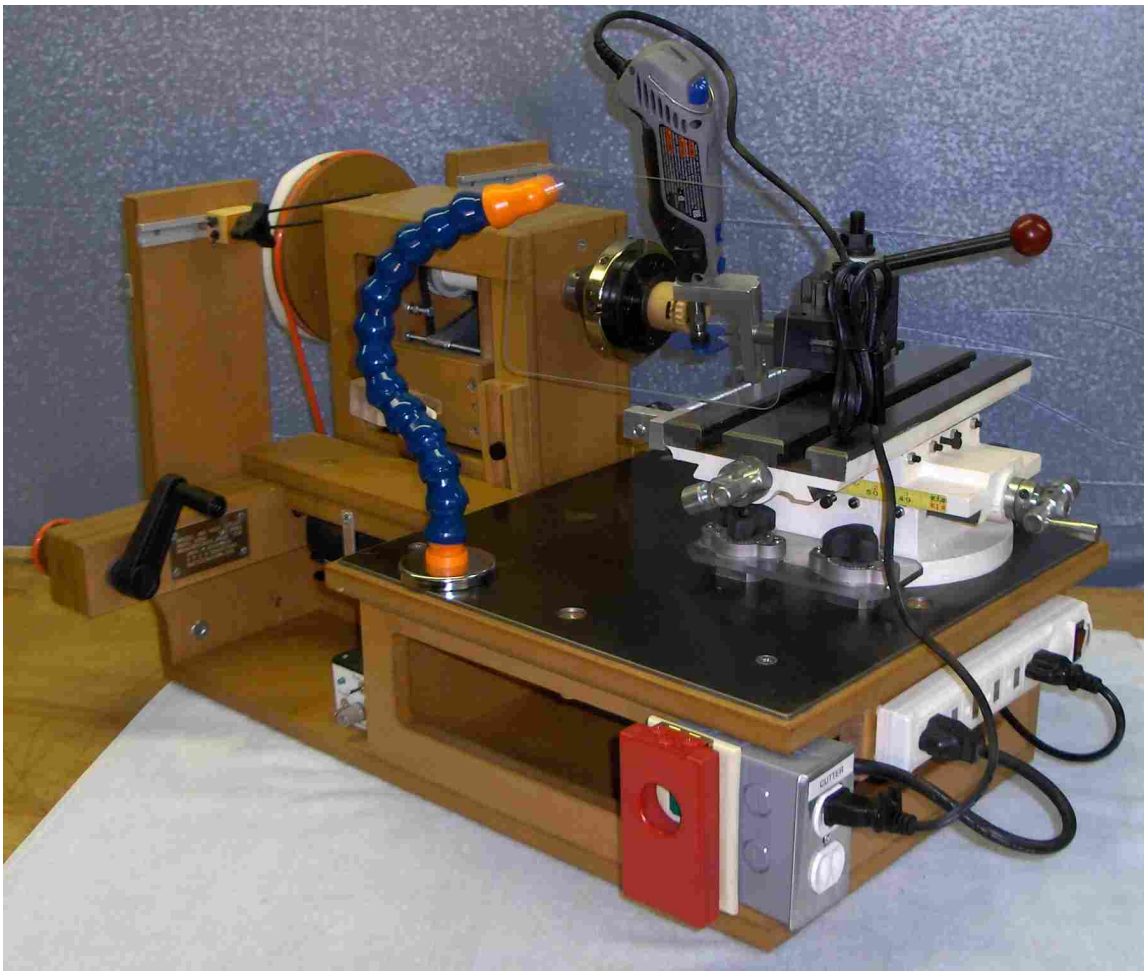
A Safety Switch for Your Tools

Before retiring several years ago, I was a machine designer at Hewlett Packard. Over the years I've also set up a number of machine tools in my home workshop. Some of them have had poorly located or hard-to-operate power switches.

One of my paramount concerns has always been user safety. An on/off switch should be easy to reach, should be so easy to operate that it's naturally used properly *every time,* and should make it *very easy* to turn the tool off in case of an emergency.

With those goals in mind, I designed the safety switch (actually a switched outlet) described here. It's built from readily available materials. The photo below shows the switched outlet installed on the right front corner of a Rose Engine (a woodworking tool using high speed cutters powered by a Dremel tool) that I built. I've placed similar switches on my table saw, bandsaw, and an auxiliary outlet for a toolpost grinder on my Grizzly 9x20 lathe.

NOTE - If you want to use the switch operator on a “hard-wired” switch for your power tool, note the changes to the materials list, skip the initial switch box assembly, etc. Just build the switch operator, install a Decora switch, and go through the final checks.



DISCLAIMERS

First off, I'm not an electrician. Building the switch involves 115 volt AC wiring. If you're not an electrician either, please hire one to do the wiring for you. That way, you're assured that everything is in compliance with electrical codes. For instance, I've heard that “altering” a wiring device (such as a box) will void the UL certification and/or violate code. As far as I know, however, I'm not asking you to make any alterations - just make use of existing features such as knockouts and pre-molded mounting hole bosses. But check with someone who knows! The wiring is pretty simple, so the cost should be minimal. Be safe - it's worth it!

Secondly, the switch used here is rated for 120 volts single phase AC, 15 amps maximum. It will not work with 230 volt tools or higher currents, and I have no idea how to modify the circuit to make it work. Consult your electrician.

Thirdly, there's no copyright on any of this. Please feel free to reproduce, re-post, edit or rewrite as you wish. I'm not in this for the money. I just want to help you stay safe. And of course, feel free to reconfigure the box orientations to suit you own needs.

Finally, the ultimate responsibility for safety is YOURS. I can only offer something that I think will make it easier for you to safely operate your own tools. I can't be there to make sure you and your electrician build, maintain and operate the switch correctly, so I'm not responsible for the results.

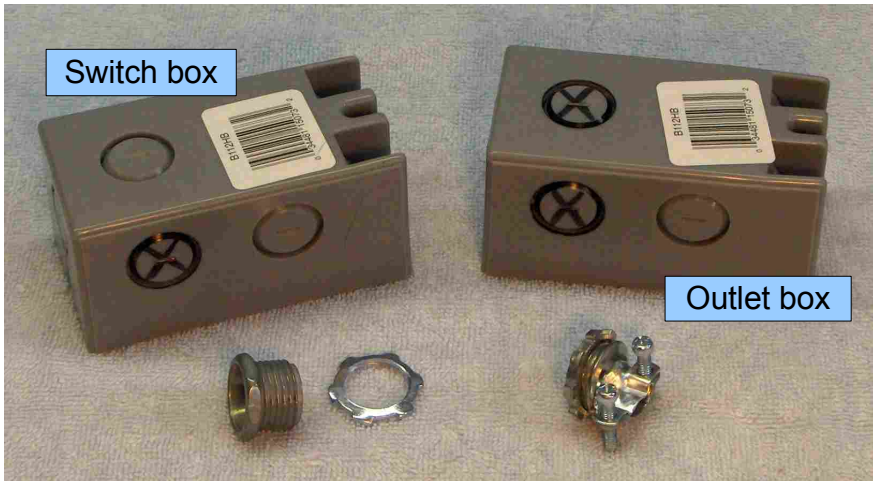
MATERIALS LIST (for a switched outlet)

2 each*	Carlon B112HB single gang PVC box
1 each*	Chase nipple, 1/2”
1 each*	Lock nut, 1/2”
1 each	Cord clamp, 1/2”
A/R*	PVC cement
1 each	2 1/2” x 4 1/2” piece of 3/4” MDF, plywood or hardwood
1/2 pkg	Stanley 80-3320 “Classic Brassware” 1 1/2” hinge (pkg of 2) -or- Ace Hardware 5301486 “Shutter Hinge” (pkg of 2)
3 each	Wood or sheet metal screws, 1/2” to 3/4” long
A/R	Red paint (optional)
A/R	Green electrical tape (optional)
1 each	Self-stick felt bumper pad, about 3/4” diameter (optional)
A/R	Fasteners to mount switch boxes to tool
1 each	Decora single pole rocker switch (Leviton 5601-02 or similar)
1 each	Decora wall plate
1 each*	Dual outlet
1 each*	Dual outlet wall plate
1 each*	Power cord & plug, 3 wire, length to suit
A/R	Additional wire suitable for 115V

*NOTE - For hard-wired switch, use just one box; omit other items marked with asterisks.

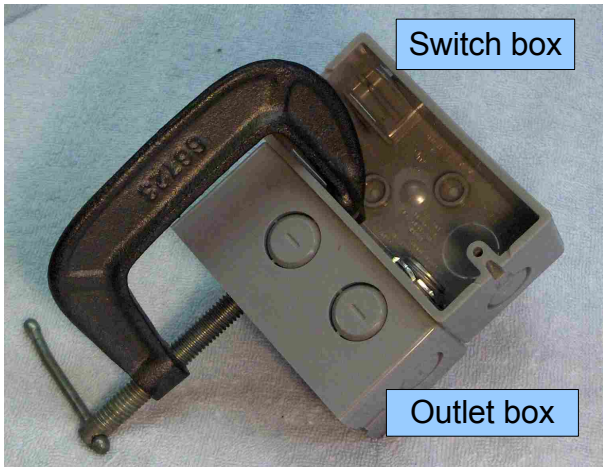
INITIAL SWITCH BOX ASSEMBLY

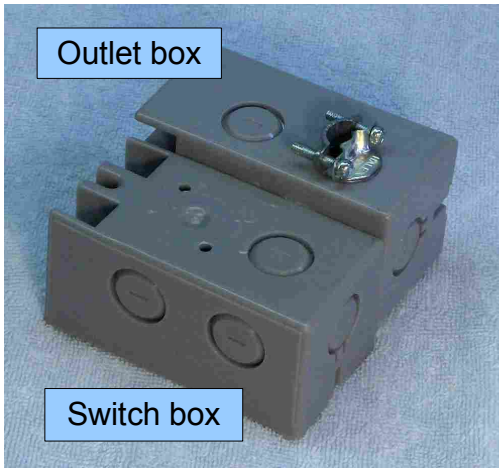
Purchase two Carlon B112HB single gang PVC boxes. One will hold the Decora switch and the other the dual outlet. These are available from various sources. I've bought them at Home Depot (marked as “old work” boxes) and other local stores for about a dollar each. I've also seen them on Ace Hardware's website for 69¢. I like these boxes because they do a good job accommodating both the device mounting screws and the wall plate mounting screws, have nicely placed knockouts, and can be glued together with PVC cement.



Assuming you want to mount the switch box at the right front of a tool, “surrounding” the corner as shown in the first photo, remove two of the knockouts (marked “X”) from one box and one from the other. You can vary the configuration to fit your tool; remove whatever knockouts are appropriate. What you'll need, unless you're hard-wiring the switch, is a through-hole between the boxes and a power cord entry hole in one of them.

I usually sand the mating surfaces before gluing, but this is not absolutely necessary. Loosely assemble the boxes side-to-back (or whatever) with the chase nipple and locknut. These will help align the boxes when they're glued. Apply PVC cement to the mating surfaces, align the boxes, tighten the locknut, and hold the boxes together for a few minutes. I've found that a C-clamp, located as shown, to be helpful in holding the sides of the boxes flat against each other while the cement does its magic.

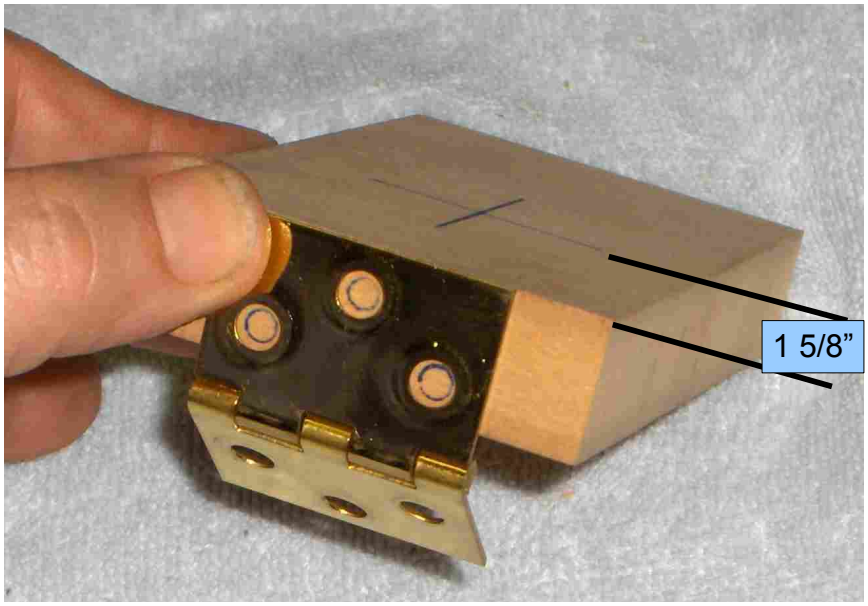




Once the boxes are glued together, mount the cord clamp in the remaining knockout hole. Drill out whatever mounting holes are appropriate, using the “pre-molded” features inside the rear surface of the box(es). For a corner installation like mine, these are the ones on the switch box - the one without the cord clamp.

SWITCH OPERATOR PREPARATION

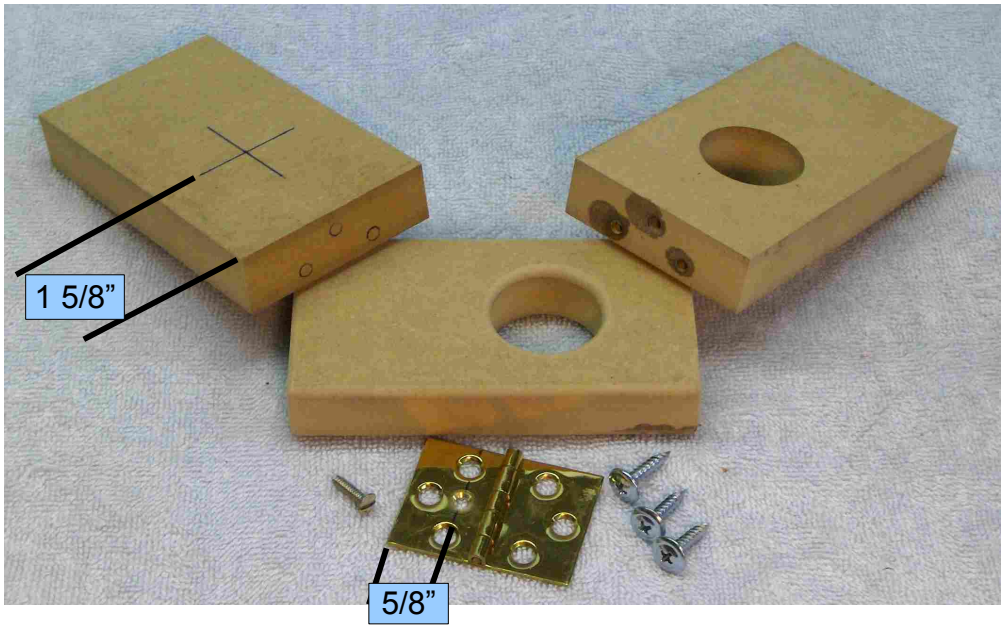
I generally fabricate the switch “operator” from 3/4” MDF. 3/4” plywood or hardwood will work, too, but use “the good stuff,” as you'll be drilling and driving screws into the edge grain.



First mark a spot 1 5/8” from one of the ends and halfway between the long sides. Then hold a hinge against the same end (centered side-to-side, with its edge aligned to the face of the MDF) and mark the three hole locations (two locations for the Ace “Shutter” hinge).

Drill a 1 1/4” hole through the MDF at the first mark. The size of this hole is not critical - it's simply finger clearance. I'd not go below 1” or above 1 1/2”. Drill pilot holes at the marked locations on the end. Caution - MDF *loves* to split whenever a screw is driven into its “end grain.” Drill generous pilot holes and strengthen them with Super Glue! Round the edges of the finger hole and the outer edges of the MDF. I generally use a 1/8” roundover router bit for this task.

Mark and drill a 5/32” hole through one leaf of the hinge. Locate the hole on the centerline and 5/8” from the outer edge. Countersink the “hinge barrel” side of the hole and deburr the opposite side. This hole will be used to attach the hinge and the operator to the switch.



Once you have the switch operator and hinge drilled and the operator smoothed, they can be assembled to each other, masked and painted. If you use spray paint, be sure you've carefully masked the barrel section of the hinge, so the paint doesn't get in and gum it up. I like to use red paint, as in “Hit red to stop.” If you want to (later on), you can put some green electrical tape on the upper half of the Decora switch - “Green for go.”

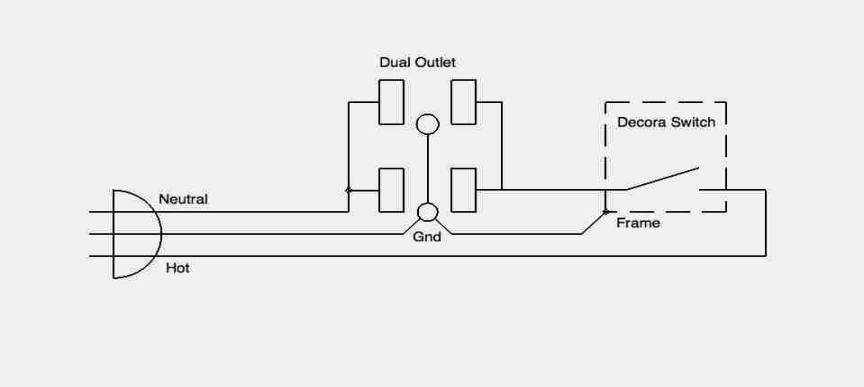
SWITCH BOX MOUNTING

Mount the switch box assembly to your tool with whatever fasteners are appropriate, using the holes you've previously drilled through the molded features of the box(es). Once they're mounted, you can determine the length of power cord to specify to your electrician. The Rose

Engines I've built include an outlet strip along the side of the base, so a cord length of about a foot is OK for my configuration.

WIRING

Now's the time to give your electrician all the parts (except possibly the switch operator) and have him (her) wire and assemble the switch box for you. It's probably redundant, but here's the schematic:



Along with specifying the cord length, you'll want to ask your electrician to be sure to mount the Decora switch correctly. It's very important that that the end marked “TOP” is indeed at the top. Otherwise, the on/off functioning of the switch will be incorrect!

FINAL CHECKS

If your electrician hasn't installed the switch operator, install it yourself. Remove the upper screw from the wall plate and re-install it with the switch operator in place. Note that the lower edge of the hinge rests against the upper edge of the switch surround. This keeps the operator from rotating out of place. If necessary, bend the bottom 1/4” of the hinge leaf slightly downward to keep it against the switch.

Verify that the operator swings freely and that its lower section positively shuts the switch off when any part of the operator's front surface is pressed. If necessary, add a small self-stick felt bumper about an inch from the bottom of the operator.

USING THE SAFETY SWITCH

Verify that your tool is switched off. Connect the safety switch to a live power outlet and plug in your tool. Push on the face of the switch operator to turn off the power to the attached outlet. Then turn on the power switch on the tool.

To start the tool, reach a finger through the hole in the switch operator and depress the top of the switch. “Green for go.” To stop the tool, push anywhere on the face of the switch operator. “Red for stop.” You can even press downward on the upper edge of the operator.

Yes, this is obvious! But being obvious (and *natural* and *convenient*) is the whole point of the exercise. The safety switch should be what you ***always*** use to turn the tool on or off. This serves two purposes. First, operating the switch keeps your hand (or maybe the arm/sleeve you'd be reaching over the tool with) away from the moving parts of the tool. Second, developing the habit of ***always*** using the safety switch to shut the tool off might just prevent or minimize an injury some day, when you need to turn the tool off in a hurry.

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