Home Electrical Device Control HOWTO

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This HOWTO will tell you how to use Linux to control your home electrical devices. You will only need to make a very simple circuit to control almost any kind of electrical device using Linux!

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1. Introduction

Many people asked me, "Is it possible to control some electrical stuff [e.g. lights, radio, tv, etc.] by using a home computer?" The answer is YES. The process is very easy, and anyone can do it.

After I read the Coffee Machine Mini−HOWTO, I got an idea of how to control my home electrical appliances. I made some modifications on the circuit discussed in that Coffee Machine Mini−HOWTO, and wrote a simple program. The circuit can control many small electrical devices.^_^ You can use **crontab** to set your lights to come on automatically or to turn on your airconditioner. I use it to control my VCR and VCD (I do still need some modification on VCR/VCD). By writing a simple program, you can control everything over the web. You can use telnet with SSH and your telephone dial in to control all the appliances you have on the circuit.

This circuit is VERY SIMPLE. Even if you don't know anything about circuits, you can set up this circuit.

2. System Requirement

Get any computer that is running Linux and has a working parallel port. :) I'm using a 386DX with 4MB RAM 40MB HD. You will need gcc to compile the program. If you want to use telnet or SSH, you will also need telnetd or sshd. You can write your own program by using ioperm and outb. If you would like to use my program, you will need g++.

Click the following link to download my program. You will need g++ to compile it.
home.att.net/~ruili/goldencat/paralle.tar.gz.

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3. Electronic Circuit

The data line of the parallel port can provide between 0 and 5 volts. Therefore, we can use this line to control a relay and let that relay control an electrical device.

Use pins 2 through 9 to get +5V

Use pins 18 through 25 as the Ground

```
            ____________________________________________________________
           /                                                            \
           \     13  12  11  10   9   8   7   6   5   4   3   2   1     /
            \                                                          /
             \     25  24  23  22  21  20  19  18  17  16  15  14     /
              \______________________________________________________/




                                             | Vcc for Relay
                                             |
                                             |
                                    / -------+--------| |---------|
P data              4.7K         B /  c      | 1N4002 |_|         |-------
-----------/\/\/\/\---------+-----| NPN    _____        | relay   |home device
                            |     \   e     /_\       |-|         |-------
                 LED        X      \         +--------| |---------|
P Ground                    |       |        |
----------------------------+-------+--------+
Relay Ground                                 |
---------------------------------------------+
```

Below is the key to the diagram above:

```
P data          parallel port data line(pin 2 to pin 9, use any)

P Ground                        parallel port ground (pin 18 to pin 25, use any)

Vcc                             depends on the type of your relay. I'm using 12VDC

Relay Ground    the ground for 12VDC

4.7k                            4.7K resistor

NPN                             C2235 NPN transistor

1N4002                  1N4002 diode

LED                             light emitting diode

relay                           a coil relay
```

+5 volts from parallel port will turn on the relay. Once the relay is on, the device connected to that relay will be on. When the parallel port's data line goes back to 0, it will turn off the relay, and device is off.

4. Examples of Relays

The diagrams below are used to explain how relays work.

The relay itself is just a switch as seen in the diagram below:

```
relay power off                        relay power on


       |3                                     |3
       |                                      |
       |                                      |
       o                                      o
        \                                     |
       o \                                    o
       |                                      |
       |                                      |
       |                                      |
       |4                                     |4
```

The diagram below demonstrates the setup of a 4 pin relay.

```
      ____________________________
      |                          |
  1   |                          |  3
 -----|---------s     o----------|-------
      |  coil   s      \switch   |
  2   |         s       \        |  4
 -----|---------s     o- \-------|-------
      |                          |
      |                          |
      |                          |
      |__________________________|
```

In the diagram above, pin 3 and pin 4 are disconnected by default. When you send +12V between pin 1 and pin 2, it will turn on a switch, and pin 3 and 4 are now connected.

The following is a 5 pin relay:

```
          ________________________________
          |                              |
    1     |                              |       5
 ---------|---+            o------------|----------------
          |   |-----------/---- s       |
          |              /      s       |
    3     |             /       s       |
 ---------|-----------o/   coil s       |       4
          |                 o---s-------|----------------
          |                     |       |
          |                     |       |
    2     |                     |       |
----------|---------------------+       |
          |_____________________________|
```

In the above diagram pin 3 is connected to pin 5, by default. By sending +12V between pin 1 and pin 2, you will will turn on a switch. Pin 1 and pin 2 will disconnect, and pin 5 and pin 4 will connect.

```
relay power off                 relay power on


    |5                                  |5
    |                                   |
    |                                   |
    o                                   o
     \                                  |
    o \                                 o  o
    |  o                                |  |
    |  |                                |  |
    |  |                                |  |
   4|  |3                              4|  |3
```

Some relays may have more that 5 pins. More pins just means there are more switches.

I wrote a simple program that can control 8 relays. The program is available at the following location and will need g++ in order to be able to use this program. http://home.att.net/~ruili/goldencat/paralle.tar.gz

A complete circuit can control up to eight relays, that means that a complete circuit can control eight different devices. You will need a DB25 connector. Using a parallel switch cable, connect this relay board to your computer. I put the relay board in a box and use a parallel switch cable to connect it to my Linux box:

```
Panel: LED, Switch              Back:  DB25 connector
```

Below is an example of how a relay board would connect with your electrical device:

```
                        CONNECTED RELAY BOARD



                         +-----+ power outlet
       1 _______3        |   __|________             ||   ||
       --|     |---------+  |  |       |             ||   ||
       2 |relay|4           | (o) (o)  |            _||___||__
       --|_____|----+       |------|---|            |        |
                    |              |                |        |
                    | +------------+                |        | plug
            ground  | | hot                         |        |
                    | |                             |        |
                  __|_|__                           |        |
                  | | | |                           |________|
                  | | | | plug
                  | | | |
                  |_|_|_| (i know it doesn't look like a plug, but it's a plug :-) )
                   || ||
                   || ||
```

To connect the system, just connect your home electrical device to the power outlet. That is it! You don't need to make any change on the electrical device. And you can connect any kind of device to that power outlet. Plug this power outlet into any wall outlet.

To see photos of what the finished product looks like, go to the following sites:

- http://home.att.net/~ruili/goldencat/p1.jpg
- http://home.att.net/~ruili/goldencat/p2.jpg
- http://home.att.net/~ruili/goldencat/p3.jpg

The following URL shows a complete electronic circuit (control 8 devices): http://home.att.net/~ruili/goldencat/01.png

5. Special Thanks

Special thanks to Rufus Chang rufus@chu.url.com.tw.

Special thanks to Chih−Wei Huang cwhuang@linux.org.tw.

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