

CRUZ DRIVER "L" V1.0

based on Jon Patton's circuit

OVERVIEW

This is a Tube Driver built with FETs. Jon Patton built it for a customer in a 1590A enclosure. This is the "L" = 1590B version.

GENERAL

What Jon says about this circuit:

This was a fun challenge, and it came together pretty quickly once we identified what would work well with his amp at home (a Bruno S100, holy crap) and on a big Fender. At home he just wants a "more" button, so I had to make sure there was a flat dirty boost in here somewhere.

I replaced the op amp buffer + inverting drive stage with a MOSFET booster, and replaced the tube stages with FETs in the normal manner. Note that the design inverts phase, which the original did, too.

I moved the tone controls to put it before the last gain stage because otherwise it was just insanity on the gain levels. It's already pretty nuts even with all the cuts in front of each stage, but this gives a lot more control over the overall clipping.

The tone control and switch are really what make this cool. (Thanks to Cody and Thomas for tossing around some ideas, even if I ultimately went with something different.) Really I'm just repurposing once again the tone control from my Sakura amp, but everything worked out just right for me to get a third mode out of this one and to have a usable bass control.

1) The bass control just shaves off some low frequencies below about 400Hz. It's a shelf filter, so the bass isn't gone, just deemphasized, and at 5:00 the cutoff is at 18Hz.

2) Treble/Tone control: This is based on a version of the Big Muff tone control, with the resistor to ground for the low-pass removed. A lot can be done to radically alter the behavior of the tone control just by varying C9, so that's what the switch does. R8 is a small resistor (I picked 2.2K) to limit the ultimate range of the tone control so that it doesn't turn into a full low-pass filter, but it can be omitted for some very very dark settings in the scoop mode. I just don't like tone controls that bottom out.

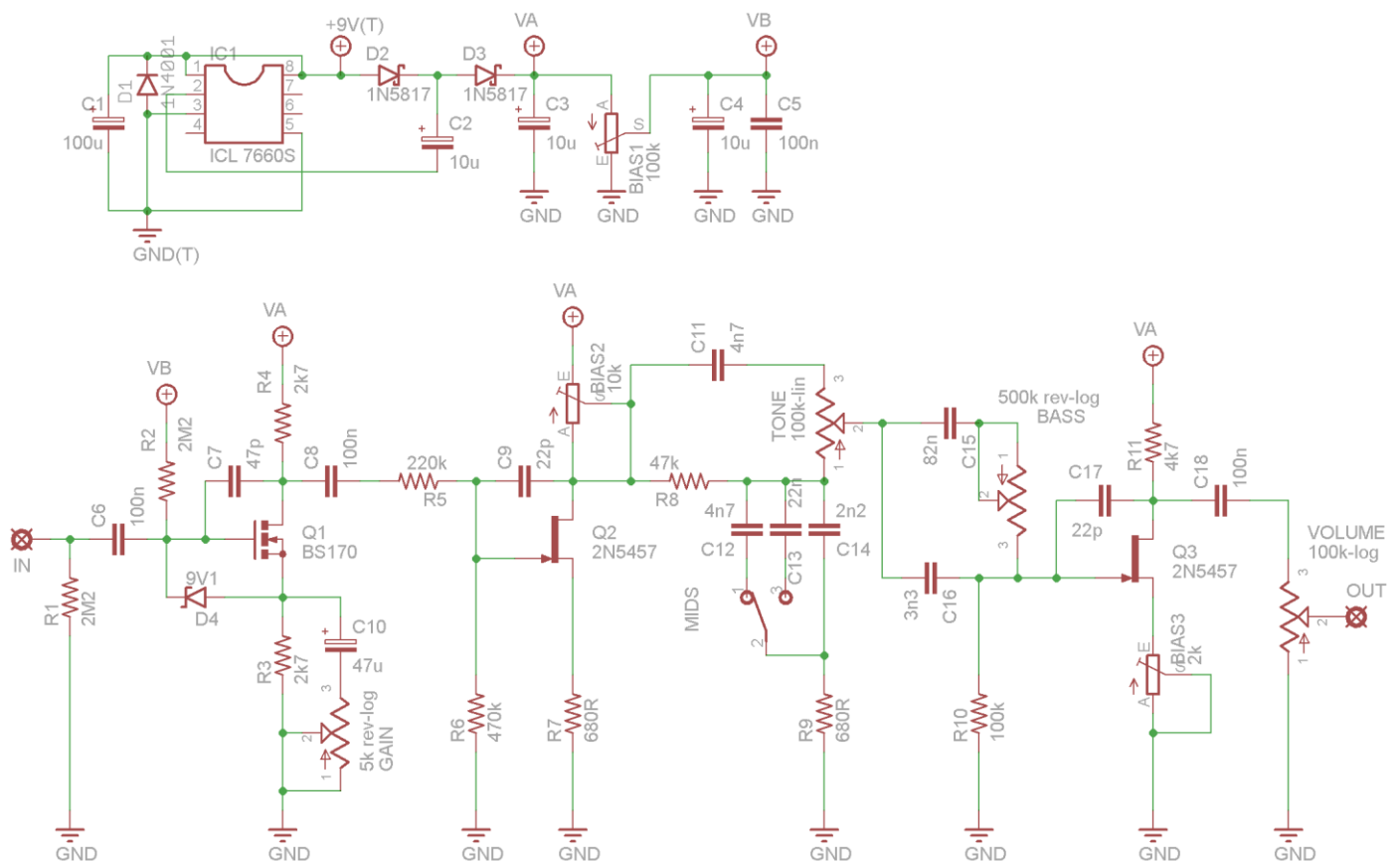
Three modes:

a) Mode 1 flipped to one side: Flat treble at ~3:00 on the knob, at 5:00 a VERY tiny boost in the treble above 700Hz, and CCW cuts the treble at that same frequency, like a see-saw. With both tone controls down, it'll form a mid hump right around the middle of a Fender amp. (If I were to leave off the switch, this is what I would use as the stock mode.)

b) Mode 2 in the center: At ~3:00, the mids are boosted by about 3dB centered ~1KHz (bass and treble are flat). There's again a slight treble boost at full. CCW, the treble gets cut at 2KHz, so it's milder than mode 1, for just shaving off the harsher harmonics created by the distortion. This mode was a freebie on the layout by adding one capacitor, so I saw no reason to omit it. It's not as dramatic as the other modes, but it will usually sound flatter when there's a lot of distortion present.

c) Mode 3 (flipped the other way) has a mid scoop at ~250Hz for added clarity (this is the "mud" frequency for guitars, so it's a good frequency to cut). CCW, the treble is cut very deeply, which allows for bass boost with the bass at full and the tone turned down, or a treble boost with the tone up and the bass down. But with the treble and bass at about 9:00, it's back to a nearly flat response but with the gain cut a lot, for some "mostly clean" boost settings.

SCHEMATIC

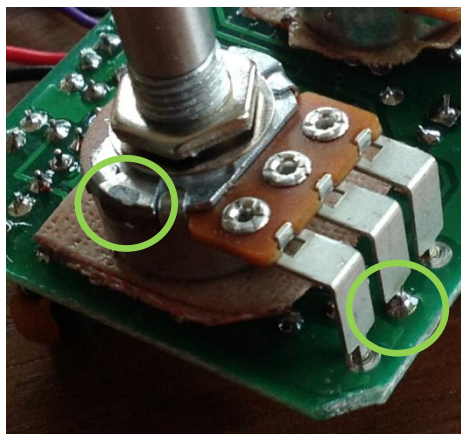
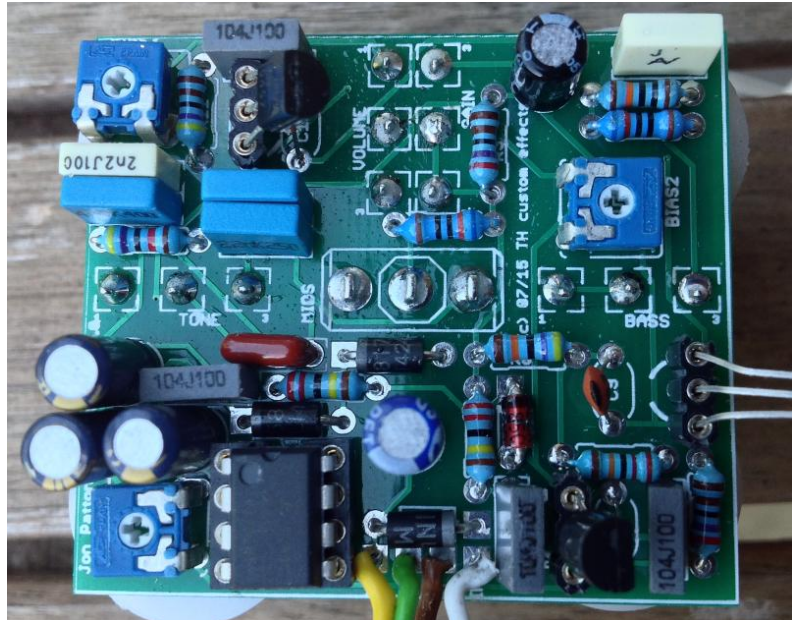
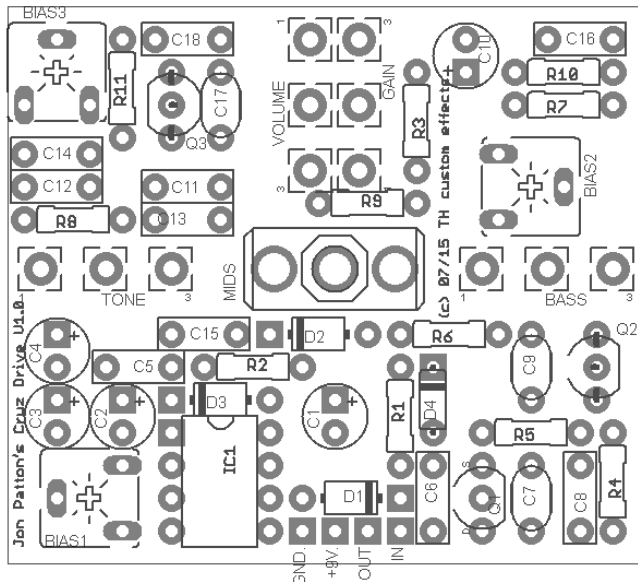


BILL OF MATERIALS

	Device#	Qty	Value	Comment
Resistors	R1, R2	2	2M2	
	R3, R4	2	2k7	
	R5	1	220k	
	R6	1	470k	
	R7,R9	2	680R	
	R8	1	47k	
	R10	1	100k	
	R11	1	4k7	
Capacitors	C1	1	100uF/16V	polarized electro
	C2, C3, C4	3	10u/25V	polarized electro
	C5, C6, C8, C18	4	100n	box film
	C7	1	47p	ceram
	C9, C17	2	22p	ceram
	C10	1	47u/16V	polarized electro
	C11, C12	2	4n7	box film
	C13	1	22n	box film
	C14	1	2n2	box film
	C15	1	82n	box film
	C16	1	3n3	box film
Pots	BIAS1	1	100k	ACP 6mm or Piher
	BIAS2	1	10k	ACP 6mm or Piher
	BIAS3	1	2k	ACP 6mm or Piher
	GAIN	1	5k rev-log	
	TONE	1	100k -lin	
	BASS	1	500k rev-log	
	VOLUME	1	100k-log	
Diodes	D1	1	1N4001	
	D2, D3	2	1N5817	
	D4	1	9V1	Zener
Transistors	Q1	1	BS170	
	Q2,Q3	2	2N5457	
ICs	IC1	1	ICL 7660SCPA	SCPA-Type is mandatory
Other	MIDS	1	ON-OFF-ON	SPDT

BUILDING

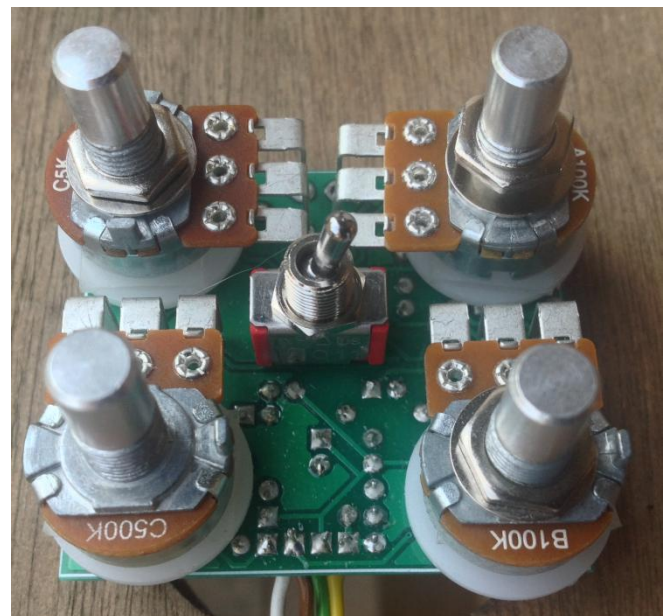
Start populating resistors and diodes first, then IC sockets. If you want to socket the transistors you put the sockets in now. Next do the capacitors, starting ceramic, box film and last pol. electros.



The board mounted pots need to go onto the other side of the board. Use some (double-sided) tape to make sure the pot cases do not shorten any pins that come through the board. As you solder them it is good practice to apply some solder to the

middle pin first, then pull it back approx. 1mm and let it harden. Then solder the other pins. This will align the pot horizontally in a better way and avoid shortcuts of the wide pot pins and the board.

Don't forget to clip of the small bracket before you mount the circuit.



ENCLOSURE

This version fits a 1590B enclosure.

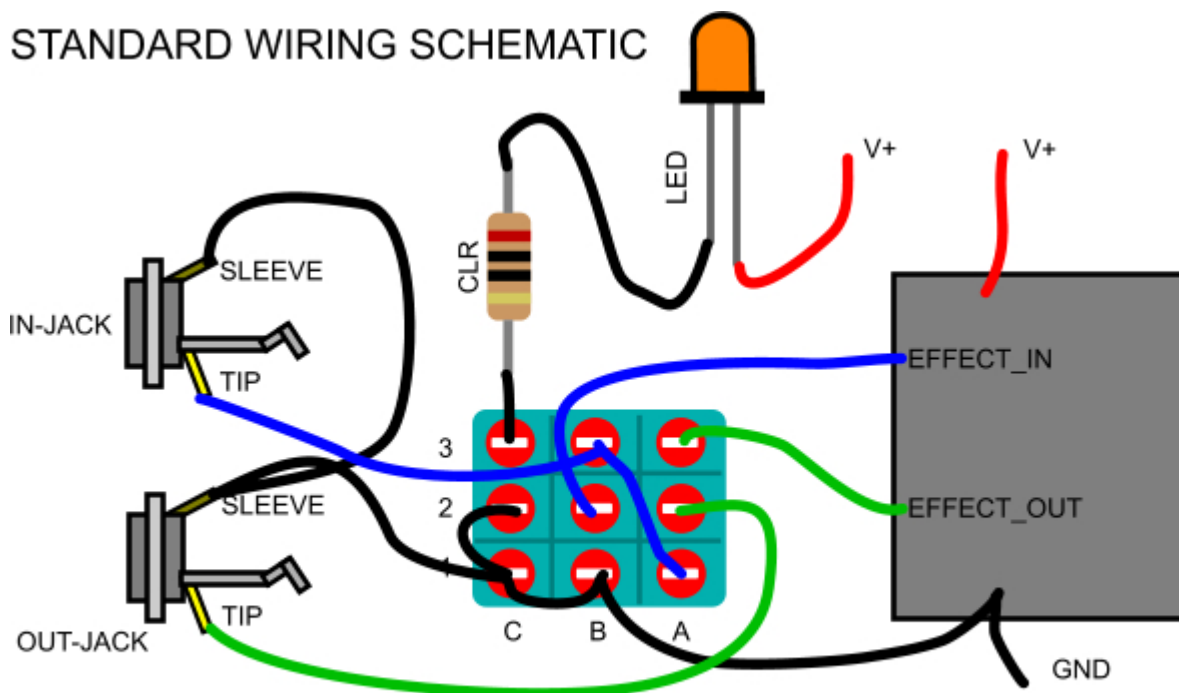
A decal that can be used as a drill template can be downloaded here: <http://diy.thcustom.com/drill-templates/>

FINALLY

This is a very good sounding Overdrive with lots of features. The tone control is superior and I spent a few hours "testing" the prototype ☺

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