# Spin Project: Christmas Light Control

Level: Intermediate
Hours to Complete: 1-2
Skills Required: Soldering, SPIN Programming, circuit building
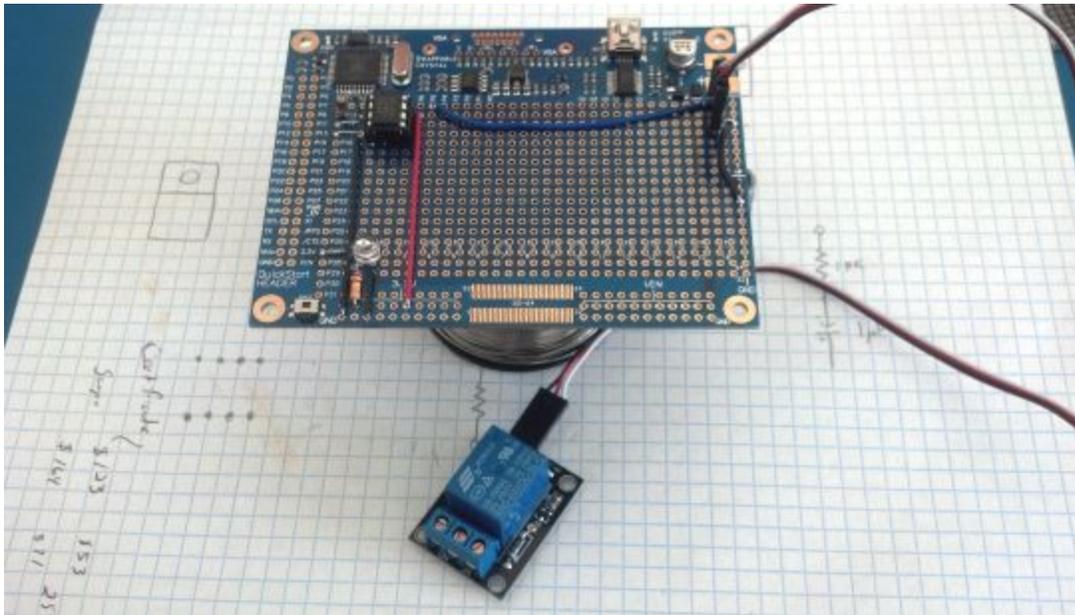
This project is an automatic Christmas Light Controller for turning on outside lights on your patio/porch. It controls your lights via a relay board.

It turns on the lights automatically at dusk and can optionally flash them at some temperature of your choosing. When the temperature reaches that preset value the lights would begin to blink automatically.

This can be useful to indicate freezing weather and slippery conditions on your sidewalk or steps, or just as a fun little addition to your holiday display. The lights are automatically turned off at dawn by the control device.

What's Needed:

- (1) Propeller Project Idea Pack (#910-32810, discontinued)
  - (1) Propeller Project Board USB (#32810, discontinued)
  - (1) Single Relay Board (#27115)

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- - (1) DS1620 Digital Thermometer (#604-00002, discontinued)
  - (1) Phototransitor, 850NM, T1 3/4 (#350-00029)
  - (1) 1 k-ohm 1/4 W Resistor (#150-01020)
  - (1) 0.1 µF Mono Radial Capacitor (part of #751-00012)
- (1) 100K, 1/4W, 5% resistor (#150-01040)
- (1) LM2940-5 Regulator (*Optional*, #601-00506, discontinued)
- (1) 22 µF Electrolytic Capacitor (Radial Lead) (*Optional*, #200-02240, discontinued)
- (1) 3-Pin Single Row Header (*Optional, but recommended*, #451-00303)
- (1) 14" 3-Wire F/F Extension Cable (*Optional, but recommended,* #805-00002, discontinued)

Note: Many of these parts are discontinued for sale or manufacture by Parallax, but may be found through other retailers, or have suitable replacements available through Parallax or other retailers.


Connecting the Bits

✓ Use the provided schematic and the images below to build your project.

The 5 V regulator and 22 µF capacitor are optional and only required if you plan on supplying Vin with more than 5 V. I wasn't sure what other things I might add to my board so I added the optional 5 V regulator and its required 22 µF minimum output capacitor. The DS1620 is powered from the 3.3 V supply rail and the serial bus is connected to P13-P15. There is a 1K resistor between P13 and pin 1 of the DS1620 (data) to protect in case of a programming error.

The phototransistor collector is connected to P27 with a 100K pull-up. This value was chosen to adjust for the correct average amount of light required to enable/disable the relay.

An optional 3-pin header and servo extension cable were chosen to connect the Single Relay Board to the Propeller Project Board. You could solder the 3-pin header from the relay board directly into the proto board area, however that would put all the load of the relay board and wires onto those three pins. If you do solder it in, it is important to understand that when connecting and disconnecting wires you could be putting a lot of stress on the proto board area and solder joints.

The relay board could be wired into your Christmas lights on a front porch or patio using the COM and NO connections on the relay board to switch the power going to the lights.

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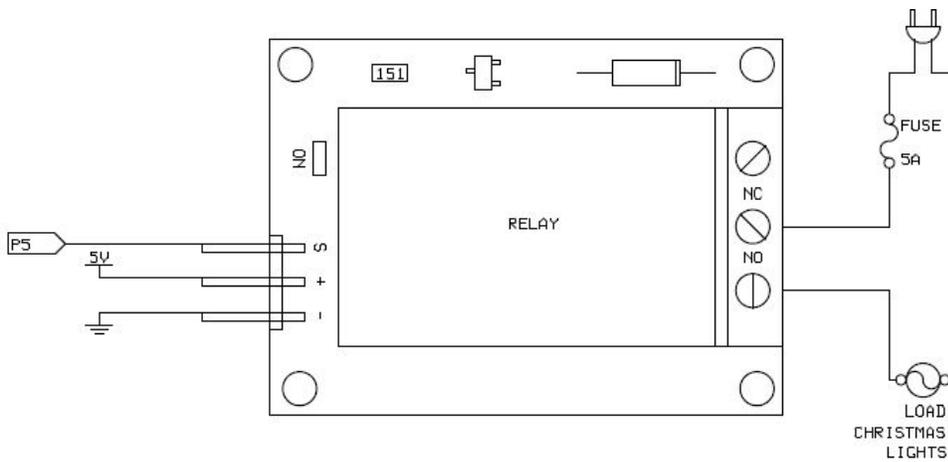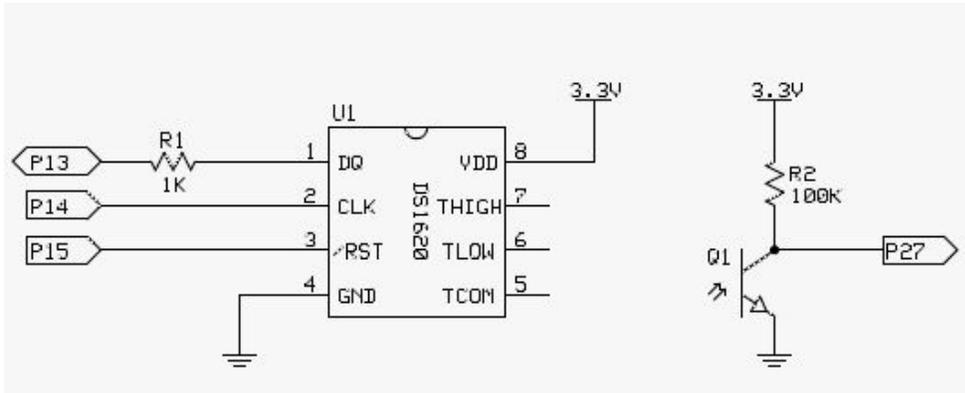
Brighten Things Up a Bit

Here is my board:

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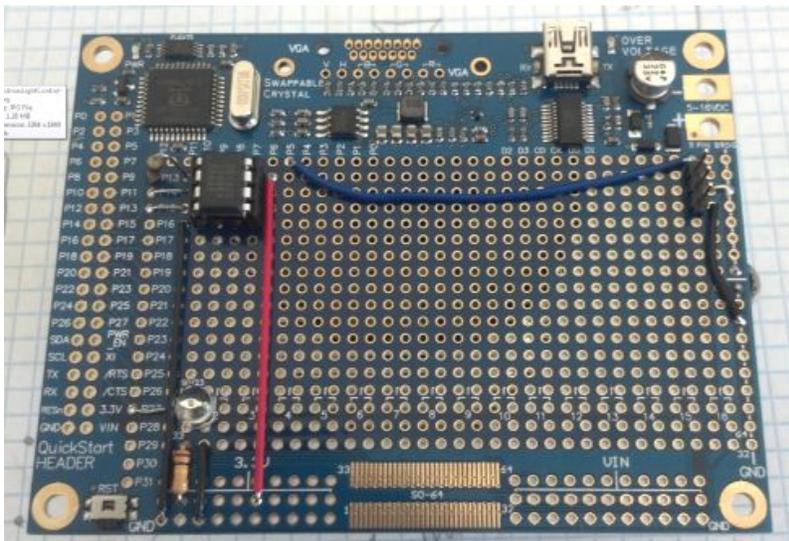
✓ Once you have everything soldered and secure you can download the code to the board.

Now when it is dark the relay will turn on automatically. When the temperature is at or below your preset point the relay will toggle once per second effectively flashing the lights. This can be used as a indication of freezing weather warning of possibly slippery sidewalk or steps.

I laid my board out so I could mount it in an enclosure on the front porch facing away from the house. This way the phototransistor picks up the ambient light and not the light from your Christmas lights.

The DS1620 returns the temperature in °F. The light sensor returns a simple 1 or 0 depending on the light level. When it is dark, the pin connected to the phototransistor reads 1. When this happens the relay turns on. If the temperature is below the set point (TEMP_FLASH) the relay toggles once per second. Once there is sufficient light, the relay turns off.

The level of light required to turn the relay on/off is set by the 100K resistor. If you would like to be able to adjust the level you can replace the 100K resistor with a 100K potentiometer in series with a 1K resistor. This will let you dial-in the light level at which you want the relay to turn on/off.

Try This:

✓ Have the temperature from the DS1620, the light/dark status, and the relay on/off status display on a 2x16 Serial LCD (#27977) or other LCD display.