Circuit Diagram Introduction

1、 CA2 Block Diagram:

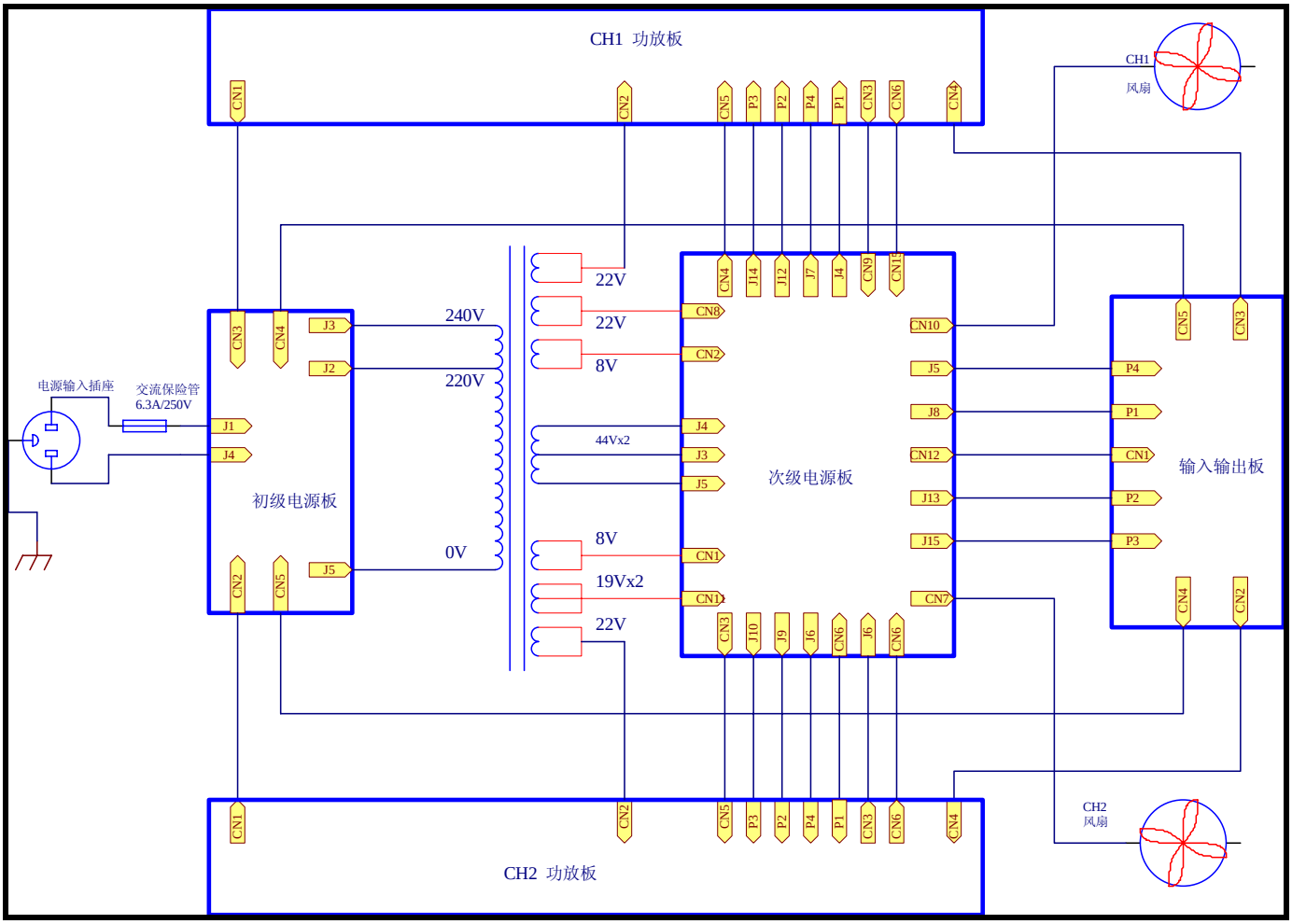


Diagram 1

2、 CA4 Block Diagram:

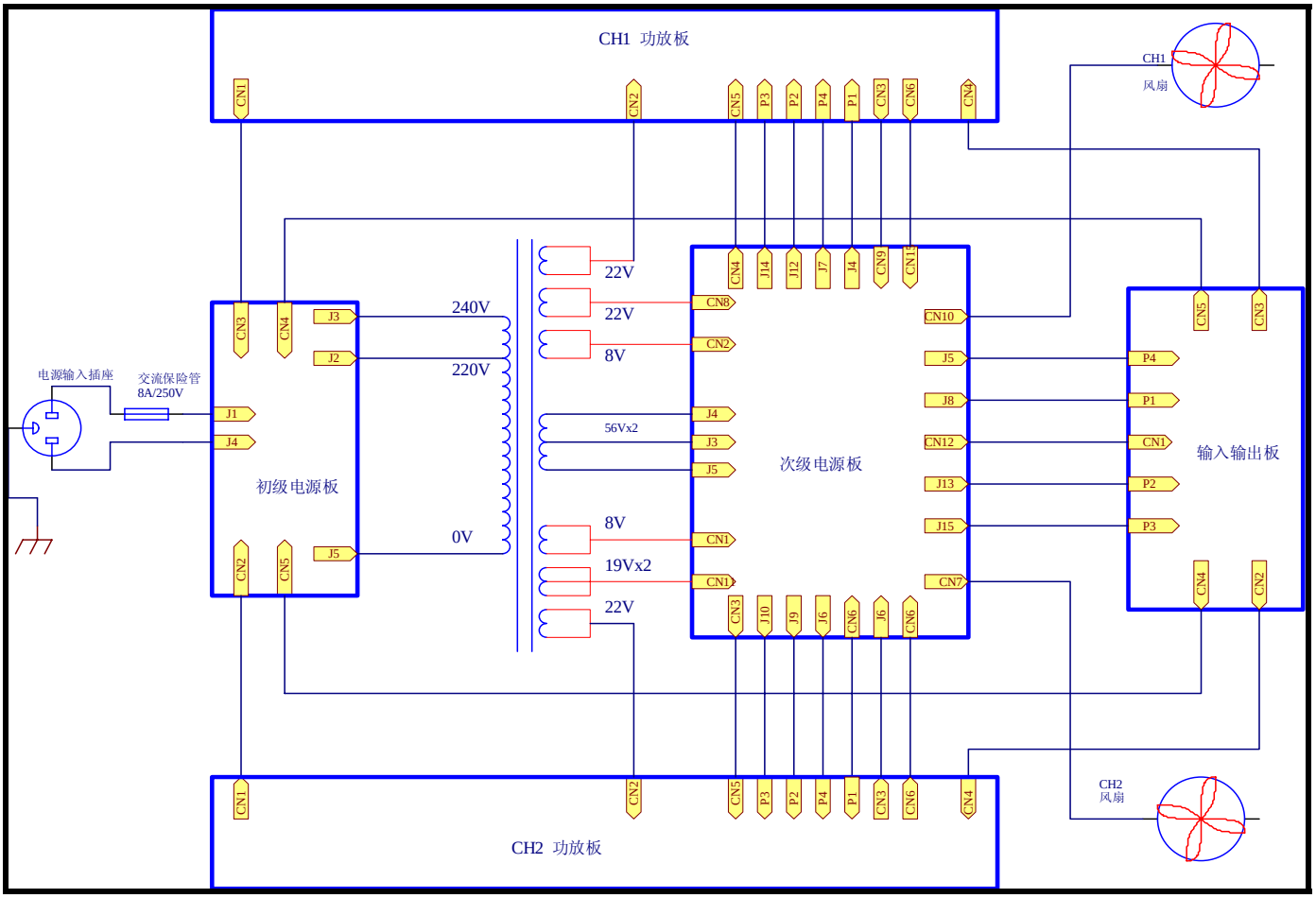


Diagram 2

3、 CA6 Block Diagram:

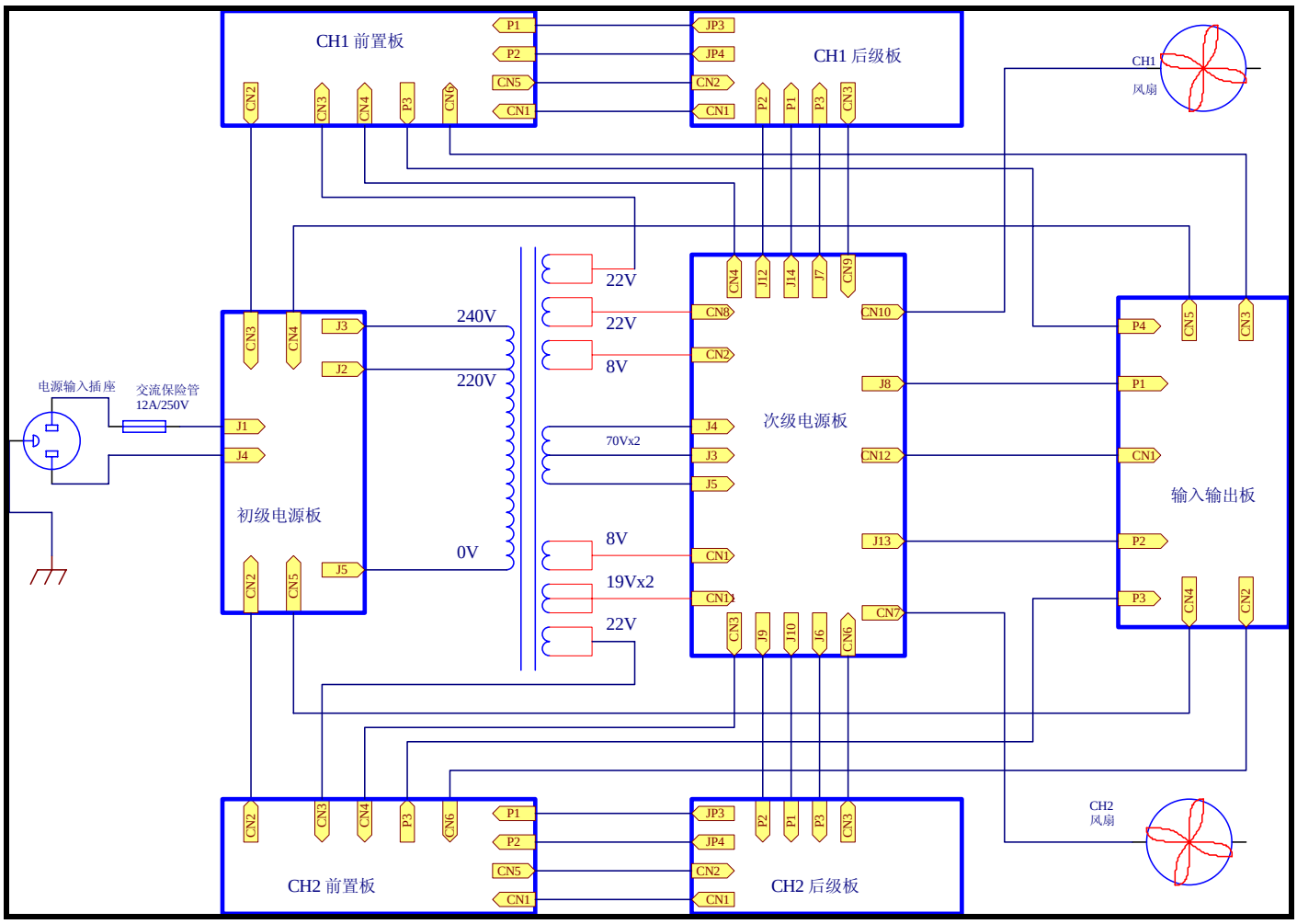


Diagram 3

4、 CA9 Block Diagram:

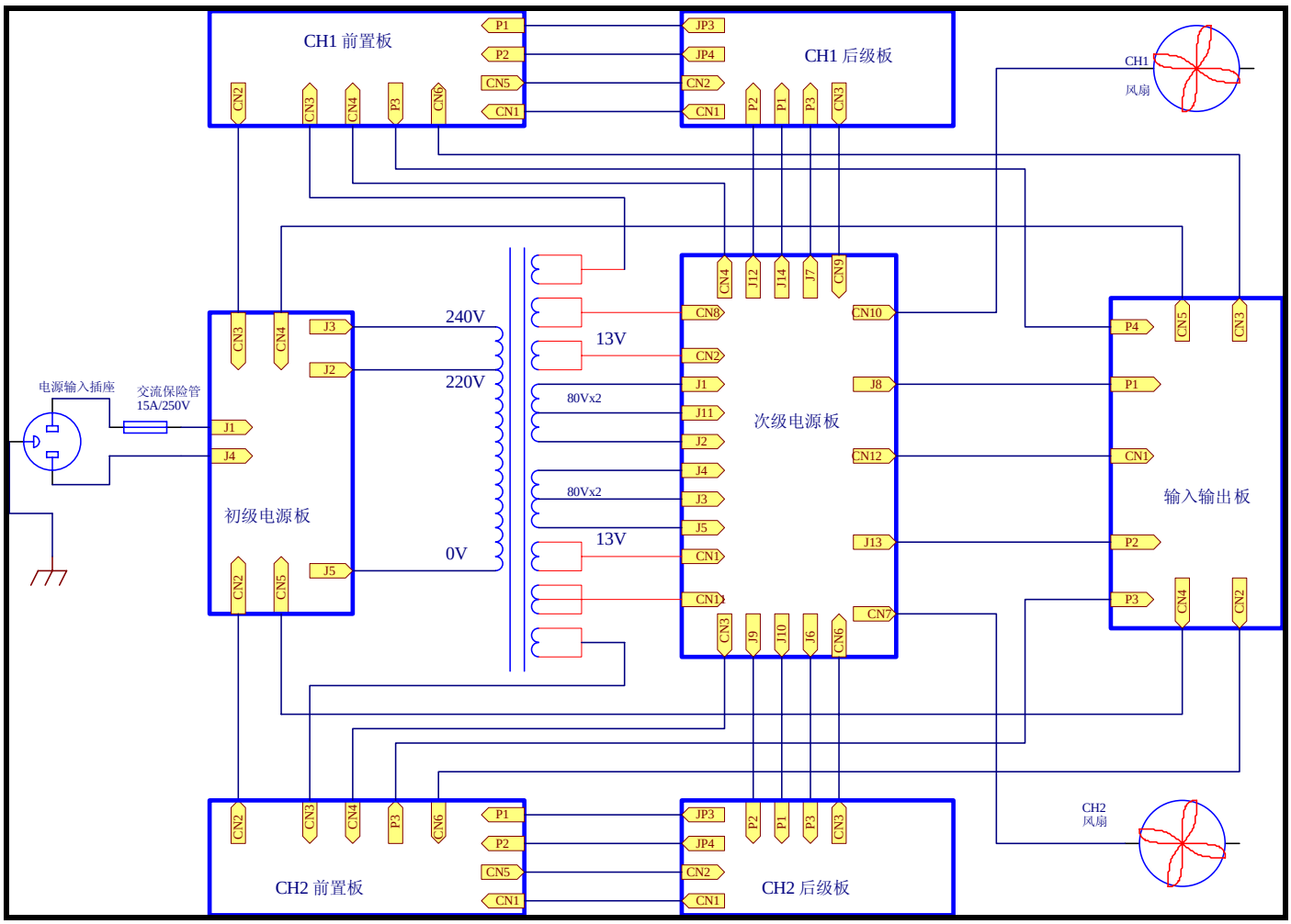


Diagram 4

5、 CA12 Block Diagram:

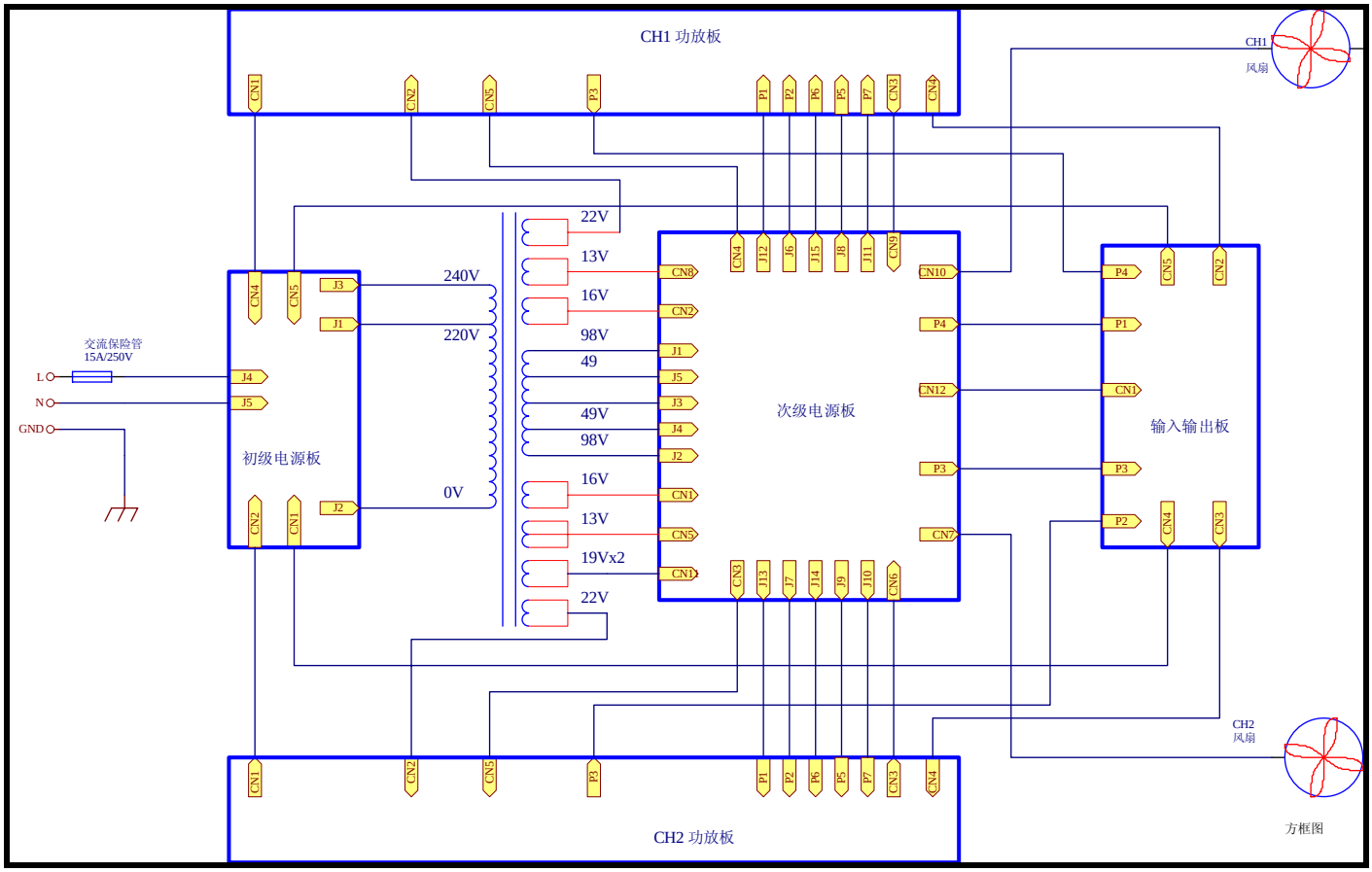


Diagram 5

6、CA18 Block Diagram:

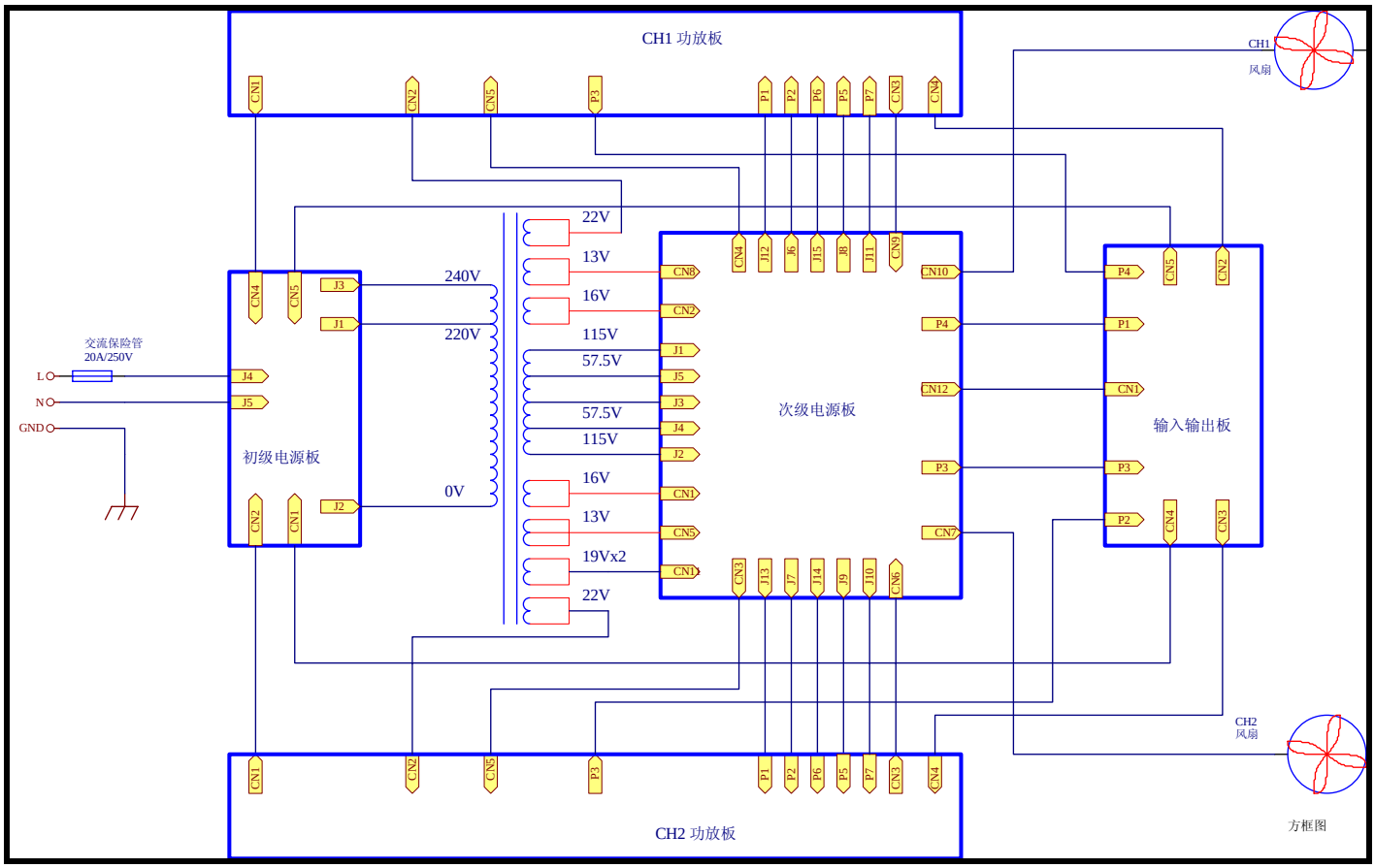


Diagram 6

7. CA2/4 Display PCB——Soft Start Circuit Diagram

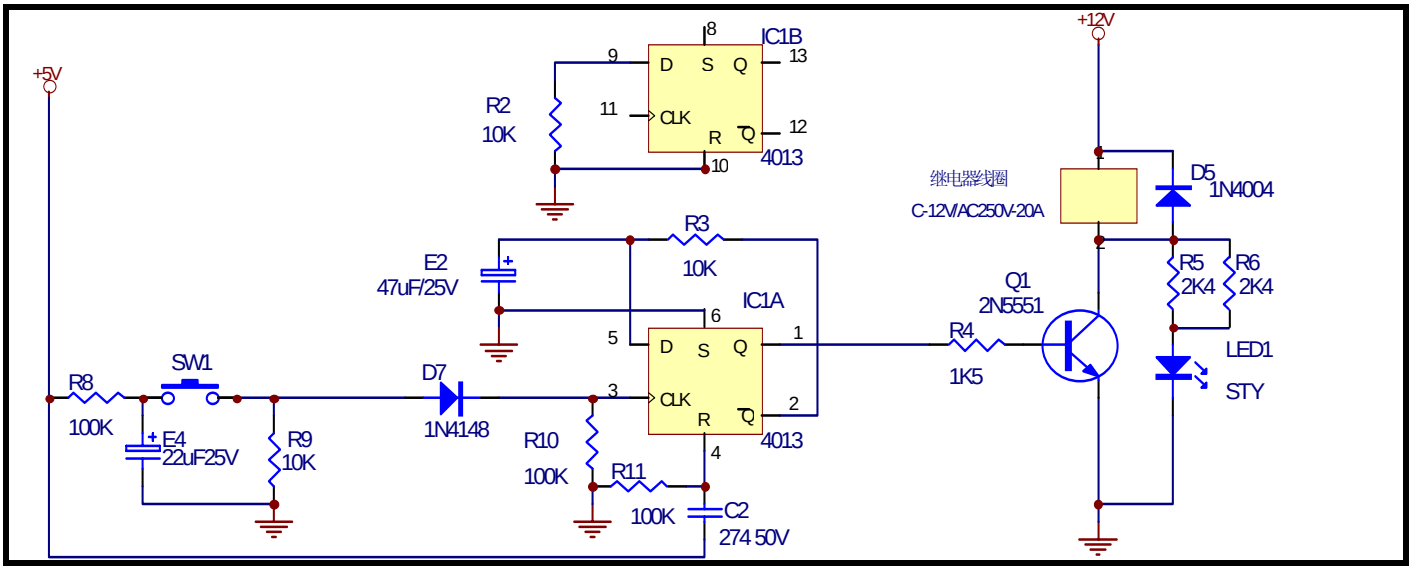


Diagram 7

Circuitry Introduction: Diagram 7 & 8 are the power on soft start circuit diagram.

1) Power on working principle: Press down the power supply switch, the third feet of the double D trigger CD4013 was touched by high level, then the first feet output high level, transistor Q1 saturated connected, stand-by LED1 light off, meanwhile, the relay close, point 3 & 4 connected as shown in diagram 8 then through 2pcs thermal resistors parallel to electrify the transformer.

2) Power off working principle: Press down the power supply switch once again, the third feet of the double D trigger was touched by another high level, then the first feet output low level, transistor Q1 stop, the relay winding power supply disconnects, point 3 & 4 releases, the pre-amp transformer then disconnect. In diagram 8, the thermal resistor SCK1058 is able to avoid any strike of surge current when switch on the power.

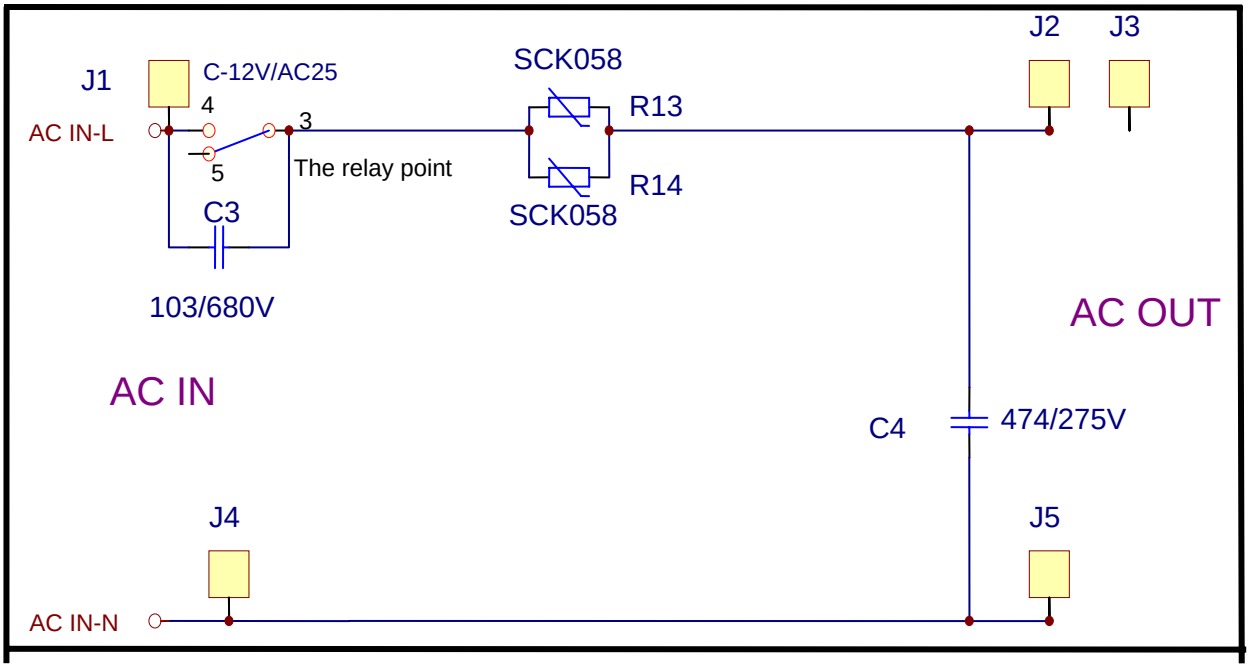


Diagram 8

8. CA2/4 Input Board- (1) Balance Input converts to Unbalance Output

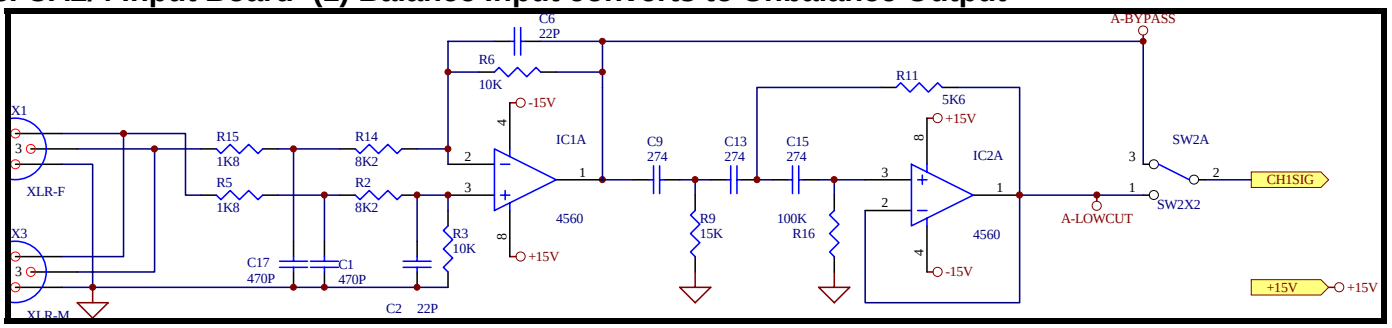


Diagram 9 (CHA Channel)

Circuitry Introduction: In the above diagram, IC1A converts to unbalance output signal from balance input signal. IC2A with C9, C13, C15, R9, R11, R16 constitutes to a 30Hz high pass with source filter. When the 2 & 1 of switch SW2A connected, when the input signal below 30Hz pass the filter, it will be attenuated according to the –18dB / times frequency.

9. CA2/4 Input Board—(2) Input sensitivity and input mode selection

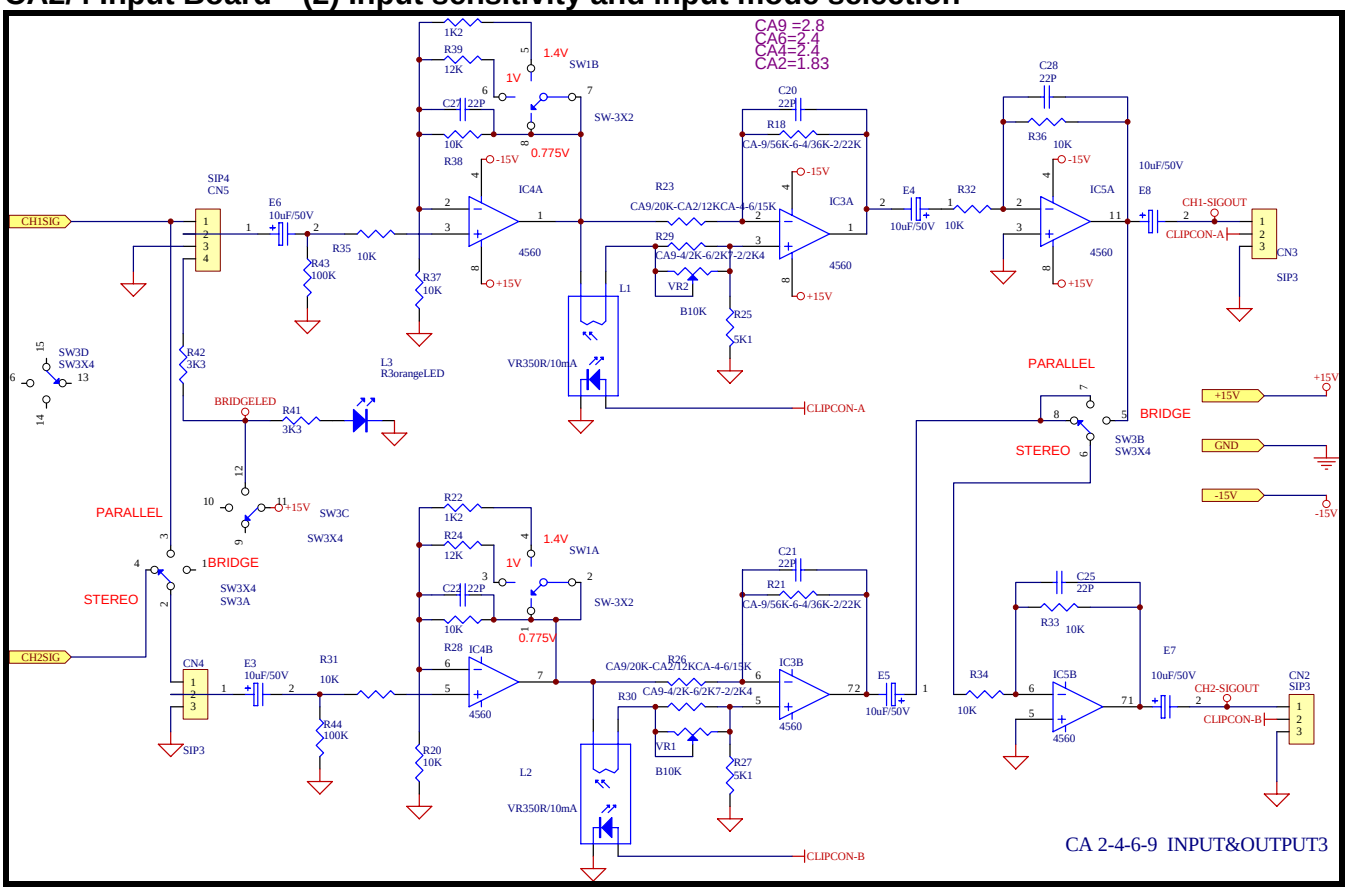


Diagram 10

Circuitry Introduction:

1. Three kinds of sensitivity: The two operation amps of IC4 used as an in-phase amp in this circuit. When the band switch SW1 on different place, it's able to change the voltage gain of IC4 and the input sensitivity then changes accordingly. 1) When point 2 links with point 1, point 7 links with point 8, the input sensitivity is 0.775V; 2) When point 2 links with point 3, point 7 links with point 8, the input sensitivity is 1V; 3) When point 2 links with point 4, point 7 links with point 5, the input sensitivity is 1.4V.
2. Three kinds of input mode: Band switch SW3 is the input mode selection. This band switch has 3 levels and 3 touch points. 1) When the switch on stereo, point 6 and 8, point 2 and 4 are connected. Signal input from CHA, controlled by CHA volume potentiometer then output from CHA; Signal Input from CHB, controlled by CHB volume potentiometer then output from CHB; 2) When the switch on parallel, signal only input from CHA, point 2 and 3, point 6 and 7 are connected. CHA volume potentiometer controls CHA output; CHB volume potentiometer controls CHB output; 3) When on bridge mode, signal only input from CHA, point 2 and 1, point 6 and 5 are connected, meanwhile, the third group point 12 and 15 connected, the bridge LED illumed. Signal of CHA after reverse phase by IC5B then enter into CHB voltage booster. Output signal controlled by CHA volume potentiometer.
3. Distortion limiter: When output signal distortion, the photo coupler L1 and L2 linked, the output gain IC3 decreases automatically, the control signal has no distortion.

10. CA2/4 Power Supply PCB

(1) Fan power supply circuit diagram

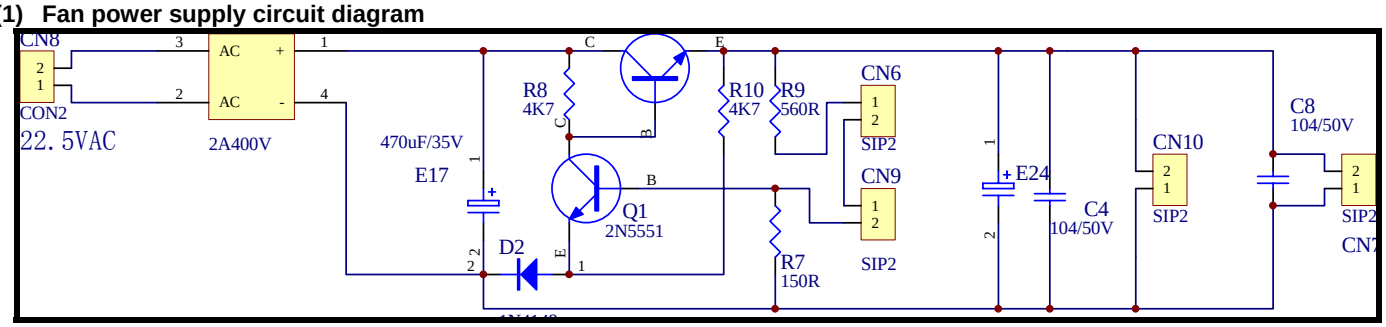


Diagram 11

Shown as above: The fan automatically speed up when the temperature increases, CN7, CN8 separately supply power to the fan of CHA & CHB, CN6 & CN9 separately series a thermal resistor with positive temperature coefficient. When temperature increases, the resistor value becomes bigger, then the output voltage raised. When the resistor value keeps the same, the circuitry is a simple series stable circuit, providing stable voltage to the fans.

(2) Pre-stage stable power supply

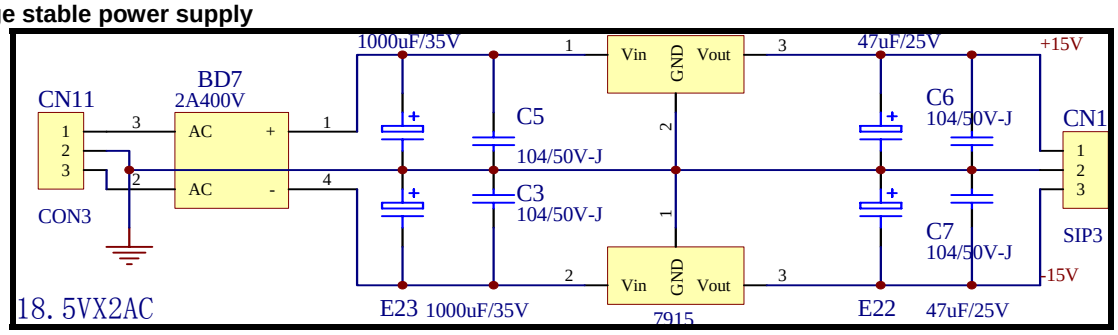


Diagram 12

The power supply of input PCB pre-amp IC is the zener IC7815 and IC7915 providing ±15V stable power source. This zener IC with high precision, small wave output and with overheat protection, it can satisfied with the power needs for the pre-amp of audio circuitry.

(3) Voltage booster and power stage voltage circuitry

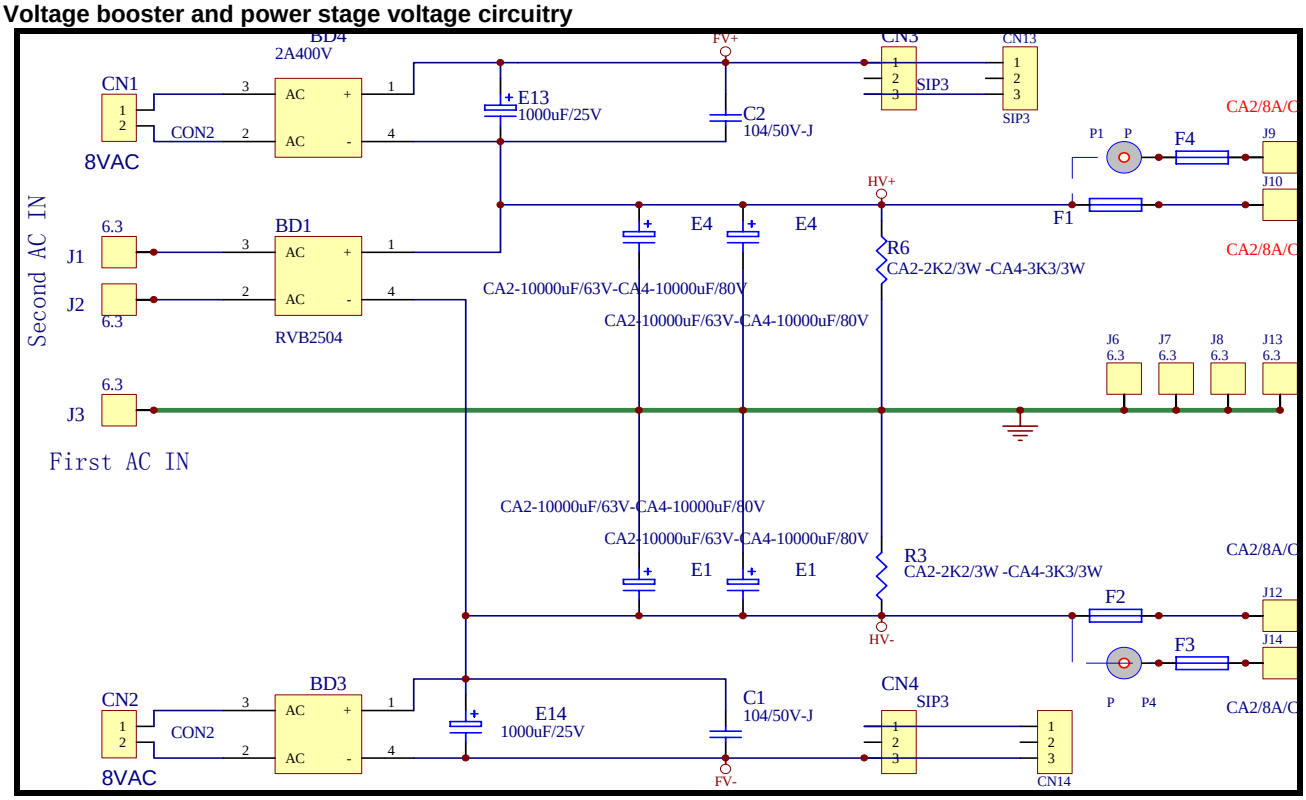


Diagram 13

The voltage of voltage booster is 10V higher than the output stage amp so as to guarantee not to cause clip distortion because of power decrease during high loading.

11. CA2/4/6/9 Main PCB Board:

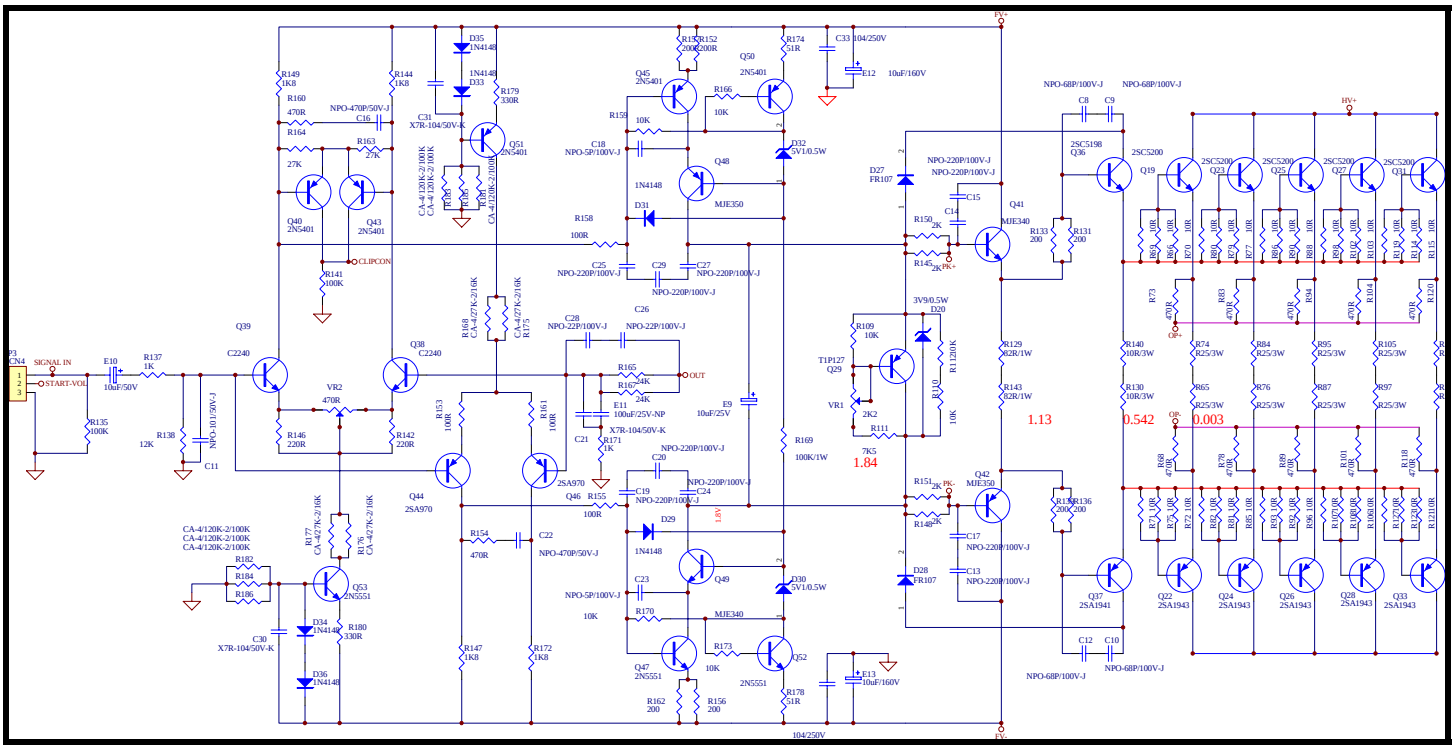


Diagram 14

(1) Voltage Booster: First pass through Diff-amp input circuit then to voltage stage booster circuit.

(2) Current Booster: Q41 & Q42 form a voltage follower providing enough current to the drive transistor of output stage power booster.

(3) Power Output Stage: Power boost by output transistor paralleled.

(4) Output Stage Bias: Q27 and other relative components form a Bias circuit providing class AB bias voltage to the output stage power booster.

(5) Midpoint Setup: Adjust VR2 can setup the amp midpoint output voltage, enactment is ±10mV.

(6) Output Transistor Bias Adjust: Adjust VR1 can change the static state working current which passed from output stage transistor, usually set the output stage paralleled power to 0.47-0.49V.

12. CA2/4 Over-current protect circuitry:

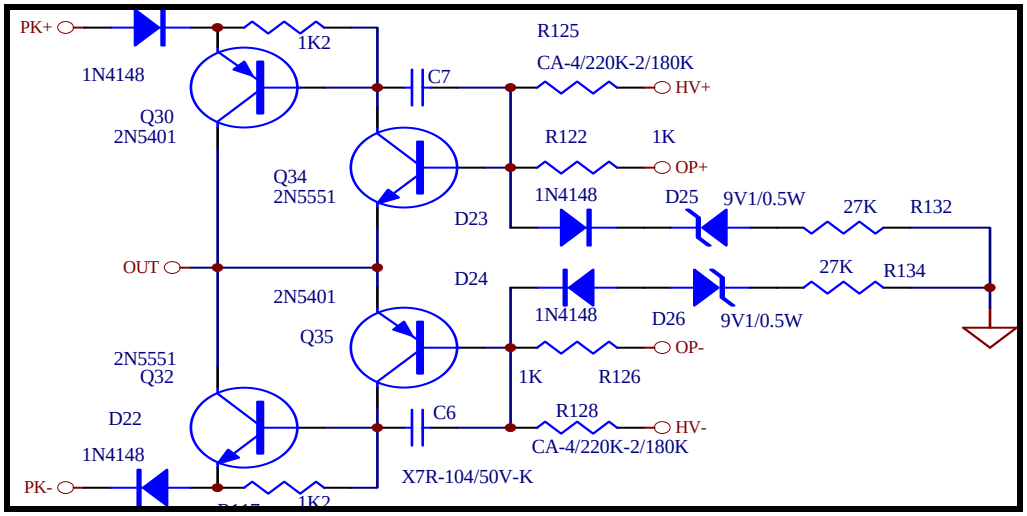


Diagram 15

Circuitry Introduction: As shown on above circuitry, OP+ and OP- separately connects to the cement resistor of the emitter on the transistor power output stage, when one of the high power transistor overloaded, the voltage of OP+ or OP- will increase and caused the Q33 or Q34 connected, the signal passed from the MJE340 and MJE350 will be diffluent by PK+ and PK-, by this way, the output current of high power transistors will be decreased again and reach the over-current protection.

13. CA2/4 Softstart, DC, Over Heat and Clip Limit Circuit Diagram:

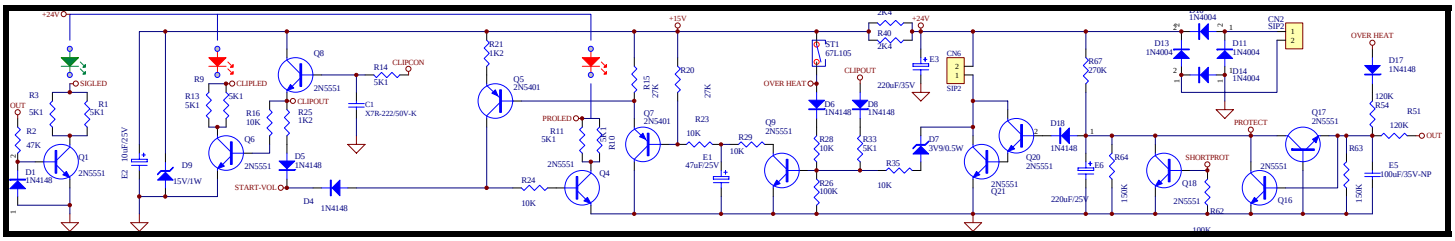


Diagram 16

Circuitry Introduction:

(1) Softstart: After turn on the power, CN2 links to 20V AC power. When it passes to the bridge rectifier, it gains +24V DC power, then through R67: 270K to charge up for the E6, about 3S later, it is about 1.5V, the transistor Q20 and Q21 were connected. CN6 is the power supply winding linked to the output relay, at this moment, the relay closed. At the instant of connecting to the power supply, the impact produced by amplifiers can't reach speakers through the output relays, by this way, it avoids producing impact to speakers when turn on the power instantaneously.

(2) DC: when the output voltage exists 1.5V of positive and negative DC voltage, transistors Q16 and Q17 were connected, then the two ends voltage of E6 capacitor decreases. The Q20 transistor cannot be connected, the relay released, the Direct Current cannot output to the speakers so as to reach the protection purpose.

(3) Over Heat: When the temperature of the modules reaches 90-100°C, the thermal switch ST1 closed and caused the transistors Q9 and Q16 closed. After the Q16 closed, it would cause the output relay disconnect. After the Q9 closed, it arose the Q7 and Q5 closed. After the Q5 closed, it will bring the output gain to 0V in Diagram 16.

(4) Clip Limit: When the output has clip and distortion, the transistor Q8 will be connected and cause the output gain automatically decreased in the Diagram 16, this can bring the output signal without clip and distortion.

14. CA12/18 Output Stage Circuit Diagram:

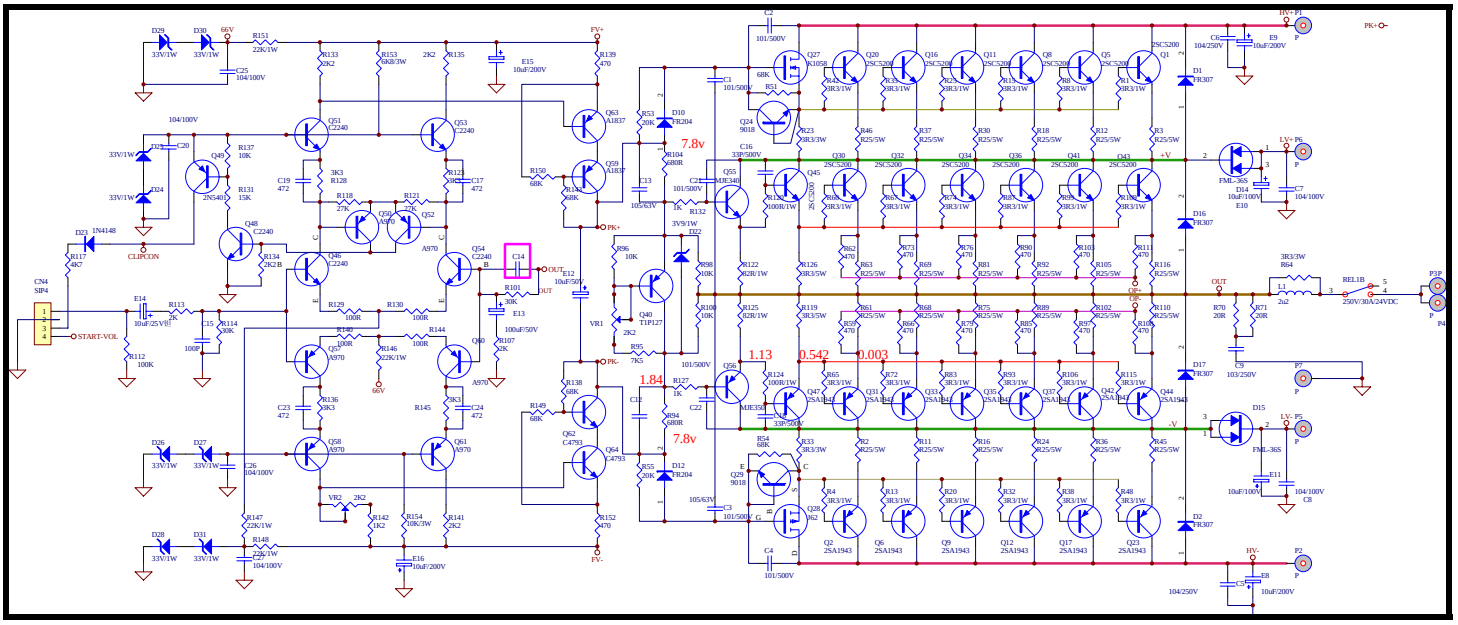
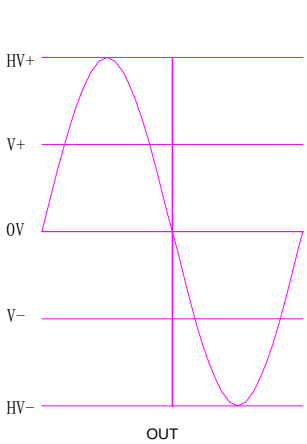
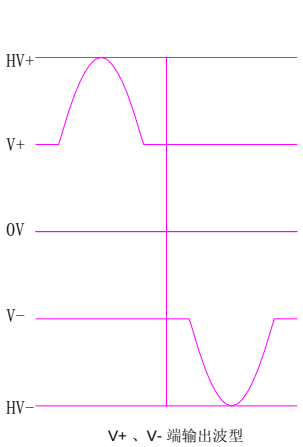


Diagram 17

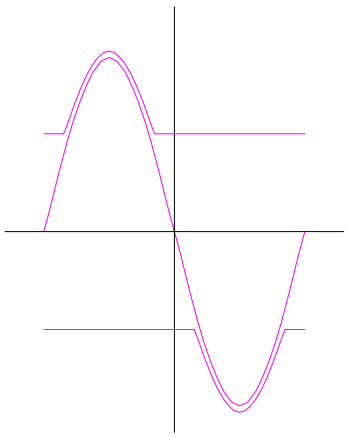
1. **Q46、Q54、Q57、Q60 constitute a double different symmetry input circuit.**
2. **R151、D29、D30 constitute positive Bias constant current supply, the current is3mA; R148、D28、D31 constitute negative Bias constant current supply, the current is3mA.**
3. **VR2 is the mid adjustable potentiometer, normally adjust the output voltage to 0V (±10mV).**
4. **R101, E13, R107 constitute a negative feedback network, the Main PCB board magnified multiple is equal to 1+R101/R107.**
5. **R139, R150, R143, Q63, Q59, R138, R149, R152, Q62, Q64 constitute a voltage booster circuit, current is 5mA (±1mA).**
6. **Q40 is hot compensation transistor, VR1 is the Bias adjustable potentiometer, normally it adjusts the V_{CE} of Q40 to 3.1V (±0.1V).**
7. **R7, D3, Q4, R10 is the signal indication circuit. When the output voltage is bigger than 0.7$V_{V\text{-}P}$, the Signal LED will be illumed on the Display PCB board.**
8. **START-VOL is the protect function control port, clip limit control and 0 current switching circuit. Through this port to control the protect circuit on the Input/Output PCB board.**
9. **REL1 is the output relay. Over-heat and DC protect are realized by this output relay. When the circuits appear protect control and the relay's output was disconnected, the Protect LED on the Display PCB will be illumed.**
10. **ST1 is the over heat protect thermal switch. When the temperature on the heat sink reaches 100℃(±10℃), this thermal switch closed, protect circuit works, and the relay's output was disconnected. When the temperature decreased, it resumes automatically.**
11. **Q15, Q18, R43, R44, E4, E6 constitute a DC protect circuit. When the DC voltage of the output is bigger than ±2V, protect circuit works, and the relay's output was disconnected. When DC quashes , it resumes automatically.**
12. **Tested by sine wave, the wave form of OUT, V+、V- are as following:**



OUT



V+ 、V- 端输出波型



复合输出波型

KEY POINT TESTING

1. The Bias voltage of CA2/4/6/9 output mid voltage, output stage power transistor:

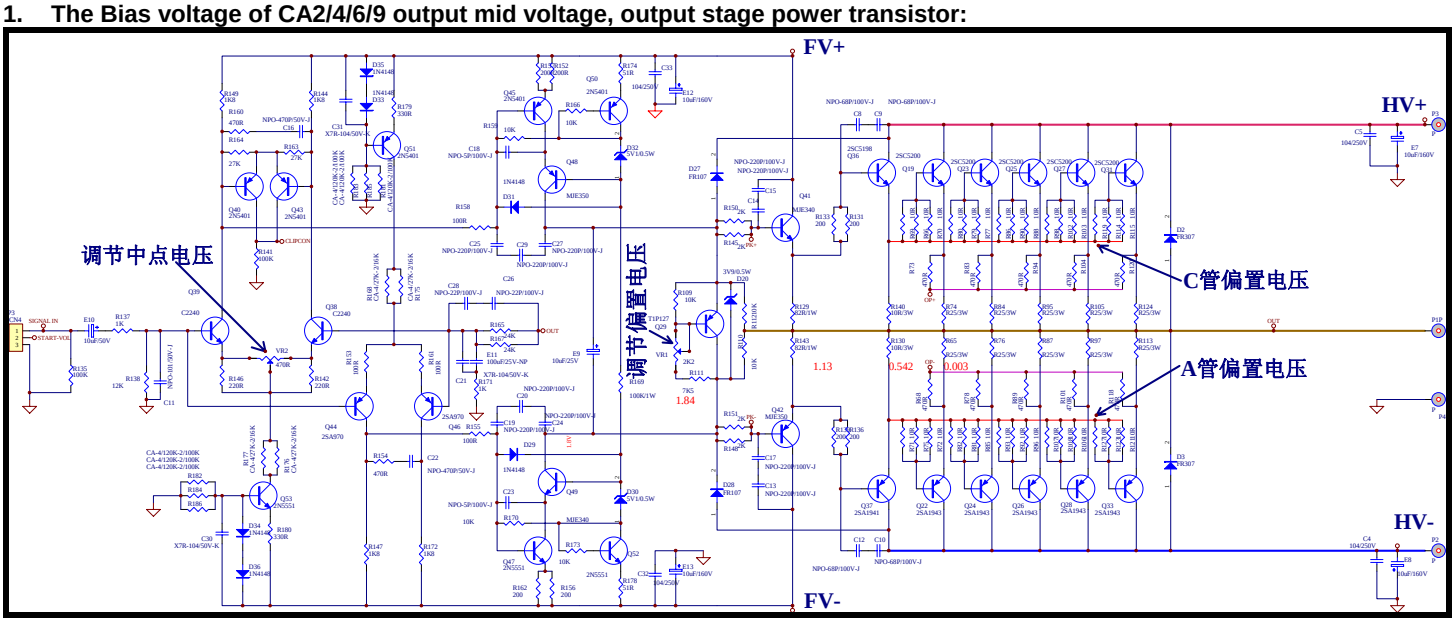


Diagram 18

(1) Static state: Usually the mid output voltage in the diagram 18 was set within ±10mV. Since these models belong to Class AB, the Bias voltage U_{be} of power transistors usually set at the voltage which the transistors just connected. As over DC will cause waste too much, low DC causes distortion, "C transistor Bias voltage" usually set to +0.47-0.49V; "A transistor Bias voltage" usually set to -0.47-0.49V. Adjust variable transistor VR2 change the mid output DC voltage, adjust VR1 change C and A transistor's Bias voltage.

(2) Voltage boost stage positive & negative voltage value and power boost stage positive & negative voltage value:

	FV+（V）	FV-（V）	HV+（V）	HV-（V）
CA2	+73	-73	+61	-61
CA4	+90	-90	+78	+78
CA6	+110	-110	+98	-98
CA9	+122	+122	+110	-110

1. Setup of CA12/18 output mid voltage and sub-stage Bias voltage:

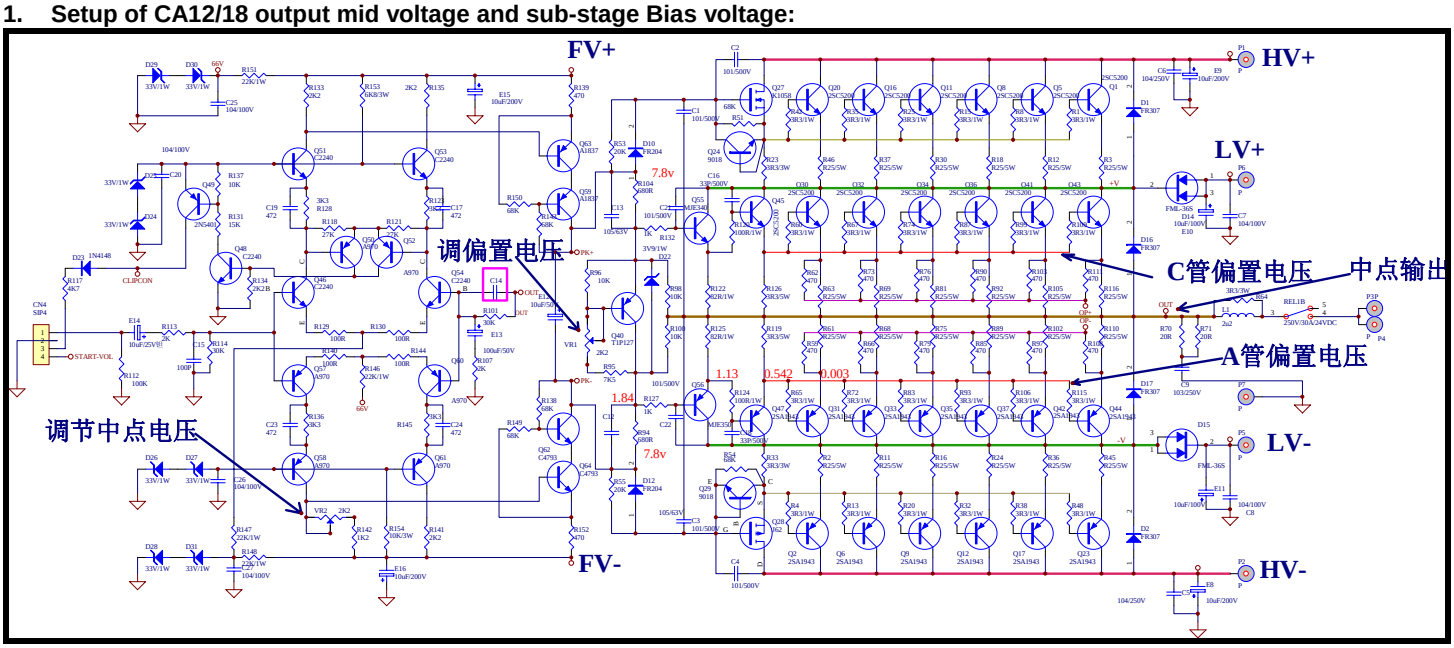


Diagram 19

(1) Static state: In Diagram 19, usually the "mid output voltage" set within ±10mV. CA12/18 is Class H, "C transistor Bias voltage" usually set to +0.47-0.49V; "A transistor Bias voltage" usually set to -0.47-0.49V. Adjust variable transistor VR2 change the mid output DC voltage, adjust VR1 change C and A transistor's Bias voltage.

(2) Voltage boost stage positive & negative voltage value and power boost stage positive & negative voltage value:

	FV+（V）	FV-（V）	HV+（V）	HV-（V）	LV+（V）	LV-（V）
CA12	+146	-146	+134	-134	+67	-67
CA18	+170	-170	+158	-158	+79	-79

Part 2: Repair Samples

Sample 1:

Defective phenomenon: One CA6 CHA Protect LED keeps illumed.

Steps: Check whether the phenomenon belongs to: 1. DC Protection; 2. Over-heat Protection; 3. Components damaged of relay circuit caused the relay no close.

Details:

(1) Check mid output voltage: 2mV, that is normal voltage, within ± 10mV, that is not DC Protection;

(2) Check over-heat protection components, if the resistor value no short circuit, that means not over-heat protection;

(3) After get rid of the above possibilities, please stress on testing the relay close circuit components, first test the power voltage, 24V is normal; then test the two ports of R67, if you find it is 24V DC, that means it has problems, normal voltage is around 22.7V. After removed the R67 then you may find the resistor was open, after replace the same model component, the equipment is normal again after turn it on.

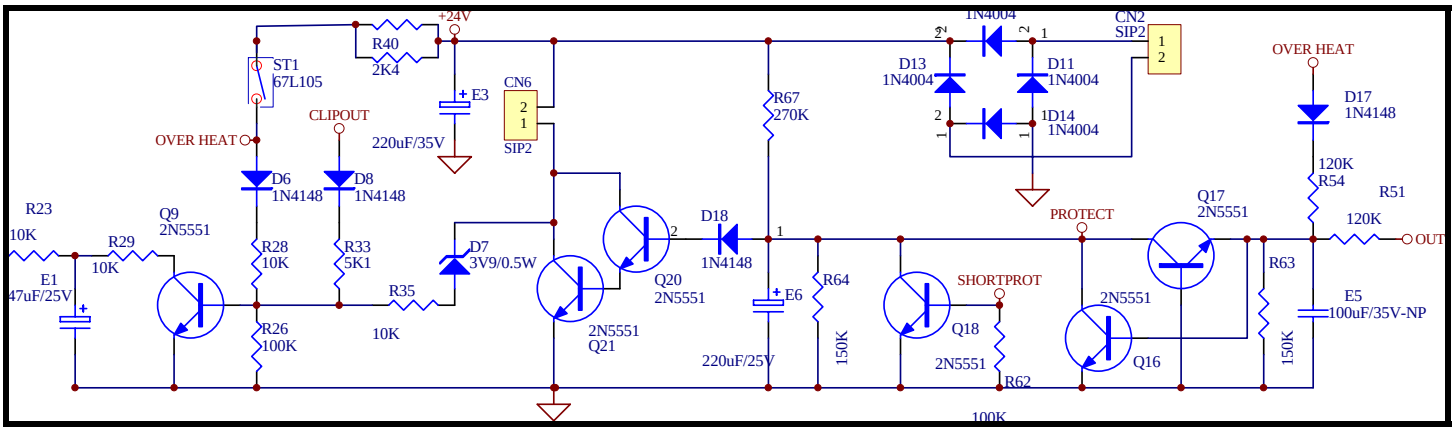


Diagram 20

Sample 2:

Defective phenomenon: One CA18, when turn it on, the relay close, input signal, CH1 output is normal, but CH2 signal is not light, no output.

Steps: CH1 normal, that means the input power supply is normal, and the transformer output voltage is normal. The defective may happen on the I/O board, also may happen on the Output Stage board. So, first to confirm which board is broken.

Open the top cover, when you found the DC fuse of CH2 all burned, the defective may happen on the Output Stage board. If all the four DC fuses were burned, the power transistors may have been damaged. On the diagram 21, it tells you how to judge the power transistors were damaged or not: On the low voltage, check the resistor value between base B and collector C of one of the transistors Q30, Q32, Q34, Q36, Q41, Q43 (drive transistor Q43 do not meet this disciplinarian). If the value is above K ohm, that means no power transistor was damaged; if the value is only several ohm (usually 7 ohm), that means some transistors were damaged. Check each value between base B and collector C of one of the transistor, if the value only several ohm, that can be sure that the transistor was damaged and need to replace anew one. The same method to judge the Q20, Q16, Q11, Q8, Q5, Q1 were damaged or not.

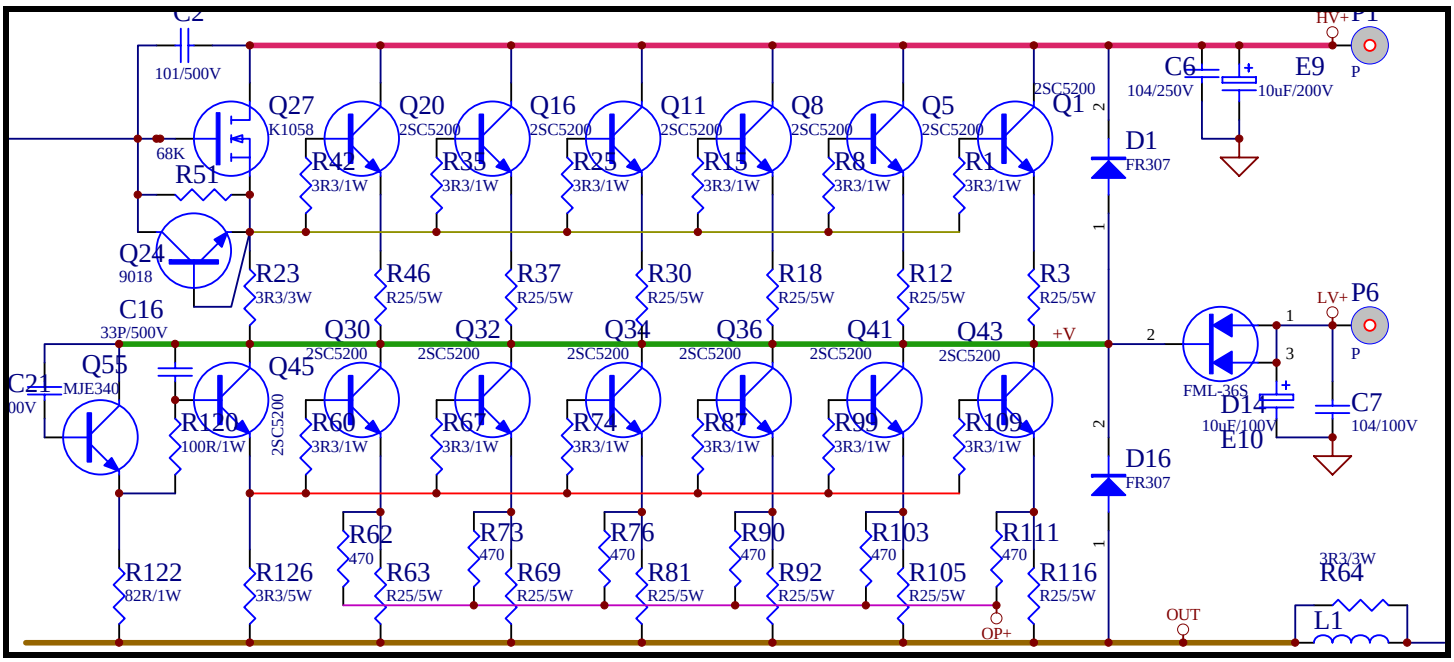

C2
101/500V
Q27
K1058
68K
R51
Q24
9018
C16
33P/500V
C21
MJE340
Q55
R120
100R/1W
Q45
2SC5200
R122
82R/1W
R126
3R3/5W
Q20
2SC5200
R42
3R3/1W
R23
3R3/3W
Q30
2SC5200
R60
3R3/1W
R62
470
R63
R25/5W
Q16
2SC5200
R35
3R3/1W
R46
R25/5W
Q32
2SC5200
R67
3R3/1W
R73
470
R69
R25/5W
Q11
2SC5200
R25
3R3/1W
R37
R25/5W
Q34
2SC5200
R74
3R3/1W
R76
470
R81
R25/5W
Q8
2SC5200
R15
3R3/1W
R30
R25/5W
Q36
2SC5200
R87
3R3/1W
R90
470
R92
R25/5W
Q5
2SC5200
R8
3R3/1W
R18
R25/5W
Q41
2SC5200
R99
3R3/1W
R103
470
R105
R25/5W
Q1
2SC5200
R1
3R3/1W
R12
R25/5W
Q43
2SC5200
R109
3R3/1W
R111
470
R116
R25/5W
R3
R25/5W
+V
OP+
D1
FR307
D16
FR307
HV+
P1
P
C6
104/250V
E9
10uF/200V
LV+
P6
P
FML-36S
D14
10uF/100V
E10
C7
104/100V
OUT
R64
3R3/3W
L1

Diagram 21