A simple light to sound converter – with video:

This a simple circuit I designed and built to convert light variations into sound. It is fun to listen to the weird sound emitted by the light of remote controls, light bulbs, TV screens and any light source.

The circuit is very simple and is based and pretty well known building blocks: a pin photodiode amplifier (U1A) converts current variations in the photodiode into voltage variations at the output of U1A. R1 is a small potentiometer used to set the gain of the current to voltage converter. Too high the gain and the amp saturates with no output, too low and no output will be heard.

The amplifier is based on a common LM358 but any other device suitable for single supply with same pinout should do.

R2 sets the volume while U2 is the amplifier based on the well know LM386: I actually used a different amplifier, a TDA2822 which happens to be a stereo amplifier found in PC speakers. I decided to put the LM386 in the schematic because it is probably easier to find.

This is the schematic.

I tried a few photodiode I took from various devices. A few are mostly sensitive to infrared, but I ended using a visible light PIN photodiode, the BPW34 which is pretty common and cheap.

The cathode of the PIN diode is marked by a small tab on one of the two diode’s leads.
The whole device can be built on a small piece of perfboard and the output can feed a pair of head phones or a small speaker. PC speakers could replace the amplifier stage but at the cost of portability. The circuit would easily fit into an Altoids tin box.

The use is immediate, just put the battery on and play with the gain and volume while pointing not directly to a light bulb: you should hear a strong buzzing noise (the 50/60 Hz mains), then try any TV (CRT or LCD), any remote control or flame.

The photodiode amplifier was not originally designed for this gadget but is intended to be part of a supercool circuit I’m working on and that hopefully will end one of these days centuries.

And this is a video. sorry for the dim light but it is evening now and I wanted to do it NOW!

I could not use regular AC (110/220Vac) light as it would have caused a strong hum.

UPDATE: Derek of Umatic/Tonewheels designed a PCB for the circuit. See his site for details.

Thank you, Derek, for sharing.

For now, have fun.

Alex.

29 Responses to “A simple light to sound converter – with video !”

1. A simple light to sound converter | StereoPropaganda says:
   3 January 2009 at 4:31 pm
   [...] View original post here: A simple light to sound converter [...] 

2. Light to sound converter - Hack a Day says:
   4 January 2009 at 7:16 pm
   [...] built what he calls a light to sound converter. It reacts differently depending on the type of light: remote controls, light bulbs, TV screens, [...] 

3. James says:
   4 January 2009 at 11:47 pm
Would love a video of this in action.

4. synthhead says:
5 January 2009 at 3:17 pm

Looks like a fun project and I’ll 2nd James’ comment!

FYI – I put up a link to this at Synthtopia:
http://www.synthtopia.com/content/2009/01/05/simple-circuit-synthesizes-sound-from-light/

Thanks for sharing this!

5. admin says:
5 January 2009 at 3:26 pm

@James, @Synthhead, the video is here now: sorry for the poor quality, I could not use regular AC light.
Thank you for your comment.

Alex

6. Querystring » Light to sound converter says:
5 January 2009 at 9:01 pm

[... ] built what he calls a light to sound converter. It reacts differently depending on the type of light:
remote controls, light bulbs, TV screens, [...]

7. blahblah says:
5 January 2009 at 9:15 pm

im pretty sure forrest mims was into this sort of thing. i saw some similar (light to sound) circuits in one of
the circuit scrapbook publications he wrote. just fyi. interesting project though.

8. Muzyka » Blog Archive » Simple Circuit Synthesizes Sound From Light says:
6 January 2009 at 8:42 am

[... ] Looks like a fun project. Details at the site. [...]

9. admin says:
6 January 2009 at 9:35 am

@blahblah, I quite sure sure not only Forrest Mims published something similar. As I wrote I just put
together two basic building blocks. It was just a collateral to a project I’m working on. Just wanted to
share it.
Ciao

A.

10. James Anderson says:
7 January 2009 at 6:35 am

A little known fact until recently… led’s can operate in forward and reverse bias. So, you might want to
use multiple led’s(different colors) that way you can make a light to audio spectrum analyzer.

11. admin says:
7 January 2009 at 10:22 am

@James Anderson, I see your point: three LEDs would replace the photodiode (and being reverse biased
would not light up) of three identical circuits. The colour of the LEDs’ case would filter the colour of the
light and each of the three circuits would generate different sounds based on the spectrum of the light.
Thank you for your input.
Alex

12. Valo-ääni-muunnin - Hilavitkutin.com - Uutisia teknikasta, ilmiöistä ja hilavitkuttimista says:
8 January 2009 at 2:17 pm

[...] http://www.5volt.eu (via [...]

}
13. ✡ blataz says:
14 January 2009 at 9:19 pm

wow… very nice.
I’ve been in a concert here in NY with these guys making sounds with lights, maybe they are interested in your work, have a look here
http://it.youtube.com/watch?v=JKruCQeBFpl&feature=channel_page
blu

14. Tom Allen says:
16 January 2009 at 10:26 pm

Can I purchase a light to sound converter from you?

Thanks,
Tom

15. ✡ admin says:
17 January 2009 at 6:32 pm

@tom, thank you for you offer but why don’t you ask a friend ? I’m pretty sure you could do it yourself though as not much experience is necessary. Make magazine (www.makezine.com) has links to some nice soldering and electronics diy tutorials.
Ciao e grazie
Alex

16. Rose says:
20 January 2009 at 9:36 pm

Can i buy one from you as well?
I would not be able to do all that, and to buy all of that stuff for one thing seems pointless. I would love to have one.
Rose

17. Paul says:
9 March 2009 at 6:21 pm

I would be very interested in buying a couple as well

18. Derek Holzer/Tonewheels says:
2 September 2009 at 6:11 pm

Thanks for sharing this Alex. I’ve been using phototransistors for a performance called TONEWHEELS for a couple years now
http://www.umatic.nl/tonewheels.html

but this is a great circuit for workshops and I’ll be having people build them in Belfast next week!

For those who are afraid of soldering irons, Eric Archer has a LITE2SOUND kit you can buy
ericarcher.net/devices/lite2sound/

although personally I don’t see what “all that stuff” one would have to buy is, besides the parts themselves and one soldering iron. I guess there will always be people with more money than time or interest to learn something new 😈

Curious to see what the major project this came out of will be.

best!
Derek

19. Ulysse says:
8 December 2009 at 1:15 am
Hi!

I’m trying to make this circuit and it is not working yet. I think I blew my LM386 amp.

I have two questions:

- What is exactly the purpose of the U1B part on the schematic? It is simply a closer view of the U1A part?
- The third connector of R1 is not connected to anything. Is that right?

Thanks a lot for your answer!

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20. **admin** says:  
10 December 2009 at 1:58 pm

Ciao Ulysse, U1B is the unused half portion of U1 that actually includes two op amps. Grounding the unused inputs lowers dissipation and prevents noise.

R1 is a potentiometer used as a simple variable resistor, hence the unused pin.

Best

A.

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21. **Andrew Back** says:  
13 December 2009 at 1:22 am

Hi Alex,

Thanks for putting this circuit online!

So I built one myself and it works, however, it is extremely fiddly and seems to go into feedback all the time. I need to leave gain set to as low as possible or near to it, and then when I switch on it almost always feeds back, until I turn the volume up and down a few times. By turning the volume up around full I can usually get it to stop feeding back. Even then the sound is quiet and if I turn the gain up it becomes even more temperamental.

Any ideas where I’m going wrong?

Cheers,

Andrew

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22. **admin** says:  
14 December 2009 at 2:56 pm

@ Andrew,

As a first test, try moving C2 to the upper pin of the volume potentiometer (R2) (the one closer to U1A). I’ll try this at home as soon as possible and in case replace the schematic.

Also, try raising C1 to 100 or 200 microFarads.

The sound you hear might be the so called “motor boating” which happens when there’s positive feedback (through power supply) between high gain input circuit (U1A and the photodiode) and output power (the amplifier + loudspeaker). The R3+C1 RC filter is used to the purpose. It is customary to say “to de-couple power supply of the two stages”.

Please let me know.

Ciao, Best regards

A.

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23. **Derek Holzer/TONEWHEELS** says:  
28 February 2010 at 9:21 am

@ Andrew,

I’ve used this circuit for a workshop now, and I can definitely say that there are some problems with the LM386 self-oscillating! One thing to look at is whether there are any ground loops in your circuit. If the ground of the LM386 has more than one path to the – of the battery, that is a ground loop and will cause the amp to oscillate by itself.

HTH,

Derek
24. **Derek Holzer/TONEWHEELS** says:
28 February 2010 at 10:36 am

PS… I have made a PCB for this circuit here:

http://www.umatic.nl/tonewheels_technical.html

If there are improvements please let me know and I will update it.

Best from Berlin,
Derek

25. **admin** says:
1 March 2010 at 12:05 pm

@Derek and Andrew,
try removing C3 (the capacitor between pin 1 and 8 of the LM386). This lowers the gain of the amplifier to 20 against 200 as with the cap mounted.
For now I can’t add anything else…
Please let me know.
Best regards, for now.
Alex

26. **Michael Peters** says:
8 April 2010 at 7:13 am

hi Alex, a friend of mine (Jürgen ) took your diagram and built this for me as I don’t speak Solderese – it does turn remote control signals into rhythmic noises but it stays totally quiet with regular light sources, LEDs, pocket lamps. Any idea what could be wrong? (he told me he was surprised that the direction of the diode didn’t seem to make any difference.)

best, -Michael

27. **admin** says:
9 April 2010 at 2:42 pm

Ciao, it is a bit surprising that the direction (I assume you are talking about the direction of incident light, not the polarity of the diode) does not matter. I suspect that the remote couples directly through radio frequency and not through IR as it should happen. I suggest to check the circuit and specifically the polarity (anode and cathode of the diode). The circuit sense VARIATIONS in light intensity so if pocket lamp and LED are powered from DC (batteries) sources you’ll hear nothing. Try with a regular CRT monitor, an LED display calculator and in general LED displays (clocks). Please return with feedback.
Best
A.

28. **ferx** says:
19 August 2010 at 2:40 pm

Hi, i build the circuit but nothing happen, no sound from light sources. I use a different photodiode because i didnt found BPW34 in my city. Could be posible that the problem is my photodiode?

Thanks for sharing and great job

29. **admin** says:
23 August 2010 at 2:39 pm

Of course you checked your assembly for errors. Other than that I can’t suggest much more.
If you are sure that your diode is actually a photodiode that should be OK as almost any common photodiode should respond to a remote’s IR light. Make sure about the polarity of the diode. Is power OK? Check it at the ICs’ pins.
Is the loudspeaker totally silent ? If not pull volume at max (potentiometer’s wiper far from ground connection) and touch the wiper (central) lead of the potentiometer : you should hear a (strong and distorted) hum meaning that the power amp and the batteries are OK.