

Need 3 AA batteries  
 Turn on Diavolino - Blinks for 60 seconds - now ready  
 on motion trigger - 1st Relay (plugs into Try Me button prop)  
 2nd Relay plugs into  
 3rd → Fog machine runs 10 seconds  
 30 second reset time

Fog Machine Controller, July 2013

In this project, you will build a Fog Machine Controller, which lets you trigger a fog machine using a prop controller. It's easy to adapt to any prop controller available (EFX-Tek Prop-1, Arduino, Picaxe, etc.)

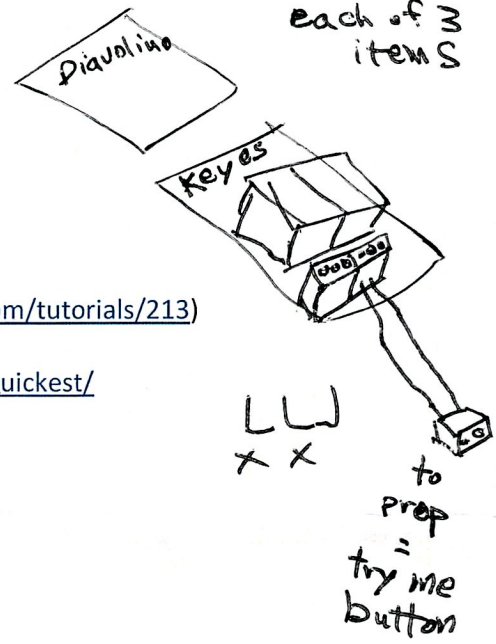
Materials Required:

- 1x 5V Relay Module
- 1x AC extension cable – this will connect to your fog machine.
- 1x Project box - comes with screws to hold it closed in a small plastic bag.
- 1x Stereo plug
- 1x Stereo jack
- 4x Screws 4-40, 1/2"
- 4x Nuts 4-40
- 1x 1" piece of plastic tubing, 1/4" outside diameter, for stand-offs
- 1x Servo extension cable – connects the relay to the stereo jack
- 1x 3-wire cable – connects the stereo plug to the controller, 6"
- 1x zip tie

1st + 2nd relay are set up for timed loop props  
 slight delay between each of 3 items

Tools Required:

- Soldering iron (need a refresher in soldering? <http://www.sparkfun.com/tutorials/213>)
- "Helping Hands". You can make one yourself, check these out: <http://www.instructables.com/id/DIY-Helping-Hands-Cheapest-and-Quickest/>
- Wire clippers
- Wire strippers
- Small flat blade screwdriver
- Small Phillips screwdriver
- Small needle-nosed pliers
- Tweezers
- Magnifying Glass (optional, unless you need it)
- Safety glasses
- Hot Glue gun and sticks
- Exacto knife and something to cut on (small board, etc)
- Multimeter
- The remote from your fog machine



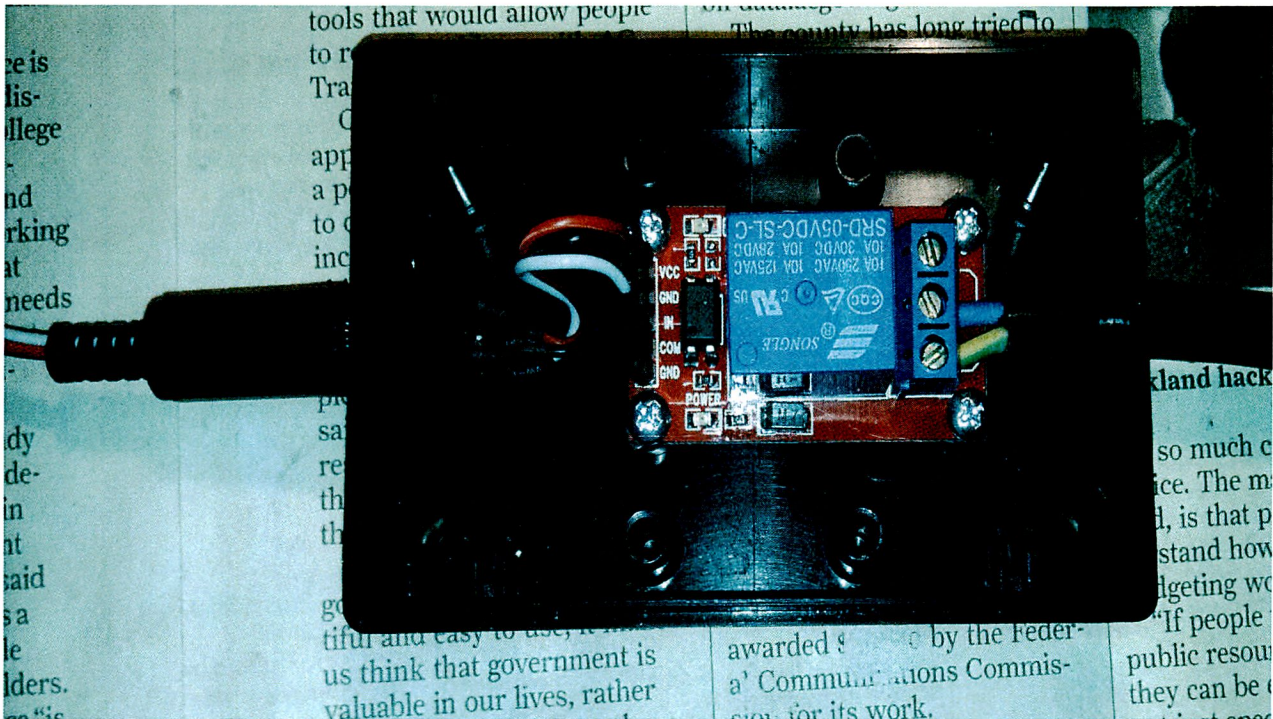
**CAUTION: USE THESE INSTRUCTIONS AT YOUR OWN RISK.**

When doing any kind of work like this, please make sure to work safely and to follow all safety precautions on applicable tools materials. Use common sense precautions to protect yourself and others from injury. Always wear your safety goggles, and work in a well-ventilated space.

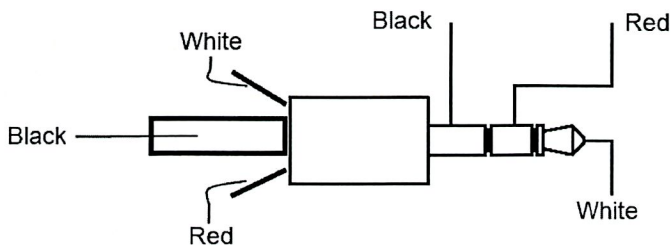
Instructions:

Before doing anything, please, take a few minutes to review the assembly instructions. Familiarize yourself with the components and get an idea of what goes where BEFORE putting solder to soldering iron.

Here's what the entire project will look like when it's done. The relay will be mounted inside the project box. The connection to the prop controller plugs in on the left, and the cable to the fog machine connects to the relay on the right. Once this is assembled we'll hot-glue everything in place so it won't move, and so water can't get in, and then screw the top on.

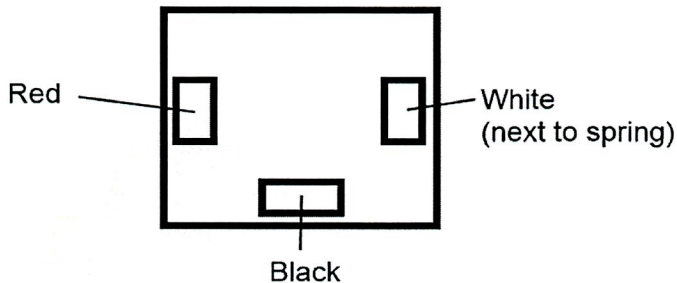


1. **Stereo plug:** Take the 3-wire cable (6 inches long, White/Red/Black), and strip the ends. Unscrew the plastic cover from the plug, and solder the wires onto the lugs, following the diagram below (the solder lugs are on the left). Make sure to run the wires down the middle of the lugs, not on the outside, so they'll fit into the plastic cover later.



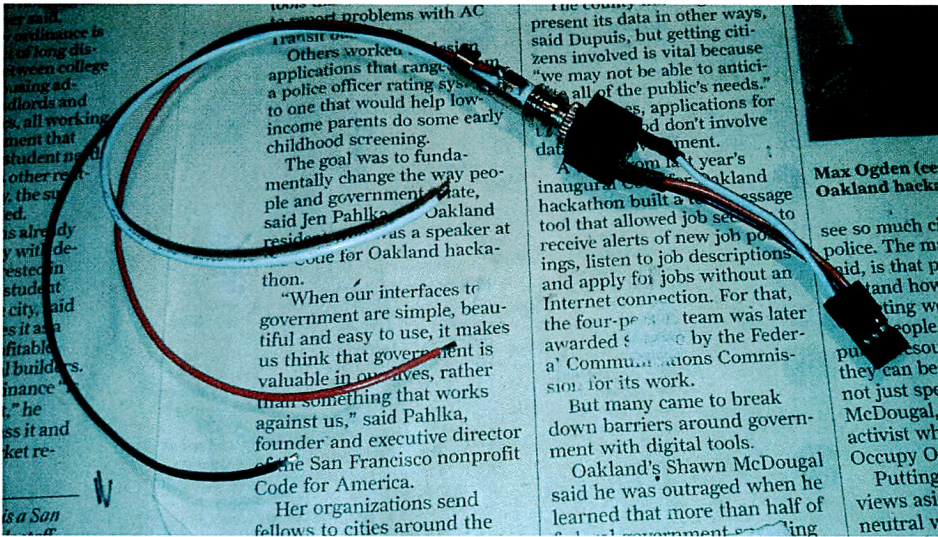
Test connections: Use the multimeter to check for shorting between wires, and to check the wires connect to the right parts of the plug. Use pliers & crimp the wings on the black lug lightly around the wires.

2. **Stereo jack:** Take the servo extension cable (White/Red/Black with the rectangular connector on the end) and strip the ends of the wires. Solder them to the stereo jack like this (this is the back side of the jack):





3. Test the connections: Plug the stereo plug into the jack, like this:

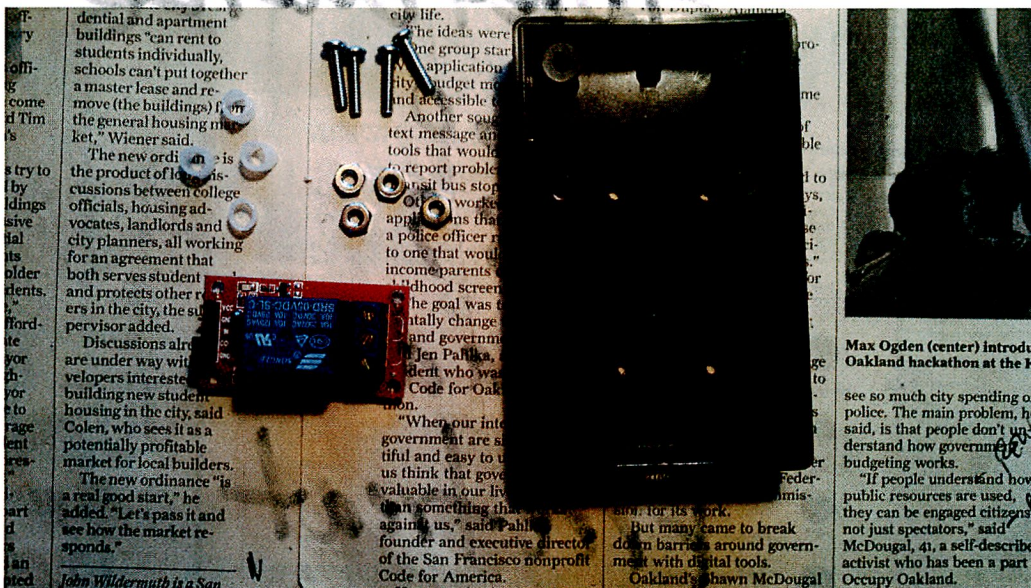


Use the multimeter to confirm that white on one end connects to white on the other end, and the same for the other two colors. Also make sure there are no shorts between the colors. When you're satisfied it's all correct, put the plastic sleeve back onto the stereo plug.

4. Make the standoffs. Using the Exacto knife, cut the small section of plastic tube in half. Then cut each half in half again, so you have four short pieces the same length.

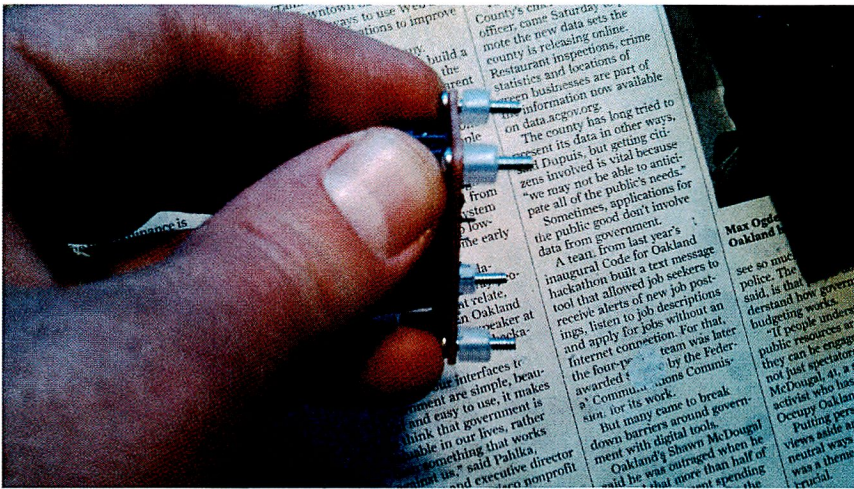
5. Install the relay into the project box. This part will require a little eye-hand coordination. Get the:

- Project box
- Screws (4-40, ½ inch long)
- Nuts (4-40)
- Plastic tube sections
- Relay





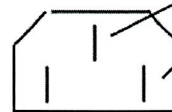
Put the screws into the holes on the relay board, and then thread the plastic tube sections onto the screws:



Now here's the eye-hand coordination part: Push the screws through the holes in the bottom of the project box (without losing the plastic tubes!) NOTE: The screw terminals face the bigger hole.

When they're through the holes in the bottom, put the nuts on the ends of the screws and tighten. If the screws don't stick out far enough, you may need to trim the plastic tube sections a bit.

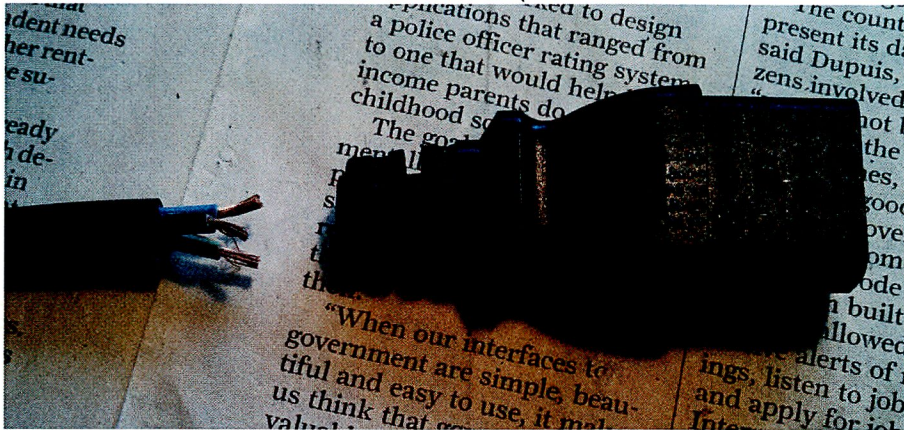
6. Screw in the stereo jack: Unplug the stereo plug from the jack, take off the nut on the end of the jack and put the nut into the countersunk hole on the outside of the box, then put the jack in the hole inside the box and spin the jack around to lock it in place.
7. Plug the rectangular servo connector into the relay board. The colors should go this way:
  - Red – VCC
  - Black – GND
  - White – IN
8. Testing: Plug the stereo jack into the plug. Take the assembled unit to the center table, where it will be tested to see if the relay will trigger correctly.
9. Test your fog machine remote: At this point we want to check what connections your fog machine uses. Look at the end of the cable which plugs into your fog machine, and verify which parts of the plug are connected to the switch. One person can hold the multimeter leads to the connections while another can press the button on the remote. Tip: Hold your multimeter leads like chopsticks with one hand; use the other hand to hold the plug. Touch the ends to the prongs of the plug, and have someone press the button. Only two of the prongs should show a connection when the remote's button is pressed.



These two should make your multimeter beep.



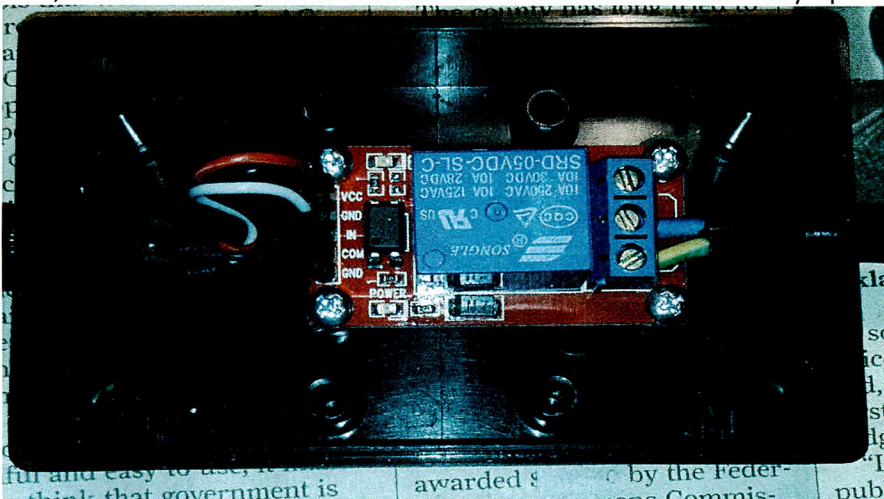
10. Fog machine cable: We're using a surplus AC cable with the same connector, to connect to your fog machine. Cut off the solid end of the cable (the one that does NOT match the one on your remote!)



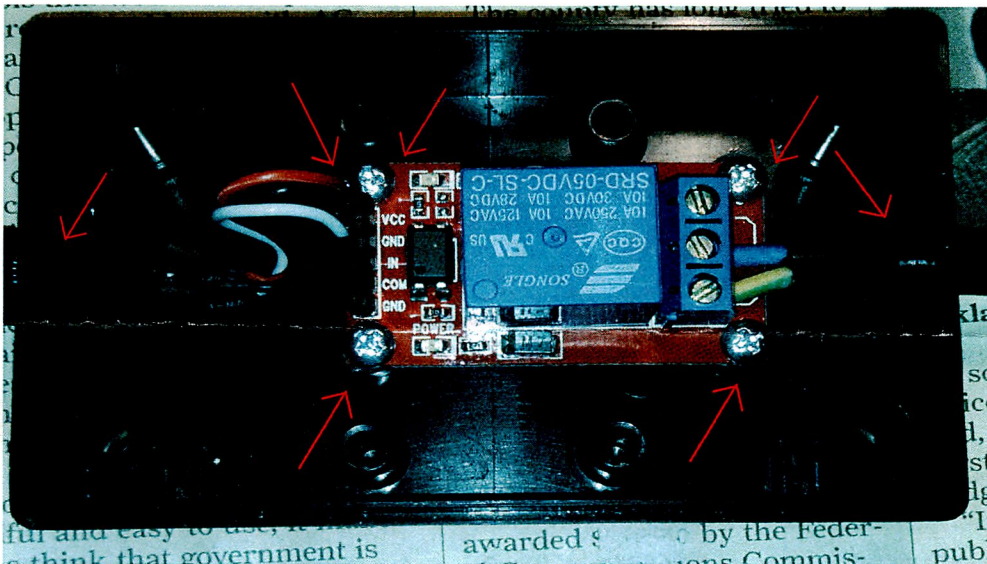
11. Strip the wires: See the picture above. Then test the connections so that you know which colors of wire in your cable connect to the switch, using what you just learned in Step 9. In the cable I used, these were Yellow/Green and Blue wires, while the Black one wasn't needed. Cut that one off.



12. Connect the fog machine cable. Run the ends of the AC cable into the project box through the remaining hole, and screw into the center common and the bottom normally-open connector:



13. Test it with the fog machine. Take your almost-completed controller to the main table; we'll test it with the fog machine.
14. Zip tie the AC cable in place. Put the zip tie around the AC cable on the inside of the box, right up against the plastic, where it comes through the hole. This will act as strain relief in case someone trips over the cable. Make it tight and cut off the long end with the clippers when you're done.
15. Hot Glue everything. Now that it's all working, we want to make sure everything stays in place and water can't get in. Put a blob of hot glue on the following (marked by red arrows in the picture):
  - a. Stereo jack, so it doesn't turn.
  - b. Standoffs under the relay, so they don't unscrew.
  - c. Servo connector where it plugs into the relay, so it can't come out (unlikely, but why not?)
  - d. AC cable to the fog machine. Use a LOT where it comes inside the box – we want to make sure water can't come in. Put some around the outside, too – make a little "collar".



16. Screw the top on. Finally, put the top on and use the little bag of four screws to screw it closed.

### Connecting to a prop controller

The ends of the wires coming out of the stereo plug have been color-coded so it's easy to connect them to any prop controller.

Black = GND - 3 SPOT TO CONNECT. TOP ONE IS STILL OPEN?  
 Red = 5V/VCC  
 White = Signal (the pin on the controller that will trigger the relay) - CONNECT TO D4

Triggering the relay: If you're coding this yourself, the white wire goes to one of the output pins on the microcontroller. Drive that pin HIGH for two or three seconds when you want a blast of fog. A link to sample code will be posted in the Yahoo group.