ExpressLRS

HDZero Backpack User Guide

Version 1.1

Background

The HDZero integration with ELRS aims to provide an interface which allows the user to control certain aspects of a HDZero Video Receiver Module (VRX). The intention is to make it as easy and seamless as possible to control some of the core settings of the HDZero system (selected band/channel, DVR recording state, etc.) from the ELRS LUA script.

Currently, the high level feature set allows a user to:

1. Change the band (R-band, F-band) and channel (1 to 8) that the VRX is receiving on from the ELRS LUA,
2. At the same time, change the band and channel that a HDZero VTX is transmitting on, assuming it has been configured to use Smartaudio control, and is connected to a Betaflight FC,
3. Start and stop the DVR recording on a HDZero VRX based on the state of an AUX channel, assuming the VRX has been configured for manual DVR recording,
4. Delay the start or stop of DVR recording by a configurable timespan, when using the AUX control described in #3 above.

There may be more features introduced in future to further extend this integration.

Required Hardware

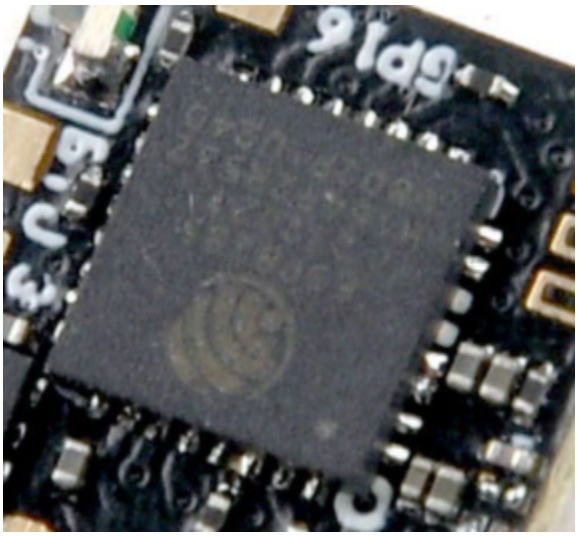
The following hardware is required:

Transmitter

An ExpressLRS transmitter module that has a backpack on board. Currently the supported models are listed here: https://www.expresslrs.org/2.0/hardware/backpack/esp-backpack/#supported-tx-backpack-targets

Backpack Receiver

In order for ELRS to control the VRX module, a receiver must be added to the HDZero VRX. Any ESP8285 based ELRS receiver will work for this. Most receivers are ESP8285 based, but in basic terms, if your RX has wifi capability, it will work. Alternatively you can inspect the chips on your RX. One will be an ESP8285:



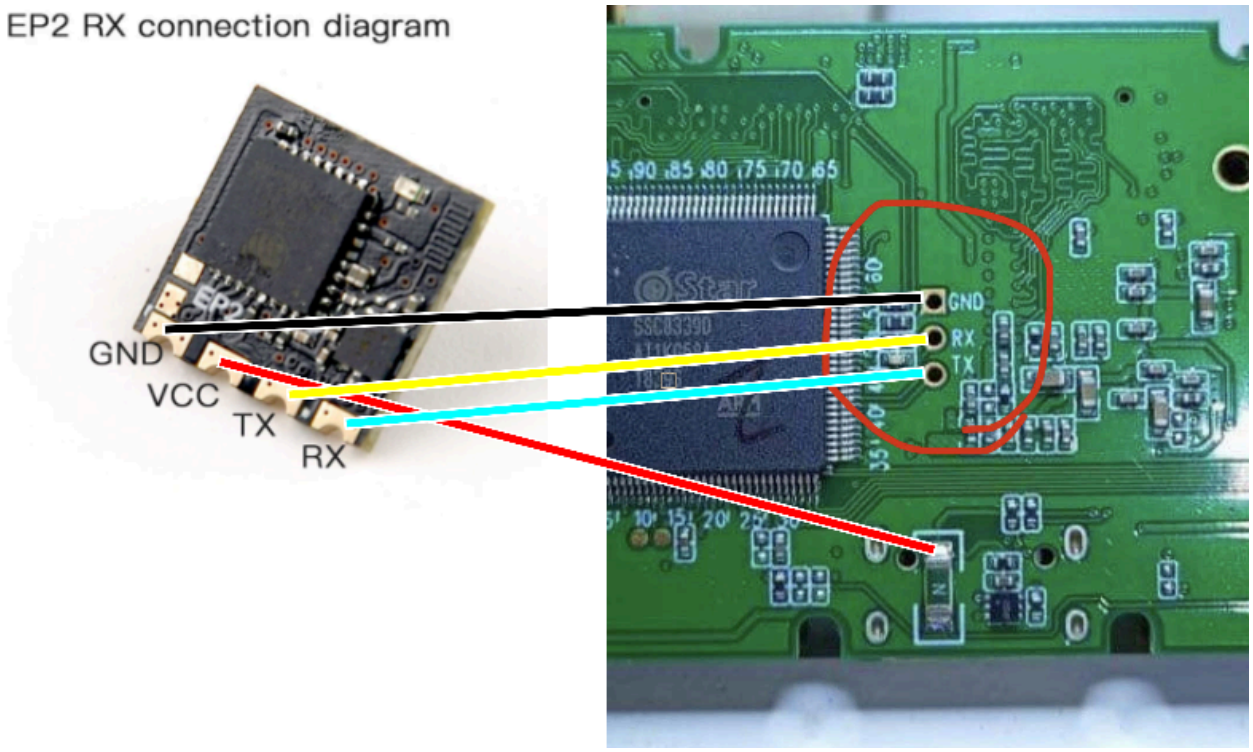
Some good candidates for backpack receivers are:

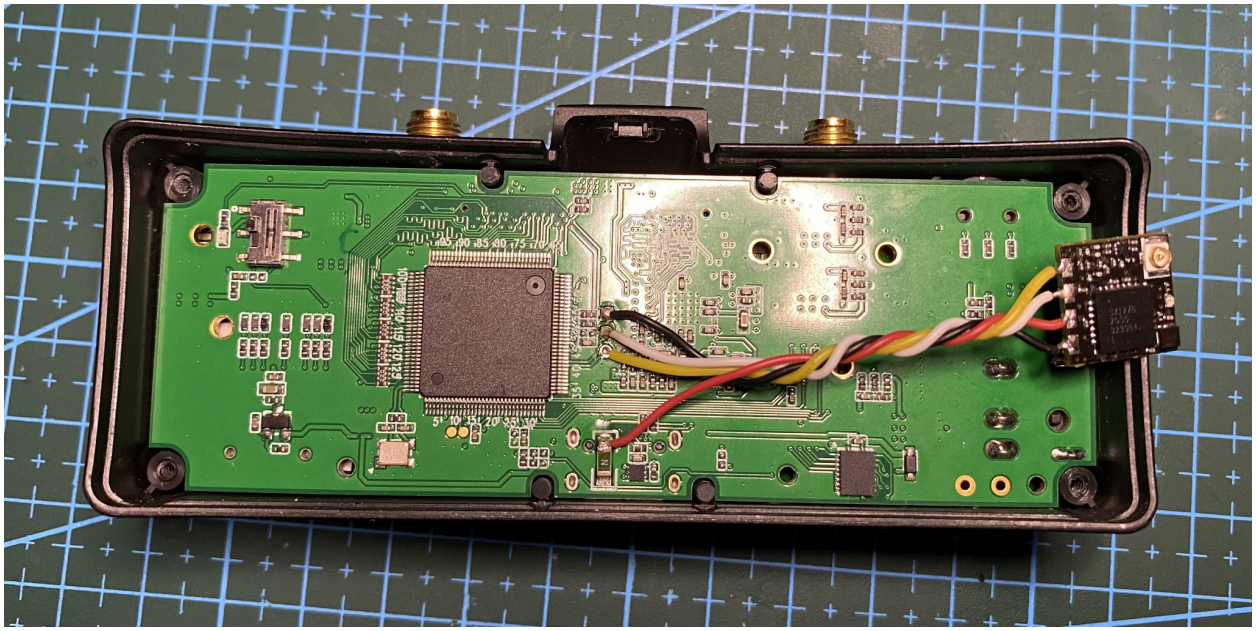
1. Happymodel EP1 (the SMD antenna on the EP2 makes them a bit tall)
2. Happymodel EP82 (designed for backpack usage)
3. BETAFPV Lite RX (Flat antenna version)
4. Any of the EP1 “clones” (i.e. flywoo etc.)

To install the backpack receiver on the sharkbyte branded VRX, you will need to remove the rear plastic cover. Unscrew the 4x corner screws, and pop out the plastic cover, to access the rear PCB.

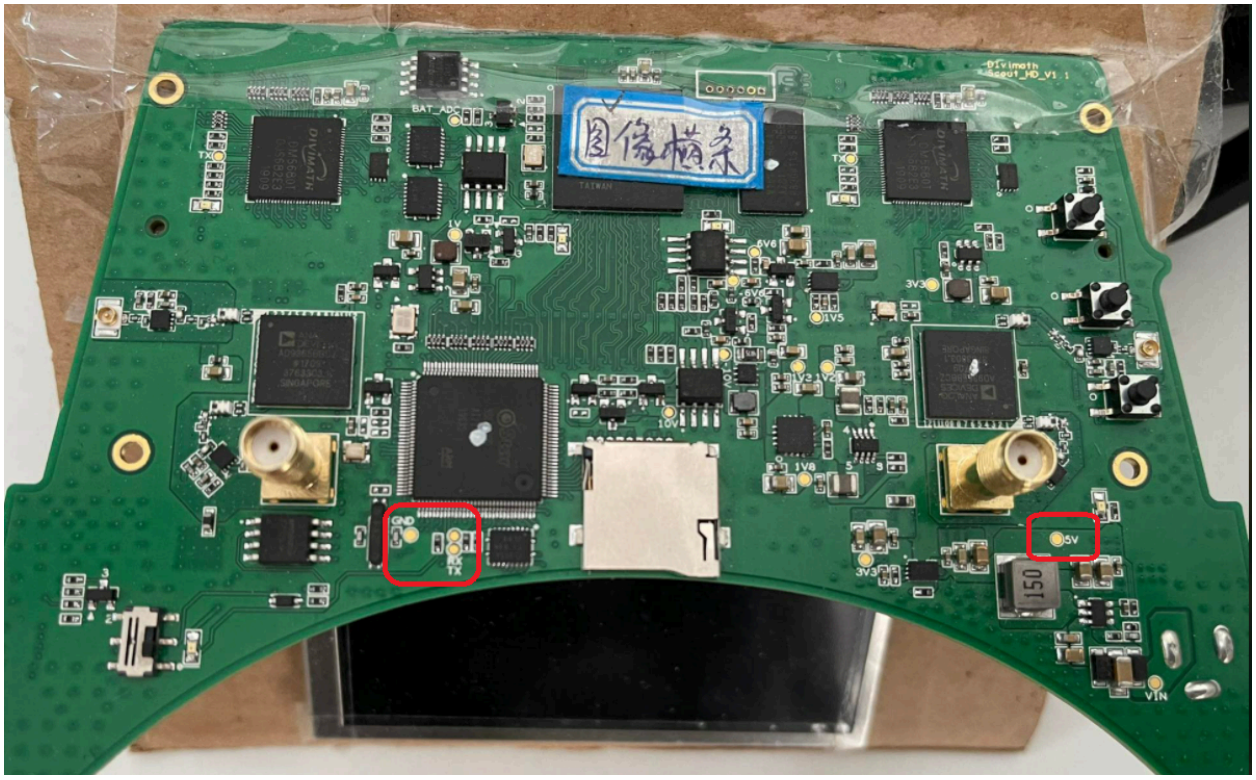
The backpack receiver needs to be connected to the spare UART on the right of the main MCU chip, as shown:

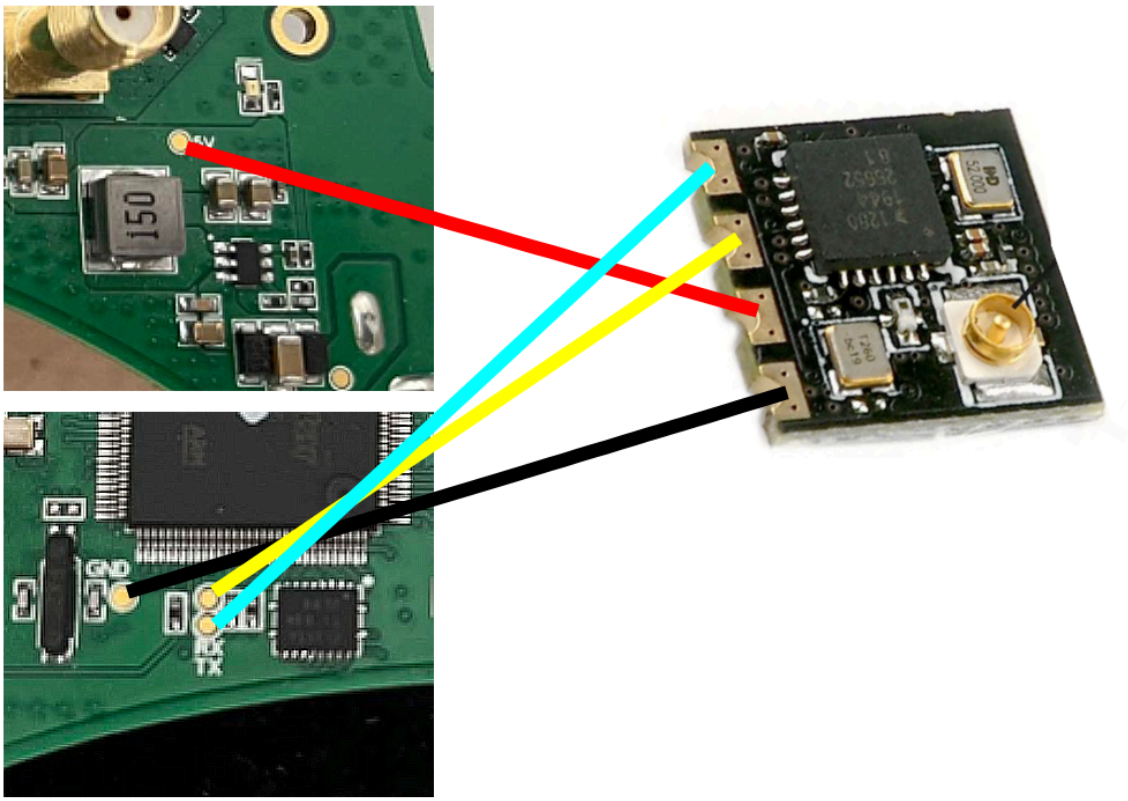
RX5.1





Scout HD





Note that you will need to install the backpack firmware on the receiver, so make sure you can access wifi on the RX for the firmware upload (i.e. by waiting for the RX to fall into wifi update on power up with no TX connected), or alternatively, use an FTDI to install the firmware (described below) before attaching the RX to the VRX.

After installing firmware (described below), and confirming operation, apply some heatshrink on the RX, and tuck it under the rear cover. You ideally want to use some thin heatshrink, as there isn't a lot of room under the rear cover.

Future HDZero VRX's will provide better options for the receiver install.

RC Receiver

If you own a HDZero VTX that supports Smartaudio (i.e. race / race V2, or Freestyle), you will benefit from the full functionality of this integration. With an ELRS receiver connected as per normal to the FC, and a HDZero VTX connected via Smartaudio to a UART on the FC, the VTX can be commanded to switch to the selected band/channel via the ELRS LUA script, so that both the VTX and VRX switch channels in harmony with one button click.

If you are currently using ELRS, then any of your existing receivers will work for this.

HDZero VTX

If you intend to use the channel changing functionality via ELRS, a smartaudio capable VTX is required. ELRS sends the channel change command to Betaflight, which forwards it on to the VTX via smartaudio, so this connection must be set up and working for the VTX to change channel.

Firmware

You will need to be running the 2.3 or later firmware on your:

- ELRS Transmitter Module
- ELRS RC Receiver (recommended, but only applies if you are not already on a 2.x release of ELRS)

You will need to be running the 1.0 or later firmware on your:

- ELRS Transmitter Backpack
- ELRS Backpack receiver

See below for details.

Configurator

You will need to download and install the 1.3.9 or later version of the ELRS Configurator from here:

https://github.com/ExpressLRS/ExpressLRS-Configurator/releases

Transmitter Firmware

Use the “TX Modules” section of the Quick Start guide on the ExpressLRS docs website for info on updating the firmware to 2.3 or later on your TX module:
https://www.expresslrs.org/2.0/quick-start/getting-started/

Transmitter Backpack

Use the Quick Start guide on the ExpressLRS docs website for info on updating the firmware to 2.3 or later on your TX module:
https://www.expresslrs.org/2.0/hardware/backpack/backpack-tx-setup/

If you are flashing the TX Backpack via USB, make sure you also remember to:

1. Ensure the DIP / jumper switches are in the correct position on your TX module before flashing the backpack chip.
2. Configure your binding phrase (or leave deselected if you wish to use the 3x power-cycle method to bind) ,
3. **NOTE**: When flashing the TX backpack via USB, you need to press and hold the boot button for the backpack chip, as you power up the TX module. On some Happymodel TX’s for example, this is labeled as 82GO. See the “Button Dance” note on the page linked above.
4. Ensure that after flashing the backpack, the DIP / jumper switches are moved back to the correct position (labeled “Normal Operation”) to allow comms between the main MCU and the backpack chip.

RC Receiver (i.e. receiver on the craft)

Use the “Receivers” section of the Quick Start guide on the ExpressLRS docs website for info on updating the firmware to 2.3 or later on your TX module: https://www.expresslrs.org/2.0/quick-start/getting-started/

Backpack Receiver (i.e. receiver in the VRX)

Flashing via WiFi (ESP-based ExpressLRS Receivers)¶

Power up your selected VRX Backpack device (connect 5v and gnd pads to any 5v power source). Let it go into WiFi Update mode (fast blinking LED), connect to the access point, and load up the WiFi Update page. The URL should be http://10.0.0.1/ (if you connected via Access Point) or http://elrs_rx.local/ (if your device has connected to your local WiFi network).

Use the ExpressLRS Configurator to create your binaries for you:

1. Open the ExpressLRS Configurator
2. Select “Backpack” from the menu on the left
3. Select “OFFICIAL RELEASES” from the top tabs
4. Select “1.0” from the “Releases” dropdown
5. Select “VRX” from the “Device category” dropdown
6. Select “HDZero RX5.1 VRX Backpack”
7. Configure your binding phrase (or leave deselected if you wish to use the 3x power-cycle method to bind), as well as Home Network SSID and Password (Optional)
8. Click the “BUILD” button, and wait for the build to finish
9. For wifi flashing (recommended):
    a. Open the web update page for the RX
    b. Upload the binary you built in step 8 using the Web Update page (either firmware.bin or HDZero_RX5.1_ESP8285_Backpack-master.bin can be used). Wait (~30s) until the LED on the VRx device has turned on again.
    c. If you are prompted with a Targets Mismatch dialog, click “Flash anyway”
    d. The Success dialog should appear and your VRX Backpack should now be ready for wiring into your HDZero VRX Module.

Flashing via UART/FTDI¶

Using the ExpressLRS Configurator, select your VRx module type, select the via UART method and set your binding phrase (Optional) and the Home Network SSID and Password (Optional). Click Build and Flash and the compiling and flashing should commence. If done right, the Success bar should appear and your VRx Backpack should now be ready for wiring into your selected VRx Module.

1. Connect your FTDI Rx pin into the Tx pad of your Backpack receiver, and the FTDI Tx pin into the Rx pad of the Backpack receiver; then the 5v and Gnd pads.
2. Boot pad needs to be bridged with the Ground pad on power-on
3. Connect your FTDI, with the connected Backpack receiver, into a free USB port (Backpack receiver's LED should light up SOLID)
4. Open the ExpressLRS Configurator
5. Select "Backpack" from the menu on the left
6. Select "OFFICIAL RELEASES" from the top tabs
7. Select "1.0" from the "Releases" dropdown
8. Select "VRX" from the "Device category" dropdown
9. Select "HDZero RX5.1 VRX Backpack"
10. Configure your binding phrase (or leave deselected if you wish to use the 3x power-cycle method to bind), as well as Home Network SSID and Password (Optional)
11. Select the via UART method
12. Click Build and Flash and the compiling and flashing should commence. If done right, the Success bar should appear and your VRx Backpack should now be ready for wiring into your selected VRx Module.

HDZero Video Receiver (the VRX itself)

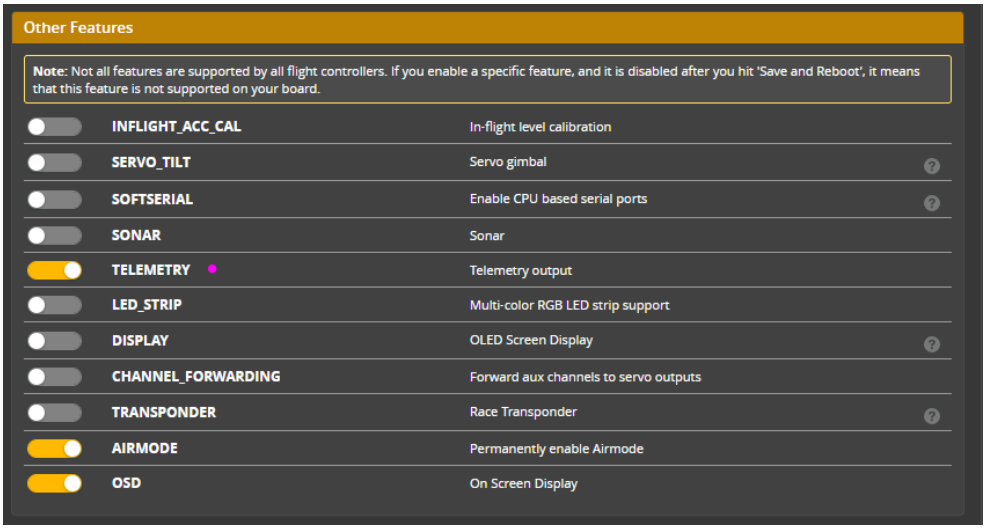
The firmware on your HDZero VRX will need to be updated to the latest version, which can be found here, along with instructions on how to update:

https://www.hd-zero.com/document

Setup & Usage

Betaflight

In order to use the VTX Administrator functionality, Telemetry must be enabled in Betaflight:



If you are using a S.A enabled VTX, the port for smartaudio must be configured, and a VTX table that suits your VTX must be populated. Refer to the HDZero VTX manual for instructions on how to use S.A on a VTX:
https://www.hd-zero.com/document

Binding

If you entered your binding phrase when flashing the TX and RX backpacks, they will be automagically bound. Nothing more to do here.

If you chose not to use a binding phrase when flashing (you really should), you can bind the VRX backpack to the TX backpack using the 3x power cycle method. For instructions, see:
https://www.expresslrs.org/2.0/hardware/backpack/esp-backpack/#binding

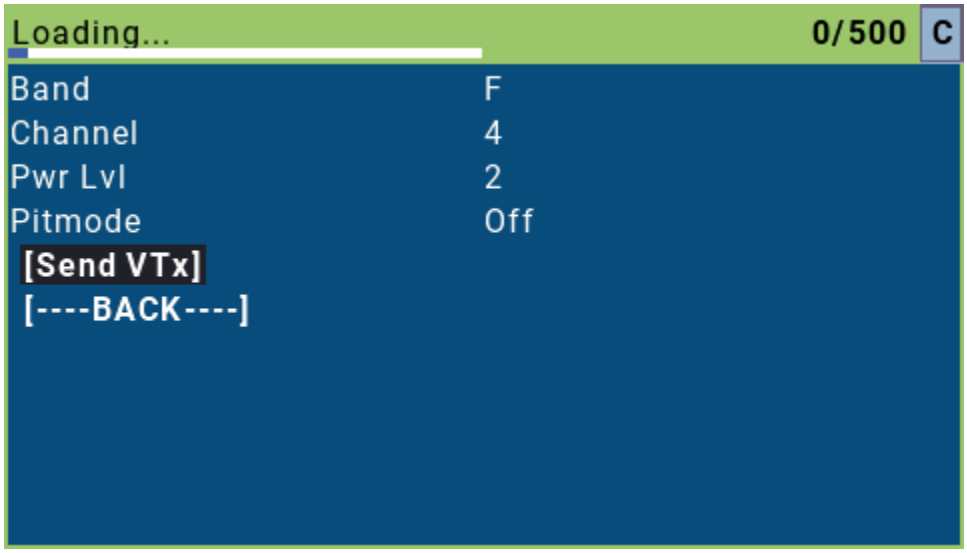
VRX Setup

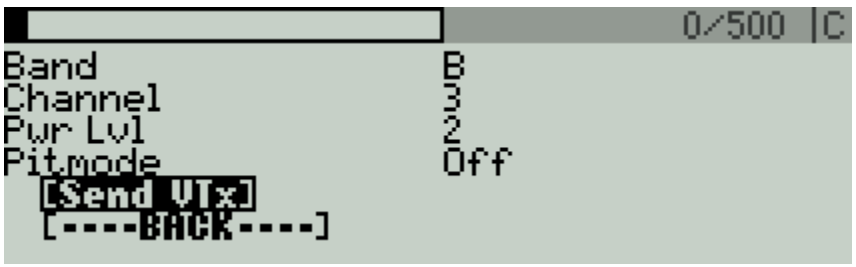
There are no specific settings that need to be enabled on the VRX to get this integration working, however there are some which need to be disabled, depending on which features you'd like to use.
Channel changes from ELRS will be ignored by the VRX if it is in any of the menu screens (main menu, scan menu, etc.). It is advisable to turn off "Auto Scan", so that if the backpack attempts to change channel on boot, the change is successful, rather than being ignored when the VRX boots into the scan menu.

If you plan to use the DVR start/stop recording control, the "Record Mode" should be set to "Manual'.

Controlling band / channel from the ELRS LUA

1. Power on your:
    a. VRX + goggles,
    b. Handset + transmitter module
    c. Quad / craft, if using a S.A enabled VTX
2. On your handset, navigate the ELRS LUA script, scroll down to the "VRX Administrator" folder, and press enter. The LUA should now be showing the VTX Administrator screen:



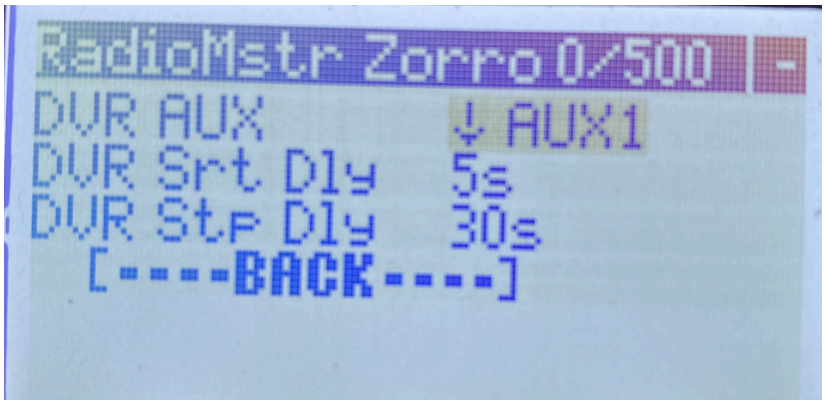


3. Select either R-band or F-band
4. Select channel 1-8
5. Leave power level at “-” and pitmode off
6. Scroll to [Send VTx] and click Enter
7. If everything is working:
    a. the S.A-enabled VTX should jump to the selected channel
    b. the VRX should jump to the selected channel

Note: You can also use the LUA script to set a channel and hit [Send VTx] while the craft and goggles are powered off, and then with the handset powered up, turn on the goggles + quad, and they should jump to the selected channel as soon as the RC link is established.

DVR recording start/stop control

1. On your handset, navigate the ELRS LUA script, scroll down to the “Backpack” folder, and press enter. The LUA should now be showing the Backpack screen:



2. Select the AUX channel (where AUX channels start from CH5 onwards) that you want to use to control the DVR start/stop. Select “AUXn” for non-inverted channels, where a channel value of +100 starts recording, and -100 stops recording. For inverted switch logic, select the “!AUXn” option, where a channel value of -100 starts recording, and +100 stops recording.
3. The “DVR Srt Dly” will add a delay to the command to start recording.
4. The “DVR Stp Dly” will add a delay to the command to stop recording. This is particularly useful to capture any post-race banter (even better with pitmic).
5. Set the HDZero VRX to use manual DVR recording control, and ensure a SD card is inserted on the VRX
6. Power up a VTX, so that the VRX is receiving a video feed, and then toggle the AUX channel you selected in step 2, and check that DVR recording starts, stops as expected.