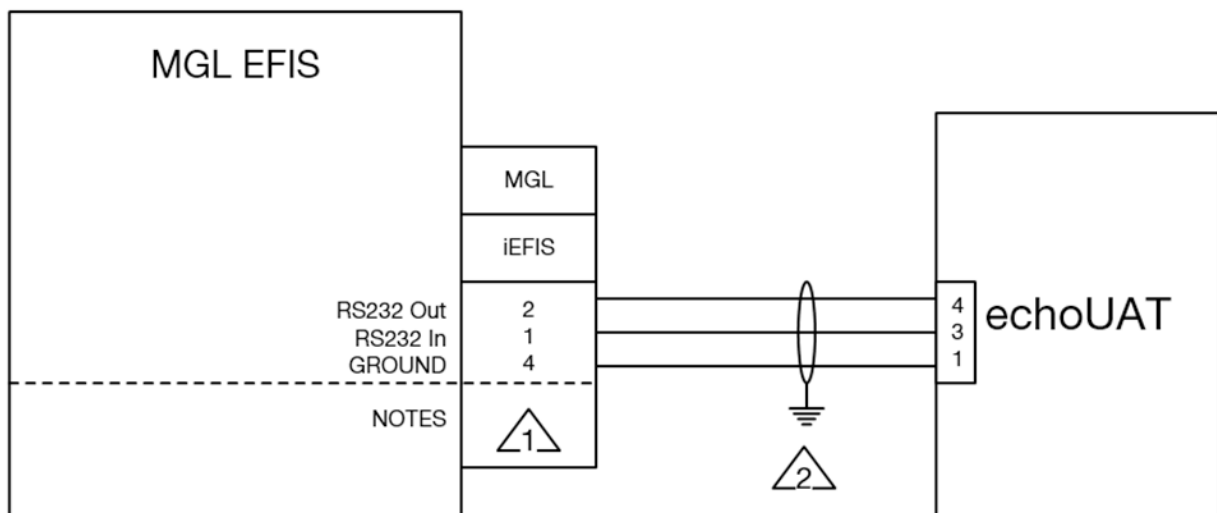
When using the echoUAT system in the transponder monitor mode, the echoUAT will provide the MGL EFIS unit with traffic data via pin 5 of the Molex connector. *If using a Garmin for position source you will need to configure the echoUAT for traffic on COM1. See Appendix C-10.*



We recommend configuration of the echoUAT be accomplished using the echo mobile application.

Some MGL EFIS system configurations can provide GPS data as well as transponder squawk and barometric pressure to the echoUAT when controlling a Trig ES transponder. The MGL EFIS will also accept ADS-B “IN” data from the echoUAT for display of traffic and weather data. Wire connections for traffic to the EFIS per MGL guidance.

Equipment	Setup Source	Control Source	GPS Source	Traffic Uplink	COM1 Rate	COM1 Data	COM1 Phy	COM1 Protocol
MGL	APP	EFIS	COM2	COM2	38400	810	RS232	TMAP

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**



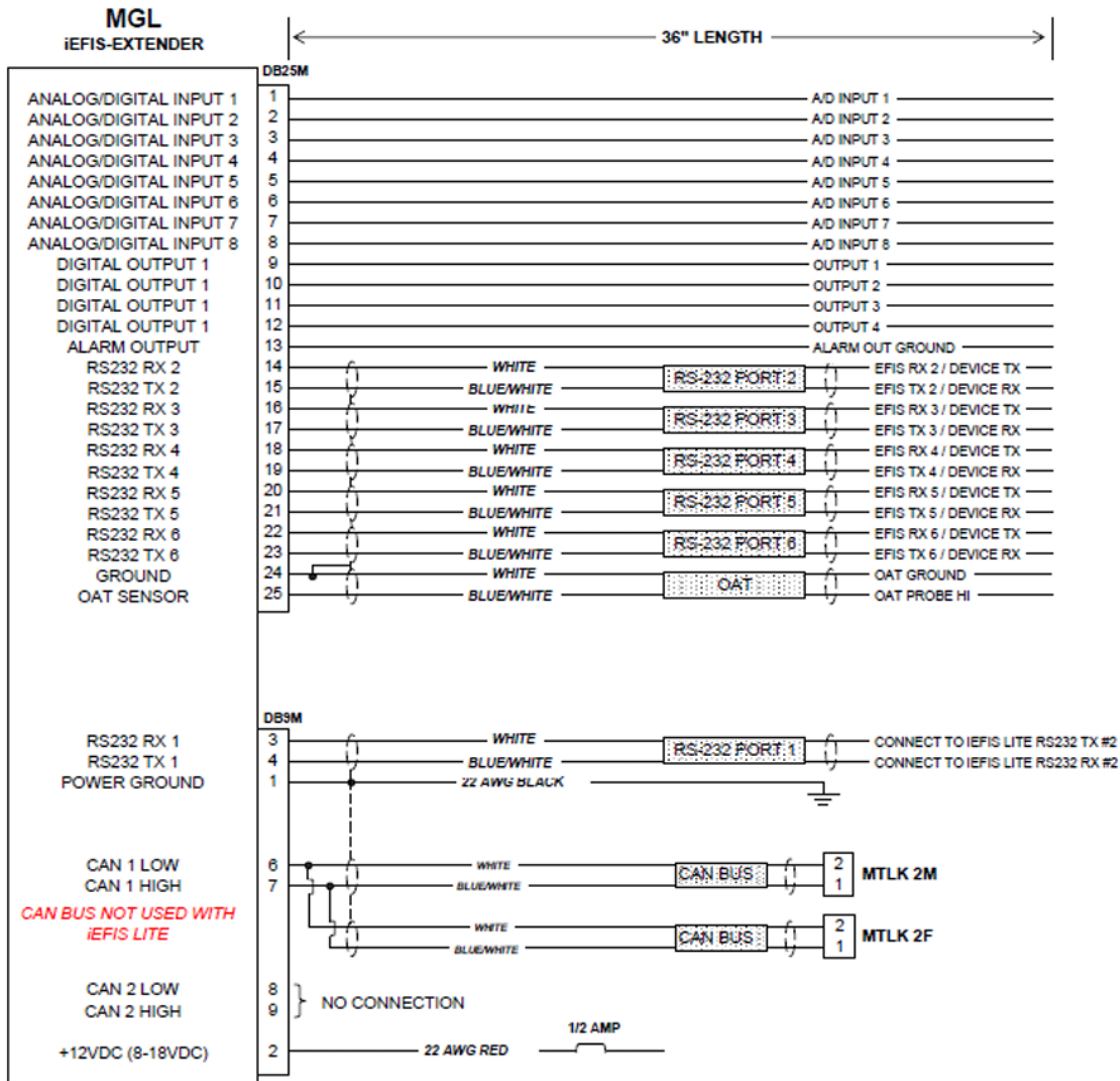
-  WIRING TO BE 22 AWG
-  GROUND SHIELD AT TRANSPONDER



Backshell - Gray  
 ALL Wire size - 22 awg  
 Length of all wires - 36"

MGL AVIONICS  
 iEFIS-EXTENDER

Note with label - "CAN BUS NOT USED  
 WITH iEFIS LITE"

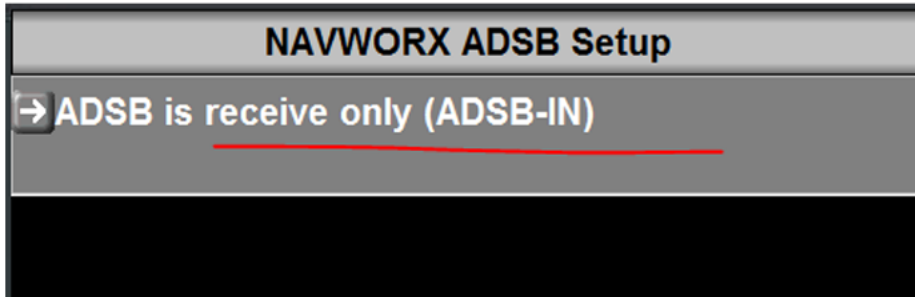


### iEFIS ADS-B Setup

With the Sandia and echoUAT combination, the EFIS is used to send encoded altitude to the Sandia transponder, and the pilot sets the squawk and mode of the Sandia Mode-C transponder from the iEFIS screen, and the transponder then sends this information to the EchoUAT ADS-B transceiver. The only connection the iEFIS has with the

EchoUAT ADS-B is to receive weather and traffic data from the echoUAT. Because of this, the EchoUAT is considered a 'receive-only' ADS-B as far as the EFIS is concerned. Although the ADS-B is an IN and an OUT, to the EFIS, it is just an IN.

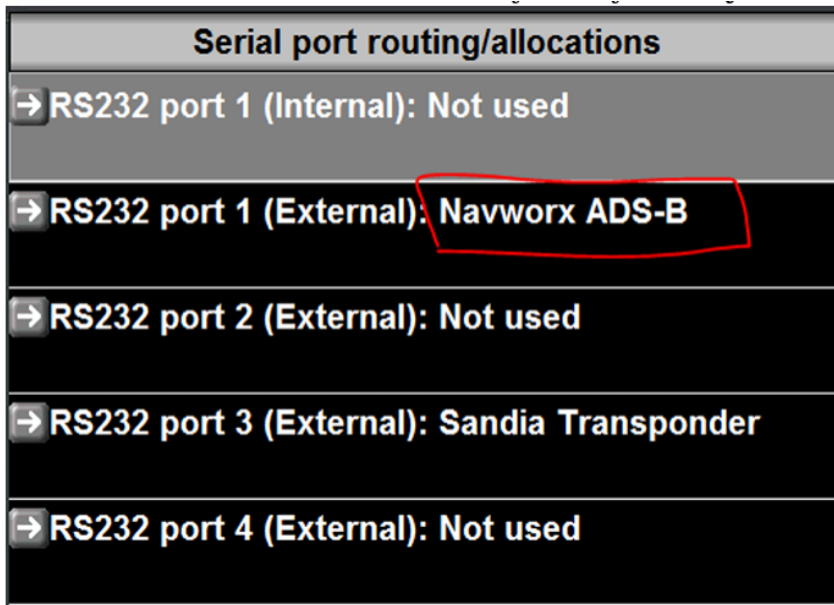
In **MENU > SYSTEM SETUP MENU > ADS-B SETUP**: Setup as **ADS-B is RECEIVE ONLY**



### iEFIS Serial Port Setup

Setup EchoUAT as 'Navworx ADS-B' on the Serial Port it is connected to in **MENU > SYSTEM SETUP MENU > SERIAL PORT ROUTING/ALLOCATIONS**. Remember to exit settings and then restart EFIS for serial port allocations to take effect.

- For iEFIS with iBox, use only **Serial Port 1** or **Serial Port 2** on the iBox, since these are the high speed iBox RS-232 channels. Do not use RS-232 Ports, 3,4,5 or 6.
- For the iEFIS-Lite or iEFIS Extender, you may use **any RS-232 channel**



## Appendix C-7 AFS Advanced Flight Systems EFIS Note

AFS models that support GDL90 traffic can receive traffic and weather from the echoUAT. Some supported models are the 3400S, 4000 and 5000 series. *Consult AFS to make sure your model is compatible.*

The configuration requires connection to either pin 3 or pin 5 of the echoUAT, depending on which GPS source you are using.

If using a GPS source that outputs NMEA at 115200 baud rate to pin 6 of the echoUAT, you will connect to pin 5 for traffic output. See table 1 for the configuration.

If using a Garmin GPS source on pin 6(COM2) of the echoUAT, connect to pin 3(COM1 TX) on the echoUAT because the COM2 port will be too slow for proper traffic reporting. Use the second table below for configuration

Weather and traffic are also supported using the AFS wireless adapter.  
**Note:** No configuration or connections to the echoUAT are required for wireless traffic.

The AFS serial port you connect to should be configured for ADS-B115K

The echoUAT should be configured to send traffic and weather to the AFS EFIS by setting the following settings in the echo installer mobile application.

### For installations on echoUAT COM2 (pin 5)

Equipment	Setup Source	Control Source	GPS Source	Traffic Uplink	COM2 Rate
AFS EFIS	APP	As required	As required	COM2	115200 Note 1

Note 1 – If COM2 is not selected as the GPS source or unused, set baud rate/protocol to echoALT default 115,200/NMEA.

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

**For installations on echoUAT COM1 (pin 3)**

Equipment	Setup Source	Control Source	GPS Source	Traffic / Uplink	COM1 Rate	COM1 Data	COM1 PHY	COM1 PROTOCOL
GDL90 EFIS, GRT, AFS, ETC	APP	As required	As required Note 1	EFIS COM1	115200	81N	RS232	GDL90

Note 1 – If COM2 is not selected as the GPS source or unused, set baud rate/protocol to echoALT default 115,200/NMEA.

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

Verify that the ADSB unit is talking to the EFIS. The CHECK -> ABOUT EFIS page will display the ADSB OSHIP messages (scroll down). The OSHIP message counter should be counting up.

## Appendix C-8 Garmin GNS 4XXW-530W GPS Note



The GNS 400W-530W series supports Garmin ADS-B+ output.

The following software requirements are necessary to use the GNS 400W-530W as a rule compliant position source.

*400 SERIES: GNS 400W / 420W / 420AW / 430W / 430AW*

*500 SERIES: GNS 500W / 500W TAWS / 530W / 530W TAWS / 530AW / 530AW TAWS*

*Main software version 5.03 or later and GPS software version 5.0 or later*

*Software updates are available from your local Garmin supplier*

**Note: The software update information does not apply to the GNS480**

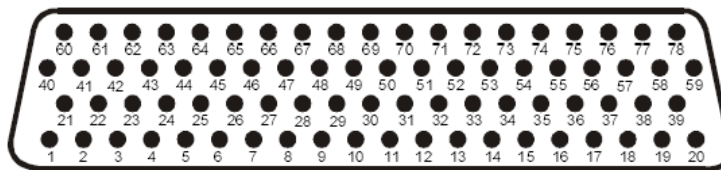
### Serial Connection

The GNS series has 4 serial ports for use with various avionics. EchoUAT needs a single wire from one of the available RS-232 Out on the Garmin to Pin 6 the Echo.

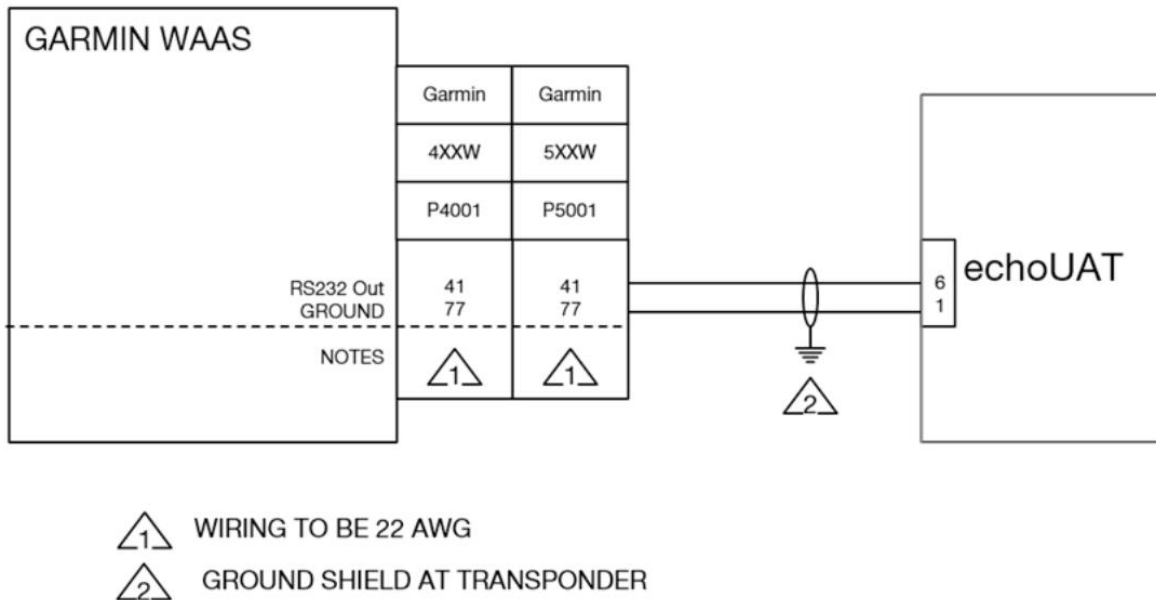
The connector on the 400 Series is P4001

The connector on the 500 Series is P5001

(View looking at rear of unit)



Pin	Pin Name
41	GPS RS-232 Out 3
54	GPS RS-232 Out 4
56	GPS RS-232 Out 1
58	GPS RS-232 Out 2



Pin 41 is shown as example for output on GPS Out 3. Pins 54, 56 or 58 can be used as alternates.

After wiring is complete configure the GNS to send ADS-B+ to Echo as follows:

Power on the GNS and press and hold the ENT key and turn the unit on. Release the ENT key when the display activates. After the GNS has completed startup you can access the port configuration using the right-hand knob.

Configuration pages can be accessed by ensuring the cursor is off and rotating the small right knob.

To change data on the displayed Configuration Page, press the small right knob (CRSR) to turn on the cursor. Rotate the large right knob to change between data fields. Rotate the small knob to change a field that the cursor is on. Once you have made the desired selection, press the ENT key to accept the entry.

- Use the small knob to reach the MAIN RS232 CONFIG page
- Select the CHNL number that matches the pin Echo is wired to example pin 41= Out 3
- Select ADS-B+ for the Output Value
- Press Enter
- Power the GNS Off and then On

**Echo Installer Application Settings:**

Equipment	Setup Source	Control Source	GPS Source	COM2 Rate	COM2 Protocol
GNS 4xxW-5xxW	APP	As required	COM2	9600	ADS-B+

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

If using a Garmin GPS with the EchoUAT and an EFIS proceed to **Appendix C10 Traffic on COM1.**

## Appendix C-9 Garmin GTN 6XX-7XX Note



The GTN 6xx-7xx series supports Garmin ADS-B+ output.

The following software requirements are necessary to use the GTN 6xx-7xx as a rule compliant position source.

600 SERIES: GTN 625 / 635 / 650

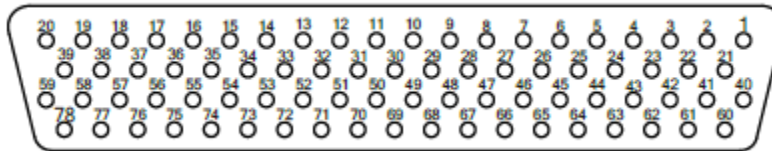
700 SERIES: GTN 725 / 750

*Main software version 3.00 or later and GPS software version 5.0 or later*

### Serial Connection

The GTN series has 4 serial ports for use with various avionics. EchoUAT needs a single wire from one of the available RS-232 Out on the Garmin GTN to Pin 6 the EchoUAT.

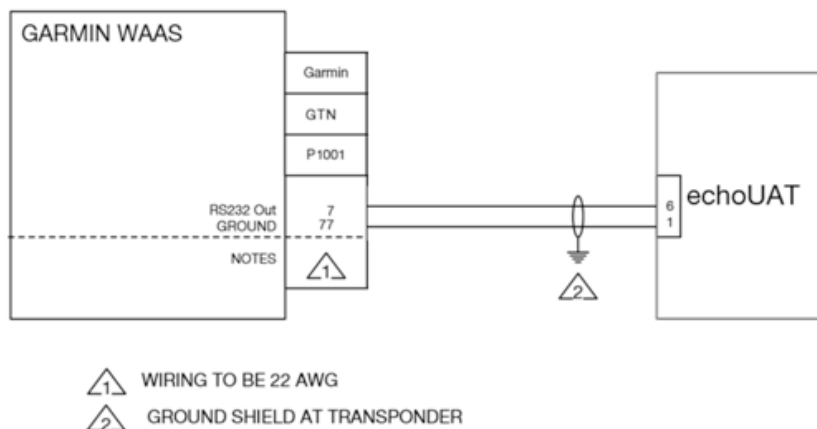
Connector P1001



**LOOKING AFT  
TOWARD PILOT'S  
SEAT**

Pin	Pin Name
5	GPS RS-232 Out 4
6	GPS RS-232 Out 3
7	GPS RS-232 Out 2
8	GPS RS-232 Out 1





GTN Pin 7 is shown as example for output on RS-232 Out 2. Pins 5, 6, or 8 can be used as alternates.

After wiring is complete configure the GTN to send ADS-B+ to Echo as follows:

To access configuration mode, remove power from the GTN. With the GTN turned off (circuit breaker pulled), touch and hold the **HOME** key and reapply power to the GTN (push in the circuit breaker). Release the **HOME** key when the display activates and the name 'Garmin' appears fully lit on the screen. While in configuration mode, pages can be selected by touching the desired key on the display. Some pages may require page scrolling to view all of the information and keys on the page. This can be done by touching the screen and dragging the page in the desired direction, or by touching the **Up** or **Down** keys.

Startup the GTN in Configuration Mode

Tap RS232

Tap the Output that matches the GTN pin EchoUAT is wired to, example pin 7= Output 2

Select ADS-B+ for the Output Value. If two entries are available for ADS-B+ choose ADS-B+ format 1.

Press Back to return to the configuration mode home screen.

Power the GTN Off and then On

Configure the EchoUAT application to receive ADS-B+ data from the GTN.

**Echo Installer Application Settings:**

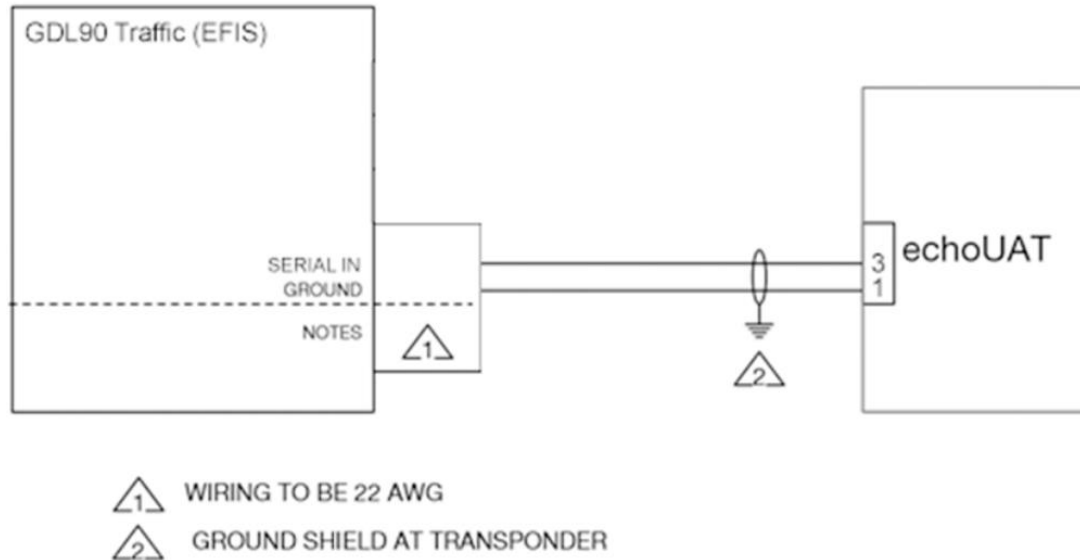
Equipment	Setup Source	GPS Source	COM2 Rate	COM2 Protocol
GTN 6xx-7xx	APP	COM2	9600	ADS-B+

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

If using a Garmin GPS with the EchoUAT and an EFIS proceed to **Appendix C10 Traffic on COM1.**

## Appendix C-10 Traffic on COM 1 via GDL90 Configuration Note

When echoUAT pin 6 (COM2 RX) is connected to a GPS source with a low baud rate, traffic delivery to an EFIS on pin 5 (COM2 TX) will also be impacted. To improve the responsiveness of traffic it can be optionally output on COM1 (Pin3) of the echoUAT.



Note that in this configuration the EFIS cannot be set for control of the echoUAT

Settings for Traffic on COM1 are as follows:

Equipment	Setup Source	Control Source	GPS Source	Traffic / Uplink	COM1 Rate	COM1 Data	COM1 PHY	COM1 PROTOCOL
GDL90 EFIS, GRT, AFS, ETC	APP	Transponder Monitor	As required Note 1	EFIS COM1	38400-115200	81N	RS232	GDL90

Note 1 – If COM2 is not selected as the GPS source or unused, set baud rate/protocol to echoALT default 115,200/NMEA.

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

After EchoUAT is configured for COM1 Traffic the EFIS will need configured to receive the data.

As an example the GRT EFIS would be set to the following settings:

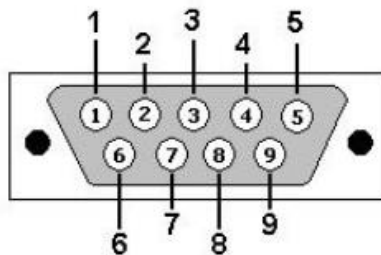
Serial Port Input: ADS-B  
Serial Port Rate: 115200

## Appendix C-11 echoUATmux Harness

The optional echoUAT mux harness allows the echoUAT to be hard wired to a GTX327/GTX330 transponder to provide squawk and barometric altitude via a direct interface. The mux harness will not work with a GTX327/GTX330 that is interfaced to a Grey code blind encoder. The altitude encoder must have an RS-232 output.

**Note: uAvionix skyFYX GPS is used as position source in this example. If you have the skyFYX-EXT or Garmin GPS you will need the GNS Mux on the next page.**

The pin out of the DB9 is shown below.



View looking into male connector

Pin #	I/O	Name	Description
1	I	GTX Transponder Control RX	RS232 RX Data from Transponder configured for Remote Mode
2	--	--	Not Used
3	I	Altitude Encoder RX	RS232 Altitude Encoder Input
4	--	--	Not Used
5	I	Aircraft Ground	Main Aircraft Power Ground
6	O	COM 1 Traffic TX	RS232 GDL90 to EFIS
7	O	COM 2 Traffic TX	RS232 GDL90 to EFIS
8	--	--	Not Used
9	--	Aircraft Power	Main Aircraft Power Input (+11 to +31VDC)

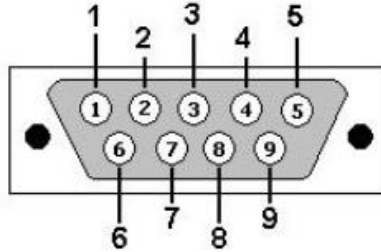
Configure the echoUAT as follows using the echo mobile application.

Equipment	Setup Source	Control Source	Traffic / Uplink	COM1 Rate	COM1 Data	COM1 PHY	COM1 PROTOCOL
GTX 327 RS-232 Encoder EFIS (optional)	APP	EFIS/Panel COM1	MFD COM2	115200	81N	RS232	GDL CONTROL

## Appendix C-12 echoUATmux GNSS Harness

For use with Garmin GNS/GTN, Avidyne and the skyFYX-EXT.

The pin connections of the DB9 are shown below.



View looking into male connector

Pin #	I/O	Name	Description
1	I	GTX Transponder Control RX	RS232 RX Data from Transponder configured for Remote Mode
2	--	--	Not Used
3	I	Altitude Encoder RX	RS232 Altitude Encoder Input
4	--	--	Not Used
5	I	Aircraft Ground	Main Aircraft Power Ground
6	O	COM 1 Traffic TX	RS232 GDL90 to EFIS
7	I	COM2 GPS RX	RS232 from GPS source (Note the different settings below for Garmin or uAvionix)
8	--	--	Not Used
9	--	Aircraft Power	Main Aircraft Power Input (+11 to +31VDC)

Configure the echoUAT as follows using the echo mobile application.

Equipment	Setup Source	Control Source	Traffic Uplink	COM1 Rate	COM1 Data	COM1 PHY	COM1 PROTOCOL	COM2 Rate	COM2 PROTOCOL
GTX 327 RS-232 Encoder EFIS GNS	APP	EFIS/Panel COM1	MFD COM2	115200	81N	RS232	GDL CONTROL	Garmin: 9600 skyFYX- EXT: 115200	Garmin: ADSB+ skyFYX- EXT: NMEA

**As of April 2024, this installation requires an echoALT retrofit. See section 9.4.2 for installation details.**

## Appendix C-13 echoUAT pairing with Funke TRT800H

This configuration has been tested with Funke TRT800H Software Version 6.5. Refer to Funke TRT800H Operation and Installation Document Number 03.2126.010.71e for additional configuration procedures and wiring diagrams for the TRT800H transponder.

For this configuration, no echoALT is required.

Ensure the echoUAT has software versions:

CPU	Software Version
protocolConverter	0.4.5 or later
pingTransceiver	2.4.66 or later
Echo Smatphone App	1.9.11 or later

### Funke TRT800H Wiring

Connect COM1 of the echoUAT to TRT800H COM2 as shown in the table below.

echoUAT Pin	Function
1	Ground
2	Aircraft Power
3	echoUAT COM1 Tx – TRT800H Serial 2 Rx (RMT-RXD) brown wire
4	echoUAT COM1 Rx – TRT800H Serial 2 Tx (RMT-TXD) white wire
5	echoUAT COM2 Tx – ADS-B data to EFIS (optional)
6	echoUAT COM2 Rx – to FYX Nav GPS

Configure the echoUAT as follows using the echo mobile application.

Equipment	Setup Source	Control Source	Traffic Uplink	COM1 Rate	COM1 Data	COM1 PHY	COM1 PROTOCOL	COM2 Rate	COM2 PROTOCOL
Funke TRT800H	APP	EFIS/Panel COM1	MFD COM2 (optional)	9600	81N	RS232	NMEA	Garmin: 9600 skyFYX-EXT: 115200	Garmin: ADSB+ skyFYX-EXT: NMEA

### Funke TRT800H Configuration

- From the “Enter Setup” menu on the TRT800H:
  - TRT800H AA field should be set to all ZEROS to disable Mode S.
  - Serial Port 1 DISABLE
  - Serial Port 2 TM350

## Funke TRT800H/echoUAT Operating Limitations

- echoUAT must be powered on before pilot transitions the TRT800H from Standby to Mode A/C mode. This pilot action to Mode A/C enables the echoUAT to detect the TRT800H device.