

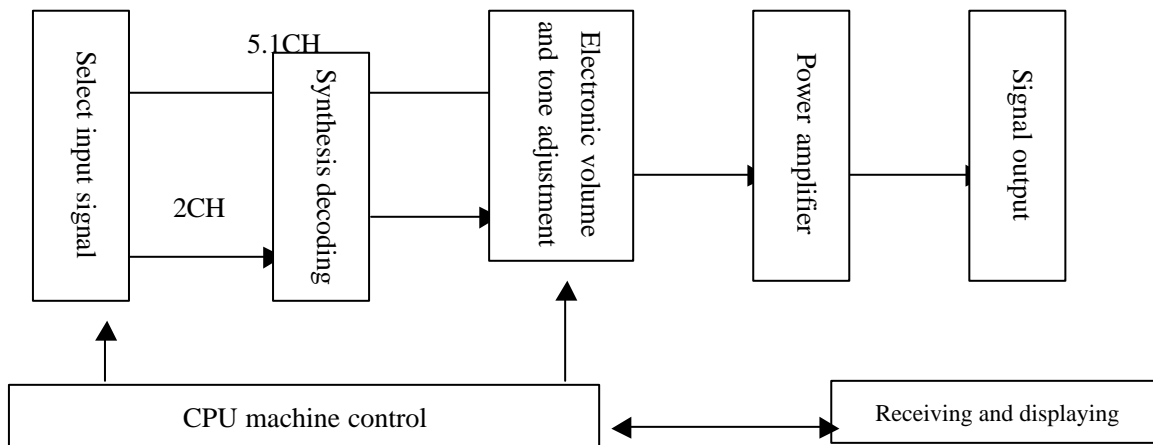
# Principal and Maintenance of INNOVATION 5.1 SUB

## 1. Brief introduction to product

INNOVATION 5.1 SUB is a medium grade active loudspeaker that comprised of one sub-woofer and two fronts, two surrounds and one center. If it is positioned in a favorable room, you will enjoy its excellent sound effects. Its main features are as follows:

1. 2.1/5.1 channel output with synthesis decoding
2. Built-in 5.1 channel power amplifier, applicable for AC-3/DTS and stereo music playback
3. 6 channels volume control and sole power control and tone adjustment

## 2. Block diagram of Machine's principal



## 3. Structures of machine

This set is composed of input board, output board, amplifier board and panel control. In the Input board, two channels select IC CD4053 to finish synthesis decoding and output board is formed only by several ports. The main component of this set is amplifier board which controls the machine and also contains amplifying component and power supply. Following will make a simple analysis on the principal of amplifier board.

### 1) Power supply

This set is powered by a toroidal transformer due to large output power of its sub-woofer. Two group of alternating currents outputting from transformer will output  $\pm 16V$  and  $\pm 26V$  voltage after commutating and wave filtering to TDA7265 and IC TDA7296.

Passing through current limit resistor R143, stable voltage IC LM7805 and capacitance C108, the outputted +16V will output +5V voltage to CPU and panel control; another current  $\pm 26V$  voltage, after passing through R120, R117 and R118, two 9.1V stable diodes VD109 and VD110, then output  $\pm 9V$  voltage and supply power to volume adjustment IC LC75347 and play IC F4558;  $\pm 6.8V$  is obtained after  $\pm 9V$  voltage is partially pressed by R119, R122 and R120, R121,  $\pm 6.8V$  is the selected power for IC 4053.

### 2) Synthesis decoding circuit

This set has function of synthesis decoding. When the inputting signal is of 5.1, through channels of X0, Y0, Z0 selected by N104 & N105, transmit to IC LC75347 where to adjust volume. This function is controlled by the 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> pin of N104 and 105 which is transmitted logic high level by the 7<sup>th</sup> pin of CPU.

When the inputting signal is 2.1 which passes through N104 and then arrives channel X1 and Z1, one of it is sent directly to IC LC75347 and adjust volume.

Another one abstracts signal from channel L & R to make synthesis decoding, N102 and N103 shall finish the function of synthesis decoding. When abstracting signal from channel L and R, then input via the 6<sup>th</sup> pin of N102B and 2<sup>nd</sup> pin of N102A, SL and SR signal are obtained by mixture and amplifying of signal L and R, after resistance sampling of SL, SW signal is obtained, C signal is received after N103A mixes and amplifies SL signal, after getting these synthesized signal SL, SR, C, SW, select output of channel by software-controlled IC CD4053 and send the outputting signal into IC LC75347 to adjust volume. At this step, the synthesis decoding is finished.

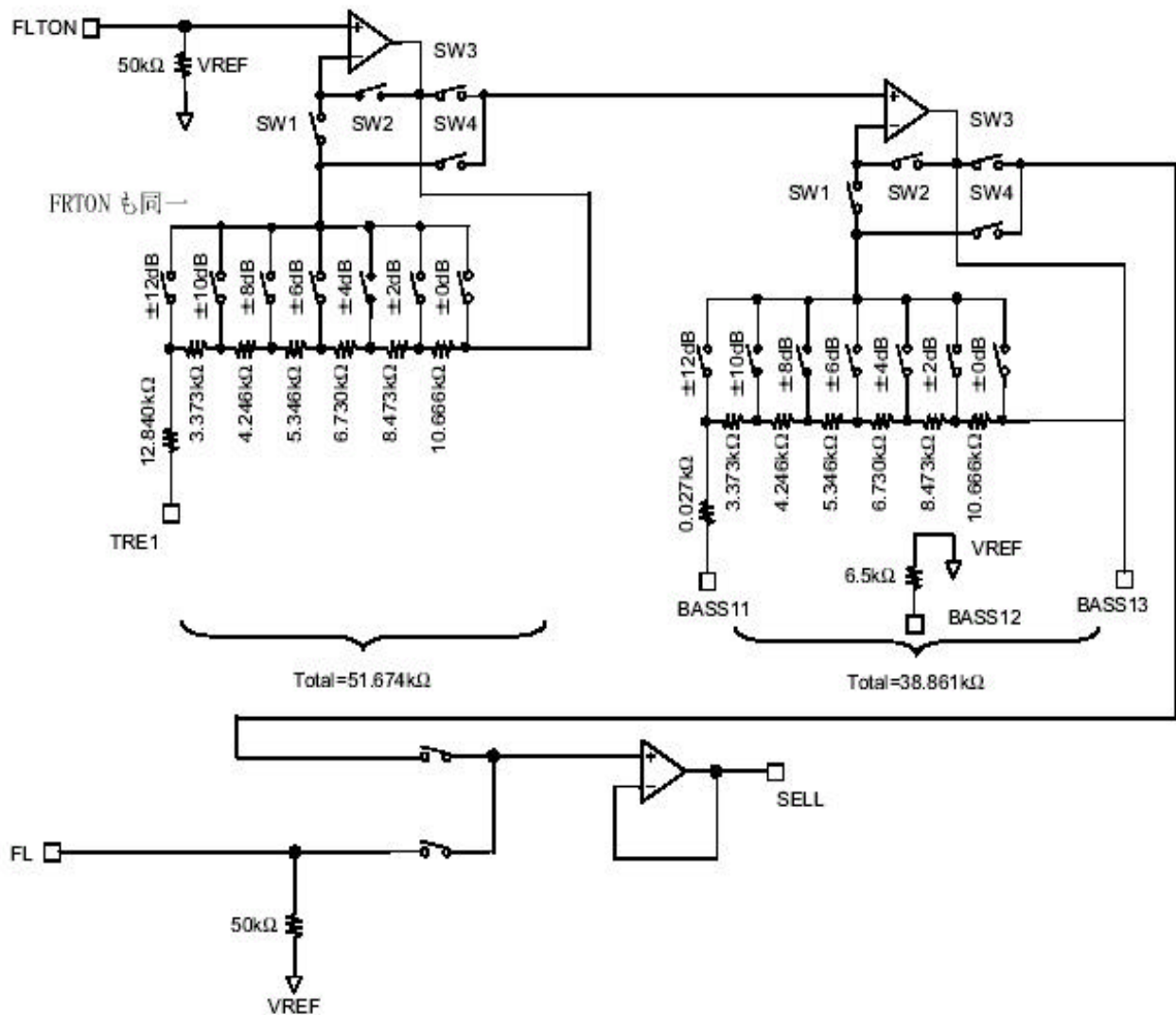
### 3) Signal output and adjustment of volume & tone

This machine has 6 channels signal input, signal inputted by each channel is directly transmitted into IC LC75347 to adjust volume and tone after wave filtering and capacitating.

IC LC75347 is 6 channels IC to adjust volume and tone solely, its gain can be adjusted from 0–95dB, which is applicable for family theatre series products. Its features include large scope of power supply, low power consumption and wide range of temperature, so it is a preferable IC. Its main per-pin functions are as follows:

Name of Per-pin	Number of Per-pin	Description of Per-pin
FLIN	7	signal input
FRIN	24	signal input
RL	20	signal input
RR	18	signal input
C	22	signal input
SBW	16	signal input
FLOUT	9	signal output
FROUT	10	signal output
COUT	11	signal output
RLOUT	12	signal output
RROUT	13	signal output
SBWOUT	14	signal output
VREF	23	basic voltage
VDD	37	power supper
CE	40	selected signal control line
DI	39	data control line
CL	38	clock control line
MUTE	35	outer mute control

Equivalent circuit of this IC internal unit :



#### 4) Amplifier circuit

Principal: signal outputted from IC LC75347 of which main channel signal is sent to N181 IC TDA7265 to amplify its power, the surround signal is transmitted to N180 IC TDA7265 for amplifying after wave filtering, and the sub-woofer signal is sent to N183 IC TDA7296 after wave filtering.

IC TDA7265 is a dual channels power amplifier IC which has stand-by and mute modes without any trouble in switching, and it also has functions of short circuit protection and over heat protection that can effectively prevent IC from damage under abnormal situation. This IC may provide the maximum 20W power output in each channel based on common output mode, when switching on BTL output, its power can reach 40W, and in addition, this IC has a strong ripple resistance capability and low power consumption during stand-by.

Per-pin functions of IC TDA7265 are as follows:

Mark sign	per-pin	function
-VS	1	negative power
OUT1	2	1st channel output
+VS	3	positive power

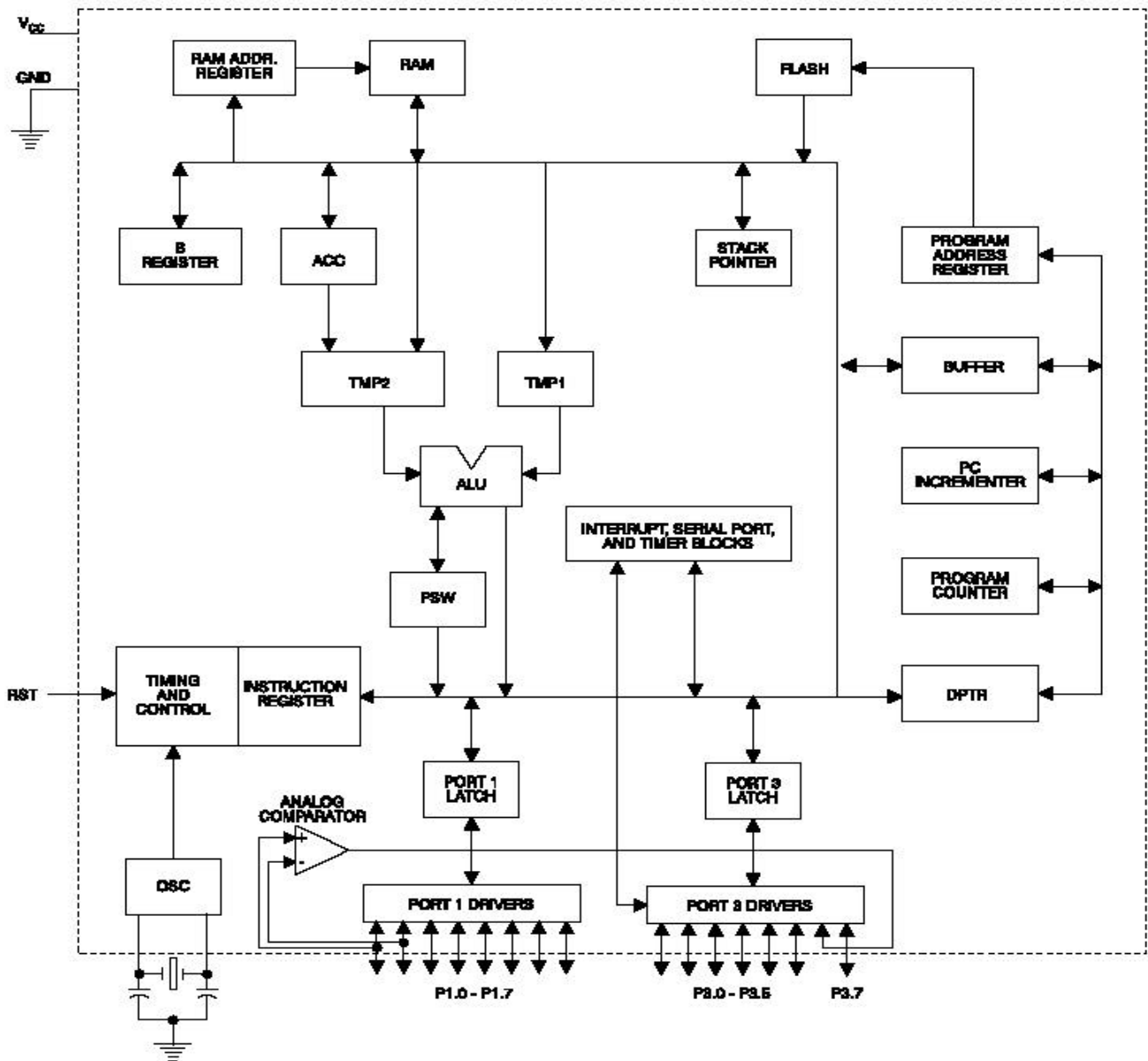
OUT2	4	2 <sup>nd</sup> channel output
MUTE	5	mute control pin
-VS	6	negative power
IN+2	7	2 <sup>nd</sup> channel input
IN-2	8	2 <sup>nd</sup> channel input
GND	9	ground
IN-1	10	1 <sup>st</sup> channel input
IN+1	11	2 <sup>nd</sup> channel input

However, IC TDA9296 is a single channel power amplifier IC; it has similar features as that of IC TDA7265, however, its output is more powerful, the single channel may reach 35W.

#### 5) Control circuit

This machine uses IC AT89C2051 as its core part to control its operation. This IC is a low voltage and high-powered IC which is equipped with 8 digits USB of 2K byte and read-only memory Single Chip Micryoco (SCM) based on CMOS technique. It has 15 I/O and 6 interrupt sources and features in low power consumption and stand-by mode.

The principal block diagram of this IC is as follows:



### Reset circuit

This set adopts a high electronic balance reset that +5V charges C118 via R100 when switching on, because capacitance voltage cannot jump, basic electrode of audion V100 is low electronic balance at the moment to switch on, open audion and transmit a high electronic balance reset signal to the 1<sup>st</sup> pin of CPU. When capacitance C118 is charged over, V100 cut-off, reset is finished at this time. The mode of this kind of reset circuit is high electronic balance reset and keeps low electronic balance.

This set is mainly adjusted by remote controller, the remote-received signal is sent to the 6<sup>th</sup> pin of CPU and treated inside CPU, then transmits control signal via the 8<sup>th</sup>, 9<sup>th</sup> and 11<sup>th</sup> pin to adjust machine's volume and tone. The panel will make corresponding display via ports of P1 so that user may know clearly the current state of machine. In addition, the 2<sup>nd</sup> and 3<sup>rd</sup> pin of CPU controls the main channel and mute of surround.

#### 5. Panel control

The panel of this machine is composed of a remote control receiver and one digital display. Since this machine is operated by remote controller, so the only man-machine dialogue path is the remote control receiver. And digital display then displays the ongoing operation and state of machine.

#### 6. Mute circuit:

The mute function of this machine is realized via the mute signal transmitted by CPU. When press key MUTE on remote controller, remote control receiver receives signal and transmits it to CPU for treatment, and then transmits high electronic balance from the 2<sup>nd</sup> and 3<sup>rd</sup> pin of CPU and open audion V102, V103, electronic balance of LRM and SCM become low and open mute. It makes use of the mode selection function of IC TDA7265 and IC TDA729; please refer to reference of IC TDA7296 for detail.

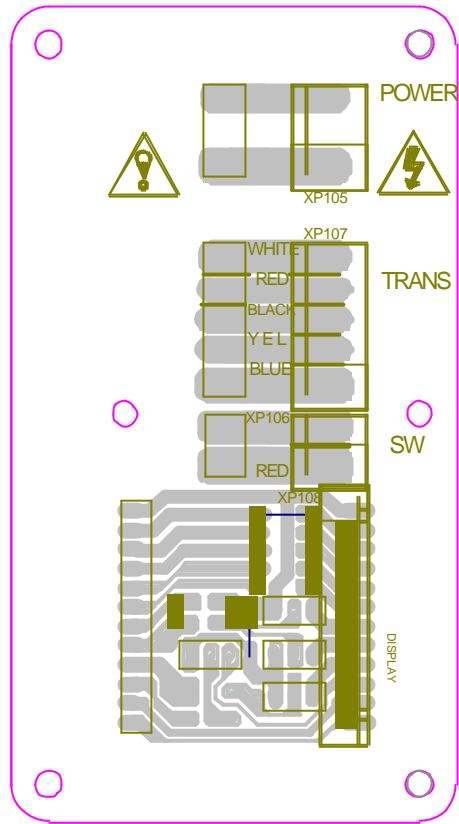
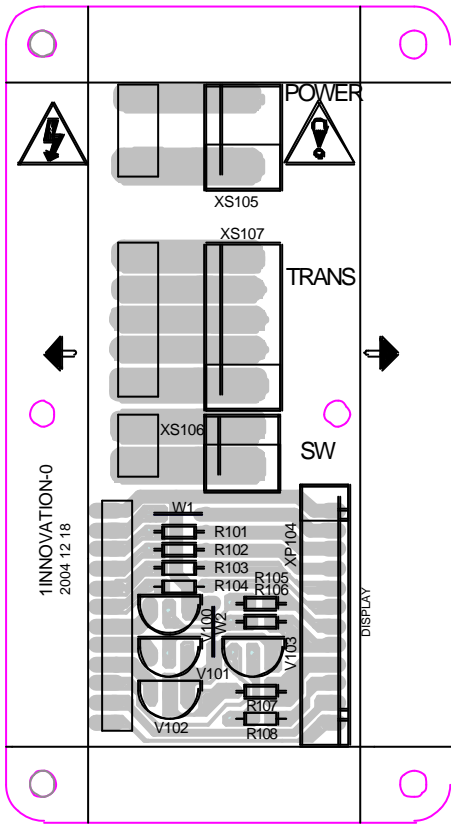
### **4. Trouble shooting**

The internal electronic lines of this machine are very simple without complicated control and inspection circuits, so that signal injection method is usually utilized to repair this set, namely put signal into the signal input port, and then follow the signal flow, if signal is broken suddenly at a point, you can determine that the trouble is generally located at this point.

Please follow the following steps to maintain this model:

Check power supply part, namely check whether  $\pm 26V$  ,  $\pm 16V$  ,  $\pm 9V$  ,  $\pm 6.8$  and  $+5V$  are normal or not.

1. If no voice output, please check mute electronic balance first when power supply is operating normally, and then check the other parts.
2. If any abnormality of display, should determine first any trouble in digital display and then check CPU.



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