

Description

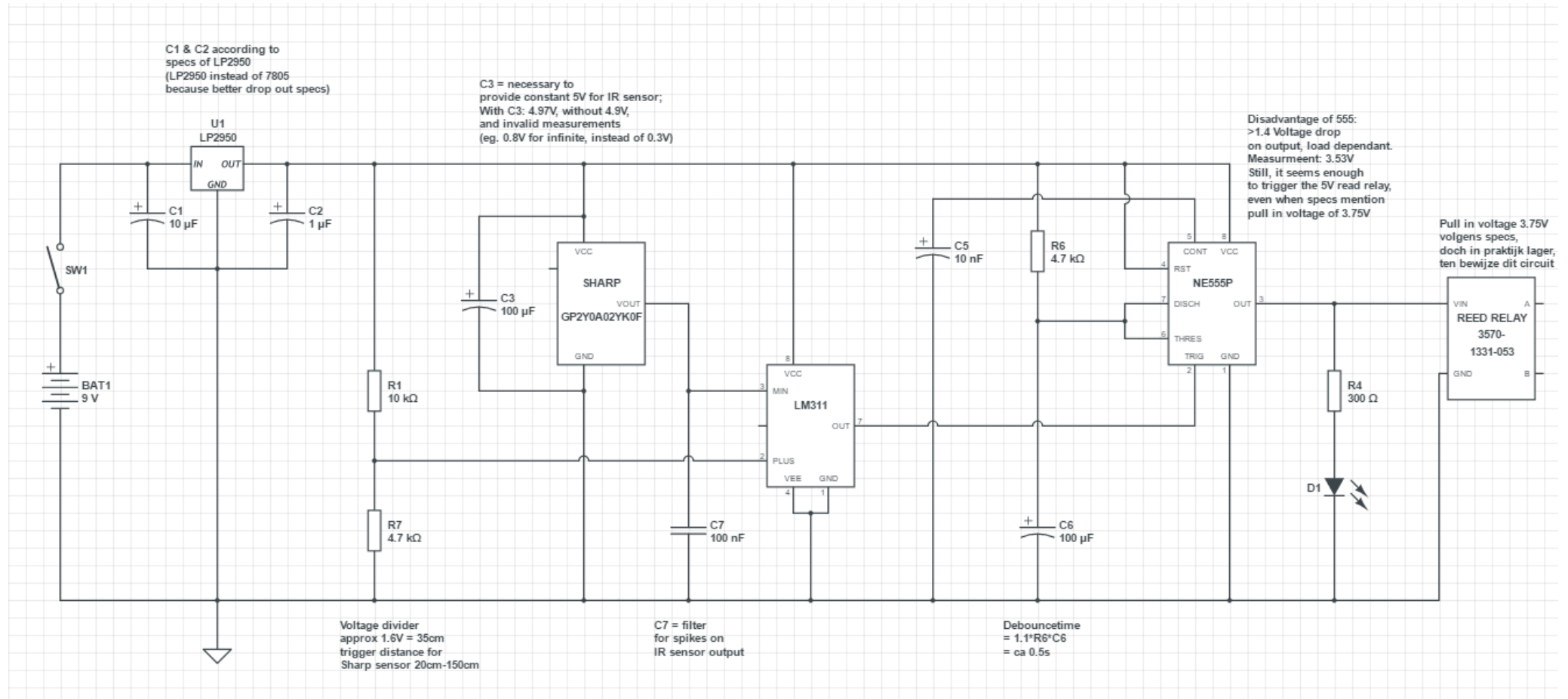
Circuit to switch e.g. the Leslie simulator on a Nord Stage 2 keyboard by means of waving your hands in front of an IR-sensor.

Currently, only momentary on/off-switching is supported; because a reed relay is used, the circuit is completely isolated from the instrument, making it completely safe.

Inspired by the D-Beam® controller of the Roland company (of which the patent should be expiring in 2016).

Copying and modification of this circuit is allowed for personal, non-commercial usage. I hope you enjoy it as much as I do! Kind regards, Steven De Roo, Belgium.

Circuit



Components

<u>ID</u>	<u>Amount</u>	<u>Ordernr</u>	<u>Image</u>	<u>Description</u>	<u>Price/1pc</u>	<u>Total</u>
LM311	1 piece	175994		Texas Instruments LM311P Lineaire IC - comparator Multifunctioneel DTL, MOS, RTL, TTL	€ 0,21	€ 0,21
Relay	1 piece	1300079		Comus 3570-1331-053 Reedrelais 1x NO 5 V/DC 0.5 A 10 W SIP-4	€ 2,40	€ 2,40
U1	1 piece	1262660		Texas Instruments LP2950-50LPRE3 PMIC - Voltage Regulator - Linear (LDO)	€ 0,56	€ 0,56
BAT1	1 piece	624691		Emmerich 9V-I-Clip Batterijclip 1 9 V (blok) (l x b x h) 26 x 13 x 8 mm	€ 0,39	€ 0,39
-	1 piece	530809		Conrad SU527629 Printplaat Hardpapier (l x b) 90 mm x 50 mm 35 µm Rastermaat 2.54 mm Inhoud 1 pieces	€ 1,35	€ 1,35
-	1 piece	738632		Lumberg KLBM 3 Jackplug 6.35 mm Bus, inbouw verticaal Aantal polen: 2 Mono Zwart 1 pieces	€ 1,84	€ 1,84
-	1 piece	522864		Strapubox GEHAEUSE MIT BATTERIEFACH Universele behuizing 101 x 60 x 26 ABS Zwart 1 pieces	€ 3,53	€ 3,53
SW1	1 piece	1304031		SCI MTE101A1 Tuimelschakelaar 250 V/AC 3 A 1x uit/aan vergrendelend 1 pieces	€ 1,15	€ 1,15
SHARP	1 piece	185364		Sharp GP 2 Y0A 02 YK Afstandsensor GP 2 Y0A 02 YK Meetbereik(en) 20 - 150 cm registratiebereik 5 V	€24.95	€24.95

-	1 piece	1304153		econ connect ICF16 IC-fitting 7.62 mm Aantal polen: 16	€0,20	€0,20
NE555P	1 piece	152184		Texas Instruments NE555P Timer Soort behuizing DIP-8 Uitvoering Precisiestimer	€0,24	€0,24
C3, C6	2 pieces	443906		Elektrolytische condensator Radiaal bedraad 2.5 mm 100 µF 16 V/DC 20 % (Ø x l) 6.3 mm x 11 mm SY 100 µF/16V 6,3 x11mm	€0,07	€0,14
C5	1 piece	531889		Keramische condensator Radiaal bedraad 10 nF 50 V/DC 10 % Holystone RDC103K050DKA 1 stuks	€0,08	€0,08
C1	1 piece	1325866		Elektrolytische condensator Radiaal bedraad 1.5 mm 10 µF 16 V 20 % (Ø x h) 4 mm x 7 mm KSS106M016S1A5B07K 1 pieces	€ 0,04	€ 0,04
C2	1 piece	445724		Elektrolytische condensator Radiaal bedraad 1.5 mm 1 µF 50 V 20 % (Ø x h) 4 mm x 5 mm Yageo S5050M1R00B1F-0405 1 pieces	€ 0,06	€ 0,06
C7	1 piece	1235240		Kemet R82DC3100AA50K Polyester condensator Radiaal bedraad 100 nF 63 V 10 % 5 mm (l x b x h) 7.2 x 2.5 x 6.5 1 stuks	€ 0,08	€ 0,08
R1	1 piece	...	...	10kOhm	...	...
R6, R7	2 pieces	...	...	4.7kOhm	...	...
R4	1 piece	...	...	300 Ohm	...	...
D1	1 piece	...	...	Bright LED	...	...
BAT1	1 piece	...	...	9 Volt battery	...	...
-	2 pieces	...		OPTIONAL: Small neodymium magnets (eg. 5mm x 10mm)	...	...
-	-	...	...	Montage wires	...	...
					Total approx.	€40

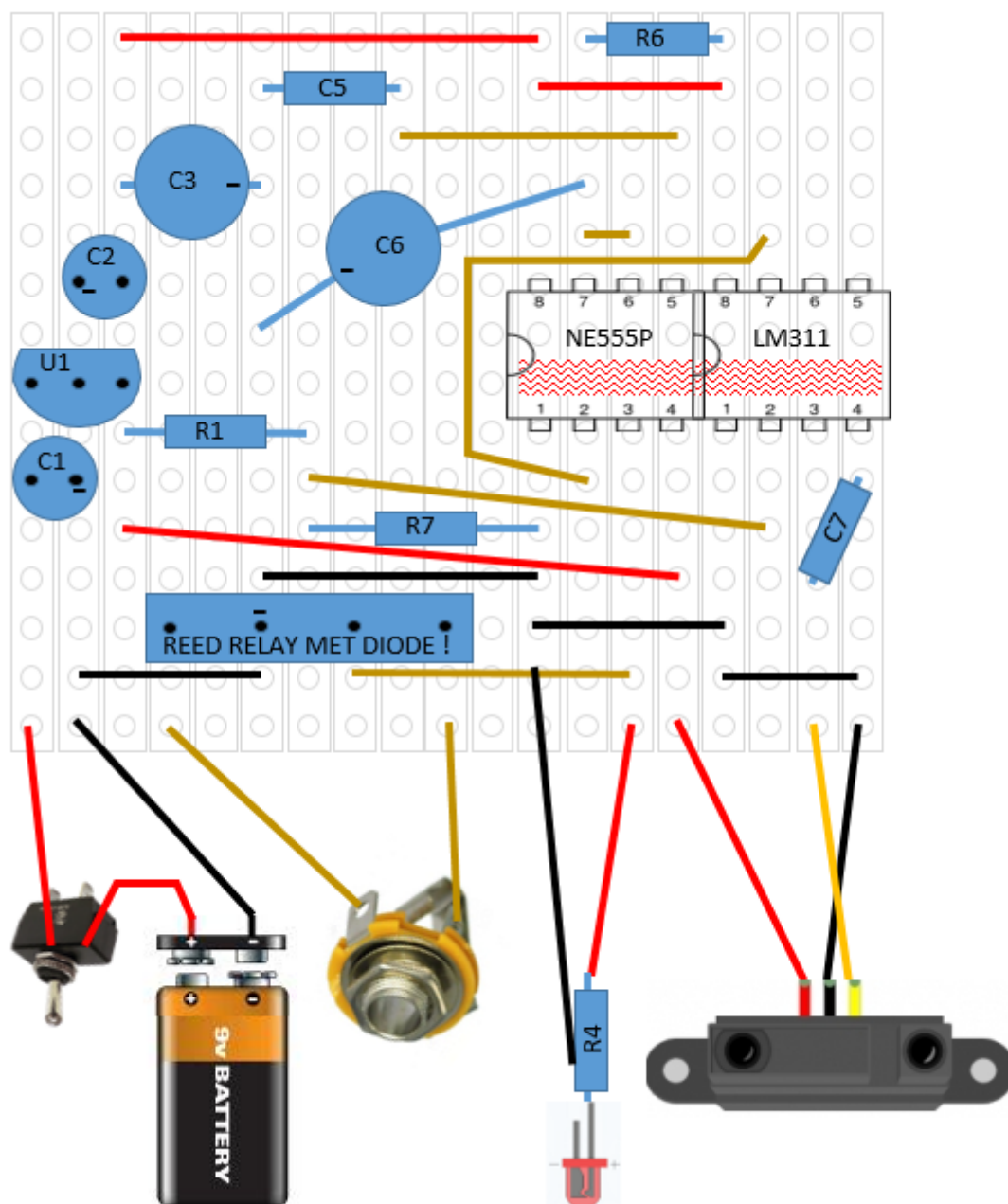
Notice: the sharp sensor has a range of 20-150cm; the range in which it will trigger this switch, is set to 35cm. Using other values for resistors R1 & R7, one should be able to use the cheaper 10-80cm version (which is listed €13.94 on the Conrad website); this reduces the price to approx. **€30. However, this has not been tested!**

Tooling

- Soldering iron (& in my case: desoldering pump ☺)
- Hot glue gun
- Standard tooling: knife, tongs, ...
- Front panel: printer / laminating device / glue

Board layout

(updated 18/08/2016; previous version had an error in placement of C2)



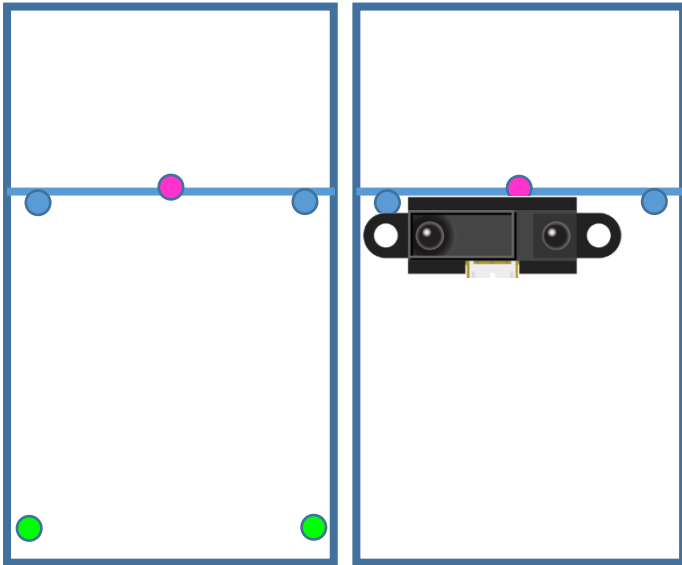
Notice: remove copper from the indicated zone beneath the IC's (eg. By scratching with a knife)

Montage hints

The box I used, has a 9V battery compartment, and some screwholes.

One of the screwholes has been cut away a bit vertically, so that the sensor can be properly aligned with the divider.

The bottom 2 screwholes have been cut away completely, allowing the PCB to be installed completely flat.

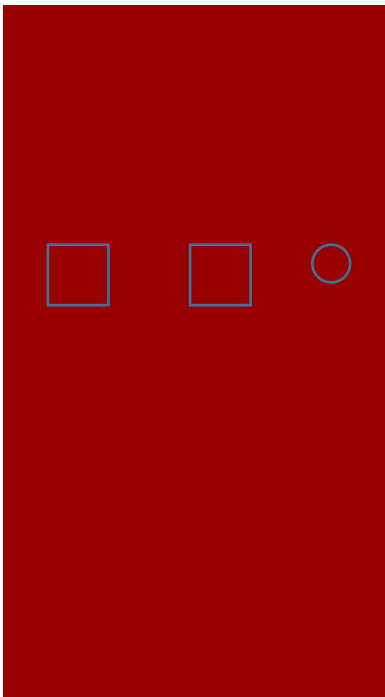


All holes in the box were cut away with a sharp knife... Please be careful here...

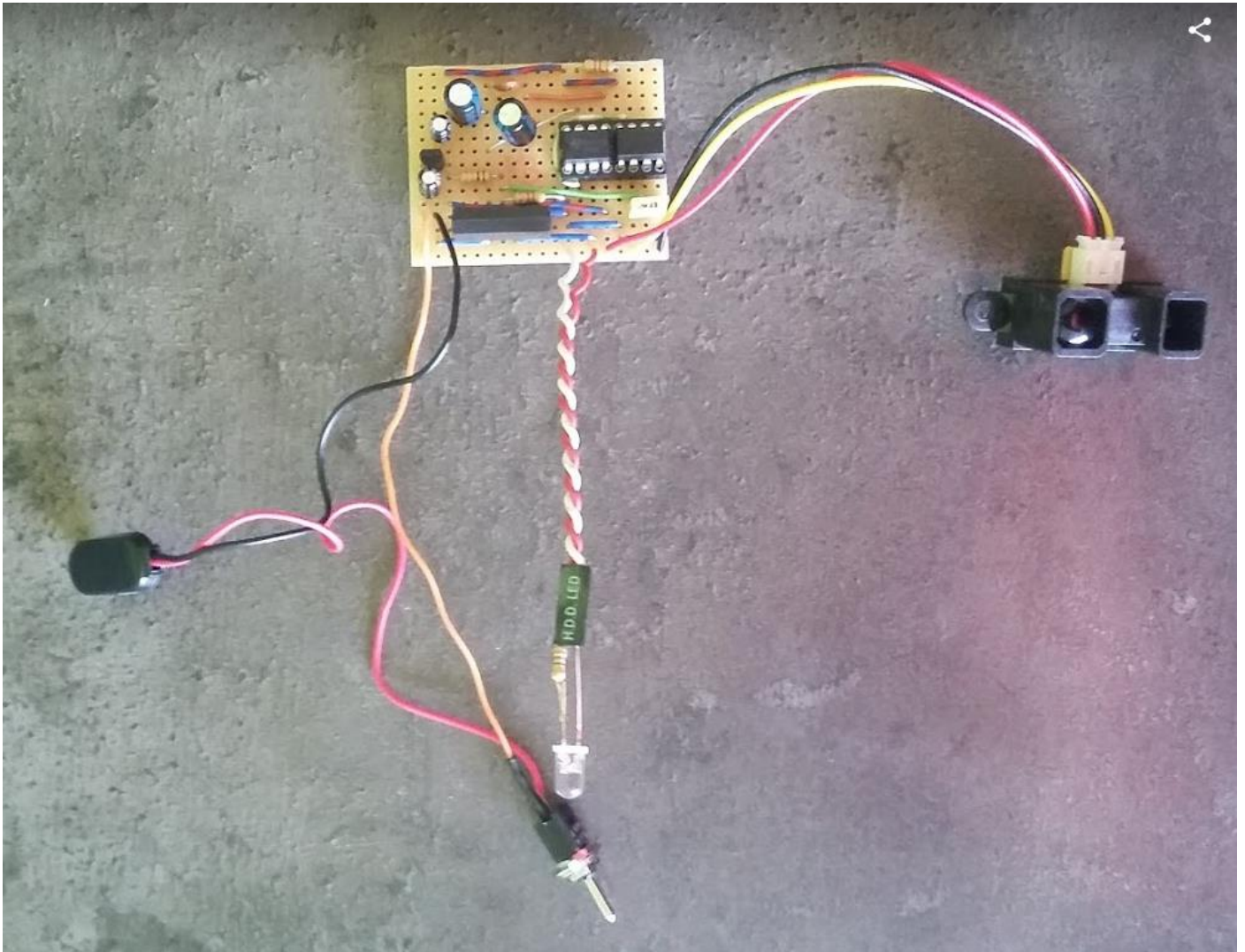
Front panel

The following drawing is scale 1:1 when printing this document on A4 paper.

Notice: cut squares before laminating; cut circle after laminating

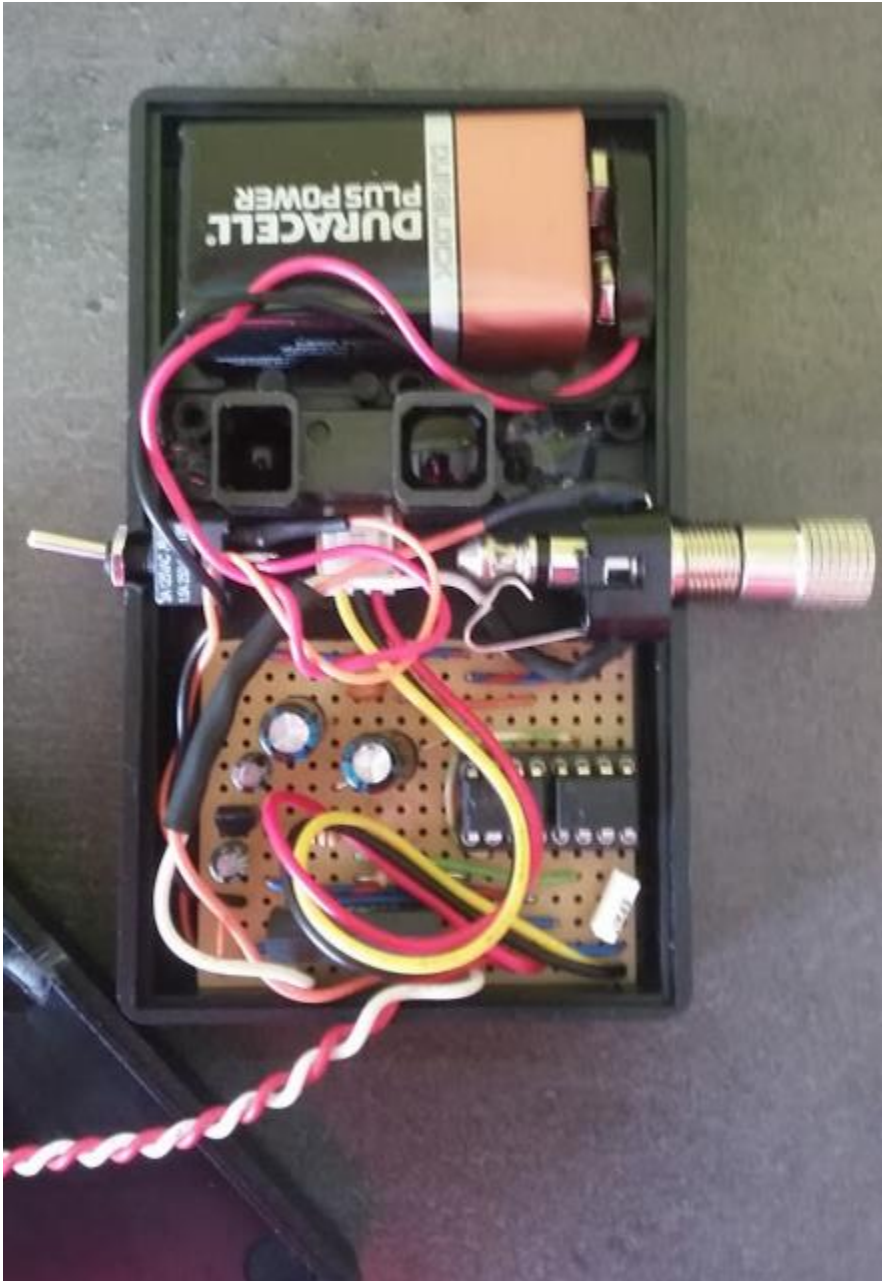


Picture before assembly



(Notice: not completely correct; in this photograph, pins 2 & 3 on the LM311 are swapped; the board layout in this document is correct though!)

Picture after assembly



Not in picture: 2 strong neodymium (!) magnets, hot glued on empty spaces on the bottom surface.
In my case, I glued one right next to the $\frac{1}{4}$ " input, and one next to the on/off switch. A third one would even be better, if you find a place for it ☺.

Final assembly



On the web

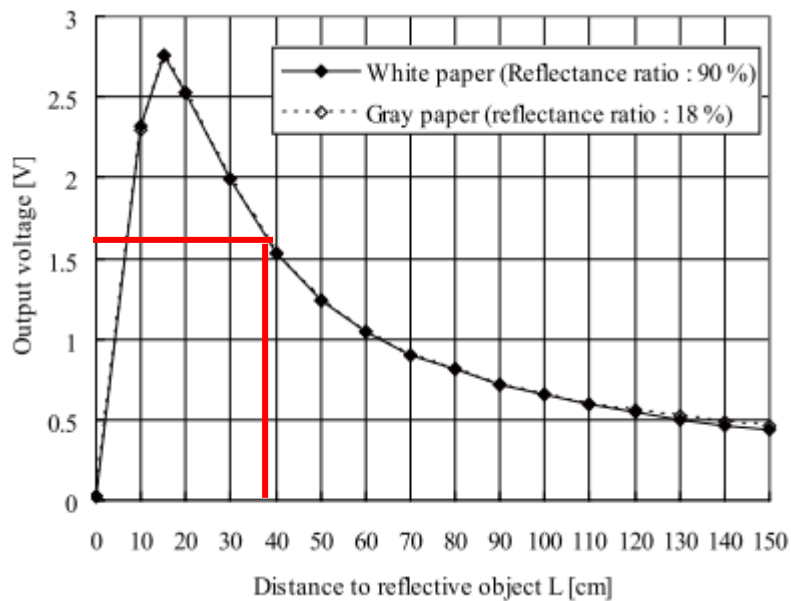
I've put this document & a movie on the Nord User Forum:

<http://www.norduserforum.com/general-nord-forum-f29/diy-infrared-switch-for-leslie-t11516.html>

Appendix: Sharp sensor behavior

Version used: 20cm-150cm: GP 2 Y0A 02 YK

using $R1=10k\Omega$ & $R7=4.7k\Omega$, trigger voltage = 1.59V = approx. 37cm



Characteristics of the 10-80cm version GP2Y0A21YK0F:

one should have approx 0.75V (so $0.75 = 5 \cdot R7 / (R1 + R7) \rightarrow R7 = \text{approx. } 1.7k\Omega$)

NOTE: untested....

