

HDRTZ User Manual

Introduction

This will be an in depth instruction manual for getting the High-Definition Real Time Zoetrope system up and running both hardware and software. Some important things you will need prior to starting include:

- Bluetooth keyboard and mouse
- Zip ties
- Duct Tape/clamps
- Ladder
- Screws/nails
- Hammer
- Pliers
- Scissors (for tape)

Cable Connections

These cable connections can either be done before or after setting up the rest of the hardware, but we recommend getting the rest of the hardware secured in place prior to connecting all of your cables. This is listed first so you have an understanding of what each cable is for.

AC Power Cable - This should be plugged into an outlet preferably on ceiling/rafters as the FPGA will be mounted on the ceiling. It will then be plugged into the FPGA to provide power.

HDMI Cable - this will be connected to the single HDMI port on the FPGA and to the projector/monitor being used

USB3.0 Hub - Connect the USB3.0 hub to the USB 3.0 port on the FPGA, future USB connections can all be connected to this.

USB-C- USB3.0 Cable - Connect this cable to the USB Hub and to the SeeCam 4K camera.

WiFi Antennas - If the WiFi antennas are not already connected to the FPGA, screw them into the Tx and Rx ports.

Wireless Keyboard/Mouse dongle - If using a wireless keyboard and mouse (recommended) connect the bluetooth dongles to the USB Hub.

Battery Pack - Make sure the wire leads of the positive and negative ends of the batteries are all wrapped together in electrical tape to the +- to USB adapter.

Micro-USB Cable - Connect the Micro-USB cable to the USB adapter on the battery pack and to the Arduino inside the crank box. This cable should go through both the hole in the base and the hole that leads to the inside of the box.

Hardware Setup

FPGA - The FPGA shall be mounted up high preferably on rafters near the projector. This can be done using zip ties going through the slits near the base of the FPGA case. Turn on the FPGA by holding down the power button in the divot on top of the case.

Camera - The camera is also mounted on the ceiling rafters near the FPGA (since it has a wired connection). It will need to be mounted directly over the center of the art. It is easier to set up if you are using the software to show what the camera sees while you are adjusting it. The center of the art needs to be within 10 feet of the FPGA location which should not be a problem with a 18ft x 18ft art piece. Camera setup can depend on the location and methods of mounting may need to be improvised. For example, the camera can be mounted to a metal mounting plate with a hole in the center for the lens to come through using tape, zip ties, or clamps. Whatever is best to prevent the camera from moving as you do not want it to move off the center of the art.

Crank box - WARNING! To prevent damage to the Arduino, detach the Arduino entirely from the system and move somewhere else if drilling or hammering screws/nails into the box. Podium top should have 5 holes: 4 pre-drilled for the four corners of the box and one in the center where the hole in the base of the crank box is. To connect the box to the podium to the top of the podium, use screws or nails in the four holes on the corner. Then for the inside of the box, unscrew the 4 screws on the top on the black plastic cover and remove the cover. This will reveal the Arduino and the rotary encoder. The Arduino should already be connected to the rotary encoder, if it is not refer to figure 1 and figure 2 for connections. The DT pin on the rotary encoder should connect to D4 and CLK should connect to D5. + should connect to 5V and GND should connect to GND. Pull the micro-USB cable through the hole in the base and the hole to the inside of the box and connect the micro end to the port in the Arduino. This cable should also pass through the hole in the top of the podium. Connect the other end of the cable to the battery array adapter, this should sit on the floor inside the podium. Put the black cover back on top of the box and screw it back in.

Difference if using motor voltage version: the inside of the motor voltage version does not use a rotary encoder, instead there is a circuit with headers that the Arduino can be plugged into. If the Arduino is removed from the headers, make sure to put it back in with the cable port facing towards the end of the board the headers are attached to.

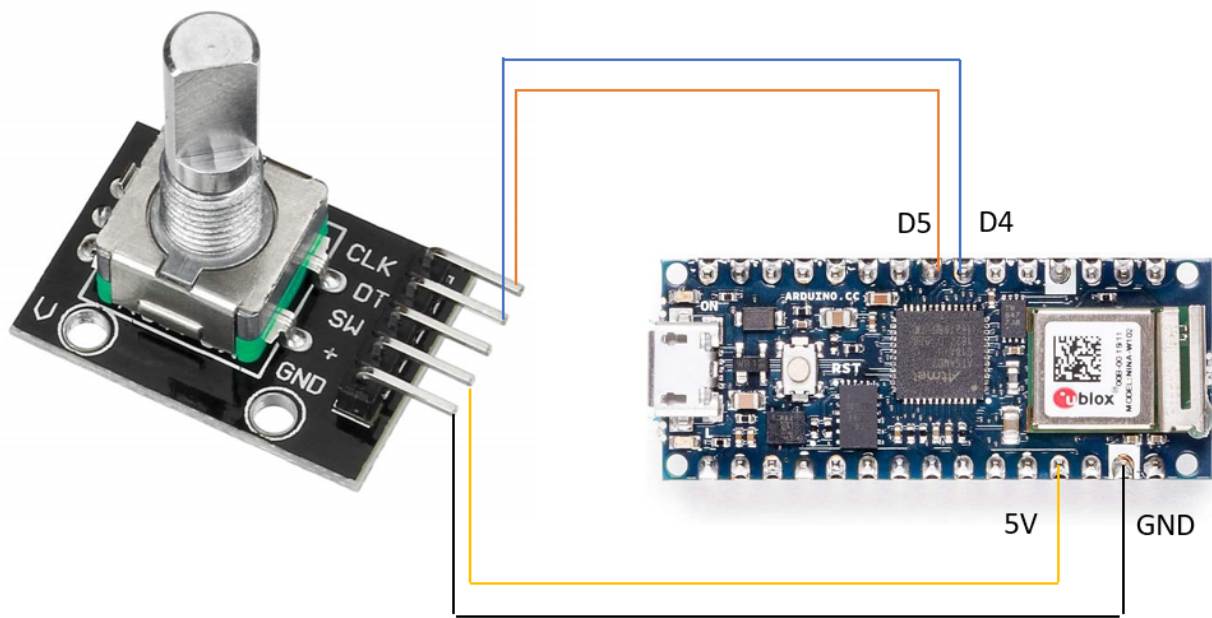
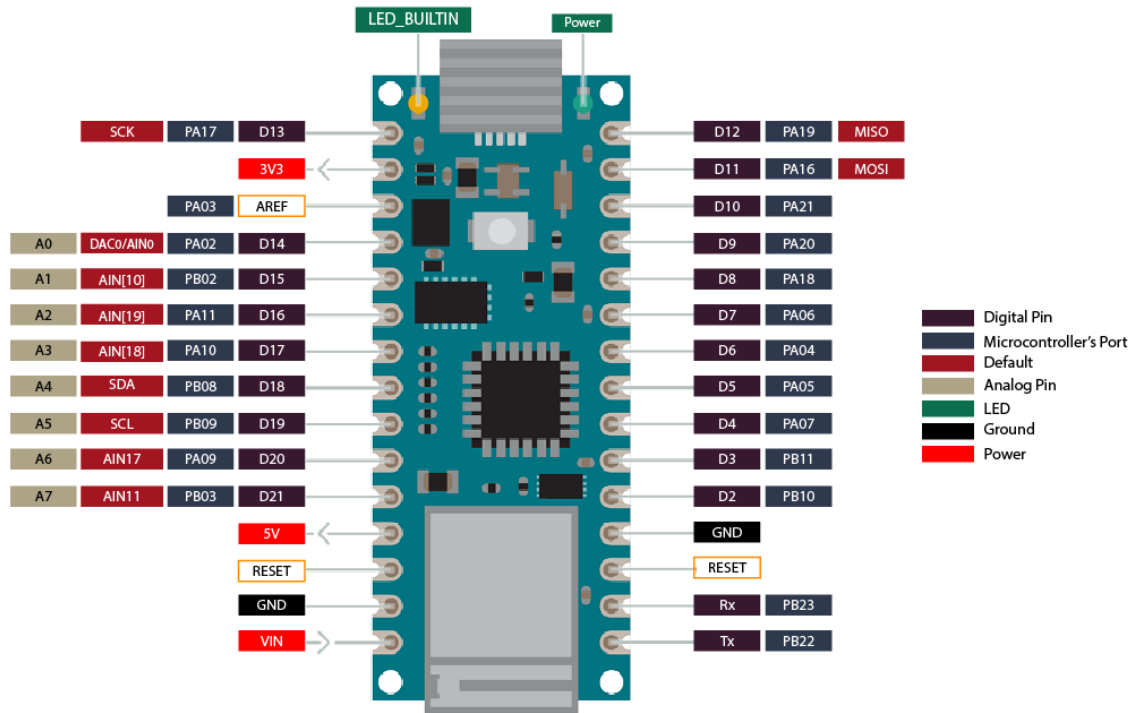


Figure 1 Rotary Encoder/Arduino Connection



Arduino Nano 33 IoT

Figure 2: Arduino Nano Pinout

Software Setup:

MAKE SURE TO USE THE CORRECT SOFTWARE FOR HARDWARE VERSION
ROTARY ENCODER - ROTARY ENCODER or MOTOR VOLTAGE - MOTOR
VOLTAGE

When the Nvidia Jetson TX2 is powered on, if it requires a password the password is nvidia, ideally the system will not power off so you will not need to put this in again. On the desktop you will see two folders, one for HDRTZ Rotary Encoder version and HDRTZ Motor Voltage. The motor voltage version was the initial prototype and was redesigned into the rotary encoder version. The rotary encoder version will provide a better visual experience. **Setup will be generally the same for both versions, just make sure to use the correct one to the hardware.** To change any setup parameters, you can use the web app in the API folder inside the HDRTZ folder, but really it is just easier to open the output.json file in the Backend folder and edit it manually. The primary values you can edit easily are the mask and crosshair. Setting the mask to 0 will

turn off the black mask, setting it to 1 will make a circle at regular zoom, setting it to 2 will make a zoomed in semicircle. **The motor voltage version does not have the second mask option.** You can edit the zoom, xpos, and ypos values but they take some learning and getting used to for moving the zoom and position of the image. Save the file and close it. Then, open a terminal by right clicking the desktop and clicking open in terminal. Then for the rotary encoder program, type **cd Desktop/HDRTZ2-RotaryEncoder/Backend**. Then type **sh runscript.sh**. To run the motor voltage program, type **cd Desktop/HDRTZ2-MotorVoltage/Backend**, then **sh runscript.sh**. To get back to the default directory type **cd** or just right click the desktop and click open in terminal again. If the program needs to be closed, either press **Alt-F4** at the same time or **Alt-Tab**. The second one will show the desktop and you can right click the ? symbol on the left to close it. Also close the terminal window. It can be rerun by repeating the above.

Setup:

1.