How I Built My

Monsters In The Dark™
Eerie Monster Eyes™

This concept is so simple it is scary.
This design is for those that only want to build the scary best.
The dead have been “sticking” around to get one or two or three.

Warning
Build and Operate At Your Own Risk

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Table of Contents

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Suppliers

Radio Shack – www.radioshack.com

I would like to note that Radio Shack is not the least expensive place to purchase your components. I have chosen to use their part numbers as Radio Shack is a nation wide chain of stores that you can quickly run to and pick up the parts.

Specifications and prices are subject to change and are as of July, 2006

The wiring diagrams in this document show 6 volt batteries. The parts list calls out 9 volt components. Feel free to double check the math for the resistor value.

Generic LED Eyes Parts List Makes 5 Pair Of LED Eyes In Single Project Box

QTY Required	Description	Part Number	Price Per Unit	Project Cost
10	Bright RED Diffused Lens LED	276-330	$1.39	$13.90
1	270 Ohm - 1/2W Resistors	271-1112	$0.99	$0.99
1	9V Battery Clip	270-324	$2.59	$2.59
1	Plastic Enclosure	270-1803	$3.69	$3.69
1	Heat Shrink Tube	278-1627	$2.99	$2.99
1	Mini Toggle Switch	275-645	$2.99	$2.99
1	Hook Up Wire	278-1224	$5.99	$5.99
Total				$33.14

If you purchase 4 more project boxes you can spread your LED eyes out and each will cost less than $9.00 to build.

The Halloween Prop Shop – www.HalloweenPropShop.com

If you are having problems find parts or want a better selection then contact me and I may be able to help.

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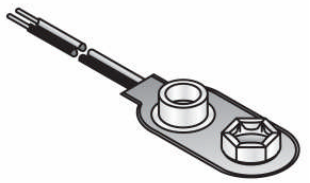
Component Pictures

Typical Representations

	Battery Clip for 9V battery
	Resistors ¼ watt and ½ watt
	Light emitting diode or LED
	The project box will hold the battery, battery clip and resistor. A hole will be drilled to allow the wires to go to the LED's and for the optional toggle switch to be mounted.
	Toggle switch will be used to turn power on and off to the Light Emitting Diodes.
	Hook up wire will be used to connect the parts together.
	Heat shrink tube will be used to insulate the solder joints and componet leads

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Recommended Tools

If you are going to be doing your own electronics project then I strongly recommend that you purchase a quality soldering station and not a $20.00 (or less) piece of junk. Also get a solder holder; it makes life so much easier.

This clip on heat sink is used to protect the device you are soldering. The heat from a soldering iron can destroy the part you are soldering if you let it over heat the part. By clipping this heat sink (on the part lead) between the part and soldering iron it will “help” prevent damaging your part. I recommend you get 2 or 3 of these.

Wire strippers are used to strip the insulation off your wire. Higher quality strippers have notched areas for different sized wires plus a regular cutting blade.

Quality Mini-Pliers & Cutter set.

Quality Screw Driver Set.

The drill will be used for drilling the holes for the wires and toggle switch in the enclosure.

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Glue gun for gluing the wires and resistor in the enclosure. The wires are glued to help prevent them from being pulled out of the box.

Heat shrink gun with the proper attachment and heat shrink tubing can be used to insulate solder joints and component leads.

Loctite™ is used to keep nut from coming loose on bolts or in our case, the toggle switch nut. You will need this if you install the optional toggle switch.

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Introduction

Monster Eyes are a great way to add a little spookiness to your haunt. They can be placed in bushes, in a hallowed out tree, near the ground, embedded in a tombstones and masks and even in the eyes of Owl hunting decoys.

What are Monster Eyes? These are 2 light emitting diodes (LED) that are connected to power supply or set of batteries. Place 2 LED's a few inches apart from each other and in a dark area and it looks as if a creature of some type is staring at you. Place a few pairs of Monster Eyes on the roof and around your cemetery and you can create a really eerie effect.

First, lets starts out by saying there are many different sizes, colors, and levels of brightness that you can choose from when it comes to picking out what type of LED's you want to use. LED's also come in clear and diffused cases as well as several viewing angles.

When it comes to price you will find LED's in retail stores typically ranging from 65 cents a piece to several dollars each.

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Terms You Need To Know

LED Brightness - Typically rated in mcd, the higher the brighter.

LED Sizes - Typically 3mm, 5mm, 8mm, and 10mm

LED Operating Voltages - Typically called out on data sheets as Voltage Forward (Vf). Most common LED's operate in the 1.9 volt to 2.2 volt range. With the addition of new colors and levels of brightness you must look up the Forward Voltage rating of your LED's on the manufacturer's data Sheet.

LED Operating Currents - Typically called out on a data sheet as Forward Current (If). Most common LED's operate in the 17mA to 25mA range. With the addition of new colors and levels of brightness you must look up the Forward Voltage rating of your LED's on the manufacturer's data sheet.

LED Viewing Angles - Is how wide the beam is when the light leaves the LED. Typically, the narrower the viewing angle the brighter the LED will be when compared to the same type of LED with a wide viewing angle.

LED Data Sheet Information

Electrical / Optical Characteristics at T_A=25°C

Symbol	Parameter	Device	Typ.	Max.	Units	Test Conditions
λpeak	Peak Wavelength	Hyper Red	650		nm	I_F=20mA
λD	Dominant Wavelength	Hyper Red	635		nm	I_F=20mA
Δλ1/2	Spectral Line Half-width	Hyper Red	28		nm	I_F=20mA
C	Capacitance	Hyper Red	35		pF	V_F=0V;f=1MHz
V_F	Forward Voltage	Hyper Red	1.95	2.5	V	I_F=20mA
I_R	Reverse Current	Hyper Red		10	uA	V_R = 5V

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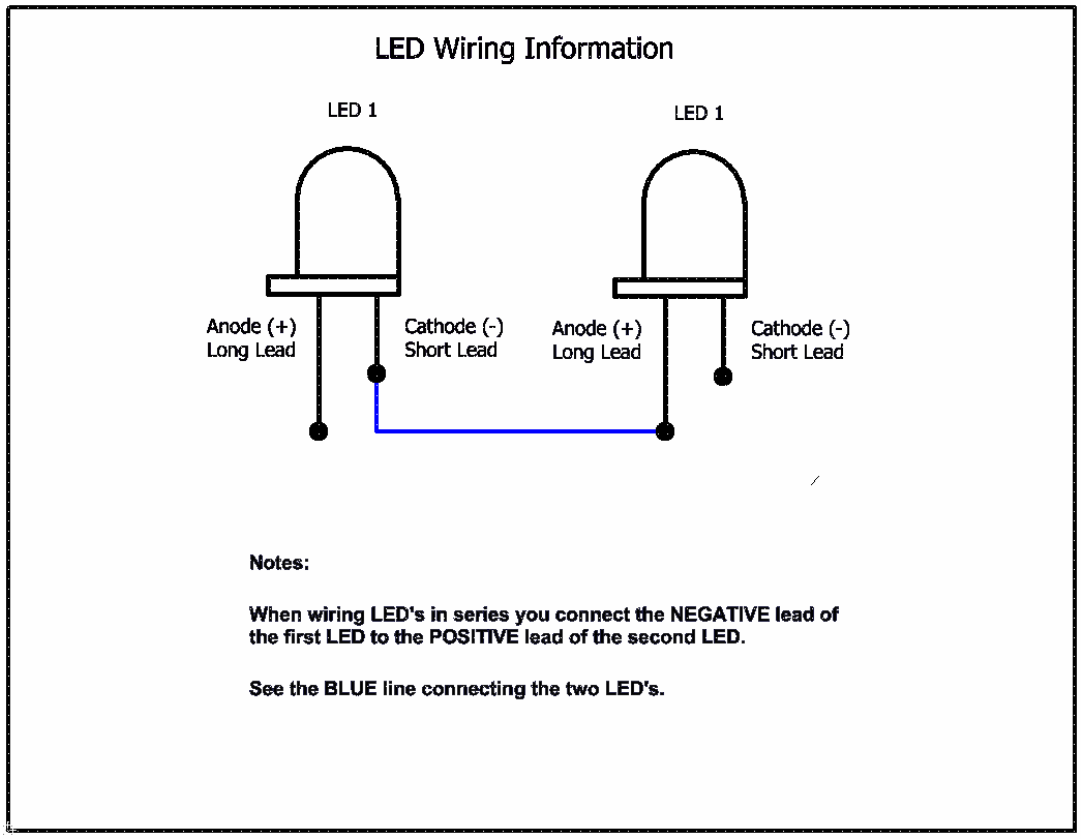
How does it work?

Connecting 2 LED's in series



When connecting two LED's in series it is important to connect them properly. If you do not wire the LED's properly they will not light up and you might damage both LED's.

In most cases the long lead of the LED will be the Anode or positive lead and the short lead will be the cathode or negative lead. To properly connect two LED's in series you connect the SHORT lead of the first LED to the LONG lead of the second LED.

WARNING – I have found a few LED's that operate in the opposite manner. You should always read the data sheet of the LED's before connecting them to a circuit.

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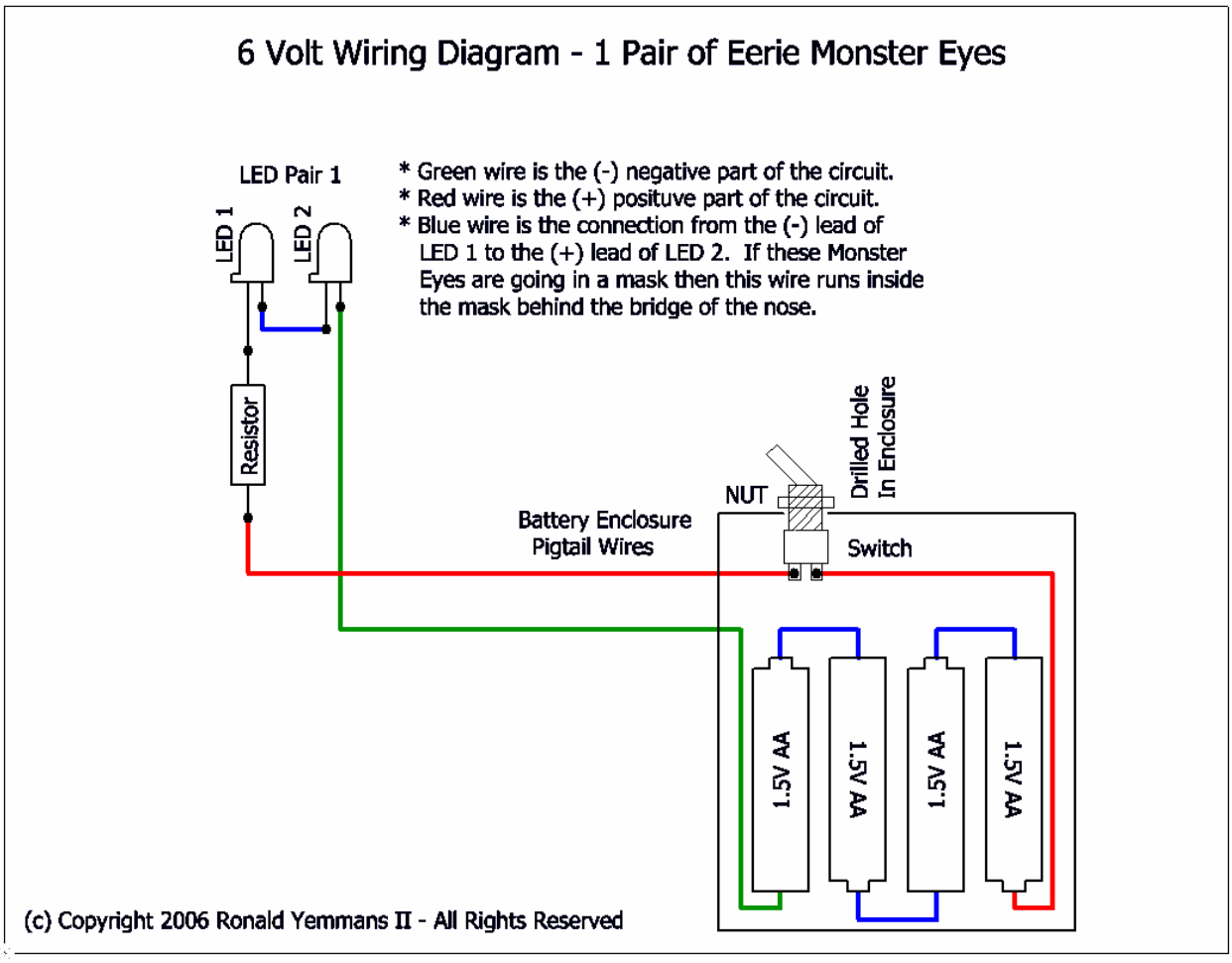
Single Pair of Light Emitting Diodes

The drawing below is a very simply “series” circuit. The batteries are connected in series to supply 6 VDC to the electronic components. The electronic components consist of a single resistor and two light emitting diodes all wired in series.

When you first apply power to a light emitting diode, the LED draws a very high amount of current. The circuit will draw to much current from the batteries and will destroy the LED. By placing a resistor (value must be calculated) in series with an LED(s) the amount of current drawn from the batteries will be limited and will prevent the LED from being damaging.



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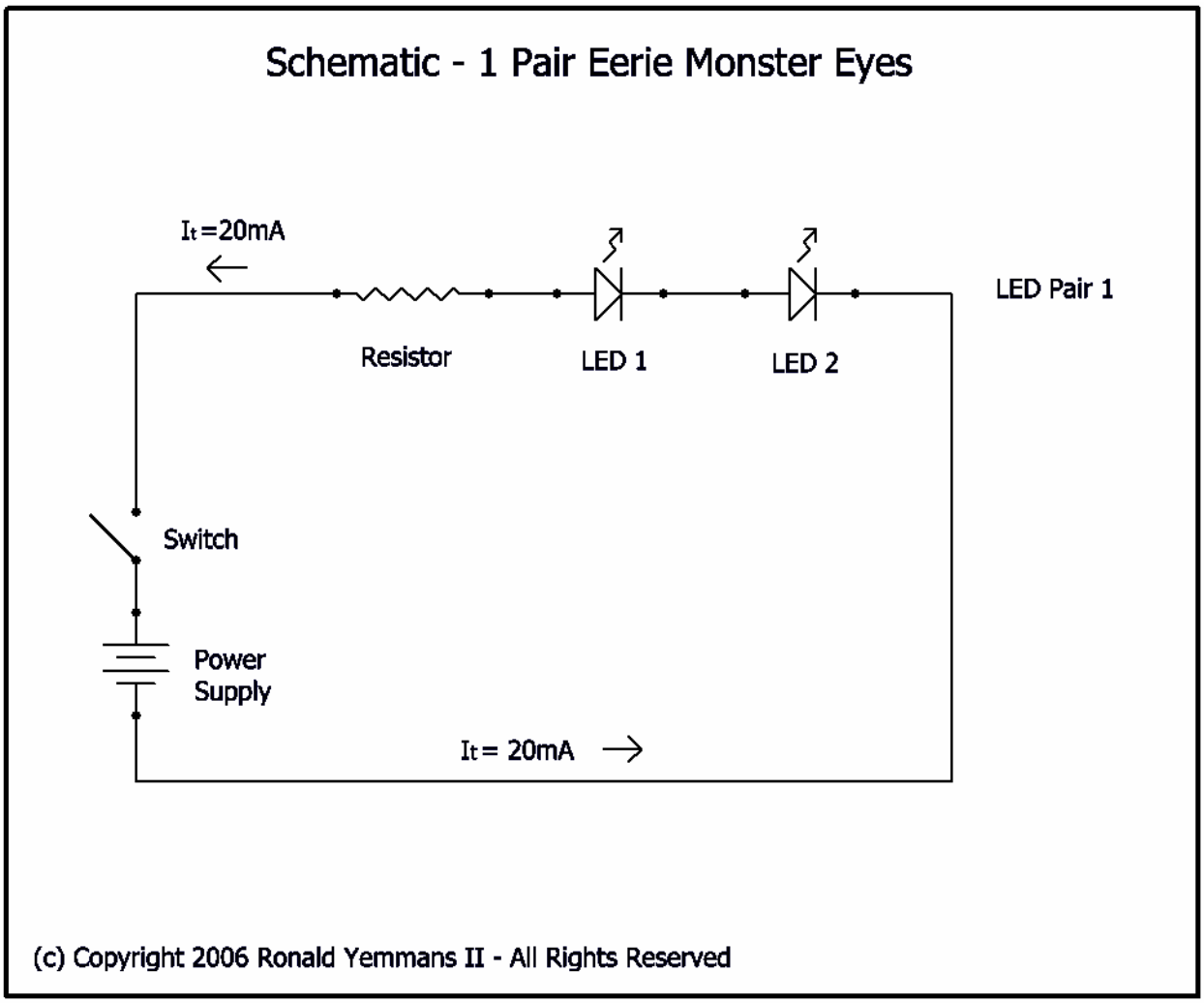
Calculating the Resistor Value

First you need to read the data sheet for the LED's you have chosen to use. There is two specifications you are most interested. The first specification is the operating voltage range of the light emitting diodes. The second specification is the maximum operating current allowed.

Example 1

LED Specifications:

Operating Voltage Range	1.9VDC – 2.1 VDC
Maximum Operating Current	20mA or **.020 Amps**
Battery Pack Used	6VDC



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Step 1 – Calculate the voltage used by the resistor.

All the components on a circuit will use up the total voltage supplied by the batteries. Since the LED's we have chosen to use are identical they will use the same amount of voltage. We need to calculate how much voltage the resistor will then use.

Since all three components are wired in series you simply add the voltages used together.

Battery = Resistor + LED 1 + LED 2 6 VDC = **X** VDC + 2.1 VDC + 2.1 VDC

Algebra – YUK! 6VDC – 2.1 VDC – 2.1VDC = **1.8 VDC**

1.8 VDC is how much voltage the resistor must use.

Step 2 – Calculate the resistance value of the resistor.

Now that we know how much voltage the resistor needs to use up AND we know that the maximum current allowed through the LED's we can calculate the resistor value in ohms.

Resistance = Voltage / Current = **1.8 VDC** / **.020 Amps = 90 Ohms**

Note: If you cannot find a 90 Ohms resistor then use the next **LARGER** size (90 – 110 ohms)

Step 3 – Calculate the **minimum** power rating of the resistor.

When the resistor uses up the **1.8 VDC** heat will be generated. If you pick to low a power rating the resistor will burn up.

Power = Current x Voltage = **.020 Amps x 1.8VDC = .036 Watts**

You will see that the most common power ratings for resistors are 1/8, 1/4, and 1/2 Watts.

1/8 Watts = **.125 Watts**, since this is a much higher rating than we calculated (**.036 Watts**) we should be safe.

The resistor required for the above circuit is **90 Ohm, 1/8 Watt.**

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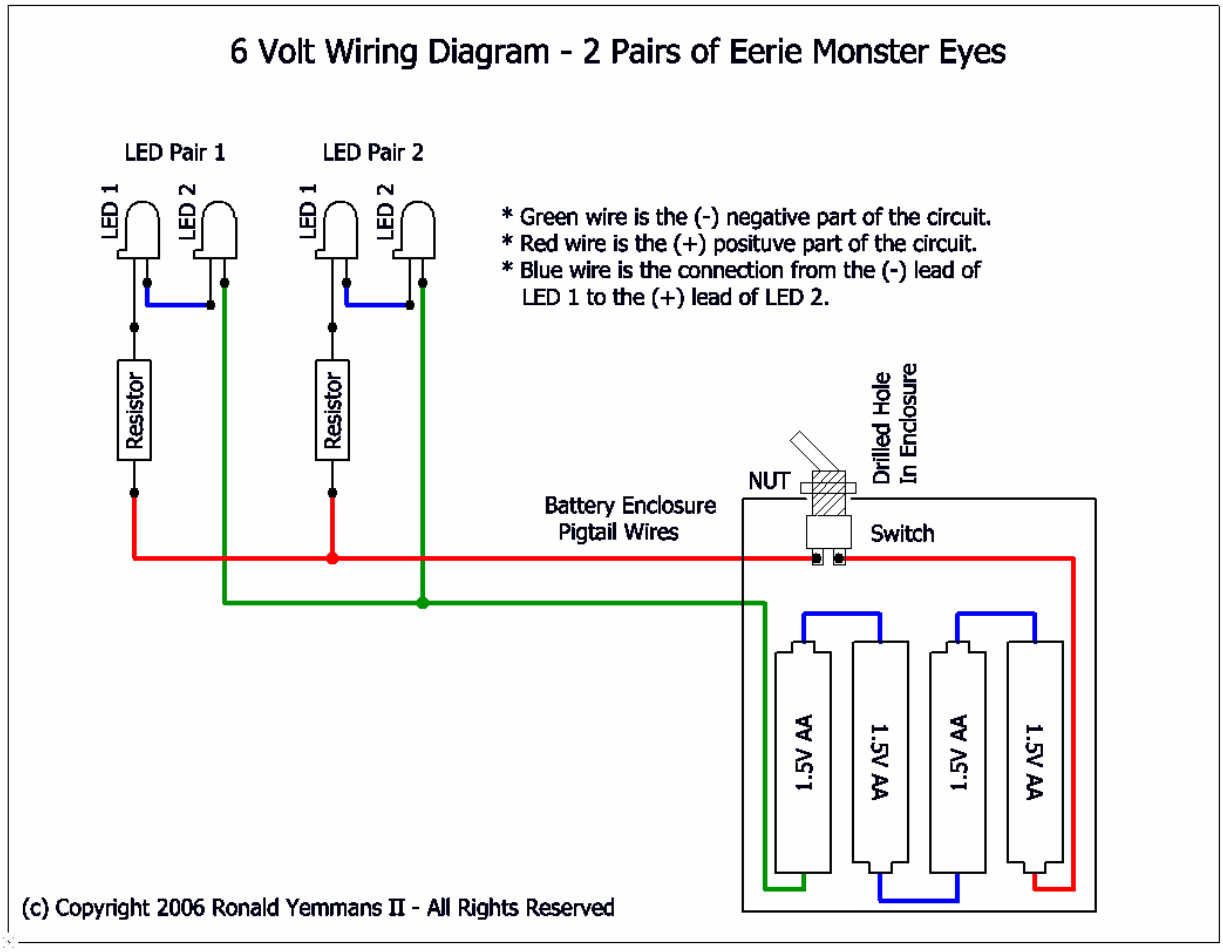
Two Pair of Light Emitting Diodes

If you take a moment to look at this circuit you will notice that each pair of LED's is wired EXACTLY the same as Example 1. When we add the second pair to the circuit as shown below we call it a "parallel" circuit, meaning that each "set" of eyes are wired parallel to each other.



Is there a difference in how this circuit works as compared to the circuit in Example 1? Only a minor difference exists. This difference is that a total of **.040 amps** will be drawn from the batteries which will cause them to "die" twice as fast.

LED Pair 1 will draw a total of **.020 amps**

LED Pair 2 will draw a total of **.020 amps**

All other aspects of the circuit remain the same as in Example 1.

If you want to learn more then search the WWW for Ohms law.

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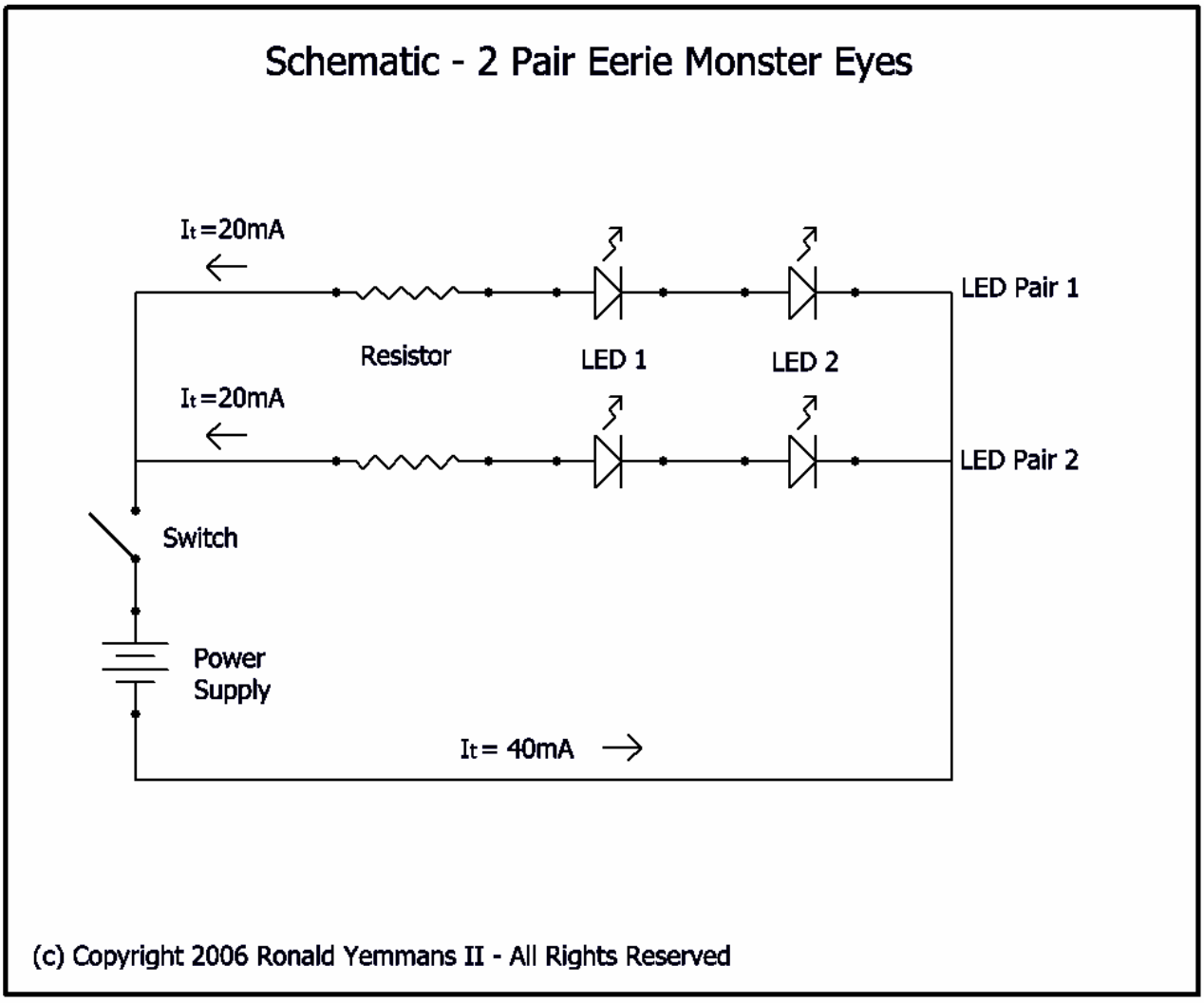

Note: Some of you may have noticed that the arrows showing current flow are pointing towards the positive side of the battery. Current flow is actually the flow of electrons. Electrons are negatively charged particles and are attracted to the positive end of the battery. While many people believe that “electricity” flows positive to negative this is not the case.

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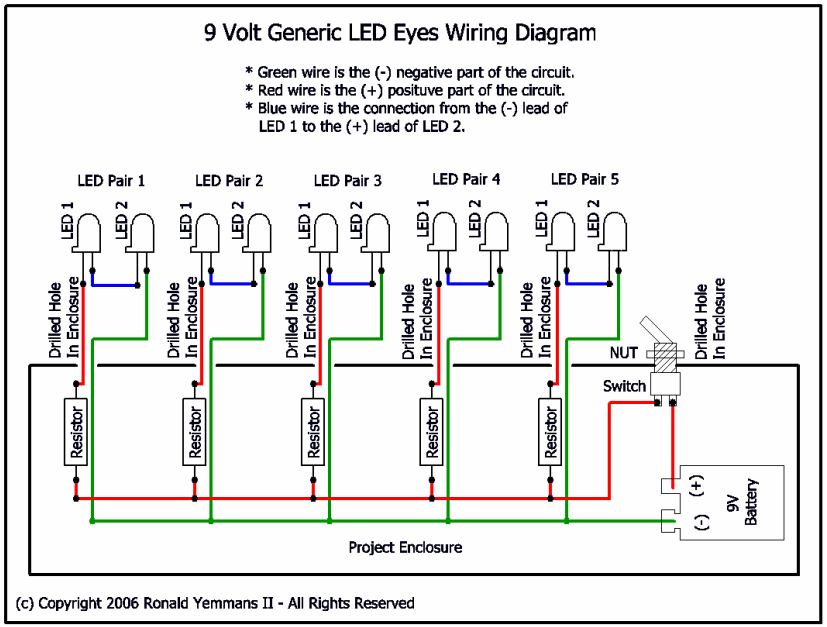
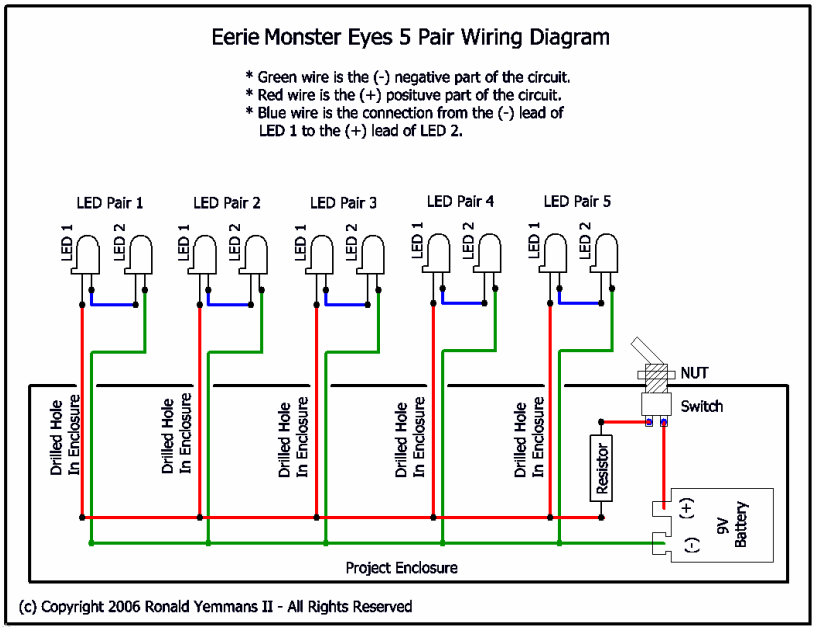
Five Pair Circuits Compared





Note: These two circuits are functionally the same. The second circuit reduces the number of number of resistors from 5 down to 1. The important thing to realize here is that considerably more current is flowing through the single resistor and we need to be concerned with the **HEAT** that will build up in it.

Recalculate power requirement for a single resistor.

.020 Amps per set of eyes .020 Amps x 5 sets = **.100 Amps**
Power = Voltage x Current 1.8 VDC x .100 Amps = **.180 Watts**

The minimum power rating for the single resistor should be no smaller the ¼ Watt, you might even consider using a ½ Watt resistor just to be safe.

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Assembly Guidelines

The following assembly guidelines are for construction of the 6 volt circuit with a single pair of LED's in example 1.

1. Remove the face plate/cover from the enclosure.

2. Drill the mounting hole in the face plate/cover for the toggle switch you purchased.

3. Drill a small hole in the face plate/cover for the wires to come out and run to the LED's.

4. Solder all the components together as shown in the diagram of Example 1.

   Remember to use your heat sink to protect your LED's from the heat.

   You must confirm that the positive leg of the LED's you are using is the long leg on your LED's.

   Cover all exposed solder joints with heat shrink tubing.

5. Assembly the box as shown in the 9 Volt 5 LED eyes Example. If you install all 5 pairs of LED's then purchase a little larger project box so all the resistors will fit inside. You should use heat shrink tube to prevent the resistor leads from short circuiting out the unit.

6. Install your battery and test the unit.

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Trouble “Shooting”

If the LED’s do not come on it is most likely due to one of the following reasons.

1. You took to long to solder the LED’s and you damaged one or both. Read the data sheet for the LED’s you have chosen. They specify how long you can apply the heat to an LED before you burn it out. Using a clamp on heat sink can help delay any damage due to heat. You typically have less than 2 seconds to hand solder LED’s with a low wattage soldering iron.

2. You have the battery leads connected backwards in the circuit. This could damage the LED’s.

3. You soldered one of the LED’s into the circuit backwards.

4. You miscalculated the resistance value of the resistor and used up to much voltage at the resistor. This should not damage the LED’s.

5. You miscalculated the resistance value of the resistor and did not use up enough of the voltage from the battery. This would damage the LED’s.

6. You miscalculated the resistance value of the resistor and are drawing to little current from the batteries. This should not damage the LED’s.

7. You miscalculated the resistance value of the resistor and are drawing to much current from the batteries. This would damage the LED’s.

I call it trouble “Shooting” because if most of the reasons listed above will burn out the LED’s and there is no way to fix them. So you “shot” yourself in the foot.

If you want to practice soldering cheap LED’s before using your really good ones then look for some low power cheapies.

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