



**PN PSTK-120 PowerSwitch Tail 120vac Kit
PN PSTK-240 PowerSwitch Tail 240vac Kit**

- **120vac (PSTK-120) and 240vac (PSTK-240) versions with customizable control signal voltage.**
- **Can be wired for normally closed (NC) or normally open (NO) operation.**
- **This is a parts kit; assembly is required. User provides power cords to match country of use.**
- **3 to 24vdc control signal range.**
- **Drive directly from microcontroller pin with as little as 3vdc @ 3ma or 5vdc @ 10 ma.**
- **20 amp switching capacity; 5300vrms isolation.**
- **Two wire control signal; no separate dc power source required.**
- **No exposed ac wiring.**
- **LED status indicator.**

CAUTION: Please make sure you have or have access to the skills necessary to assemble and use this product. Always secure the case with the included screws before applying electrical power to the power cord. Please read this entire document before starting assembly. Our liability is limited to the purchase price of this product only. By using this product you agree that PowerSwitchTail.com, LLC cannot be held liable for any damages or injuries resulting from use or repairs.

The PSTK-120 or PSTK-240 kit allows you to customize the PowerSwitch Tail product to meet your application needs. There are two kit models. The PSTK-120 is designed to operate with 100-120vac devices and power sources. The PSTK-240 is for use with single-pole 200-240vac devices and power sources. Both products provide single-pole switching at 20 amps max. These kits have 1C contact relays and can be wired for either normally closed (NC) or normally open (NO) operation.

The PSTK-240 is a single-pole device and will not work with two-pole switching of 220vac mains commonly found in the US and Canada.

Before You Start:

For proper operation, the power source must be connected to the solder pads or terminal block J2 labeled "LINE" of the printed circuit board (PCB). This is because power to operate relay K1 is derived from the "LINE" side power cord. The PSTK-xxx will not operate if the source of power is connected to the "LOAD" side pads. The plug or "male" power cord should always be connected to the "LINE" side of the circuit board.

You can optimize the voltage required for the control signal by selecting and installing different resistor values for R1 and R2. See table on page 2. In general, the resistor values are set to provide a control signal current between 3-15ma across the voltage range shown below. You can experiment with different values if the control signal voltage or current is limited. We have tested units that operate as low as 3vdc @ 3ma.

| Input Voltage | R1 | R2 |
|------------------|----------|----------|
| 3 – 5 volts dc | 1K ohm | 470 ohm |
| 5 – 12 volts dc | 1.5K ohm | 1.1K ohm |
| 12 – 24 volts dc | 4.7K ohm | 3.0K ohm |

Note to advance users: Since the input is an opto-isolator, input current is the triggering parameter. For any input voltage, the value of R2 should be selected for 3-10ma and not to exceed 20ma.

The power cords may be soldered directly to the pads on the circuit board (recommended for loads >14 amps) or attached with optional 3-position terminal blocks J1 and J2. If using the terminal blocks, be sure to install them with the wire slots facing toward the edge of the board. The maximum size wire for the solder pads is #10AWG and the terminal blocks is #14 AWG.

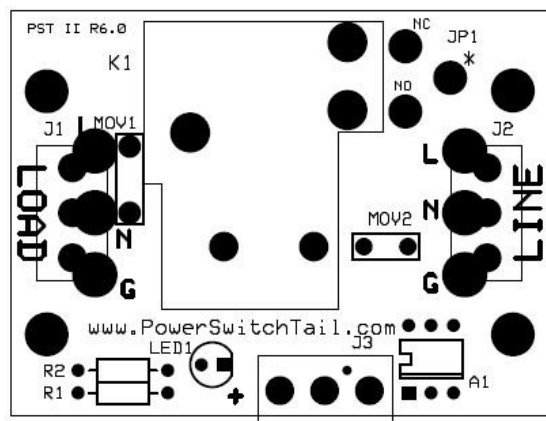
Assembly:

All components are inserted from the component side (side with the white lettering) of the circuit board. The circuit board is labeled with the outlines and IDs of all components. Certain parts are polarity sensitive and must be installed correctly. Solder the specified parts and trim off the excess lead lengths before moving to the next step.

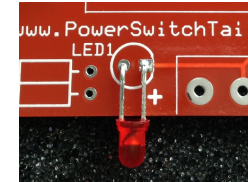
Note: To prevent damage during shipping, chip A1 is inserted in the back side of the PCB. Remove and install from the top side when instructed in step 6.

We suggest assembling the kit in the following sequence:

1. Install LED1. The short (cathode) lead on the LED goes in the hole with square pad. The LED sits on the edge of the PCB and inserts



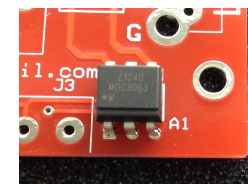
into the hole in the side of the case. It may be easier to solder the pads from the top side of the circuit board instead of the solder side. NOTE: The “+” sign on the PCB is for J3.



2. Install resistors R1 and R2 using the selected values.
3. Install the 3-position terminal block J3. Make sure the wire slots are facing toward the edge of the circuit board so that they are accessible through the cutout in the enclosure.



4. If you are using the optional 3-position terminal blocks for J1 and J2, install them with the wire slots facing outward toward the edge of the circuit board.
5. Install the two MOV (Metal Oxide Varistors) at MOV1 (14mm unit) and MOV2 (7mm unit).
6. Install SSR chip A1. Make sure the “bar” on the chip case is facing the edge of the circuit board.



7. Install relay K1.

8. Install wire jumper JP1 between "*" and "NO" for normally open (NO) operation. For normally closed (NC) operation, install the wire jumper between "*" and "NC."
9. Before attaching the power cords, slip the rubber grommets over the power cord cables.

On each end of the PCB are three large pads labeled "LOAD" and three large pads labeled "LINE." These pads also connect to the smaller pads for the optional terminal blocks J1 and J2 respectively.

The LOAD side connects to the load usually a corded receptacle. The LINE side connects to the source of power usually a corded plug.

In the next steps, solder the power cords to the large solder pads or connect them to the terminal blocks as follows:

L(ine) pad: Black wire (US) or **Brown** wire.

N(eutral) pad: White wire (US) or **Blue** wire.

G(round, safety) pad: Green wire (US) or **Green/Yellow** wire.

When using the terminal blocks, turn the screws CCW to open the gates in the wire slots, insert the stripped wires, and turn the screws CW to tighten.

10. Attach the plug side or "male" power cord to the pads labeled "LINE" or terminal block J2. **This is the power cord that normally connects to the source of electrical power.** Refer to step 9 and Figures 1 and 2 for color code standards.
11. Attach the receptacle, outlet, or "female" power cord to the pads labeled "LOAD" or terminal block J1. **This is the power cord that normally connects to the device or appliance that uses the electrical power.** Refer to step 9 and Figures 1 and 2 for color code standards.
12. Visually inspect your work and double-check your solder connections. Be sure all joints on relay K1 and the power cords are full. Retouch any joints if necessary.

13. Inspect the power cord wiring on the top side of the circuit board and at the entry points of the terminal blocks. If you are using

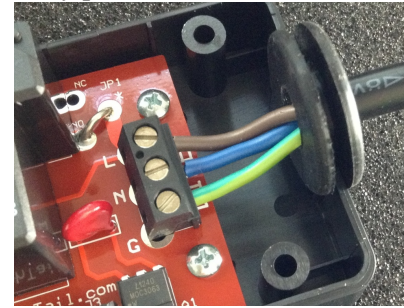


Fig 1: Line cord attached to optional terminal block J2, European cord.



Fig 2: Line cord attached to optional terminal block J2, US/Canada cord.

stranded wires, look for possible shorts between adjacent wire connections caused by stray wire strands that do not enter the holes or wire slots completely.

14. Install the circuit board into the bottom of the case by aligning the LED with the hole in the case wall and the grommets to the slots in case ends. Secure the board with the 4 short screws.
15. Install the case cover by aligning the case top over the grommets. Make sure the three holes are over the control signal terminal block. Turn the case over and secure the case halves using the 4 long screws.

16. On the case top label, mark the appropriate control voltage range to match the installed resistors R1 and R2.
17. Attach the actuating signal wires to the 3-position terminal block J3. Observe polarity (+ lead to terminal 1 and - lead to terminal 2). At this point, you can test the actuating signal wiring by applying the control signal and observing the LED. The LED should go on when the signal applied. At this time, relay K1 will not operate.
18. Plug the line side power cord into the source of power. The relay should now respond (hear the click) when the control signal is applied. Turn off the control signal and attach your ac powered device or appliance to the load side power cord. Apply the control signal to turn on power to your device or appliance.

CAUTION: If you wired the PSTK for normally closed operation, the outlet side of the PSTK will be energized without the application of the control signal. Also the LED indicator will not be lit.

Notes:

1. Relay K1 and the PSTK-xxx case gets warm during normal usage.
2. No “phantom” power is drawn when relay K1 is not energized.
3. The PSTK-xxx is not intended for use in outdoor environments.
4. Always disconnect power to the LINE side power cord before opening the case.
5. The relay is capable of switching 40 amps. However, the traces on the circuit board and power cord codes limit the maximum current to 15 or 20 amps depending on the electrical code in your country. When driving loads greater than 14 amps, solder the mains wires directly to the PCB.
6. The Ground terminal (terminal 3) is internally connected to the safety ground (Grn or Grn/Yel wire) of the power line. Connection to this terminal is optional.

7. The PSTK can be connected directly to any I/O ping of most micro controllers. This includes Arduino and its variants, Beaglebone, Raspberry Pi, etc.

Troubleshooting:

You can test your PSTK-xxx by performing the following:

1. With the mains power disconnected or turned off, create a control signal source by connecting two 1.5v batteries (any size) in series (the + side of one to the - side of the other). This will give you an approximate 3.0 volt dc source. Or you can use another power source that you know can output at least 3 ma @ 3.0 volts.
2. Connect the + (positive) side of the dc source to terminal 1 of the PSTK-xxx and the - (minus) to terminal 2. The LED should go on. If it does not, reverse the leads on terminals 1 and 2.
3. Energize the mains power to the LINE terminals of the PSTK-xxx. A load of the PSTK-xxx LOAD terminals is not required. You should hear a “click” indicating the relay is actuated.
4. Remove the control signal (battery or power source) and the mains power. Connect a electrical device to the LOAD terminals.
5. Reapply the control signal. You should again hear a “click” and power should be applied to the device or load. If not, check to be sure any power switch on the device or load is turned on.

Also here is a link that you might find helpful: <http://techvalleyprojects.blogspot.com/2012/04/powerswitch-tail-ii-and-arduino.html>

For assistance, please contact us at support@powerswitchtail.com.

Soft copy of this and related documents can be found at www.powerswitchtail.com.

Parts List

Product: PSTK-120 and PSTK-240

Revision: Rev 6

Date: 6-30-2014

Substitute the following for the PSTK-240

MOV1 Metal Oxide Varistor, 14mm 250V (V250LA20AP)
MOV2 Metal Oxide Varistor, 7mm 250V (V250LA2P)
K1 Relay, Power 40A 240VAC coil (AZ21501-1C-240A)

| ID | Description |
|------|---|
| J1 | Terminal Block, 5.08mm, 3 position (Not included with kit.) |
| J2 | Terminal Block, 5.08mm, 3 position (Not included with kit.) |
| J3 | Terminal Block, 5.08mm, 3 position (39880-0303) |
| LED | LED, 3mm, Hi-eff Red Diffused |
| MOV1 | Metal Oxide Varistor, 14mm 130V (V130LA10AP) |
| MOV2 | Metal Oxide Varistor, 7mm 130V (V130LA2P) |
| R1a | Resistor, 1.0K ohm, 5%, 1/4w (Brn-Blk-Red-Gold) |
| R1b | Resistor, 1.5K ohm, 5%, 1/4w (Brn-Grn-Red-Gold) |
| R1c | Resistor, 4.7K ohm, 5%, 1/4w (Yel-Vio-Red-Gold) |
| R2a | Resistor, 470 ohm, 5%, 1/4w (Yel-Vio-Brn-Gold) |
| R2b | Resistor, 1.1K ohm, 5%, 1/4w (Brn-Brn-Red-Gold) |
| R2c | Resistor, 3.0K ohm, 5%, 1/4w (Orn-Blk-Red-Gold) |
| K1 | Relay, Power 40A 120VAC coil (AZ21501-1C-120A) |
| A1 | SSR, Opto-isolated, 600V (MOC3063) |
| PCB | Circuit Board, PN PST rev 6 Case, ABS, with 4 screws PCB screws (4 each) Grommets (2 each) |
| JP1 | Wire, 16awg solid, 1 inch |

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