

Why does this *(\$ ^#^ thing pop when I hit the bypass switch??

Whether there is a pop when you bypass or un-bypass a box depends on whether the internal circuits have been carefully designed to prevent it, or if there is a flaw in the circuit that makes a formerly-quiet box now pop at you.

What causes the pop? All pops from bypass switching come from a sudden change in voltage level on the signal line going into the amplifier from the effect. This sudden change can come from three and only three things in non-defective pedals, assuming even marginally competent design:

1. the input and output capacitors on the effect will always leak a little bit of DC, no matter how good they are. When the pedal is bypassed in the "classic" true bypass circuit (see "The Technology of Bypasses" at GEO) both capacitors are open circuited. While they are open, the leakage will shift their DC voltage a little, and when the pedal is un-bypassed again, the capacitors have to charge back to their in-use voltages. That sudden voltage difference and the charging current that brings the capacitors back to the working voltage is heard in the amplifier as a pop. If the effect has any gain, the input capacitor pop is further amplified by the gain of the pedal into a bigger pop.

2. for non-mechanical switches the switch elements may couple a little of their control signal into the signal path. This is what happens with JFET, CMOS and relay bypass switches. If any of these are driven with a sudden-change control voltage, the unavoidable capacitances inside them can couple the fast wavefront into the signal lines, and this makes a pop. Some CMOS switches couple only a nanosecond or two of sound in, but several volts of it. The amplifier could not normally respond to this, but it overloads other circuits in the effect, and that overload is then heard as a pop.

3. finally, for true-blue mechanical switches, if the signal itself is not at exactly zero volts when the mechanical contacts touch (and bounce a few times!) this makes an instantaneous change of signal level just because the **signal** is suddenly connected. This tends to be smaller, but some people hear this as a pop. If the switch bounces a bunch, there is a whole train of these on-again, off-again signal bounces, so there's a "crackle/pop" sound if it's really bad.

Here are the fixes:

1. For mechanical switches, put a 100K to 4.7M (exact value does not matter) resistor from the "outboard" end of both the input and output capacitors to ground. This keeps the ends of the capacitors pulled to the right voltage all the time, and cures the leakage problem. No capacitor clicks.
2. Ramp the control voltage up/down slowly (over a mS or two) to keep it from being coupled through the small capacitances.
3. No help here. Live with it, only switch when your guitar is quiet between notes, or use #2.

It is also possible that your stomp boxes pop from an assortment of defects in the box, or from causes outside the box itself. If anything puts DC on the signal line from outside the stompbox, the stompbox output cap will be dutifully pulled to 0V by pulldown resistors when the effect is bypassed, and you'll hear a find [pop] when the effect is brought back in as the capacitors are asked to charge to some other voltage suddenly. No amount of fixing on the box itself will make this go away. Fortunately, you can use a DVM to measure the DC on the signal lines and figure out whether it's the stompbox itself or something outside that's causing this to happen. Just measure the DC voltage between the tip and ring of a cord plugged into the input and output of the stompbox with the effect NOT bypassed. If the stompbox has an internal problem like a leaky coupling cap, there will be DC. If there's no measurable DC voltage, the popping is something outside the stompbox.

So - why do your expensive boutique boxes pop? Since I think they use mechanical switches, you're seeing either #1 or #3, maybe something outside the stompbox. Be sure that you have the "pull-down" resistors connected from the input/output capacitors to ground **on the effect board**. If they used to be quiet, and are now starting to pop, an input or output capacitor may have partially failed, and have become so leaky that the pull down resistors that are there can't pull the leakage to ground level anymore.