DIY Camera Monitor
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https://learn.adafruit.com/diy-camera-monitor

Last updated on 2021-11-15 06:21:42 PM EST
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Overview

In this project, we're going to make a DIY monitor using an HDMI display backpack and a 3D printed enclosure.

A display monitor is a very helpful tool for video production. The Adafruit HDMI 5" display backpack features an integrated mini display driver that is great for DIY projects. It's fully assembled, works with any HDMI device and includes mounting tabs for easily attaching to a surface.

To make this monitor, you'll need access to a 3D printer, soldering iron, the 5" display backpack, slide switches, JST extension, UBEC and a camcorder battery holder.

The assembly is moderately straightforward. You only need to solder a few wires, snip a few cables and fasten a couple of screws. The 3D printed parts take about 2-3 hours to make. If you don't have access to a 3D printer, visit your local hackerspace or send the parts to a 3d printing service.
Parts

We have all the lovely components and tools to build this project. Be sure to check out the featured products on the right sidebar.

- HDMI 5" Display Backpack (http://adafru.it/2232)
- 2X SPDT Slide Switch (https://adafru.it/drN)
- UBEC DC/DC Step-Down (https://adafru.it/efD)
- JST Extension (https://adafru.it/doS)
- Camcorder Battery Holder (https://adafru.it/wB2)
- 1/4" to 3/8" Convert Screw Adapter for Tripod (https://adafru.it/efF)
- 1/4" Mount Adapter To Video Camcorder Hot Shoe (https://adafru.it/efG)
- Phillip Flat Head #4-40 x 3/8 (https://adafru.it/eIL)

Tools & Supplies

You'll need a couple of hand tools and accessories to assist you in the build.

- Solder Iron (http://adafru.it/1204) + Solder (http://adafru.it/734)
- Silicone Wire (http://adafru.it/1877)
- PLA Filament (https://adafru.it/dtp)
- 3D Printer (https://adafru.it/tkf)

Circuit Diagram
Wired Connections

Follow the circuit diagram above to reference the connections for each component. The parts are not to scale but should give you a visual idea of the circuit.

Battery Holder
Positive > UBEC Positive
Negative > UBEC Negative

HDMI Backpack
GND > UBEC negative
+5V USB > UBEC positive

The positive wire on the battery is connected to the slide switch and positive wire on the UBEC (from the short wires). The short negative wire from the ubec is connected to the negative wire on the battery holder.

The +5V and GND pads next to USB port are connected to a female JST cable. A slide switch is connected to the -25mA pad on the HDMI display backpack.

Cut the 'Open for -25mA' jumper before soldering connection to slide switch.

Powering with USB only

Optionally plug in a micro USB cable to the HDMI display backpack to power from a batterybank or wall outlet using a USB adapter.

You can optionally convert the UBEC into a microUSB cable using an DIY connector plug (http://adafru.it/1390). Look up the pinouts for wiring and be careful to get it right!

3D Printing

No 3D printer? 3D Printing Services

Check out 3Dhubs.com (https://adafru.it/iNA) or makexyz.com (https://adafru.it/CeA) for a directory listing of local 3d printing operators to get your parts printed for reasonable prices! Search from dozens of makers and see reviews and printed samples.
This enclosure is a two part design optimized to print with FDM 3D printers. The two parts are secured together with #4-40 Phillips machine screws. Features openings for the HDMI port, power and dimming switches and micro USB port. There's also a fixture at the bottom for securing a standard 1/4-20 tripod thread screw for mounting.

**PLA Filament**

These parts are optimized for printing in PLA material. The parts print best with no support or raft.

- Download STLs
  - [https://adafru.it/eg1](https://adafru.it/eg1)

- 3D Printer Profiles
  - [https://adafru.it/enD](https://adafru.it/enD)

**Slicing Software**

The recommend settings above should work with most slicing software. However, you are encouraged to use your own settings since 3D printers and slicing software will vary from printer to printer.
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<thead>
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<th>File</th>
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<th>Notes</th>
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<td>displayBack.stl</td>
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<td>0.2 Layer Height</td>
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<td></td>
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<tr>
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<td>90/120 Feed / Travel Speeds</td>
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</tr>
</tbody>
</table>

**Assembly**

Let's start off the assembly by preparing our battery holder. You'll need to remove the shrink wrap around the positive and negative connectors on the back of the battery holder.
Desolder wires from battery holder

The battery holder includes hoop connectors. We need to cut or unsolder the hoops that are attached to the wires.

Tin wires and slide switch

Next up we need to wire the slide switch to the battery holder. Prepare a slide switch by tinning two terminals. Measure two pieces of heat shrink tubing (http://adafruit.it/1649) and add them to the positive red wire before soldering to the slide switch.

Slide Switch Connection

Solder the thick red wire from UBEC to the slide switch. Use hot air (https://adafruit.it/dxl) to shrink the tubing and secure the slide switch connections.
Solder UBEC

Solder the thicker wires from the UBEC to the positive (red) and negative (black) wires on the battery holder.

Solder the thinner from the UBEC to the positive and negative wires to the 5V and GND pins on the display backpack.

UBEC JST Connector

Remove the black connector from the UBEC (It's the one with the thin wires). You'll need to solder a short JST cable with a male connector.
Thread UBEC Wiring through back cover

Insert the JST connector from the UBEC through the hole in the center of the display cover part (displayBack.stl). Pass all the wiring through the opening.

Make sure it's the correct side! The back of the display cover has chamfered mounting holes.

Mount battery holder to back cover

Position and orient the battery holder over the cover so the mounting holes line up. Use four #4-40 phillips screws to secure the battery holder to the back cover.
Assembled Cover and Battery Holder

Check point. Ensure the wiring is long enough to reach the display backpack. The slide switch should be able to reach the opening in the enclosure.

Prepare display backpack

Use a panavise to securely hold the backpack while soldering.

Open -25mA for dimming

In this project we want the dimming feature so we need to break a trace on the display backpack to enable it.
Break the Trace

Check the back of the display backpack and look for the -25mA label. Use a filing tool or x-acto knife to remove the trace between the two pads under "Open for -25mA"

Second Slide Switch

Prepare a new slide switch to enable the dimming feature. Notice the length of the wiring is rather short, it doesn't need to reach far once inside the enclosure.

Solder dim switch

Measure two pieces of silicone wire to solder a slide switch to control the dimmer.
Mount Display Backpack to Enclosure

Position and orient the display backpack into the enclosure. Insert the display backpack at an angle with the slide switch portion going in first.

Fasten four #4-40 phillips screws to each of the tabs to secure the display to the enclosure.

Wire JST to Display Backpack

We need to wire up a JST cable with a female connector to the display. This cable will plug into the UBEC.

Measure and cut a JST extension cable with female connector. Solder wires of the JST cable to the pads on the display backpack. Red wire to the +5V USB and black wire to GND.
Install Slide Switches into Enclosure

Use curved tweezers to insert each slide switch into the port openings near the top of the case.

Package wiring and components

Arrange the wire connections to the sides of the case, away from the pads and slide switches.
Closing up enclosure

Ensure the UBEC and wired connections are fitted into the enclosure.

Mount back cover

Position and orient the back cover over the enclosure. Line up the mounting holes and fasten four #4-40 phillips screws to each mounting hole to secure the cover to the enclosure.
Install tripod adapter

The bottom of the enclosure features a mounting hole for a standard tripod adapter.

Place the tripod thread into the opening and install it by using a flat head screwdriver to fasten the 1/4" to 3/8" convert screw into the bottom of the case.

The tolerance should have a tight fit. Use adhesives for a permanent installation.
Test it, Display it!

Attach a charged camera battery the holder and plug in an HDMI cable. Slide the switch to power it on and connect it to your DSLR camera or other device. The second slide switch should turn on/off dimming of the screen.

DIY 3D Printed HDMI Monitor

This is really nice, low-cost display perfect for DIY projects like monitoring aerial drone shots, mobile gaming, and of course video production and photography.