Noise Issues with PIR Sensor Circuit

forum.allaboutcircuits.com/threads/noise-issues-with-pir-sensor-circuit.143879

MichaelMarr

- [Home](#)
- [Forums](#)
- [Hardware Design](#)
- [Sensor Design & Implementation](#)

  - [Search Forums](#)
  - [New Posts](#)

I recently subcontracted the design of a motion sensing circuit using a [BISS0001](#) chip. The designer decided to add a 555 timer to the design with the output of the [BISS0001](#) triggering the 555 in mono-stable mode. The 555, in turn, causes a remote 12Vdc relay to

energize. The sensor circuit is connected to the relay circuit by a 12 foot long RJ11 6P4C cable. The sensor circuits can be daisy chained with up to 4 sensors feeding into the relay circuit whereby any one of the sensors can energize the relay if motion is detected. The time delay on the 555 is 20 minutes.

I am experiencing false detection signals which cause the relay to energize even when no motion is being detected. Clearly, this is a noise issue considering that the length of the cables in a 4 sensor configuration is effectively 48 feet. I have attached the circuit schematic to this post and would welcome any suggestions which might improve the immunity of the circuit.

I don't understand why the designer decided to use the 555 timer when the <u>BISS0001</u> was already capable of driving the relay with an ON time of 20 minutes but, unfortunately, this is the design that I now have to work with.
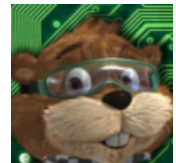
Mod edit: please no email addresses. It attracts spam.

Attachments

Last edited by a moderator: Jan 1, 2018

> <u>MichaelMarr said:</u>
>
> I recently subcontracted the design of a motion sensing circuit using a BISS0001 chip. The designer decided to add a 555 timer to the design with the output of the BISS0001 triggering the 555 in monostable mode. The 555, in turn, causes a remote 12Vdc relay to energize. The sensor circuit is connected to the relay circuit by a 12 foot long RJ11 6P4C cable. The sensor circuits can be daisy chained with up to 4 sensors feeding into the relay circuit whereby any one of the sensors can energize the relay if motion is detected. The time delay on the 555 is 20 minutes.
>
> I am experiencing false detection signals which cause the relay to energize even when no motion is being detected. Clearly, this is a noise issue considering that the length of the cables in a 4 sensor configuration is effectively 48 feet. I have attached the circuit schematic to this post and would welcome any suggestions which might improve the immunity of the circuit.
>
> I don't understand why the designer decided to use the 555 timer when the BISS0001 was already capable of driving the relay with an ON time of 20 minutes but, unfortunately, this is the design that I now have to work with.
>
> I can be reached by email at <u>michael.marr@doublemdesign.ca</u> if you wish or at 416-795-9997

Does it only happen when the jumper is in the 0-10 minute mode or does it also happen when the jumper is in the 0-20 minute mode? I don't see a need for Q2. I think it could (should) be disconnected/removed.

Q2 might be there to help the discharge transistor on the 555 dump the charge on those big timing caps. Other than that, I don't know either.

Do the relays have diodes across their coils? You would want to snip the back EMF right there rather than in a long cable. The long cables are also good antennae.

The 555 might be there to give a consistent time once the PIR triggers. The BISS0001 is in the retrigger mode (pin1 is high) and the scope shot on the left shows a varying ON time likely due to the PIR voltage crossing the comparator's threshold multiple times. On the surface, one wonders why it's not in the one-shot mode but there's probably a reason the designer did what he did. What does he have to say about it? I couldn't find a good datasheet that showed the max time for the BISS. Maybe it can't do 20min with the adjustability you need?

Essentially, what you have is an assortment of comparators and other analog circuits driving the logic in the BISS and 555. These are by nature noise-sensitive and they latch. You'll have to poke around to see what is false triggering. Noise into the 555 trigger is an obvious one but also the comparator stuff on the input of the BISS. Try and isolate the two circuits (pull R3) to see what is getting triggered by the noise. Check the PCB layout as well. You want that 12V relay stuff to be by itself, not sharing power or ground paths with the 5V PIR stuff.

Personally, I'd dispense with the 555 (and maybe the BISS, too) and use a PIC or similar microcontroller to do the job. It could easily discriminate between noise and signal. The later ones have built in analog stuff as well. You are likely going to be changing the PCB layout anyway...

Finally, you posted contact info that I snipped. If member wants to contact you, they can use a PM or PM me and I will give it to them. If email / phone numbers are in the posts, the spammers will be upon us.

Good luck!

Attachments

- PIR Controller BISS0001.pdf
  223.9 KB Views: 13

- sa555.pdf
  1.5 MB Views: 3

- PIR Controller BISS0001-3.pdf
  159.3 KB Views: 6

Last edited: Jan 1, 2018

Q2 might be there to help the discharge transistor on the 555 dump the charge on those big timing caps. Other than that, I don't know either.

Do the relays have diodes across their coils? You would want to snip the back EMF right there rather than in a long cable. The long cables are also good antennae.

The 555 might be there to give a consistent time once the PIR triggers. The BISS0001 is in the retrigger mode (pin1 is high) and the scope shot on the left shows a varying ON time likely due to the PIR voltage crossing the comparator's threshold multiple times. On the surface, one wonders why it's not in the one-shot mode but there's probably a reason the designer did what he did. What does he have to say about it? I couldn't find a good datasheet that showed the max time for the BISS. Maybe it can't do 20min with the adjustability you need?

Essentially, what you have is an assortment of comparators and other analog circuits driving the logic in the BISS and 555. These are by nature noise-sensitive. You'll have to poke around to see what is false triggering. Noise into the 555 trigger is an obvious one but also the comparator stuff on the input of the BISS. Try and isolate the two circuits (pull R3) to see what is getting triggered by the noise. Check the PCB layout as well. You want that 12V relay stuff to be by itself, not sharing power or ground paths with the 5V PIR stuff.

Personally, I'd dispense with the 555 (and maybe the BISS, too) and use a PIC or similar microcontroller to do the job. It could easily discriminate between noise and signal. The later ones have built in analog stuff as well. You are likely going to be changing the PCB layout anyway...

Finally, you posted contact info that I snipped. If member wants to contact you, they can use a PM or PM me and I will give it to them. If email / phone numbers are in the posts, the spammers will be upon us.

Good luck!
Click to expand...

After looking at it again, it looks like Q2 is there to discharge the timing cap to allow RETRIGGERING. If the PIR senses anything, the light will stay on for another X minutes.

Note, a 555 timer triggers as soon as power is applied. Is it possible you have intermittent power? Or too much power draw for the little LT 7805 (low power version) in the design.
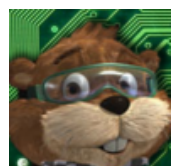
I designed a PIR sensor a while back (about 2 years ago now - so the cob webs are dusty).

One of the things I recall needing to do is filter the power to the PIR chip heavily (I.E. add a large electrolytic cap where R13). 0.1mHz time constant sort of heavily. Any small movement of the power supply can cause the PIR sensor to activate since the PSRR is so low in this transistor configuration - this amplifies through your amplifiers stages and boom you have a large signal. I found that the LED's turning off/on were large enough loads to cause ripple on the power supply which shot through all of the stages.
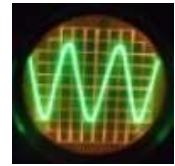
Reducing your gain (currently ~90dB) will also help but will hurt your sensitivity at long distances, but using different lenses for different configurations can help compensate.

One problem with these circuits is that they take a while to stabilize due to the low frequency of the sensor (somewhere around 1Hz). Adding diodes around C7 and C8 will help the amplifiers stablize more quickly on startup because you'll charge the caps more quickly.

Hopefully some of this helps - As I didn't have much time to understand your problem nor recall much from my PIR days.

You must log in or register to reply here.

| Thread starter	Similar threads	Forum	Replies	Date
S	Noise Issues with PIR Sensor Circuit .. #2	Sensor Design & Implementation	11	Dec 10, 2023
H	GNSS Receiver designed IC circuit noise issues	IC Design	0	Jun 3, 2023
E	Buck Converter to Battery Charging Circuit Voltage Dropping & Noise Issues	Power Electronics	7	Oct 2, 2020
	Mounting several PCBs behind a front panel with no enclosures. Any shielding or noise issues?	PCB Layout , EDA & Simulations	1	May 2, 2019
G	Noise Issues! CD40106 based synth.	Analog & Mixed-Signal Design	7	Nov 12, 2016

You May Also Like

-

  Renesas Eyes Battery Charging and Power Management With New USB-PD ICs

  by Charles Lee

-
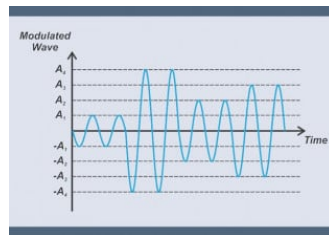
  Introduction to Modulation Techniques in RF Systems

  by Dr. Steve Arar

-

  Infineon, Littelfuse, and Toshiba Release High-Performance Power MOSFETs

  by Duane Benson

-

  Microchip Reveals CAN FD System Basis Chip in Tiny Footprint

  by Jake Hertz