SBUS Module Manual

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1   Introduction

This document is a manual covering features and usage of the Airborne Innovations SBUS Modules. These modules (SBUS to Serial and Serial to SBUS) allow transparent transmission of SBUS manual piloting commands over the Picoradio link. They are compatible with Microhard NanoDDL and PicoDDL radios and any transparent serial radio link with suitable characteristics (with low latency and strong link characteristics).

2   SBUS Module features

The SBUS interface modules consist of two small processor boards which can interface directly with Picoradio or any other serial based datalink..

SBUS Data is encoded as efficient and serial packets with two byte packet header, length, and CRC16 checksum. These packets are impervious to corruption through lost transmission bytes.

The modules work well with the Taranis radio system (and should work with most other systems such as Futaba).

2.1   Base station side (SBUS2Serial Module)

The base station side is set up to be able to plug between an RC receiver (which remains on the ground instead of being mounted in the aircraft), and into a datalink (RS232 or TTL), such as the Microhard pDDL motherboard, or directly into a companion Picoradio module. The module can be powered by USB power or by external 5V.

This allows a short range wireless connection between the manual piloting console and the base station, while still achieving the benefit of single link transmission of command and control, video, and manual piloting over the stable Picoradio link.

The LED on the module will flash when incoming manual control samples are received over SBUS (at a rate approximately a factor of 10 lower than the received control rate).

2.1.1   SBUS2Serial Module Pinout

Pin	Description
GND	GND for Serial port
GND	GND for RC Receiver
VCC	VCC input (5V input when connected to external power), or 5V output when connec ted to USB power. Connect to RS232 Converter VCC and RC Receiver Power
TX	Serial TX output (115200 Baud), Connect to radio RX

| Pin	Description
SBUS Input	SBUS Input from RC Receiver

Please also note the reset button- when mounting it is a good idea to place a small standoff or 3D printed structure around it so that the button cannot be accidentally pushed while in use.
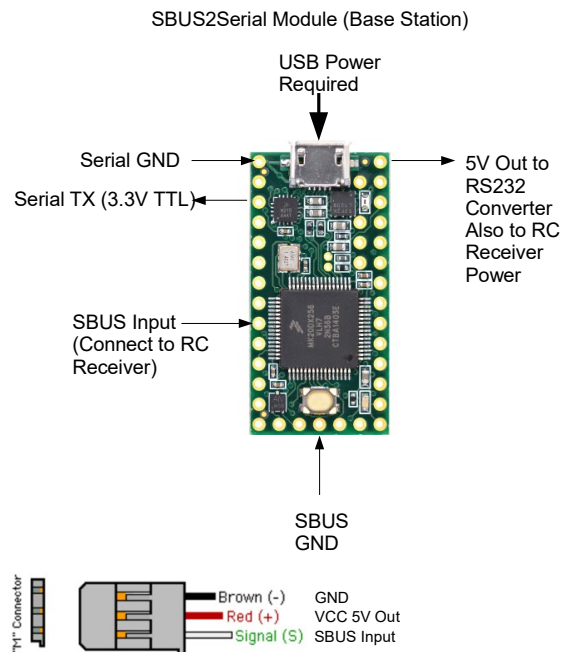
Figure 1: SBUS2Serial Module connections

(Base Station)

2.1.2   RS232 Converter Pinout

When connecting to a Microhard pDDL/nDDL Motherboard, we provide a small RS232 converter module with a male DB9 connector which can be integrated with the SBUS2Serial module to plug directly into the Microhard motherboard.
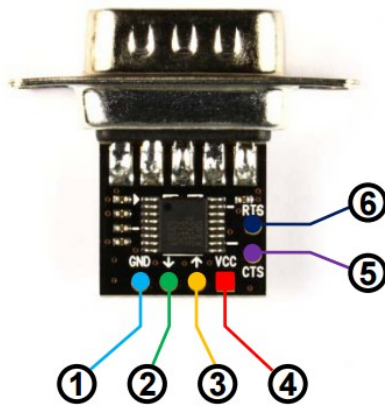
Pin	Name	Signal
①	GND	Ground
②	↓(TX)	Transmit Data
③	↑(RX)	Receive Data
④	VCC	Supply Voltage
⑤	CTS	Clear To Send
⑥	RTS	Request To Send

Connect GND, RX, and VCC directly to the Serial2SBUS module.

With care, these modules can be wired together and built into a small enclosure or heat shrink package.

Figure 2: Microhard pDDL motherboard with SBUS2Serial module (USB power taken from Microhard motherboard)
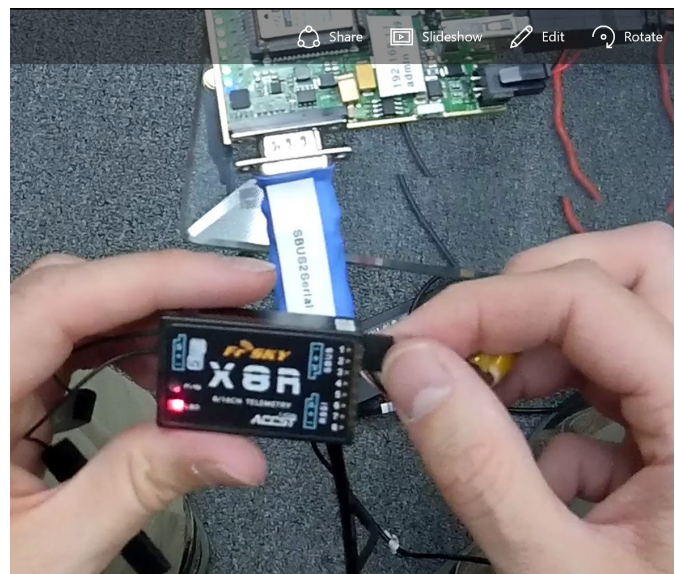

Figure 3: Attaching FrSky X8R Receiver

2.2   Airborne side (Serial2SBUS Module)

This side receives serial data from the Picoradio module and outputs an SBUS signal.

If you wire this module to a female servo plug you can use a M-M connection for convenience to plug it directly into a Pixhawk for manual control. However you may want to eliminate the extra connection failure point.

The LED on the module will flash when incoming manual control samples are received over the serial link (at a rate approximately a factor of 10 lower than the received data rate).

2.2.1   SBUS2Serial Module Pinout

Pin	Description
GND	GND for Serial port
GND	GND for RC Receiver
VCC	VCC input (5V input when connected to external power). Connect to Picoradio Serial Port 5V Output.
RX	Serial RX input (115200 Baud), Connect to Picoradio TX
SBUS Output	SBUS Output. Connect to Pixhawk RCIN / split to gimbal if needed.

Please also note the reset button- when mounting it is a good idea to place a small standoff or 3D printed structure around it so that the button cannot be accidentally pushed while in use.
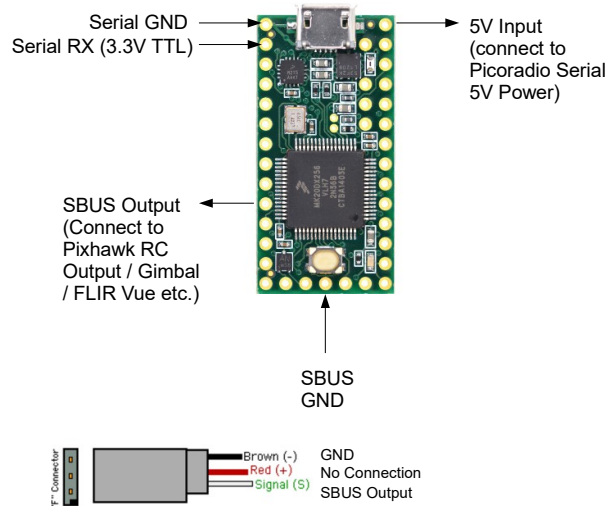
Serial2SBUS Module (Airborne)

Figure 4: Serial2SBUS Module connections

(Airborne Side)

2.3   Usage and Warnings

Use this system with extreme caution and testing diligence.

This system can be used to eliminate an RC receiver as part of an airborne system, and the associated headaches and interference problems which can result from placing an RC receiver in close proximity with other airborne systems.

However there are still many considerations for success.

You should still test the system thoroughly before using it in a critical situation (i.e. for manual piloting of a valuable vehicle).

Safe and reliable operation of this system is the responsibility of the user, and we cannot accept liability for damage to life or property through operation of this system.

2.3.1   Radio link characteristics

Datalinks are built fundamentally differently from RC links. Typically they may have an acquisition / search mode before link is acquired, and/or when link is lost there may be a significant period where there is no link before signal is reacquired. In addition there can be fades and significant periods where there is no manual control. Your system should always be configured so that during periods of no transmission the vehicle will still maintain stability and proper operation, i.e. this system should never be used in a critical application where if the vehicle

2.3.2   Range performance and testing

There are many link characteristics that can cause issues, such as radio reflections from parked vehicles, buildings, fences, and other metal objects. Line of sight should always be maintained to the vehicle (people / obstructions / vehicles etc should not block the path between the vehicle antennas and the base station antennas), and we strongly recommend enabling and using the dual antenna diversity receive mode of the Picoradio / PDDL systems (note that two antennas must be connected if diversity RX mode is enabled). We highly recommend a range test to confirm manual performance at all extremes of your test range. In the past we have also used variable attenuators to verify adequate gain margin for safe flight. Basically our advice is test the heck out of the system and qualify it on the ground before you fly.

2.3.3   Failsafe configuration

You should always properly configure and test failsafe operation of your autopilot system. Keep in mind how the autopilot system is configured and what would happen if the SBUS signal stopped appearing at any particular moment. You should test this on the ground and in simulation.
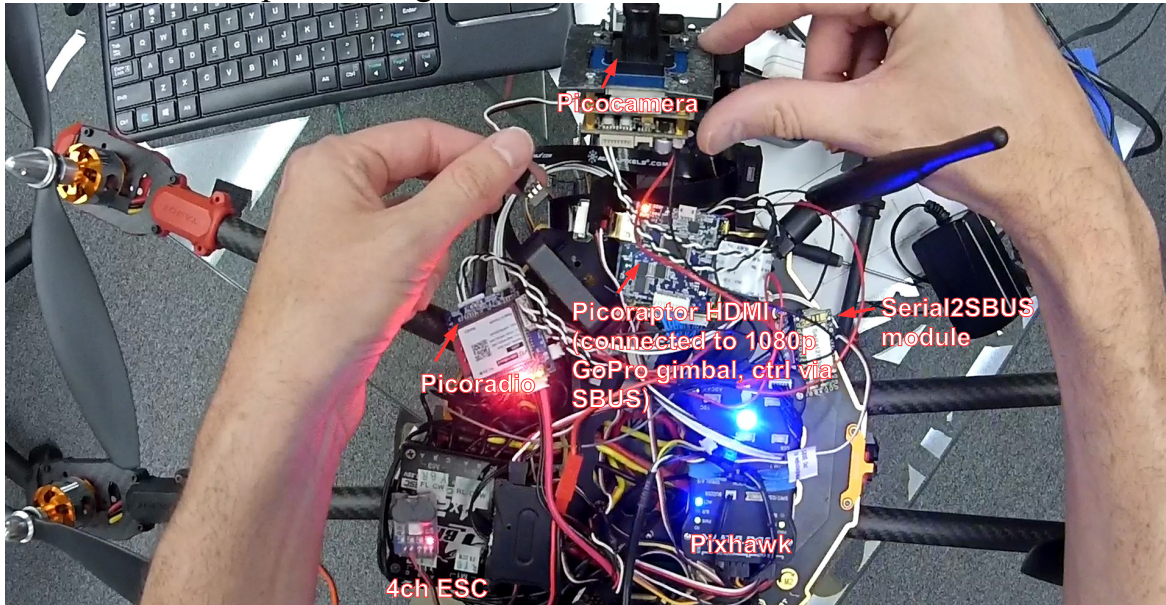
2.4   Demo Multicopter Configuration

Figure 5: Demo Multicopter Configuration