

ColecoVision Paddle Controller IntelliPaddle Instructions

V0.11
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Disclaimer

I take no responsibility for any damage to any system, person or property caused by building or using the controllers.

Overview

These instructions will show how to build a paddle controller for either the Colecovision or the Intellivision systems.

The intelliPaddle will easily work with any model 2 system, and with a little modification to other models can be used with them also.

The ColecoVision Paddle Controller, CVPC, can be used with the ColecoVision system as well as other systems that a standard Atari 2600 Joystick will work with.

How does the paddle controller work?

The PCB contains three main components:

- ATTINY – this controls everything
- A 2x (IntelliPaddle only) and a 4x Optocoupler

Additionally, there is a 600 P/R rotary encoder attached to the ATTINY.

The ATTINY reads the pulses sent by the rotary encoder and determines if the paddle has been turned, if so, it determines the direction and send the appropriate signal to the 4x optocoupler. The optocoupler will connect the appropriate pins on the DP9 pin so the system will react accordingly. To sum it up, the paddle is acting like a joystick, it just presses the left, right, up or down button x times based on how fast you turn the paddle. The optocouplers are there to isolate the power between the circuit and the system.

BOM – Bill of Material

Item	#	Source	Note
circuit board	1	OSH PARK	
ATTINY84-20PU	1	Amazon	
Controller software	1	github	
fire button - 16mm round toggle switch	1	Amazon	
power switch with 9v battery connector	1	Amazon	
Step-Down Linear Voltage Reg.	1	Amazon	
Power LED 5mm	1	Amazon	
Joystick cable	1	Console5	Might be able to salvage
8 pin DIP socket (optional)	1	Amazon	Note Required, suggested
14 pin DIP socket (optional)	1	Amazon	Note Required, suggested
16 pin DIP socket (optional)	1	Amazon	Note Required, suggested
dip switch 2 position	1	Amazon	
470-ohm DIP resistor array 9 pin A471J	1	Amazon	
600 P/R Rotary Encoder	1	Amazon	
PC847 4x OptoCoupler	1	Amazon	
PC827 2x OptoCoupler	1	Amazon	IntelliPaddle
M3 3 mm x 5.3 mm female brass threaded insert	3	Amazon	Optional
M3 x 16mm	3	Amazon	Optional
2mm x 6mm self-tapping screws	4	Amazon	Optional
Wires			Can use wires from Rotary Encoder.
Shrink Tubing			optional
Paddle Housing – 3D printed	1	Thingiverse	
ATTINY Programmer		Tindie	Optional, there are other ways to program the chip. Look on the internet.

Additional items you will/may need

- Soldering Iron
- De-soldering iron or wick
- Wire cutters
- Wire Strippers
- Multimeter
- Hot glue gun
- 2.5mm hex screwdriver
- Pliers
- Needle nose pliers
- Tweezers
- Solder
- Flux
- ATTINY Fuse repair - [FuseRepair](#)

What the parts look like



Before we start

You have a few options on how you build your paddle:

1. Case options

- a. The simplest option is to use the top that doesn't contain a screw hole.
 - i. Pros:
 - 1. Easier to assemble.
 - 2. Easier to change battery.
 - ii. Cons:
 - 1. Over time the lid may loosen.
- b. Option 1 using the lid with screw holes. Just use the bolts screwed into the plastic, the first time will take a little effort, but after that it shouldn't be too bad. This is the most preferable method.
 - i. Pros:
 - 1. More secure assembly.
 - ii. Cons:
 - 1. Harder to replace battery.
 - 2. Plastic may eventually strip.
- c. Option 2 using the lid with screw holes. Install the brass threaded inserts.
 - i. Pros:
 - 1. Stronger construction.
 - 2. Plastic won't strip over time.
 - 3. Nicer overall, more professional.
 - ii. Cons:
 - 1. Inserts are hard to install properly.
 - 2. Adds cost to the build.

2. Use sockets for chips.

a. Pros:

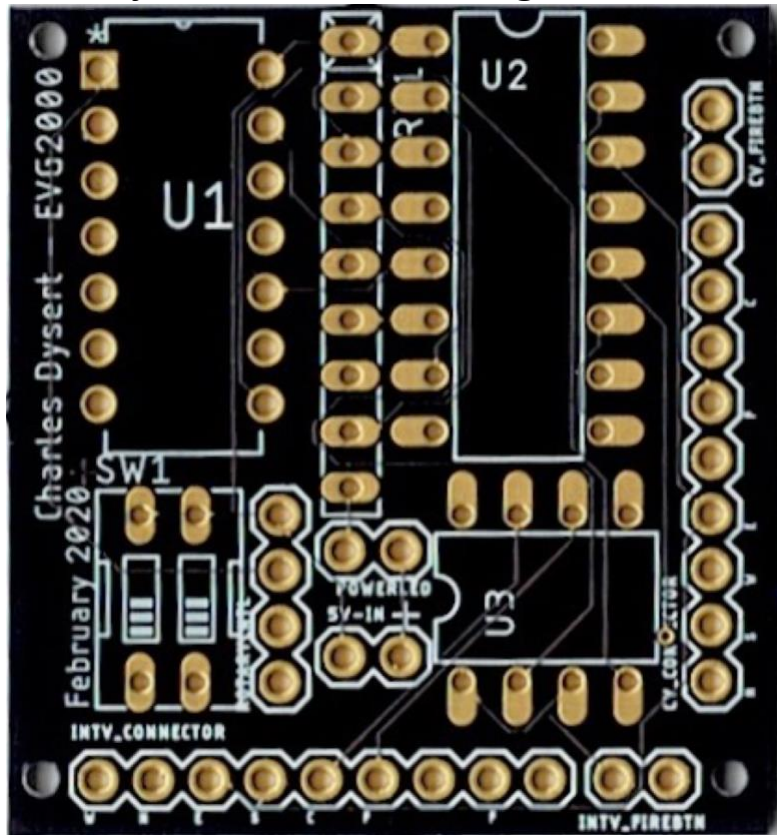
- i. Easier to build, don't have to worry about damaging the ICs while soldering.
- ii. If a part is bad, easier to replace.
- iii. If a software update occurs, much easier to remove the ATTINY from a socket as opposed to unsoldering the chip.

b. Cons:

- i. Minor additional expense.

Overview of the PCB

This is an older version of the PCB, the position of items is the same, just some text changes.



U1 is the ATTINY microprocessor, right below it is the DIP switch for changing direction and orientation. Below that is where the controller cord is connected for the IntelliPaddle. The last two connectors in the bottom right corner is where the fire button connects. Along the right edge is where the joystick cable connects for the ColecoVision Paddle Controller. The top two connectors are for the CVPD fire button. U2 and U3 are the 4x and 2x optocoupler respectively. U3 is only used for the IntelliPaddle. To the left of U3 is the Power LED and power in connectors. To the left of these connectors is where the rotary controller connects. To the left of U2 is the 470-OHM resist

Getting Started

Prepare the rotary controller

First, we'll install the knob on the rotary controller.

You will notice two things about the knob.

- The knob is fairly solid, the reason being the extra weight makes it so the paddle can also act like a spinner.
- You will notice there is a line near the shaft hole, the flat edge on the shaft should line up with this line.



Pushing the knob onto the shaft will require a lot of force, and once on will be difficult to remove. See picture below to see approximately how far the knob should be pushed down. As you push the knob on, stop when you get close the final position and make sure the knob still turns freely. Press a little further on, and then retest. About half the silver lip should be visible. If the knob does not turn freely, the knob is pressed on too far. Carefully try to pull it back up.



Trim the cable to about 12", save the piece you cut off as you can use the wires later. You will either have nut, as in picture above or a rubber grommet. If you have the nut carefully remove the nut, if you have the grommet carefully cut it off at the rotary controller. Once you have done this, there are 3 small screws to remove. Once the screws have been removed, carefully remove the metal case. Once the case is removed, carefully pull the black plastic cover off of the wires. You will notice a braided metal wire, carefully cut and remove this. You should now have something similar to the picture below.

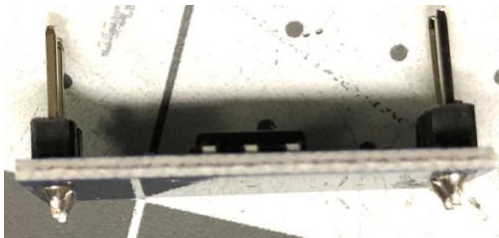


Notice the blue capacitor sticking out. This is the first rotary controller I've had that there was a capacitor sticking out this

far. I modified the controller top to have an opening to accommodate this. Keep this in mind when installing into the top of the case.

Prepare the Voltage regulator

If your voltage regulator has pin headers, unsolder the pins so we can connect the wires.



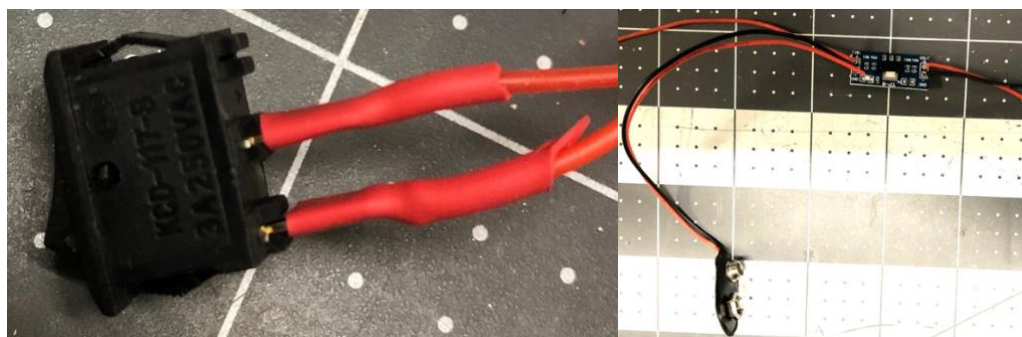
After removing the pins, hookup the regulator to a bench power supply set to 9 volts. Then adjust the output voltage to about 5 volts. You can also temporarily connect it to a 9-volt battery.



Connect wires to the output connections. You can use a few inches of the wire salvaged wire cut from the rotary controller.

Prepare the Power switch, and the 9-volt connector

One end of the power switch connects to the power-in connection on the regulator. The positive, red, wire from the 9-volt connector goes to the other terminal of the power switch. It's a good idea to use shrink tubing, but that's your call.



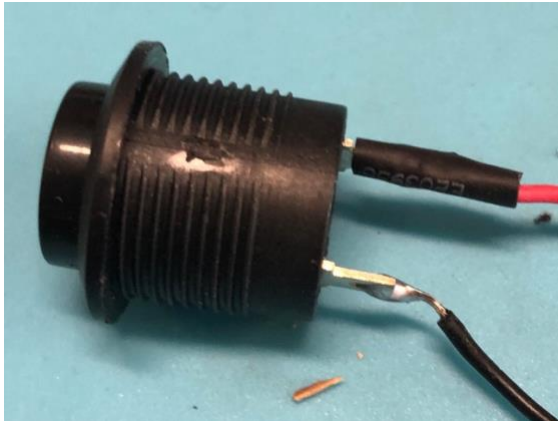
Prepare the Power LED

Cut a red and black wire, about 3" long, from the salvaged piece of wire cut from the rotary controller. Clip the leads of the LED, remember which leg is positive and which is negative. Long lead should be positive. Connect red with to positive, black to negative. Shrink tubing suggested, your call.



Prepare the Fire button

Connect a few inches of the salvaged wire, color not important. Connect a wire to each side of the fire button. Shrink tubing suggested.



Prepare the Joystick cable

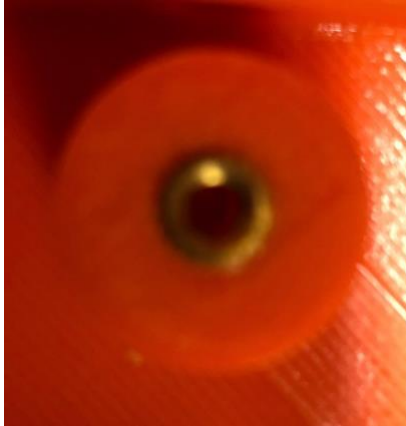
You can salvage a cable from another controller, such as a genesis controller. If you do reuse a cable, verify all of the wires are connected and working.

Remove about 65mm of the casing from the joystick cable. Strip the nine wires and tin the tips. You will probably need to use flux.



Install the female brass threaded inserts - optional

You will need to use a soldering iron or a special tool to melt the inserts into the 3 locations.



Start installing components to the PCB.

Install the Resistor network

Install the IC sockets