SPRING REVERB

datasheet ver. 17/01/17

www.op-electronics.com

Printing error: last datasheet revision contained a mistake about the value of C5 capacitor, the cap value should be 680p and not 47n. This may cause drastic high frequency roll-off with very attenuated reverb signal

The SPRING REVERB is a real spring reverb effect pedal based upon Accutronics© Blue Reverb, it features controls for Level, Drive, LPF, Threshold and Decay. External reverb tanks can be connected with “rca to jack” cables to bypass Blue Reverb tank. True bypass is achieved with mcu controlled relay and soft pushing switch to limit noise while engaging the unit.

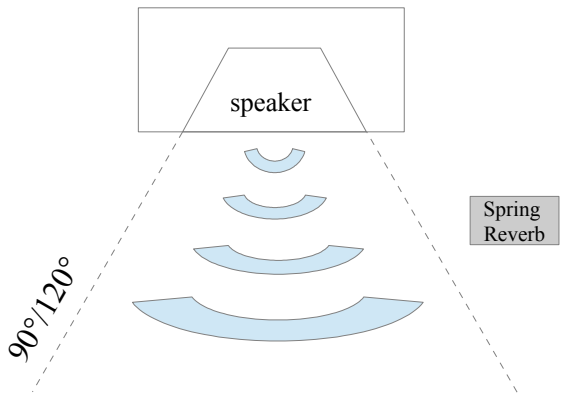
LEVEL: sets the amount of reverberation vs dry signal
DRIVE: controls how much signal is being feed to the spring
LPF: tone control on wet signal
THRESHOLD: used together with DECAY sets the level at which the signal controls the decay/gating of the reverb, when up the decay/gating function is disabled
DECAY: used together with THRESHOLD sets how long the reverb will last. When up it's disabled.
DECAY has another important function: when THRESHOLD is all the way up (disabled) it will limit resonance when playing at loud volumes.

DECAY & GATED REVERB
DECAY and THRESHOLD can perform two tasks, they can simulate the decay of the reverbaration time or give a gated reverb effect when pushed at their limits.

LEVEL & DECAY
When THRESHOLD is up you can use LEVEL and DECAY to adjust the desired amount of reverb. You can get a wide range of reverberation by playing with these controls together, when they both are all the way up the reverberation is quite insane!

PLAYING LOUD
Spring reverbs are notorious for microphonic behaving, picking up all the amplified sound in the air and sending it to the amp once again until feedback occurs. Blue Reverb is also susceptible to feedback especially when used inside a stompbox. Hopefully there are solutions:

1) Build it right, proper assembly inside the box and orientation of the tank is mandatory as well using shielding material to isolate the tank.
2) Position of the effect with respect to the amp can help, if possible place the effect outside the 90°-120° front field of the speakers. The Blue Reverb uses to go into feedback in the frequency range of 800 hz to 1.5 Khz, at the sides of the amp high and mid frequencies are weaker so the chances for feedback are lower

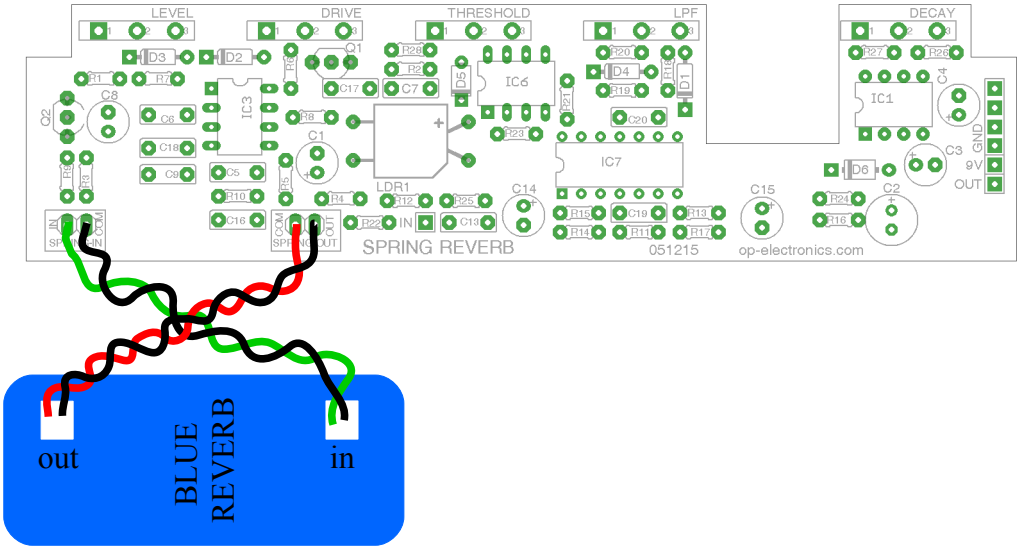


3) DECAY pot helps to kill the feedback too (THRESHOLD must be up). Start with the pot all way down and go up slowly, once you hear feedback turn down a little bit as feedback disappears.

SILKSCREEN TYPO

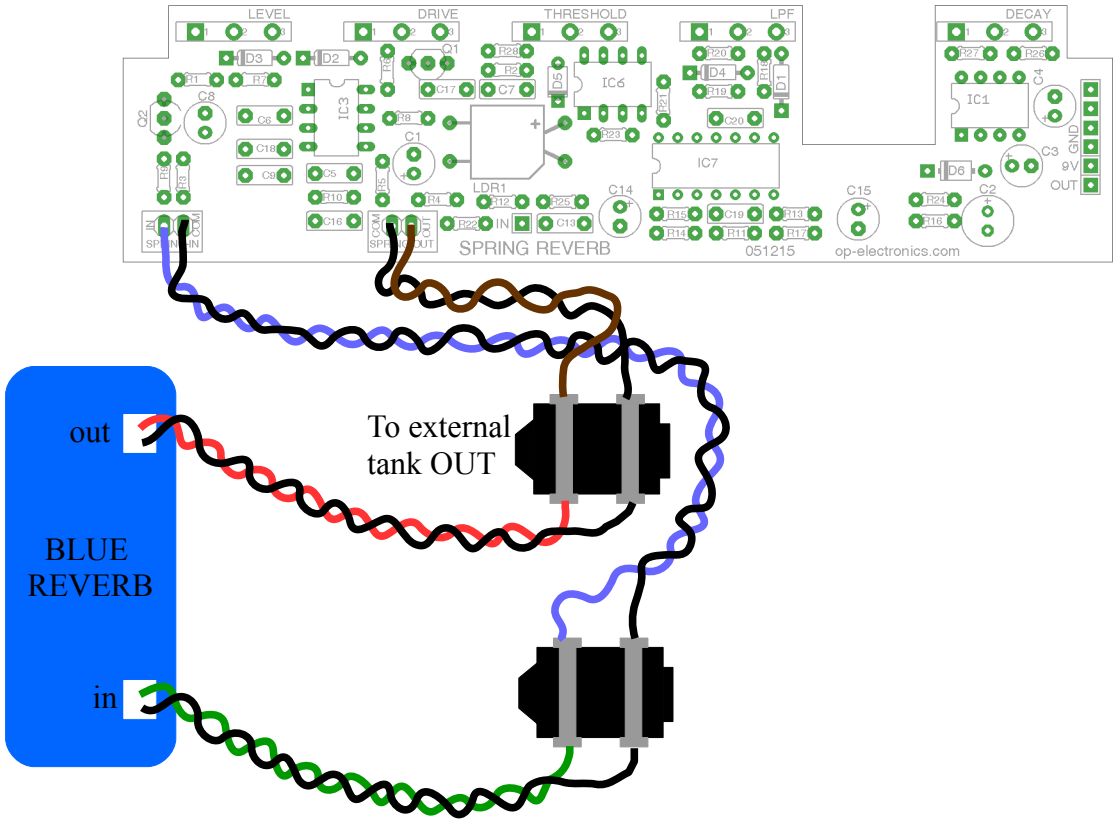
On pcb 061015 there's a small typo error in SPRING-OUT connector, the pad labeled IN should in reality be called COM

INTERNAL TANK wiring



EXTERNAL TANK wiring

It is possible to drive an external spring reverb tank provided that it matches the impedance of drive and recovery stages. You can use TS jack connectors with normally close switch contacts as inserts so when you plug the external tank the Blue Reverb gets disconnected:



Twist cables as in the picture to improve common mode rejection ratio. Connect the effect to the external tank using good quality shielded RCA-JACK cables with metal connectors, cheap cables will pick-up noise and raise hum.

REVERB TANKS

Blue Reverb tank used for the project is AMC2BF3 which stands for:

- 2 springs
- 150 ohm input impedance
- 1500 ohm output impedance
- long decay time (2.0 to 3.5 secs)

As said external tanks need impedance matching with drive and recovery circuit to work, not all tanks will function properly. We succesfully tested 4DB2C1D which sounded great. Go to Accutronics website (www.accutronicsreverb.com) to figure out what the codes mean and get impedance numbers.

INPUT IMPEDANCE: drive stage is able to work with 150 ohm to 250 ohm coils for Type 1 & 4 and 190 ohm to 310 ohm coils for Type 8 & 9

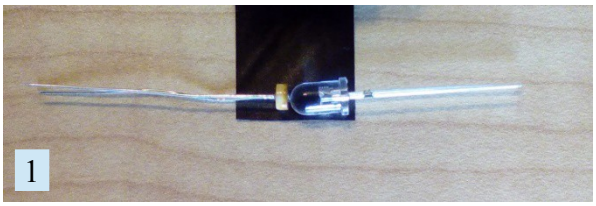
OUTPUT IMPEDANCE: since input impedance of recovery circuit is very high all of the Accutronics tanks with output impedance in the 500 ohm to 12000 ohm range can be used

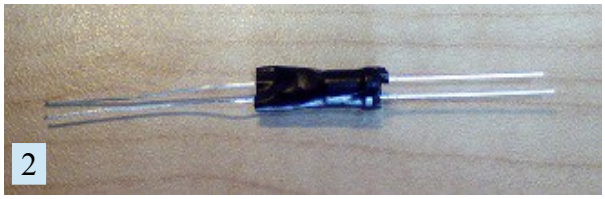
LDR

The LDR optocoupler for this project can be made with an ultrabright blue LED and a photoresistor like Excelitas VT935G (group C) or GL4537-1 / GL5537-1. Any other photoresistor with similar characteristics will work.

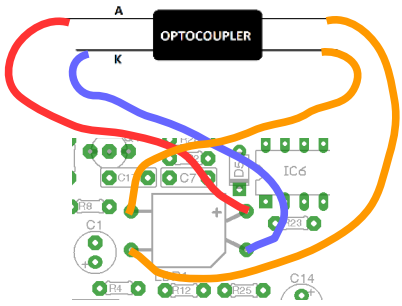
Follow the instructions to build the DIY optocoupler:

1) face the photoresistor surface with the LED, they must be touching
2) while holding both together tape or even better shrink wrap them. Don't use other colors from black, the principle behind this is to make less of the LED light to reach outside and external light to get inside.





Anode (A) pin of LED (longest leg) must be connected to "+" pad on pcb. Photoresistor has no polarity.

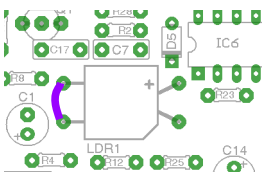


Qty	Value	Package	Parts	Description
1	1N4001	DO41	D6	Rectifier Diodes
1	10	0204/5	R2	RESISTOR
1	100	0204/5	R16	RESISTOR
1	100K	0204/5	R10	RESISTOR
5	100n	C050B-025X075	C7, C17, C18, C19, C20	CAPACITOR
10	10K	0204/5	R1, R13, R14, R15, R17, R18, R19, R20, R21	RESISTOR
1	10K LOG	16MM	LEVEL	POTENTIOMETER
3	10u	E2,5-6	C3, C4, C14	POLARIZED CAPACITOR
1	1K	0204/5	R23	RESISTOR
1	1K LIN	16MM	THRESHOLD	POTENTIOMETER
2	1M	0204/5	R12, R24	RESISTOR
5	1N4148	DO35	D1, D2, D3, D4, D5	Fast Switching Diode
1	1u	E2,5-6	C8	ELECTROLYTIC BIPOLAR
2	1u	E2,5-6	C1, C15	POLARIZED CAPACITOR
1	500 LIN	16MM	DRIVE	POTENTIOMETER
2	22	0204/5	R8, R9	RESISTOR
1	220	0204/5	R4	RESISTOR
1	220K	0204/5	R5	RESISTOR
1	220u	E2,5-7	C2	POLARIZED CAPACITOR
2	22K	0204/5	R11, R27	RESISTOR
1	empty		R22, C16	empty
1	2N3904	TO92	Q1	NPN Transistor
1	2N3906	TO92	Q2	PNP Transistor
1	3K3	0204/5	R3	RESISTOR
2	jumper	0204/5	R28, R26	jumper
1	470n	C050B-025X075	C13	CAPACITOR
1	240K	0204/5	R25	RESISTOR
1	47n	C050B-025X075	C6	CAPACITOR
1	56n	C050B-025X075	C9	CAPACITOR
1	100K REV LOG	16MM	DECAY	POTENTIOMETER
1	5K LOG	16MM	LPF	POTENTIOMETER
2	6K8	0204/5	R6, R7	RESISTOR
1	ICL7660S	DIL08	IC1	CHARGE PUMP
1	NE5532N	DIL08	IC3	OP AMP
1	TL061	DIL08	IC6	OP AMP
1	TL074P	DIL14	IC7	OP AMP
1	See datasheet	-	LDR1	Optocoupler
1	680p	C050B-025X075	C5	CAPACITOR

Some components are not used anymore in the latest upgrades of the circuit:

JUMPER: R28, R26
EMPTY: C16, R22

If you don't need all the fancy things the circuit can do you can build the unit without LPF, THRESHOLD and DECAY. You can save on knobs, pots and some parts. The colored parts in the list above can be left out. If DECAY is left out use a jumper between pad 3 and 4 of LDR:



Fitting Blue Reverb tank inside the enclosure

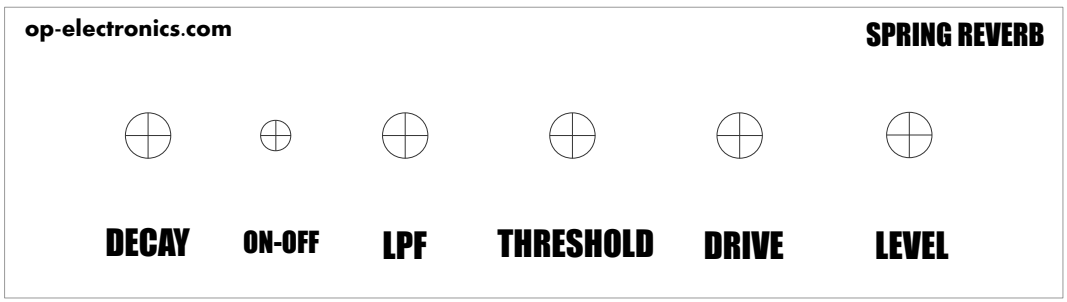
The board was made to fit inside a 1590XX enclosure. You can hard fix the tank to the enclosure with bolts and rubber feet, it's important to leave a gap between box and tank surface. Other option is to leave the tank floating inside the enclosure and foam to hold it in position. Face the tank down with flat surface looking up and connectors side looking at ground. We tried both solutions but floating the tank gave us the best overall results.

Vertical or Horizontal building

It is possible to build the Spring Reverb as a stompbox to be placed on the ground (vertical mounting) as well as rack(y) like unit which can be placed on top of the amp (horizontal mounting).

SWITCHING

Switching is a delicate choice for a spring equipped stompbox, if you're building it like an effect pedal, standard mechanical latching footswitches will make the bypassing action a hell. The best solution is to equip the unit with a relay controlled by a soft momentary switch. This will make switching absolutely silent. Check our Relay Switch Kit, this is a microcontroller true-bypass switch. If you're building it like a rack unit you can use a mechanical toggle switch (noise should be lower than with footswitch) or the Relay Switch Kit linked above but with a pushbutton OFF-(ON) in place of the footswitch OFF-(ON). With rack unit you can make remote switching too, with Relay Switch Kit just a 2 conductors cable is needed.



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schematic version 191116