

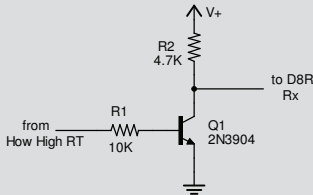
Using the *How High RT* with FrSky Telemetry

FrSky (www.frsky-rc.com) produces a series of two-way telemetry radio products. Their D8R(v2) telemetry receiver can accept a serial data stream and send it to compatible transmitter modules (DFT, DJT, DHT). For documentation visit www.frsky-rc.com/download.asp

The *How High RT* altimeter (version 3.2* or later) produces an inverted serial output signal that is plug-in compatible with the FrSky receiver. This provides real-time altitude information at the data port on the ground-based transmitter module.

*Note: Version 3.2 of the *How High RT* began shipping on April 11, 2011. It can be identified by the white "32" mark on the black, square, processor chip. The earlier version 3.1 (without the mark) does not have the "Inverted Serial Output Mode" required for plug-in compatibility. We at Winged Shadow Systems will provide free updates to the latest version. Simply return your unit to the address at the end of this document. Your only cost is the postage to send it to us. We will cover the cost to send it back to you.

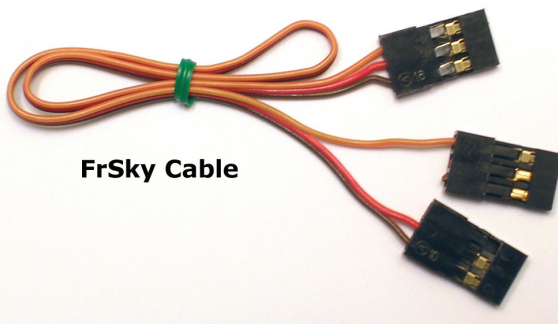
Alternatively, you can use the non-inverted serial output of the earlier *How High RT*, however you will need to invert the signal yourself. An inverter circuit like the one shown can be used.



Connections

The serial data input on the D8R(v2) receiver is located on the side of the case and is labeled "Rx". Unfortunately, the pin labeled "+5V" is not a supply voltage (despite its name) and cannot be used to power the altimeter. Power for the altimeter is most conveniently acquired from one of the servo channels on the end of the receiver. Winged Shadow offers a special cable that simplifies connection. Plug the connector with the single orange wire into the side of the receiver (orange wire to the "Rx" pin). Plug the connector with the brown (-) and red (+) wires into channel 8 on the end of the receiver. Be sure to observe the polarity marked on the receiver side. If you are otherwise using channel 8, you can use any other servo channel or use a Y-connector to share the connection with a servo.

The three-wire end of the cable simply plugs into the *How High RT* (be sure to observe the polarity marked on the board).



FrSky Cable

Mode Selection

The *How High RT* must be set to "Inverted Serial Output Mode" to work with the FrSky receiver. Refer to the *How High RT* instruction sheet and the *Real-Time Instruction Supplement* for information on changing modes. (All our instruction sheets

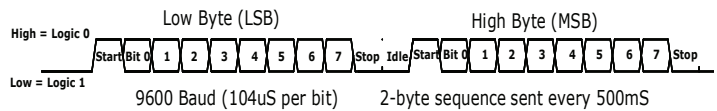
are available at the 'downloads' page of our website www.WingedShadow.com/downloads) Products that are ordered with the FrSky cable are preset to this mode before shipping.

Receiving Altitude

When power is turned on the *How High RT* will indicate its modes in the first two-seconds. The Red LED will come on steady to indicate feet or flicker to indicate meters. The Yellow LED will blink 4 times to indicate Inverted Serial Output Mode.

Then the Red LED will flash to indicate the peak altitude of the last flight (this can take several seconds). When complete, the *How High RT* will make its ground reference reading (to compensate for field elevation and barometer setting). It will then start sending serial data. The Red LED will flash briefly every 2 seconds (to let you know it is on). The Yellow LED will flash briefly every 500mS (each time it outputs an altitude value).

The inverted output waveform is shown below:



Data Decoding

Refer to the FrSky document "Two-Way System Protocol" for details on the data format as received at the transmitter (Host) end. The transmitter module data port on the FrSky system outputs a series of 11-byte data frames. (Some data bytes are replaced with a two-byte sequence, so some data frames can be longer than 11 bytes.)

A stream of frames (starting with 0x7E, 0xFE) provide information on the analog port values and the link quality. Interspersed with these frames are user data frames (which begin with 0x7E, 0xFD) that contain the data from the *How High RT*. Here is an example of a user data frame (values in hexadecimal):

7E	FD	02	05	AC	02	00	00	00	00	7E
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- 7E,FD = User Frame ID
- 02 = Number of valid data bytes in the frame
- 05 = Unused byte (counts from 0 to 1F and repeats)
- AC,02 = Altitude Data (LSB first)
 $0xAC + (0 \times 02 \times 256) = 172 + 512 = 684$
- 00,00,00,00 = Unused bytes
- 7E = Frame End Byte

More Info

FrSky does not currently provide a display or simple means to decode the data frames (although they might in the future). However, independent developers have produced interesting products based on this system. A quick internet search for "FrSky Telemetry" will provide you with information on this community of modelers and experimenters.

Winged Shadow Systems is not affiliated with FrSky and does not produce or sell FrSky products.

Need Help? Email us at support@wingedshadow.com or call (630)837-6553

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