

HOW TO ADAPT TOY CAR: WRITTEN INSTRUCTIONS



This instructional guide will teach you how to modify the steering mechanism of standard 12V ride-on toy vehicles to accommodate children ages 3-6 with limited mobility. These adaptations were designed to supplement motor rehabilitation treatments done during physical therapy for patients with cerebral palsy.

BACKGROUND

How can we leverage engineering technologies to design affordable, accessible machines that increase autonomy and independence?

This question stems from the gap between technological capabilities and human equity. While we live in an era of rapid robotics and AI advancement, many benefits of these technologies, specifically healthcare and rehabilitation, often are inaccessible due to high prices and lack of outreach to public healthcare spaces. By asking how we can use engineering to create affordable, accessible machines, we are addressing the fundamentals of equality and equity.

Currently, high-end and increasingly necessary assistive technologies, such as advanced prosthetics, automated home systems, and mobility aids, are not being covered by insurance and unaffordable to the average person. Many of these inaccessible technologies promote autonomy and independence amongst physically disabled communities. This often results in a disproportionate amount of individuals with job insecurity, mental health challenges, limited healthcare/aid services, and many other struggles that able-bodied people don't have to deal with to the same extent.

The greatest thing about America is that it is so diverse, but as of late our communities are becoming increasingly divided. I believe that if we can start to bridge these gaps we will refind our sense of community and peace that we pride ourselves on.

My project aims to promote the awareness of these issues, the emotional toll it takes on the disabled community (particularly in young children), and engineering technologies that are used for rehabilitation and healthcare services to aid these challenges. By creating an easy access curriculum I hope to inspire people to think about human-centered design, pushing them to advocate for the disabled community. As well as encouraging young STEM-oriented students to participate in hands-on, self-lead projects with an impactful cause.

If you are interested in reading further about the importance of parental investment in disabled children, the effects of autonomy in childhood development and the responsibility of the government in funding pro-disability initiatives you can [click here!](#)

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PARTS

Car model used: TOBBI 12V Kids Ride On UTV (Model TH17L0974)

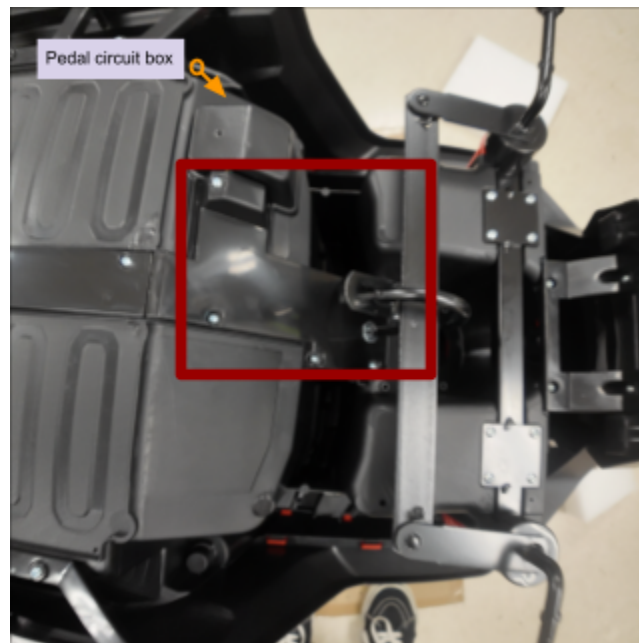
- a) 6-12V ride-on toy vehicle
- b) 16–20 gauge wires
- c) CESS 1/8" 3.5mm Mono TS Female Jack Socket with Switch Panel Mount
- d) 16-14 AWG 1/4" Male Disconnect pieces
- e) AbleNet Big Red Button

Click [here](#) for a playlist of basic engineering skills you will need for the adaptation process

STEPS

DISASSEMBLING THE PEDEL WIRES

1. Ensure that the car is first turned off and flip car upside down to expose the under side
2. Unscrew the front middle module plate that contains the pedal circuit



3. Detach the bundle of wires from the plastic surrounding it by pushing in the side tabs of the box, disconnecting it from base and exposing the wires

- a. The pedal should pop out as well



- 4. Go around to the other side of the car so that you can see the exposed wires connected to the pedal
- 5. Use a screwdriver to press the lip on the crimp connectors to disconnect the wires from the 3 prongs attaching it to the part that is connecting the wires to the pedal
 - a. Best to keep track of the color order of the wires

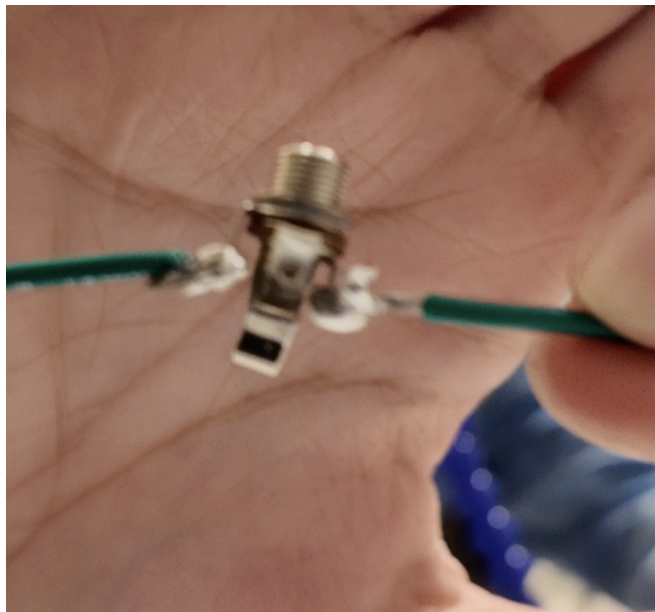


MAKING THE MONO JACK

- 6. Cut two wires 6-7 inches long and strip about an inch off of each end
- 7. Thread one end of each wire through the hole on each side of the mono jack, then fold the excess striped wire back onto itself



8. Solder the wires to their respective prongs
 - a. **NOTE:** Make sure that the solder doesn't touch any other part of the mono jack except for the one prong it is being connected to. If the solder cross connects the car could short circuit



9. Attach crimp connectors to the remaining sides of the wires
 - a. Ensure that the metal of the striped wire is touching the metal inside the crimp connector before clamping with pliers (you should be able to gently pull the wires without it coming out)



ATTACHING THE MONO JACK TO CAR

10. Turn the car on and put it in drive
11. Place each side of your multimeter leads onto the disconnected wires to see which combination invokes a spike in values (trying to find which wires are power and which one is ground)
 - a. Make sure that your multimeter dial is set to DC Voltage, the symbol of which commonly looks like this \bar{V} or $V=$
 - b. **NOTE:** If for whatever reason you cannot find the correct combination with the multimeter, connect the button to the mono jack and touch the ends of the mono jack to the disconnected wires. Press the button after each try and find whichever two wires turn on the car
12. Connect the two ends of the mono jack circuit with the wires that elicited the value spikes
13. Plug in the button into the mono jack to test if the button turns the axles of the car in the correct direction
14. Unplug the button and screw off the ring attached to the top of the mono jack

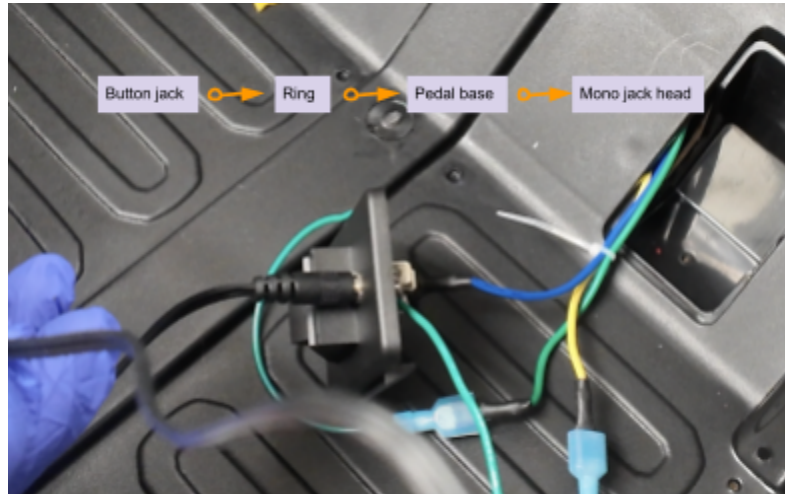


15. Unscrew the screw attaching the pedal cover to the actual switch and circuit box



16. Feed the head of the mono jack into the hole where the screw was, screw the ring back on, and plug the button back in

17. Reconnect the ground wire (whichever wire not connected to the mono jack) to any of the prongs on the switch



18. Place the switch back into the base of the pedal (don't worry about the pedal cover)
19. Reconnect the pedal part into the base of the car feeding the wires through to the underside of the car
 - a. **TIP:** Use a screwdriver to bend in the flaps until the part clicks in place and is secure



20. Go back to the underside of the car and rescrew the middle plate to the base of the car
 - a. The one or two screws closest to the pedal might not screw due to the additional wires, this is okay as long as the plate isn't dragging on the ground when driving

ASSEMBLING THE CAR

21. Follow the instructions given by the provider on how to construct your specific car
 - a. **TIP:** Use joint pliers to hold one side of the axle while another person screws in the nuts to attach the wheel, otherwise the nuts won't actually screw on

22. Unscrew the plastic covering and red topper on the button and spin the inside to shorten the length of the wire to remove as much clutter in the car
 - a. If the button doesn't allow for this just wrap the cords up and tape it to the inside of the car
23. Put the plastic back on and zip tie the sides of the button onto the front of the steering wheel (cut off the extra zip tie tails)
 - a. There should be two holes on each side on the base of the button to feed the zip ties through, however if there isn't you can drill two small holes

DONATING THE CAR

1. HMS School for Children with Cerebral Palsy

Donations & Community Relations

Ceciry Rodriguez-Pimentel, Director of Development & Community Engagement

cpimentel@hmsschool.org

2. Child Life Services at the Children's Hospital of Philadelphia

Child Life, Education and Creative Arts Therapy

childlifedonations@chop.edu

3. Philly ADAPT

Disabled in Action of Pennsylvania

disabledinactionpa@gmail.com