DNY40W

No.28

DIY Issue No. Twenty Eight

- experience the discrete transistorized era with the DNY40W power amplifier
- diy Learning, actual Assembly and testing
- pure analog processing
- a true diy learning for beginners in audio hobby yet with hi fidelity (hifi) sound

The Solid State Transistorized era was in the 1960's

a time that I can never go back to experienced what's on those years when it comes to music equipments and gadgets. My old uncle told me that those music gadgets are cool, it revealed the true color and signature of music, a pure and dynamic sound.

Flashback:
I remember in the mid 70's, we have a ponograph, it was called Transistor Phono, we have also an AM Radio - it was called Transistor Radio, we got that Black & White National Television with a clear emphasis onTransistorized TV. The Transistor is a brilliant invention which accelerated the development and advancement in electronics, thanks to those brilliant guys John B., William S. and Walter B. of Bell Labs (1948).

The present:
In this digital era, the discrete transistor design is fast being replaced by a compact semiconductor called - Integrated Circuit or populary known as **IC**. Most of the audio products you can find in the market is now design with IC hand in hand with digital processing and interface -- a scheme which is needed in the information age we are living now.

the experienced and Learning :
But as my uncle said, pure, non digital processing revealed the true color of music - he is referring to the pure analog processing music gadgets in his time. No wonder that many audiophile build their own power amplifier with pure analog processing with discrete Transistor design or even the primitive Vacuum Tube design.

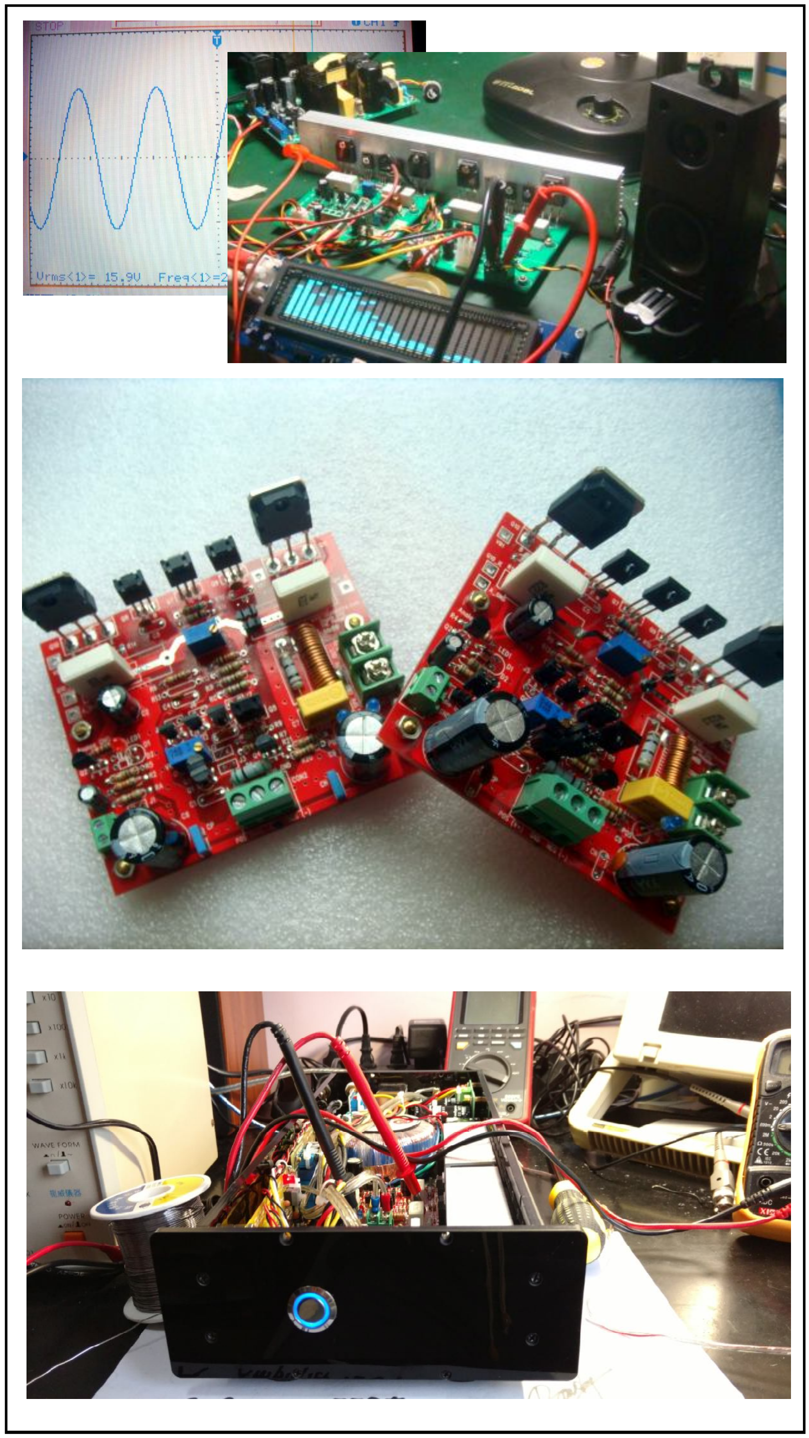


Figure 1 : The DNY40W

DNY40W

The DIY Learning and Improvement Issue No. 28 with the **DNY40W discrete power amplifier** project will take you back to the analog era and let you experience the adventure to build your own - personal pure analog process power amplifier in the power of your finger tips.

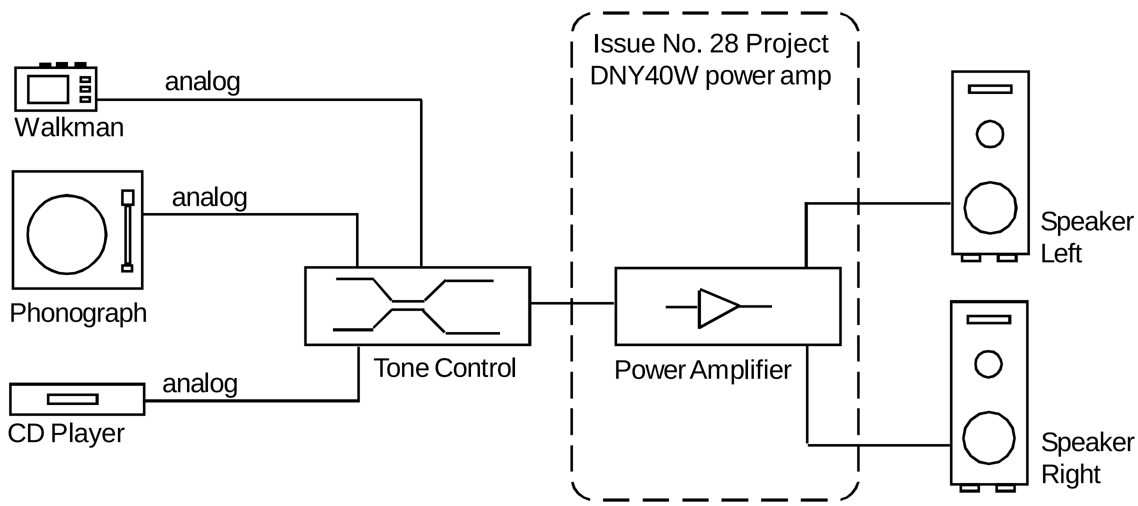
What's more? It's fun!! Because it provides you the knowledge, a self learning (diy learning) at the convenience of your free time, a diy experienced of knowing the circuit better - its function and operation, diy assembly and diy testing.

Thanks to the effort of the following guys who collaborated and rocks this Project (*Danny, Arnel, Dandy, Ariel and Michael Angelo* - The Philippines).

Back to Basic - *Understanding Audio Processing* : Let's start with the basic of the BASICs, Figure 2 is the block diagram of an analog processing in a home environment setup while Figure 3 shows the modern digital processing. Which one is better?

Our fellow audio hobbyist and audiophile would prefer to build their own power amplifier, a specially crafted and far superior than commercial amplifier -- to build transistor design in class A or class AB or even a more serious to use the vacuum tube for unparallel listening pleasure. On the other hand, commercial audio amplifier is now design digitally.

To answer the question correctly, "which one is better" you have the chance to build our diy DNY40W power amplifier and build another digital class D amplifier and let your sense experienced the answer - - - - if my old uncle is right or wrong.



Music Source

Recorded music on media like LP, cassette tape or CD player, it is played on the player with analog low level output, typical signal level is 0.7~2.0 Vrms.

Tonal Processing

Normally composed of a Bass and Treble control to Boost or Cut the low and high frequencies according to user preference

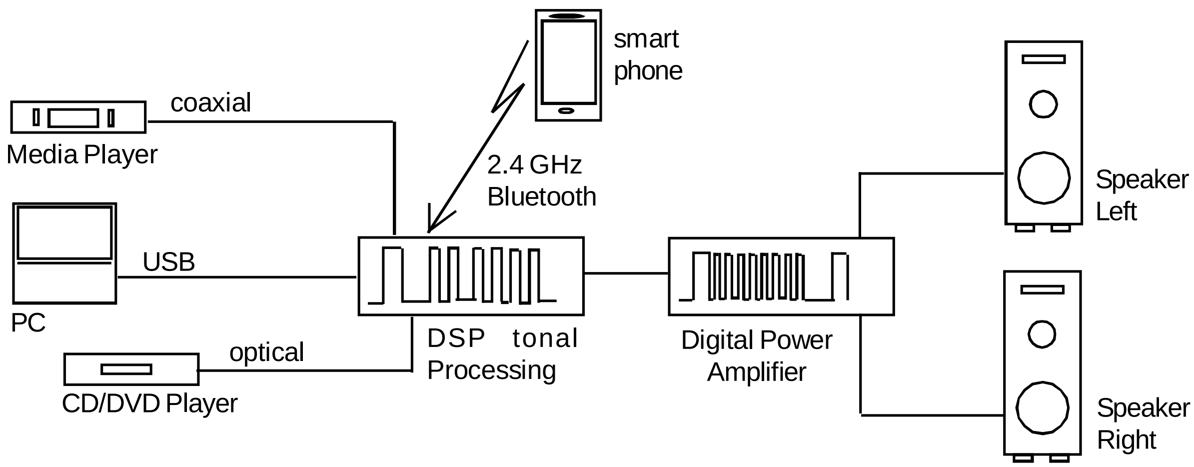
Amplification

Amplify the low level input signal (0.7 to 2 Vrms) from the tone control into much higher signal voltage swing at the speaker (ex. 18Vrms)

Sound Conversion

The speaker will convert the "sound electrical signal" into sound waves which our ears can understand.

Figure 2 : Basic Analog Processing Audio Setup in the Home environment



Music Source

Modern digital media with direct digital ouput as USB, Coax, optical and Bluetooth A2DP (Advance Aduio Distribution Profile)

Tonal Processing

It implement DSP processing runs by software, where it used several algorithm for different processing environments like Pop, Jazz, Wide, Tube, Heavy,etc.

Amplification

Amplify the low level signal from the DSP in digital PCM, it used appropriate technique such as DPP (digital power processing) technology.

Sound Conversion

The speaker will convert the “pseudo electrical signal” (converted digital signal into analog or D/A) into sound waves which our ears can understand.

Figure 3 : Basic Digital Processing Audio Setup

DNY40W Block and Schematic Diagram :
The DNY40W power amplifier block diagram is shown in Figure 4 and the Schematic diagram is shown in Figure 5. I took the liberty to expand the block as:

(1) Input Stage
(2) Differential / Constant Current Source 1
(3) Feedback Network
(4) Voltage Amplifier / Constant Current Source 2
(5) Output Transistor Bias Control
(6) Driver Transistor
(7) Output Transistor
(8) Zobel Network
(9) SWCK
(10) Load
(11) Power Supply / Grounding

Let’s see the function of each stage, refer to the block diagram in Figure 4 and then refer to the actual circuit diagram in Figure 5.

(1) Input Stage (R2)
The Input Stage abbreviated as “IS” in Figure 4 is the interface to the tone control or music player, it is called the “input” --- a low level electrical “audio signal” typically 700 mVrms (0.7Vrms) to about 1.4Vrms.

The input impedance (Zin) is effectively the resistance of R2. The R2 along with C2 form the high frequency low pass filters to reject high frequency (RF), a frequencies above the audio spectrum of 20Hz to 20 KHz.

The R2-C2 filter prevent this high frequencies from entering the Differential Amplifier stage so that the effective signal to be process is only the audio frequencies.

The capacitor CA is a coupling capacitor which prevent dc voltage (block) to be transferred into the music source, or the music source transfer dc voltage into the differential amplifier stage. Its use is important to make it sure that, the dc bias of the differential amplifier will not be disturb.

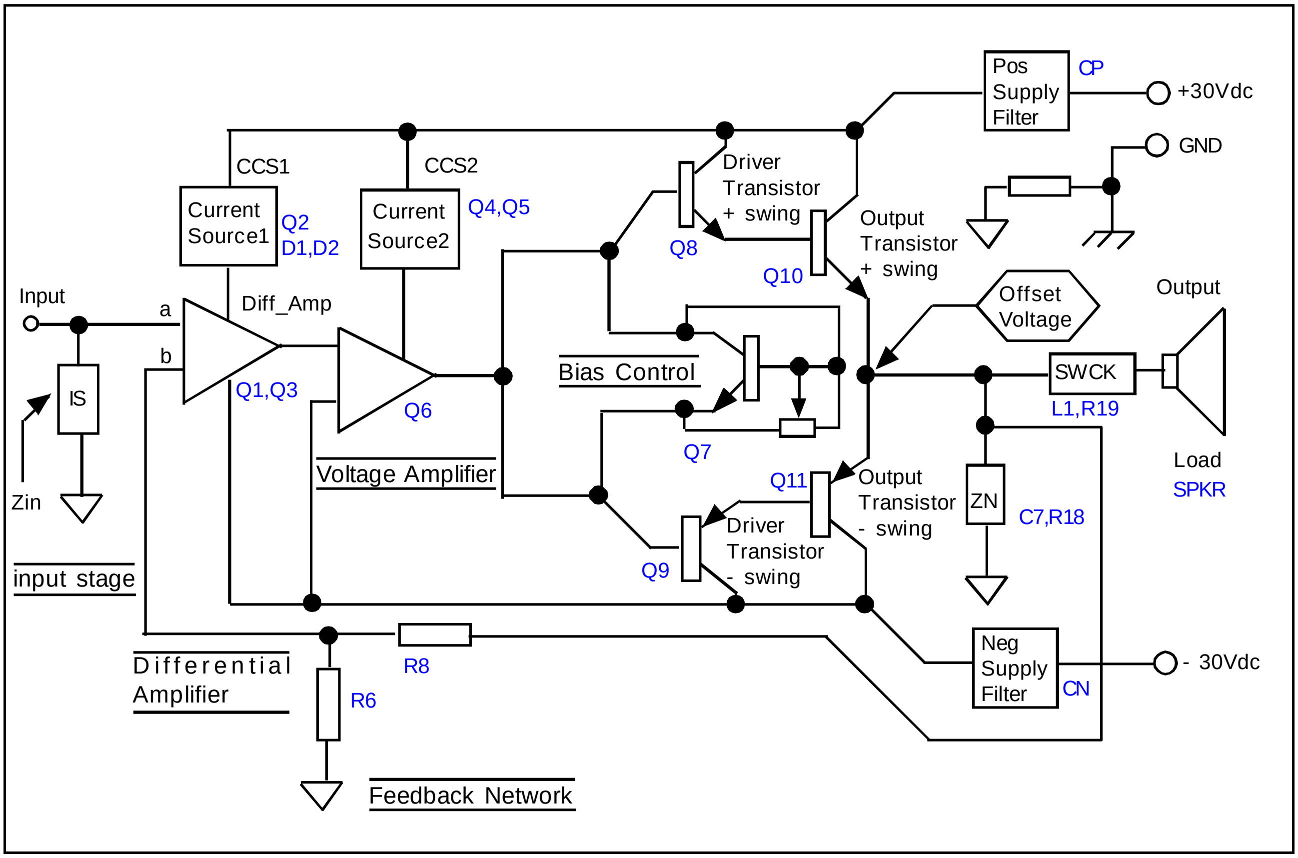


Figure 4 : DNY40W Power Amplifier Exploded Block Diagram

(2) Differential Amplifier (Q1, Q3)
Constant Current Source1 (Q2, D1.D2)

The differential amplifier (Q1 and Q3) accept input voltage signal and output a current signal, it provide the initial amplification of the input signal (0.7Vrms to 1.4Vrms), it control the offset voltage, distortion and making the stability of the amplifier in conjunction with the negative feedback network.

The requirement of the differential amplifier (Q1 and Q3) for a good Offset Voltage is a good pair (equal performance) of PNP transistor. The offset voltage is the voltage appears at the speaker output, theoretically it is zero volt dc (0 Vdc) but in the real world it is not, it plays as high is +/- 200mVdc, which means this level of dc voltage of 0.2Vdc is positively “offset” from zero - it is not acceptable. For the sake of engineering quality, our team set the offset voltage to maximum +/-50 mVdc (+/- 0.05Vdc).

The dc voltage at the speaker should be minimum, a high dc voltage at the speaker may tend to damage the speaker in prolong use, that is why it is very important to test and meet this specification, it must be observed religiously. It is the first test to do - - - to know the dc voltage appearing at the speaker before putting the Power Transistor Q10 and Q11 and adjusting its bias voltage (Q7 via VR1).

The use of Constant Current Source (CCS), *I called it here as CCS number 1 or CCS1 specific for the constant current for the differential amplifier stage*, theoretically the CCS1 will introduce an infinite source impedance ...... please note, that, in the real world, it only approaches ideal - - - - thus, our CCS1 will only achieve a very high impedance seen by the emitter of the differential amplifier which will make it to have a high CMRR (Common Mode Rejection Ratio). Having a high CMRR means - - a better performance which has the ability to “reject” a “common” signal or any noise at the differential inputs “a” and “b”.

The CCS1 mechanism is to have a constant voltage across R4 (in Figure 4), this can be achieve with the diode D1 and D2. This will provide a theoretical voltage across D1-D2 of 1.4Vdc (*perhaps it is 1.238Vdc in the real world as measured by your digital voltmeter*), which in effect will provide 0.632Vdc across R4 (instead of 0.7Vdc theoretically).

The CCS1 is "source" the current to the emitter of the differential amplifier, which simply means, the current is "going into" the emitter of the differential amplifier Q1 & Q3, an important to differentiate when you may see a CCS using a NPN transistor which will be "sinking current" instead of "sourcing".

(3) Negative Feedback Network (R8. R6)
In conjunction with the differential amplifier is the Feedback Network, which is composed of R8 and R6 - - - a path of the output signal is being fed back into the input "b" of the differential amplifier. Basically these resistors will determine the "close loop gain".

(4) Voltage Amplifier (Q6)
It is also commonly called VAS (Voltage Amplifier Stage). It accept current as the input from the differential amplifier output and it will output a high voltage swing at its collector which will drive the Driver Transistors Q8 and Q9.

Obviously, the gain of the differential amplifier Q1 and Q3 is not enough to drive the driver transistor that is why a high gain voltage amplifier is used (Q6). In the circuit in Figure 5, the VAS is composed of a Common Emitter, this configuration provides the greatest voltage gain (*as compared to Common Base or Common Collector*) with high input impedance. The requirement of high input impedance is required not to load the previous stage - - the differential amplifier output of Q1.

The use of Constant Current Source 2 (CCS 2) will improved the gain of the voltage amplifier seen as a load -- the impedance of the Constant Current Source (CCS) is very high, ideally it is infinite, in our real world that is only approaching to the ideal.

In Figure 5, you will see C3 connected between the base and collector of Q6, basic textbook shows that this is called Miller Capacitance (Miller's effect) named after John Milton Miller. This component is important for an amplifier (I*nverting amplifer as in Q6 - Common Emiter*) which will limit the gain of the amplifier, which mean, as you increase the input the output become distorted, this is so because of the effect of the parasitic capacitance between the input and the output, specially at high frequencies. The value of C3 may vary between electronic design and PCB design - the transistor used in Q6 and the effect of PCB trace on Q6, which means, it is dependent on the "total effect of capacitance". In this design, a 10pF capacitor is used.

If you changed the electronic design or pcb design, the C3 capacitance "maybe" changed as well and thus the 10pF may no longer applied, maybe a different value is required.

You may see also in Figure 5 of the capacitor C4 at the output of the VAS, the function of this capacitor is to stabilized and kill the high frequency oscillation when all the power transistor is connected. Without it, the power transistors will gets hot easily and may burn it (damage it). It is placed at the VAS stage as this stage is processing the highest gain of amplification.

(5) Driver Transistor (Q8, Q9)
The Driver Transistors will "drive and provide enough current" into the Output Transistor (Q10 and Q11) so it can effectively provide the needed current to have a maximum voltage swing into the Speaker (Load).

Obviously, the VAS output current is not enough to drive the Power Transistors. . . . . I would rather say, the current output required by the VAS to drive the Output Transistors would be large, and that makes the VAS very hot and requires higher power handling capability transistor - - knowing it is already operating in Class A, that makes Q6 continuous conduction *(well.... with the excemption if you will use a real world darlington Power Output Transistors - as you may know darlington comes in package with each driver transistor)*.

With the rule of thumb on reliability, the driver transistor Q8 and Q9 were used and makes the VAS ouput current lesser (*means, less hot generation at Q6 and use of lower power transistor*) making the design a reliable circuit and better performance.

You may see again the Miller Capacitance at the B-C junctions of the driver transistors, which is the same used as explained earlier.

(6) Output Transistor (Q10, Q11)
In conjunction with the Driver Transistor (Q8 and Q9), the Output Transistor (Q10 and Q11) provides the current demand into the speaker (load).

You may noticed that it looks like a tag-team of transistors populary called "darlington", most engineers called this configuration as Emiter Follower, as they are not real darlington Transistors, as opposed to the "real darlington transistors" which packed in one package.

The use of Emiter Follower configuration was voted for the sake of cost, as real darlington transistor are relatively expensive compared to the configuration of Emiter follower.

The Output Transistors must be place into a suitable heatsink to effectively dissipate the heat generated during the amplification. It is expected that, 25% to 30% of power were converted into heat during the amplification process at the Power Transistors.

If you do not put the power transistors into a suitable heatsink, it will get hot, and very hot and may end up in what is called thermal run-away that damage the output transistors and will burn your speaker - a dangerous scenatio that you may not like it.

(7) Bias Control for the Output Transistor (Q7)
The use of this transistor is to set the output current of the Power Tansistors Q10 and Q11 by controlling the input current into the driver transistors (Q8 and Q9). The Q7 is called Vbe multiplier - we loved to called it Bias Control.

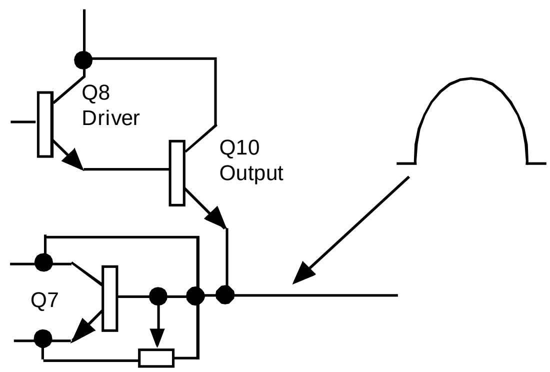
By setting the input current to the driver transistors, you can make the Output Transistors to operate in class A , class B or in between class A and class B, *known as class AB operation*.

In class A, the output transistor keeps on conducting (always have current at the collector like 70mAmp to 100mAmp) with or without input signal at the differential amplifier at point "a".

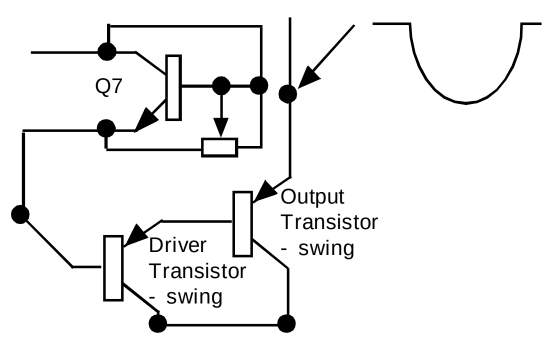
In class B, the output transistor will not always conducting or not always have collector current. If there is no input signal at point "a" at the differential amplifier stage, the collector current is practically zero, but the collector current is maximum when a maximum input signal at the differential amplifier point "a".

In the class AB operation, the output transistor have an idle Collector Current, like 10mAmp or 25mAmp or even higher - just remember that the higher the idle current - the more hot the output transistors and requires bigger heatsink. Let's understand it.

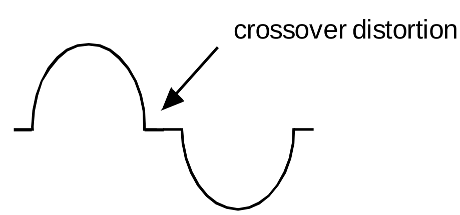
Setting an idle current is desirable in order to avoid the crossover distortion (class AB). This is a distortion or "dead signal" when the audio electrical signal - - positive signal and negative changes polarity. Consider a pure sinewave of 1KHz frequency as shown below, during the positive cycle, the Transistor Q8 and Q10 conducts,



During the negative cycle, the Transistor Q9 and Q11 conducts,

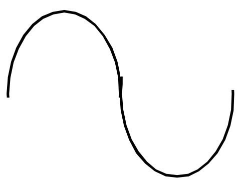


Combining the 2 signals, you may see a dead signal while changes polarity from positive to negative.



(exaggerated representation of crossover distortion)

By adjusting the Bias Control (Q7) thru VR1, the input current to the output transistors varies and the dead signal will be eliminated (*making the cross over distortion minimized or completely eliminated*).



The effect will be a cleaner music as heard on the speakers specially for the high frequencies in the range of 4KHz to 16 KHz (20 KHz if ever you can hear it), specially at low volume (low input signal at the differential amplifier point “a”).

As a real bias “Bias Control” in any situation, (a) at normal temperature of Q10 and Q11 or (b) at hot temperature of Q10 and Q11, the Q7 will act as servo mechanism to countermeasures the temperature changes of the output transistor, Q10 and Q11, as :

(1) Power Transistor Hot - decrease the Bias
(2) Power Transistor Warm - increase the Bias

in this way, a thermal run-away can be avoided by decreasing the bias when the transistor gets hot. Without a servo mechanism, when the output transistors get hot, the bias keep the same level then the output transistors keeps on getting hot and becoming hotter which leads to thermal run away.

To effectively let Q7 do its job and perform real action, it must be installed into the heatsink where the output transistors are installed.

In most design, the driver transistors (Q8 and Q9), the output transistors (Q10 and Q11) and the bias control transistor (Q7) are placed in one heatsink.

Although, Q7 do not process the audio electrical signal as the differential and VAS stage, it is there to activate (set proper bias) the driver and output transistors into conduction to deliver the “power” needed at the load. Similarly, the CCS 1 and 2 do not also process the audio electrical signal, they are there for the proper operation of the circuit which process the audio electrical signal.

(8) Zobel Network (R18, C7)
This RC network R18 and C7 will make the system stable with the speaker or when the speaker is removed.

The speaker (or speaker system) is composed of an inductor, its impedance become higher when the frequencies goes higher, this is also the same when you remove the speaker, the speaker (load) is now a very high impedance which tend to destabilized the amplifier -- it “might oscillate”.

To prevent this from happening, the Zobel Network is in place to countermeasures the scenario by introducing low reactance of the capacitor C7 which in effect shunt the Resistor R18 there by lowering the total load impedance. With this effect, the whole system is much stable in any case.

(9) Speaker Wire Capacitance Killer (SWCK) (L1, R19)
The SWCK (I love to call it this way--”swack”) is the “capacitance killer” to stabilized your power amplifier when you use long speaker wire (maybe 10 meters or more) that it creates capacitance due to the proximity of the wires in pair.

The capacitance is then a part of the speaker (load) which is worst at high and low frequencies. To kill the capacitance caused by long wires, the inductor L1 is introduced, as *you may know, the inductor is the opposite of capacitor*. But there is problem with an inductor - the Q, it tends to be a series L-C which when tuned become an oscillator and worst is the impedance is approaches zero.

To make it operational without issue, the R19 is introduce to kill the high Q, when it is shunt into the inductor.

(10) Speaker (Load)
We know already from Figure 2 that the speaker will convert the electrical audio signal into sound waves which our ear can understand. The speaker is the sum total of all the characteristics of the amplified audio signal, it is where we listen to the fidelity of the amplified music.

The speaker should be observed in terms of “proper loading”, our amplifier was design with 8 ohms impedance so the speaker to be used must be 8 Ohms.

(11) Power Supply and Grounding Systems

The power Supply is one of the main important ingredients of any power amplifier which is the “source of power”.

If the power supply is not well designed - not well filtered, have rippled / noise, the power amplifier sound quality will severely affected specially the bass (low frequencies below 200 Hz). If there is no enough high frequency filter it may result to several issues like damp oscillation or even amplifying RF.

Along with proper grounding system, it makes the power amplifier stable, humless, noiseless and motorboatingless amplifier. A wrong implementation of grounding can heard its affect on the speaker.

To improved the noise, the power supply ground (PSU_GND) and the analog ground (A_GND) were separated and meets at one point by R1. This technique is pretty important specially when integrating the power amplifier into different boards/module like tone control, mp3 player, bluetooth module, etc.

Hardware Revision :

The DNY40W amplifier comes with several revisions by other guys interested with the design, what we have at issue #28 are the version :

Hardware	:	version 2.1
PCB	:	version 4.0

For those interested with revisions, and how the DNY40W evolved with time, you may visit the official forum at www.elab.ph (electronic forum in the Philippines)

http://www.elab.ph/forum/index.php?topic=42590.200

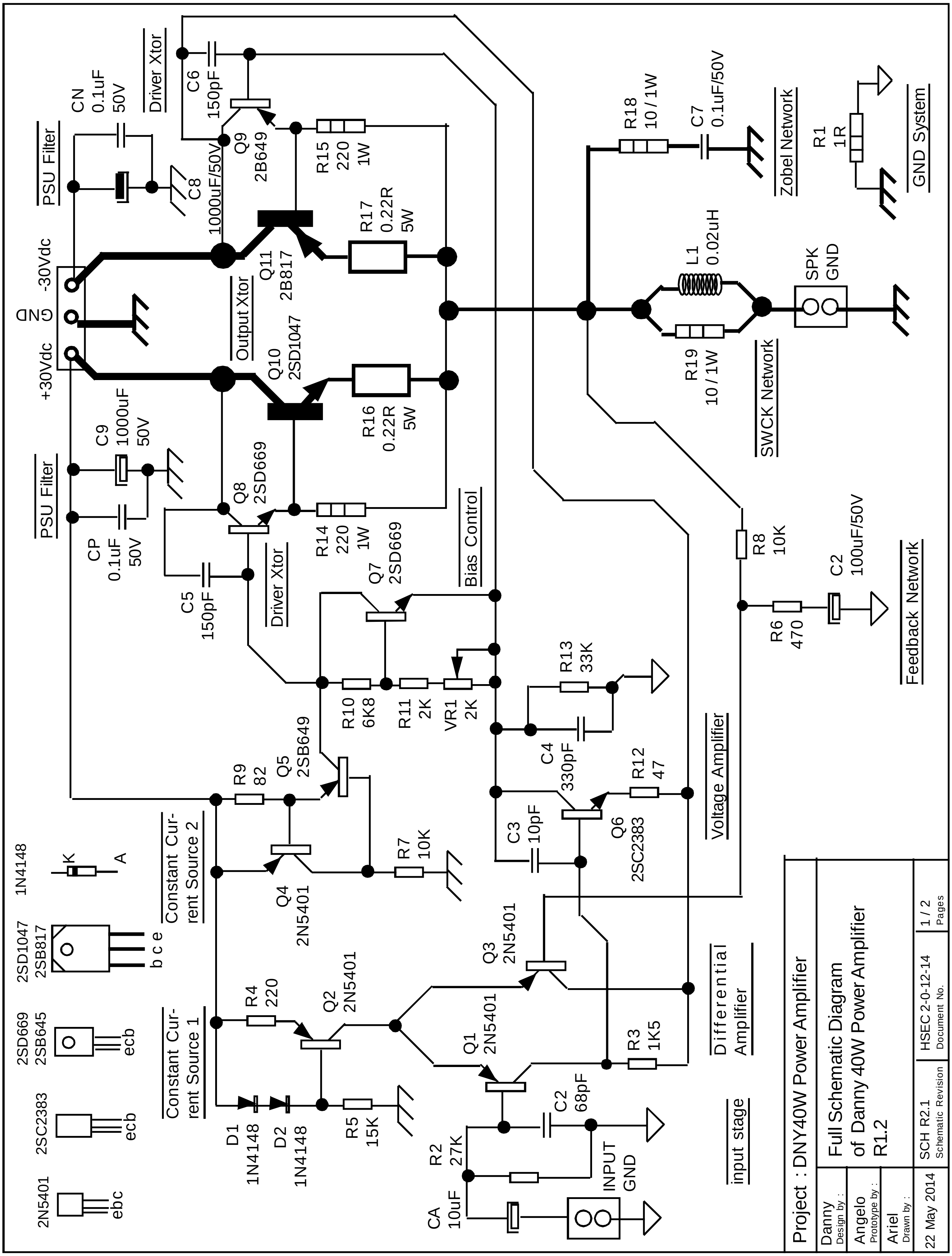
Table 1 shows the recorded revision.

In DIY Learning and Improvement issue #30, the hardware and PCB are version 4.0, **with the addition of current mirror at the differential amplifier** which is said to be the true requirement of a differential amplifier which forces Q1 and Q3 to have equal collector current.

You may check out issue #30 for diy learning and experimenting with the improved version of DNY40W power amplifier - I called it **P3A2,** find it out why.

Table 1 : Hardware Revision History

Rev	Date	Items	Action	Remarks
1.1	-	Bias control improved using Vbe Multiplier, replaced the diode	Changed	
2.0	-	Released version in Forum	-	Unable to record all changes
2.1	22-5-2014	Added : - 0.1uF /50V filter on the Power Supply - Added input coupling capacitor, 10uF / 50V - 200 ohm trimmer resistor on the differential amplifier - Jumper to bypass the 200 ohm trimmer resistor	Add	This is the schematic diagram shown on the next page Figure 5
3.0	28-5-2014	Changed : - Re-compute and re-desing the biasing based on output power of 100 Watt Add : - Current Mirror on the differential amplifier	Changed	*reserved the right to keep in our project management under development. This design do not yet pass circuit design reliability review.*
4.0	2-6-2014	Maintained values as in version 2.1 but added : - Current Mirror on the differential amplifier, as option - jumper setting to bypass the current mirror transistors - RA and its jumper, as option - LED1, as option - LED2 and LED3, as option	Add	Team Revision for diy Learning and Improvement published in issue diy learning and improvement 30 (under construction).


PSU Filter
CN
0.1uF
50V
C8
1000uF/50V
Driver Xtor
C6
150pF
Q9
2B649
R15
220
1W
R17
0.22R
5W
Q11
2B817
Output Xtor
Q10
2SD1047
R16
0.22R
5W
-30Vdc
GND
+30Vdc
C9
1000uF
50V
PSU Filter
CP
0.1uF
50V
C5
150pF
Q8
2SD669
Driver Xtor
R14
220
1W
Q7
2SD669
Bias Control
R18
10 / 1W
C7
0.1uF/50V
Zobel Network
R1
1R
GND System
L1
0.02uH
SPK
GND
R19
10 / 1W
SWCK Network
R8
10K
C2
100uF/50V
R6
470
Feedback Network
R13
33K
R10
6K8
R11
2K
VR1
2K
C4
330pF
R12
47
Voltage Amplifier
R9
82
Q5
2SB649
C3
10pF
Q6
2SC2383
R7
10K
Q4
2N5401
Constant Current Source 2
1N4148
K
A
2SD1047
2SB817
b c e
2SD669
2SB645
ecb
2SC2383
ecb
2N5401
ebc
Constant Current Source 1
R4
220
Q2
2N5401
Q3
2N5401
Q1
2N5401
R3
1K5
Differential Amplifier
D1
1N4148
D2
1N4148
R5
15K
C2
68pF
R2
27K
CA
10uF
INPUT
GND
input stage
Project : DNY40W Power Amplifier
Full Schematic Diagram
of Danny 40W Power Amplifier
R1.2
Danny
Design by :
Angelo
Prototype by :
Ariel
Drawn by :
22 May 2014
SCH R2.1
Schematic Revision
HSEC 2-0-12-14
Document No.
1 / 2
Pages

Interested to build this Project?

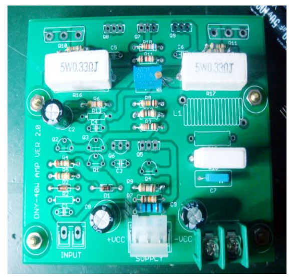
If you are interested to build this project, you might like to avail our diy assembly procedure as well as our Testing Procedure which we specially prepared for absolutely beginner's and intermidiate amplifier builder specific to DNY40W. Drop an email to me at:

danztherock@hotmail.com
dandymenor@hotmail.com
dandy@gadgetslabph.com

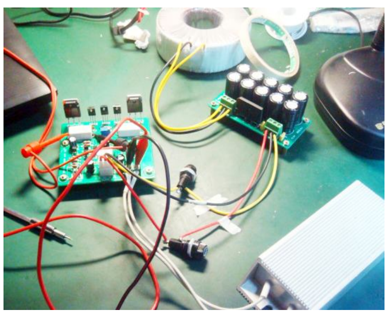
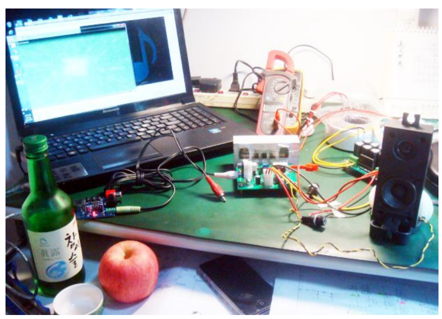
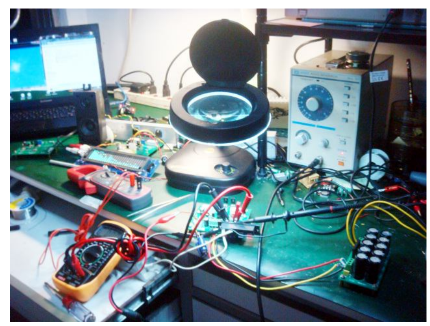
I will respond or my friends will respond as soon as I (we) got your email. Visit www.1diyshare.com and www.gadgetslabph.com. Thank you for dropping by.

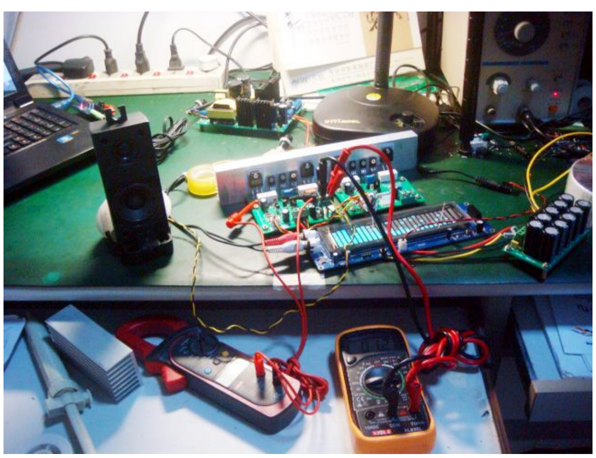
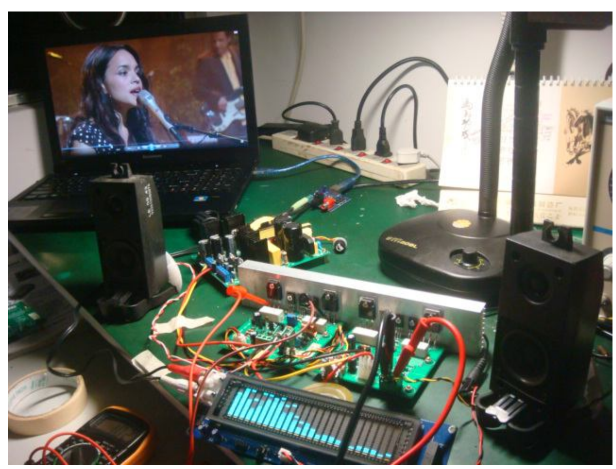
DNY40W Gallery:

Welcome to the Gallery, it shows how the Project evolved toward success.

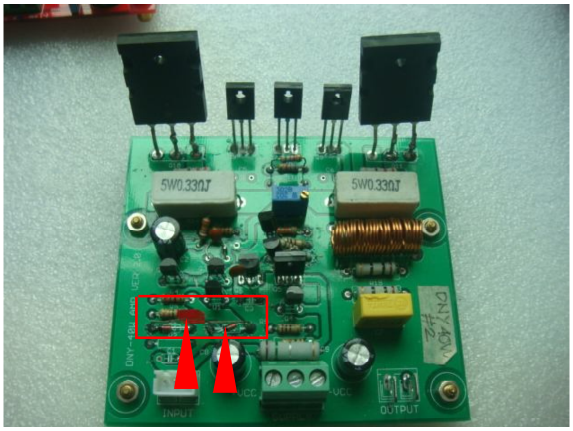


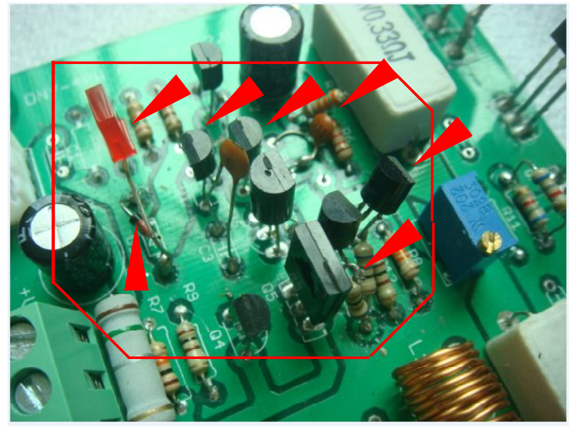

May 2014 - PCB R2.0 with HW R2.1

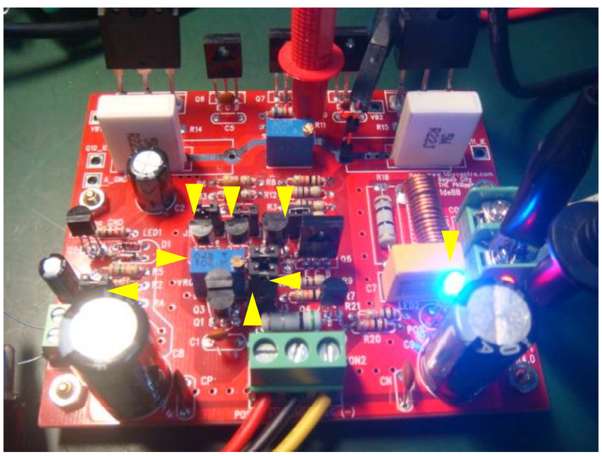



Prototyping Stage - LSPD2 (May 2014) :
Assemby - Bring Up Test - Parametric Testing - Functional Testing at 1diyTeam workbench (Tianjin China)

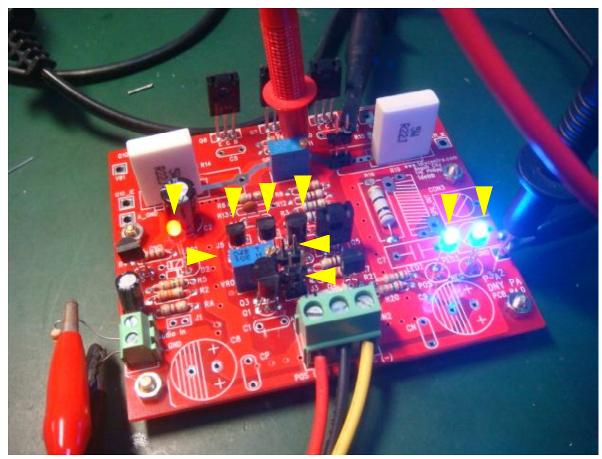




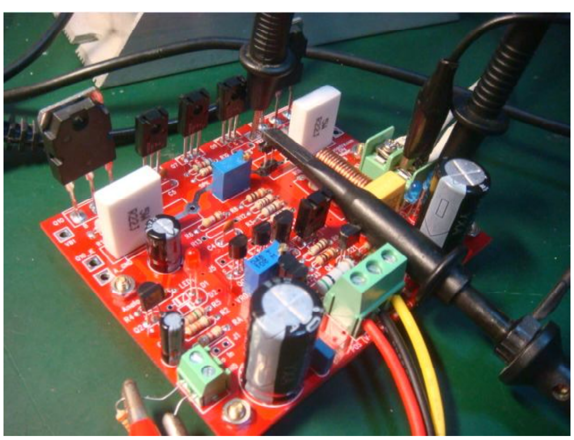
Prototyping Stage - LSPD2 (June 2014) :
Modifying the PCB Revision 2.0 to include the educational revision to add current mirror on the differential amplifier as well as to add some stuff on the constant current source for the differential amplifier



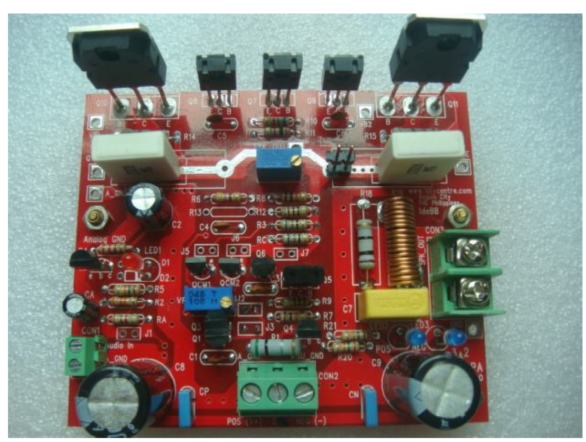
(June 2014) :
Newly designed PCB 4.0 that is backward compatible with the HW version 2.1 by adding jumper setting.



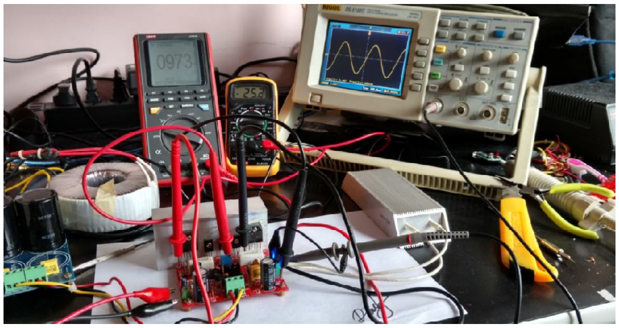
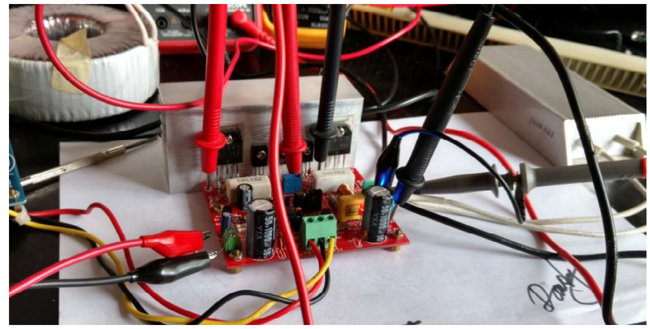
(June 2014) :
The Educational version circuit (R4.0) populated into the new PCB R4.0, adding current mirror, Power LEDs and used LED in the constant currect source for the differential amplifier.



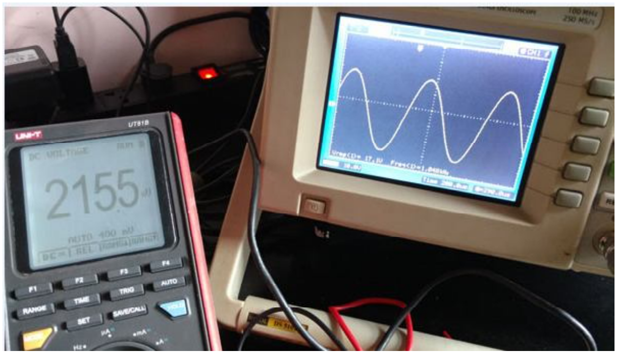
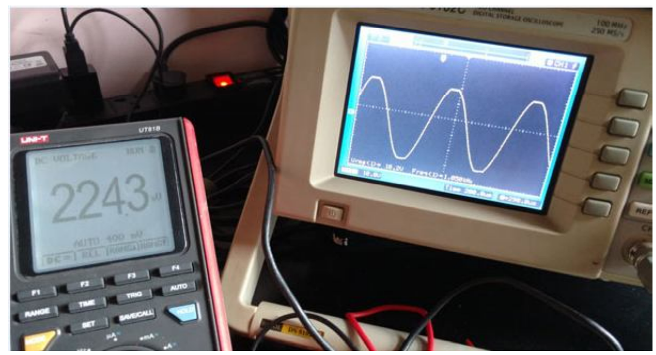
(June 2014) - Testing



(June 2014) - The final & completed board

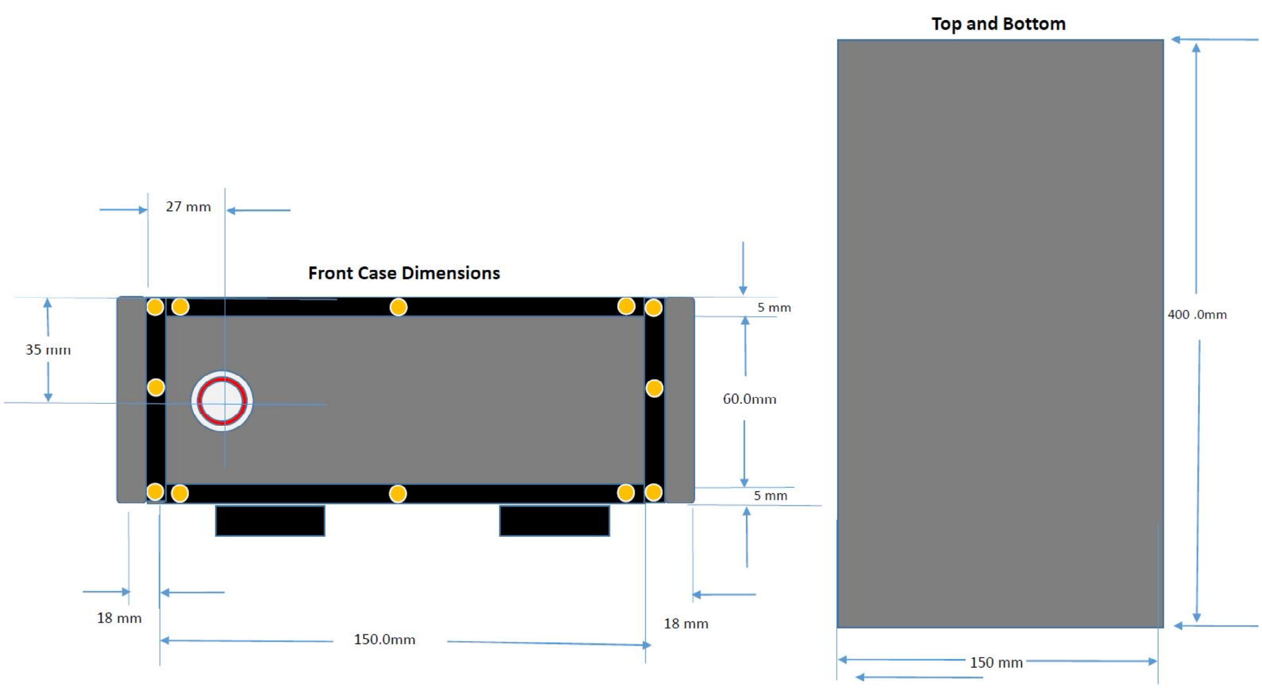



checking the parameters electrically, monitoring the Offset Voltage, the Output Transistor Current and the signal output voltage.

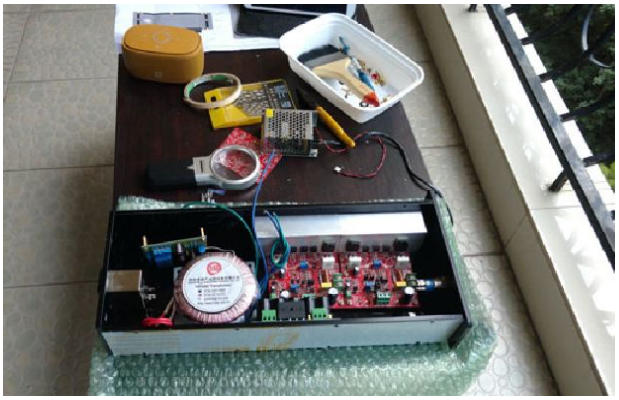



maximum voltage swing at the 8 ohms resistive load when the supply voltage is +/-28Vdc

Prototyping Stage - LSPD2 (June 2014) :
Electrical Performance Test

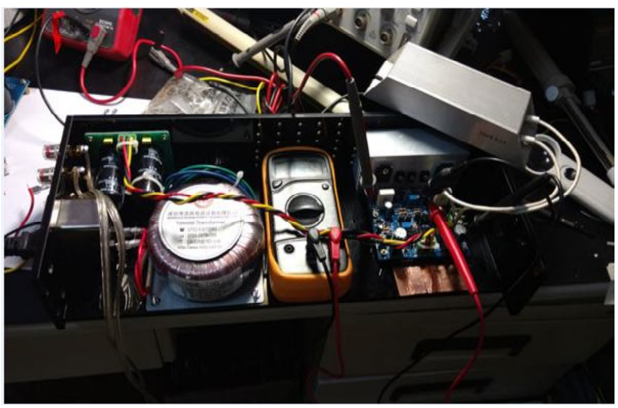


Casing Design (July 2014) - a fiber Glass Casing
A fiber glass casing design, the dimension are made smaller that the normal size of the 1diyTeam DR series class D amplifier casing

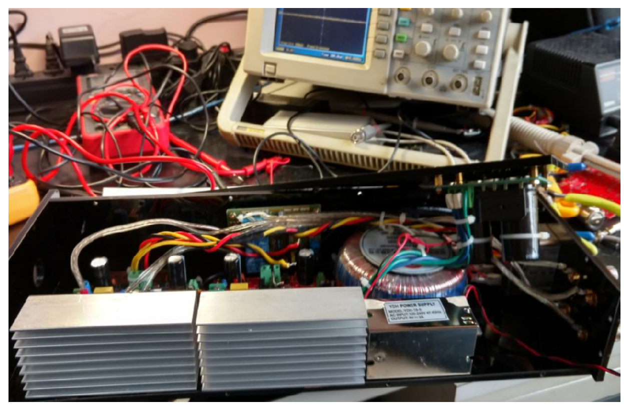


arranging the boards into the case, see the fitting in the real case against the design on the paperwork

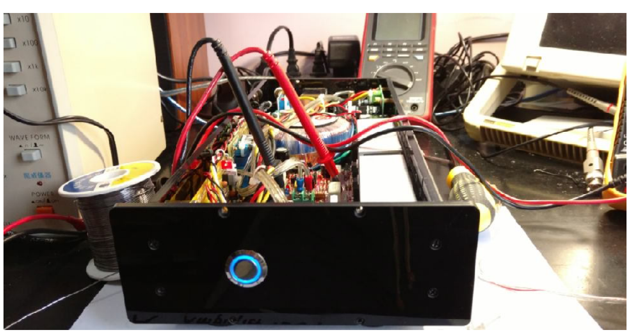
start drilling - Speaker Terminals and Input RCA



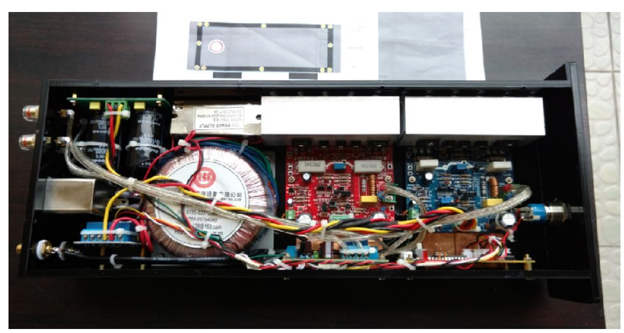
re-check the performance when it is on the real case, check the first board (The Right Channel)



added the 2nd board (The Left Channel)

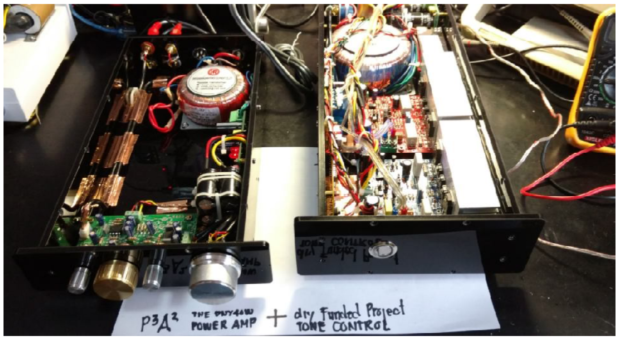


Electrical test of both boards - the Right and the Left channel is powered on at the same time



Top view of the assembled DNY40W Power Amplifier *(I called it also Pure Analog Process Power Amplifier or simply P3A2)*

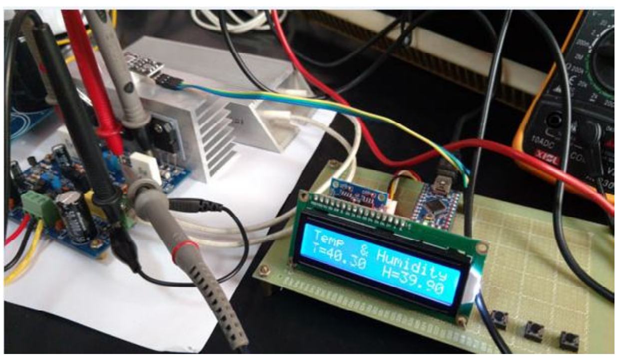
Casing Assembly with the DNY40W Boards (July 2014



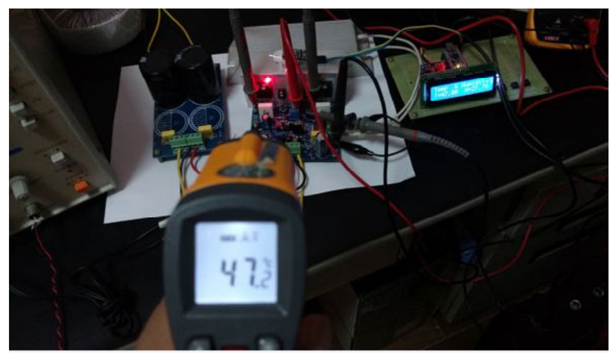
Sound Test with the diy Funded Project Tone Control (December 2014)

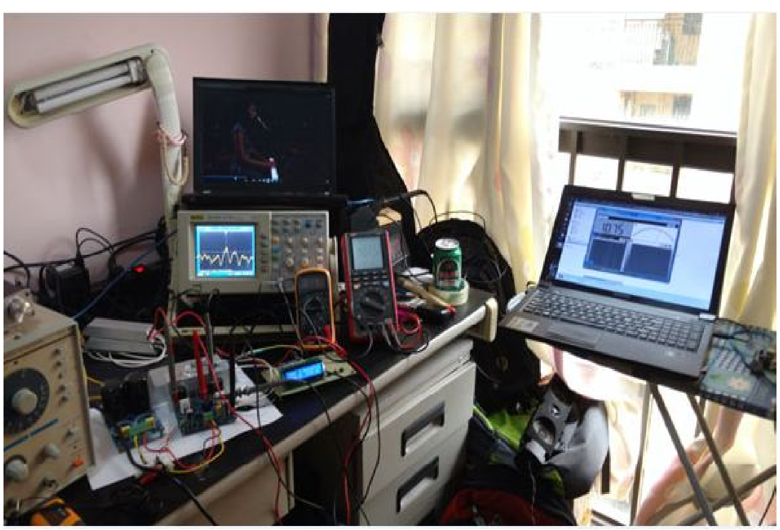

Final fiber glass casing - a fully working DNY40W power amplifier project

Reliability Test :



Temperature monitoring the heatsink using customized programmed Arduino hardware


Temperature manual check using Infrared Temperature sensor



DAQ monitoring the Offset voltage and the base voltage of the power transistor.

DC offset :
data logging the offset voltage variance with temperature change over time

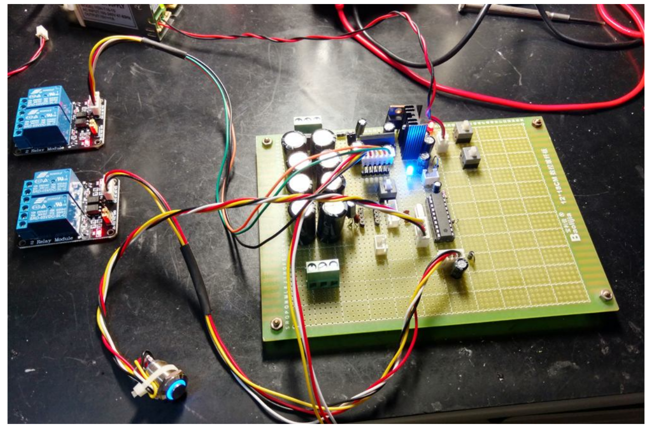
Ouput Transistor dc bias :
checking and data logging the servo mechanism of the Vbe multiplier (bias control)

UNRELEASED

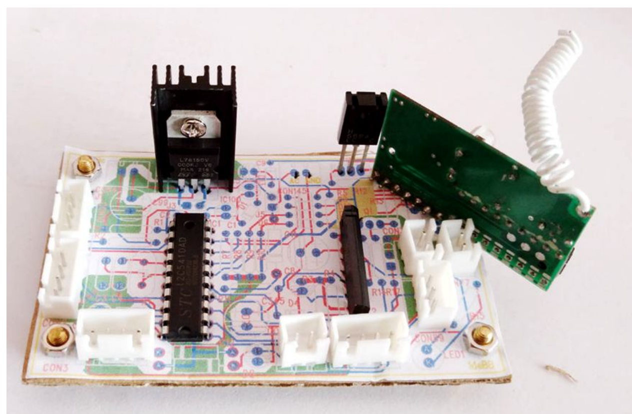
What's New :

I innovate stuff .... my greatest asset are my friends who believe in Easy, Affordable, Fast and Fun ways (EAFF)--- *the DIY way.*

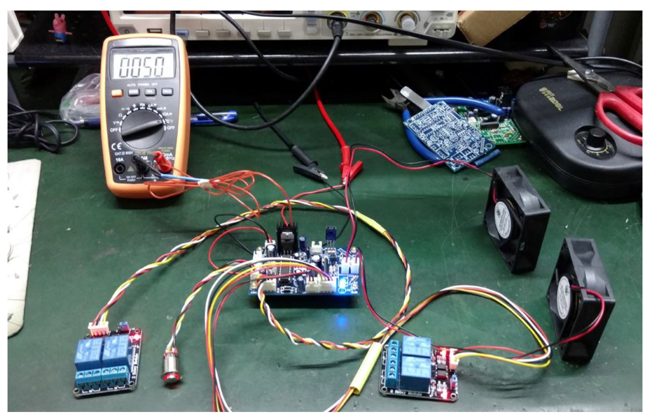
F. Dandy



PoC (Proof of Concept) on the universal PCB.



The Mock-up



The real-world Prototype

SAMuC

A new toy for amplifier builder who want to make a difference. Smart Amplifier Manager driven by Micro Controller (SAMuC) supervise, control and protect speakers and our amplifier.

- •Micro Controller Brain, Intel 8051 high speed
- •Control AC Power, reduce standby mode current consumption
- •Protect Speaker from more than +/-0.85Vdc offset voltage
- •User delay hardware selection : 6 seconds, 60 seconds
- •LED flash Man Machine Interface
- •Fast Flashing LED – Speaker Protect enabled
- •Slow Flashing - 1 hour timer is ON (Auto Shut-off)
- •Steady – normal operation
- •Fan auto, remote control and manual turn on/off
- •Firmware Upgradable
- •Expandable
- •Home Automation Control CAI with 315 MHz / 433 MHz
- •Internet of Things (IoT) ecosystem

Take your diy Learning to the next level - move forward for a better diy way, don't stuck up your brain aiming for the highest amplifier power, instead, blend your hobby with the wonderful stuff around, a variety of things that you can incorporate to makes your project nicer and better. Happy DIY folks!

diy improvement issue 28

Thank you for having this document published by HSEC Baguio, *The* Philippines. First publication on December 2014.

This project involved the use of electricity, careful and electrical safety must be applied when doing the project.

Featured Project :

DR100W conCEPT - Learning Platform

Heart Systems - the "tiny" company located in Baguio City, who established the 1diyTeam, promote & support : **diy Learning**, it created several low cost **Trainer Kit platform** generally for learning hardware design and interfacing, MCU programming and systems integration - - targetting the Starters with zero background.

The DR100W conCEPT is the latest platform in the field of Audio and Music reproduction.

What do we have here? The conCEPT will let you learn the following :

- **Audio** :
- Equalization reproduction with different mode , Rock, Classical, Pop, Jazz (hardware)
- Effects : Turbo Bass and 3D Sound
- Bass and Treble
- Digital gain, volume and balance control
- Digital Power Amplifier

- **Hardware** :
- Digital processing technique control by I2C
- Analog and digital Interfacing
- Modular and Systems Integration
- Solutions to Noise and Issues
- Hardware and Software compromise and optimization
- Hardware assembly / debugging

- **MCU Programming** (Software) :
- Man Machine Interface (MMI) implementation
- I2C Protocol and logic control, UART
- LCD Displaying
- Programming technique and problem solving

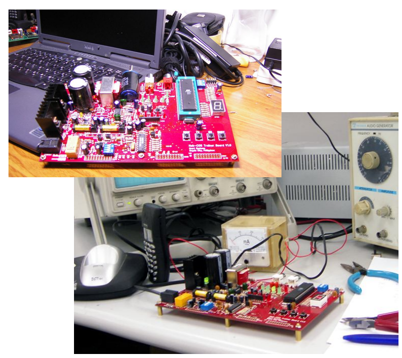
- **Testing** :
- Parametric Test, Tone Control signal testing
- Hardware & Software Test / Reliability Test
- Automatic Test Equipment (ATE)

- **Project Management**:
- Project Milestone
- Ladder Systems Product Development

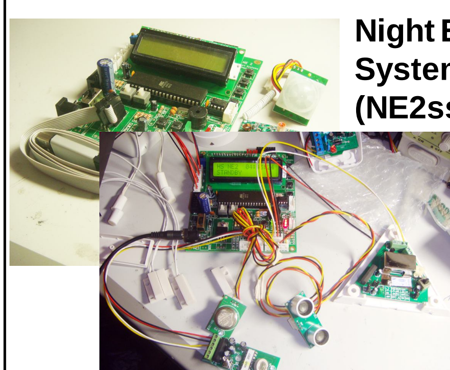
We are talking to our brilliant fellow hobbyist to help us to deliver this Trainer Platform.

STARTER MCU-EB8051 Assembly Language
General Trainer Kit

Digital Audio Tone Control (DATC) Trainer Kit
Digital Audio



Hobbyist Central Office Simulator (Hob-COS) Trainer Kit
Telephony



Night Eyes Security Systems V2 (NE2ss) Trainer Kit (Security)

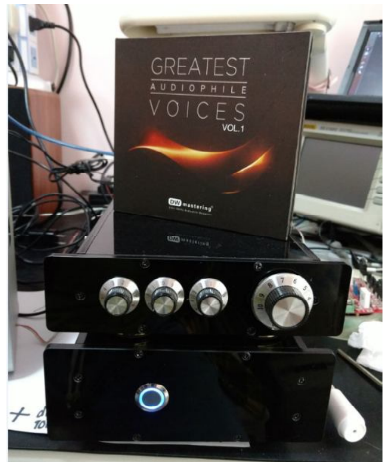
T*HE* 1diy Learning Platform - Proudly made by true blooded hobbyist for the general Hobbyist courseware & shareware

UNRELEASED

DNY40W

Team DNY40W (P3A2 / DNY PA)

Project Manager	: F. Dandy
Hardware Design	: Danny
PCB Design	: Arnel
Engineering Build	: Michael
Testing / Reliability	: Ariel
Procurement	: Richa / Amy



diy funded project tone control

DNY40W / P3A2 Discrete Power Amplifier

DR100W Concept Project (the Learning Platform)

The ***DR100W Concept Project*** is another Educational Trainer - Project from Heart Systems, Baguio City *THE Philippines*. It is a hardware, software, modular board integrations and system design do-it-yourself learning platform.

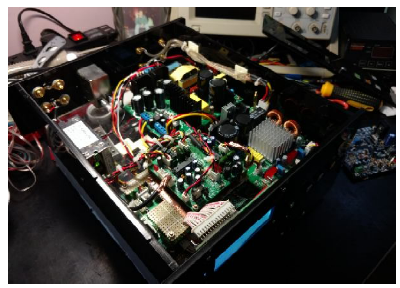
Features:

■ **Audio** :
- ☐ Equalization reproduction with different mode , Rock, Classical, Pop, Jazz and Normal
- ☐ Effects : Turbo Bass and 3D Sound
- ☐ Bass and Treble
- ☐ Digital gain, volume and balance control
- ☐ Digital Class D

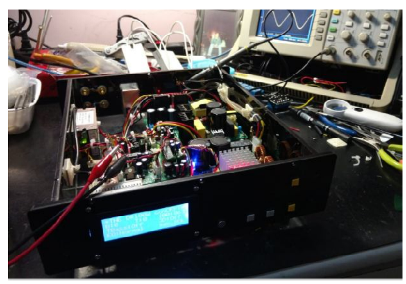
■ **Hardware** :
- ☐ Digital processing technique control by I2C
- ☐ Analog and digital Interfacing
- ☐ Modular and Systems Integration
- ☐ Solutions to Noise and Issues
- ☐ Hardware and Software compromise and optimization
- ☐ Hardware assembly / debugging process

■ **MCU Programming** (Software) :
- ☐ Man Machine Interface (MMI) implementation
- ☐ I2C Protocol and logic control, UART
- ☐ LCD Displaying
- ☐ Programming technique and problem solving

■ **Testing** :
- ☐ Parametric Test, Tone Control signal testing
- ☐ Hardware & Software Test
- ☐ Qualification and Reliability Test (QA)



Hardware :
- Equalizer
- Tone Control
- uProcessor (8051)
- Class D Amp
- SMPS



DR100W Concept for diyer's who love to customized their own power amplifier :
- displaying
- Interface & MMI
- power output
- casing
- hardware

diy Learning & Improvement series

Published by the 1diyTeam & GADGETsLab and hosted by Heart System Electronics Center (HSEC) Baguio City - city of pines, *THE* Philippines.

Issue No. 28, November 2015

If you want your project or idea to be published in one of the diy Learning & Improvement, please contact me :

danztherock@hotmail.com
dandy@gadgetslabph.com

Thank you for contacting me.