Recalibrate P3 International Kill-A-Watt

repairing that which was designed to be unrepairable

The Kill-A-Watt is a convenient and inexpensive way to measure AC line volts, amps, power, VA, and KWH. However, they are built "down to a price" so not the most robust device. (Still, good value for money; only $25 USD at Harbor Freight.)

One failure mode is due to abuse by over current; if you try to draw much over 15A for too long, the internal thermal fuse fails permanently open. There are various youtube videos on how to fix this (mostly by just shorting out the fuse; I'd prefer soldering in a proper fuse).

The other failure mode is that the unit goes out of calibration "suddenly". This is apparently caused by a "glitch" (technical term) causing the internal EEPROM to forget it's contents.

Fortunately, there is a built in calibration program in the Kill-A-Watt. Unfortunately, it does require some special equipment to be able to successfully calibrate the unit. Here is the method I've used, gleaned from the reference links below, plus some experimentation. See below for schematic of a test rig.

First procedure: calibrate for 110 Volts and 0 Amps current.

- Connect the unit to a source of 110VAC. This can be arranged by using a Variac, or by using a heavy-duty "filament" transformer wired to "buck" the line voltage.
- Press "Volt" and "Hz" buttons simultaneously to enter cal mode. Screen reads "oPEn".
- Press "Hz" to accept "oPEn", which I **think** means "open circuit = no load".
- Press "Watt" until you see "C110". This means "cal at 110VAC".
- Press "Hz" to accept "C110".
- Press "Watt" until you see "SAVE".
- Press "Hz" to perform the calibration. This will take a couple of seconds, and afterwards, the Volts display should read nearly the same as your input voltage, and the Amps display should read 0.00.
- Power everything down.

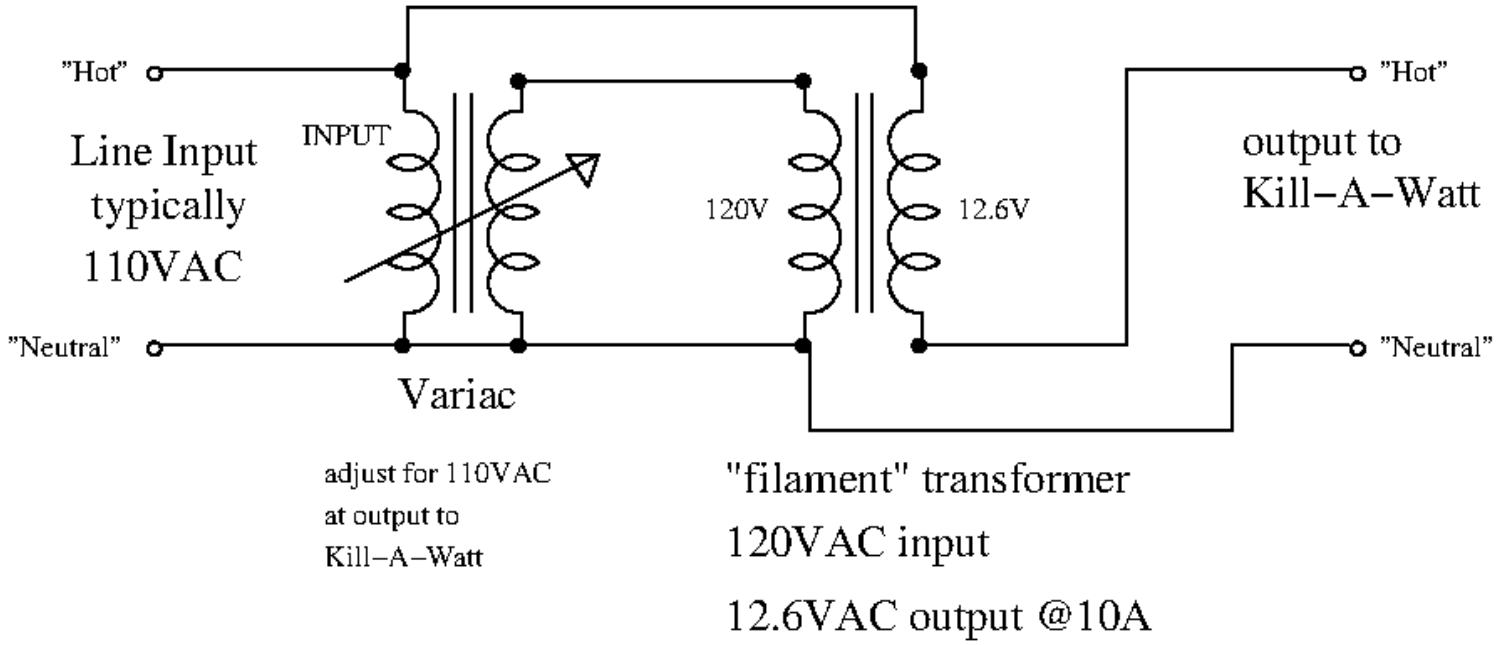
Second procedure: calibrate for 110 Volts and 10 (ten!) Amps current.

- Arrange for a load that draws 10 Amps at 110V. One can do this using a combination of hot-plates, space heaters, and incandescent light bulbs. You will probably have to adjust the way you get your 110V, as with the increased load, resistive losses will probably cause the voltage you used in the first procedure to drop significantly below 110V.
- Press "Volt" and "Hz" buttons simultaneously to enter cal mode. Screen reads "oPEn".
- Press "Watt" until you see "C110". This means "cal at 110VAC". Since we didn't choose "oPEn", it assumes 10Amps.
- Press "Hz" to accept "C110".
- Press "Watt" until you see "SAVE".
- Press "Hz" to perform the calibration. This will take a couple of seconds, and afterwards, the Volts display should read nearly the same as your input voltage, and the Amps display should read near your load current value.
- Power everything down.

That's it. The unit will be calibrated to the accuracy of your own measurements and ability to set V=110 and A=10.0. I got close-ish, so my Kill-A-Watt is off a percent or two.

Test Rig

The test rig needs to deliver 110VAC to the Kill-A-Watt, and it needs to do it both at no load and at 10Amps load. Below is a schematic of one test rig that would work. It does not show the load; as stated above, that's whatever combination of space heaters, hot plates, and incandescent bulbs you can cobble together.



The Variac does not need to be rated for more than about 100 watts, as it's only used to drive the filament transformer primary. Of course, if you have a great big Variac that can handle 1100 Watts, then just use that, and you can skip the filament transformer. In that case, just hook the Kill-A-Watt that you're calibrating to the output of your huge Variac.

The filament transformer needs to be hooked up so that the secondary is "bucking" the line voltage. "Bucking" means "subtract"; the filament voltage (nominal 12.6 v) will be subtracted from the (nominal 120v) line voltage, at least if the filament primary sees the entire line voltage. As you reduce the filament transformer primary voltage with the variac, the buck voltage will also decrease, so that the output (line voltage minus filament voltage) will increase. If the output voltage is higher than the input voltage, then the filament transformer is "backwards" and you should reverse the connections to the secondary.

"Variac" is probably a trademarked name for a variable AC transformer. As far as I'm concerned, it's practically a generic term.

Warning! Danger Will Robinson!

AC Mains voltage will kill you. Don't be fiddling with the wiring of your test rig whilst it's plugged in. **AC MAINS VOLTAGE WILL KILL YOU.** Don't attempt to build this if you're not comfortable working with mains electricity.

References

1. announcement of discovery of the calibration menu
2. This looks like another post by the same person who made the above post.
3. A forum with an enlightening discussion of the calibration menu
4. more on this forum about the calibration menu

FAQ

Q. Will you fix my Kill-A-Watt?

A. No, I'm retired and so not interested in a job.

Disclaimer/Warning

This is just my "repair log". I don't claim that doing what I did is safe or recommended.

Soldering irons are dangerous, be careful. Oh, and don't eat the solder.

William Dudley
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