Automatic Power Control of PC Peripherals via a USB, version 1.1

By R. G. Sparber

Protected by Creative Commons.[1]

Each morning, I power up my PC. It is obvious when I forget to flip the switch on the adjacent power strip because my monitor, scanner, and external hard drive are all dead.

The problem comes at the end of the day. I usually remember to turn off the PC but often forget to power down the peripherals.

This bad habit stems from having an automatic power strip that I bought from Radio Shack many decades ago. It monitored the current drawn by the PC and controlled a relay that turned on 4 outlets. A few months ago, it broke. I could not figure out what failed so salvaged most of the parts[2].

Today I have returned to those carefree days with a newly built PC controlled outlet. The job was made far easier than it was for the Radio Shack engineers because I have access to a USB port.

The idea is to power a relay from a USB port and have its contacts switch 120VAC. When the PC is on, the USB drives the relay which turns on the 120VAC. When the PC is off, the USB turns off and the relay disconnects the 120VAC.

---

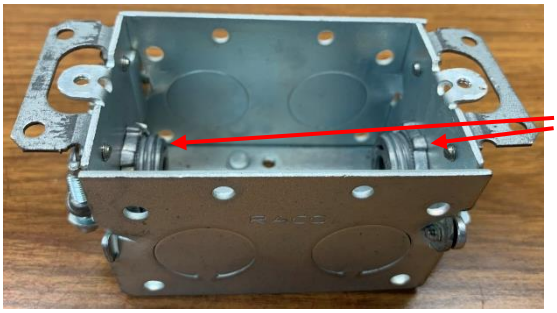
[1] This work is licensed under the Creative Commons Attribution 4.0 International License. To view a copy of this license, visit http://creativecommons.org/licenses/by/4.0/ or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

[2] "feed the disease" – never throw things away!

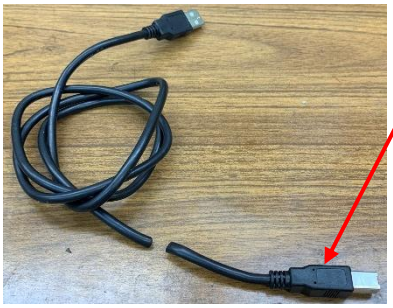
The needed parts have been highlighted in **bold**.

It came as a nice surprise to learn that many modern appliances use a **relay** that can switch up to 10 amps at 120VAC with a coil that only needs 5VDC. This means low cost. I bought 10 of these beauties on Amazon for $7.86 with Prime[3].

The only subtle part of the design was to add a diode across the relay coil. This addresses a potential problem if the USB plug is removed while the PC is running. Without the diode, an arc can form on the plug's contacts plus some of this electrical noise could get into the PC. With the **diode**, there is no arc.



My **enclosure** is this neat outlet box. The sides come off for easy access. I have already installed **cable clamps** in the ends.



I have no shortage of old **USB cable**s. On the remote chance that I will someday need the antiquated USB-B plug, I left a few inches of cable.

I also have no shortage of old **power cord**s with the male plug molded on.

A 15 amp **duplex outlet** will be needed along with a matching **cover plate**.

You will need a soldering iron, solder, wire stripper, and small wire cutter. A piece of heat shrink would be nice but you can use electrical tape. Glue is needed to secure the relay.

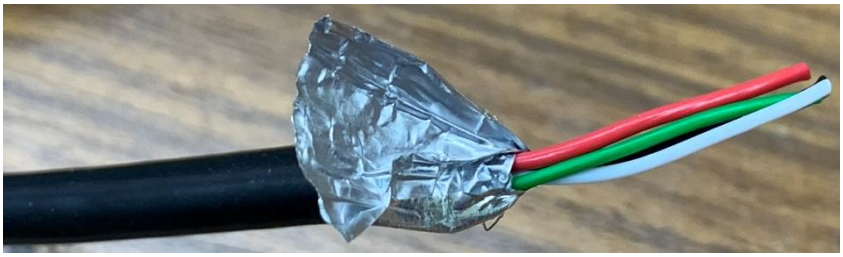
---

[3] Search for "Senmod 10pcs 5VDC Household Appliance PCB Relay SRD-05VDC-SL-C Power Relay 5 Pins for Arduino". This name is misleading because most Arduinos cannot supply enough current to operate this relay.

I need to expose two wires from within the USB cable. Step 1 is to carefully cut off about 1 inch of the outer insulation. You will see a braid of very fine wires under it.

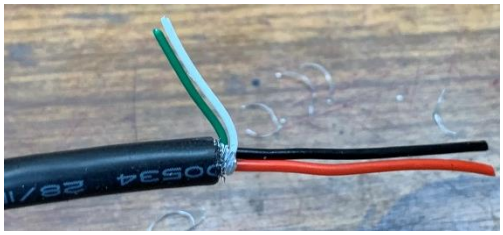
Pull all of those fine wires back to expose a metal foil covering.

Trim off all of those fine wires and carefully inspect the cable to be sure they are all removed. Even one of these wires would cause far too much excitement if it happened to touch the 120 VAC wires.



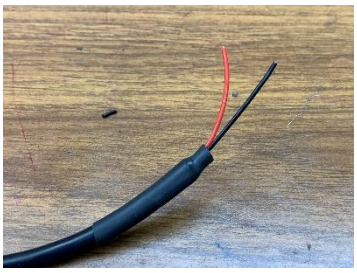
Unwrap the foil to expose the 4 wires.

Trim away the foil being careful not to nick any of the wires.

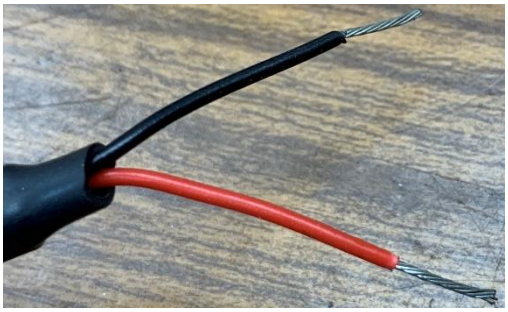


Cut the green and white wires so they are about ¼ inch long. Fold them back against the outside of the cable.

Slide the heat shrink over the USB cable.

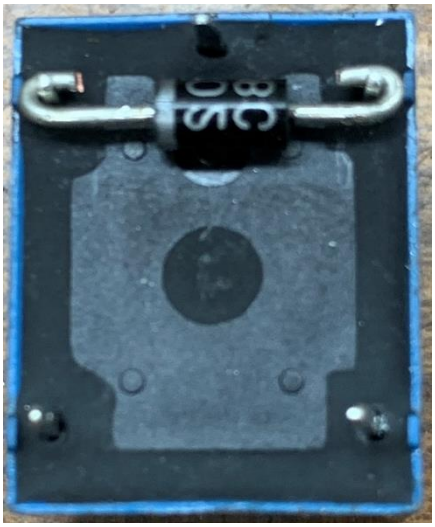


A few seconds with a heat gun and the end of the USB cable is nicely insulated.



Strip about 3/16 inch of insulation from the red and black wire. Then tin each one.

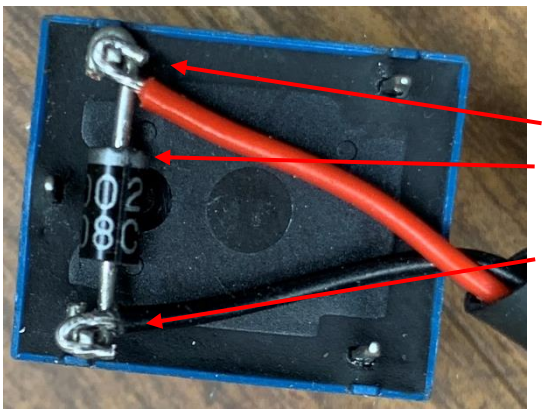
Any small diode will work in this circuit. The only requirements are that you can see the band painted on its body and that it fits across the relay.



We are looking down on the relay with its pins pointing up.

Wrap the leads of the diode around the pins shown here. Crimp the wires so the diode does not fall off.

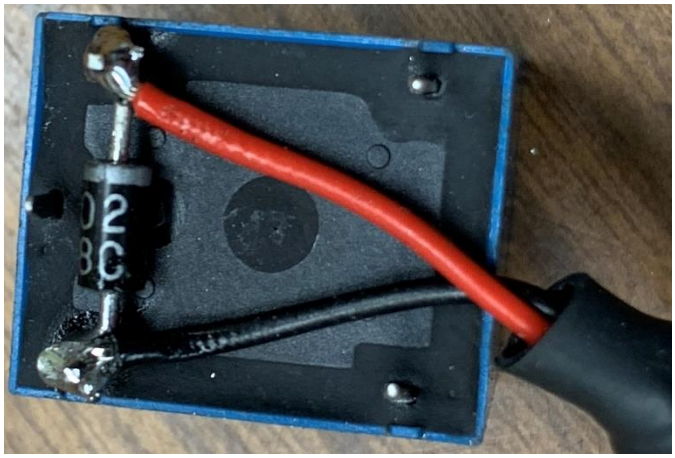
Feed the USB cable through the cable clamp.



Then crimp on the wires:

The red wire goes to the relay terminal that has the band of the diode.

The black wire goes to the other terminal.

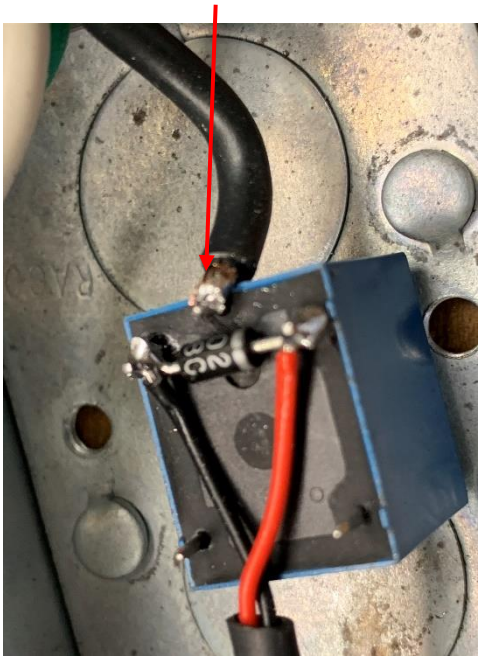


Solder the diode and wires to the relay pins.

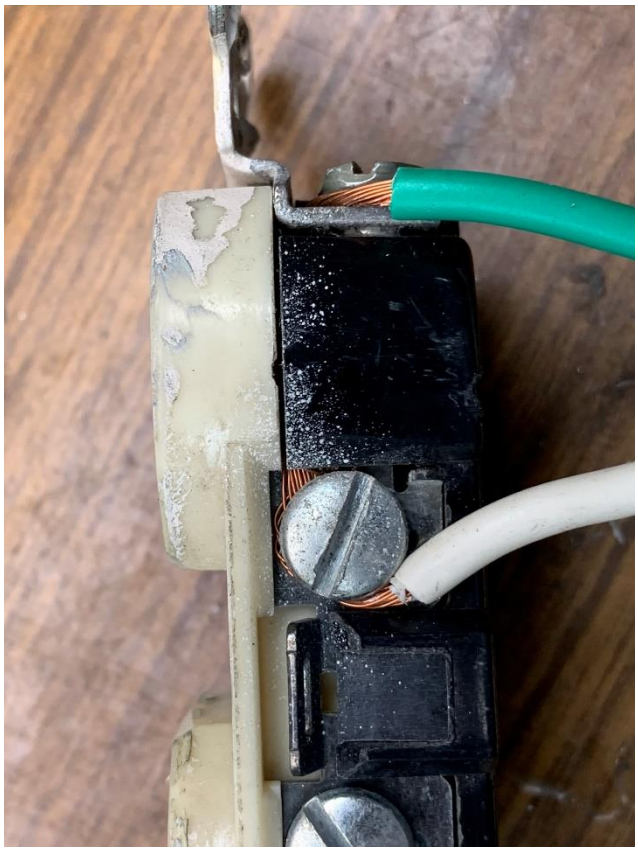
The power cord is fed through its cable clamp.

The black wire is trimmed to reach the pin adjacent to the diode.

Strip about ¼ inch of insulation from this wire and tin with solder. Then solder it to the relay pin.



Now would be a good time to glue the relay to the bottom of the outlet box.
OK, not my best gluing job.

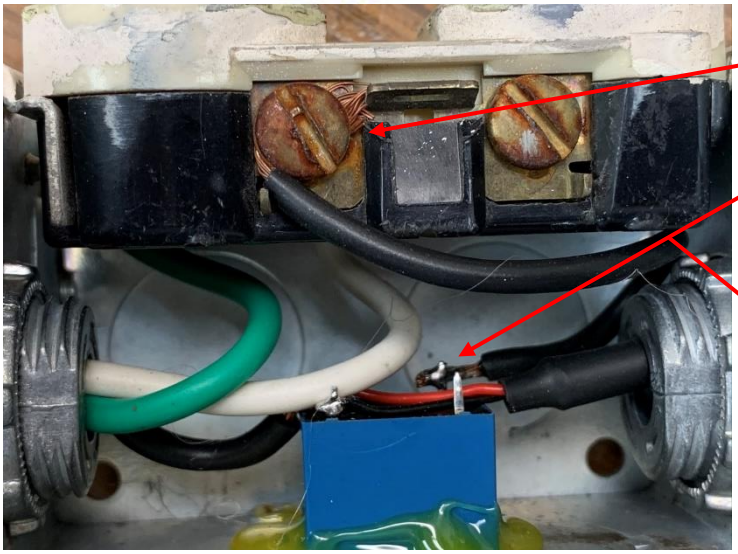


The green wire from the power cable has about ½ inch of insulation removed. Twist the strands tightly together and clamp them under the ground screw of the outlet.

Not shown is a second green wire that goes from this screw to a screw threaded into the metal box. This second wire is essential to prevent shocks if the power lead somehow contacts the box.

The white wire is clamped under the shiny screw.

Note that the white wire is on the same side as the long slot of the outlet.
The black wire is on the same side as the short slot.

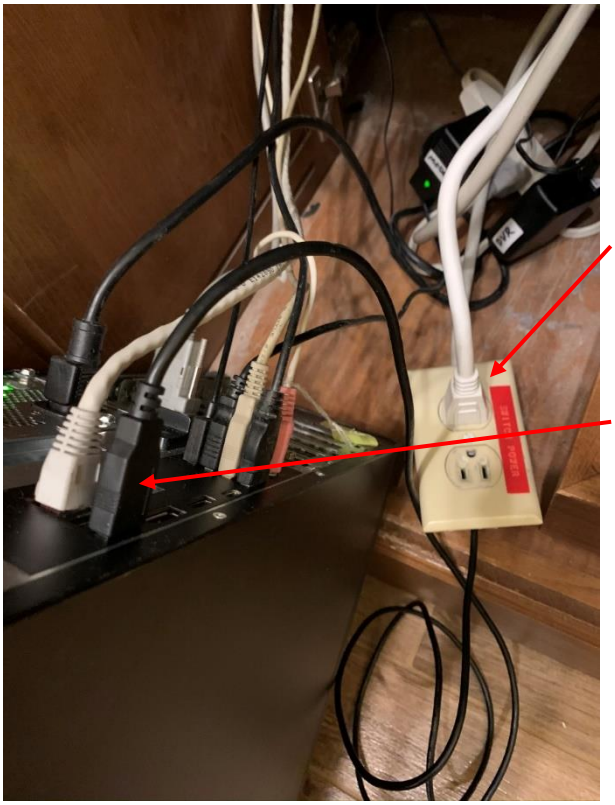


A short length of black wire is secured under a screw that is adjacent to the shorter slot of the outlet and connects to a pin on the relay. This is the pin on the same side as the red wire from the USB cable.

Test the power controller on your PC before the final button up.

Once satisfied that the power controller works, coat the exposed conductors on the relay with heat glue or some other insulation. Having 120VAC and an exposed USB cable in the same box demands at least a little bit of paranoia about the shorting of conductors.

With the sides reattached to the box and the cover installed, I added the label "SWITCHED POWER".



My power strip plugs into my new power controller and

the USB cable plugs into a spare port.

No more having the monitor, scanner, and external hard drive on all night!

One packaging variation is to use a female plug attached to a power cable rather than the duplex outlet. You could then get away with a much smaller enclosure.

I welcome your comments and questions.

If you wish to be contacted each time I publish an article, email me with "Subscribe" in the subject line. In the body of the email please tell me if you are interested in metalworking, software, and/or electronics so I can put you on the best distribution list.

If you are on a list and have had enough, email me "Unsubscribe" in the subject line.

Rick Sparber
Rgsparber.ha@gmail.com
Rick.Sparber.org