HDZero Goggle User Manual

Revision	Date	Description
1.0	Nov 24, 2022	Initial draft
1.1	Jan 6, 2023	Added notes for 18650 battery cases and 6S power in
1.2	Jan 13,2023	Added firmware update note for MacOS Added notes for expansion module installation
1.3	Mar 25,2023	Added notes for DVR, WIFI and firmware update steps
1.4	April 3, 2023	Added notes for RTC and no dial for tuning channel
1.5	April 29, 2023	Added module bay power instructions
1.6	June 16, 2023	Modified instruction for WIFI streaming and RTC by SX
1.7	Dec 12, 2023	Added low band setting description
1.8	May 7, 2024	Named the firmware package as yyyymmdd
1.9	Jun 27, 2024	Moved the emergency firmware to the recovery folder
2.0	July 15 2025	Added ELRS backpack and Goggle 2
2.1	Aug 16 2025	Added OLED display disclaimer

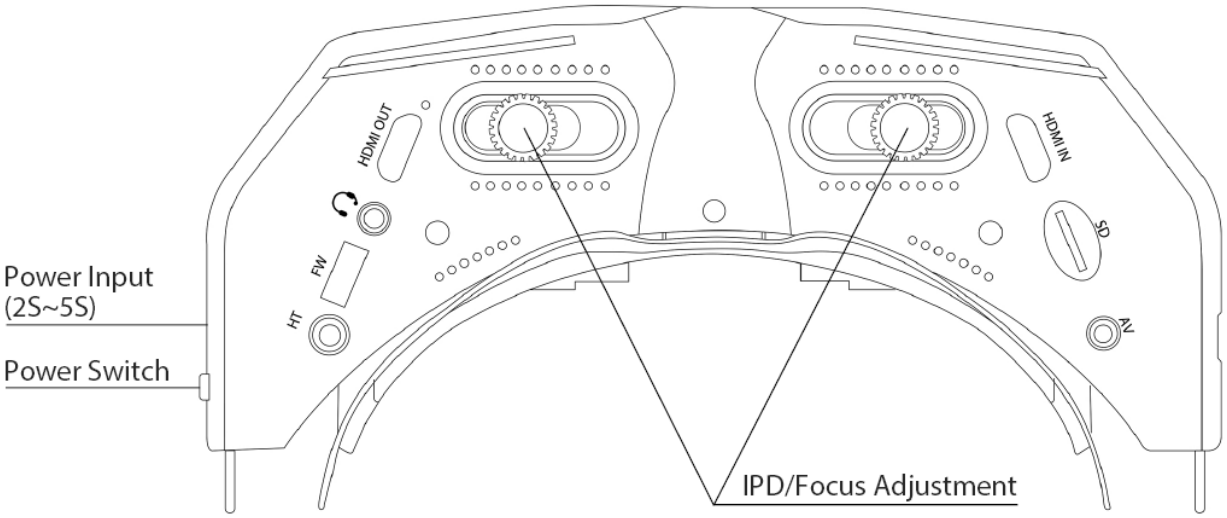
For more product information, please visit:
www.hd-zero.com

Table of Contents

Introduction

The HDZero Goggle is an all-in-one FPV goggle for digital, analog and HDMI video. Please take the time to read through this operating manual thoroughly before using.

Diagram



Features

- Power on/off sliding switch – be confident that the goggle is on or off at a glance or by feel
- Designed for open source, the new goggle runs Linux. All code for the user interface is new and open source
- Support diopter lens inserts
- 90Hz 1080p OLED screens with sliding IPD adjustment and dials for focus adjustment
- By integrating the entire goggle display pipeline with HDZero's fixed-latency video transmission, these goggles achieve 3ms glass-to-glass sub-frame latency with no jitter or dropped frames
- Mounting rails for patch antennas or whatever else you might want to mount
- Recessed front SMA jacks so no need to remove antennas when packing the goggle away
- Three independently addressable fans work in combination to cool the internals and prevent fogging. They are soft mounted to prevent screen vibration and noise
- HDMI input and HDMI output
- Built-in microphone for DVR
- 3.5mm combination headphone / microphone jack for audio and external mic
- 3.5mm analog video/audio input for use with ground station inputs

- Integrated 2D deinterlacer that adds no delay for analog input
- Built-in ESP32
- Built-in H.265 DVR
- 6-axis smart inertial measurement for head tracking pan+tilt support
- Add-on side-mounted analog module bay that accepts most of today's analog modules
- Add-on 2.4Ghz WiFi video streaming module for live streaming

Added features for the Goggle 2

- Fully enclosed optical module to keep dust out
- Significantly sharper edges for enhanced optical display clarity (<1.5% distortion)
- Greatly enhanced analog reception performance, ensuring improved handling of weak signals
- Available in two shell colors—White and Red—to suit individual preferences
- Built-in analog receiver
- Built-in 2.4Ghz WiFi video streaming module for live streaming

Specification

- HDZero Camera glass-to-goggle glass latency: <3ms
- Adjust IPD range: 57-70mm for Goggle 1, 58-72mm for Goggle 2
- Adjustable focus range: +2 to -6 diopter for Goggle 1, +4 to -7 for Goggle 2
- Full HD 1920x1080p 90fps OLED micro display
- FOV: 46deg
- Input voltage: 7V-25.2V (2S-6S)
- Power consumption: 14.5W (with HDZero RF on), or 8.4W (with AV In)
- Weight: 294g for Goggle 1, 305g for Goggle 2
- Dimension: 185x81x66mm

Included Accessories

- 1x HDZero goggle
- 1x wide face plate
- 1x narrow face plate
- 1x foam padding
- 1x goggle strap
- 1x 1200mm XT60 cable
- 1x 150mm HDZero VTX programing cable
- 1x Lens cloth
- 1x Thick Canvas Goggle Bag for Goggle 1, or
- 1x Hardcase for Goggle 2

Setup

The HDZero goggle has many features that can be customized to the individual pilot.

Power Switch

There is a sliding power switch on the right side of the goggles. You may use it to turn on/off the goggle, or just leave it on and plug/unplug the DC barrel plug to turn the goggle on and off.

In order to prevent voltage spikes entering the goggle, it is mandatory to plug in a 6S (max 4.2V /cell) battery only if the power switch is off.

Power Input/Consumption

The goggle supports 7-25.2V power input [1]. Please make sure the power polarity is correct [2] (Center pin positive) before powering on the goggle.

TABLE 1. Power Consumption

	Mode	Power Consumption
1	HDZero Digital	1.2A@12V
2	Expansion module+ IRC RapidFire[3]	0.9A@12V
3	AV In	0.7A@12V
4	HDMI in	0.7A@12V

Notes:

1. DO NOT use a 6S or above HV lipo to power on the goggle, it will permanently damage the goggle.
2. 18650 battery cases can kill your goggle (blow the fuse). Always install batteries in correct polarity, check with case's battery checker beforehand, if the checker lights don't turn on, the batteries are installed backwards and the goggle's fuse will blow to protect the goggle. This can be repaired by replacing the fuse inside the goggles, but at owner's own cost.
3. RapidFire is a product of ImmersionRC limited. It is not included.

XT60 Cable

The goggle includes a 1200mm XT60 cable for connecting a battery in your pocket. You may also purchase a shorter 90mm cable on HDZero shop if you wish to locate your battery on the goggle head strap.
The XT60 cable (either 1200mm or 90mm) has no voltage regulator. The cable passes voltage directly through the goggle.

Notes:

1. Do not connect an over 6S battery to the goggle, as the maximum voltage rating of the goggle is 6S (4.2V/cell).

2. Some types of XT60 cable, i.e., HDZero VRX cable, has integrated DC regulators. Make sure that cable is able to output enough current as indicate at Table 1. The goggle won't boot or keep rebooting if there if that happens.

Face Plate/Padding Foam

The goggle includes both a wide face plate and a narrow one. You may choose the appropriate one to fit your face, and use the included 7mm thick foam padding for both comfort and preventing light leakage.

Optical Adjustment

After goggle is powered on, you will see an image on the OLED displays. Complete the following steps to adjust the optics:

1. Focus adjustment: Close one eye and slowly twist the focus knob on that side of the goggle until the image comes into focus. Once it works well with one eye, repeat the process with the other eye.
2. IPD adjustment: Close one eye and slide the knob to center the image. Once the image is centered, repeat the process with the other eye.
3. Fine adjustment: Open both eyes and look at the merged image. Make small adjustments to the focus and IPD for each eye until it feels visually comfortable and merges into a single clear picture.

Note: Do not expose the lens directly to sunlight. Otherwise, the OLED displays might be damaged.

Head Strap

The goggle includes a 50mm (2 inch) wide head strap with battery pocket. Once you have configured the face plate and padding foam for your preferred face fit, put on the head strap and adjust the tightness to your preference.

HDMI input

The HDZero goggle includes a single port HDMI 1.4b receiver through a mini HDMI port. The incoming HDMI video is routed to the OLED display without adding any frame buffer latency.

Please note that most HDMI connectivity issues are due to either incorrect monitor settings or a faulty HDMI cable. If you encounter issues using the HDMI input, try connecting with alternative HDMI sources and alternative cables to rule out these common causes.

The current firmware supports resolution up to 1080p60 and 720p100 for HDMI input.

HDMI Output

The HDZero goggle includes a high-performance single channel HDMI transmitter that is fully compliant with HDMI 1.3a through a mini HDMI port.
The HDMI output will display exactly the same content as what appears on the OLED displays.

TABLE 2. HDMI Output Format

	Input Source	HDMI Output format
1	HDZero 60fps Camera	1280x720x60fps
2	HDZero 90fps Camera	1280x720x90fps
3	NTSC	1280x720x59.97fps
4	PAL	1280x720x50fps
5	HDMI in	Not supported

AV input

The HDZero goggle supports AV input through a 3.5mm AV jack. The pinout is shown in FIG 1.
The AV input cable is not included. It is available on the HDZero shop and other online stores.

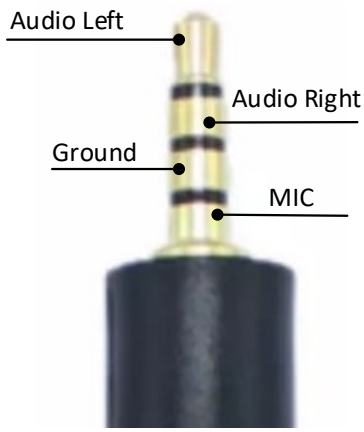


FIG 1. AV input Jack

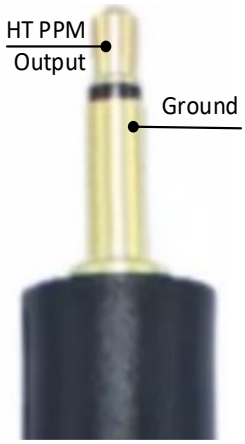


FIG 2. HT output Jack

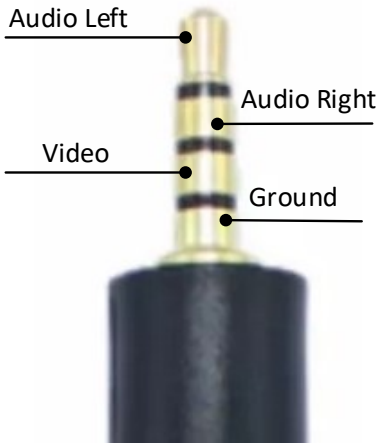


FIG 3. Line In/Out Jack

Expansion Module Bay

The HDZero goggle has an expansion module bay for installing expansion module that supports analog receiver and/or WIFI modules.

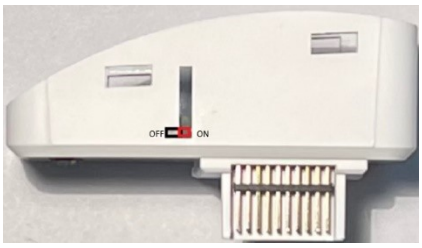
Notes:

1. HDZero goggle provides 5V power to analog receiver and in-takes its CVBS output. There are no control signals from the goggle to analog receiver. You need to tune analog receiver's channel and menu setting by its own buttons and display.
2. There are two-row pins on the connector of expansion module, and a two-row socket on goggle. Make sure these 2-row pins are well seated into the 2-row socket. Analog receiver will not be able to power up if 2-row pins is one row down.

Expansion Module

Expansion module V1 supports analog receiver only, and V2 supports both analog and WIFI. Expansion modules are sold separately.

Some of expansion module may have a physical switch to power on or off the inserted analog receiver. The switch does not control the power of WIFI circuit of V2 modules.



Except some early version of Goggle 1, all HDZero Goggle 1 and 2, there is a soft switch available in the goggle menu to turn on the power to module bay. Please note that early expansion modules cannot be controlled by this soft switch.

Notes:

1. The soft switch must be turned on for the module bay to be powered and is off by default.
2. For Goggle 2: Although Expansion module V2 supports both analog and WIFI, its WIFI function is disable when it is insert to a Goggle 2 that has built-in WIFI already.

HT Output

The HDZero goggle has a 6-axis smart inertial measurement unit for head tracking pan+tilt support. The HT output jack pinout is shown in FIG 2.

The HT cable is not included. It is available on the HDZero shop and other online stores.

Audio Line In/Line Out

The HDZero goggle has a CTIA standard 3.5mm Line in/Line out jack for microphone and headphones. The pinout is shown in FIG 3.

Mounting Rails

The HDZero goggle has a unique mounting rail for patch antennas or whatever else you might want to mount.

Here is mount adapter for TrueRC patch antennas by Ryan Quellet, and ball joint rail mount by userzero1.

FW Port

The FW port is used for flashing firmware to HDZero VTXes. A 150mm programming cable is included.
The instruction for flashing VTX firmware is described on HDZero Firmware Update section.

Open Source

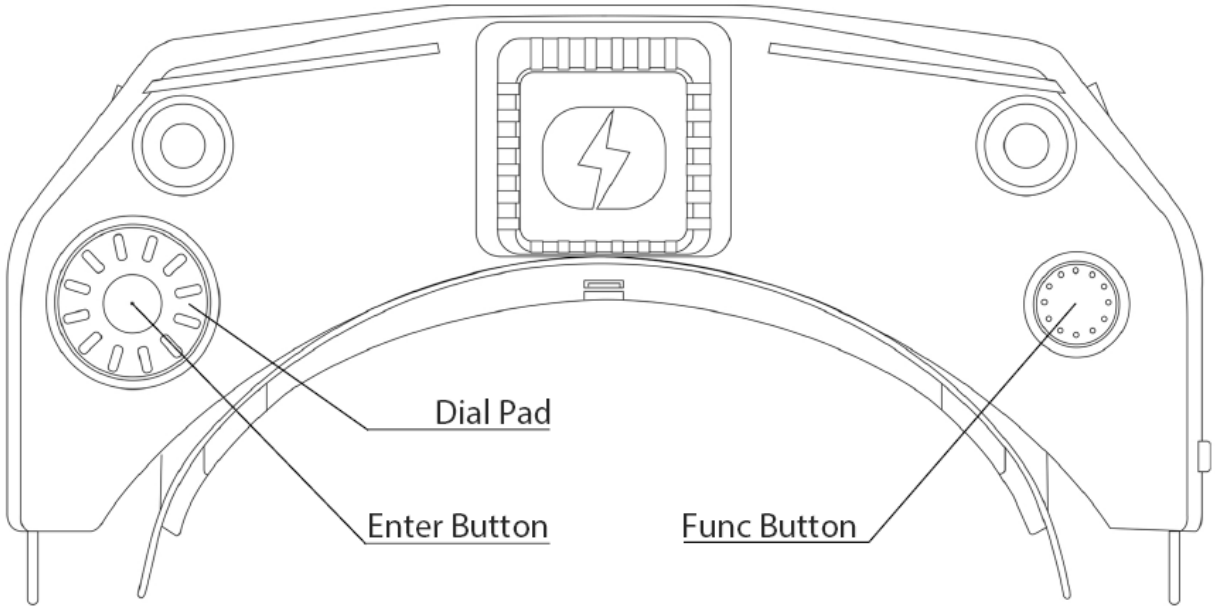
The HDZero Goggle is open source. You can find the SoC Firmware and Goggle CAD files at Github.

HDZero Goggle Operation

This section describes the general operation of the HDZero goggle.

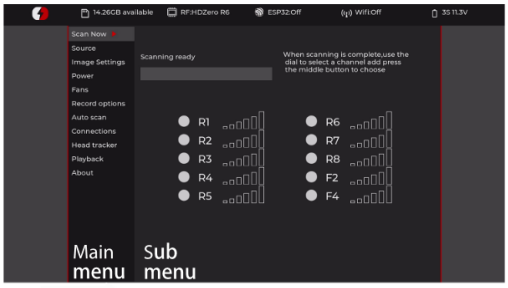
Controls

- Dial Pad
- Enter Button
- Func Button



Video view and Menu view

Press and hold



- Single click: Show/hide goggle OSD
- Dial up/down: Change to desired channel, click to confirm
- Press and hold: Switch between menu view and video view

- Single click: Start/stop DVR
- Press and hold: Change top fan speed

- Single click: Switch to sub menu
- Press and hold: Switch to main menu
- Dial up/down: Navigation

Goggle OSD:

1: Goggle power low voltage alarm
2: Top fan speed
3: Goggle temperature indicator
4: VTX temperature indicator
5: Recording state
6: Video Link Quality indicator
7: Left Top antenna signal strength
8: Left Side antenna signal strength
9: Right Side antenna signal strength
10: Right Top antenna signal strength

Video Source

The HDZero goggle can display video from any of 4 sources:

- Built-in HDZero digital receiver
- Built-in Analog receiver (appliable to Goggle 2 only)
- AV in
- Expansion Module in (such as with an analog video receiver)
- HDMI in

HDZero Digital Receiver

The “Scan Now” option on the main menu will scan the following channels for an HDZero video signal:

- R1-R8, E1, F1, F2, and F4 channels, or
- L1-L8 if low band is selected

“Scan Now” will perform the following:

- Scan the above channels,
- Lock on to the channel if there is only one valid channel with a signal, or
- Let you choose between the channels if it has found two or more channels, or
- Continue to scan after 5 seconds if no signal is detected, or
- Wait for a long press of the Enter button to exit to the main menu

Notes:

1. To enable low band, (1)VTX side: Set to Lowband at VTX menu, (2) Goggle side: set Source -> HDZero Band to **Lowband**. Here are the center frequencies for L1-L8.

Low Band Channel	L1	L2	L3	L4	L5	L6	L7	L8
Frequency (MHz)	5362	5399	5436	5473	5510	5547	5584	5621

2. Only Nano 90 camera supports 540p60 mode. When it is set to 540p60, the goggle needs to set Source > HDZero BW to **Narrow**. All other modes need to set Source > HDZero BW to **Wide**.

Analog Input

The HDZero goggle takes analog video input from (1) the AV input jack or, (2) the external Expansion Module (not included, available on the HDZero Shop) or, (3) built-in analog receiver for Goggle 2. The goggle processes analog video from either of these inputs in the same way, but the Expansion Module provides an easy plug-and-play experience if you are using a standard FPV analog module. There is a soft switch available in the goggle menu to turn on the power to the module bay. **This must be turned on for the module bay to be powered and is off by default.**

The HDZero goggle uses a novel approach to process the analog input, resulting in improved analog video quality:

- It uses a video decoder with an adaptive comb filter to separate Y/C from the composite video;
- It uses a deinterlacer to convert fields to frames, instead of doubling the interlaced lines;
- It uses an upscaler to record and display the video;

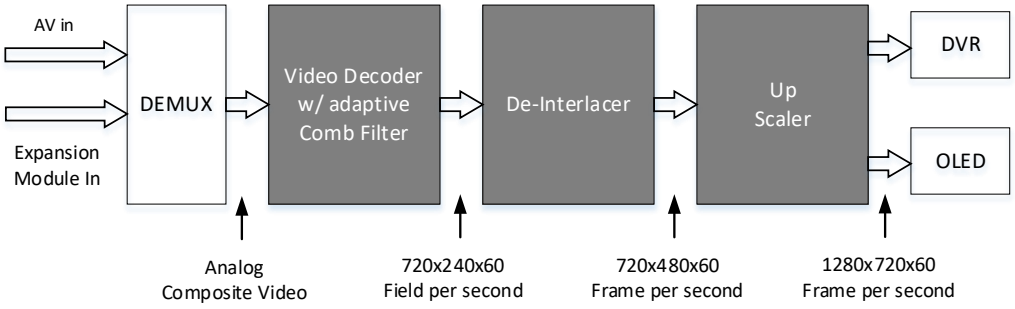


FIG 4. Signal Processing Path for Analog Input of Goggle 1

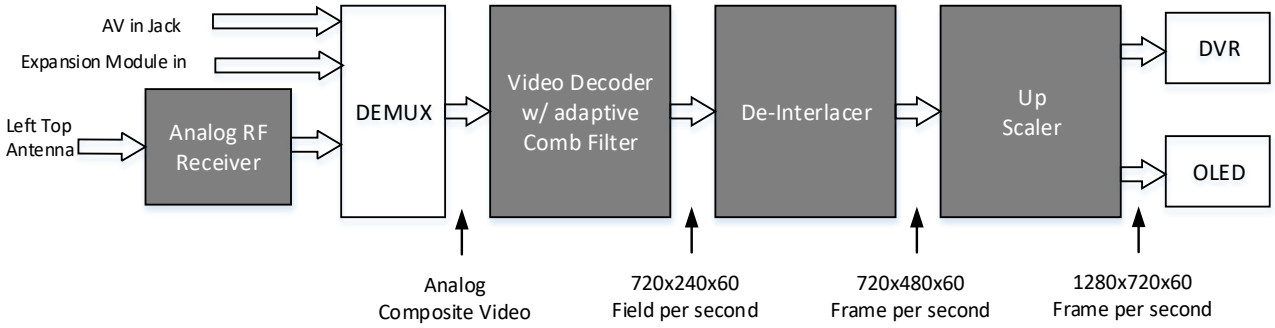


FIG 5. Signal Processing Path for Analog Input of Goggle 2

Fan Management

There is one fan on the top of the goggle and one fan on each side of the goggle. All fans are soft mounted to reduce vibration and noise. There are three temperature sensors on top and sides of the goggle.

These fans are critical to goggle performance:

- The top fan provides cooling for the OLED displays and defogging for the optical lens;
- The side fans provide cooling for the IO and RF boards inside the goggle

They will prevent goggle from being too hot, improving OLED life span and ensuring maximum HDZero RF performance.

Top fan can be set to a 1-5, and side fans for 2-9 level, corresponding from minimum to max speed.

There are two control modes for side fans:

- Automatic mode: Goggle firmware will automatically speed up/down the fan on each side;
- Manual mode: You can manually set the speed for each fan;
- Regardless of the current mode, the goggle firmware will enter into **rescue** mode under these situations:
    - temperature sensor on top reports hot: top fan goes to max speed;
    - temperature sensor on left/right reports hot: left/right fan goes to max speed;

You can change the *top* fan speed by pressing and holding the Func Button. You can monitor the *top* fan speed changes on the goggle OSD to quickly change the amount of air blowing onto your face and the optic lenses while in the Video view.

Notes:

1. Only the side fans have automatic mode. The top fan is always in manual mode unless it is in rescue mode.
2. It is recommended to use automatic mode for side fans, and set top fan speed as desired level.

Image Settings

The HDZero goggle has an image processor to fine tune video before feeding to DVR and display. It includes:

- Brightness
- Saturation
- Contrast

OLED Control

For OLED display, you may set OLED brightness to the desired level. Note that the OLED brightness setting applies to the OLED display only.

If the HDZero goggle detects no movement or no key input for programmed time (1/3/5/7 minutes), it will dim the OLED display as an alarm, and it will wait for another one minute before turning off both the display and HDZero digital receiver with a short beep. The OLED display and HDZero receiver will resume normal operation if the goggle detects movement or any key input. This feature can be disabled by setting the waiting time to “Never”.

OLED displays can provide more vivid colors than traditional LCD panels, However, if they are displaying the same content for an extended period of time, it may come across issues like "Image retention" or "Image burn-in". It is highly recommended to use the above OLED auto off feature or “Go Sleep” from main menu to turn off OLED while not using the goggle.

DVR

The HDZero goggles integrates a DVR for both the HDZero digital receiver and analog input. These are the DVR options:

- **Automatic Record**: DVR will start to record when it detects there is valid HDZero RF on the current channel, and stops recording when the signal is no longer detected.
- **Manual Record**: DVR will start/stop only if Func button is clicked.
- **MP4 format or TS format**: MP4 format is better supported by many video editing applications. However, MP4 files can be corrupted if the goggle loses power before the file is closed after recording, which can happen if the goggle runs out of battery or the power cord is unplugged unexpectedly. Unlike the MP4 format, the TS format saves the stream instantly to DVR without any risk of corrupted files, even if the goggle suddenly loses power. TS format is preferred.
- **H264/H265**. The DVR must use the H264 format when recording 90fps video (it records in 1280x720x90 for better quality). It uses the H265 format in all other cases.
- **Audio**: You can choose to record audio or not. There are 3 audio sources that can be recorded:
    - Built-in microphone
    - Line in (From Line in/out port, usually from an external MIC)
    - AV in (From AV in Jack or built-in analog receiver audio output)

The file system on SD card can be corrupted by suddenly power off while goggle is writing data to it.

HDZero Goggle operates on a Linux-based system, and it is unable to store final emergency data when powered off abruptly. This can result in corrupted SD card file systems and video files that won't play. Here are tips on how to avoid powering off while recording is ongoing:

- Auto record mode: after quad is landed, do one of the following
    - Long press "Enter" button to switch to menu mode, then power off the goggle, or
    - Power off quad first, and wait for 10 seconds, then power off the goggle
- Manual record mode: Click "Func" button to stop DVR before power off the goggle
- Select "Scan and Fix" if Windows or Mac reports problem when SD card is inserted.

Note: It is convenient to start/stop DVR with ELRS backpack function. See ESP32/Backpack Module.

TABLE 3: DVR resolution

	Input Source	Recording resolution	Encoder
1	HDZero 60fps Camera	1280x720x60fps	H.265
2	HDZero 90fps Camera	1280x720x90fps	H.264
3	NTSC	1280x720x59.97fps	H.265
4	PAL	1280x720x50fps	H.265
5	HDMI in	The same as input resolution and frame rate	H.264

Playback

The HDZero goggle can play back DVR recordings.

- The player lists the recent recording first. Use Dial up/down to select a file, and click to play it
- On controller bar, use Dial Up/Down to seek video (5 seconds forward/backward), and click to play/pause
- Long press the Enter button to exit the controller bar, and long press Enter again to exit the player.

Notes:

1. The player will ignore files that are less than 5MB.
2. The playback feature is designed for quick review—whether checking a recording or locating the final moments of a lost drone. Please note that it does not play back at full frame rate.

OSD

The goggle supports OSD from flight controller (FC OSD) and OSD of its own status (Goggle OSD). You may select if both OSD should be recorded with video stream at Record Options sub-menu.

Goggle OSD can be shown/ hidden by clicking the Enter button under Video view. The positions of Goggle OSD items are fixed on current firmware.

The goggle has built-in OSD fonts for BetaFlight, Arduino and iNav. It will automatically load the corresponding font according to type of flight controller that is connected with HDZero video transmitter. You can also customize FC OSD by putting bitmap files under SD card root directory/resource/OSD/FC.

Tune Channel

By Dialing up/down, video channel number can be tuned on video mode for HDZero receiver, or built-in analog receiver on Goggle 2. However, this can be disabled by putting a file named as “no_dial.txt” on SD card root directory when booting up.

The video channel number can also be tuned by ELRS backpack as described below.

ESP32/Backpack Module

The HDZero Goggle supports a built-in ESP32 Backpack that achieves:

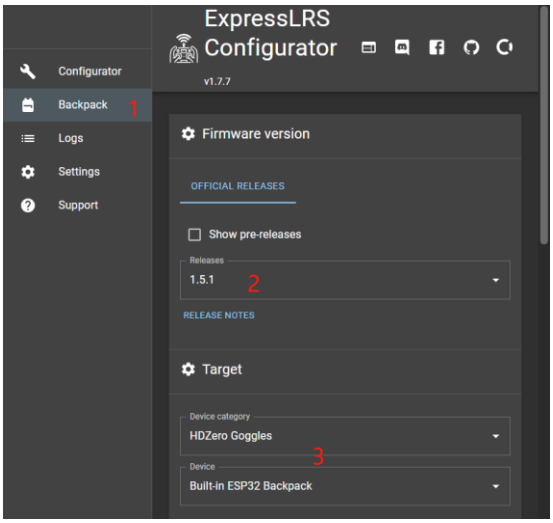
- Tune channel number of built-in HDZero
- Tune channel number of built-in Analog receiver for Goggle 2
- Wireless head tracking
- Start/Stop DVR using a radio switch

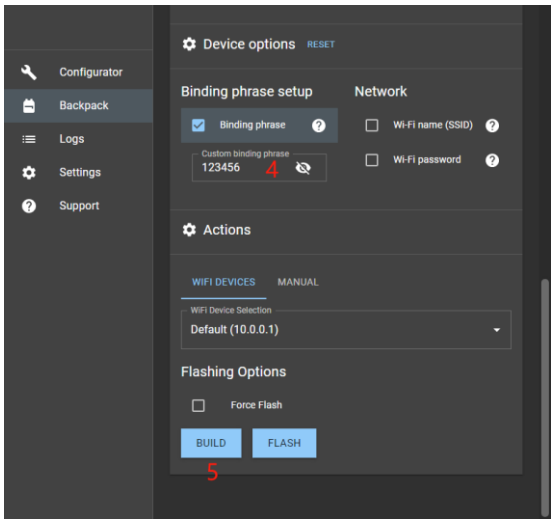
Update ELRS backpack firmware

- Install **ExpressLRS Configurator** from Releases · ExpressLRS/ExpressLRS-Configurator
- Open **ExpressLRS Configurator** to build firmware for goggle:

1 Switch to Backpack menu
2 Select the same release version with the radio backpack
3 Select target HDZero Goggles -> Built-in ESP32 Backpack
4 Set the same binding phrase as the radio backpack, otherwise your backpack needs to be bonded manually
5 Click “BUILD”. A folder will pop up automatically containing the following 4 files when completed. Copy them to “ELRS” directory under SD card root
    i. boot_app0.bin
    ii. bootloader.bin
    iii. firmware.bin
    iv. partitions.bin

- Insert SD card to HDZero Goggle
- Goggle main Menu: Firmware -> Update ESP32 to flash Backpack firmware for the Goggle





Bind HDZero Goggle and ELRS TX

Please flash your ELRS Transmitter backpack firmware of Radio to the same version as HDZero Goggle Backpack firmware. Refer to [Tx Backpack Setup - ExpressLRS].

If the binding phrase of goggle is different with Radio, it is needed to bind manually for first use.

1. Goggle: ELRS -> Backpack = on
2. Goggle: ELRS -> Bind
3. Radio: ExpressLRS Lua -> Bind

After a few seconds, the goggle will display success if the binding is complete.

Start/Stop DVR Using a Switch

The HDZero goggle supports start/stop recording using a switch on radio. Here are steps to setup on Goggle and Radio:

1. Goggle: Record Option -> Record Mode = Manual

2. Radio ExpressLRS Lua -> Backpack -> DVR Rec = AUX*n*↑ | AUX*n*↓, where *n* is aux channel number of the switch which is specified to start/stop Goggle DVR.

Set Channel Number Using Radio

The HDZero goggle supports set channel number using ExpressLRS Lua on radio. Here are steps to setup on Radio:

1. Enter Radio ExpressLRS Lua -> VTX Admin
2. Set Band and Channel you want to
3. Send VTx

Note: Channel number of both HDZero receiver and built-in Analog Receiver can be set by the method.

WiFi Module

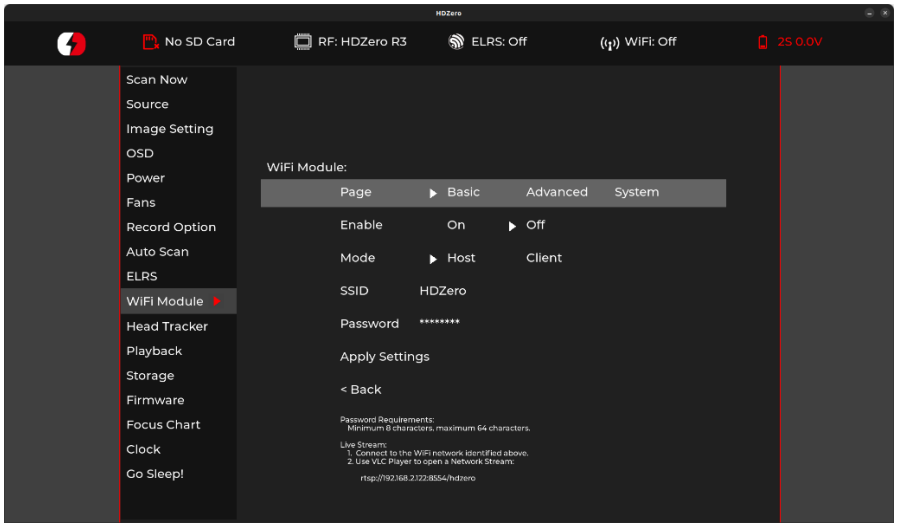
The HDZero Goggle 1 expansion module V2 and Goggle 2 supports WIFI video streaming to smart phone, desktop or laptop. Multiple devices can wirelessly connect to the goggle and receive the video simultaneously.

Control over the behavior of the WiFi module is completely managed from within the WiFi Module page. Users have the ability to configure the goggle as a Host (Access Point) or a Client (Join Network).

WiFi Module page supports both “Basic” and “Advanced” configuration fields.

Basic Fields

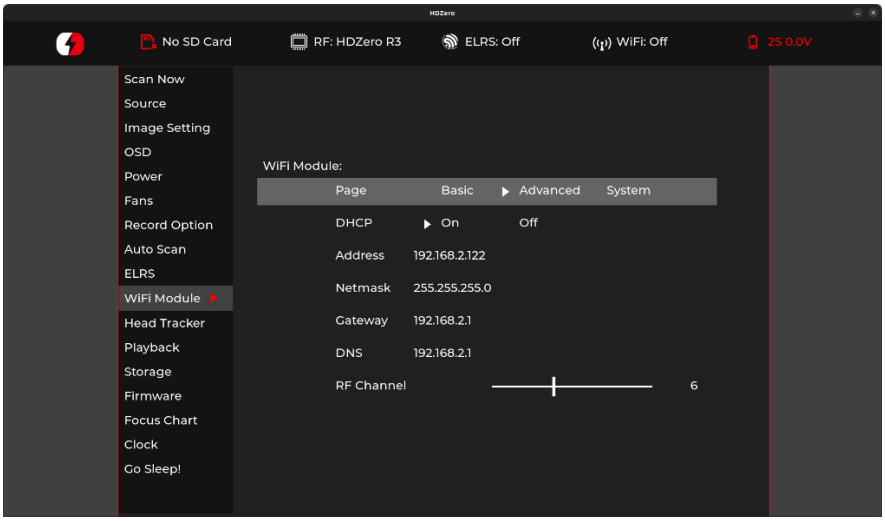
- Enable – Powers On or Off the WiFi Module hardware.
- Mode – Host (Access Point) or Client (Join Network).
- SSID – User can specify a Host and Client network names individually based on Mode.
- Password – User can specify a Host and Client network password individually based on Mode.
  - Note that password requires a minimum of 8 characters.
- Apply Settings – Stores and configures the WiFi Module hardware with the settings the user has modified.



Advanced Fields

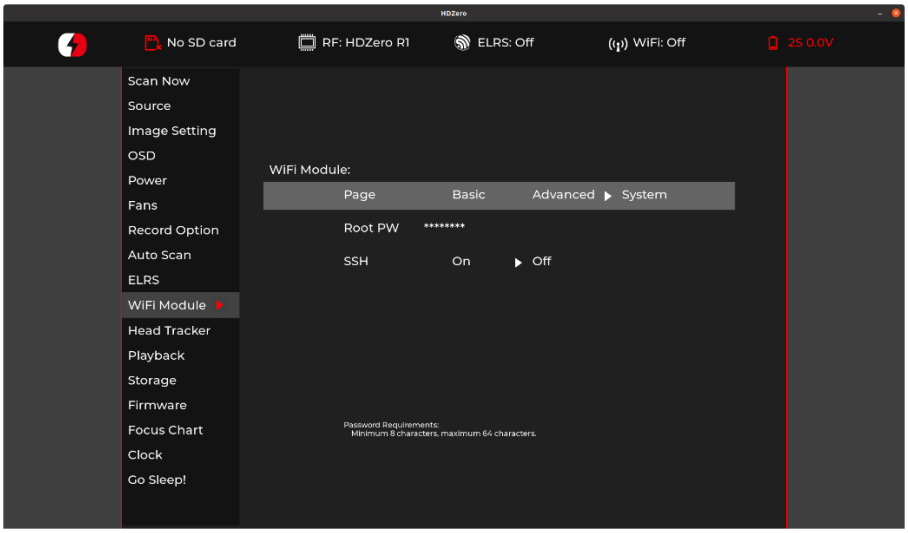
- DHCP – This setting only applies to Client Mode.
  - Note the Address specified will be requested for use by the WiFi. Ultimately it is up to the router to find and available address if the address requested is not in use, then the one specified will be used.
- Address – The network ip address.
  - This setting applies for both Host and Client modes.
- Netmask – The network subnet mask.
  - This setting applies for both Host and Client modes.
- Gateway – The network gateway ip address.
  - This setting applies for both Host and Client modes.
- DNS – the Domain Network Service ip address.

- RF Channel – This setting only applies to Host Mode and a user can specify which radio frequency channel they want to communicate on.



System Fields

- Root PW – Update the root password for the goggles.
  - This applies to SSH and SCP communications.
- SSH – Enable/Disable Access to the goggles.
  - Defaults to disabled as a security precaution.



Finally, if either page is modified “Basic” or “Advanced”, the user must return back to the “Basic” page and select “Apply Settings” in order to configure the WiFi Module.

In order to establish a wireless video stream with the HDZero Goggles via a smartphone or computer, the user must follow these steps:

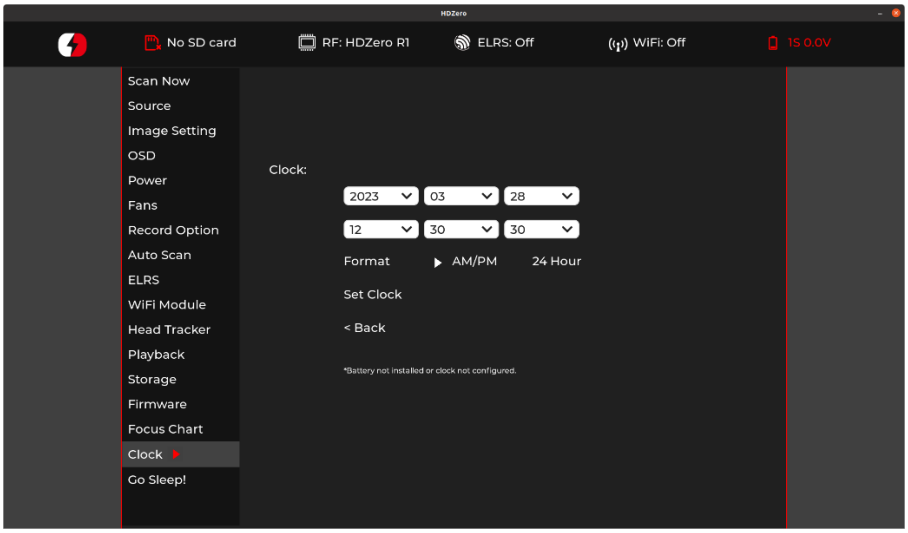
1. The “Basic” page within the WiFi Module page will contain the necessary information in order to establish communications with the HDZero Goggles:
    a. Host Mode – Refer to the SSID and Password fields in order to join the HDZero Goggle wireless network.
    b. Client Mode – Refer to your wireless access point user manual.
2. Install VLC app (or other similar app that supports RTSP) on your device.
3. Open the above app, choose “Open Network Stream”, and type the RTSP URL provided by the “Basic” page footnote as it will provided the necessary URL in order to establish a video stream via VLC app, below is the default ip address if the user has not made modifications within the “Advanced” page:

    `rtsp://192.168.2.122:8554/hdzero`

Video latency is expected due to networking protocols, buffering schema of the app, and OS platforms.

Real Time Clock

The HDZero Goggle includes a Real Time Clock (RTC). Goggle 1 is shipped without a pre-installed battery, whereas Goggle 2 comes equipped with one. If the battery is missing or depleted, the device will lose its stored date and time information. However, the RTC can still be configured via the Clock Page which will set the system clock and hardware clock upon invoking “Set Clock”. For users who have installed an aftermarket battery this only needs to be done once. Otherwise, when the goggle boots up it will revert to the last date and time the user had specified since applying “Set Clock” command.



An aftermarket battery could be CR2032 laptop battery with MX1.25-2P male connector. An example can be found here.

Note: It is user’s full responsibility for any damage due to opening the goggle to install the battery.

HDZero Firmware Update

Download the latest Goggle firmware from HDZero download.

TABLE 4. Goggle Firmware File

	Downloaded Firmware (.Zip file)	Zip File Content	Purpose
HDZero Goggle 1	HDZEROGOGGLE_Revyyyymmdd.zip	HDZERO_GOGGLE_nnn.bin	To flash firmware from Goggle main menu
		Recovery/HDZG_OS.bin Recovery/HDZG_BOOT.bin Recovery/HDZGOGGLE_RX.bin Recovery/HDZGOGGLE_VA.bin	For emergency recovery
HDZero Goggle 2	HDZEROGOGGLE2_Revyyyymmdd.zip	HDZERO_GOGGLE2_nnn.bin	To flash firmware from Goggle main menu
		Recovery/HDZG_OS.bin Recovery/HDZGOGGLE_RX.bin Recovery/HDZGOGGLE_VA.bin	For emergency recovery

Flashing Firmware to a HDZero VTX

The HDZero goggle can flash firmware to a HDZero video transmitter via its FW port. Here are the steps:

To flash a single VTX:

1. Copy HDZERO_TX.bin to root directory of a SD card that is formatted as FAT32
2. Power on the goggle
3. Connect the VTX and HDZero goggle with the included programming cable
4. Go to Main menu | Firmware |Update VTX, the display will show the status of the flashing process
5. Disconnect the VTX
6. This VTX is now flashed with the latest firmware

To flash multiple VTXes of the same type:

1. Copy HDZERO_TX.bin to root directory of a SD card that is formatted as FAT32
2. Power on the goggle
3. Connect one VTX to the HDZero goggle with the included programming cable
4. Go to Main menu | Firmware | Update VTX, the display will show the status,
5. Disconnect the VTX, this VTX is flashed
6. Repeat 3-5 for the other VTXes

Note:

Flashing VTX firmware with Goggle is highly ***not*** recommended for Goggle safety consideration. HDZero Programming Cable is preferred for its convenience and safety. However, a Windows system is needed to run the HDZero Programmer app, Mac is not supported for now.

Flashing Firmware to the Goggle

The HDZero Goggle runs on Linux. Its firmware contains the customized Linux distribution and its application software. We only need to update the application instead of updating the whole OS and application in most cases. However, there are some rare cases where the OS could become corrupted, such as losing power during update process. It is also possible that changes may have to be made to the OS in the future to add new functionality.

Before you start to update firmware, go to Main menu|Firmware|Current version. It should be in the following format:

- ***n***.xx.yyy, or
- app:***n***-xx rx yy va zzz

If ***n*** is greater or equal than 9, take Normal Goggle Firmware Update Process, otherwise take A Special One Time Goggle Firmware Update Process.

Normal Goggle Firmware Update Process (for *n*≥ 9)

1. Disconnect all cables from the goggle. Keep the power cable only;
2. Prepare the firmware file:
   - For Goggle 1: HDZERO_GOGGLE_nnn.bin
   - For Goggle 2: HDZERO_GOGGLE2_nnn.bin

   Copy it to root directory of SD card that is formatted as FAT32, and make sure there is no previous firmware in the root directory;
3. Power on the goggle;
4. Go to Main menu | Firmware | Update Goggle, the display will show the current version;
5. Wait for the completion (about 3 minutes), then power off;
6. Done!

A Special One Time Goggle Firmware Update Process (for *n* < 9)

1. Disconnect all cables from the goggle. Keep the power cable only;
2. Extract HDZERO_GOGGLE- *nnn*.bin/HDZG_BOOT.bin/HDZG_OS.bin, and copy them to root directory of a FAT32 formatted SD card;
3. Insert SD card, Select Main menu | Firmware | Update Goggle. Power off after completion;
4. Power on goggle, wait for 2 min then power off;
5. Power on goggle, wait for 5 mins then power off;
6. Done!

Note: (1)HDZG_BOOT.bin/HDZG_OS.bin will be removed from SD card if update successfully. (2) Have to wait for the above specified time, DO NOT move to next step in a hurry.

The goggle can be bricked under some rare cases. If the goggle is on the firmware version ***n*** is 9 or later before bricked, follow Goggle Emergency Firmware Update Process; if ***n*** is earlier than version 9 or you are not sure which version it was on, please follow Goggle Emergency Firmware Update Process using Phoeix App.

Goggle Emergency Firmware Update Process (for *n*≥ 9)

1. Disconnect all cables from the goggle. Keep the power cable only;
2. Extract HDZG_OS.bin/ HDZGOGGLE_RX.BIN/ HDZGOGGLE_VA.BIN, and copy them to root directory of a FAT32 formatted SD card, and insert SD card to the goggle;
3. Power on goggle, wait for 5 min then power off;
4. Done!

Note: (1)HDZG_OS.bin/ HDZGOGGLE_RX.BIN/HDZGOGGLE_VA.BIN will be removed from SD card if update successfully. (2) Have to wait for the above specified time, DO NOT move to next step in a hurry.

Goggle Emergency Firmware Update Process using Phoenix App (for *all versions*)

Download PhoenixCard.zip from the HDZero Download site, and extract it to a location on a Windows machine, for example, C:\PhoenixCard. This is a one-time process. There is no Mac or Linux version for now.

Download the latest firmware package from the HDZero Download site, and extract all files in the zip file to your local drive, i.e. C:\Temp.

1. Launch C:\PhoenixCard\PhoenixCard.exe;
2. Follow the steps on FIG.5 to make a bootable SD card;

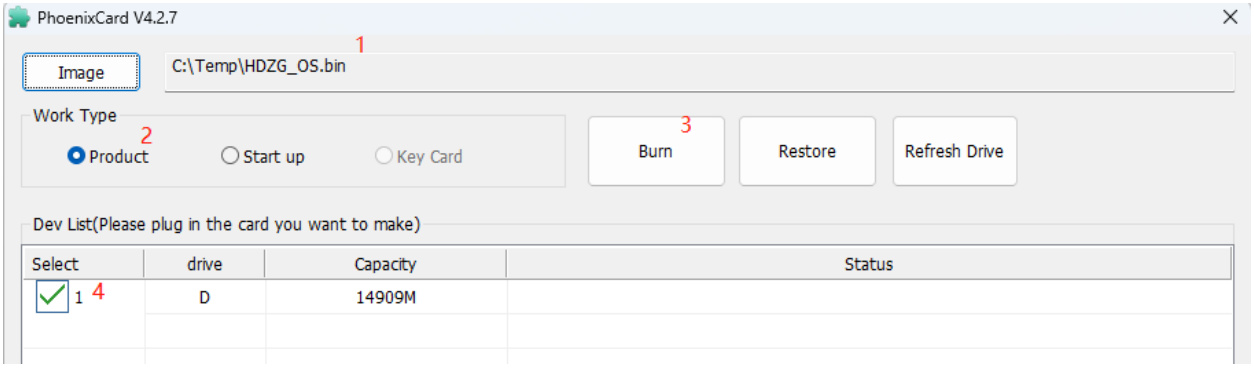


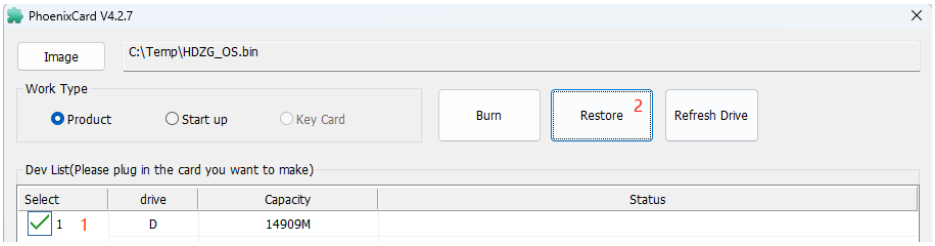
FIG 5. Make a bootable SD Card

3. Eject the SD card from Windows, and insert the SD card into the SD card slot of the goggle;

Unplug all of the cables, i.e., HDMI in/out, Line in/out, AV in. Keep the power cable only. Power on the goggle, you will hear a long beep immediately. Wait for 3 minutes and you will hear another long beep;

4. Power off the goggle, and pull out the SD card from the goggle. (Do not power on goggle now);

5. Follow the FIG.6 to restore the SD Card from BOOT mode, and format it as FAT32 on Windows;



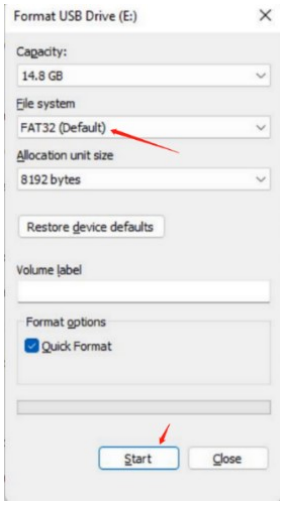


FIG 6. Restore a SD Card

6. Copy HDZGOGGLE_RX.bin and HDZGOGGLE_VA.bin to the SD card root directory;
7. Insert SD card into goggle, power on the goggle, wait for 2 minutes, and there will be a long beep;
8. (Optional) Pull out the SD card, and check SD card contents on the PC. The 2 files should be removed if flash process is successful;
9. Power the goggle off and then on again.

Notes:

(1) A bootable SD card has a hidden partition that Windows Explorer will not show. And it can't be removed even SD card is formatted with Windows Explorer. It means the goggle will flash itself from the bootable SD card unexpectedly and mess up goggle firmware if a bootable SD card is inserted when the goggle is powered on.
(2) The above Step (5) must be followed strictly to get rid of the hidden bootable partition. Otherwise, it will brick the goggle when goggle is powered with this SD card inserted. If this happens, you will need to repeat the emergency firmware update process described in this section.
(3) Have to wait for the above specified time, DO NOT move to next step in a hurry.
(4) When the goggle is bricked, it shows HDZero Boot screen and will not get into Main menu.

Troubleshooting

Support should be attempted in the following manner.

1. Read this manual first
2. Follow us on Facebook/Discord if possible
    a. Facebook: https://www.facebook.com/groups/hdzero
    b. Discord Server: https://discord.gg/VSkXzkKPHt
3. Email Technical Support: support@divimath.com

OLED Display Disclaimer

(1) Due to the nature of OLED technology, the presence of dead pixels is not uncommon and may occur during manufacturing. Please note the following guidelines:

- **Single dead pixel**: This is considered normal and does not affect product performance.
- **Two consecutive dead pixels** (in any direction—horizontal, vertical, or diagonal): Acceptable if the total number does not exceed **four instances**.
- **Three or more consecutive dead pixels** (in any direction): This is considered **abnormal** and may qualify for warranty evaluation or replacement.

(2) OLED displays can provide more vivid colors than traditional LCD panels, However, if they are displaying the same content for an extended period of time, it may come across issues like "Image retention" or "Image burn-in".

We appreciate your understanding and strive to maintain the highest quality standards.

Warranty

The HDZero Goggle can be exchanged for a new unit within 7 days for any manufacturing defects if returned in new condition. The optic module will be warrantied for repair for 6 months, and all other components, for 2 years, if there are no signs of excessive use. Buyer will be responsible for shipping costs. If beyond the warranty period, we will provide repair services for a cost. For assistance with warranty issues, please contact support@divimath.com.