



# Stratux Open Source ADS-B Receiver Equipment Supplement



Revision E

19 Jan 2024

## Revision Notes

<b>Revision</b>	<b>Date</b>	<b>Change Description</b>
A	17 Mar 2016	Initial Release
B	1 Apr 2016	Miscellaneous spelling, grammatical and procedural corrections
C	6 Oct 2016	Noted software is compatible with Model 2 Hardware. Added wiring diagram.
D	2 May 2017	Updated links to software, added wiring diagram
E	19 Jan 2024	Several sections rewritten for newer software and settings.

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ADS-B Radar imagery on the Sport SX (courtesy of James Clark)

# 1 Introduction

## 1.1 About the Stratux Open Source ADS-B Receiver

Stratux is an “open source” system capable of receiving 978 MHz UAT and/or 1090 Extended Squitter ADS-B data. When configured with a 978 MHz UAT function, Stratux can display FIS-B weather and TIS-B traffic data via a serial port connection on all GRT EFIS display units including the 10.1, HXR, HX, EX, SX, and Mini (versions with moving map), as well as the WS and HS legacy display units. The Stratux receiver, when equipped with a Wi-Fi adapter, also transmits data to a large variety of tablet-based iPad and Android EFB (Electronic Flight Bag) devices.

See [stratux.me](http://stratux.me) for more information.

**WARNING:** Stratux is a receiver ONLY. Do not expect or rely on any traffic information unless your aircraft is also participating in ADS-B OUT, and the output is verified to be functioning.

The Stratux open source ADS-B receiver may be purchased in kit form (under \$250 as of this writing for a dual band version), or via individual components purchased and assembled by the user. Again, please refer to [stratux.me](http://stratux.me) for more information.

This supplement is intended to support GRT users with information about Stratux connectivity and use with GRT EFIS systems.

ADS-B Radar image on a Sport SX

*(Image courtesy of James Clark)*



The interface between Stratux and GRT display units allows for:

- FIS-B subscription-free weather and other information displayed on a GRT display unit while within ADS-B ground coverage;
- TIS-B traffic information displayed on a GRT display unit while within ADS-B ground coverage;
- Direct airplane-to-airplane traffic information displayed on a GRT display unit from nearby aircraft participating in ADS-B OUT on 978 MHz UAT and 1090MHz ES frequencies.

## 1.2 Stratux Raspberry Pi Software

Official releases of the Stratux software support serial adapters since release 1.1b1. However, in order to limit conflicts with some GPS modules and radios, all releases only recognize adapters that are programmed as a Stratux serial adapter, such as the official Stratux serial adapter sold in the Stratux store. Other serial adapters may be used by GPS modules and radios so they are not automatically used for traffic and weather. This can't be reconfigured with the built-in settings. The official releases can be patched to support other adapters including the Trendnet TU-S9. Patching the software may create conflicts with some GPS modules and radio receivers. GPS modules using a u-blox chipset are recommended as they can't conflict with regular serial adapters. This includes the recommended internal GPYes 2.0 and external VK-162 GPS modules available in the Stratux store. The patches were originally tested with Stratux version 1.6r1. They are expected to work with the US-configured "eu" versions including the current 1.6r1-eu029.

Patches for other adapter chips are on the GRT web site on the [Miscellaneous Software](#) page. Download the update-stratux-force-serialout.zip file and extract the update file that works with your adapter. For the Trendnet TU-S9 adapter recommended by GRT, use the update-stratux-tu-s9.sh file. The TU-S9 adapter uses a Prolific PL2303 chip and this script configures every PL2303 as a serial output. (This conflicts with the BU-353-S4 GPS.)

Connect a web browser to the Stratux and update it using the extracted update-stratux sh patch file, just like a regular Stratux update. An update function is part of the web interface that every Stratux with Wi-Fi has. It's normally used to install Stratux software updates without removing the SD card. Connect a computer or any device that can upload files to web sites to the Stratux Wi-Fi. Open the web browser on the computer/device and enter the web address 192.168.10.1. This should open the Stratux web interface. Use the menu on the left side (or upper left corner) to access Settings. On the Settings page, click/tap on "Click to select System Update file" and select the update-stratux sh patch file. After you select the file it may ask you to click/tap once more to begin the update, or it may begin the update immediately. Then the Raspberry Pi should reboot a couple times. Once it's back up and running you can go back to the same Settings page and if it found your serial adapter it should now include a "Serial Output Baudrate" setting. At that point the serial output should be working at the currently configured baud rate. You may need to wait one minute for the output to start.

If an official Stratux update is loaded later, it will restore the limited serial adapter support and you will need to load the patch file again.

## 1.3 Stratux Serial Output Configuration

When a serial output adapter is detected the "Serial Output Baudrate" setting appears in the Settings page in the Stratux web interface. The Stratux serial output defaults to 38400 baud for compatibility with older systems. Increasing the baud rate to 115200 is recommended. In any case the EFIS serial port rate must be configured to match. If a USB serial adapter is used on the EFIS instead of a built-in port, the EFIS automatically tries 115200 and 38400.

Serial output begins automatically about one minute after the system boots.

## 1.4 Serial Port and Hardware Requirements

A high-speed serial port is required on each GRT display unit that will be used to display weather. Only ports built into the EFIS display are high speed. Not all ports are high speed on all models. Legacy WS and HS screens have some exceptions noted in the connection table on the next page.

Only traffic will transfer over a serial inter-display link, and only the nearest 32 reports. All traffic and FIS-B/weather data will transfer over an Ethernet inter-display link.

**Antennas:** The use of an externally-mounted Stratux antenna is optional. GRT beta testers in Van's RV aircraft have reported good signal with the included antenna when the unit is within view of the sky (typically on the instrument panel glare shield). Signal reception may be improved by mounting an antenna on the belly of the aircraft. The included antenna may be removed and a dedicated passive transponder or DME antenna may be connected in its place.

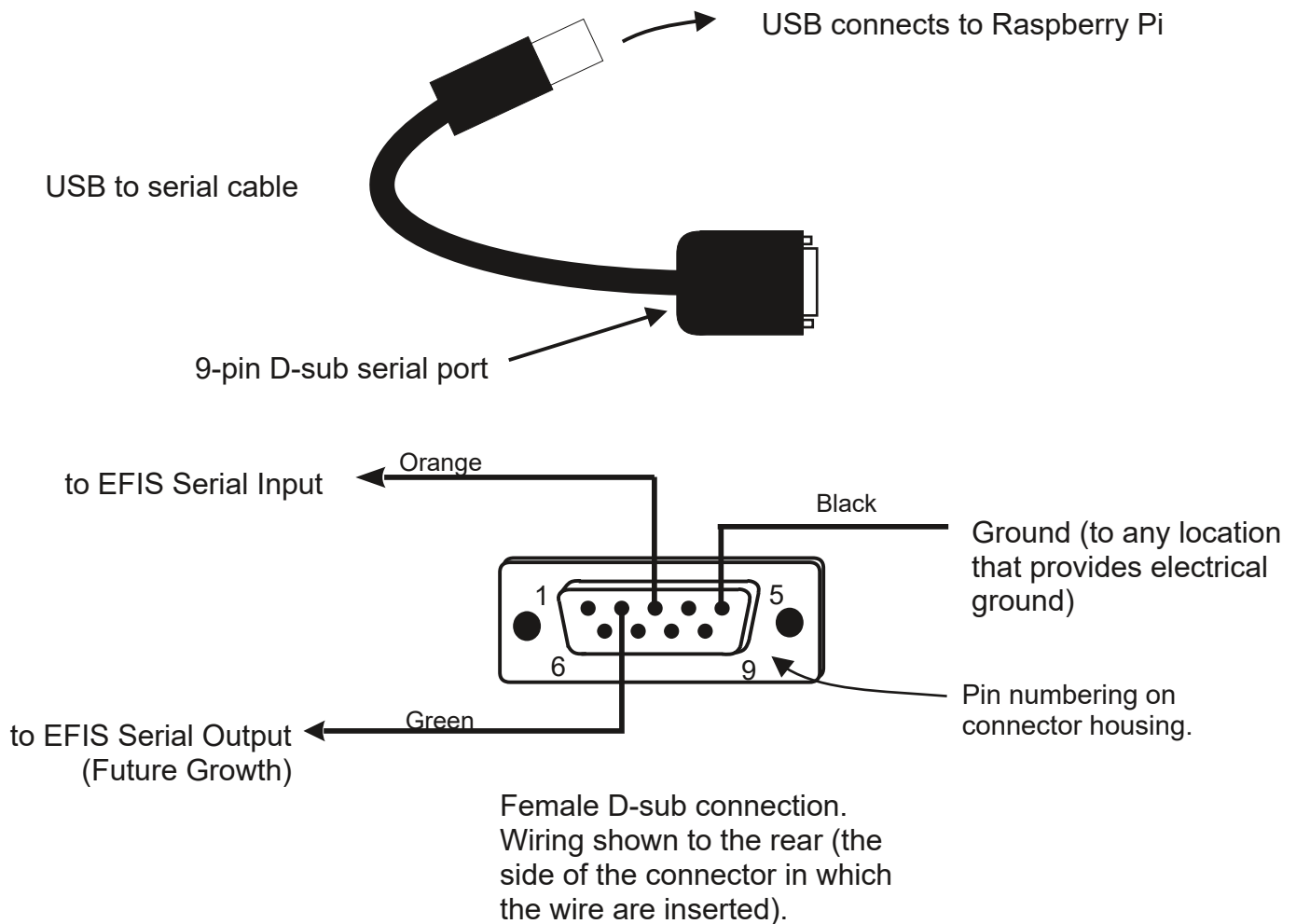
More information on antennas used with the Stratux project may be found at: [www.reddit.com/r/stratux](http://www.reddit.com/r/stratux). Search "antennas".

## 2 Installation & Wiring

### 2.1 Electrical Connections

Wiring to the Stratux with a standard 9-pin RS232 serial adapter such as the Trendnet TU-S9 should be accomplished as follows:

USB-Serial Cable 9-pin D-sub pin	EFIS Connection	EFIS Setting
Serial Data Out – Pin 3	Any unused high-speed serial input	<p>Set baud rate to match Stratux settings. 38400 is the default. 115200 is recommended.</p> <p>Set Serial Port Input to “ADS-B”</p> <p>Requires a high-speed serial port. These are:</p> <p>HX, HXr, 10.1, EX, Mini – All ports</p> <p>Horizon WS/HS – Ports 1* &amp; 2</p> <p>Sport WS/HS – Port 4</p> <p>*Horizon WS/HS port 1 can’t be used for ADS-B when a module is attached to the back.</p> <p>Pass-thru and combiner/expander ports are always low speed. Some expanders can handle 38400 baud but only as a last resort and they may overload the EFIS connection.</p> <p>HX, HXr, 10.1, SX, EX, and Mini displays can read ADS-B data through their USB port using a compatible USB serial adapter such as the Trendnet TU-S9. SX, EX (below serial number 800), and Mini displays (below serial number 1000) require a simple USB 2.0 hub in between.</p>
Serial Data In – Pin 2	Serial output on the same port used for serial input	Off. There is no data transfer from the EFIS back to the Stratux. This may be used in the future.
Serial Data Ground – Pin 5	None	Connect to aircraft ground.



The serial input is required. Ground is required if the Stratux is not otherwise wired to aircraft ground. Serial output from the EFIS is not required, but may be used in the future.

## Stratux Serial Wiring

The Stratux store sometimes sells an official serial adapter board with RS232 and TTL/RS485 pins. This board is automatically recognized by the Stratux software without patching. Use the 232T pin for the traffic/weather output to an EFIS serial input. The 232R pin can be wired to the EFIS output for future growth.

Stratux, when equipped with Wi-Fi, can display ADS-B information on tablets running Electronic Flight Bag (EFB) apps such as: ForeFlight, Seattle Avionics FlyQ, WingX Pro7, Naviator, FltPlan Go, iFly GPS, DroidEFB, Avare, and more. The recommended Raspberry Pi 3B includes onboard Wi-Fi.

See [stratux.me](http://stratux.me) for more information on EFB compatibility.



## 3 Setup & Programming

### 3.1 Display Unit Setup

Use the following procedure to program your GRT display unit to communicate with Stratux.

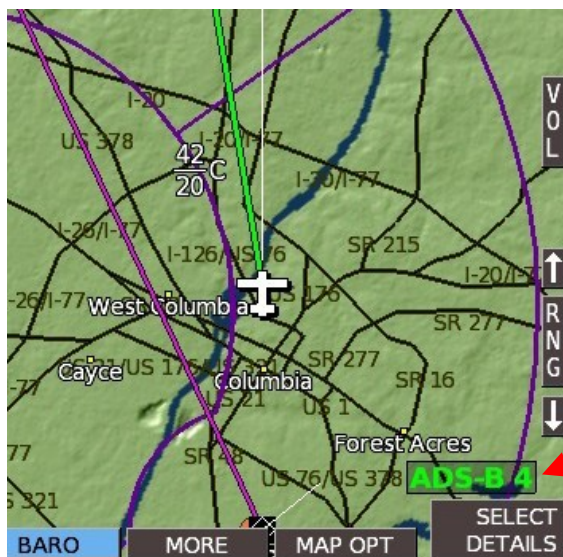
1. Power up the GRT EFIS system. Access the Setup Menu on the display unit that Stratux is connected to.
2. If using a serial port on the EFIS, under General Setup, scroll to the Serial Port settings for the wired port and configure the Rate, Input, and Output.
3. If using a USB serial adapter on the EFIS side instead of a serial port, under General Setup, scroll to just below the Serial Port setup options. Highlight **USB ADS-B** option and turn knob to select **ON**.
4. Stay on General Setup screen. Scroll down to Traffic Altitude Filter. This is used to filter out irrelevant traffic from the map beyond a certain reported altitude from your position.
5. Configure Traffic Distance Filter to filter out traffic far from your position.
6. Press **SAVE** softkey.
7. ADS-B Out transmitters have receiver capability settings to configure if you have a receiver that can display traffic. Configure these options to match your Stratux reception capabilities.

Setting	Value	Notes
Flight ID and Address	–	Press knob to activate menu
Flight ID	Enter actual value	Enter aircraft registration/N-number
Mode S Address	Enter actual value	Mode S code (base 16-Hex). Find by looking up N-number on FAA website. This address is used to filter your aircraft from received traffic reports. Note: The 6-character Mode S code is only listed for aircraft with an airworthiness certificate, and not for reserved N-numbers.
USB ADS-B	Off/On	If using a USB serial adapter on the EFIS side instead of a serial port, set this to On. Otherwise leave it set to Off.
Traffic Altitude Filter	Set to preference	Excludes traffic outside the vertical distance relative to your altitude. ADS-B towers focus on traffic within 3500 feet of your altitude but you can directly receive traffic signals from all altitudes.
Traffic Distance Filter	Set to preference	Excludes traffic outside the lateral distance from your position. ADS-B towers focus on traffic within 15 nmi of your position but you can receive from much farther.

## 3.2 Post-Installation Checkout

1. Pull the aircraft outside and power up the GRT EFIS system.
2. Power up Stratux and verify connectivity on UI (192.168.10.1) and EFB.
3. Go to Set Menu > Display Unit Maintenance. Scroll to ADS-B Status. If the Valid Frames counter is counting, data packets are being received. The Stratux takes about one minute to start sending serial data. It will always send something at least once per second, even if the antennas are disconnected.
4. When the receiver is within range of one or more ADS-B ground towers, a green **ADS-B x** icon will appear on the side of the moving map, with the “x” representing the number of towers received in the last minute. See image below.

Note: Ground tower signals, including weather (FIS-B), can not be received on the ground unless an ADS-B tower is located on the airfield. For most locations you need to be 2000-3000 feet in the air for reception.



Receiver is communicating with 4 ADS-B ground towers.

## 4 Using the Stratux ADS-B Receiver

- RADAR:** Bring up the GRT EFIS MAP screen. Under the SHOW softkey, there is a list of items to choose from: RADAR, SHADE, TERRAIN, METARS, etc. Note that only one map feature can be selected at a time. Currently, RADAR and TERRAIN can't be displayed at the same time. On the 10.1 or HXR, access the SHOW softkey by pressing SCREEN, then MAP OPTIONS. When selected on the larger map, radar will also be displayed in the HXR/10.1 map inset.
- METARs and TAFs**, if available, are shown on the DETAILS page of the airport. Select METARS on the moving map SHOW menu to display color-coded METAR symbols, wind barbs, and visibility.

**CAUTION:** Most other map information is hidden in SHOW METARS mode. Don't stay in this mode while flying.

- Go to the Moving Map Setup Menu for traffic alert and AIRMET/METAR/TAF viewing options:

Setting	Value	Notes
Traffic Alert Window	On or Off	Traffic inset automatically appears when traffic is a threat.
Show AIRMET	Choose to show on all MAP pages, on North-Up page only, or never.	
Color airports using METARS		
METAR Text	Choose to display weather report text in Raw or Translated (English) form	
TAF Text		

- TFRs** are shown when regular airspace boundaries are shown. They can be selected with the map cursor to see altitudes. Then push the knob for DETAILS to see the TFR NOTAM text.
- Traffic** is shown as a black diamond icon with the altitude above or below you in hundreds of feet. An arrow indicates if climbing or descending, and a vector line shows the approximate direction of flight. In addition to the moving map and geo-referenced charts, traffic icons can also be displayed in 3D on the PFD on EFIS models with Synthetic Vision. To turn PFD traffic on or off, go to Set Menu > Primary Flight Display and scroll to Traffic In View. Select ON or OFF.

