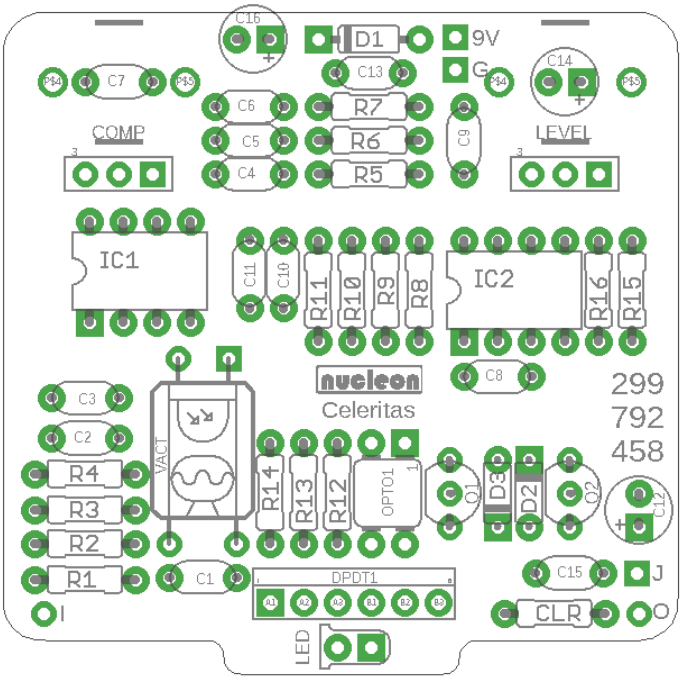
Celeritas Optical Compressor

Date Modified: November 11, 2018

The word celeritas is probably the origin of the c in $E = mc^2$, indicating the speed of light. Optical compressors are known for their smooth sound and attack and much lower noise floor than Dyna Comp derivatives. The compression is achieved with a vactrol (a combination of a LED and LDR in one package). The guitar signal controls the brightness of the LED which shines on the LDR. As more light shines on the LDR the resistance goes down and this adjusts the signal level. We experience this as compression.

The Celeritas circuit is a stripped down version of the famous Diamond Compressor. The tone circuit has been removed and a number of over the top audiophile features have been removed.



BOM

Resistors	
R1	1M
R2	100k
R3	1k
R4	470k
R5	10k
R6	6k8
R7	3k3
R8	100k
R9	100k
R10	470k
R11	470k
R12	220k
R13	220k
R14	3k3
R15	10k
R16	10k
CLR	3k3

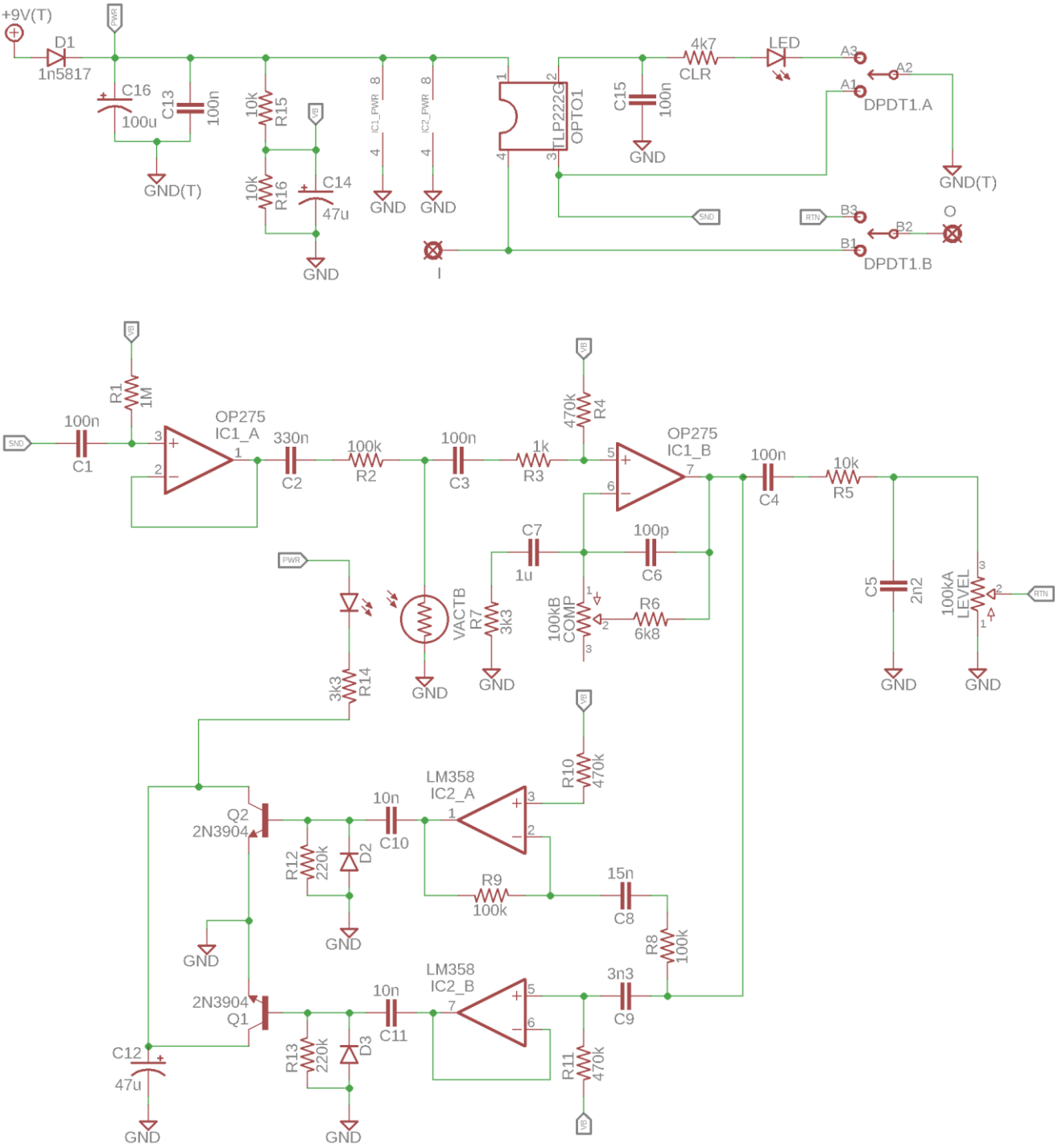
Capacitors	
C1	100n
C2	330n
C3	100n
C4	100n
C5	2n2
C6	100p MLCC
C7	1u
C8	15n
C9	3n3
C10	10n
C11	10n
C12	47u
C13	100n MLCC
C14	47u
C15	100n MLCC
C16	100u

Note: on some PCBs C16 is accidentally mislabeled as ‘A’.

Diodes and misc	
D1	1N5817
D2	1N4148
D3	1N4148
Opto	TLP222G
Q1, Q2	2N3904
IC1	OP275
IC2	LM358

Controls	
LEVEL	100 kA
COMP	100 kB
Bypass	DPDT Stomp
Vactrol	VTL5C3 (See Notes)

Schematic


+9V(T)
D1
1n5817
PWR
C16
100u
C13
100n
GND(T)
10k
R15
10k
R16
VB
C14
47u
GND
IC1_PWR 8
4
GND
IC2_PWR 8
4
GND
I
1
2
3
4
TLP222G
OPTO1
C15
100n
GND
4k7
CLR
LED
A3
A2
A1
DPDT1.A
GND(T)
SND
RTN
B3
B2
B1
O
DPDT1.B
R1
1M
VB
100n
C1
SND
OP275
IC1_A
330n
C2
100k
R2
100n
C3
1k
R3
470k
R4
OP275
IC1_B
100n
C4
10k
R5
C5
2n2
100kA
LEVEL
RTN
GND
GND
C7
1u
100p
C6
100kB
COMP
R6
6k8
PWR
VACTB
R7
3k3
GND
GND
3k3
R14
LM358
IC2_A
R10
470k
Q2
2N3904
10n
C10
R12
220k
D2
GND
R9
100k
15n
C8
R8
100k
GND
LM358
IC2_B
3n3
C9
2N3904
Q1
10n
C11
R13
220k
D3
GND
R11
470k
C12
47u
GND

NOTES

Board Mounted Pots

This design uses board mounted 'snap in' 9 mm pots. Snap off the small 'anti rotation' tag under the shaft so it sits flat to the enclosure top. Leave the rest of the tabs in tact for added board stability.

Power Supply

The effect has a tendency to (pleasantly) distort at 9V. If you like a clean sound, all higher end (isolated) power supplies (Voodoo Labs, Strymon, Burky etc) have a way to feed the pedal 12, 15 or 18V. Alternatively you could use the Nucleon Hyperdrive board to boost to 18V. This increases the headroom and prevents distortion. If you use the Hyperdrive (with or without the switch) I recommend mounting it to the side of the enclosure, at a 90 degree angle to the Celeritas board. This in my experience minimizes the risk of inducing noise into the circuit from the charge pump. A 125B enclosure is probably best in that case because of the extra space. In any case, use capacitors that are rated 25V or above. Use low profile electrolytics or bend them 90 degrees flush with the board if you use a 125B to prevent the them interfering with the jacks.

Opamps

The OP275 chip is an expensive thing. I've used cheaper opamps for prototyping and they work, however don't sound as good IMO. Use an IC socket and judge for yourself.

Vactrol

The VTL5C3 is also expensive and can be hard to find. And alternative is to 'roll your own': an LED and LDR facing each other and covered by heat shrink tubing. It's been reported that a 3mm yellow LED with GL5539 LDR works well in this circuit. Something worth trying if you don't have the vactrol on hand.

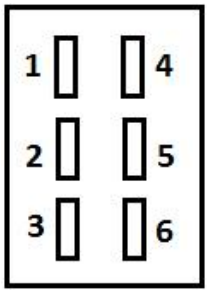
B Stock

The first batch of boards are missing a Vb connection on R16. To test your board for this use a digital multi meter set to continuity check (usually a beep will sound if there's a connection between the black and red probes). Touch one probe to the upper pad of R16 and the other to the upper pad of R10. If these two are not connected (no beep) please make this connection on the back side of the board with some wire or a clipped of component lead to ensure proper operation.

Wiring

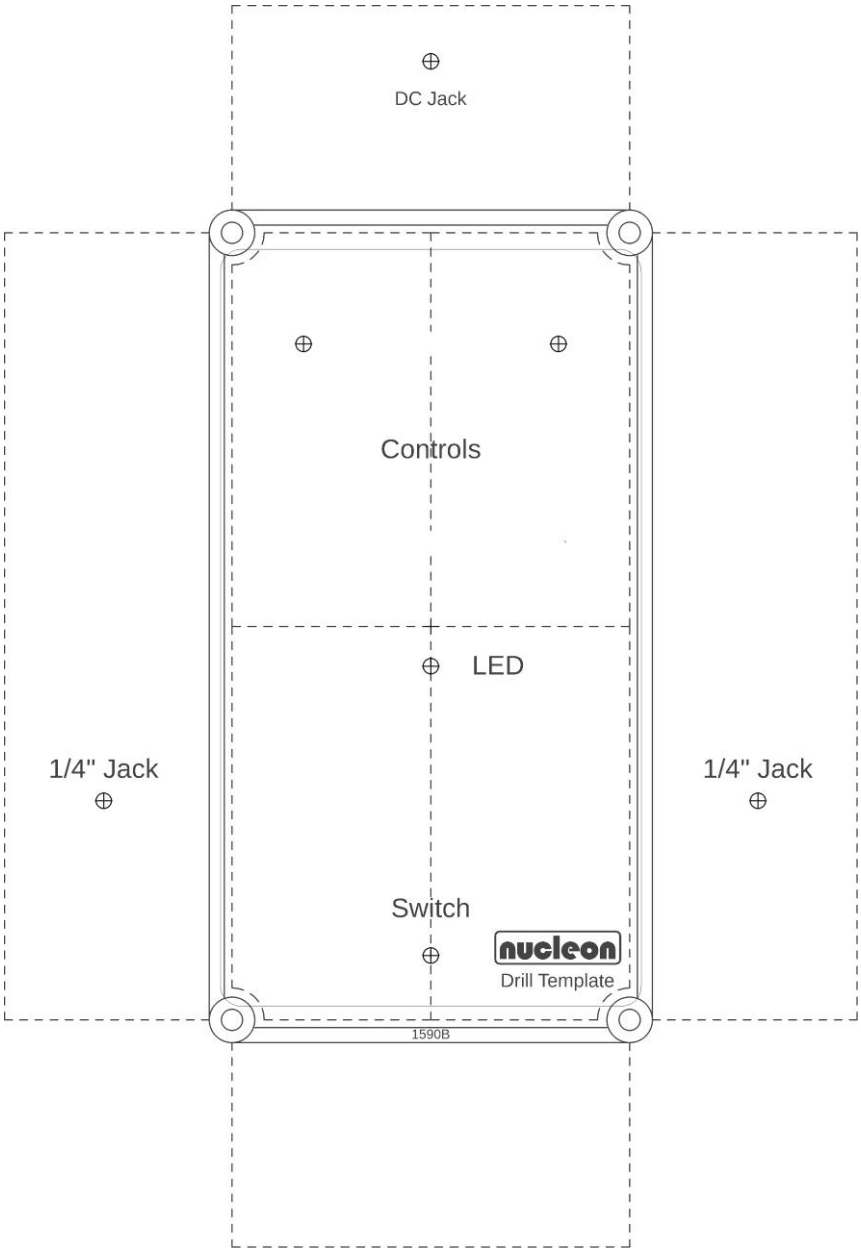
I - tip of input jack
O - tip of output jack
J - sleeve of output jack
9V - sleeve of power jack
G - center of power jack

Bypass DPDT
Two sets of three (1 + 2 + 3 and 4 + 5 + 6) corresponding to columns on a DPDT switch.
1 and 4: top lug
2 and 5: center lug
3 and 6: bottom lug



For quick and easy wiring consider using the Nucleon Bypass board.

Drilling template 1590B (side mounted jacks, power on top)

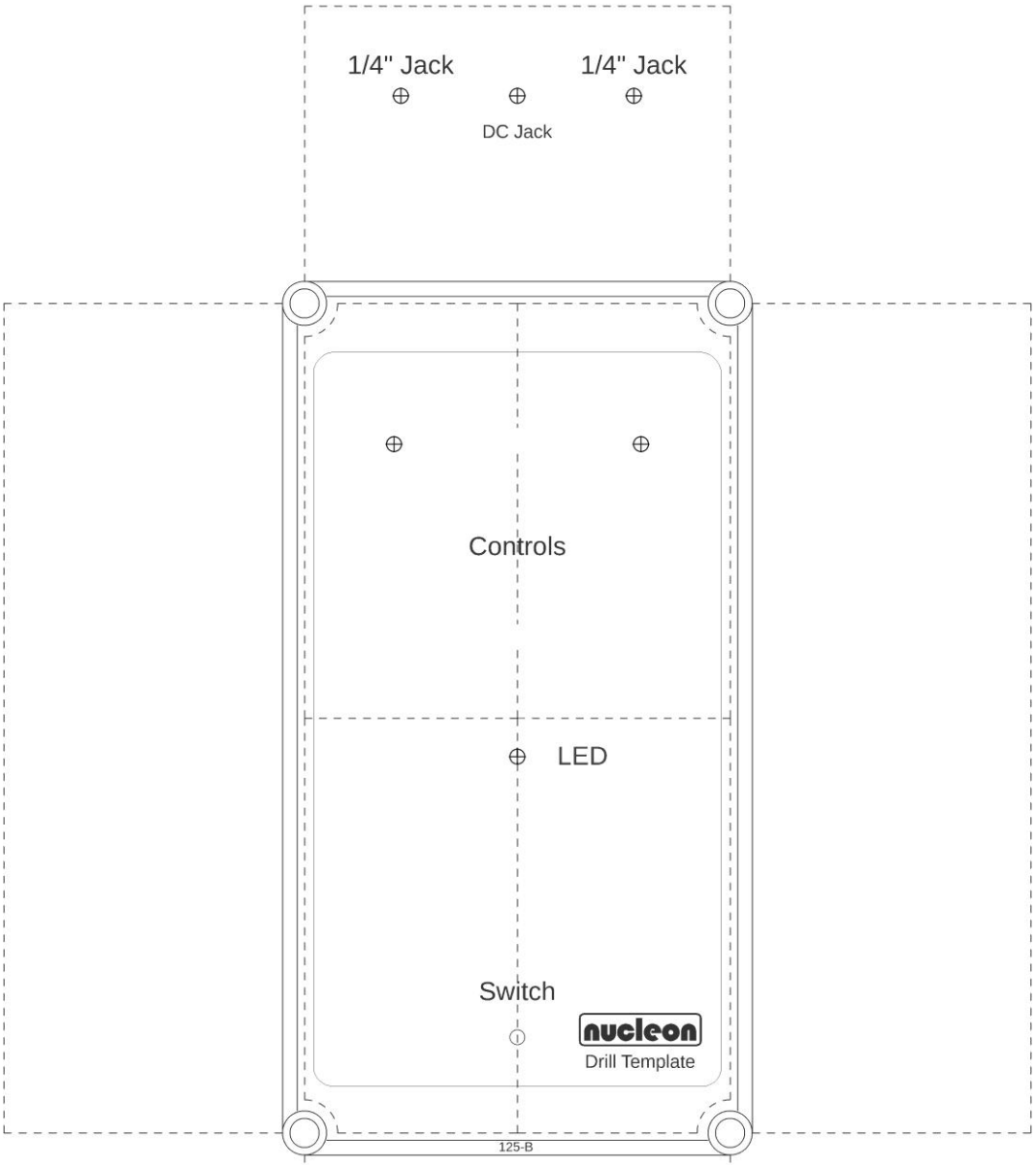


Drill Sizes

Pots: 7 mm minimum (use 8mm if you need some wiggle room)
Toggle switch: 6mm (7mm for extra wiggle room)
Jacks: 9 or 10 mm
Stomp: 12 or 13 mm (5 inches usually)
DC Jack: 7 mm (small barrel, no switch) to 13 mm (round 'Boss style' switched jacks)

Drilling template 125B (top mounted jack, power on top)

(unverified)



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DC Jack: 7 mm (small barrel, no switch) to 13 mm (round 'Boss style' switched jacks)