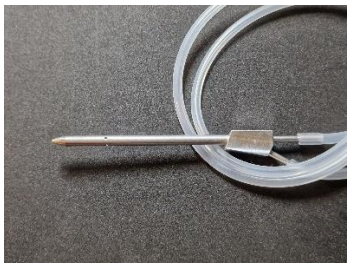
AIRSPEED SENSOR

User Guide

Disclaimer

Warning: THIS PRODUCT IS NOT A TOY. Read all these instructions before using this product to avoid misuse of the product, which could lead to damage to both the product itself, and damage to other people or property. RC Light Systems is supplying a high quality unit, which you, the user, will use to provide capabilities to your R/C aircraft. The final set up is in the hands of you, the user. RC Light Systems cannot monitor the installation of this product, and therefore will in no way accept liability or responsibility due to misuse of the user installed product. Any responsibility or liability must be accepted by you, the user. If you, the user, will not accept full responsibility, return this product to the original place of purchase. This product must only be used in a safe manner, in accordance to the ANO if used in the UK, or the respective guidelines provided by the governing body of your country. Every single product is tested for full functionality before shipping.

RC Light Systems Airspeed Sensor instructions



The RC Light Systems airspeed sensor provides airspeed telemetry based on differential pressure measured from a pitot tube.

The sensor provides indicated air speed (IAS) and true air speed (TAS). IAS is used in low-speed scenarios, for example stall warnings and TAS is used in high-speed scenarios.

The sensor is available in three hardware variants which differ by maximum speed value.

Note that the pitot tube is sold separately.

Specifications

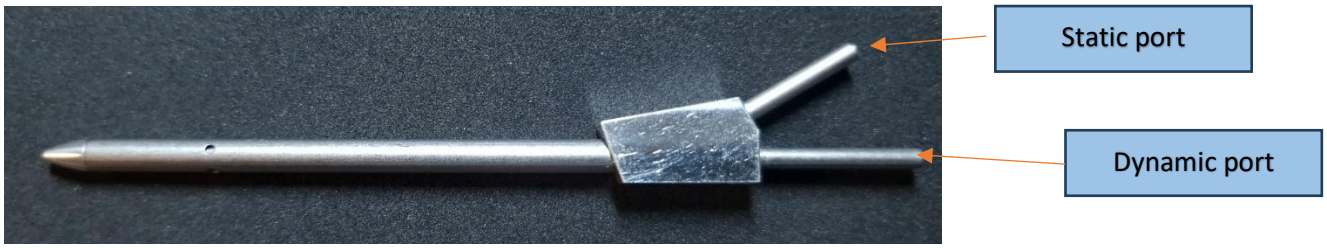
Voltage	5v to 12.6v (rx voltage)
Current draw	15mA
Speed ranges	0-180MPH (4Kpa – max speed before damage 350MPH) 0-280MPH (10Kpa) 0-600MPH[1] (50 Kpa - by request)
Speed resolution (internal sensor)	4Kpa – 1.25 m/s 10Kpa – 1.99 m/s 50Kpa – 4.46 m/s
Supported Radios	Spektrum XBus and SRXL2, Jeti ExBus and Ext, Powerbox P2Bus, Futaba SBus2, FrSky S.Port JR/DFA DMSS
Weight	10.6g
Dimensions	38mm x 23mm x 14mm (excluding connection points)

Operation

A pitot tube should be installed such that the front of the probe is in ‘clean’ air and parallel to the flight path (0 degrees angle of attack to airflow). The pitot tubes dynamic and static ports are connected to the sensor using silicon tubing and the sensor then connected to the telemetry bus of the RX.

The sensor should work with any standard pitot tube, there are various options available. A basic pitot tube is available from RC Light Systems as shown below:

[1] The 600MPH sensor is not corrected for air compression and will have increasing errors from 350MPH upwards. A later firmware update will be made to add corrections for speeds in the range Mach 0.4-0.6



The sensor will not report speeds below 3 m/s.

The sensor must be set to the correct radio/protocol, this can be performed using the bootloader or using the button (See later – configuration). RC Light Systems are able to pre-configure the sensor at time of dispatch if required.

The airspeed sensor uses an appropriate hardware based pressure sensor which is unique to the speed range. Each sensor is assembled with the correct internal sensor for the speed range specified, and must be ordered for the desired maximum speed. It is not possible to change the speed (pressure) range after purchase.

The internal sensors have a resolution as indicated in the specification table. The Airspeed Sensor uses a 10x oversampling with low pass filtering to average between values and will present a continuous speed range at the resolution of the radio system.

IAS vs TAS

There are two common types of airspeed, Indicated Air Speed (IAS) and True Air Speed (TAS). The sensor provides both airspeeds.

IAS is the basic airspeed generated from the pitot tube. This is purely dependent upon the pressure differential seen at the pitot tube ports.

TAS refines IAS by compensating for air density using QNH (ground air pressure), altitude and temperature. The sensor allows for altitude, temperature and QNH to be entered via the bootloader or via a Jeti or Powerbox transmitter.

For stall warnings IAS is most appropriate as the mechanism that causes a wing to stall is ultimately based on pressure and in the speed based stall calculations air density cancels out. For determining how fast your aircraft is travelling, TAS gives the most accurate answer.

If you are using the sensor for stall warning you should test the stall at a safe height to determine the reported speed and use a safe margin above that for an alarm.

Note that the actual chain of airspeed types is IAS -> CAS -> EAS -> TAS.

CAS – corrected air speed adjusts for instrument errors and pitot placement. The internal hardware sensor has built in temperature compensation but there is no calibration possible for pitot placement.

EAS – equivalent airspeed adjust for air compressibility effects at higher speeds (and potentially high aerodynamic loads). As of firmware v1 the sensor does not adjust for air compressibility.

LED Colours

The Sensor uses red and blue LEDs indicate status and configuration values.

Colour	Mode	Meaning
Red	Slow flash from power on	Waiting to see the correct signal
Red	Fast flash	failsafe detected
Blue	Solid	Select protocol detected and telemetry being sent
Red	Solid from power on	In bootloader mode, re-attached to bootloader and re-flash

When entering configuration mode the sensor will show both red and blue together for some operations giving a purple colour.

Configuring the airspeed sensor

The sensor can be configured using the button or by using the bootloader software and an appropriate dongle.

To configure the sensor using the button the sensor must be placed into configuration mode.

To enter configuration mode hold down the button whilst applying power to the sensor. The sensor will slowly flash purple and then quickly flash purple. Once the quick flashes are visible the button can be released. The sensor in now in configuration mode.

In this mode the led will flash red and indicate a sequence of numbers:

1 red flash, 2 red flashes

This sequence will repeat continuously.

The red flashes indicate the top level configuration item (see list below) and any desired item is accessed by clicking the button when the correct number of red flashes are displayed.

To save and exit configuration mode press and hold the button, you will see fast flashing purple and then fast flashing red. Once fast flashing red is seen the button can be released and the sensor will return to normal operating mode.

Configuration items

The sensor has 2 configurable items that can be altered using the button. Each item is denoted by the red flash count as follows:

Red flashes	Item	Description
1	Radio / protocol	Sets the radio protocol the sensor will use. This must be set correctly for your radio type or the sensor will not work.
2	Sensor Id	Sets the id of the sensor (for Futaba and Spektrum SRXL2 only)

Setting the radio and protocol

To set the radio and protocol you need to enter item 1. Place the sensor in configuration mode as previously described, and when you see one red flash click the button.

The sensor will now start flashing in blue. This blue flash indicates the value of the selected configuration item, in this case the radio protocol.

Clicking the button will cycle through the available protocols as shown below.

Blue flashes	Protocol
1	Jeti – ExBus
2	Jeti – Ext
3	Powerbox – P2Bus
4	JR/DFA DMSS
5	Spektrum – XBus
6	Spektrum – SRXL2
7	FrSky – S.Port
8	Futaba – Sbus2

Once you have selected the protocol for your system you can exit to the main menu (red flashes) by pressing and holding the button. You will see fast purple flashes and then fast red flashes. Once you see fast red flashes you can release the button and the sensor will return to showing the list of configuration items.

From here you can either carry on to set the sensor id if needed or save the protocol and exit to normal operation.

You need to store your selected protocol to permanent memory so the sensor selects the correct one at power on. To do this press and hold the button whilst at the main menu until you see the fast purple then red flashing. When you release the button all the settings will be stored and the unit will return to normal operation.

If you want to abandon your changes simply power the unit down, the changes will only be saved if you store them.

TAS Parameters

The sensor allows for modification of the TAS related parameters. These can be set via the bootloader or via a Jeti or Powerbox transmitter.

There are three TAS parameters:

1. Altitude – the altitude of the runway
2. Temperature – the ambient temperature of the site
3. QNH – the local pressure at runway height.

These default to 500’, 15 Centigrade, and 1013.25 mBar. Adjusting these to the conditions on the day will provide a slightly more accurate TAS value.

Protocol and Transmitter specific features

This section describes features that are specific to certain radio systems

Jeti Ext and ExBus

The sensor supports both Ext and ExBus protocols. You should connect the sensor to a correctly configured port on your RX or CentralBox. The sensor provides a JetiBox menu to set TAS related parameters. This is accessed using the Applications | JetiBox menu option on your transmitter.

Powerbox

The sensor supports the Powerbox P2Bus protocol. Access to the TAS parameters is via the sensor menu in the standard Powerbox fashion.

Spektrum XBus and SRXL2

Spektrum only supports a single airspeed value for the airspeed sensor. Using the bootloader you can chose between IAS and TAS as the reported value. The sensor defaults to reporting IAS.

The AR6610T, AR637T, AR820T, AR8360T, AR10100T have bind/data/SRXL2 ports next to the throttle port. These are shared with the remove RX port. If you are using a remote RX (satellite) you cannot use this port for the sensor (the sensor will connect but the satellite will not work correctly). This means if you are running any other smart devices (for example an Avian ESC) you will have to y-lead the Sensor with the other device and connect into 1 port, you will also need to set the SRXL2 ID correctly (see below).

SRXL2 specific configuration options

In SRXL2 mode the sensor has an additional configuration item:

Red flashes	Item	Description
2	SRXL2 ID	For SRXL2 protocol only, allows alternate id setting to co-exist with Avian ESCs

The SRXL2 ID determines how the sensor interacts with the RX. There are two options under this item:

Blue flashes	Meaning
1	Active mode – the sensor is the primary device on the SRXL2 connection and will initiate the correct operation of the SRXL2 port.
2	Passive mode – the sensor is a secondary device on the connection and will participate in communication but will not initiate.

For modes 2 there must be another device on the same connection (y-leaded) to activate the SRXL2 communications.

If you are y-leading with an Avian ESC, set passive mode.

Futaba SBus2

In Futaba mode the sensor has an additional configuration item:

Red flashes	Item	Description
2	SBus2 slot	For SBus2 protocol only, sets the base slot (two used, IAS and TAS)

The SBus2 Slot sets the sensor configuration (slot) for telemetry reporting, and can be set as below.

Blue flashes	Meaning
1-29	Base slot number

The sensor defaults to slot 8.

The sensor does not support Futaba sensor configuration (plugging into the rear of the TX). You must use the sensor page to set the selected (and following) slot to ‘airspeed’ to access the sensor data.