How to Convert a 24V scooter to 36V - Dirty Method

by **trebuchet03** on June 27, 2007

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Author: PRO **trebuchet03** author's website

I have a degree in Mechanical Engineering... And secret love for aerodynamics....

I ride a recumbent bike... what of it?

I like aquariums, bacon, efficiency and the feeling of putting on warm pants when it's cold inside.

My goal is to open my own start up or to work for another one. I feel it more important to utilize my creativity than to accept a higher paying job. Others I know, with a variety of engineering degrees working for companies I shouldn't name have had their hobbyset reduced to drinking and TV and it's typical to hear another complaint about another reason they don't like where they work..... Not for me.

I would like to live more on what you would like to live without. Have anything you'd like to live without?

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Intro: How to Convert a 24V scooter to 36V - Dirty Method

It's a quest for E-speed... And I don't mean a dot com bubble "E." These instructions are proof of concept for, hopefully, bigger plans.

Image Notes
1. Motor Controller
2. Power Switch -- aka Screwdriver
3. Ammeter
4. 1 of 3 12v gel cells
5. 24V spec'd motor - 350watts

step 1: Source Parts

Two scooters were used for this project. Both of which were found deralict and to be thrown away at Standford University. Dumpster diving may, or may not, be illegal. But better to ask forgiveness later.

The first scooter has rusted away and is completely un-ridable. It is a 36V machine.
The second is a 24V model, with heavily sulfated battery packs. Ridable, if you can get it power

Charger: I picked up a battery charger from harbor freight for other projects -- it cost me $10

That's all that's really needed -- lets get to it.

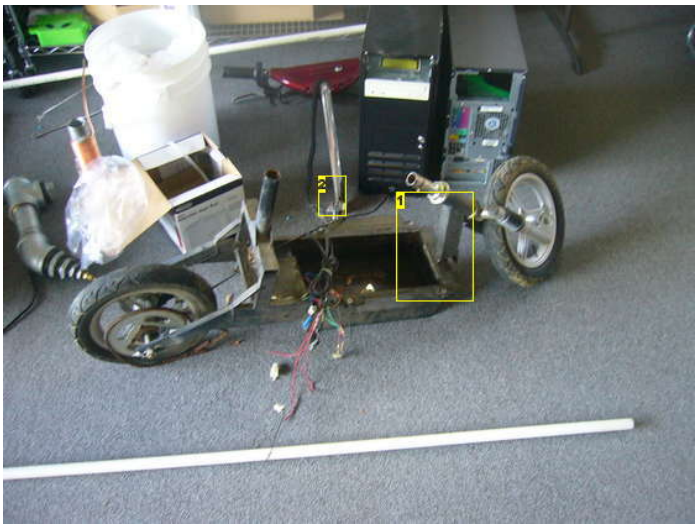


Image Notes
1. Broken
2. Bent

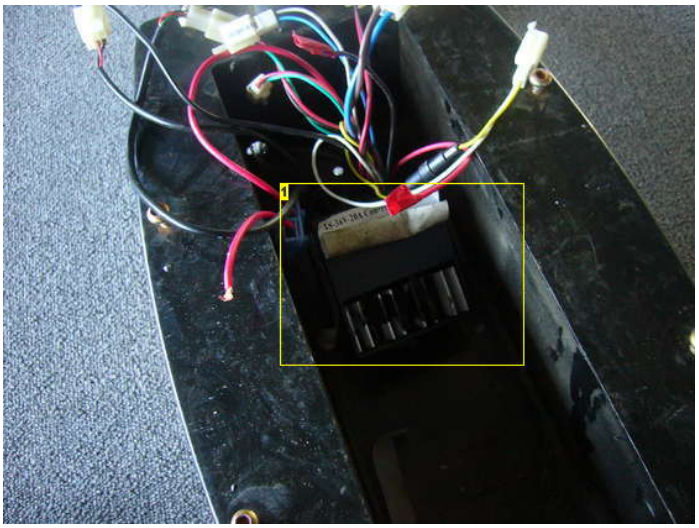


Image Notes
1. 36V motor Controller

step 2: Gut Scooters

This is really a more careful operation that it sounds. You'll want to mark everything, to make sure you can put it back together at a later date.

Important things to mark on the motor controller

- Motor
- Battery
- Power Switch
- Charger
- Brake Switch (to kill motor while braking)
- Hall effect sensor (throttle) -- this has three wires B-R-Gr
- Any other accessories (such as a horn or running lights)

Also, keep track of your connectors. From what I've seen in the 6 or so scooters I've come by, disassembled and hacked together - everyone uses the same set of connectors - but they don't always use the same connector for the same task.

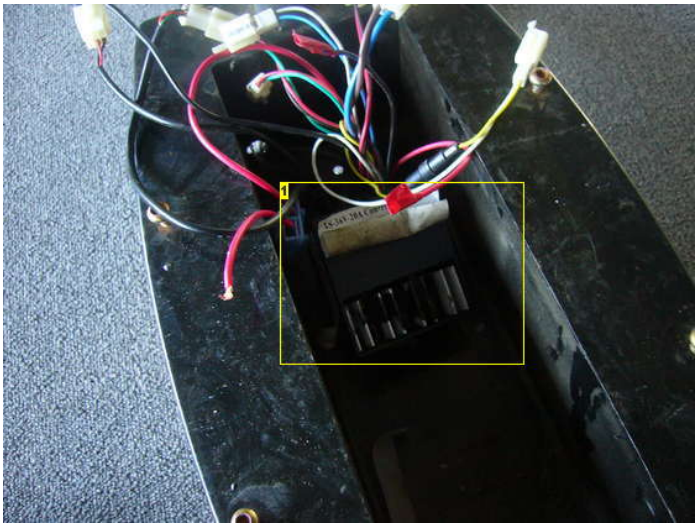


Image Notes
1. 36V motor Controller

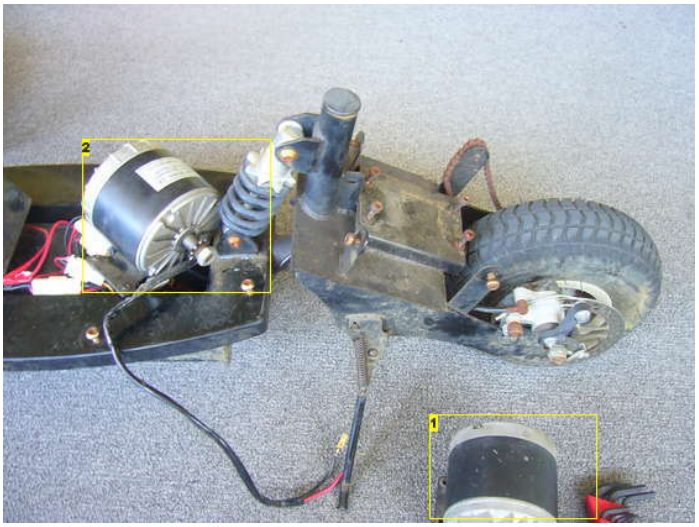


Image Notes
1. 36V motor
2. 24V motor

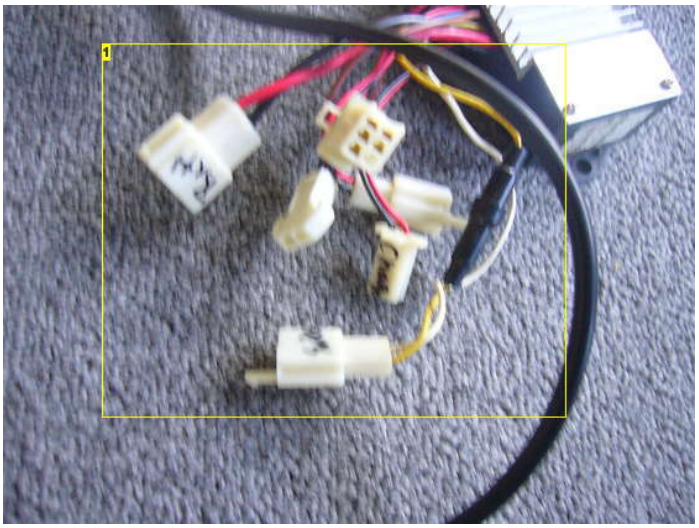
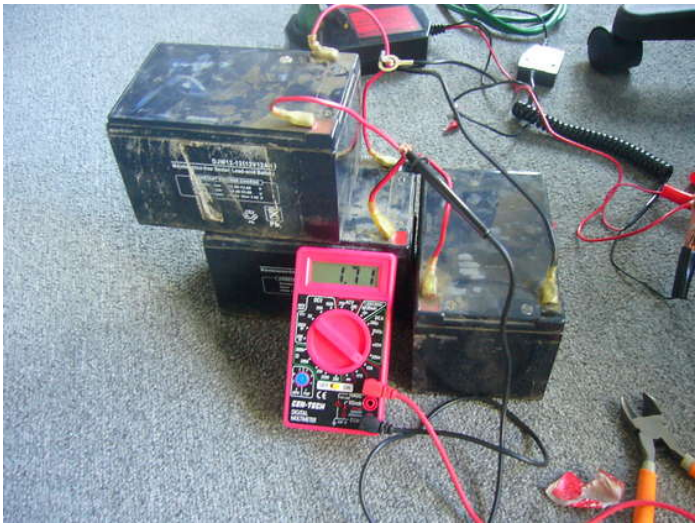


Image Notes
1. Marked... Looks like I uploaded the wrong image... bugger

step 3: Charge Batteries

I used the 3 12 volt gel cells from the 36V scooter for this hack - the 24V sulfated pack will be desulfated at a later date. These need to be charged. I charged them on a 1.5A "smart" charger using a multimeter and an ammeter to monitor progress. This is a proof of concept, and a rather dirty hack -- so things are twisted and clamped together.



step 4: Wire Up Good Scooter

Here is where it gets tricky... It's highly likely that your connectors will not match -- mine didn't. The best way to go about this is to start with one connector. See if both sides mate. If they do, more on.

If Not - check the other side of the connector on the **other** scooter. Then remove the pins from the connector and do a Frankenstein swap. The pins usually have a small tap inside - push it to the side with a small screw driver, then pull the wire/pin out.

Sometimes, there's no remedying it. In cases like these -- you can jam the pin on the wire into the connector, then secure with tape. Be sure they won't short inside the tape as these motor controllers are rather sensitive :/

You absolutely need to connect the following items

1. Hall Effect Throttle
2. Motor
3. Battery

For safety you should also connect the brake switch.

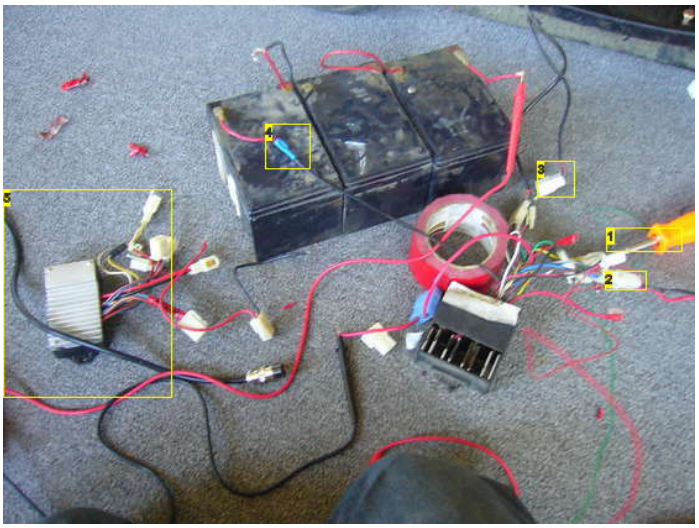


Image Notes
1. Switch
2. To Motor
3. To throttle
4. Power (ground)
5. Old controller

step 5: The Power Switch

I couldn't get the pins out of my power switch -- nor did I want to as I'd need to move 4 different connectors around.

The power switch is open while off, and closed when on. My solution was to stick a metal screwdriver inside, short the pins and tape it on. Not elegant at all - but utility is the idea.

step 6: Motor

This was a big question mark.

The 36V motor did in fact mate with the motor mount on the scooter. However, the shaft offset is different throwing the chain out of alignment.

Solution -- make an adapter plate....
Dirty Solution -- use the 24V spec'd motor

The big question was weather or not the 24V motor would handle the new voltage and amperage....

step 7: Power On and fly!

I used my ammeter between the batteries and the controller -- this way I could monitor draw. It also served as a handy power indicator. .01A draw means the controller is on (the switch circuit is closed).

When you wire everything together -- connect the battery second to last, and the power switch last. It's also probably a good idea to do a "dry run"-- without the motor connected to the rear wheel (VIA chain).

Before powering on, make sure all connections are tight -- and insulated. The last thing you want is to accidentally short something.

Once your dry run is successful -- load everything into the scooter. I taped on my ammeter so I could monitor current flow

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Results? Yes.

It's faster -- but it was a little slow to accelerate. My front tire has a leak, that keeps getting bigger. So that didn't help. But truly, much faster than the 24V variant I was running before :D

Proof of concept:
1. 24V motor appear to take the extra strain - likely shortening their expected lifetime
2. Gel Cells aren't too sensitive to Charging at 1.5A (just make sure the temps stay low)
3. This can be done within a few hours (except charge time - you'll want a bit longer)

Yes, I've been bit by eFever... I've always liked it, it's just reaching critical mass methinks.

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Related Instructables

Fun Electric 3 Wheel Scooter Segway knockoff under $100 (video) by prabbit22m

How to take apart an electric scooter for electric parts. by ljfa321

Steampunk Razor Scooter (slideshow) by gimmelotsarobots

Transition Electric Scooter. by saul

Electric Mountain Board by Vurp

Pimp an electric scooter (in progress..) by djupblue

Make your own Go-Kart. by poobajones

Electric Semi-recumbant Bicycle, w/ Battery Trailer (slideshow) by Iconoclastic Technocrat

Comments

19 comments **Add Comment**

alex-sharetskiy says: Jan 19, 2009. 8:55 PM **REPLY**
how would you fix the batteries?

12V says: Jun 7, 2009. 12:36 PM **REPLY**
basically you use a Desulfator (there is one on instructables!) which sends 1ms long 50v pulses.

amando96 says: Mar 16, 2009. 2:14 PM **REPLY**
i broke my scootrer's headtube aswell, but fixed it...

ReCreate says: Dec 23, 2008. 12:27 PM **REPLY**
those batteries look like they need to be cleaned or exchanged for new ones

trebuchet03 says: Dec 23, 2008. 7:50 PM **REPLY**
Naw, like many things - it's what's on the inside that counts ;)

Radioactive_Legos says: Aug 25, 2008. 12:38 PM **REPLY**
My friend and I are going to be converting his older-model Razor E300 to a higher voltage. I'm thinking we could get a new controller and a 48 volt battery pack, and probably a new motor. The batteries will still have to fit in the existing cavity, so they'll each have to be half the size, making the scooter have a much shorter range (oh well). I have a Zivan NG-1 48 volt charger from me and my dad's electric bike conversion. Any advice?
Thanks

Derin says: Apr 10, 2008. 9:40 AM **REPLY**
how do u dispose the cells

candle360 says: Nov 3, 2007. 5:15 PM **REPLY**
can somone help me find a 32v scooter with charger, I need it to fix my bro's electric chopper, I just want it to go faster, his has no charger, about 50 bucks to replace it...
so I'm just looking for the gutted parts, and I can do the rest, because my bro's chopper only went about 20mph when it worked, and with a 32v, I looked it up, will tow more and may go faster...

newkiraj says: Jul 27, 2007. 1:12 AM **REPLY**
One of my friends and I took a Razor E100 Scooter, and ordered some rather huge NIHM's online. It will do 40 mph w/ his 250 lb dad riding it. WOO HOO!!!!

newkiraj says: Jul 27, 2007. 1:14 AM **REPLY**
hey I was just wondering 4 one of my other scooters, could I take a 12 V. , and a switch and just hack those right to the motor just skipping the controller? If so, could it damage it at all? Im not sure about the motor's ratings, but its another E100

trebuchet03 says: Jul 27, 2007. 1:58 AM **REPLY**
You would lack control -- in that case, you'd be either all go or nothing. Which, on a scooter, can be a bit dangerous (from a control standpoint). Being able to slowly get up to speed ("slow" being relative to immediately all on) is in fact a safety feature on two wheeled vehicles ;)

newkiraj says: Jul 27, 2007. 2:43 AM **REPLY**

i might rethink doing that... maybe a potentiometer instead of a switch?

newkiraj says: Jul 27, 2007. 2:44 AM **REPLY**

or any type of variable switch for that matter

newkiraj says: Jul 28, 2007. 1:34 AM **REPLY**

Okay, I did it today, I think it might fry the motor eventually, because the original controller is toast, the throttle is toast, and it caught fire. But, now that I put in new EVERYTHING it will go about 25 - 30 MPH -- a lot faster than the original 8 MPH!
xD hope it dosent start on fire again!!

drcrash says: Jun 30, 2007. 9:22 AM **REPLY**

Does increasing the voltage by 50 percent roughly double the power?

For resistive circuits, it generally does---the power is proportional to the square of the voltage, so 3/2 the voltage gives 9/4 the watts. I'm not clear on inductance in electric motors, though.

I'd think that if you saturate the flux capacity of the electromagnet cores, the excess power would be converted straight to heat. Does your motor get very hot?

I'm wondering if there's a simple test you could do with your multimeters to tell when you're saturating the cores, and limit the power to what actually boosts speed, without wasting more as heat. (BTW, those meters look familiar... and really cheap... I have a yellow one and a red one from Harbor Freight, too.)

Also, do you have any links to good instructions for de-sulfating the 12V sealed batteries? I have a couple that need help.

gmanstl says: Jul 25, 2007. 3:54 PM **REPLY**

See Anybody use a desulfator to "restore" old SLAs?
Increasing the voltage by 50 percent will probably smoke your controller before it even gets to the motor.
What motor and controller ar you using?

trebuchet03 says: Jul 25, 2007. 4:50 PM **REPLY**

A 36v controller from the 36V derelict scooter ;)

I used a 24V rated motor - which is still healthy and spinning away :)

gmanstl says: Jul 27, 2007. 12:28 AM **REPLY**

K, the motor may take over 24 Volt, but not 36 Volt. Is it a Unite Motor?

trebuchet03 says: Jul 27, 2007. 1:56 AM **REPLY**

Yep, it's a United Motor - it's been taking the 36V and hasn't had a problem yet. On paper, 36V would be bad for it. In reality, it's a hunk of copper, aluminum, steel and plastic. Remember, for this we care what it *can* do, not what it was intended to do ;) The wire inside is too big for the loads at 24V - so I'm not concerned about a fire or anything of that sort. Switching over to the 36V motor would yield a bit more speed, as it was wound for 36V, but that added complexity to this very short project.