

# Using the *How High RT* with FrSky Telemetry

FrSky ([www.frsky-rc.com](http://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](http://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 D8R(v2) FrSky receiver. This provides real-time altitude information at the data port on the ground-based transmitter module.

## FrSky New-Product Compatibility

**D4R-II Receiver** -- FrSky now offers a smaller, lighter receiver with two-way telemetry. The D4R-II uses the same telemetry protocol as the larger D8R(v2) described in these instructions. The *How High RT* works with either receiver.

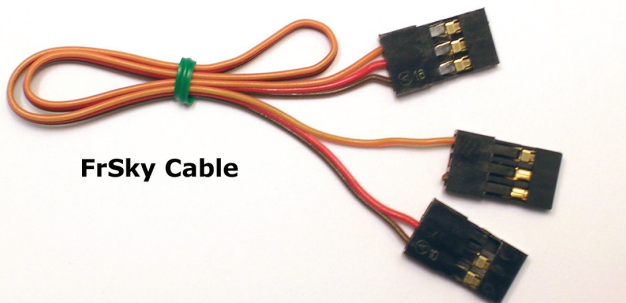
The D4R-II uses a different connector, but comes with a set of unterminated wires: Rx (yellow), Tx (brown), AD2 (white), GND (black). Connect the *How High RT* signal output pin (or the orange wire on the standard cable) to the Rx (yellow wire) receiver input.

**FrSky Sensor Hub** -- FrSky has introduced a "Sensor Hub" that is designed to work with their sensors and their DHT-U and FLD-02 displays. This system does not display the "user data frame" used by the *How High RT*. Therefore, the *How High RT* is not compatible with the FrSky DHT-U or FLD-02 displays and sensor hub.

## 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

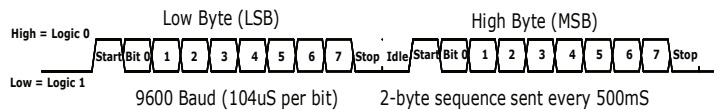
are available at the 'downloads' page of our website [www.WingedShadow.com/downloads](http://www.WingedShadow.com/downloads)) Products that are ordered with the FrSky cable are preset to this mode before shipping.

## 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 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
```

- 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 simple means to decode and display user data frames. However, independent developers have produced interesting products based on this system. A quick internet search for "FrSky Telemetry" and "How High RT" will provide you with information on this community of modelers and experimenters.

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