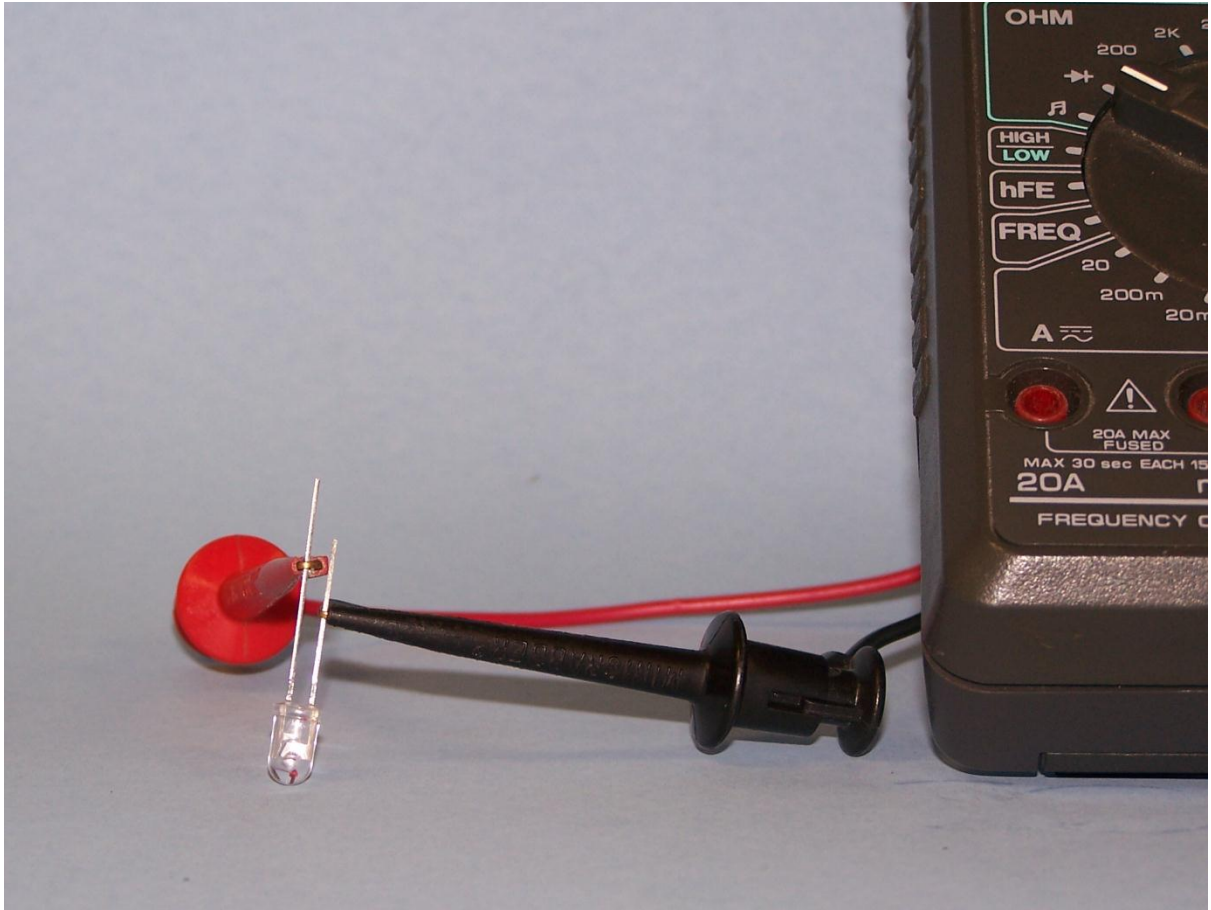


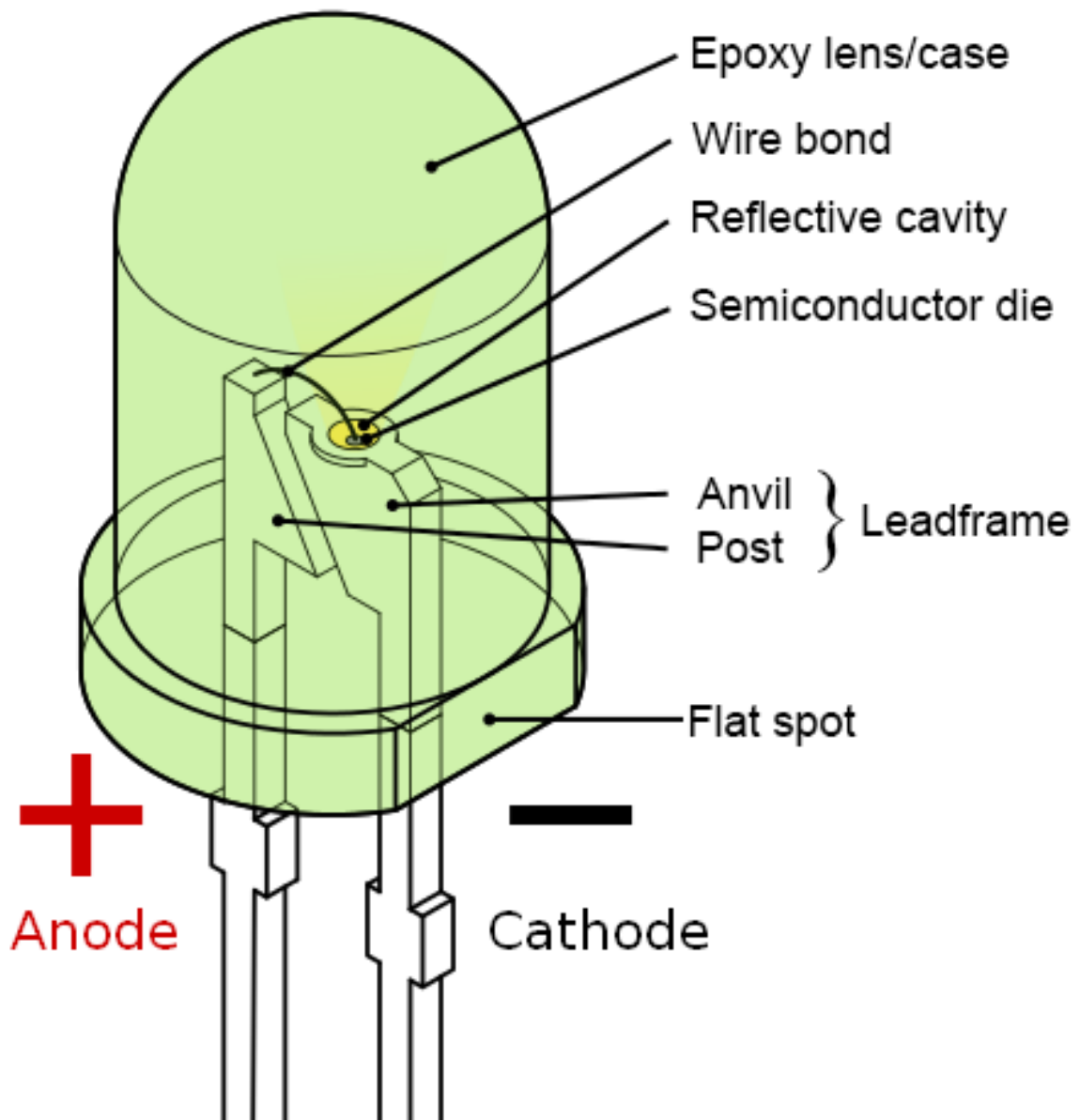
Chapter 1: Introduction – Our First Project



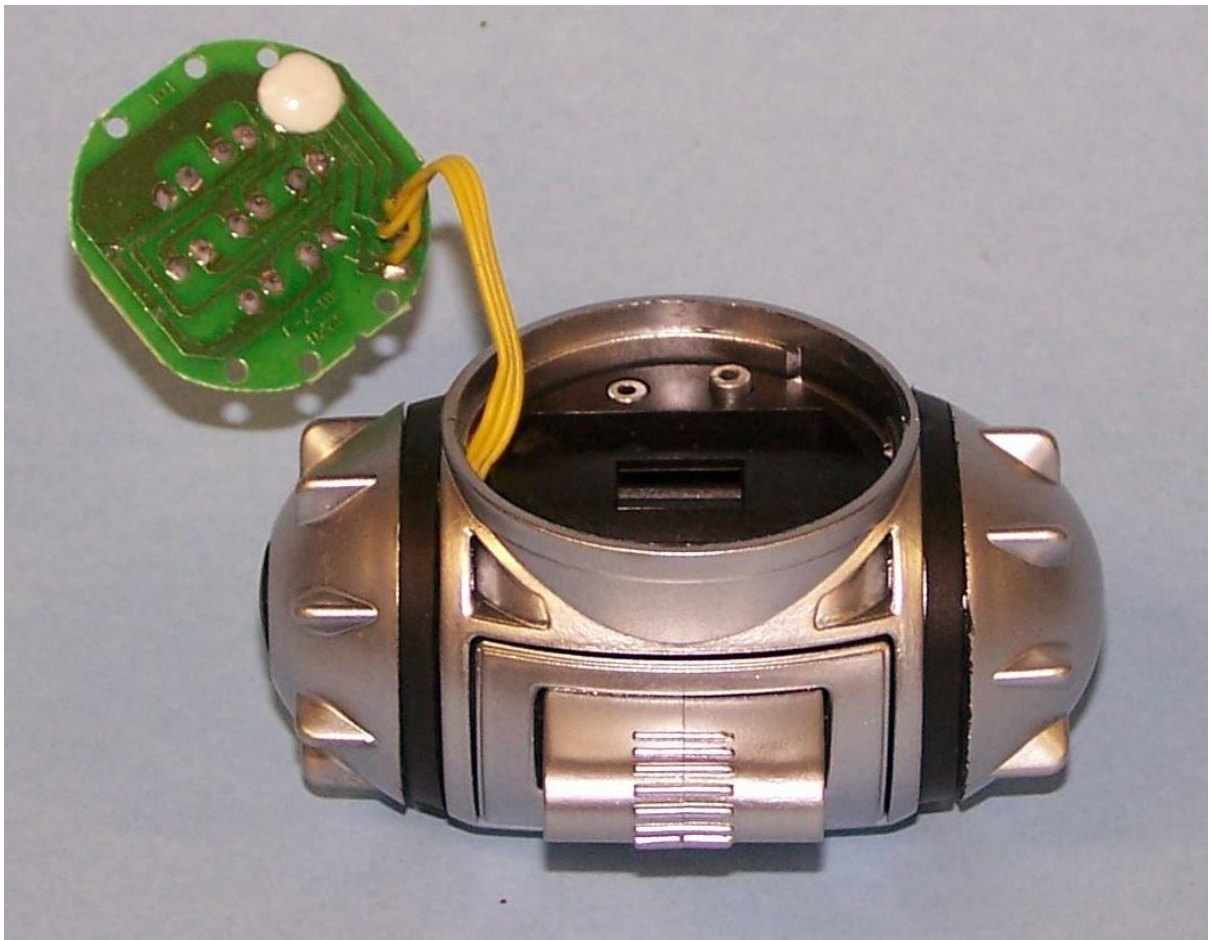


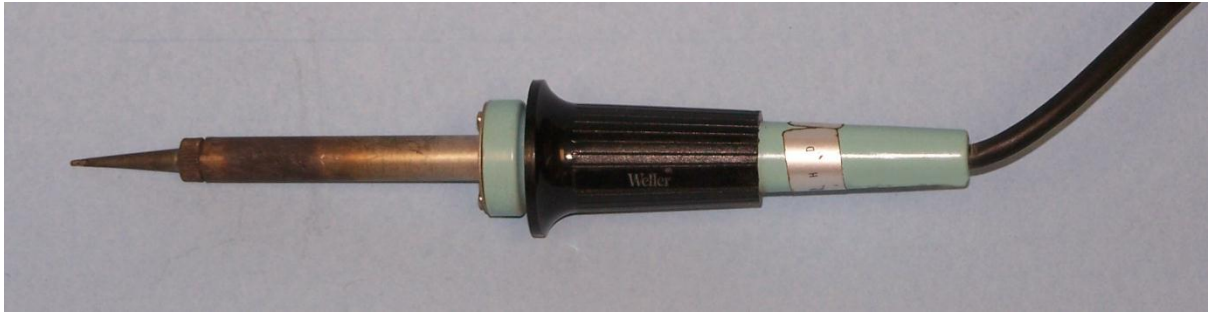




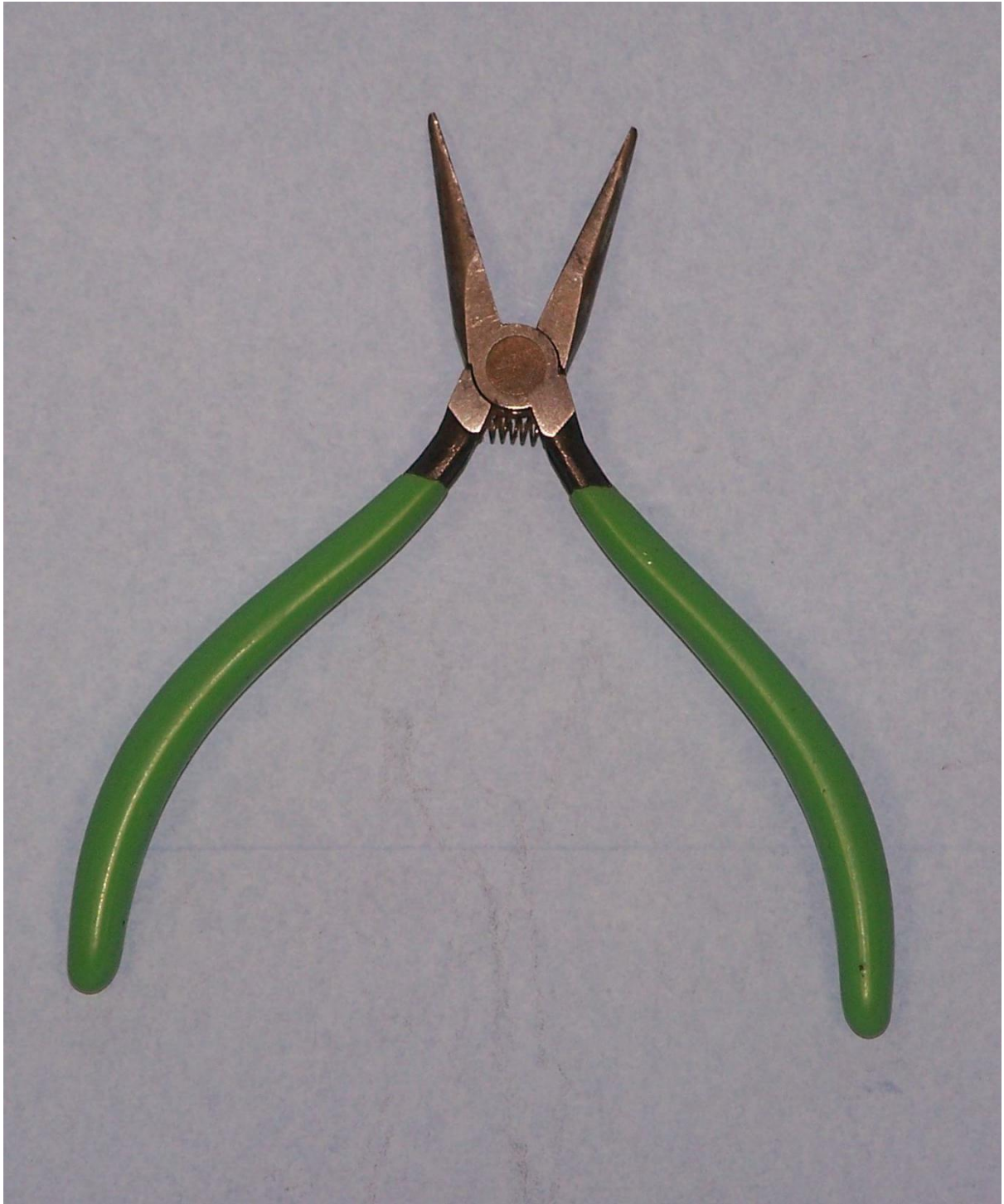


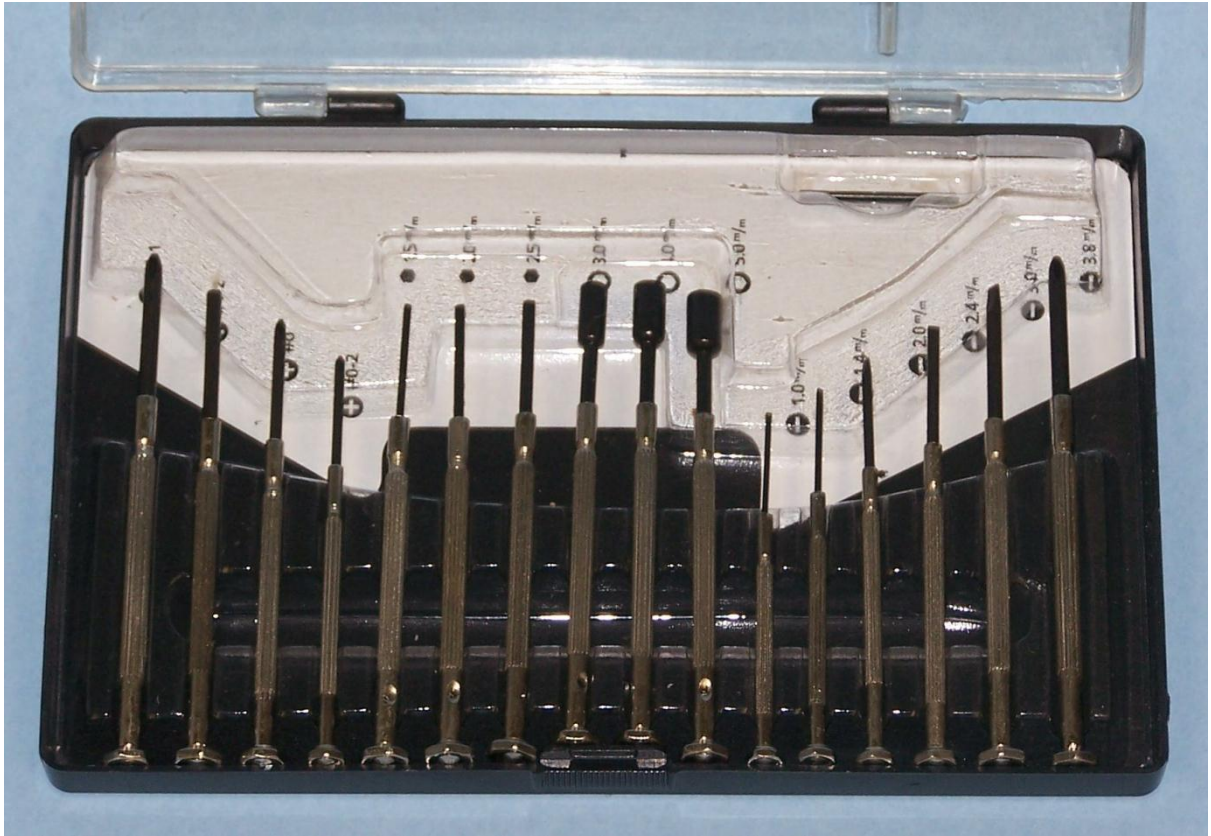


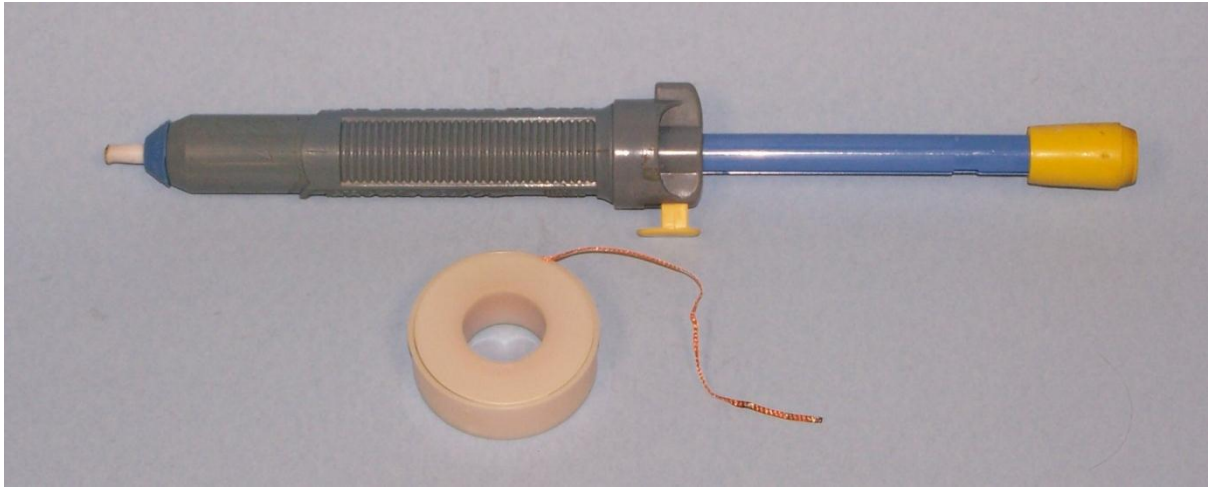






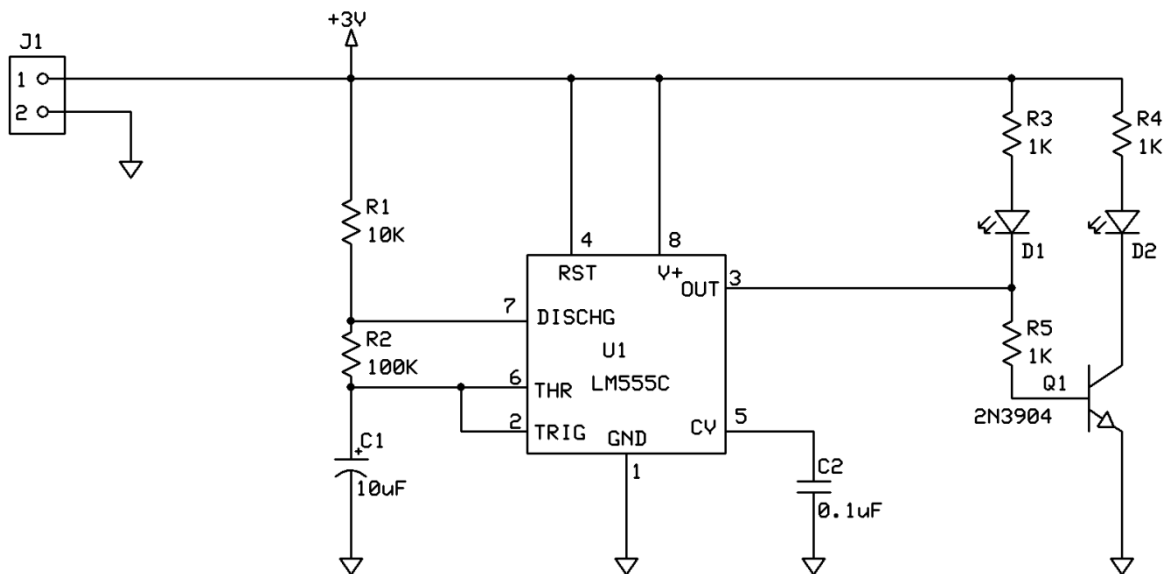
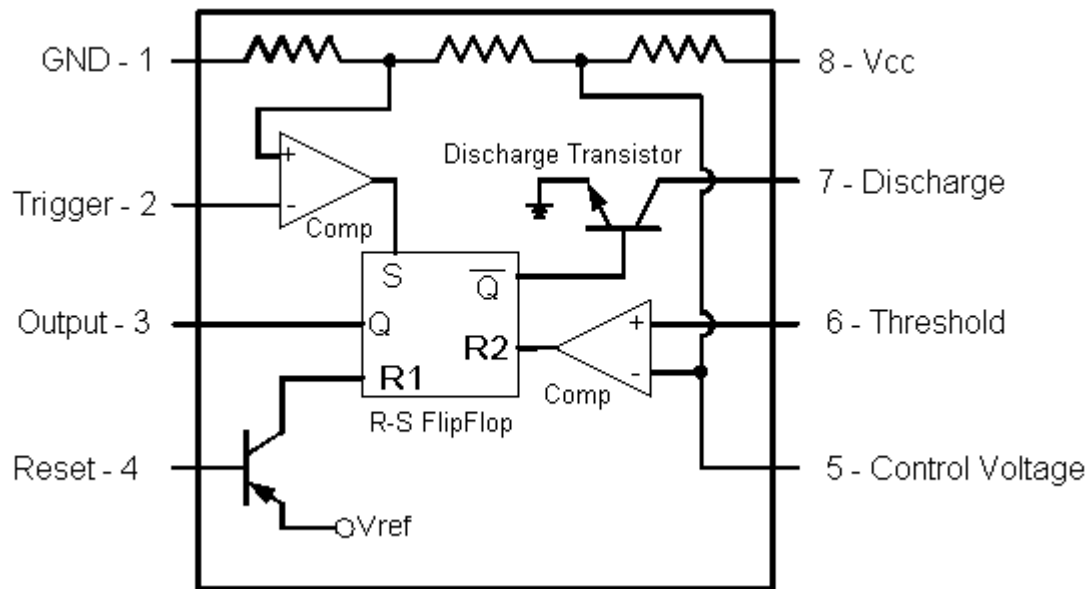


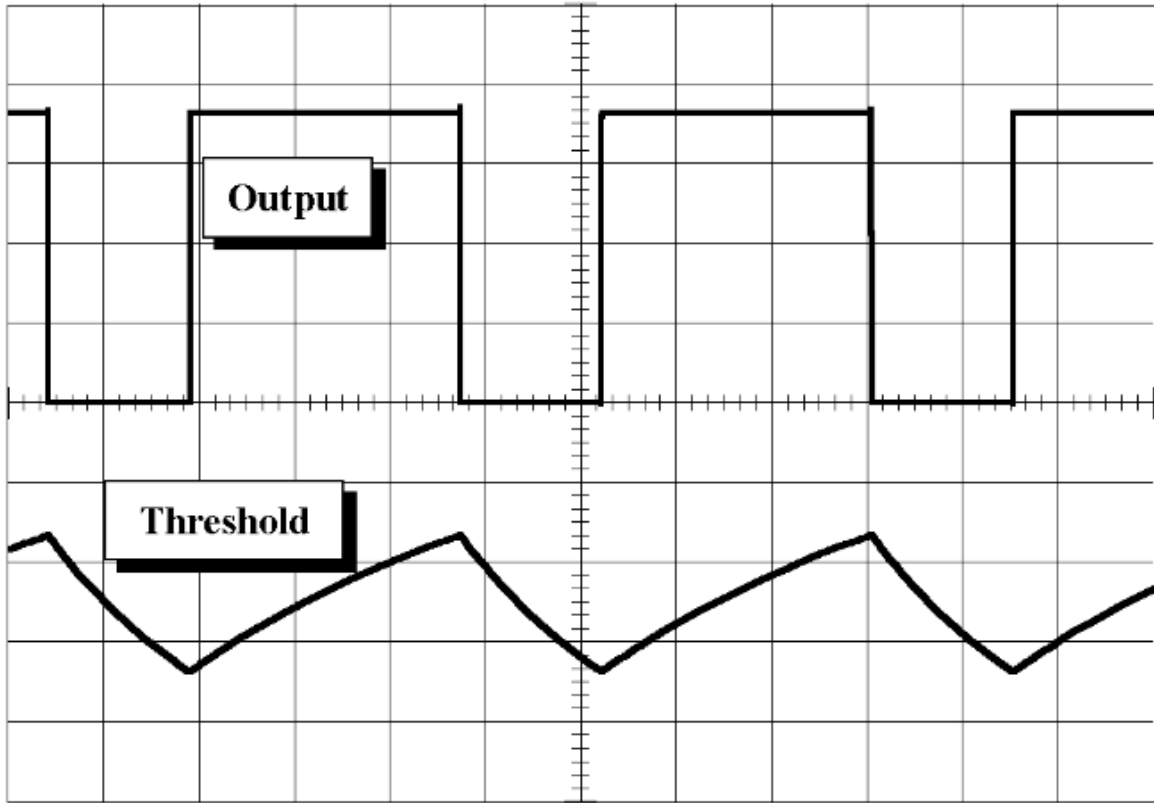


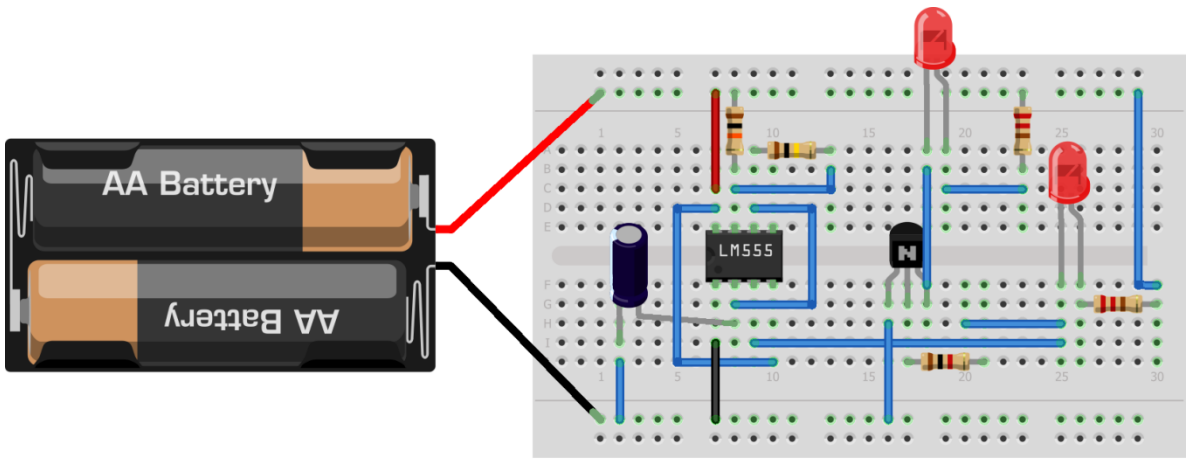




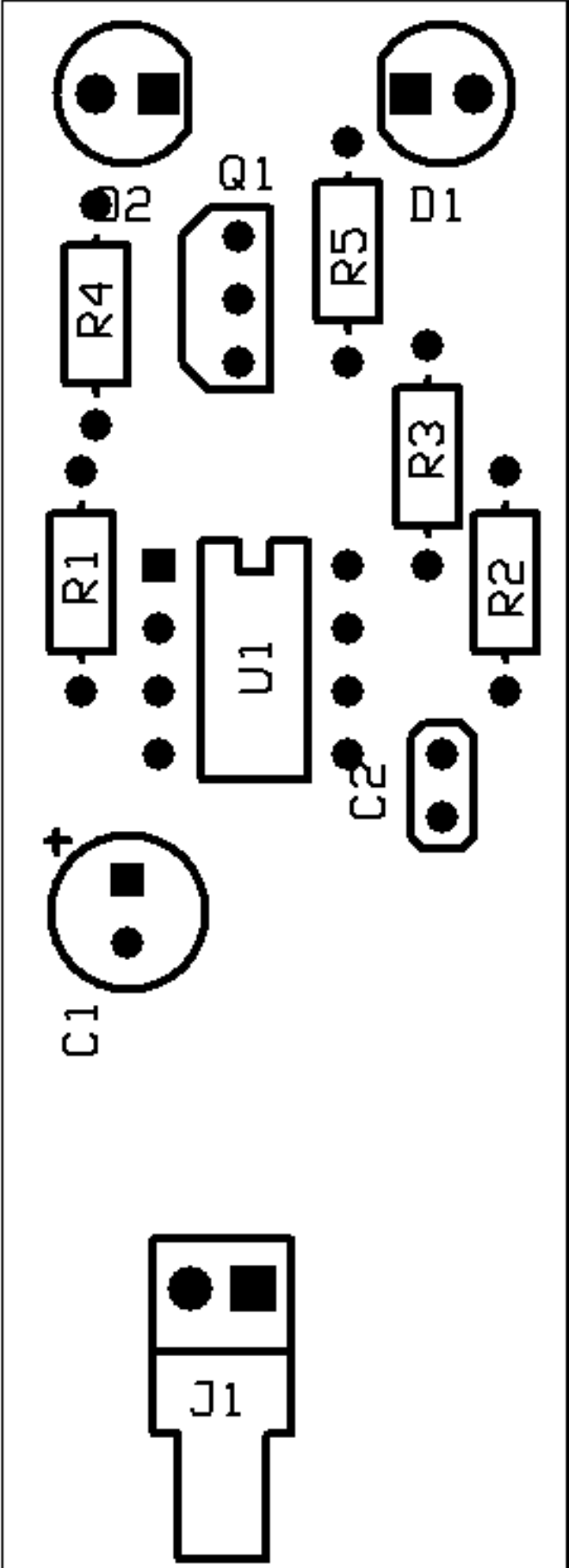
Chapter 2: Infrared Beacon

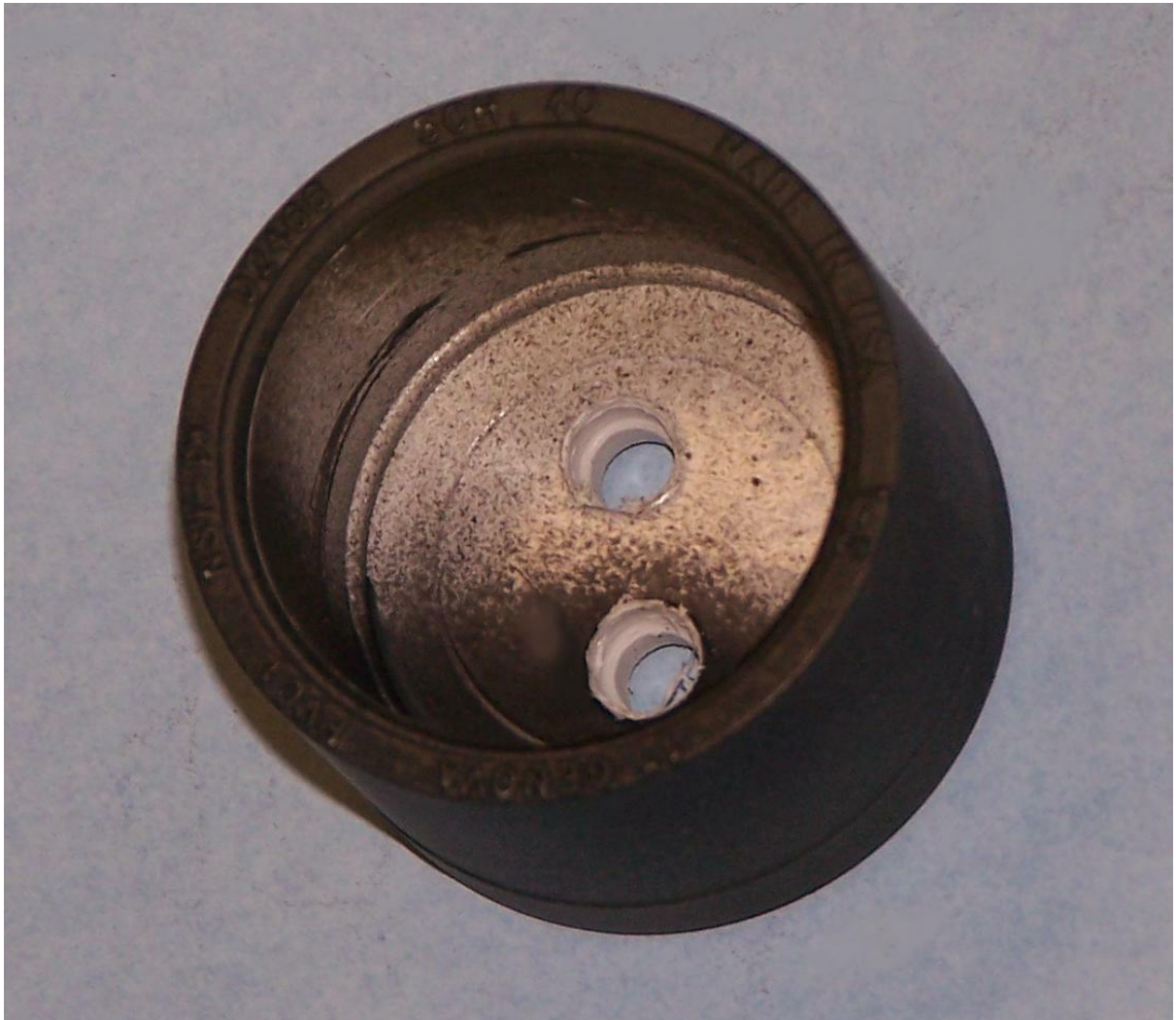
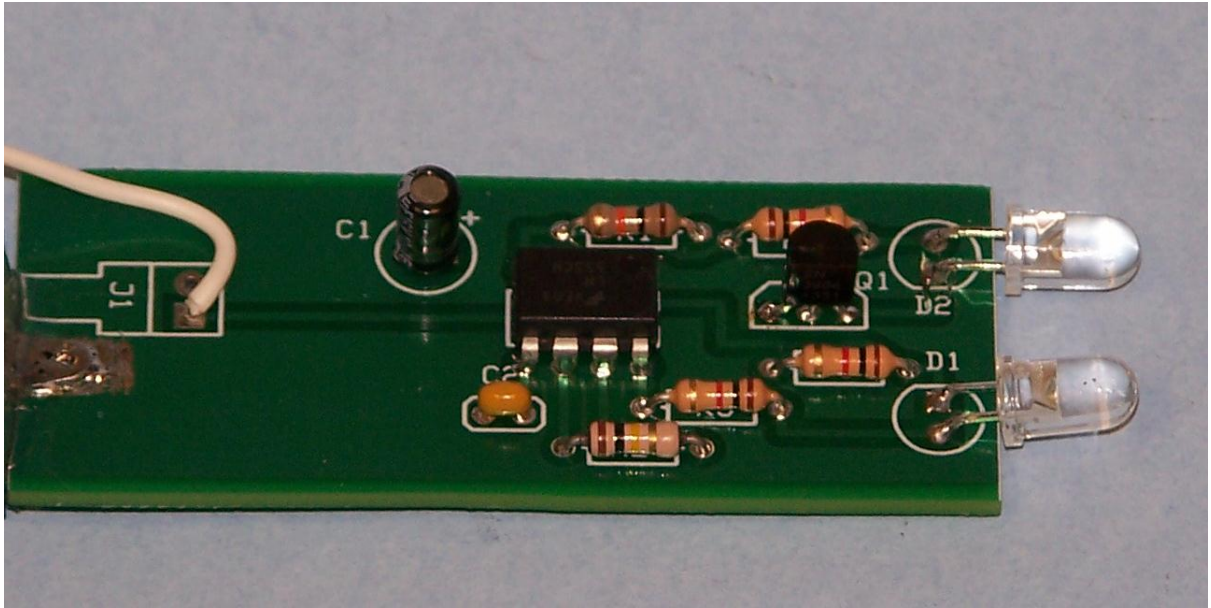


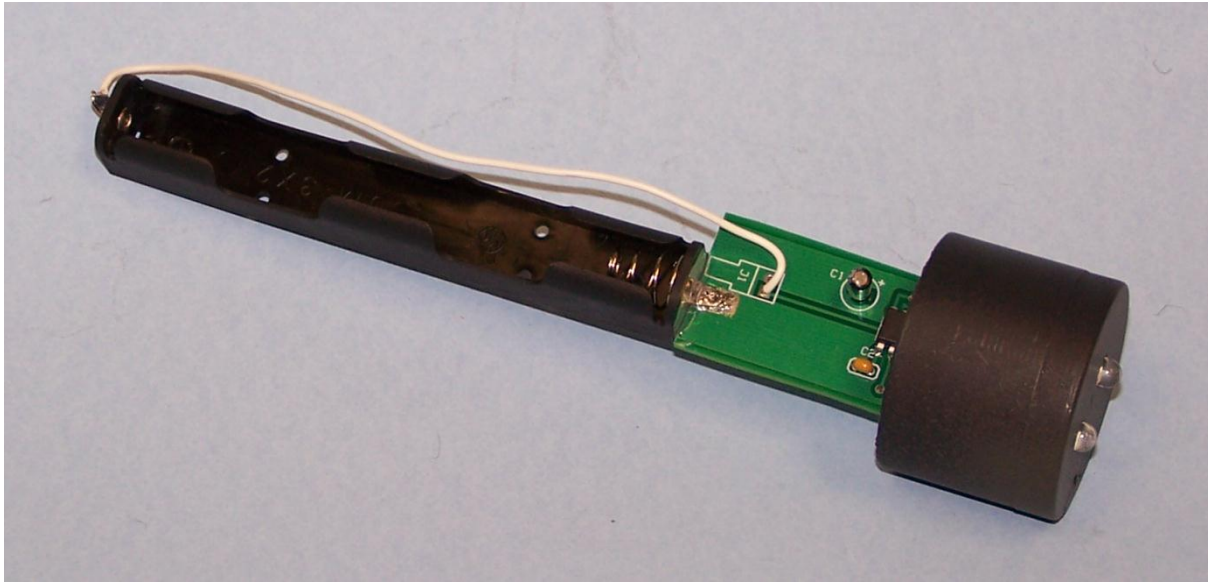


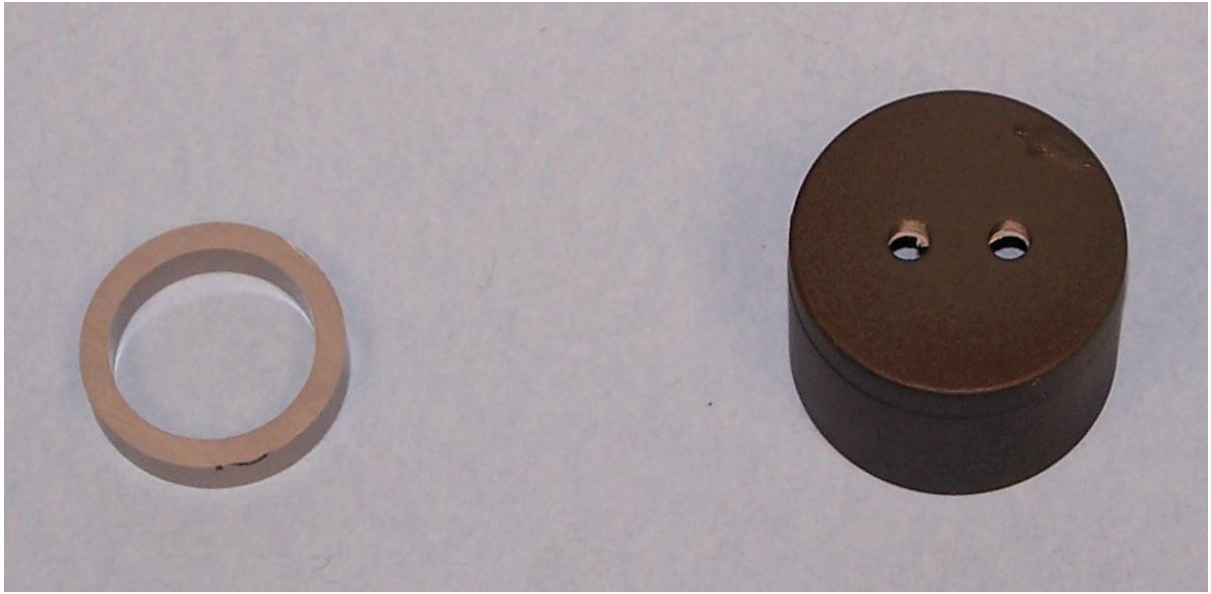


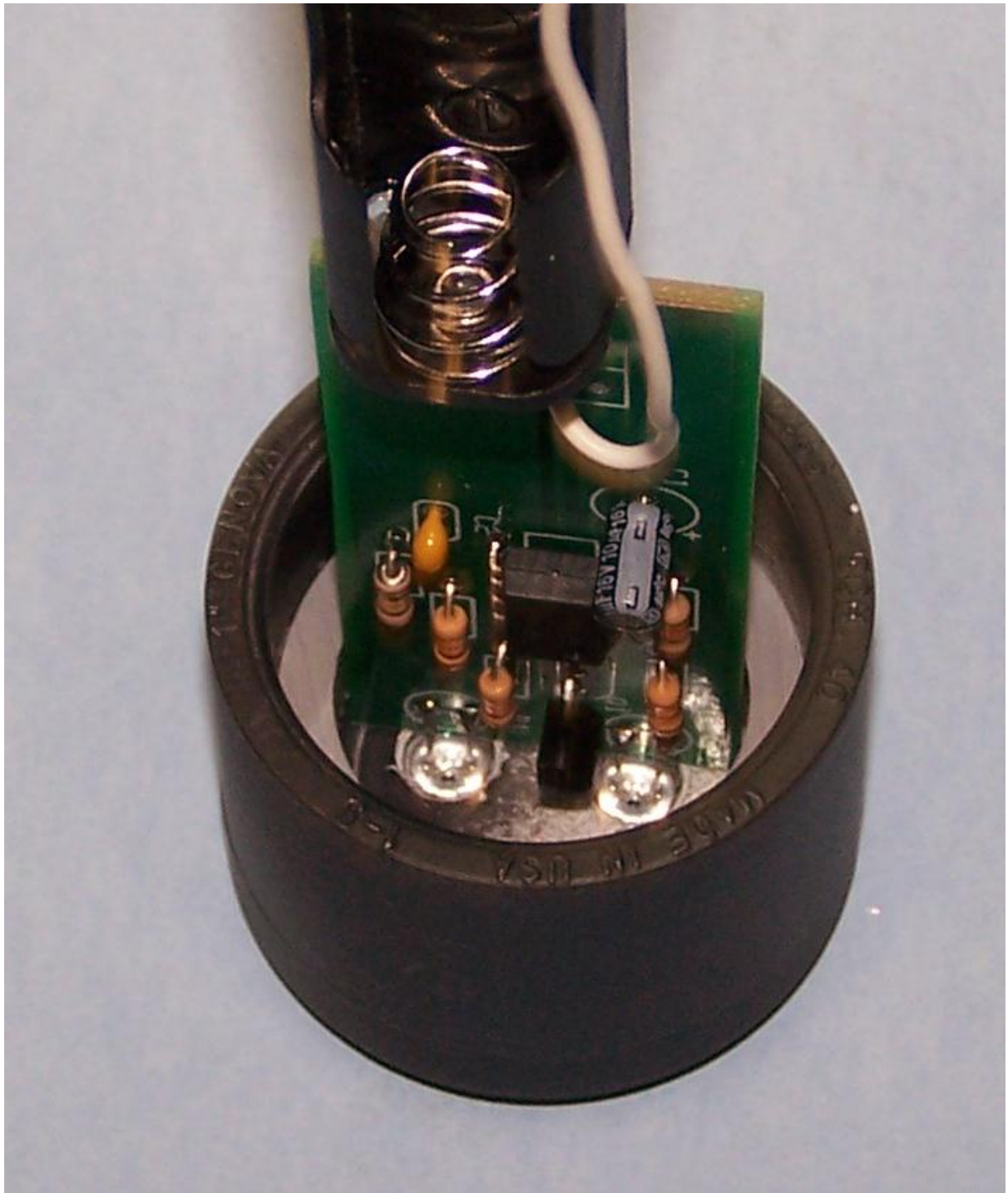
Made with  Fritzing.org





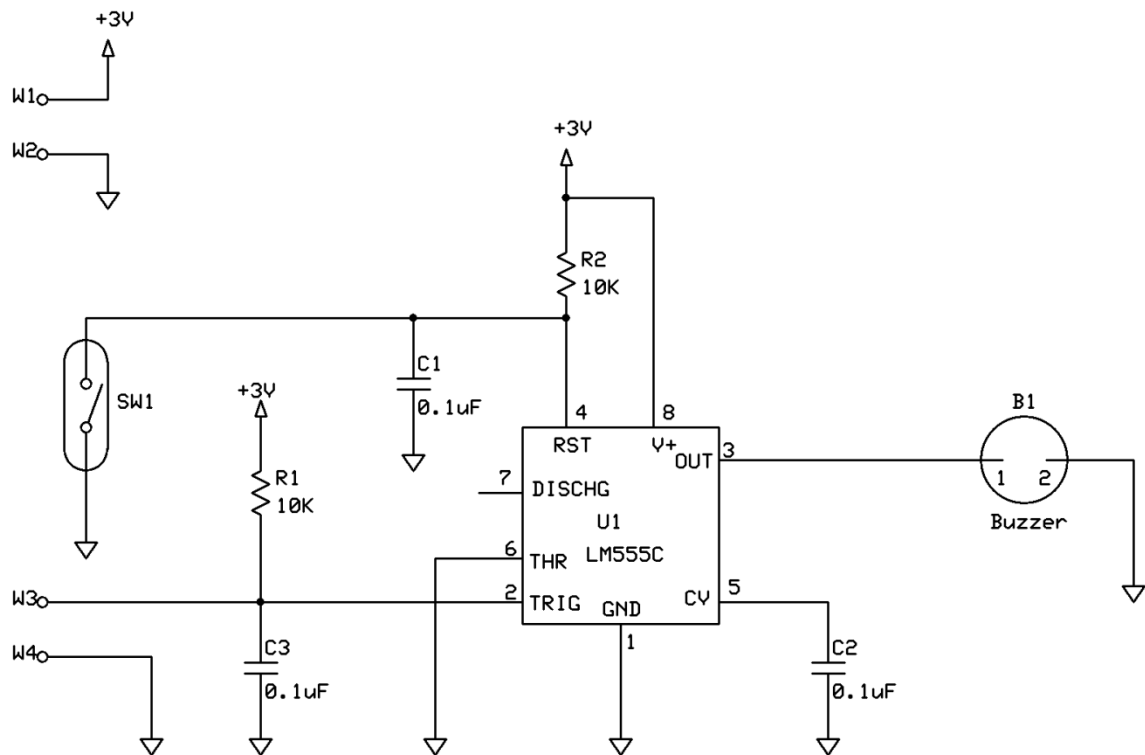
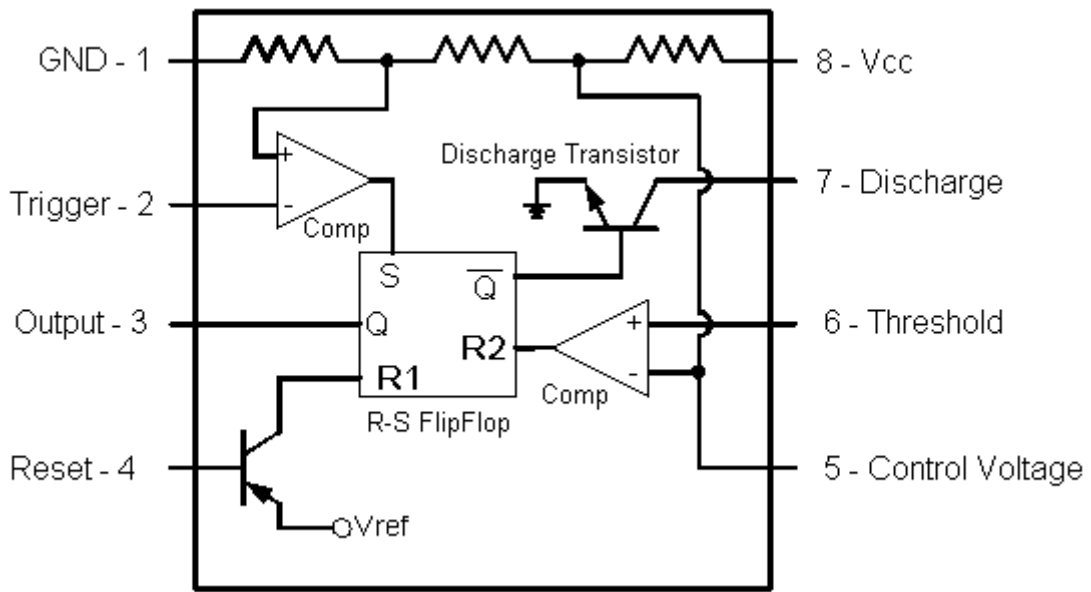


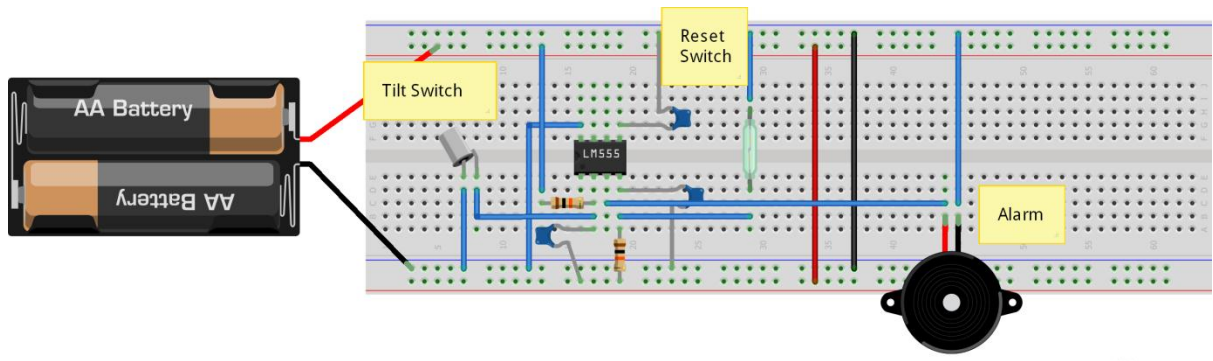




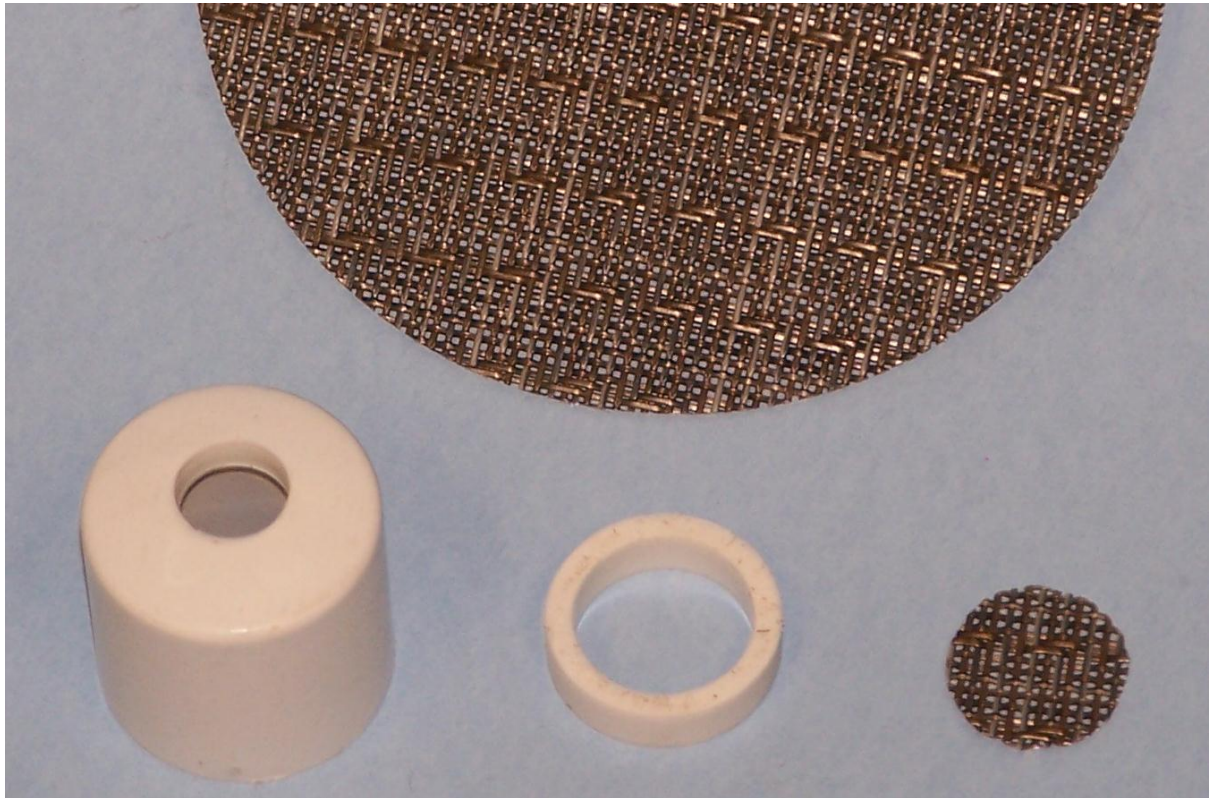


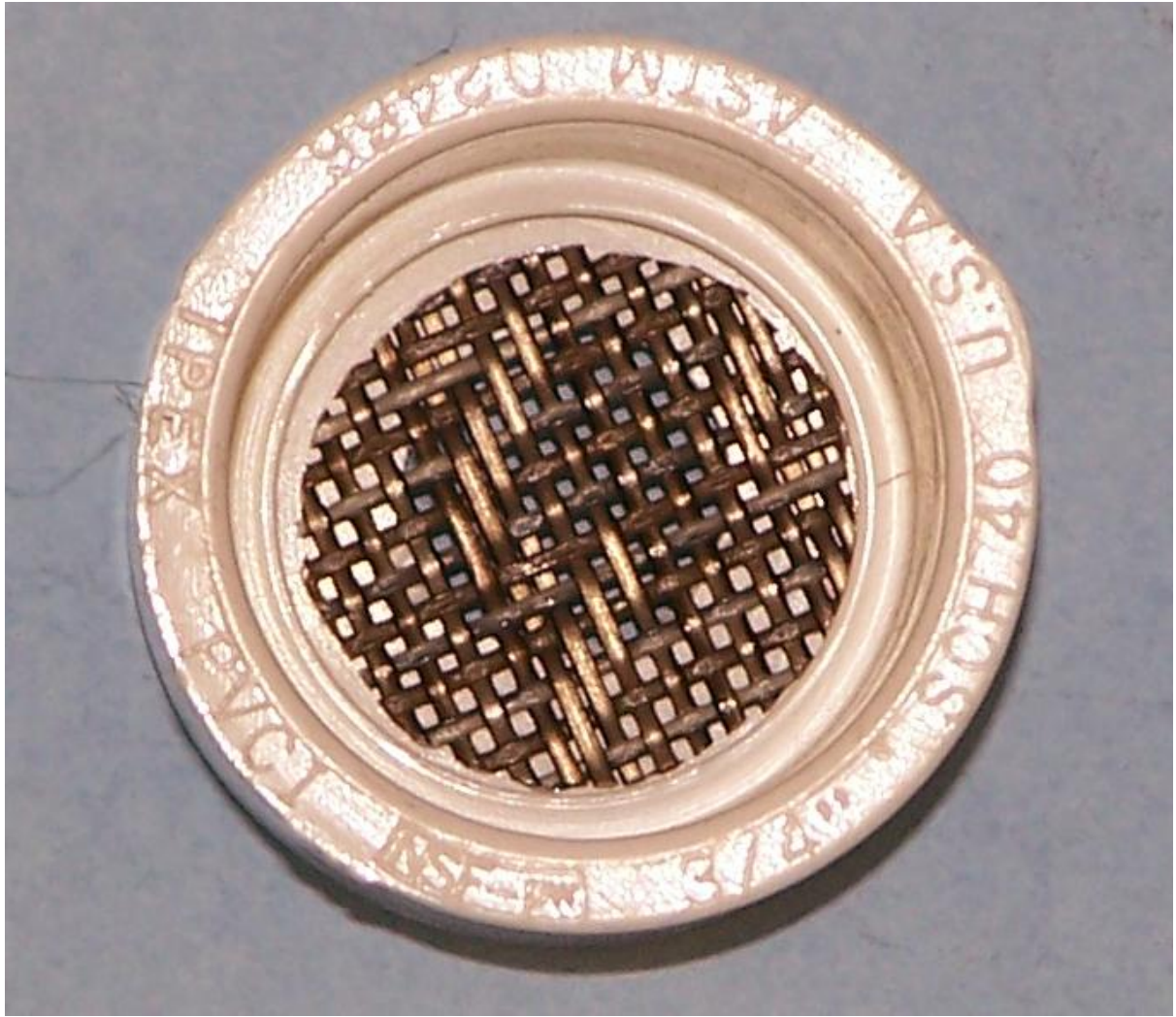
Chapter 3: Motion Alarm

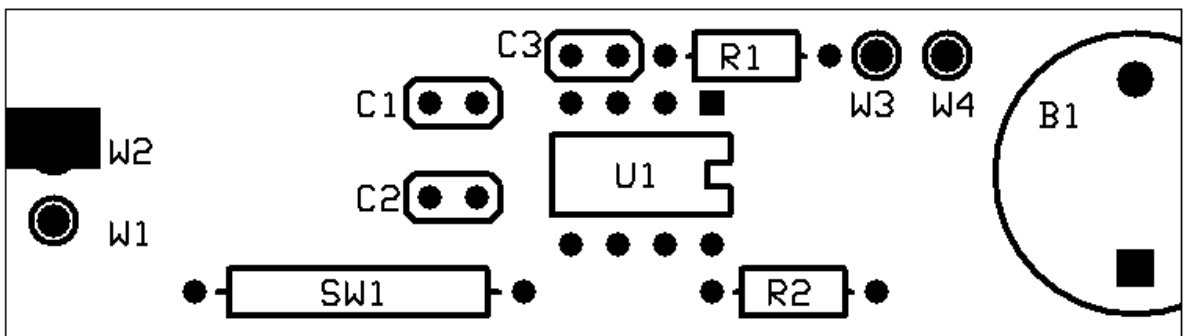
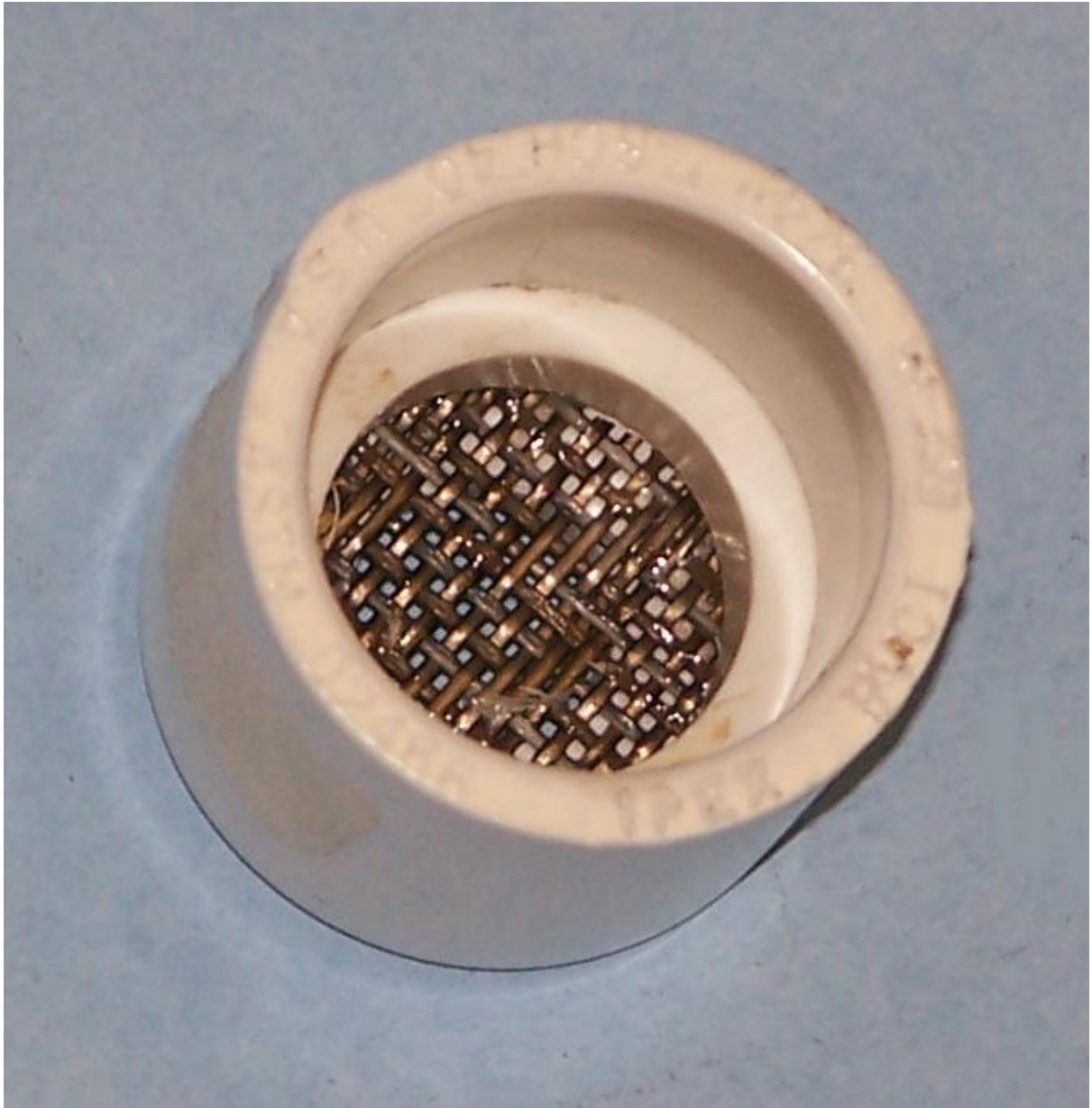


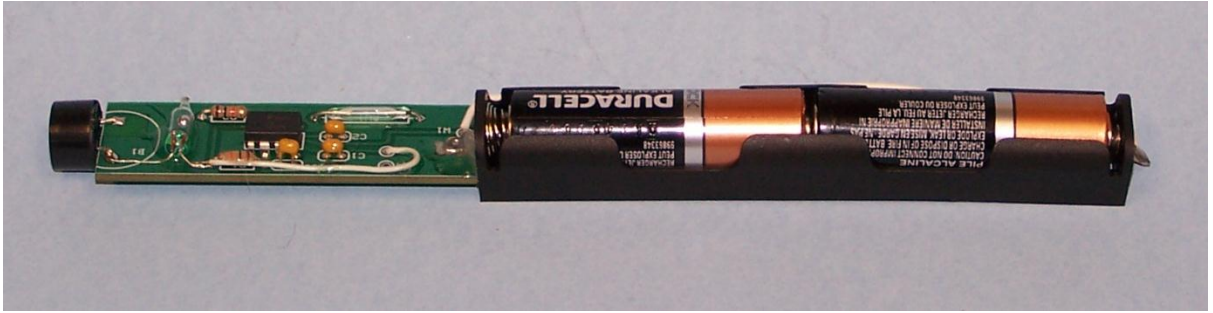


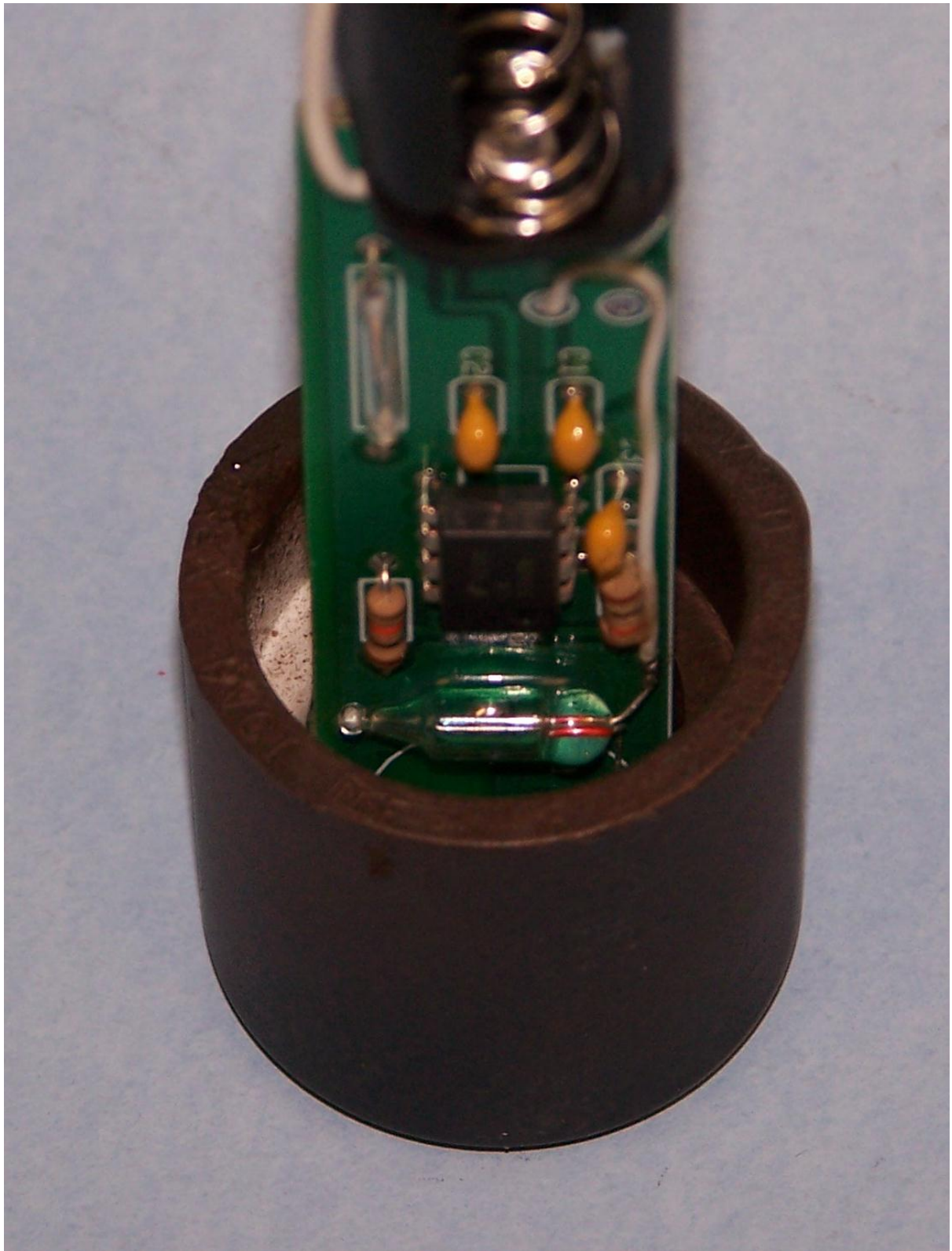
Made with  Fritzing.org





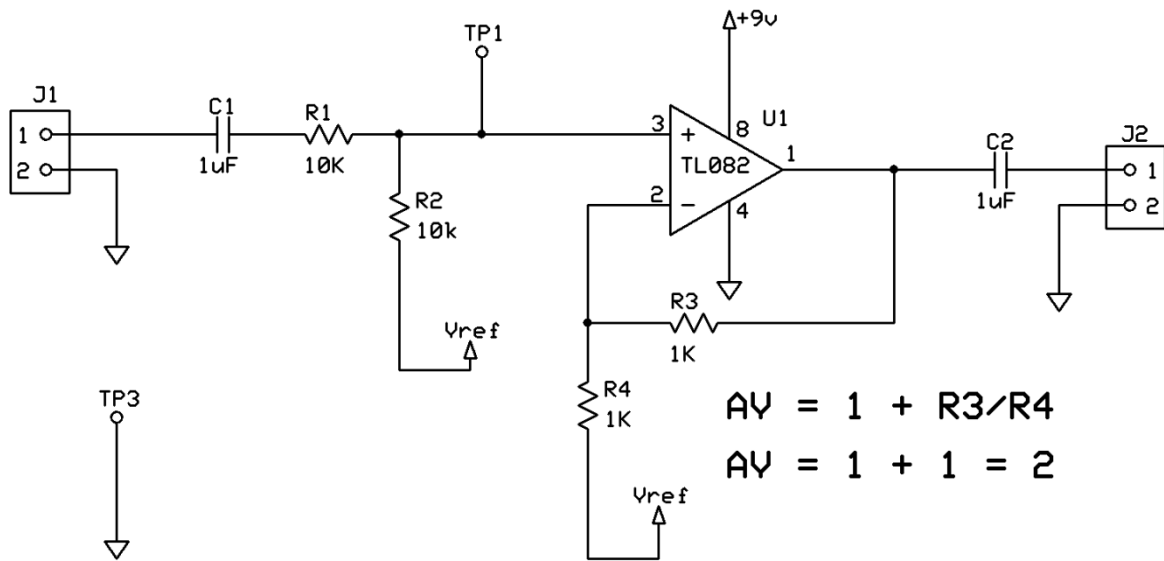


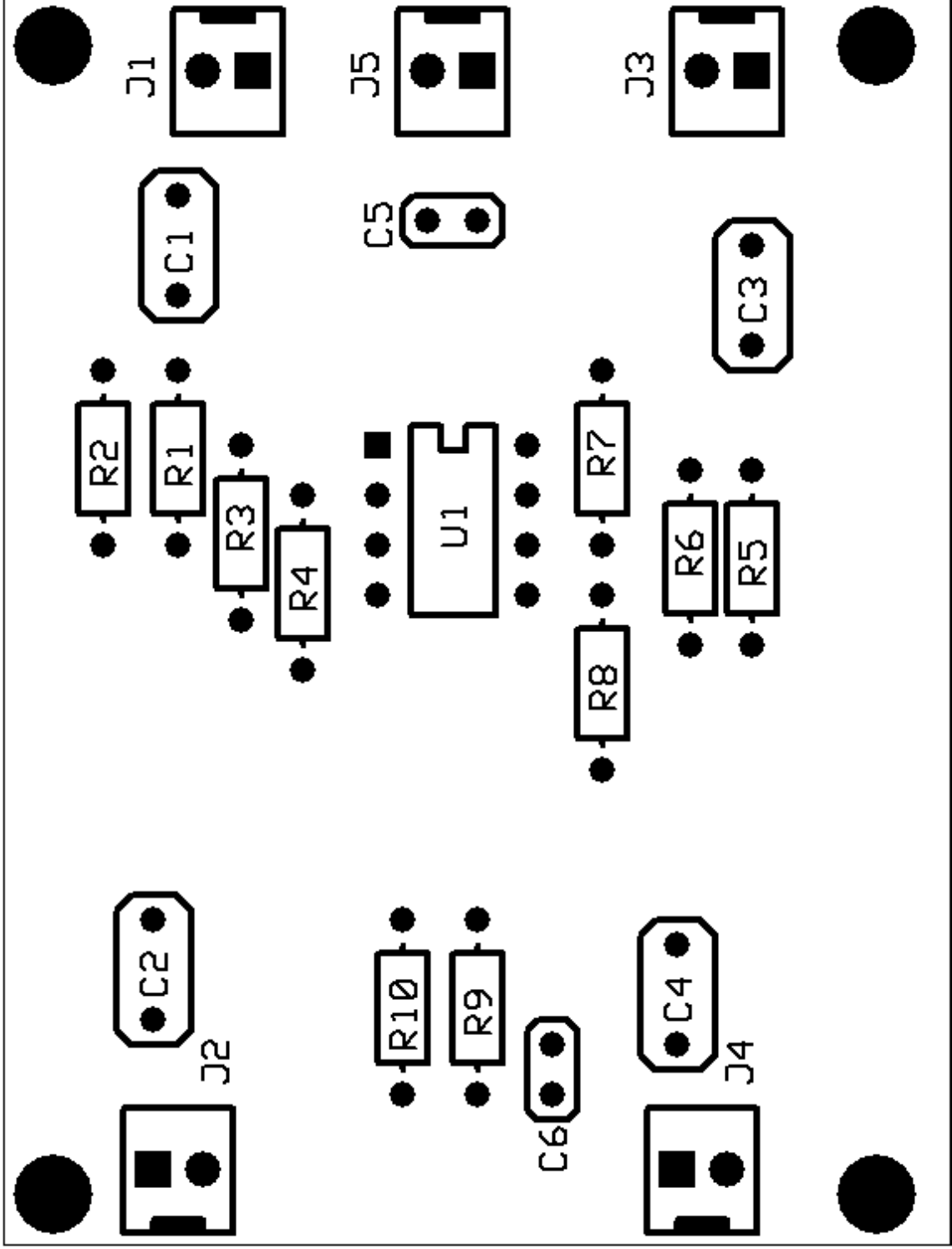


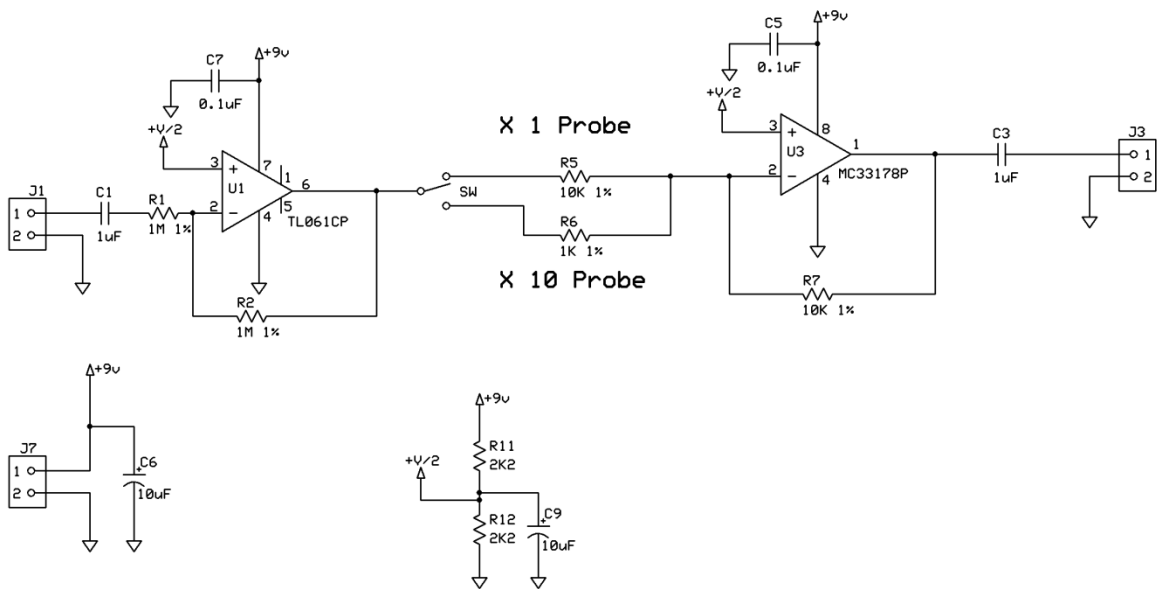
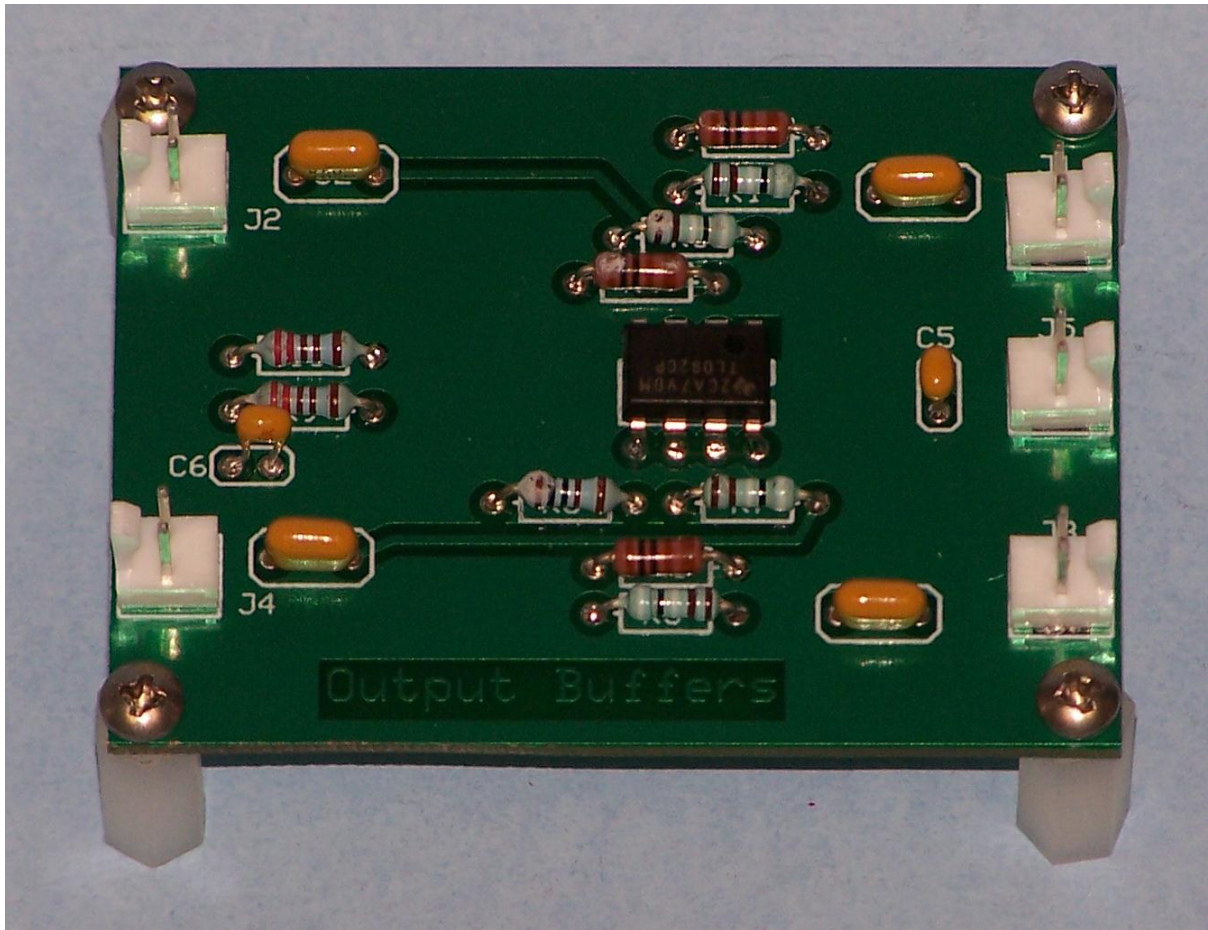


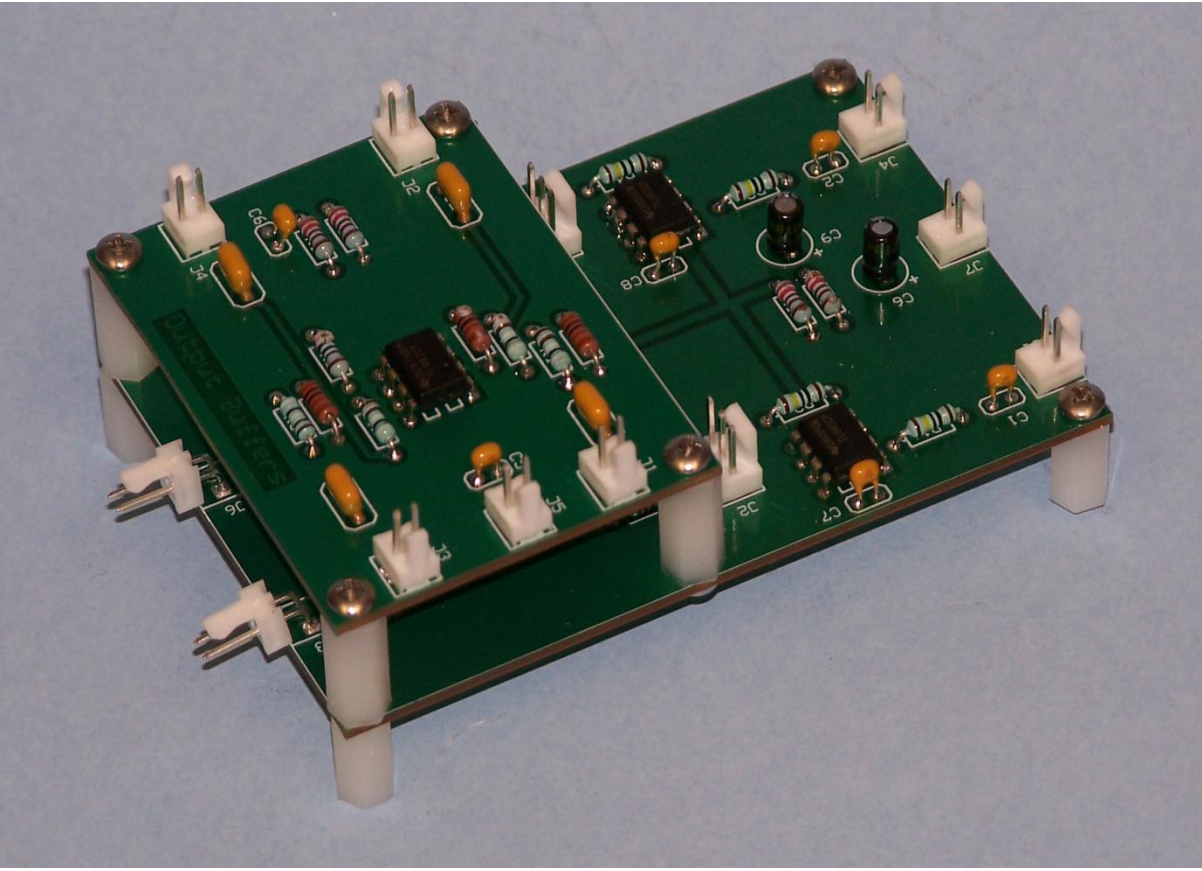
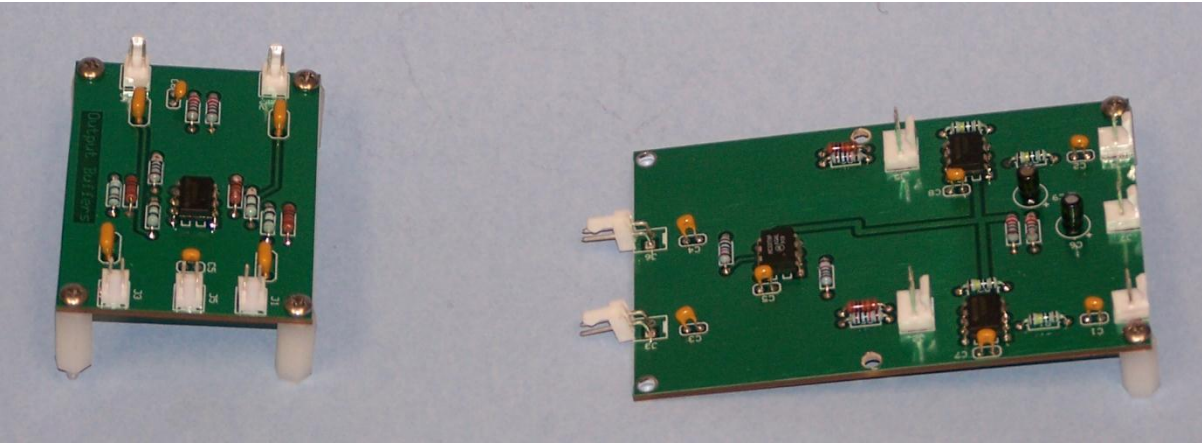
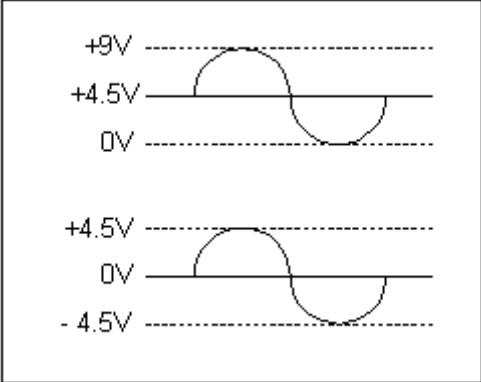


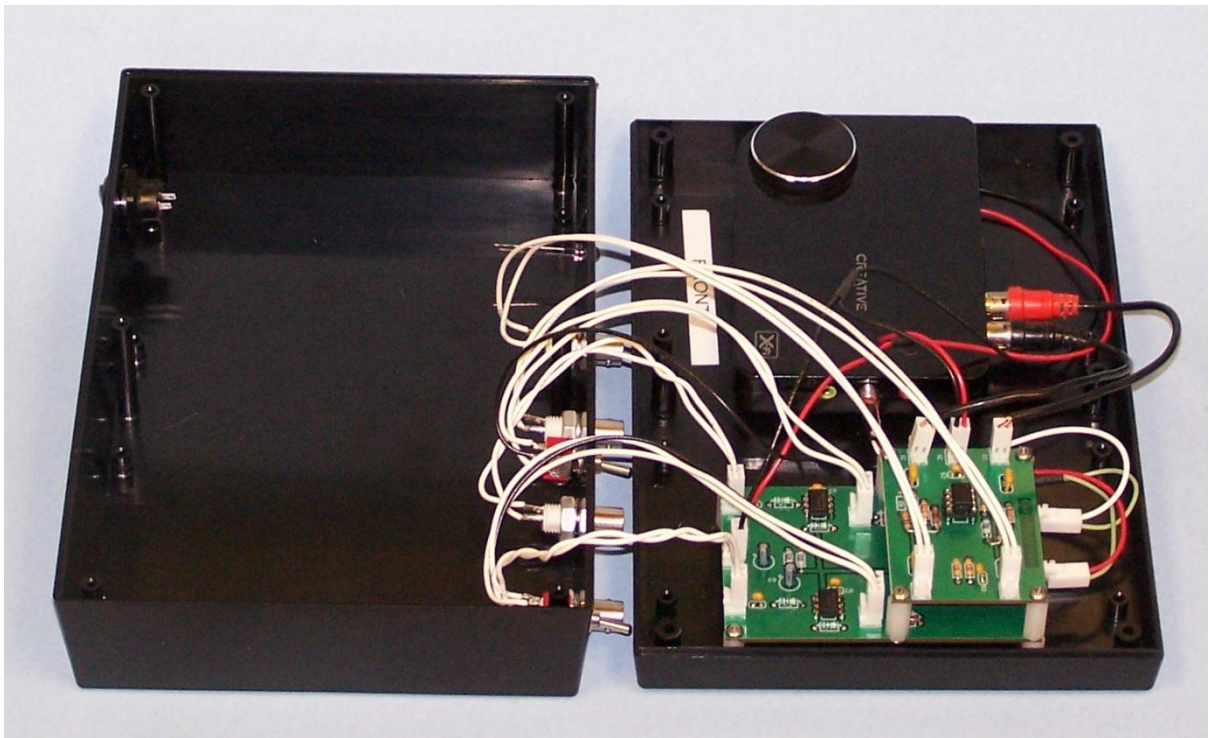
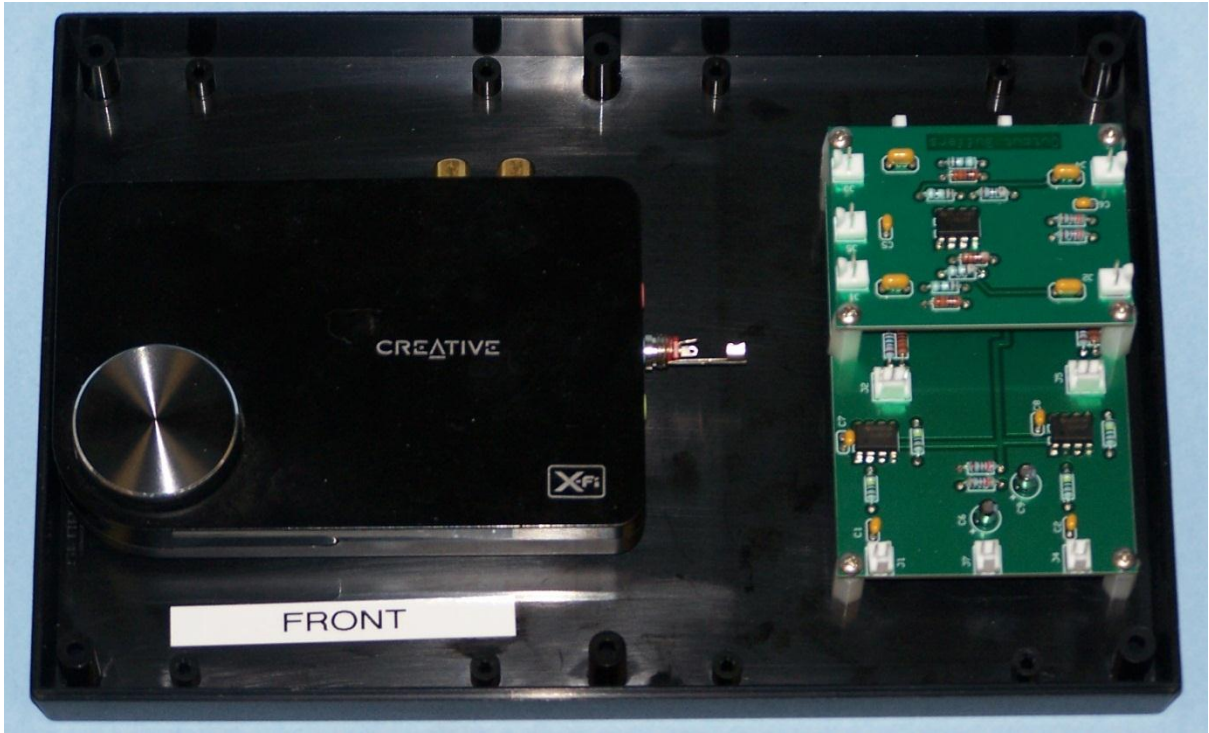
Chapter 4: Sound Card-based Oscilloscope



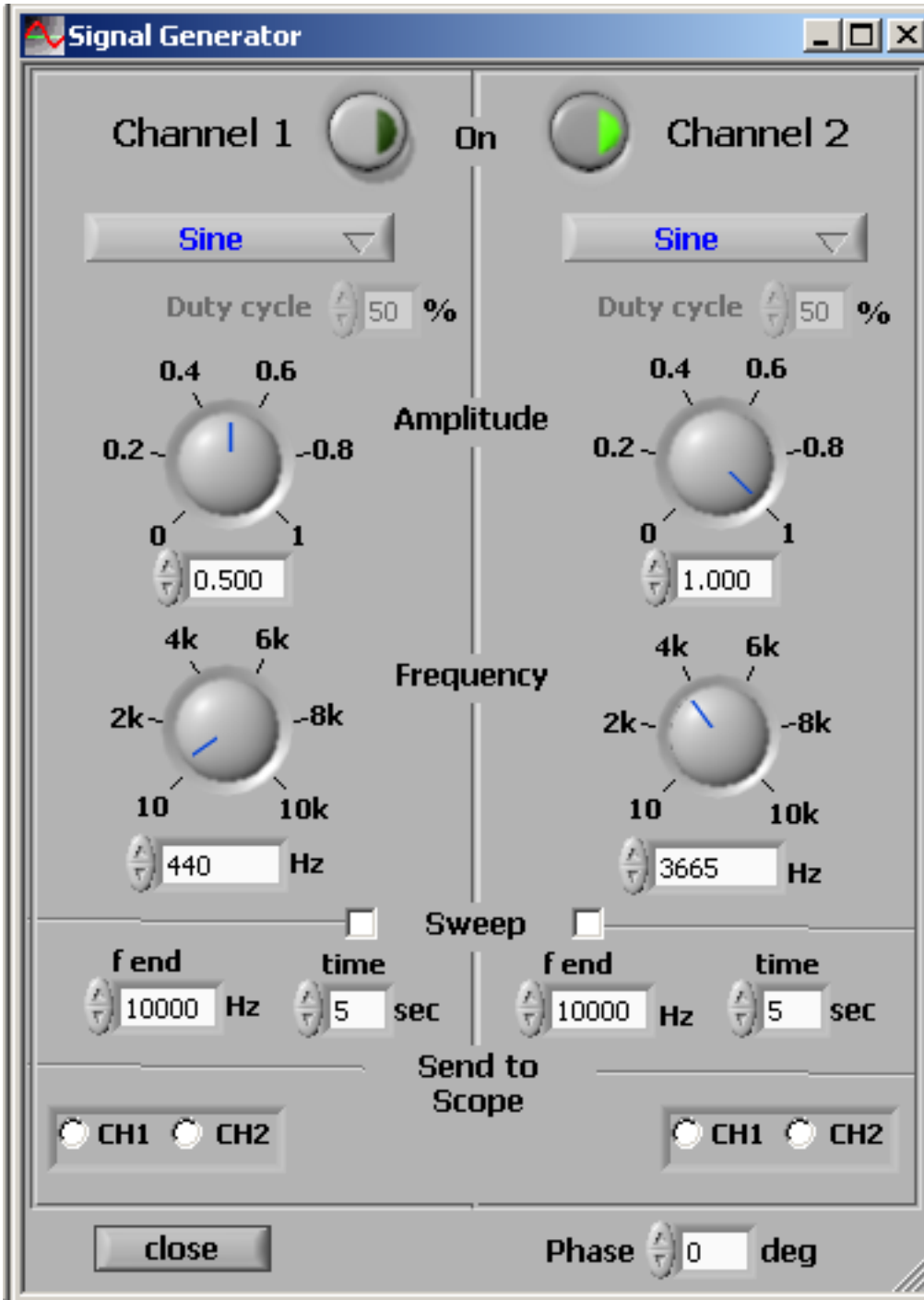


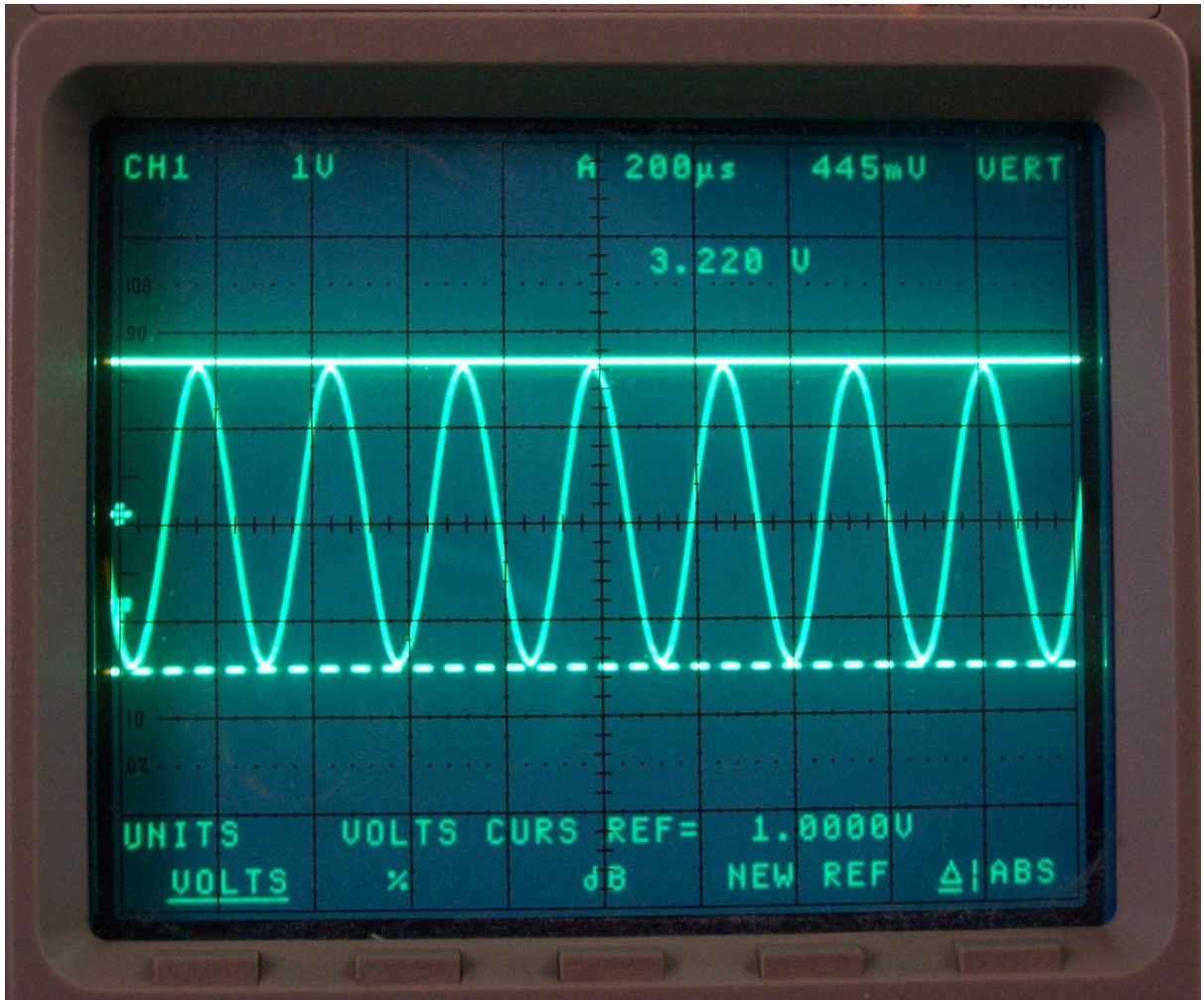


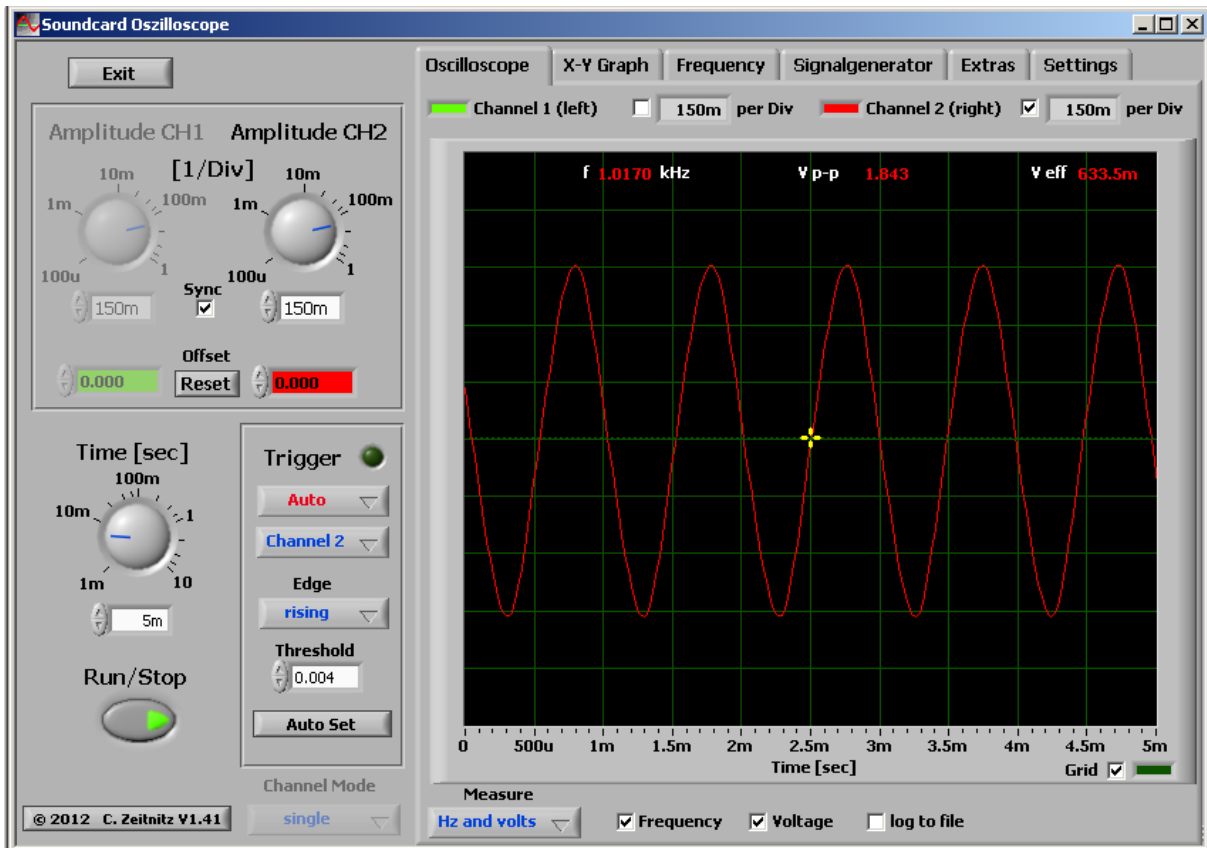
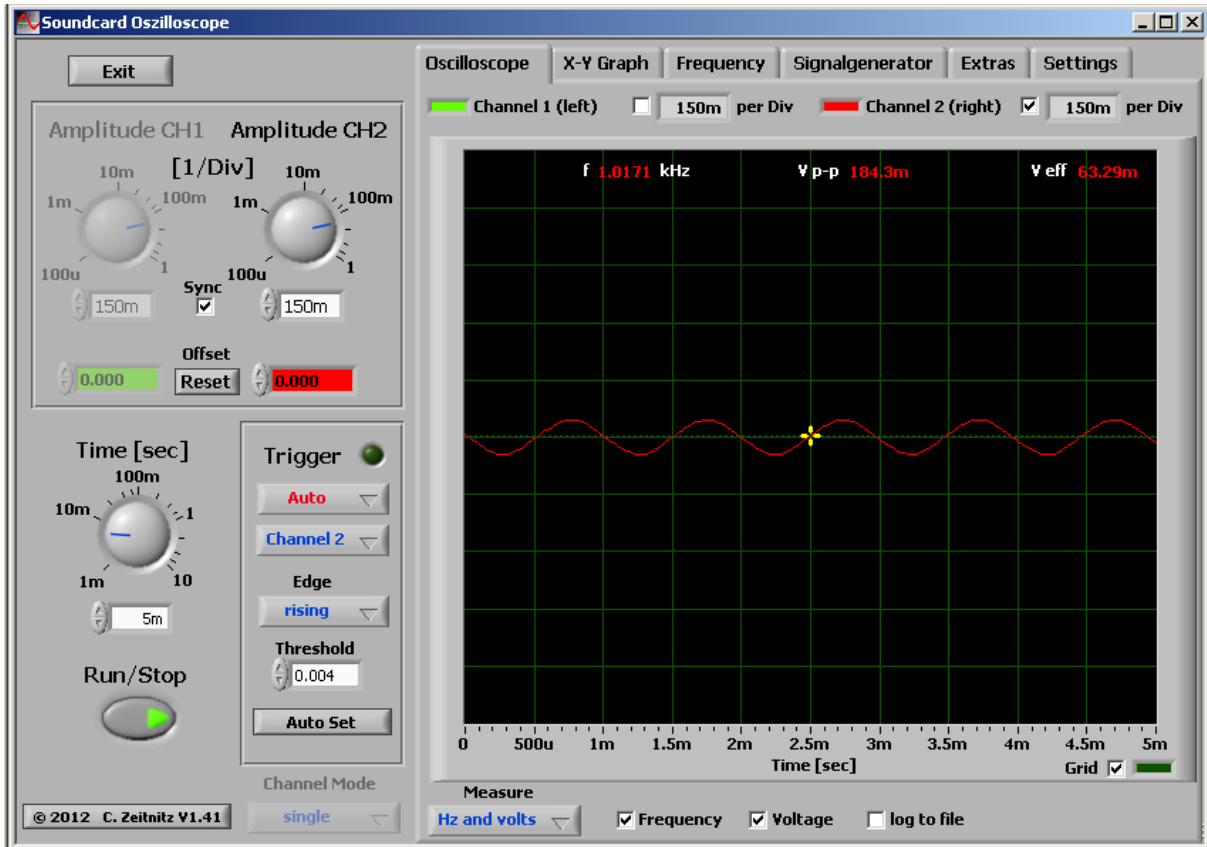


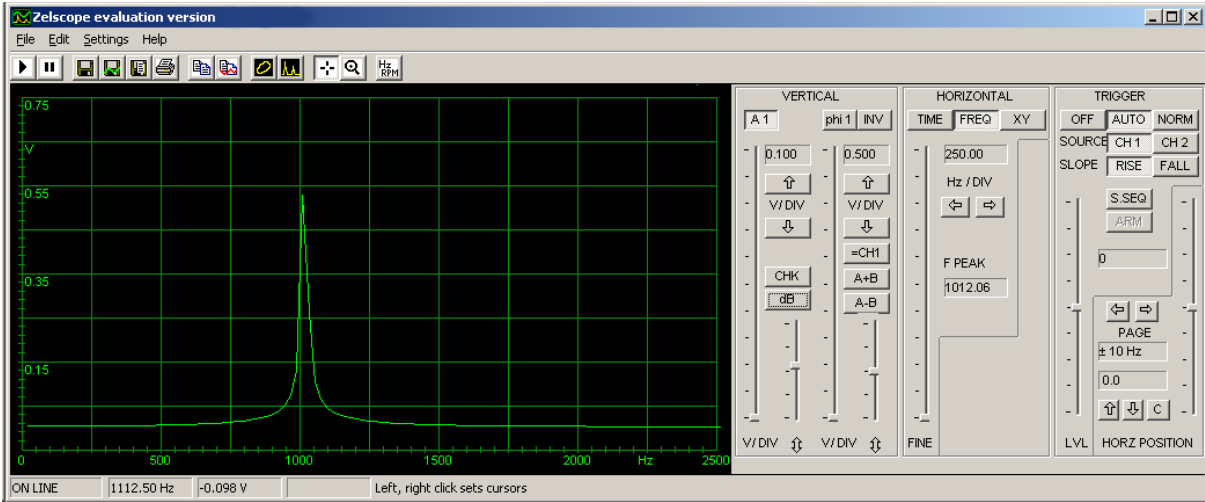
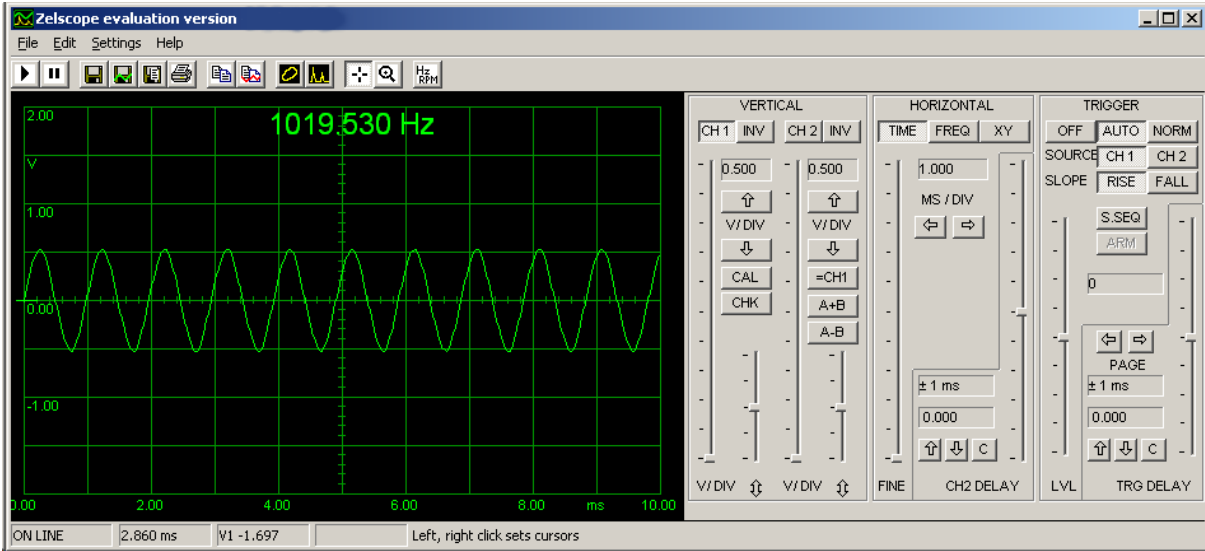


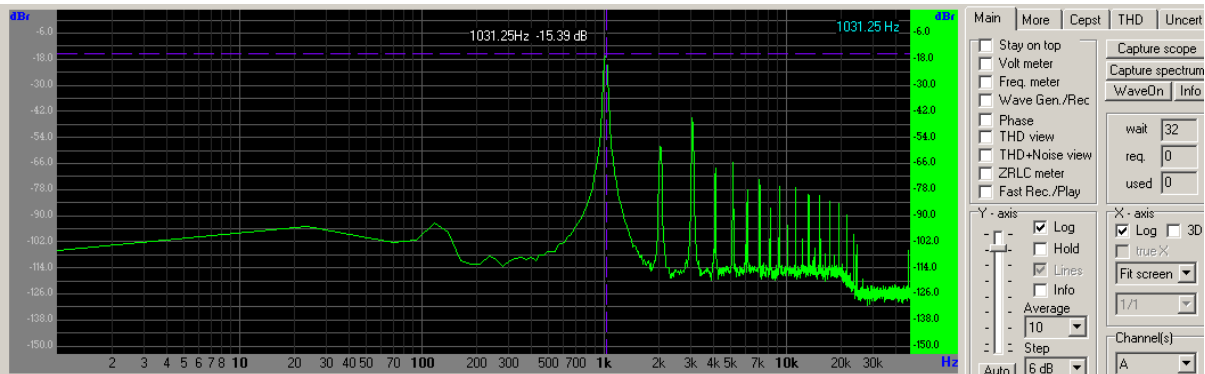
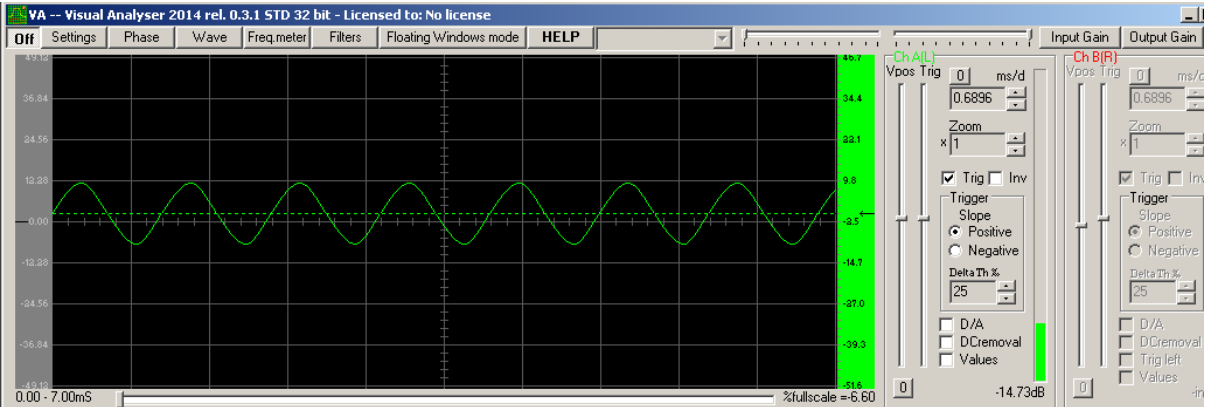
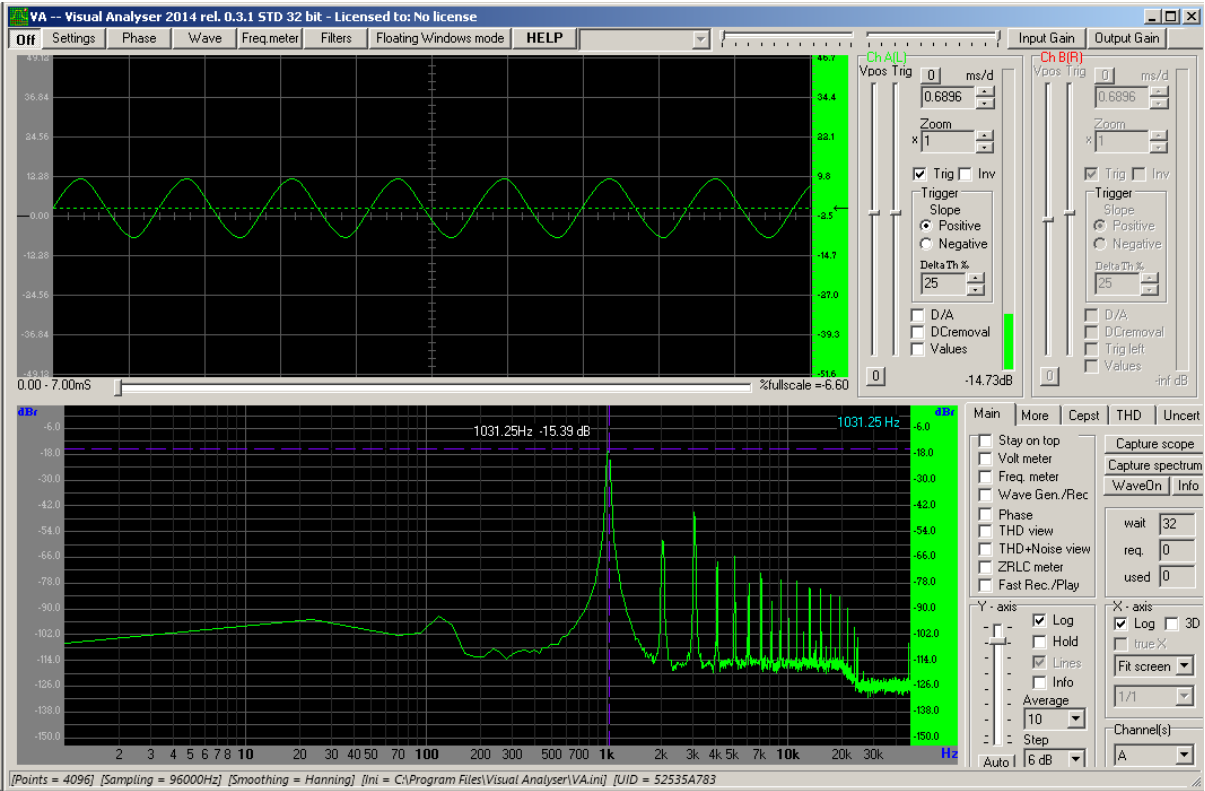


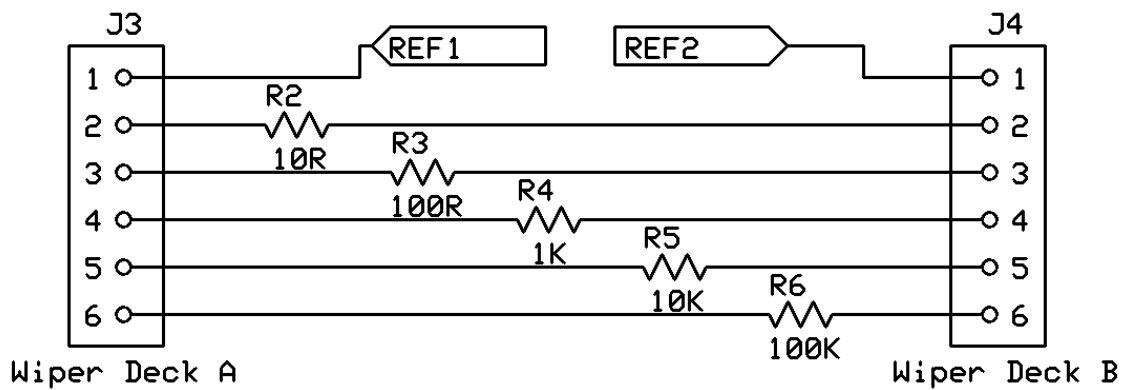
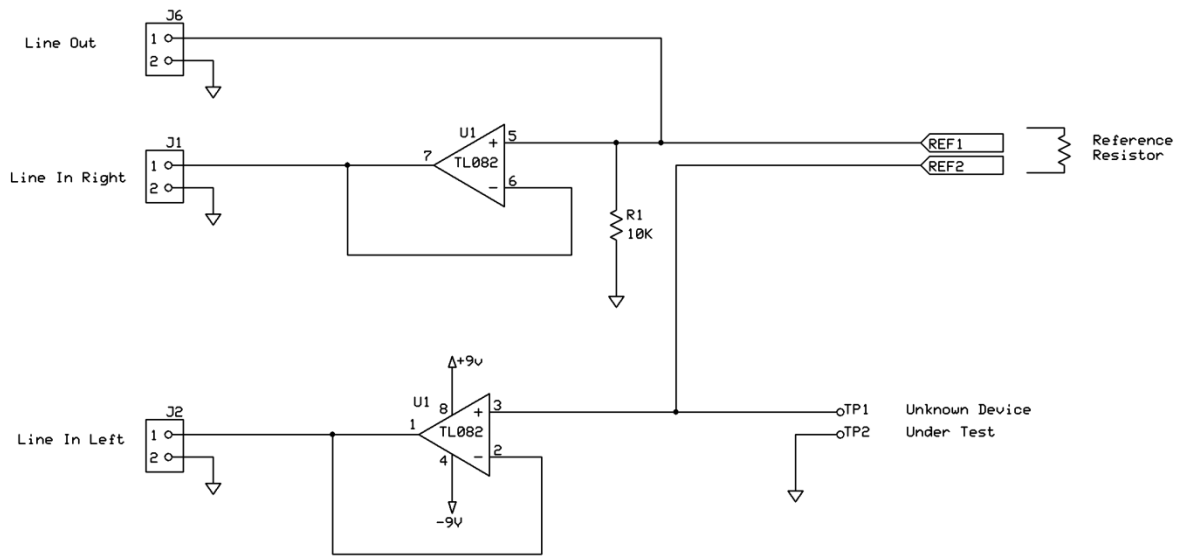
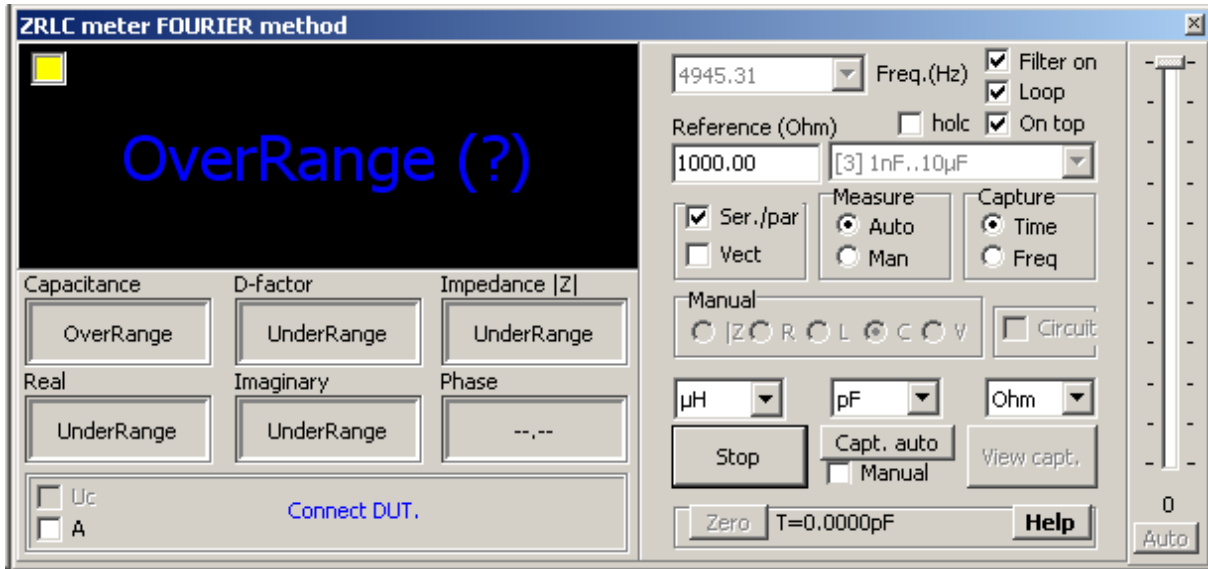


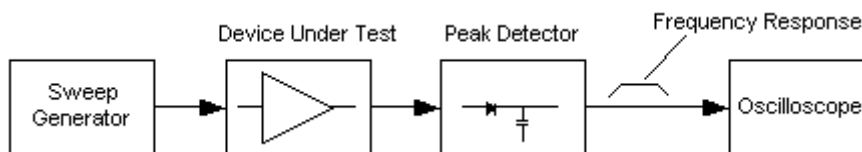
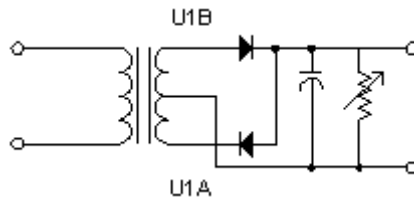
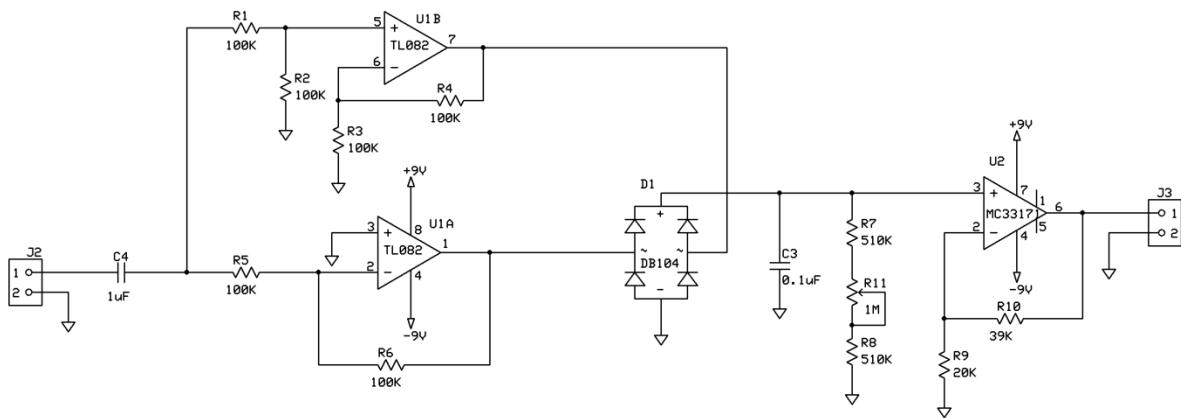
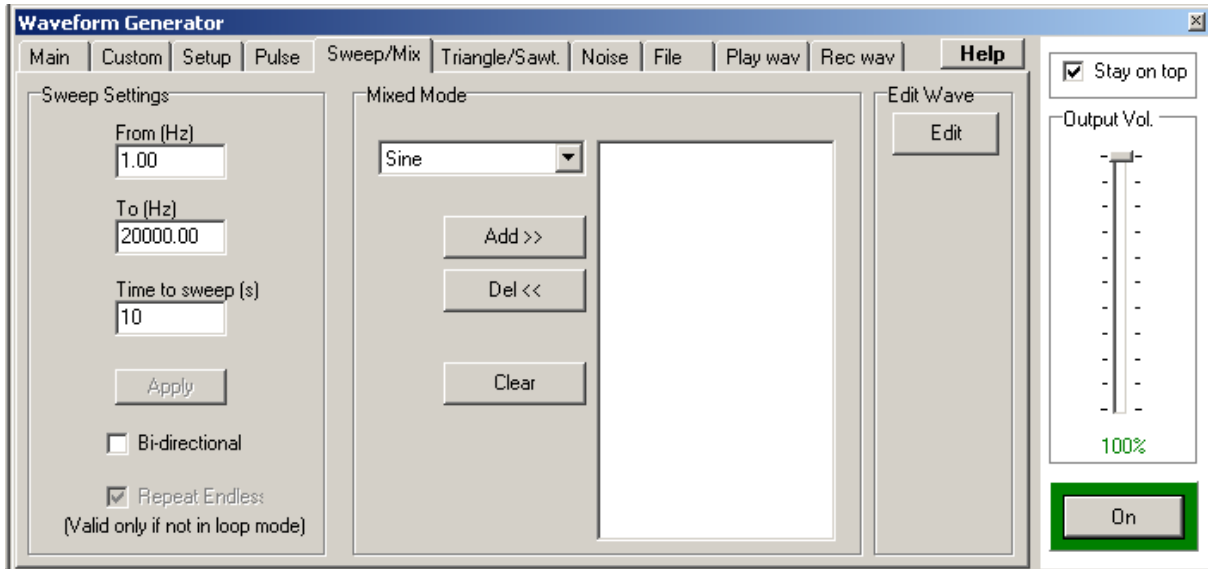


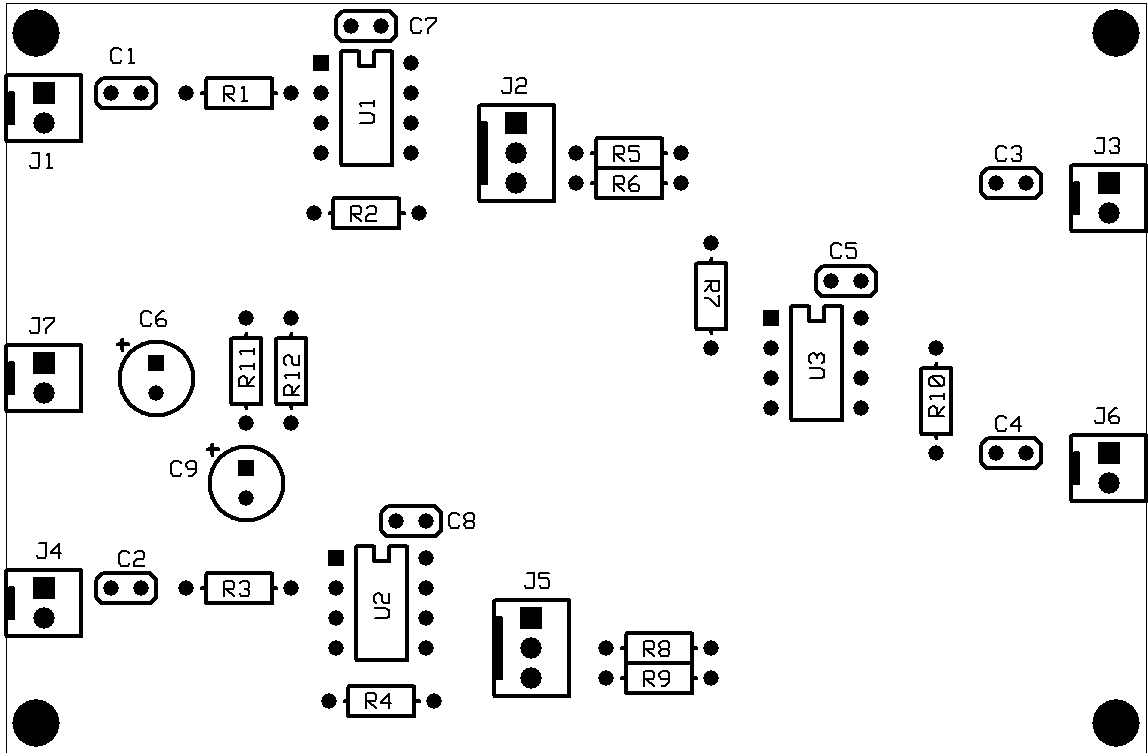




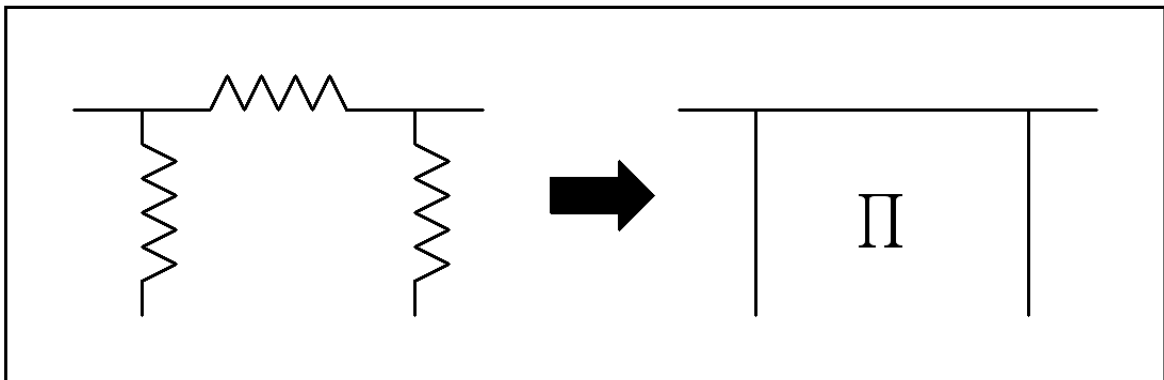
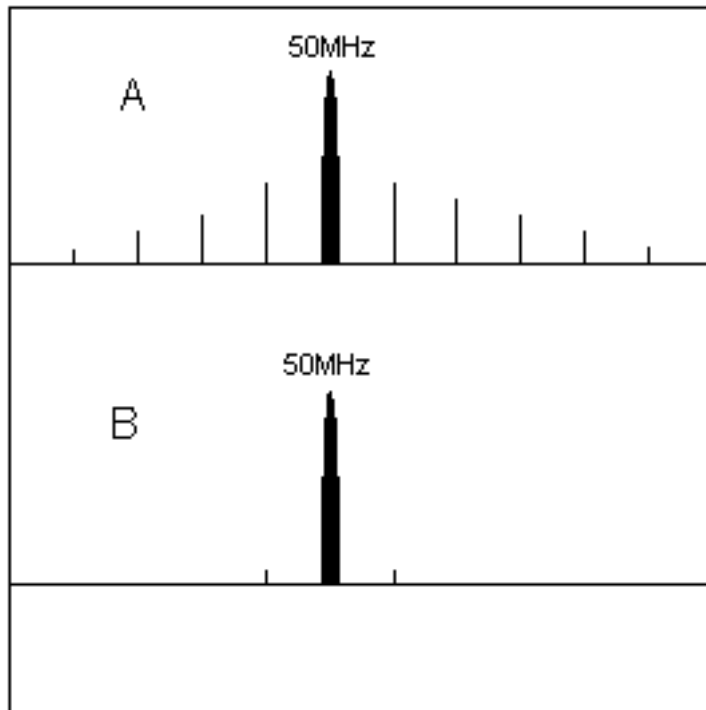
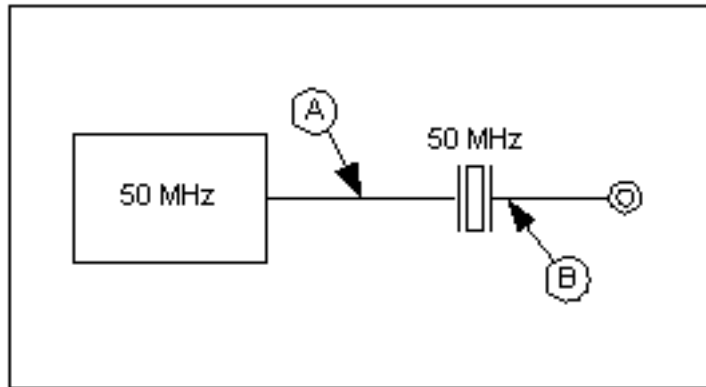


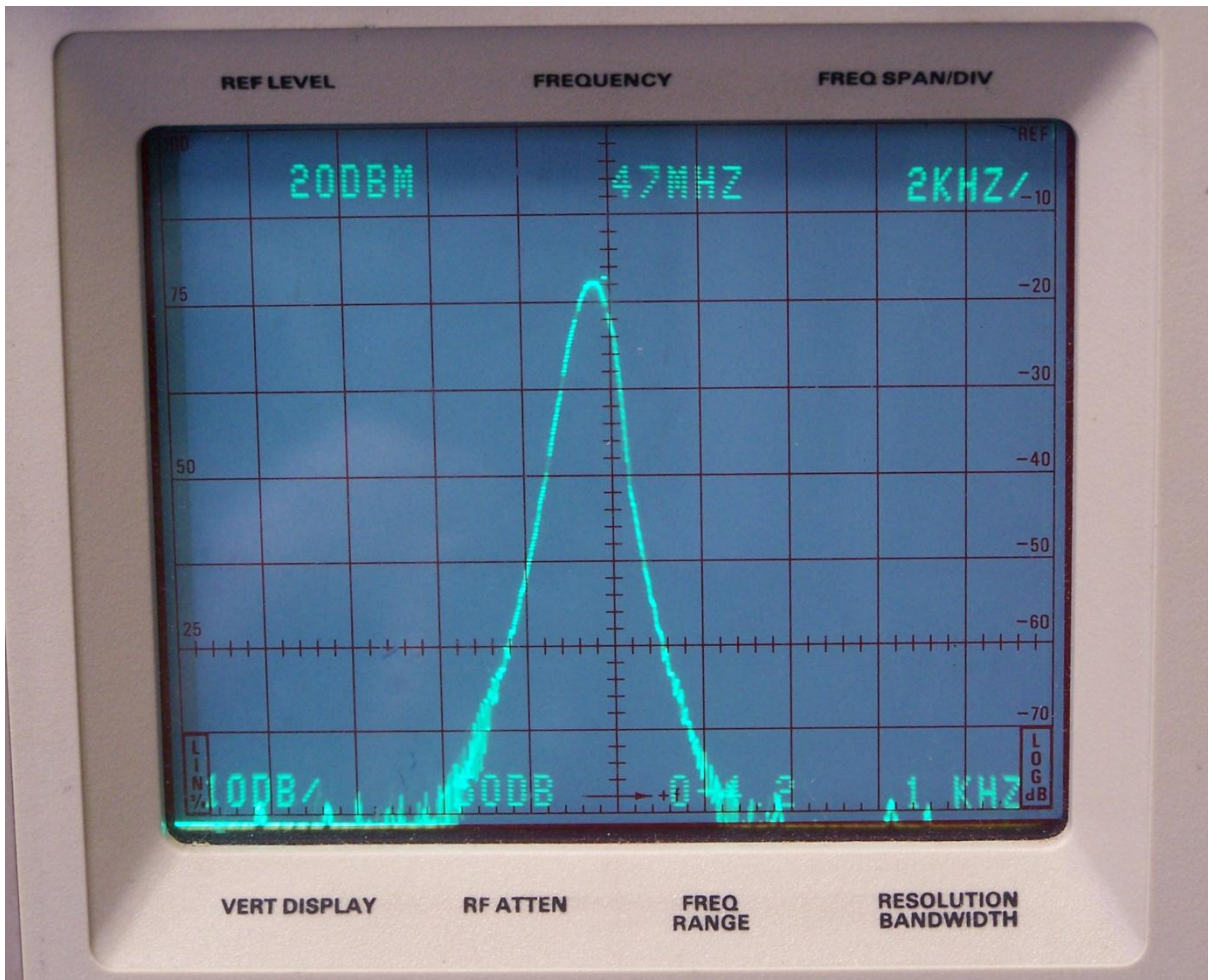
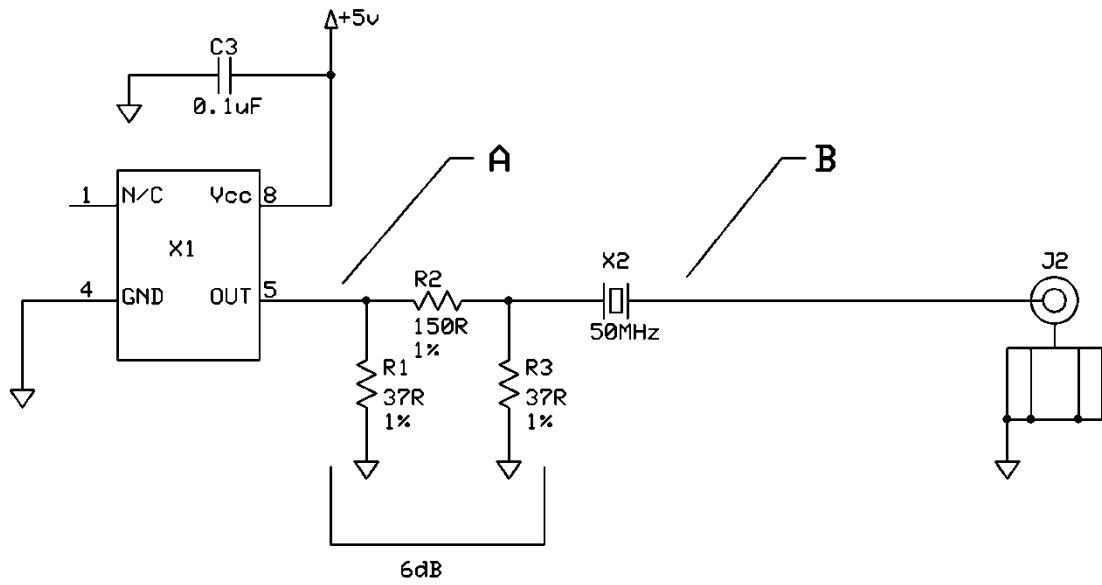






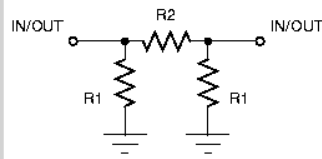
Chapter 5: Calibrated RF Source



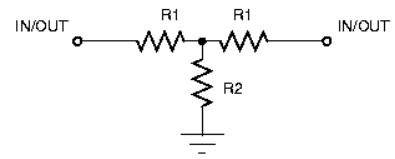


Pi & Tee Network Resistive Attenuation Calculator Results

Pi Style



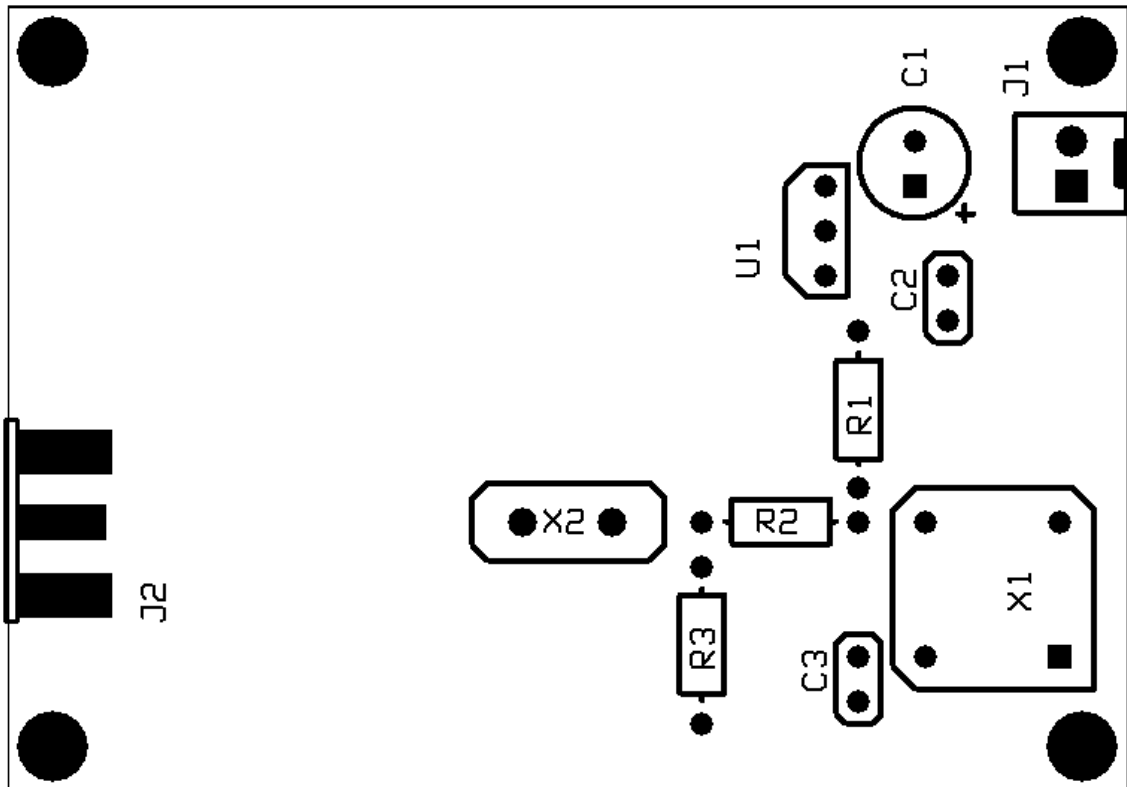
Tee Style

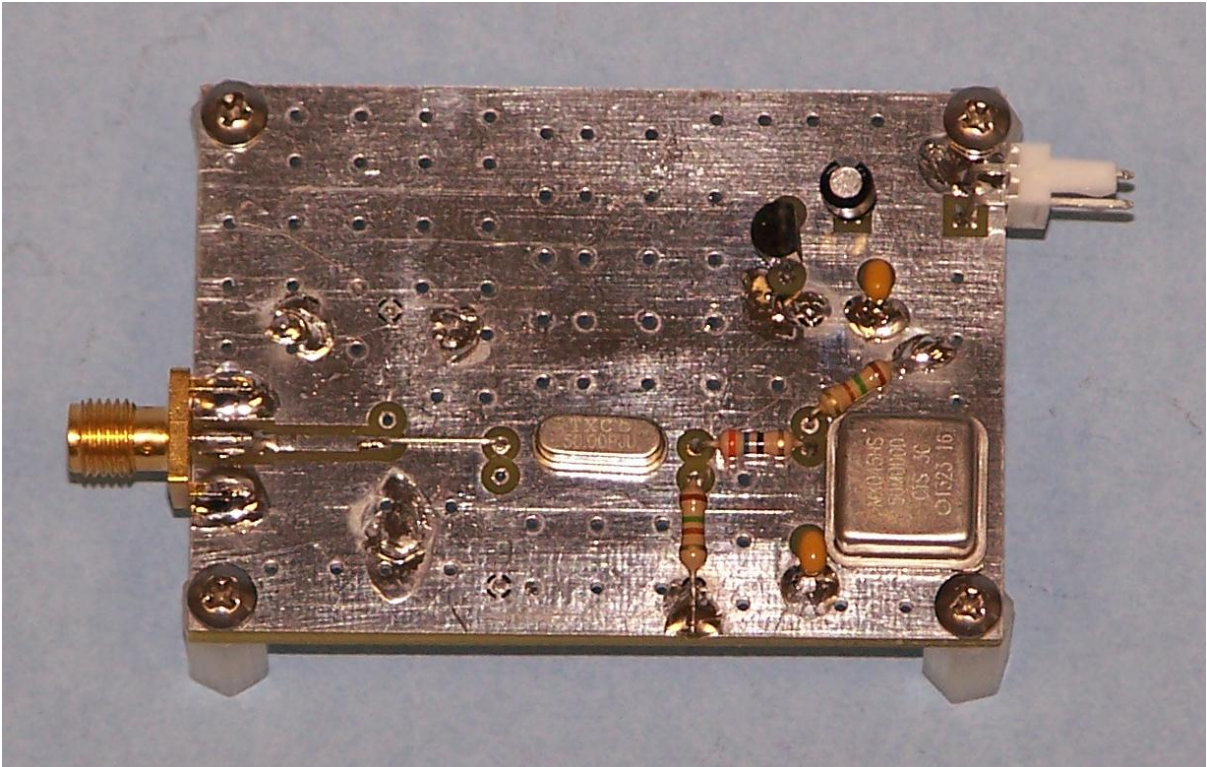
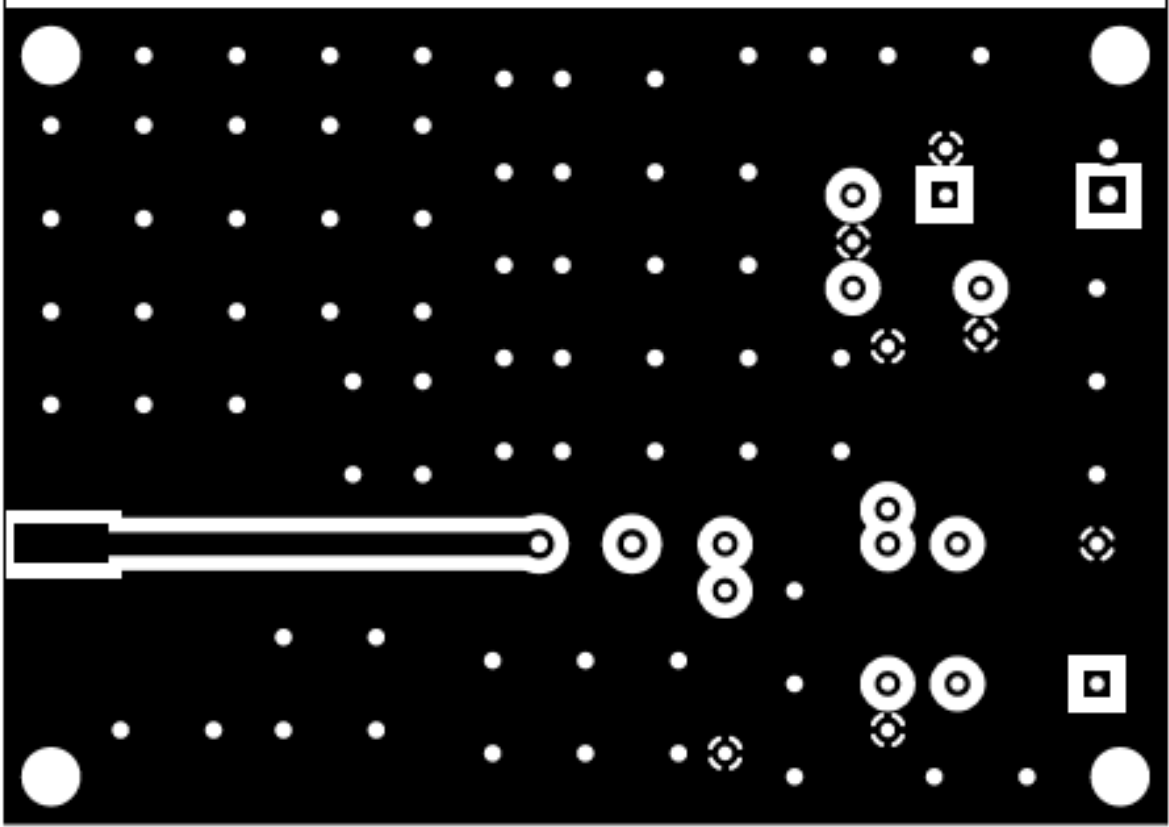


Attenuation : 6.000 dB
Input/output impedance : 50.000 ohms

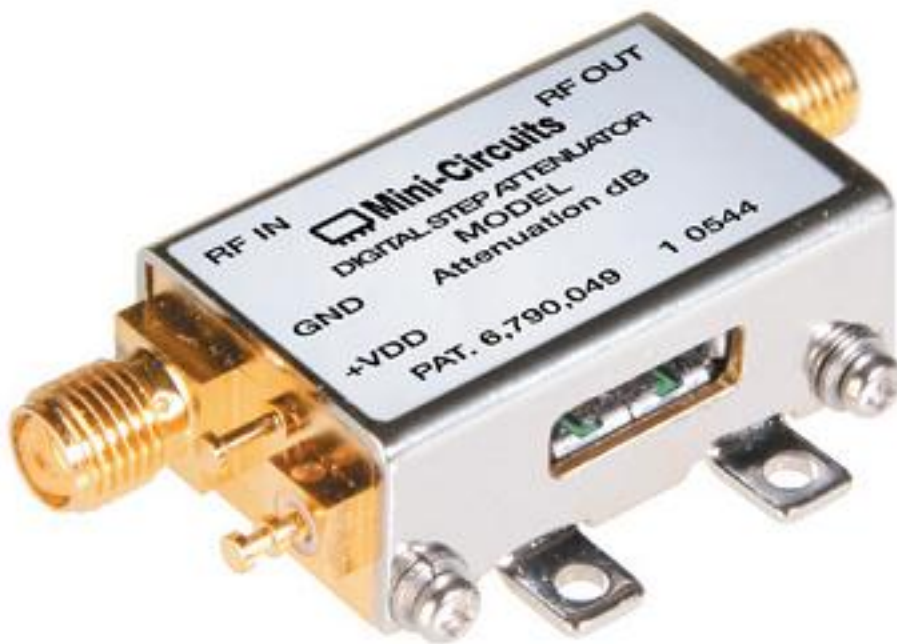
Pi style R1 : 150.476 ohms
Pi style R2 : 37.352 ohms

Tee style R1 : 16.614 ohms
Tee style R2 : 66.931 ohms

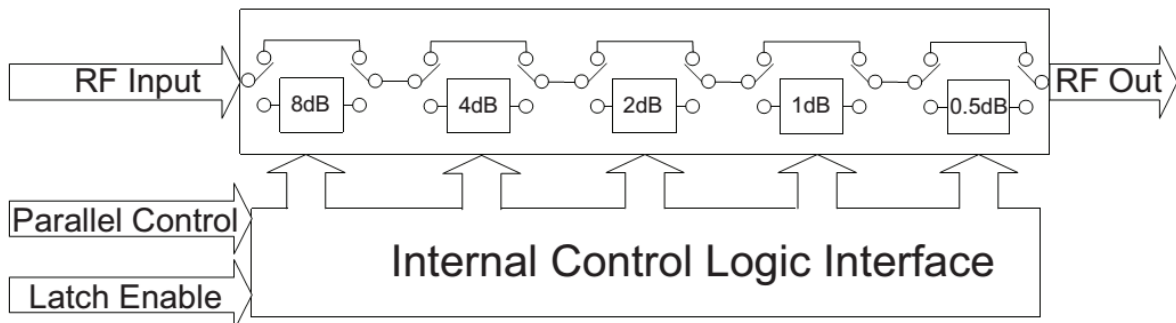


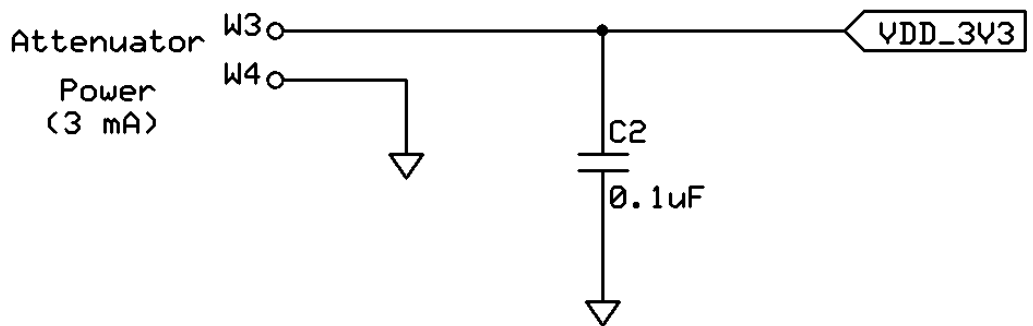
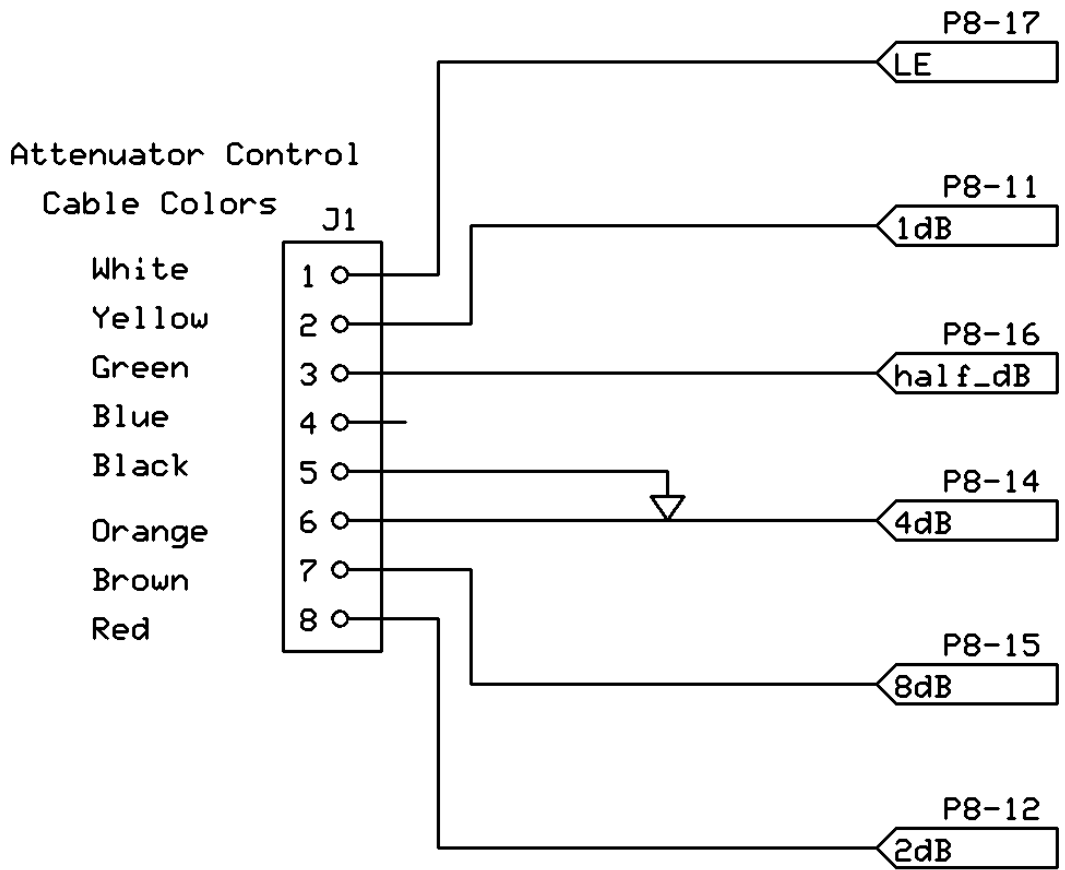


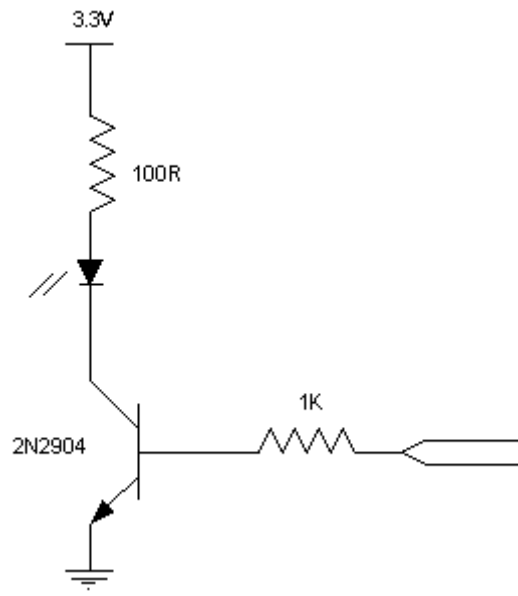
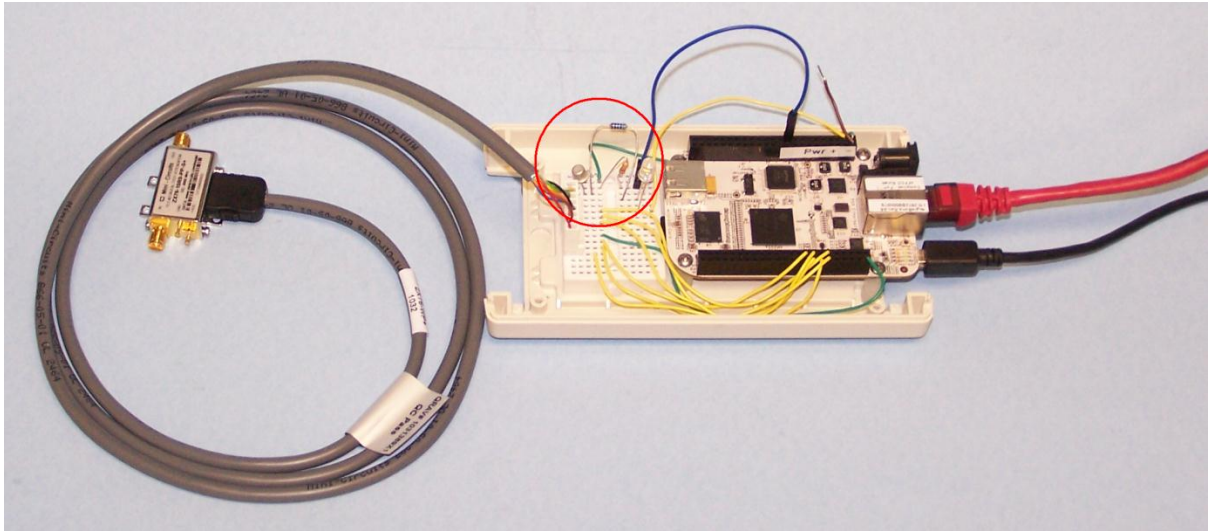


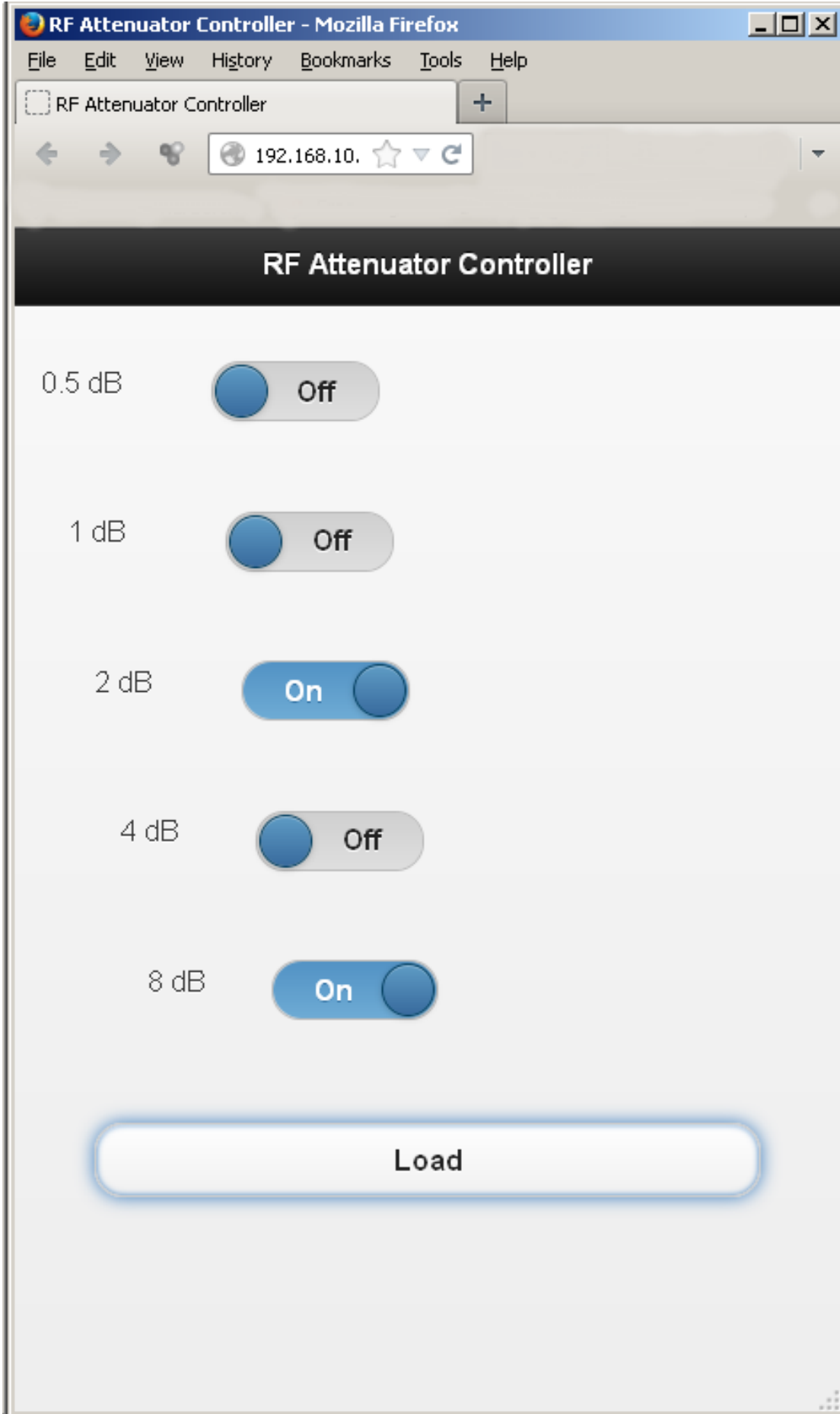


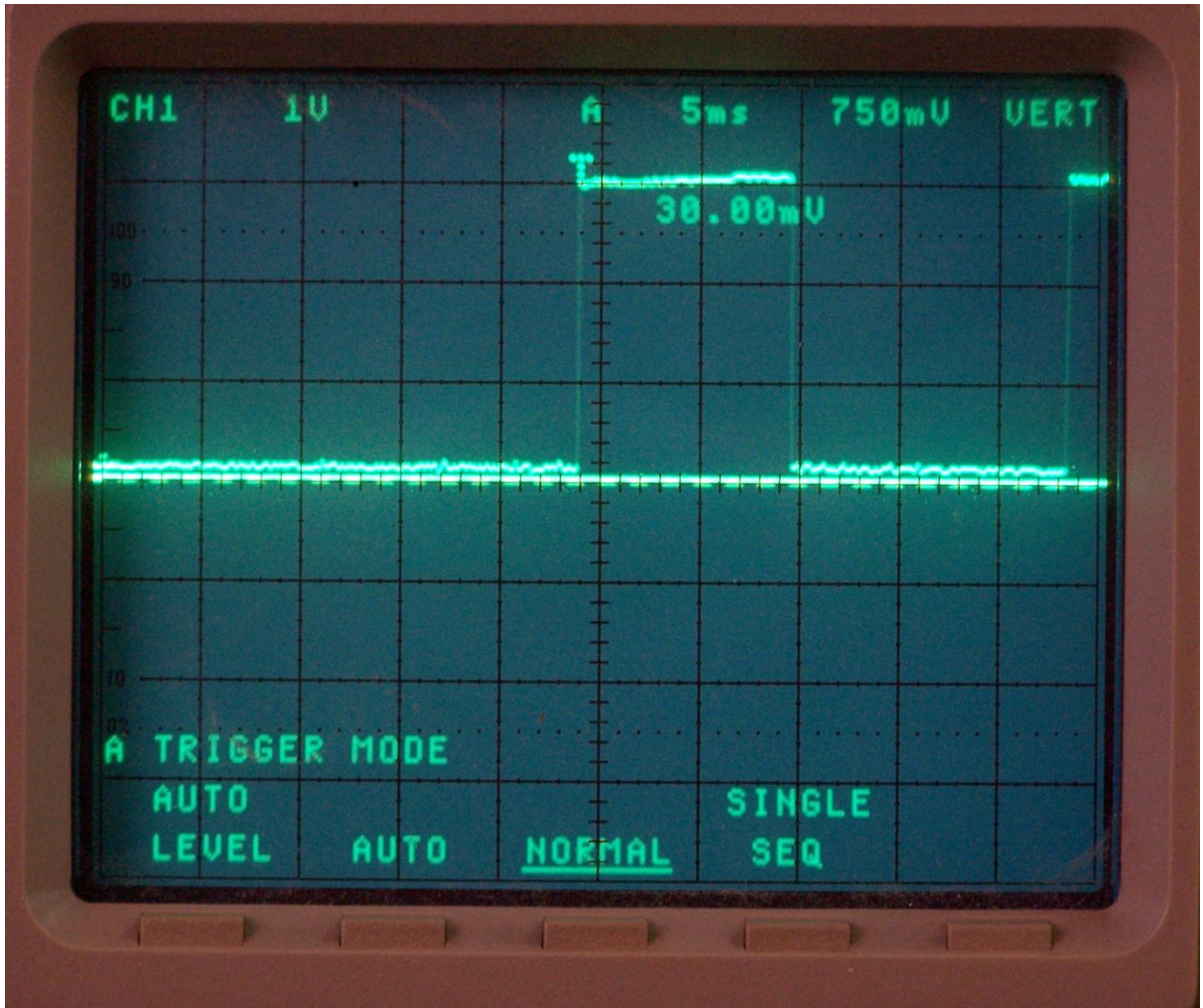
Simplified Schematic







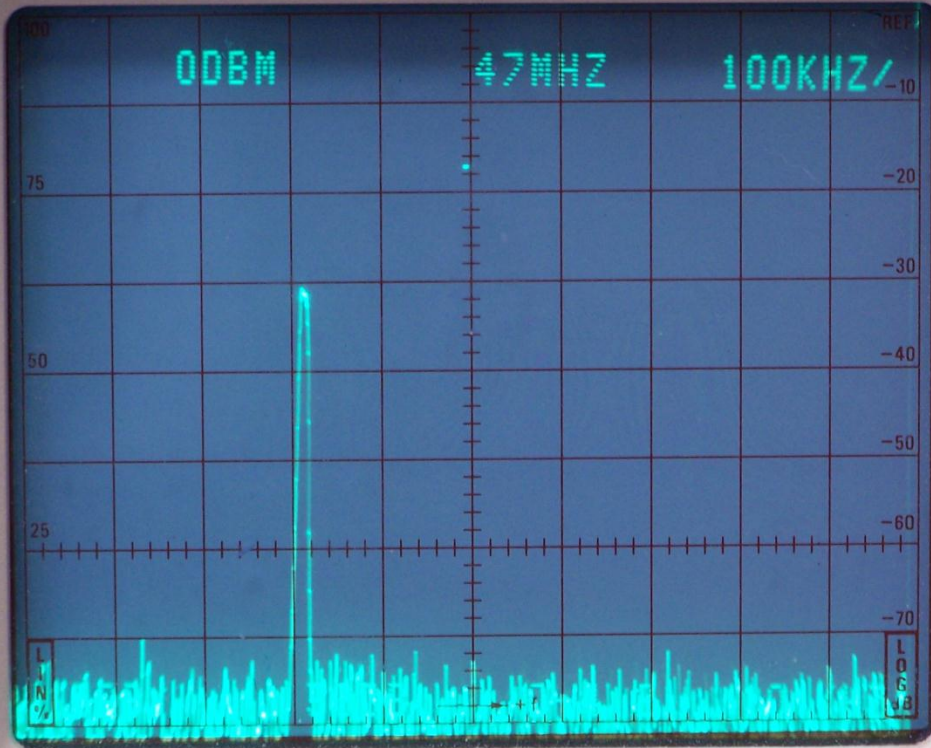




REF LEVEL

FREQUENCY

FREQ SPAN/DIV

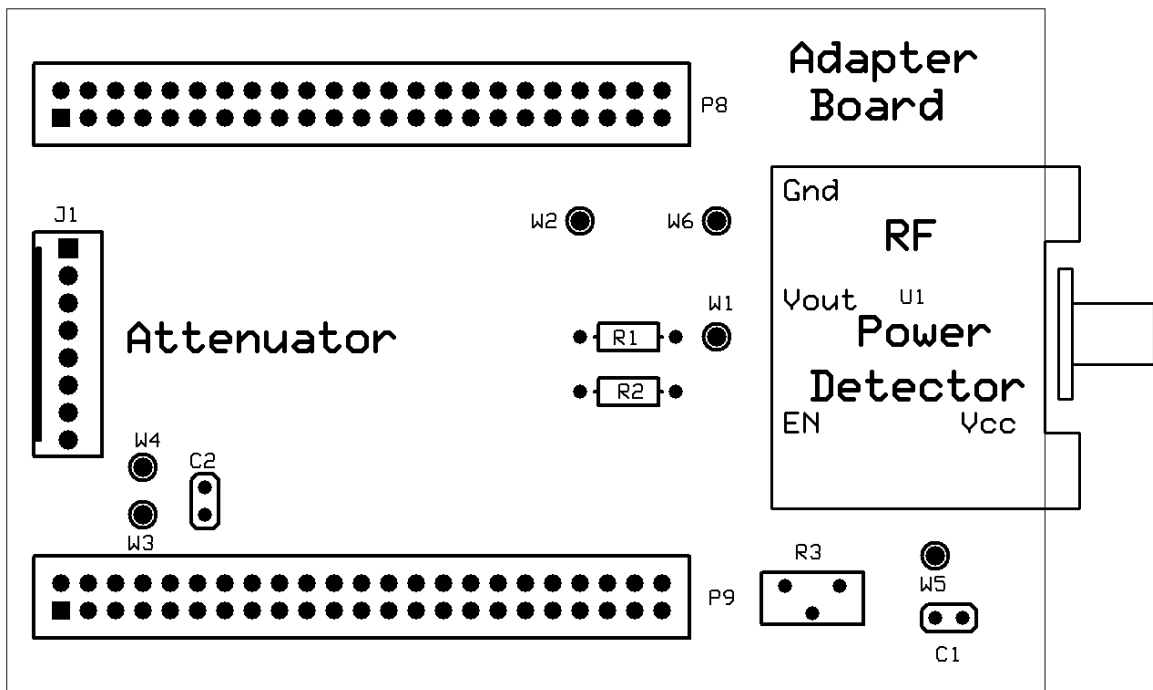
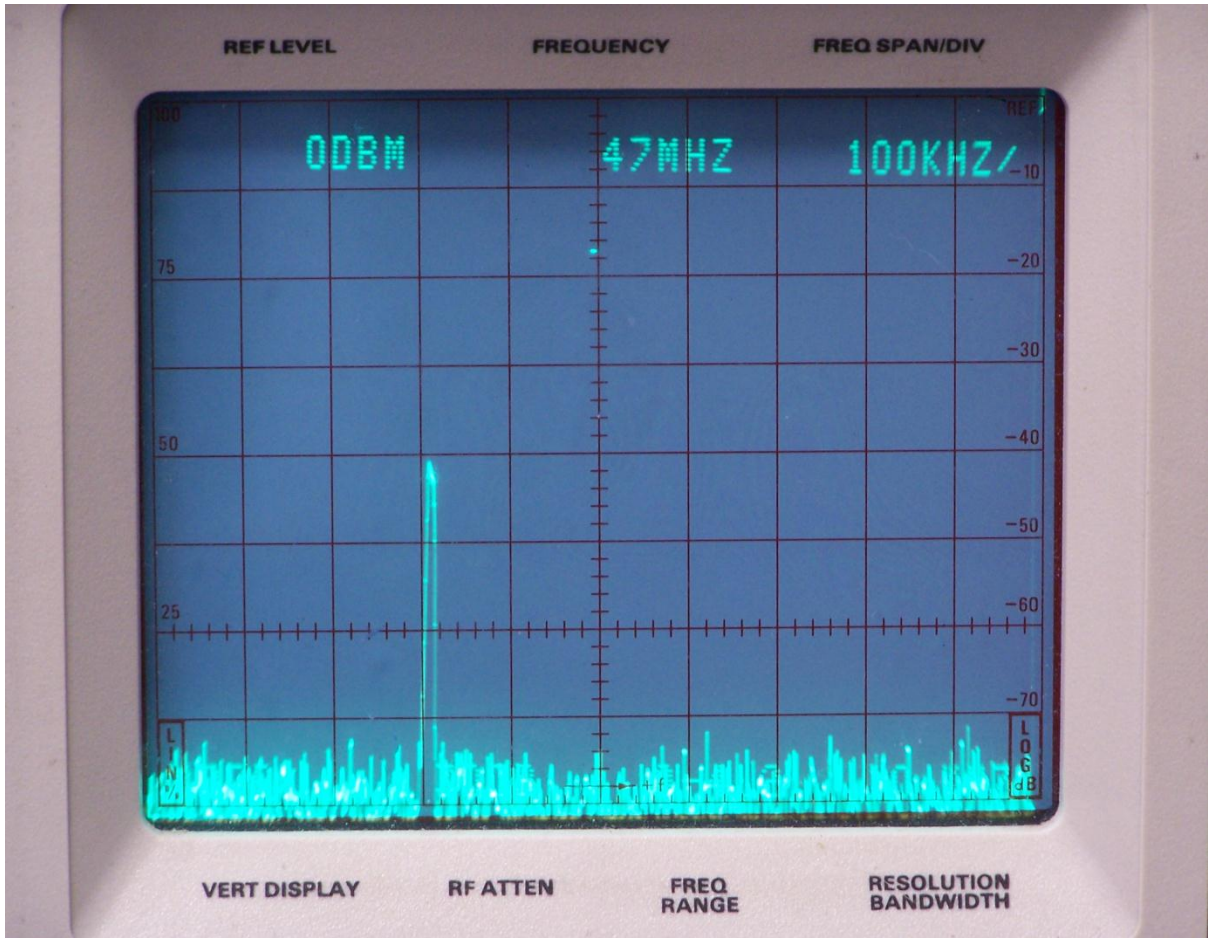


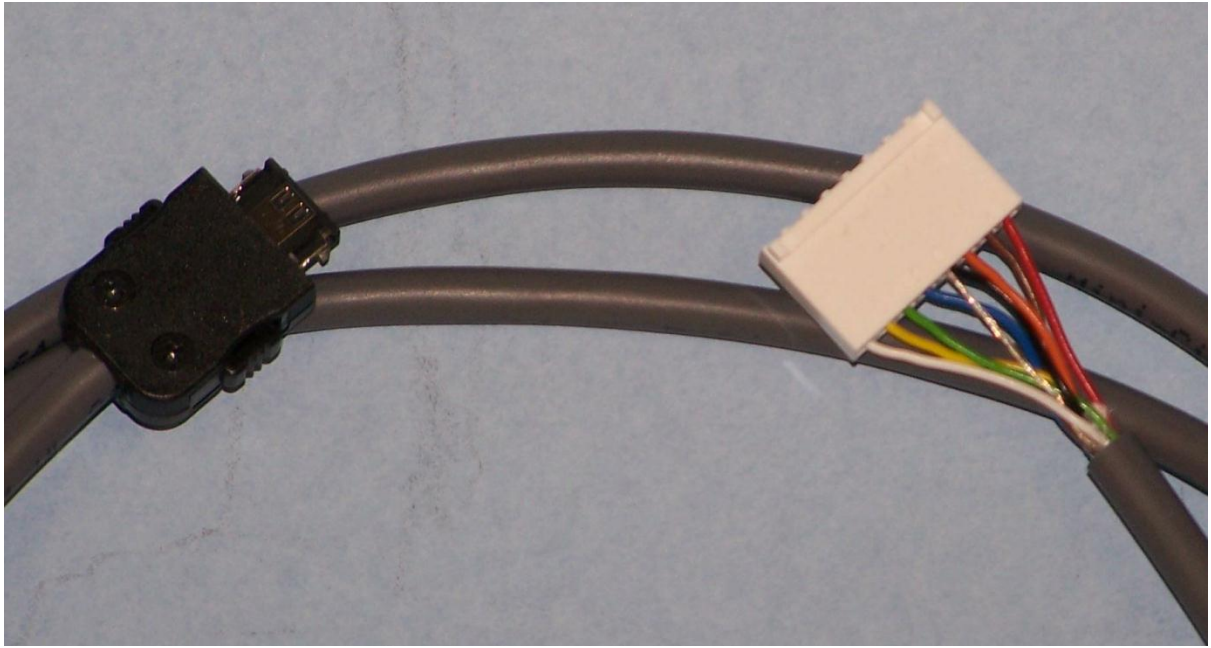
VERT DISPLAY

RF ATTEN

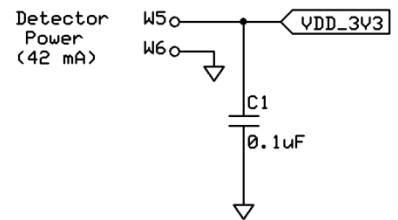
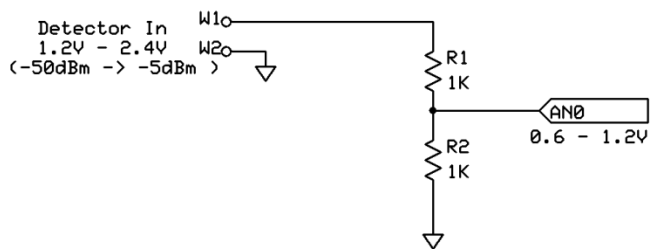
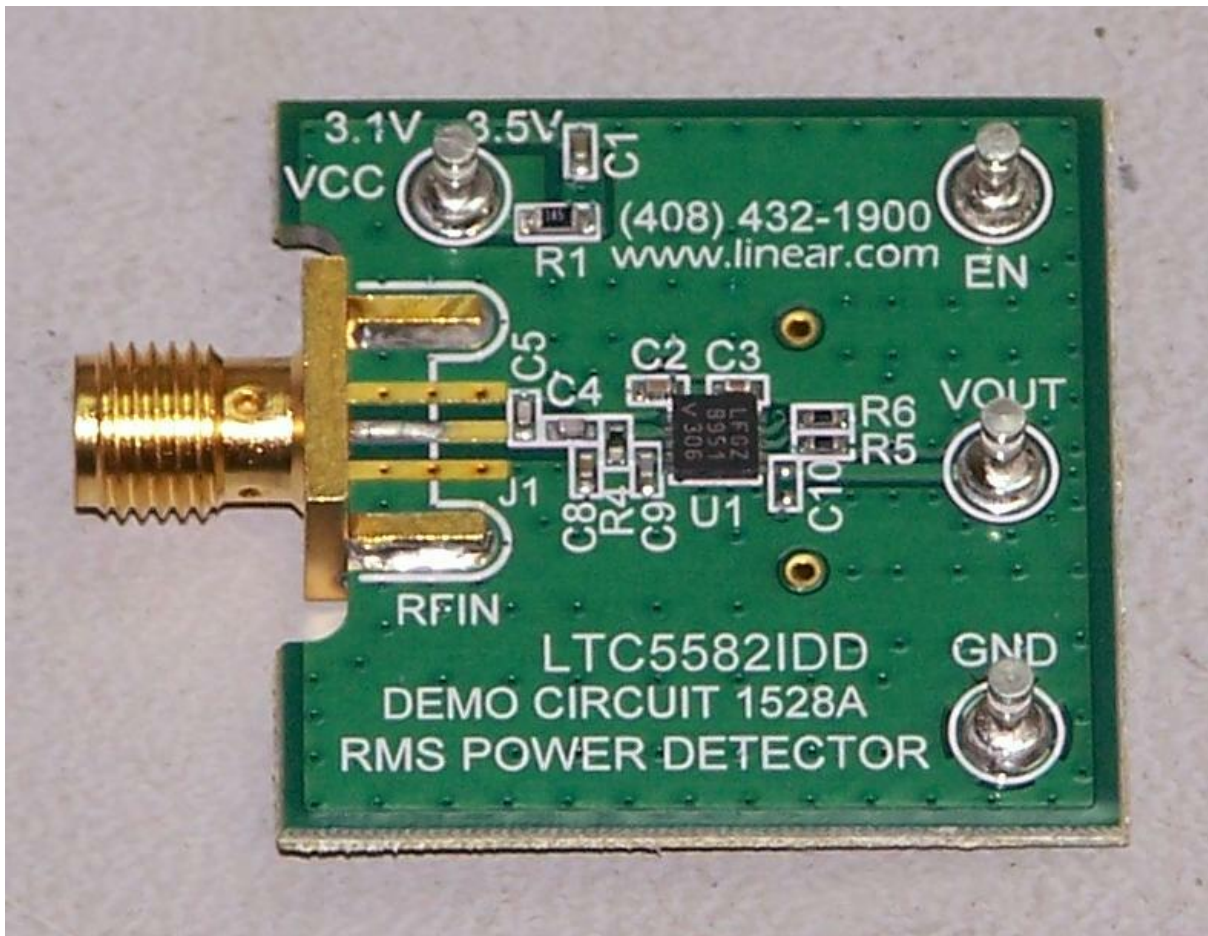
FREQ RANGE

RESOLUTION BANDWIDTH

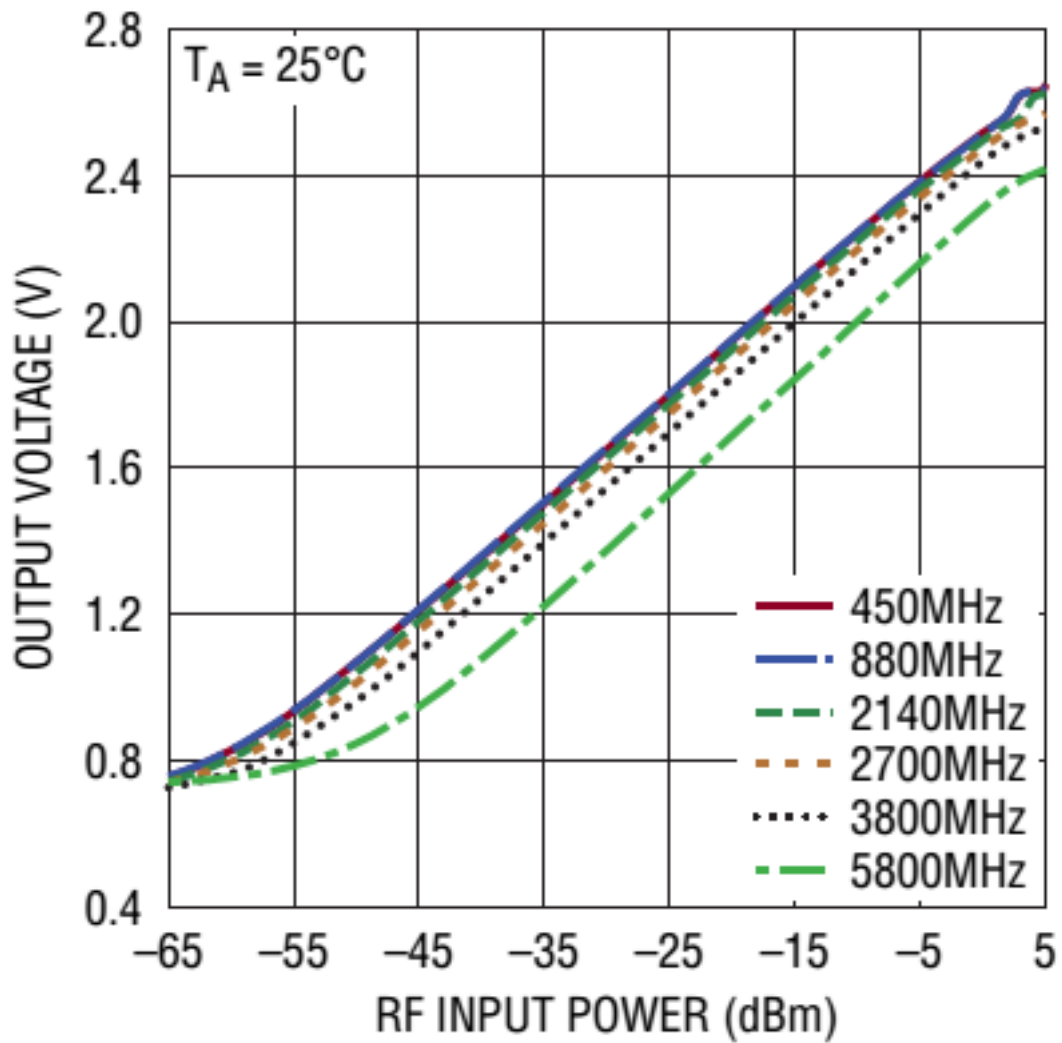




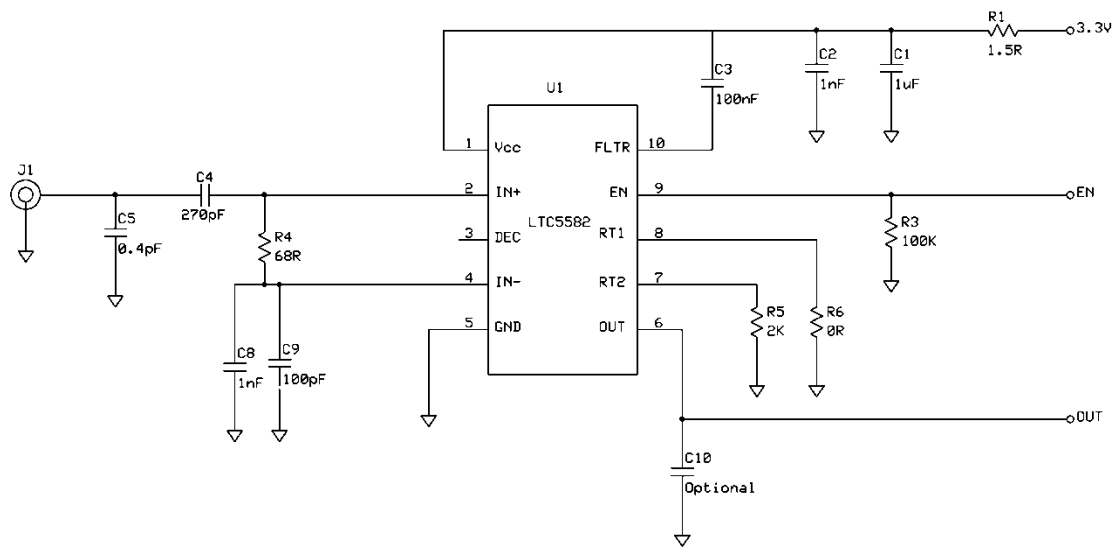
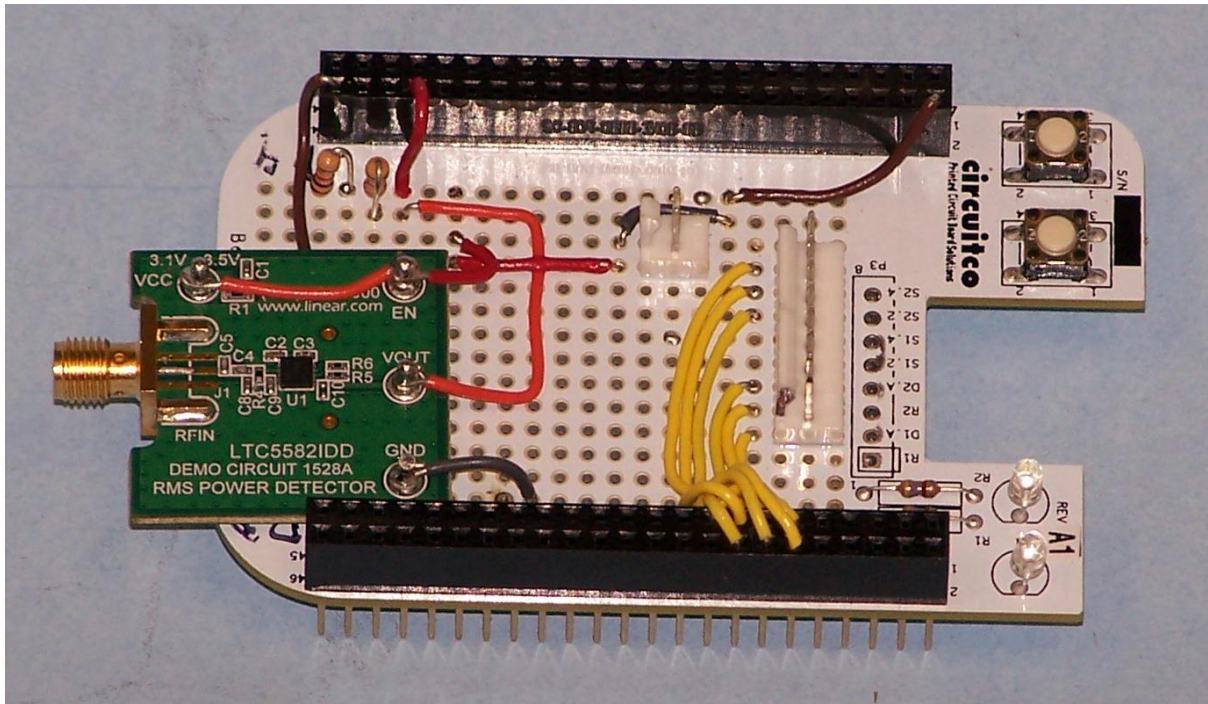
Chapter 6: RF Power Meter – Hardware



Output Voltage vs RF Input Power



5582 G01



File Edit View Windows Help run Preview

Project Files

- cloud9
 - attic
 - autorun
 - demo
 - analog.js
 - analog2.js
 - blinked.js
 - fade.js
 - input.js
 - input2.js
 - extras
 - node_modules
 - attenuator.js

```

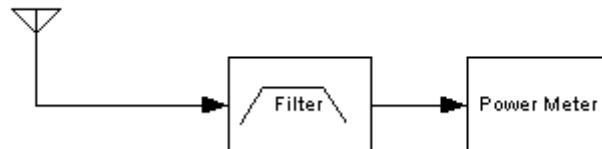
1 var b = require('bonescript');
2
3 var inputPin = "P9_39";
4
5 loop();
6
7 function loop() {
8   var value = b.analogRead(inputPin);
9   var diff = value-0.667; //0dBm input
10  console.log ("Value"); //DAC Reading
11  console.log("Difference"); //Difference between current reading and 0dBm
12  console.log(diff); //Difference between current reading and 0dBm
13  console.log ("Power"); // ~ 7% change per dBm
14  console.log((diff/0.007)); // ~ 7% change per dBm
15  setTimeout(loop, 1);
16 }
17
18
  
```

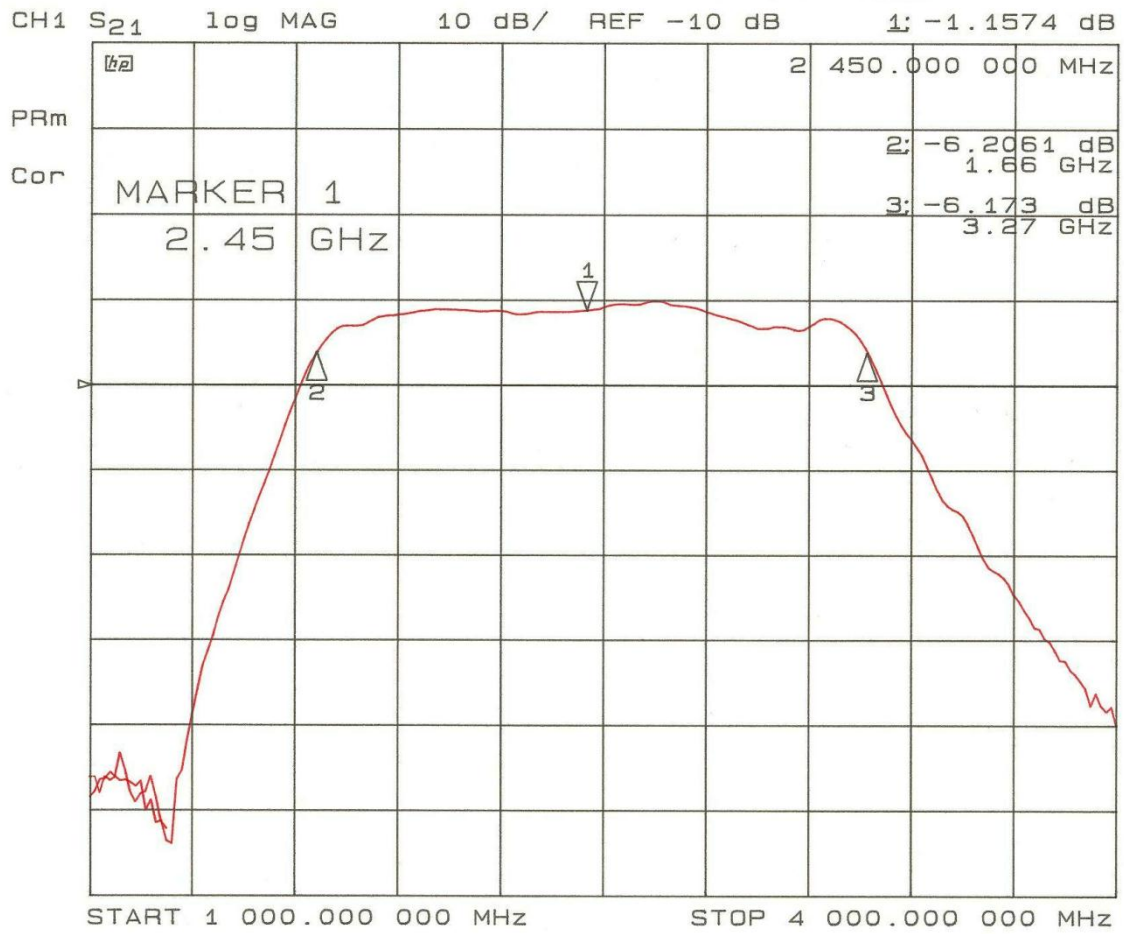
Console Output:

```

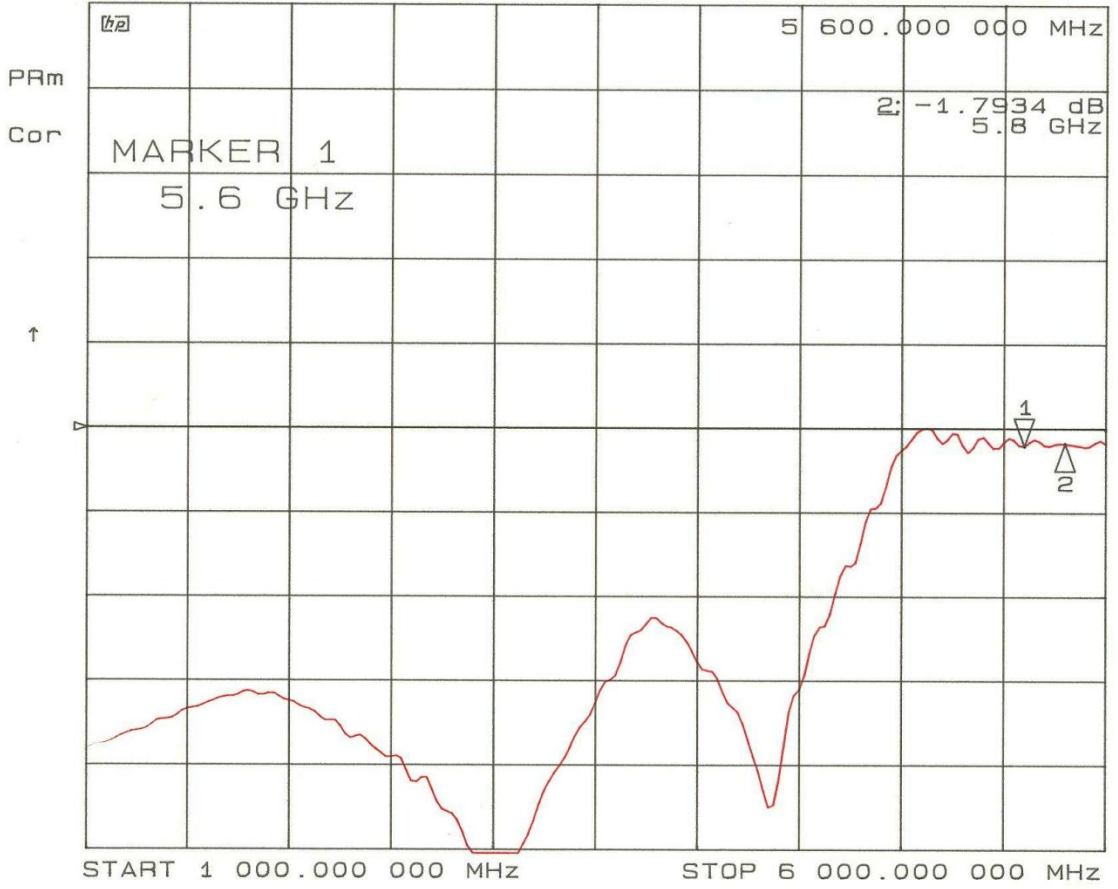
1. 142857142857144
Value
0. 6744444444444444
Difference
0. 0074444444444444365
Power
1. 0634920634920522
  
```

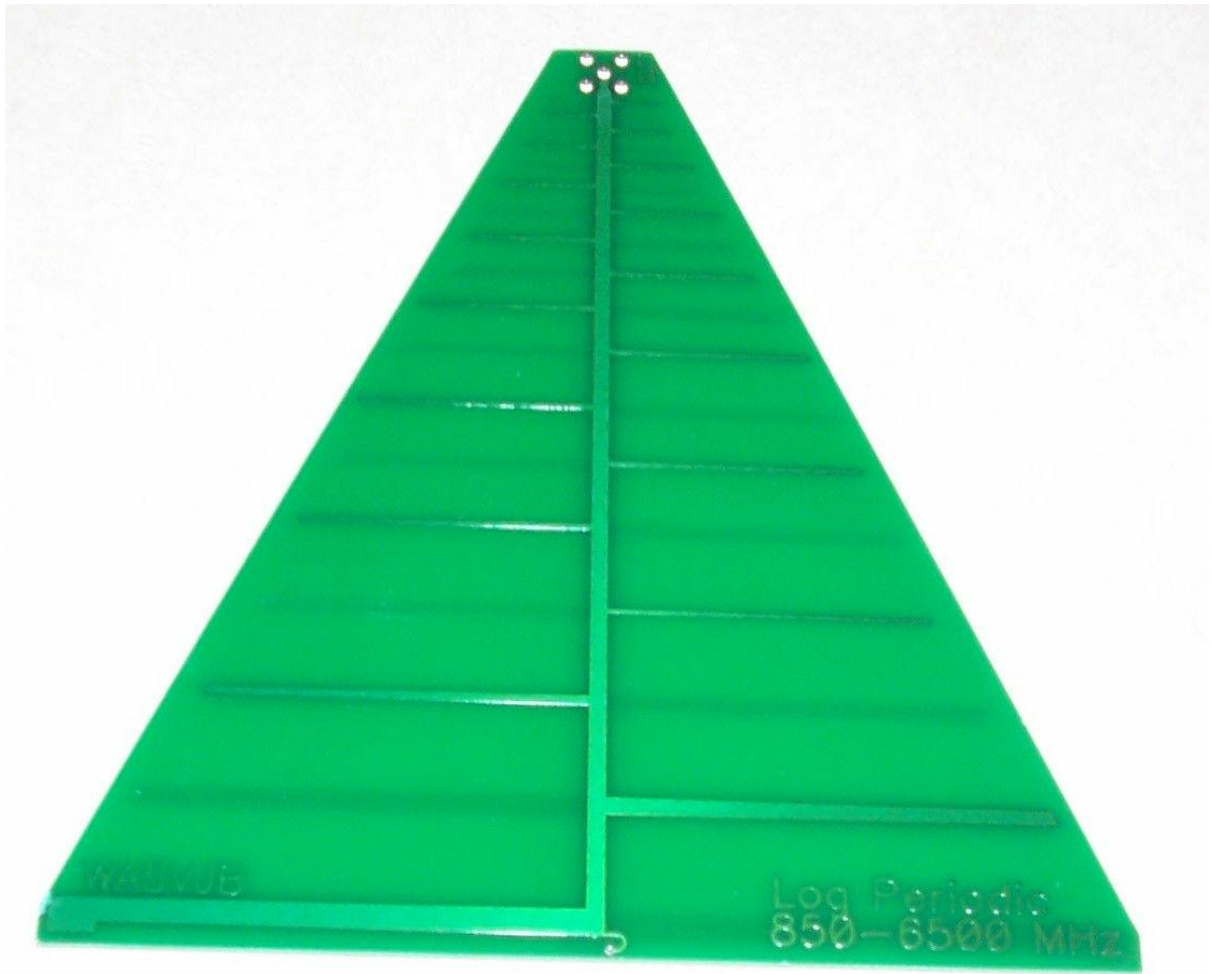
Calibrated Antenna





CH1 S₂₁ log MAG 10 dB/ REF 0 dB 1: -2.1356 dB



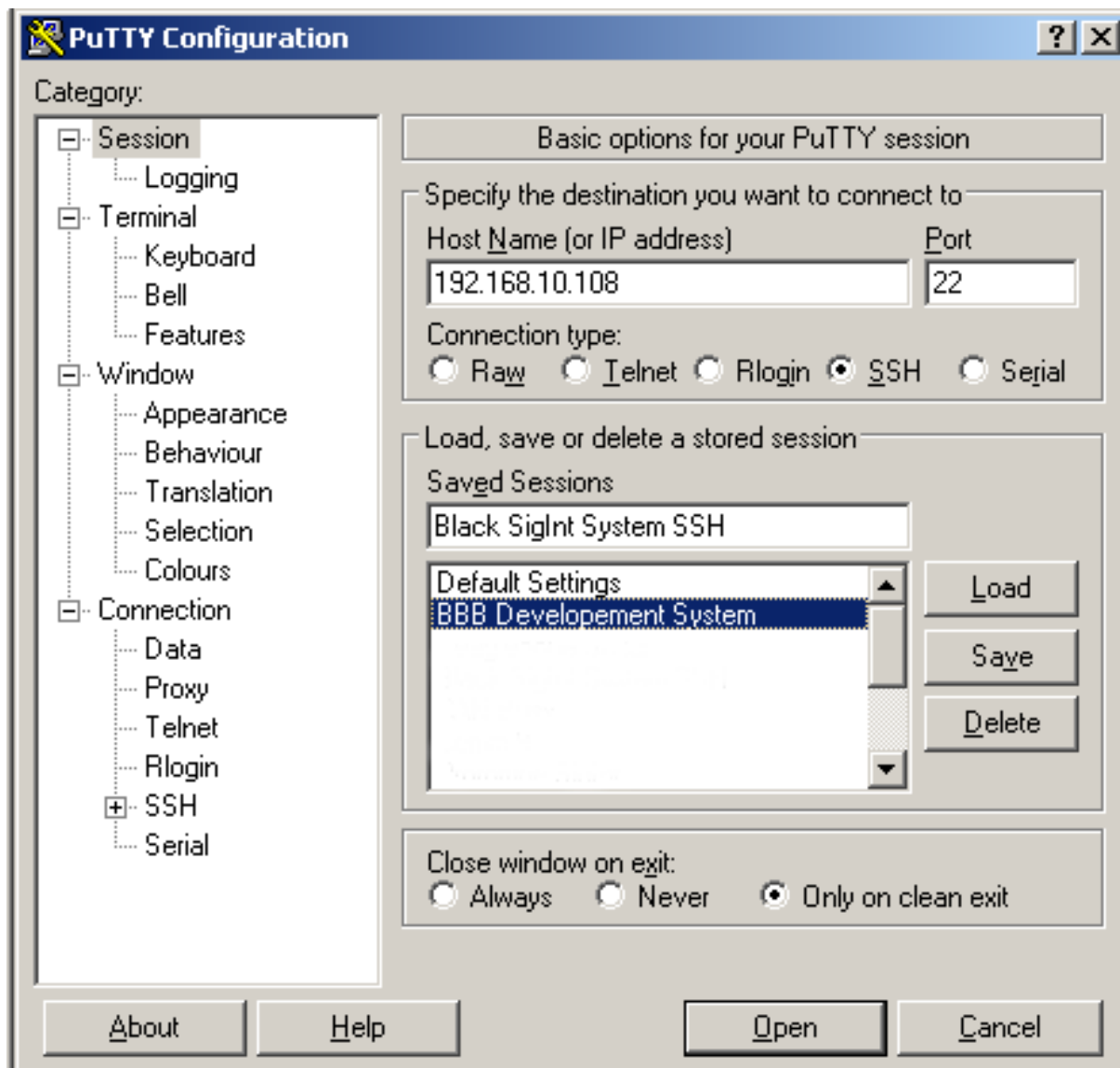


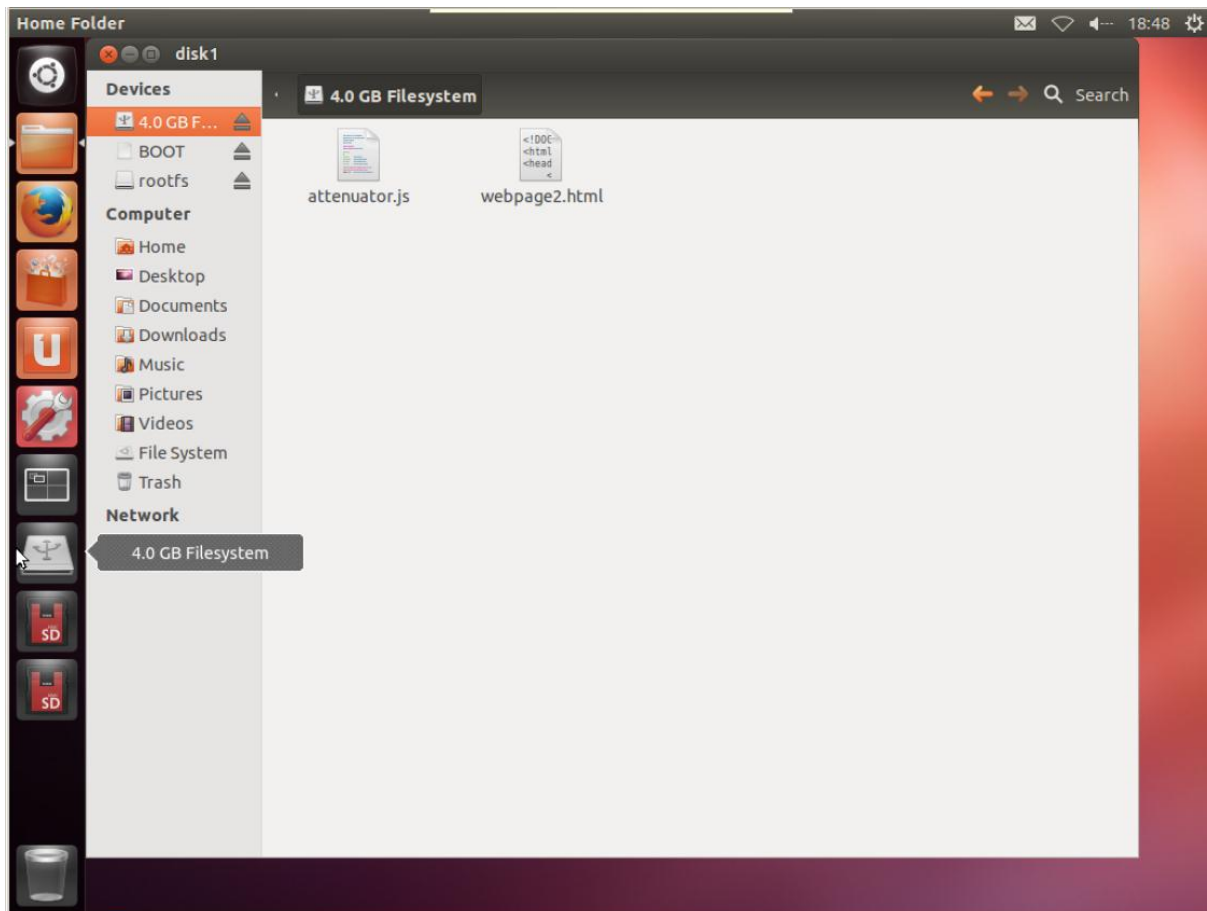
Chapter 7: RF Power Meter – Software



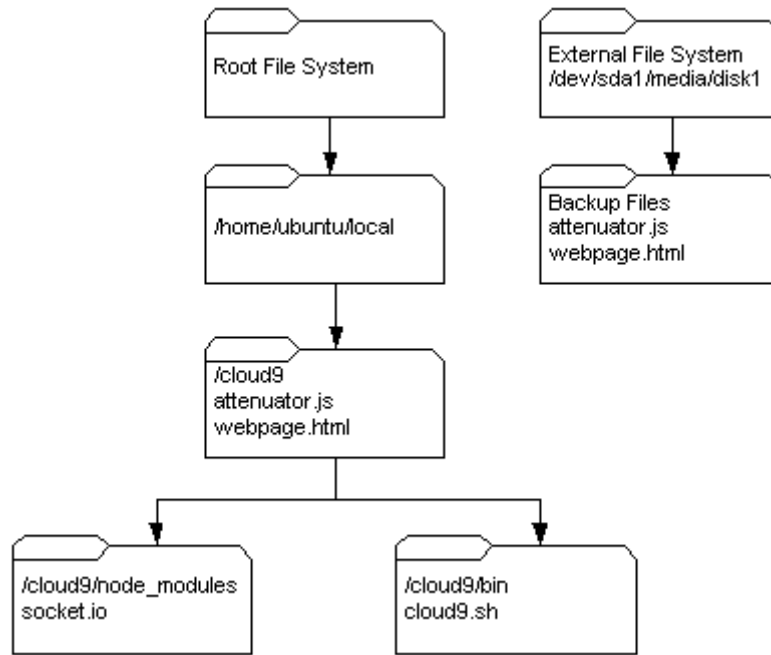
```
eth0      Link encap:Ethernet  HWaddr c8:a0:30:ac:bf:56
          inet addr:192.168.10.108  Bcast:192.168.10.255  Mask:255.255.255.0
          inet6 addr: fe80::caa0:30ff:feac:bf56/64  Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6918  errors:0  dropped:0  overruns:0  frame:0
          TX packets:1525  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0  txqueuelen:1000
          RX bytes:4104837 (4.1 MB)  TX bytes:142389 (142.3 KB)
          Interrupt:56

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128  Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0  errors:0  dropped:0  overruns:0  frame:0
          TX packets:0  errors:0  dropped:0  overruns:0  carrier:0
          collisions:0  txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```



```
192.168.10.108 - PuTTY
root@ubuntu-armhf:~# cloud9.sh -l 0.0.0.0
make: Nothing to be done for `worker`.
Linux ARM
connect plugin start
Connect server listening at http://0.0.0.0:3131
IDE SERVER PLUGIN:  auth
IDE SERVER PLUGIN:  git
IDE SERVER PLUGIN:  gittools
IDE SERVER PLUGIN:  hg
IDE SERVER PLUGIN:  npm
IDE SERVER PLUGIN:  filelist
IDE SERVER PLUGIN:  search
IDE SERVER PLUGIN:  revisions
IDE SERVER PLUGIN:  settings
IDE SERVER PLUGIN:  shell
IDE SERVER PLUGIN:  state
IDE SERVER PLUGIN:  watcher
IDE SERVER PLUGIN:  node-runtime
IDE SERVER PLUGIN:  npm-runtime
IDE SERVER PLUGIN:  python-runtime
IDE SERVER PLUGIN:  apache-runtime
IDE SERVER PLUGIN:  ruby-runtime
IDE SERVER PLUGIN:  php-runtime
Started '/home/ubuntu/local/cloud9/configs/default'!
IDE server initialized. Listening on 0.0.0.0:3131
```



```

root@ubuntu-armhf: ~
root@ubuntu-armhf:~# cat $SLOTS
0: 54:PF---
1: 55:PF---
2: 56:PF---
3: 57:PF---
4: ff:P-O-L Bone-LT-eMMC-2G,00A0,Texas Instrument,BB-BONE-EMMC-2G
5: ff:P-O-L Bone-Black-HDMI,00A0,Texas Instrument,BB-BONELT-HDMI
6: ff:P-O-L Override Board Name,00A0,Override Manuf,DM-GPIO-Test
root@ubuntu-armhf:~#

```

```

root@ubuntu-armhf:~# cat $SLOTS
0: 54:PF---
1: 55:PF---
2: 56:PF---
3: 57:PF---
4: ff:P-O-L Bone-LT-eMMC-2G,00A0,Texas Instrument,BB-BONE-EMMC-2G
5: ff:P-O-L Bone-Black-HDMI,00A0,Texas Instrument,BB-BONELT-HDMI
6: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_16_f
7: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_11_f
8: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_12_f
9: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_14_f
10: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_15_f
11: ff:P-O-L Override Board Name,00A0,Override Manuf,bspm_P8_17_f
12: ff:P-O-L Override Board Name,00A0,Override Manuf,cape-bone-iio
root@ubuntu-armhf:~# █

```

The screenshot shows a web browser window at <http://192.168.10.108:8080> displaying an "RF Power Meter" and an "Attenuator Controller". The RF Power Meter shows a reading of 47.49206349206349 dBm. The Attenuator Controller has five sliders for 0.5 dB, 1 dB, 2 dB, 4 dB, and 8 dB, all of which are currently set to "Off". A "Load Settings" button is visible at the bottom of the controller interface.

The IDE in the background shows the source code for `attenuator.js` and `webpage2.html`. The `attenuator.js` code includes logic for turning an LED off, logging status, and handling socket connections to send data to the client. It also includes a function to get the server IP address on LAN.

```
110 // Turn the LED off
111 b.digitalWrite(outputPin5,0);
112 console.log("8dB OFF");
113 }
114 }
115
116 socket.on('output', function () {
117   b.digitalWrite(outputPin5,1);
118   console.log("Latch Enable High");
119   b.digitalWrite(outputPin5,0);
120   console.log("Latch Enable Low");
121 });
122 });
123 // Send data to the client (webpage)
124
125 io.sockets.on('connection', function(socket){
126   // send data to client
127   setInterval(function(){
128     socket.emit('data',{'date': ((b.analogRead(inputPin7)-0.667)/0.007)- " dBm"});
129   }, 100);
130 });
131
132 // Get server IP address on LAN
133 function getIPAddress() {
134   var Interfaces = require('os').networkInterfaces();
135   for (var deName in Interfaces) {
136     var iface = Interfaces[deName];
137     for (var i = 0; i < iface.length; i++) {
138       var alias = iface[i];
139       if (alias.family === 'IPV4' && alias.address !== '127.0.0.1' && !alias.internal)
140         return alias.address;
141     }
142   }
143   return '0.0.0.0';
144 }
145
146
147
```

The screenshot shows the IDE's Console and Output tabs. The Console tab is active and displays the following message:

```
Server running on: http://192.168.10.108:8080
```

http://192.168.10.108:8080



RF Power Meter

RF Power

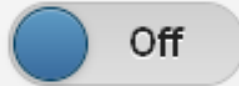
47.49206349206349 dBm

Attenuator Controler

0.5 dB



1 dB



2 dB



4 dB



8 dB



Load Settings

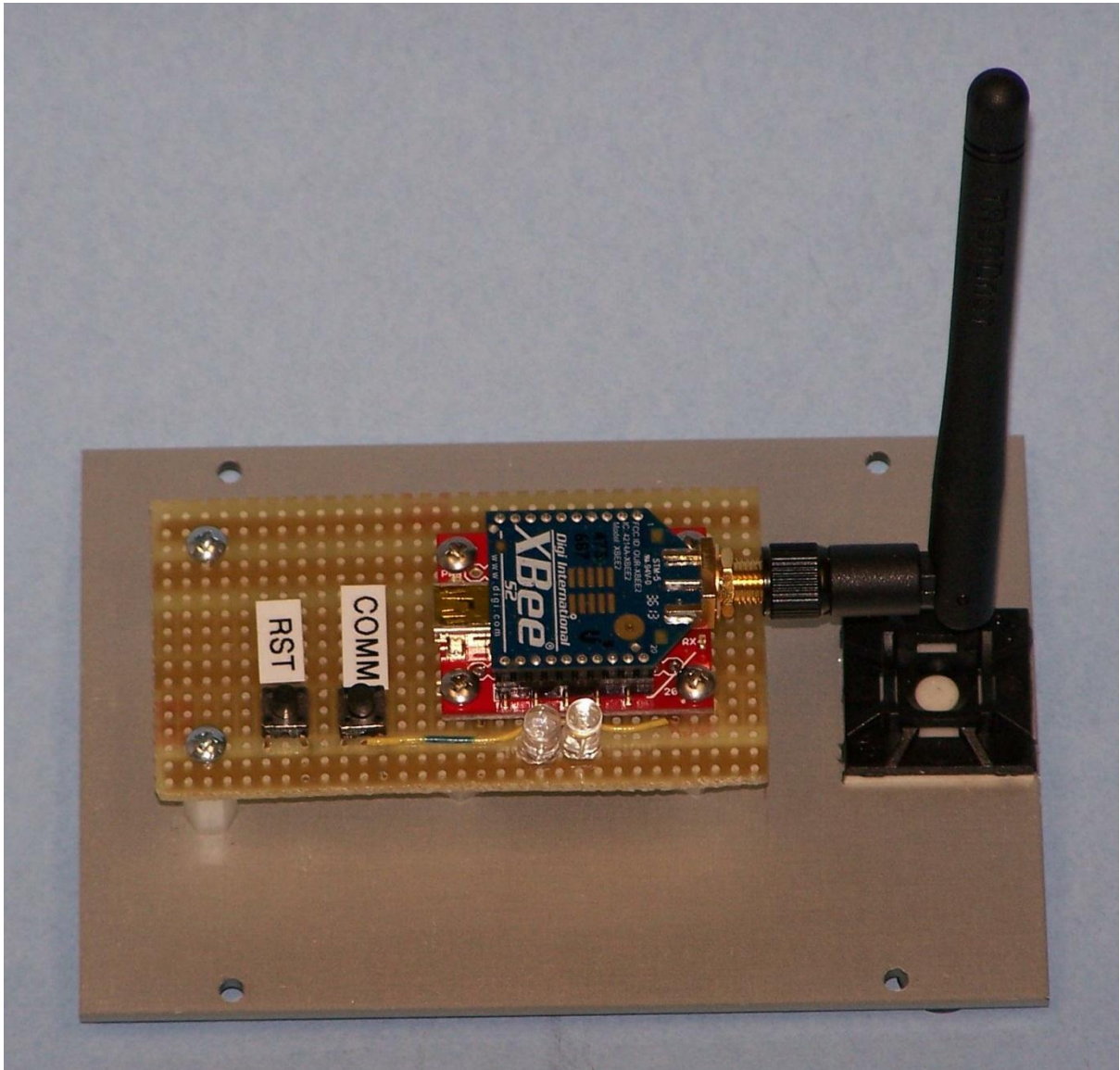
```
ubuntu@ubuntu-armhf: ~
login as: ubuntu
ubuntu@192.168.10.108's password:
Welcome to Ubuntu 12.04.2 LTS (GNU/Linux 3.8.13-bone20 armv7l)

 * Documentation:  https://help.ubuntu.com/

153 packages can be updated.
71 updates are security updates.

Last login: Mon Jun  2 16:35:02 2014 from 192.168.10.105
ubuntu@ubuntu-armhf:~$ █
```

Chapter 8: Creating a ZigBee Network of Sensors







Discover radio devices

Select the ports to scan

Select the USB/Serial ports of your PC to be scanned when discovering for radio modules.



Select the ports to be scanned:

- | | | | |
|-------------------------------------|---|-------|---|
| <input type="checkbox"/> |  | COM1 | Communications Port |
| <input type="checkbox"/> |  | COM3 | Intel(R) Active Management Technology - SOL |
| <input checked="" type="checkbox"/> |  | COM9 | USB Serial Port |
| <input type="checkbox"/> |  | COM10 | RIM Virtual Serial Port v2 |

Refresh ports

Select all

Deselect all

< Back

Next >


Finish

Cancel

Discover radio devices [min] [max] [close]

Set port parameters

Configure the Serial/USB port parameters to discover radio modules.



Baud Rate:

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600
- 115200
- 230400
- 460800

Data Bits:

- 7
- 8

Parity:

- None
- Even
- Mark
- Odd
- Space

Stop Bits:

- 1
- 2

Flow Control:

- None
- Hardware
- Xon/Xoff

Select all

Deselect all

Set defaults

< Back Next > Finish Cancel

Discovering radio modules...

Search finished. 1 device(s) found



1 device(s) found

⌵ Stop

Devices discovered:



Port: COM9 - 9600/8/N/1/N - AT

Name:

MAC Address: 0013A20040B14054

Select all

Deselect all

Your device was not found? [Click here](#)

Cancel

Add selected devices

The screenshot shows the XCTU software interface. The title bar reads 'XCTU'. The top toolbar contains icons for home, search, tools, help, settings, play, share, and cloud. The main area is divided into two panels:

- Radio Modules:** Displays a list of discovered modules. One module is selected, showing:
 - Name:** (empty)
 - Function:** ZigBee Router AT
 - Port:** COM9 - ...,/N - AT
 - MAC:** 0013A2...B14054Control icons for delete, refresh, and expand are visible to the right of the module card.
- Radio Configuration:** Contains a speech bubble with the text: "Select a radio module from the list to display its properties and configure it."

CE Coordinator Enable	Coordinator [1]
SC Scan Channels	1FFE Bitfield
SD Scan Duration	4 exponent
A1 End Device Association	0000b [0]
A2 Coordinator Association	000b [0]
AI Association Indication	0
EE AES Encryption Enable	Disable [0]
KY AES Encryption Key	0
NI Node Identifier	

I/O Settings


Modify DIO and ADC options

D8 DIO8 Configuration	Disabled [0]
D7 DIO7 Configuration	CTS flow control [1]
D6 DIO6 Configuration	Disabled [0]
D5 DIO5 Configuration	Associated indicator [1]
D4 DIO4 Configuration	Disabled [0]
D3 DIO3 Configuration	DO Low [4]
D2 DIO2 Configuration	DO High [5]
D1 DIO1 Configuration	DO High [5]

I/O Line Passing

IA I/O Input Address	FFFF
-----------------------------	------

Updating radio firmware



Updating radio firmware...

Programming module: 42%

[Show details](#)

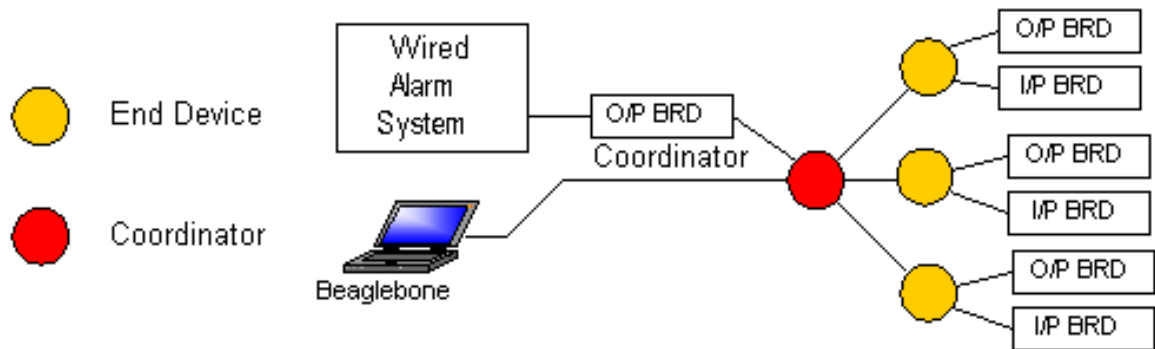
[Close](#)

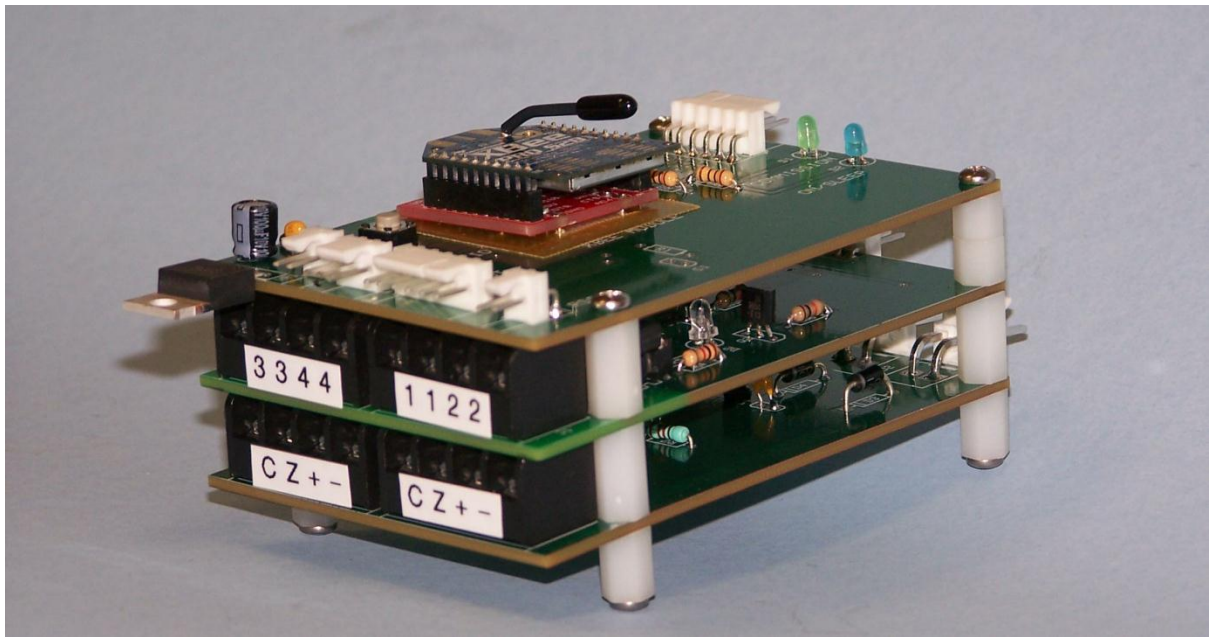
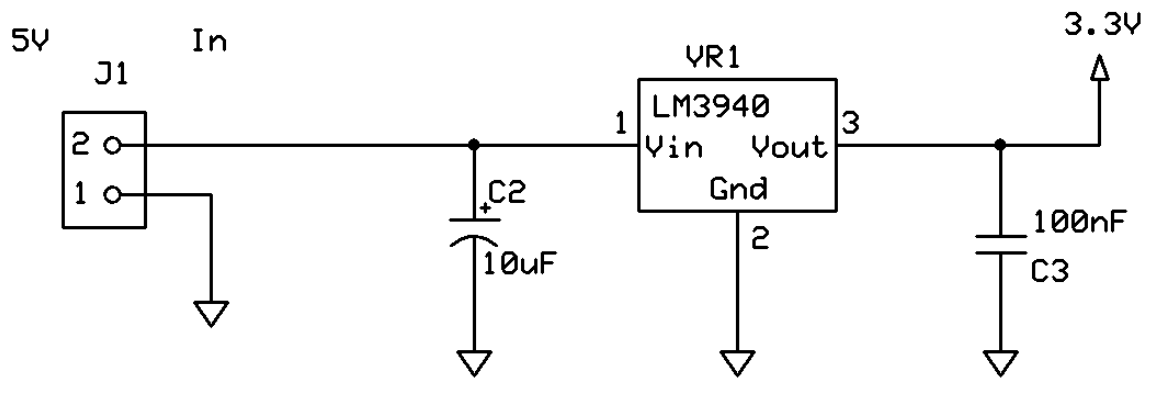
▼ **Networking & Security**

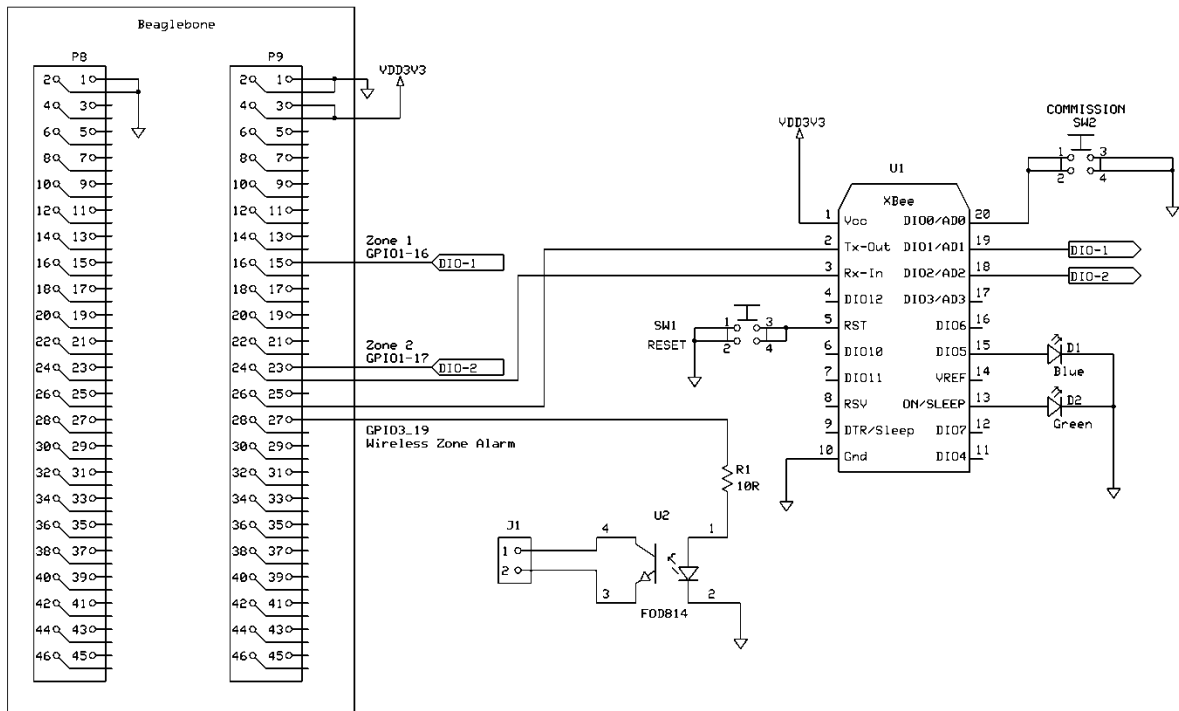
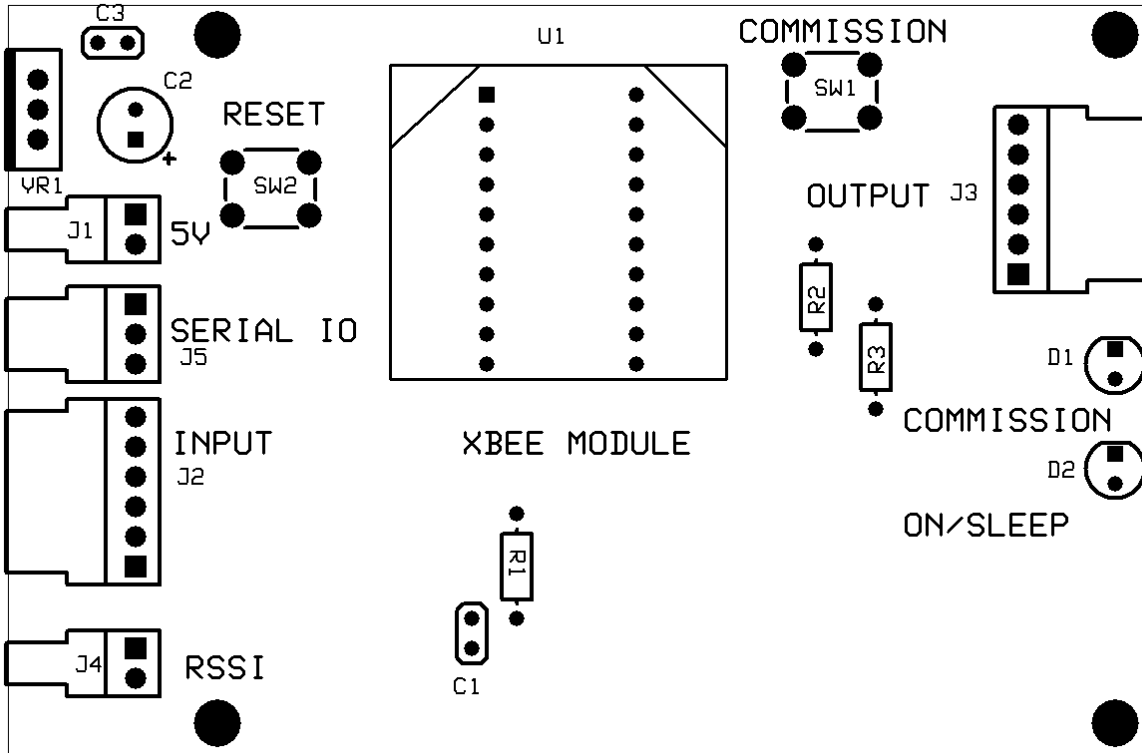
Modify networking settings

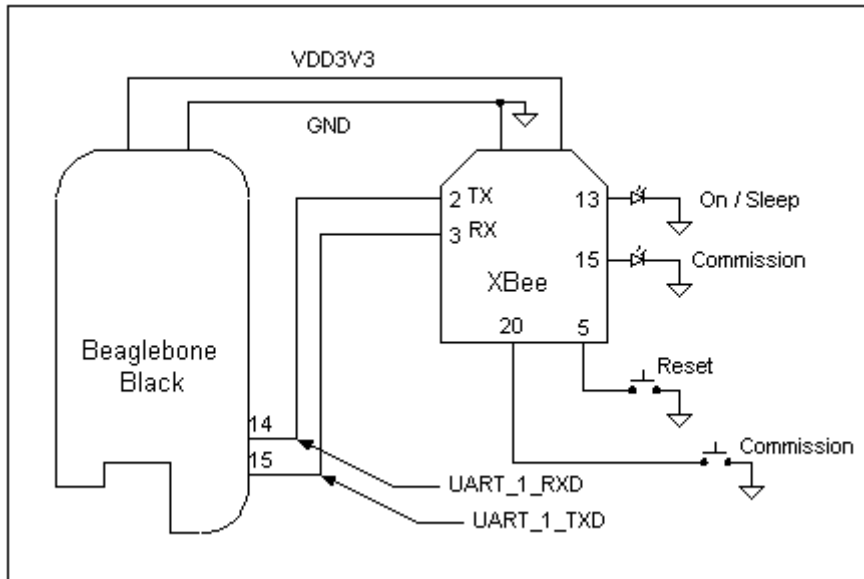
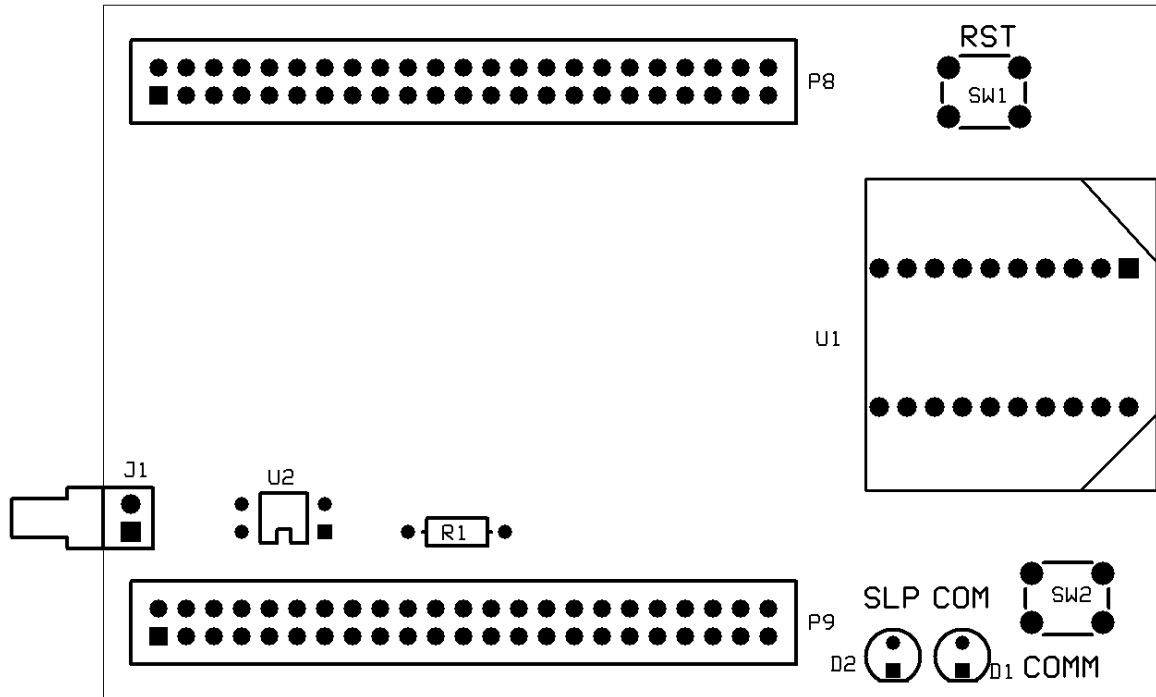
CH Channel	C
ID PAN ID	3332
DH Destination Address High	13A200
DL Destination Address Low	40C16125
MY 16-bit Source Address	0
SH Serial Number High	13A200
SL Serial Number Low	40BF1EF1

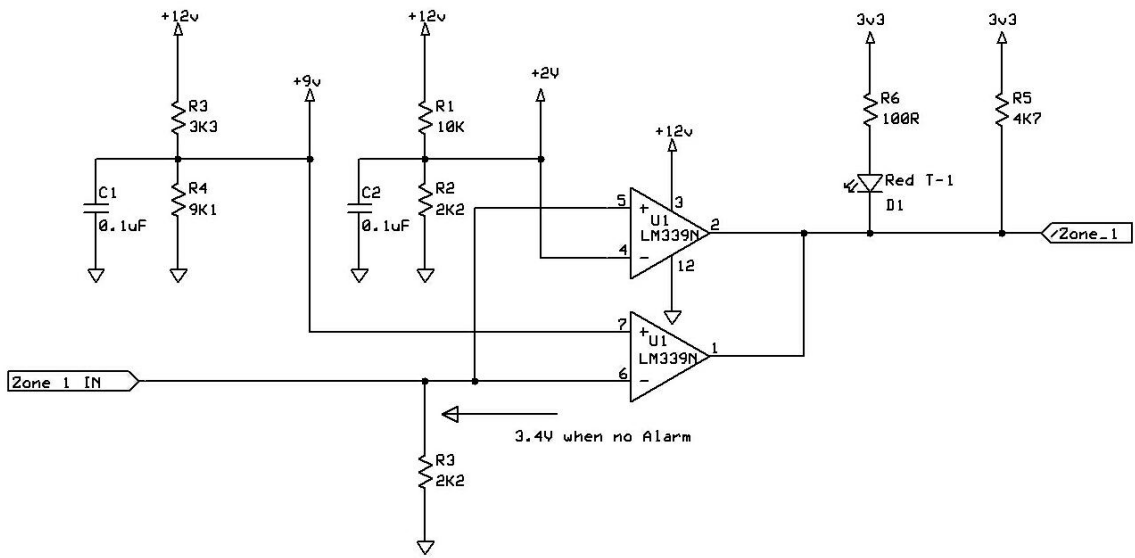
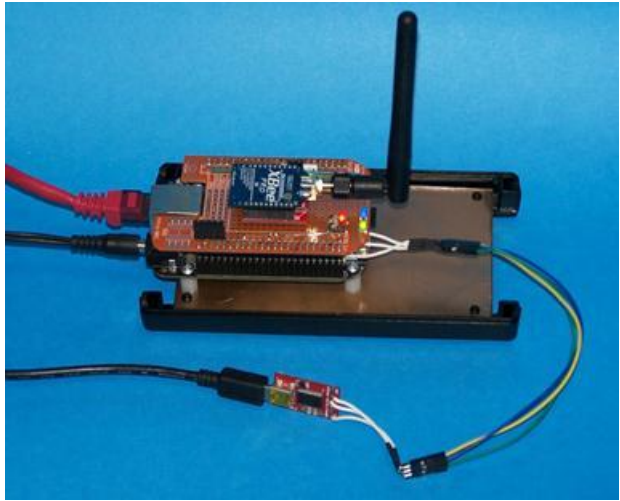
D2 DIO2 Configuration	DI [3]
D1 DIO1 Configuration	DI [3]
D0 DIO0 Configuration	Disabled [0]
PR Pull-up Resistor Enable	FF
IU I/O Output Enable	Enabled [1]
IT Samples before TX	1
IC DIO Change Detect	6

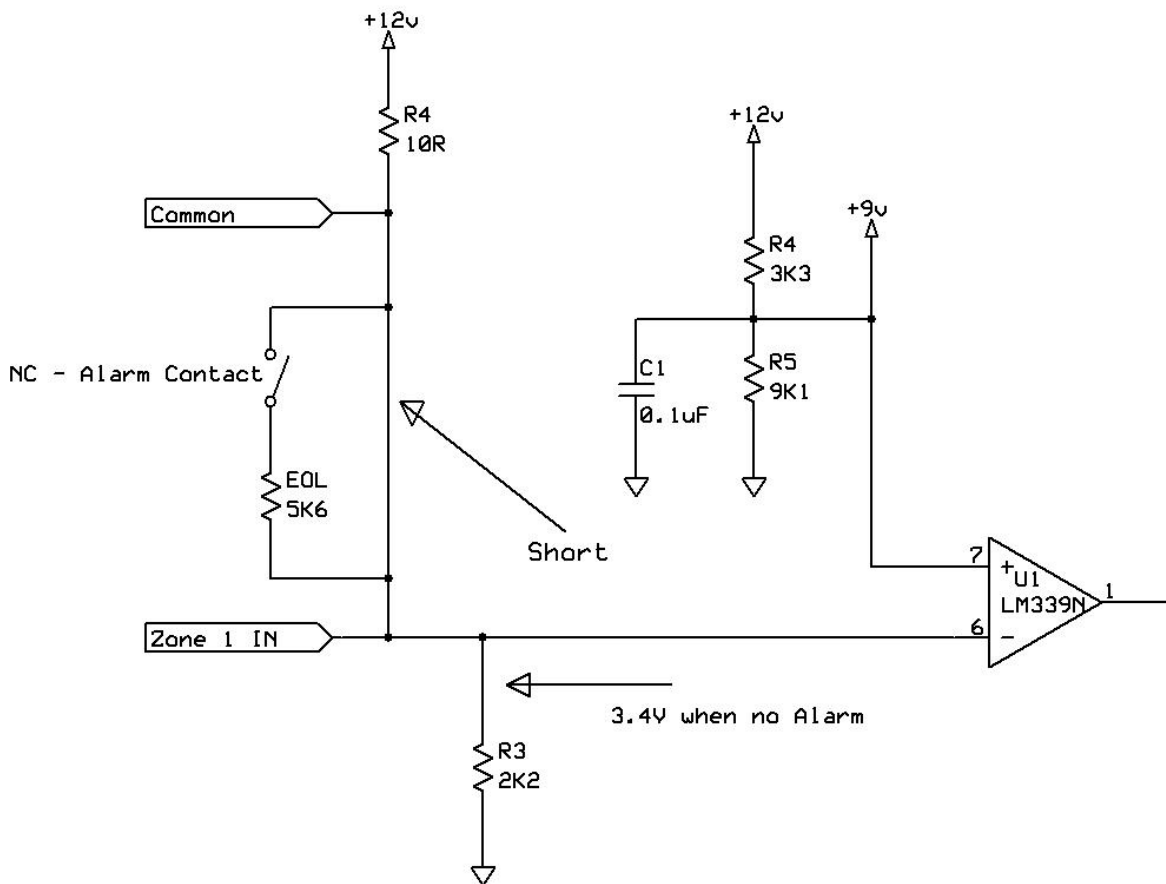
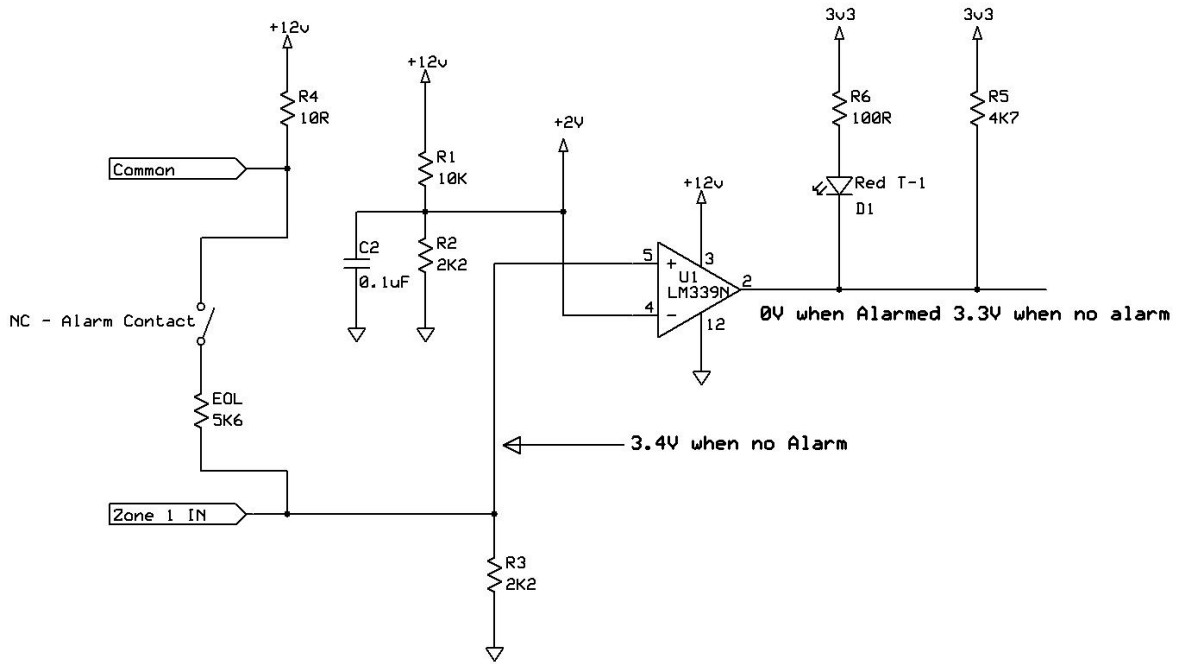


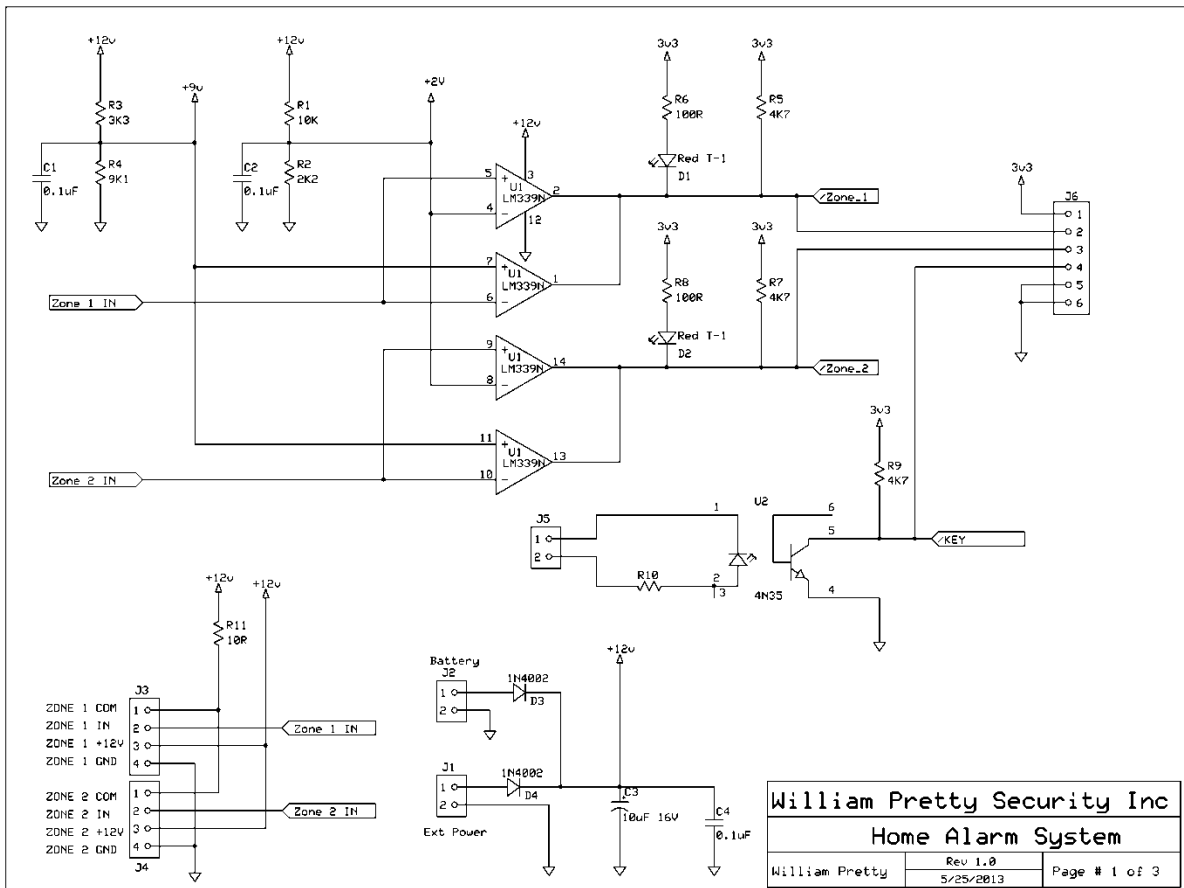
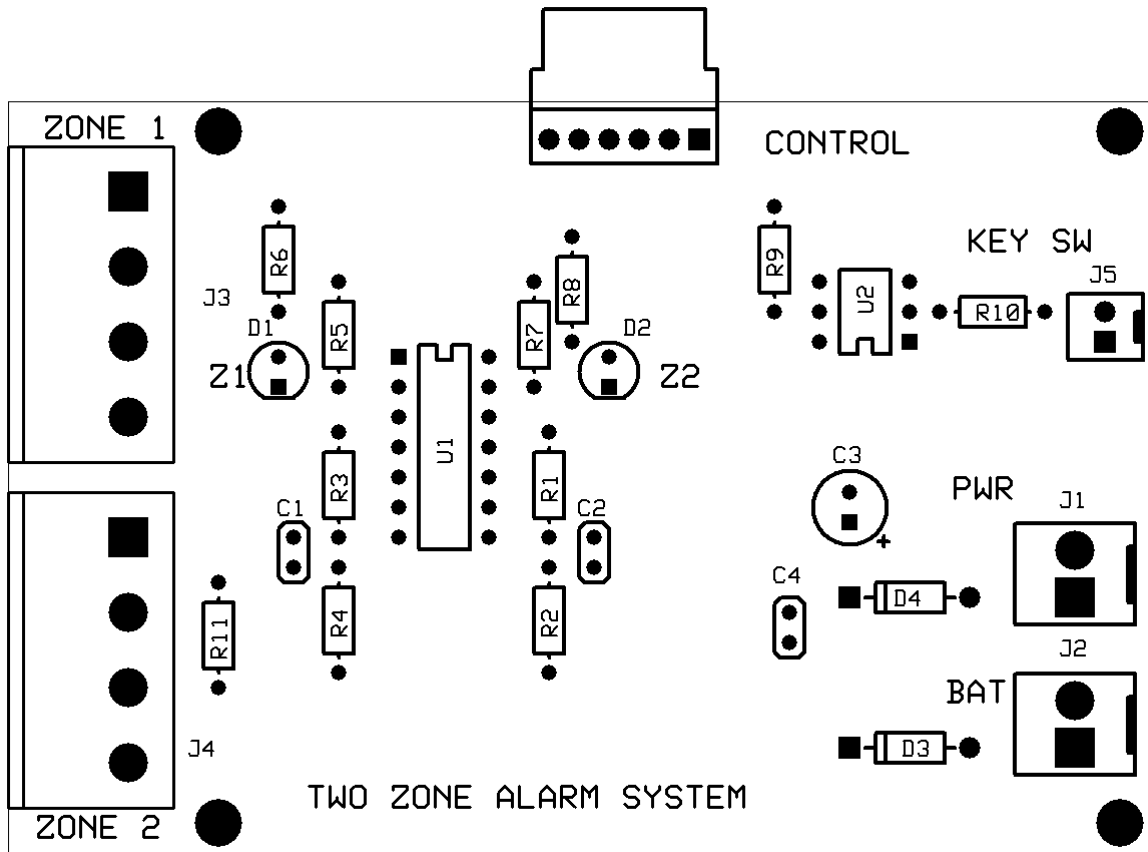


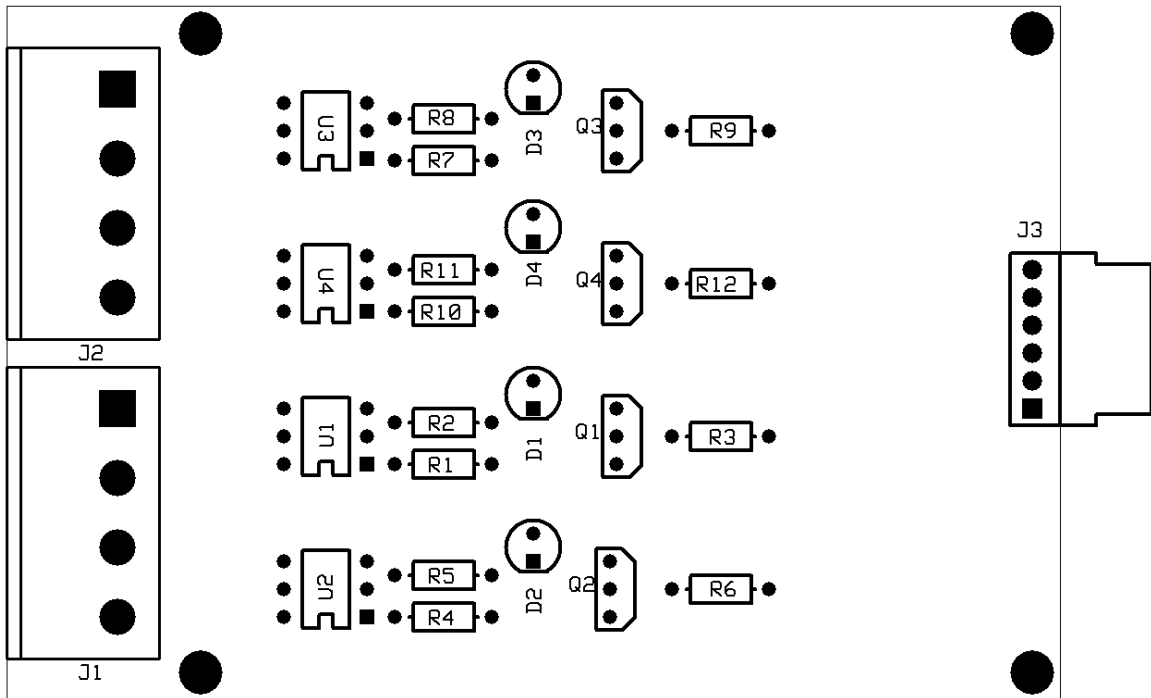
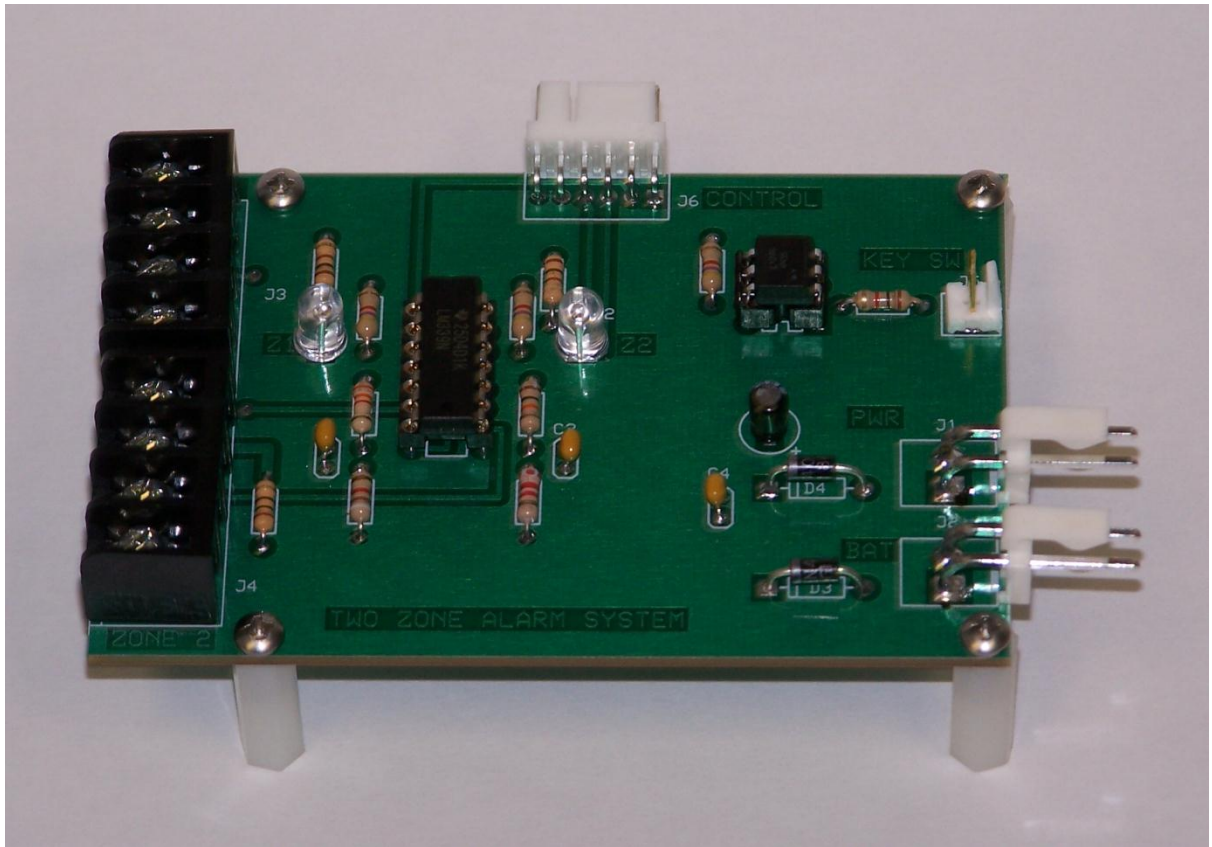


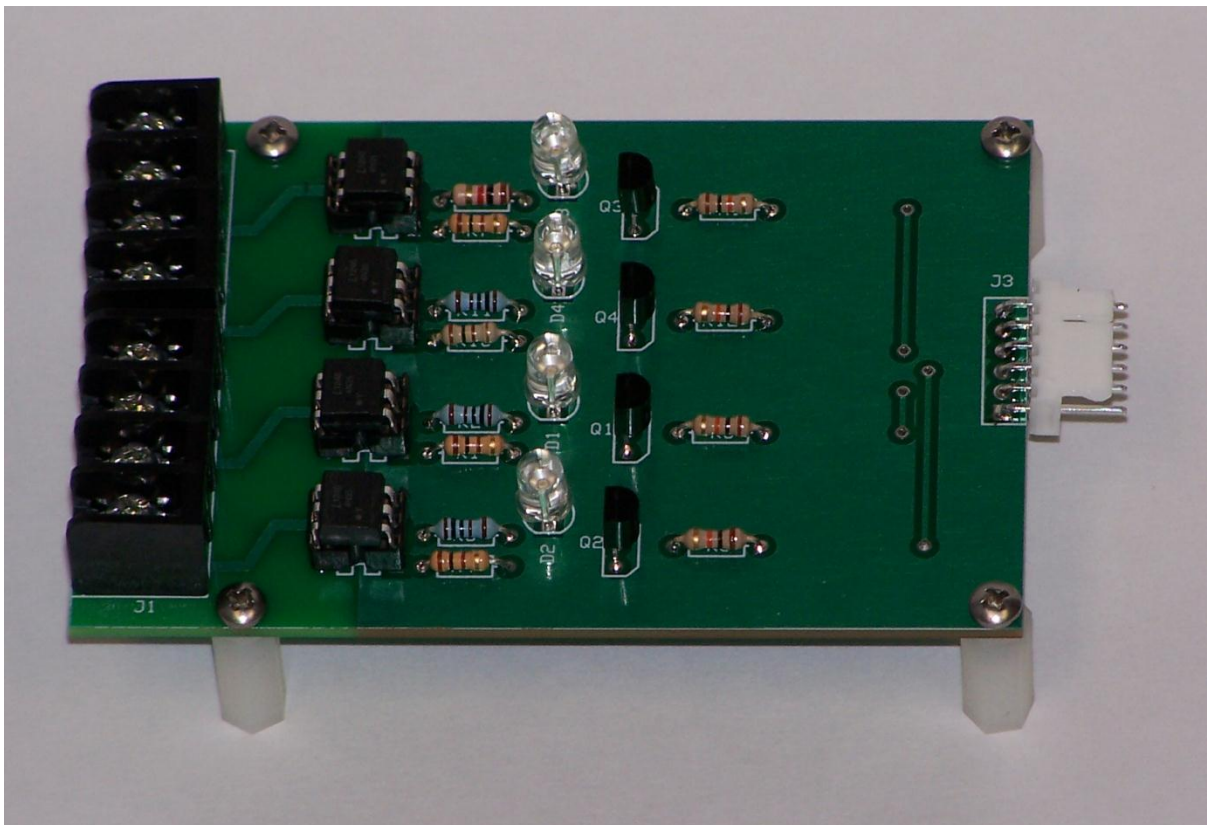
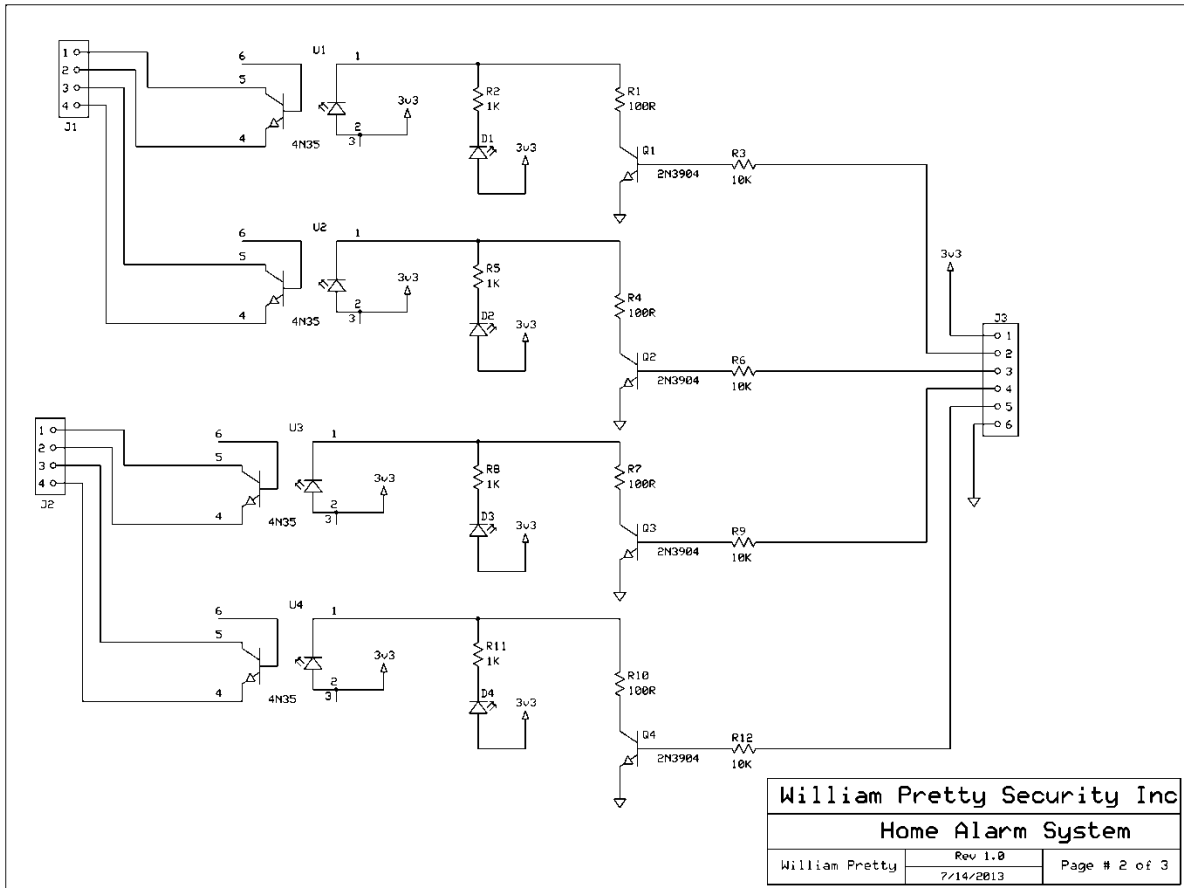


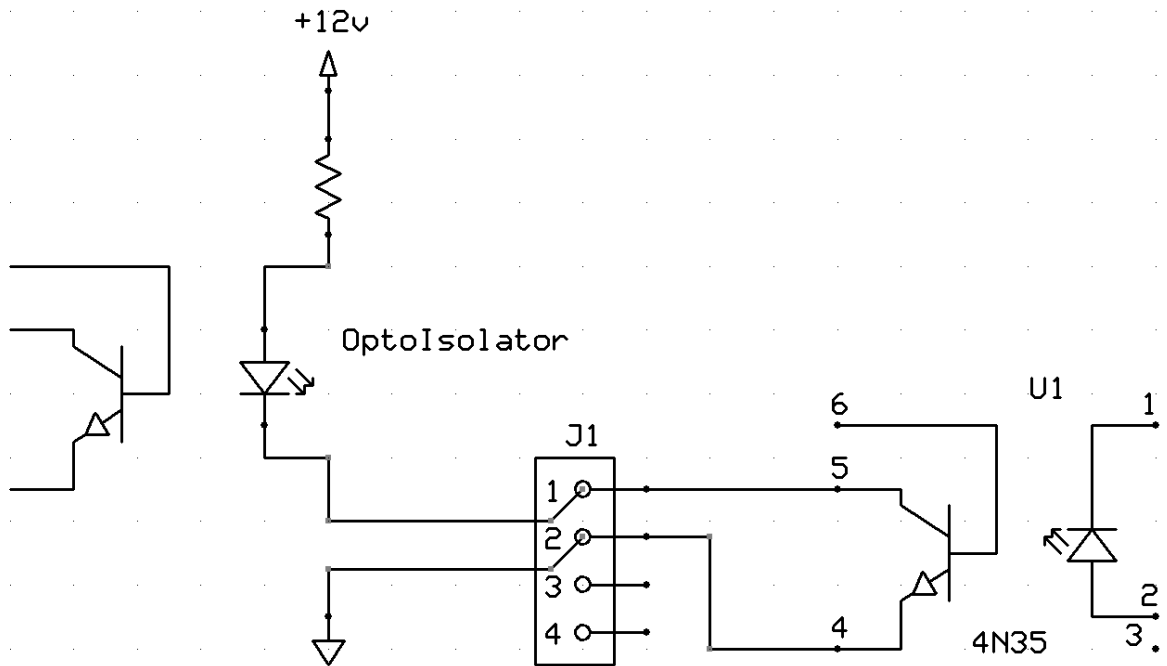
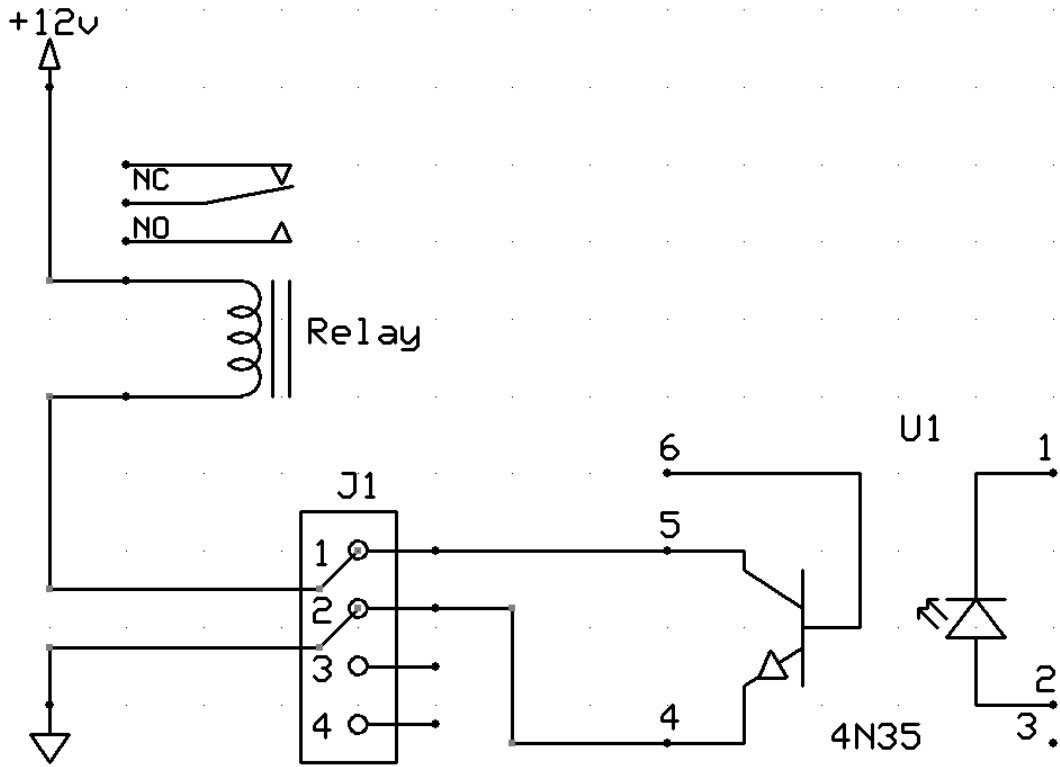












1 LINE LOAD 2
94371305
ECT-4089-2



AMF
POTTER & BRUMFIELD
ECT10872 5 V DC
MADE IN U.S.A.

