

Principle, Knowledge and Maintenance of AV230 (RU) Contents

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Chapter One Product Description

AV230 (RU) is an intelligent premium power amplifier that adds touch button and voice navigation to its predecessor, allowing it to have a handsome and distinguished appearance as well as a complete man-machine interaction mode that facilitates user operation. Its main characteristics are as follows:

1. Built-in 5-channel power amplifier that can adapt to AC-3/DTS and stereo music playback. 110W main channel and central surround sound.
2. Mix of AC-3/DTS, VCD and DVD. AUX input interface and super bass/stereo output interface.
3. 6-channel volume control and independent level control. 7-stage electronic balance.
4. Bass enhancer system, cyber logic, hi-fi playback.
5. One button for movie, music and karaoke.
6. Intelligent voice navigation.
7. Multiple electronic balance modes that adapt to different music styles.
8. Automatic spectrum analysis and compensation, automatic signal compensation.
9. Profile surround sound. Situation effect processing for AC-3/DTS effect.
10. Multiple spectrum display modes.
11. Complete karaoke function including microphone independent volume control, overall volume control, and voice compensation, delay and echo adjustment.
12. Karaoke wide sound field function.
13. Touch control function.
14. Intelligent protection upon overcurrent and over voltage.

Chapter Two Operating Principle

Section One Structure

AV230 (RU) mainly consists of the following seven parts:

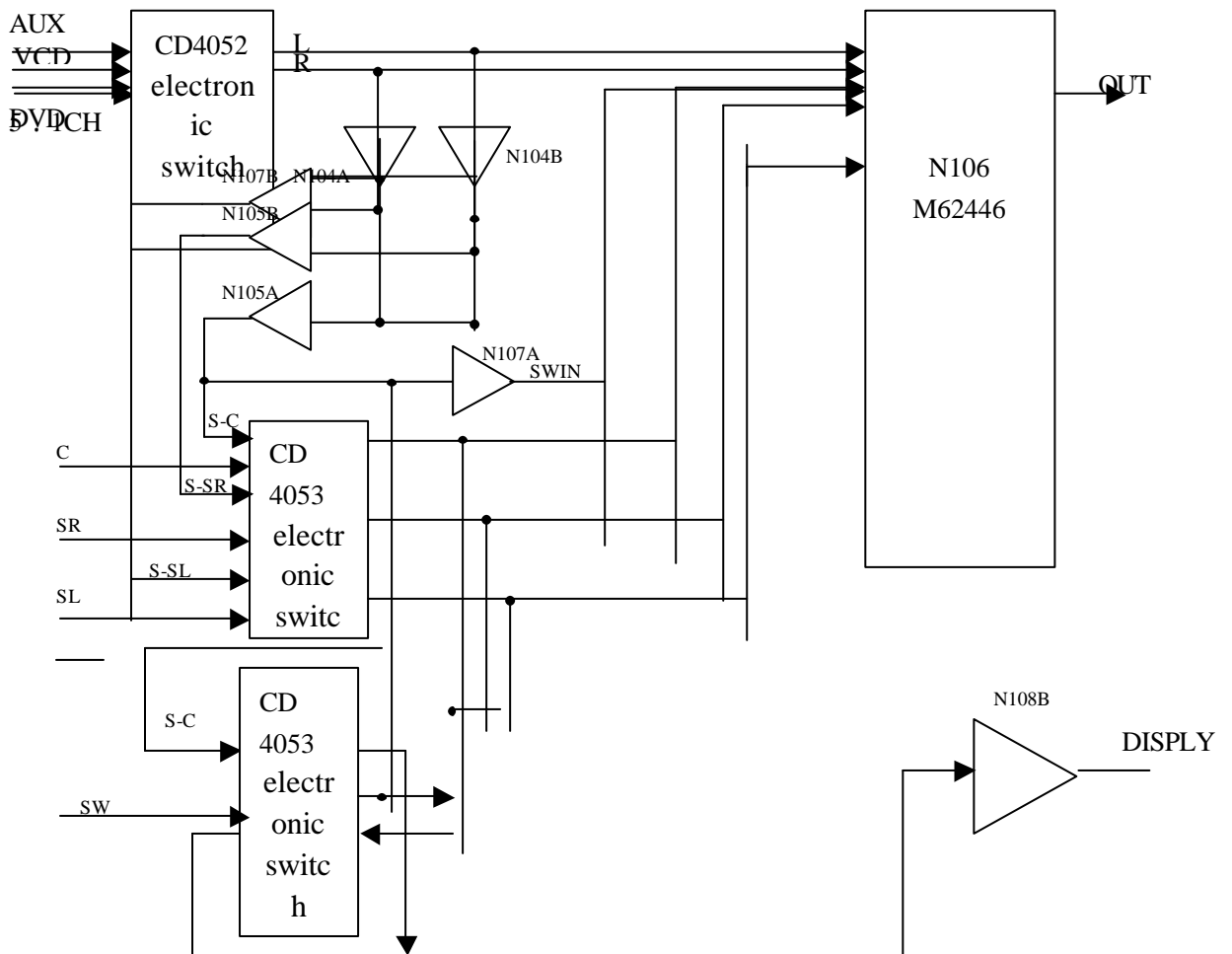
- I. Volume Board: select input of signal source, cyber logic, and bass enhancer control.
- II. Signal Processing Board: karaoke signal processing and 5.1-channel signal amplification.
- III. CPU Board: overall control, frequency point gating, automatic search circuit.
- IV. Control Panel: VFD display, touch selection and backlight display.
- V. Voice Board: intelligent voice navigation system, operating mode indicated by voice
- VI. Power Panel and Protection Circuit: provide operating voltage required by element circuits and execute overall protection.

VII. Power Amplifier Board: power amplification of 5.1 channel signal or analog signal.

Section Two Volume Board

AV230(RU) has four input modes: AUX., VCD, DVD and 5.1 channel.

The cyber logic function of AV230 (RU) is to get C/SR/SL/SW channel signals by sampling from L/R channel and then processing through low-pass filter and adder subtractor. Mode switch is achieved using electronic analog switch. The signal flow chart is as follows:



I. Input option and sound field processing mode

The input option of AV230 (RU) is achieved via electronic switches CD4052 and CD4053, the truth tables of which are as follows:

5.1 channel input mode: Now A/B/5.1CH control pins of M62446 are of high level. L/R channel signal of 5.1 input is outputted from pin 3/13 of N101 and sent to IC N106 for

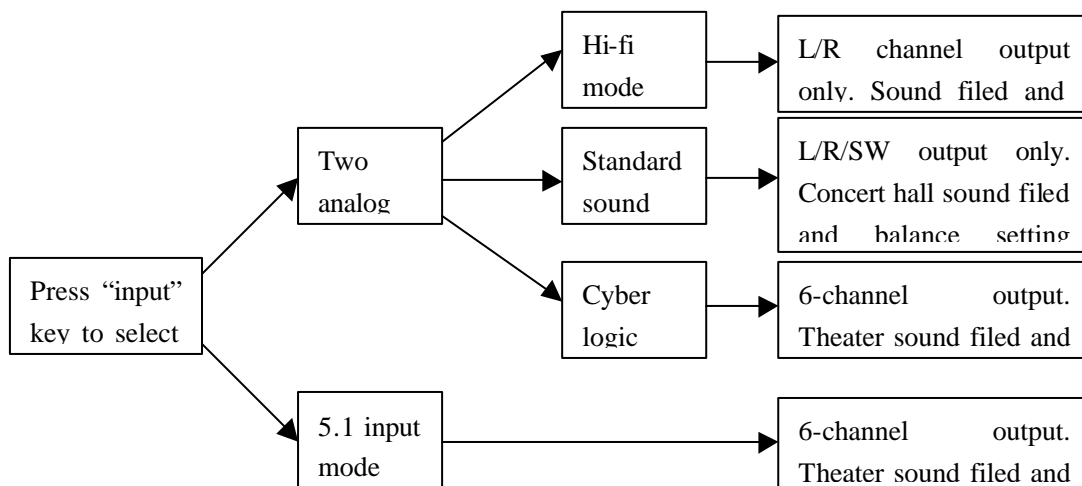
volume and tone control; meanwhile, C/SR/SL signal on 5.1 input terminal is respectively sent from pin 14/15/4 output of N410 to IC N106 for independent volume control. And SW signal is outputted via pin 4 of N103 and then send to M62446 after being amplified by N107A.

Three analog input modes: AV230 (RU) totally has three analog input modes: AUX/VCD/DVD, which are controlled via A/B signal respectively (see details in truth tables).

AV230 (RU) totally has three sound field modes: standard sound field, cyber logic and Hi-Fi.

1. Standard sound field: Under overall CPU control, when bass enhancer is off, L/R channel output and subwoofer output are available; when bass enhancer is on, only L/R channel output is available.
2. Hi-fi: Under overall CPU control, only L/R channel output is available to M62446;
3. Cyber logic:

Pin 9/10 of electronic switch N101 (CD4052) select a series of analog L/R channel input signals. N101 (CD4052) signals. L/R signals are outputted from pin 13/3 via the internal electronic switch of N101, and divided into two ways. One way is respectively sent into pin 13/15 of M62446, for electronic volume and tone control. The other way produces SW/S-SR/S-SL/S-C signals via buffer, adder-subtractor and low-pass filter. SW/S-SR/S-SL signals are sent to pin 12/2/5 of N102. N102 select synthesis and decoding signal input (see truth table of CD4053) from synthesis and decoding and 5.1CH signals, outputs C/SR/SL signals and sends into pin 11/8/9 of M62446 for volume control. Still another way of SW



signal directly sends to pin 6 of M62446 after being outputted from N107A. 5.1CH signal sent into M62446 is outputted from pin 31-36 after volume and tone control, and then outputted to signal board by XS20 power distributor.

The relation between sound sources in input circuit and sound processing modes is as illustrated below.

II. Control circuit

Pin 23/26/27 of CPU (N100) output data, PVST and clock signal and send to pin 39/40/41 of M62446, controlling pin 1/2/3/4 of M62446 to output control level, so as to select input signal and spectrum sampling signal. It is worth noting that PVST signal is a latch control signal. When the data and clock of CPU is sent to M62446, an identification signal will be added, indicating that this signal can only be used by M62446 while other IC of I²C bus can not use current data and clock signal.

III. Frequency spectrum sampling circuit

Only S-C/S-SR/S-SL/SW signals are sampled during frequency spectrum sampling in AV230 (RU) and added to pin 14 via a 150K sampling resistance. Another S-C synthesis and decoding signal is added to pin 1 of N103, called S-C'. 5.1CH and LR-T of M62446 select sampling signals. When synthesis and decoding is selected, the control signal of 5.1CH is of low level while pin 9/11 of N103 is of low level. According to the truth table, it is known that the outputs are X0/Z0. Sampling signal is grounded while LR-T is of H level. Select Y1, S-C' signal is outputted from pin 15 of N103 to N108B, adding to OK-R signal for the amplification of frequency spectrum signal, and then sent to frequency point gating and auto search circuits.

Section Three Signal Processing Board

The signal processing board superposes, mix and amplify 5.1-channel signal sent from the volume board, voice signal sent from the voice board and karaoke signal.

I AV230 (RU) Karaoke Circuit

1. Function: this circuit process human voice through power amplifier and reproduce it via speaker. It includes human voice beautification circuit, wide sound field processing circuit, karaoke echo and delay regulating circuit. In addition, AV230 (RU) has a special circuit that enables 5 profiles without inserting microphone.

2. IC and its role for karaoke

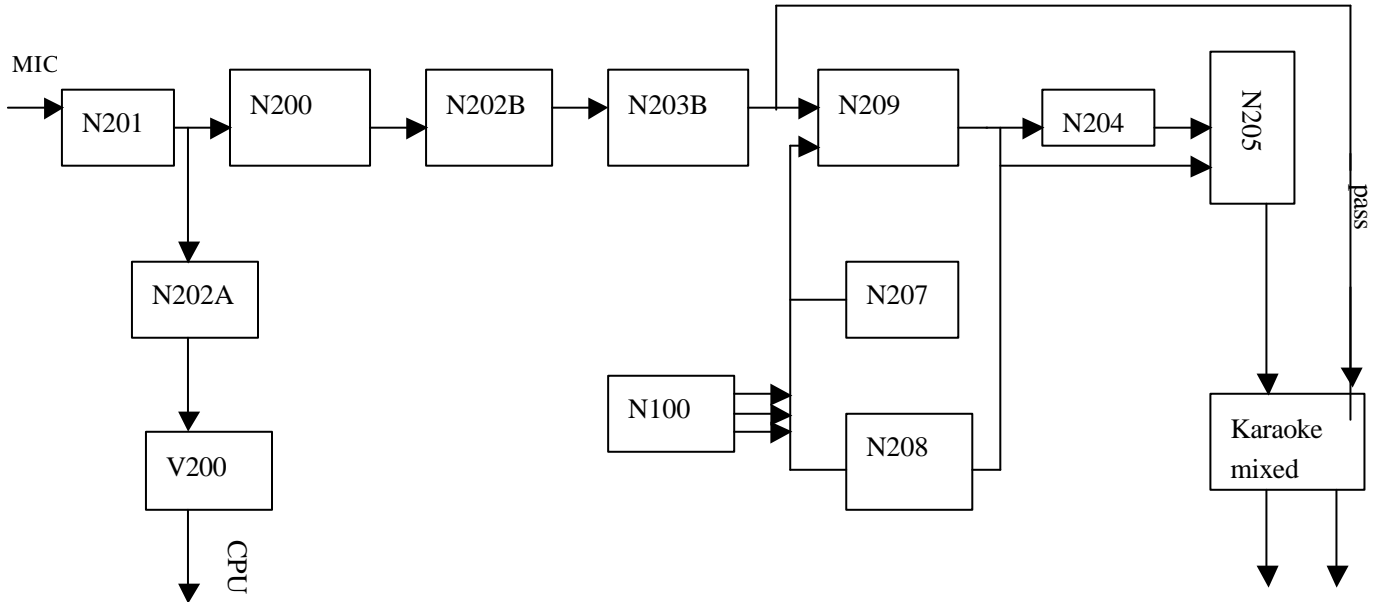
| IC serial number | Name of IC | Role of IC |
|------------------|------------|---|
| N201 | 4558 | Transmittal. Preamplification for karaoke signal |
| N200 | PT2315 | Volume control of karaoke, including tone control |
| N205 | CD4053 | Electronic switch |
| N209 | PT2399 | Karaoke echo processing |
| N207 | CD4051 | Karaoke delay adjustment |
| N208 | CD4051 | Karaoke echo control |
| N204 | 4558 | Phase inverter |

PT2315 function pin

| S/N | Name of pin | Description | Remarks |
|-----|-------------|---|---------|
| 1 | REF | Reference voltage (1/2VDD) | |
| 2 | VDD | Power supply | |
| 3 | AGND | Analog | |
| 4 | TREB L | L/R channel treble control pins | |
| 5 | TREB R | | |
| 6 | RIN | R channel input | |
| 7 | LOUD-R | R channel loudness control pin | |
| 9 | LOUD-L | L channel loudness control pin | |
| 11 | LIN | L channel input | |
| 12 | BIN L | L channel bass control input/output pin | |
| 13 | BOU L | | |
| 14 | BIN R | R channel bass control input/output pin | |
| 15 | BOU R | | |
| 16 | RFOU T | R channel output | |
| 17 | LFOUT | L channel output | |
| 18 | DGND | Digital | |

| | | | |
|--------|------|---|--|
| 19 | DATA | (DATA) control data of sequence transmission (DATA) | |
| 20 | LCK | Clock input of sequence transmission | |
| 8 , 10 | NC | Not connected | |

3. Flow chart of karaoke signal



When the microphone is inserted, MIC signal is sent via MIC to the transmittal circuit combined by N201A and N201B for amplification. Amplified MIC signal gives CPU a MIC identification signal after N202A amplification, followed by VD201 rectification and filtering control triode V200. CPU sends PKM signal, which is of low level, causing cutoff of triode V103/V105 and enabling output of MIC signal; another way reaches pin 6/11 of PT2315 after C219/C222 coupling, outputs from pin 16/17 after internal volume and tone control, mixed into one way and sent to N202B and then reversely send to N203B for amplification. Signals amplified by N203B are divided into two ways. One way is directly outputted. The other way is outputted from pin 14 after being coupled by R222/C247 to PT2399 for internal delayed reverberation adjustment, reversed by N204 and outputted by mixing with karaoke signal. While OK-R is outputted from pin 14 after being gated by N205 and superposed to L/R channel.

In this circuit, the bass boost network made up of triode V201 connected to the negative terminal of N202B is primarily for bass boost of 75HZ low frequency signal.

During delay adjustment for PT2399, first control signal is given to CPU, which sends this control signal to N100 by data communication with voice processing IC (N100HT86P00, HT86384), and then N100 will control N207 to connect to pin 6 of PT2399 by selecting different resistance values for purpose of delay adjustment.

Echo control is to change the resistance value at the connection point to R229, so as to change the superposition on through connect signal for echo control.

The wide sound field processing control signal of SOK's karaoke is in wide sound field mode when it is of high level, when the signal of OK-R is the OK signal inverted by

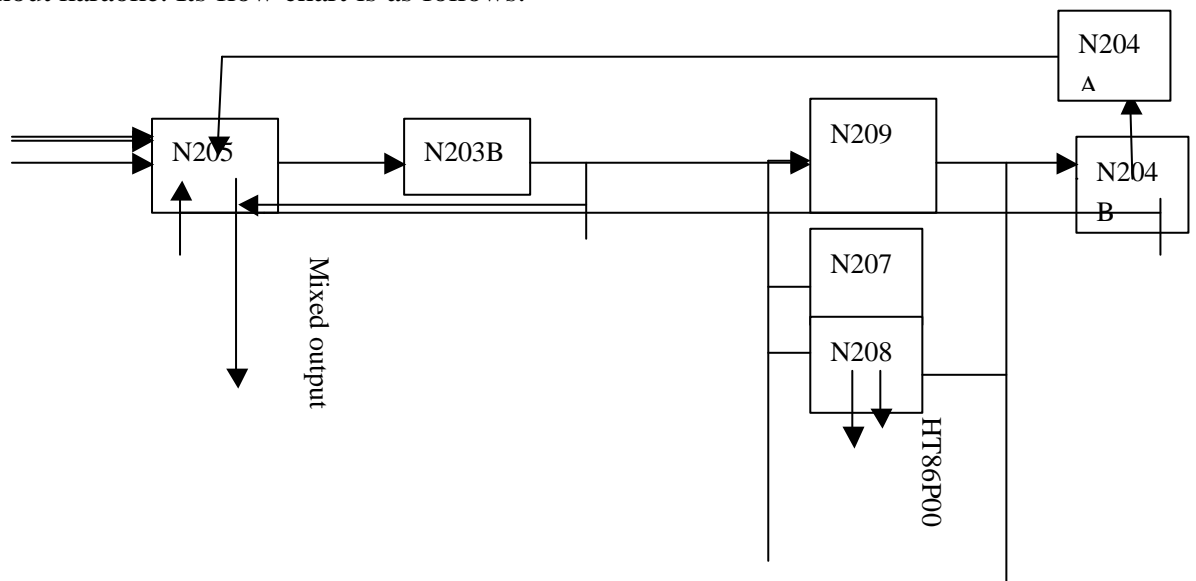
N204A.

A sense signal of OK-SW on the MIC plug conducts MIC signal detection together with the network made up of V200. When MIC is not plugged, it is of low signal; when plugged, it is of high signal.

Karaoke auto mute is also available. When P-KT fails to detect signal for a continuous time, CPU will send a P-KM signal to mute karaoke and avoid MIC from receiving noise, which may affect sound effect.

- **Signal flow chart of profiles**

AV230 (RU) has a special function that switching between 5 profiles is available without karaoke. Its flow chart is as follows:



When pin 9/10 are of high level, sampled L/R/C signals are outputted via from pin 3 N205 gating, and sent to the internal of PT2399 after amplification by N203B for reverberation delay adjustment (by HT86P00 and HT86384 for voice processing), and then superposed to L/R/C channel to form different profiles.

In this circuit, MIC shall not be inserted and is only available in 5.1CH mode. N203A is for the purpose of reversal.

II. Bass enhancer circuit

P-BURST is the switch signal of bass enhancer. When it is of high level and added to the base electrode of V102, V102 will be switched into conduction. When the collector electrode outputs low level, V107 will be cut off; when the collector electrode is of low level, V107 will also be cut off. SW signal is normally outputted to external terminal. Meanwhile, the high level signal of P-BURST is added to the emitter electrode of V108. V108 is positively biased and switched into conduction. The collector electrode adds high level to the base electrode of V101. V101 is positively biased and switched into conduction, and ground SW signal, not superposing it to L/R channel signal.

In reverse, when P-BURST is of high level, V100 will be switched into conduction and SWM signal cannot be outputted from external terminal. Meanwhile, V101 is cut off and SW signal is superposed to L/R channel signal.

The bass enhancer of AV230 (RU) can be divided into three steps. This principle is to change the volume of bass enhancer by changing the SW output volume of M62446.

Meanwhile, SWM signal is added to relay via XS9. When the relay is off, SW signal will be grounded, disabling the output at super bass port.

III. Mixing and amplification circuit of 5.1 signal and karaoke

After L/R channel signal of 5.1 signal is superposed with SW signal and amplified by N101B/N100B, it is sent to the reverse phases of N101A/N100A. Meanwhile, OK-R/OK-L signals are also respectively added to the reverse phases of N101A/N100A. After mixing and amplification by N101A/N100A, they are outputted respectively from pin 1 of N100A/N101A to power amplification circuit for power amplification.

Meanwhile, the C-1 signal sent by volume board is added to the reverse phase of pin 6 of N102B and added to the reverse phase of N102A after amplification. Now C1-1 signal after electronic reverberation processing is also added to the reverse phase of N102A and sent to power amplification circuit after mixing and amplification.

SR-1/SL-1 of another volume board is also added to the reverse phases of N103B and N104B for amplification and then sent to N103A and N104A for further amplification, and later sent to power amplification circuit.

One way of 5.1 signal being mixed and amplified is sent to power amplification circuit passing through XS9, and the other way forms DIST (distortion error detecting signal) signal passing through R111-R113/R142/R145/VD100-VD104, which will be added to CPU for automatic gain, so as to control volume output.

IV. Voice channel test circuit

| | CD4051 | | | | | Truth | | |
|---|--------|----|----|----|----|-------|----|----|
| | X0 | X1 | X2 | X3 | X4 | X5 | X6 | X7 |
| A | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| B | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| C | 0 | 0 | 0 | 0 | 1 | / | 1 | 1 |

N105 is a single pass 8-option electronic switch, 5 ports of which are used. The voice signal of voice board sent by C127 and R155 to the reverse phase of NN108A for amplification, and then added to pin 3 of N105. The output terminal is changed by high/low control level of pin 9/10/11 (see the truth table above), enabling it to respectively add to the reverse phase of N100A/N101A/N102A/N103A/N104A as required by CPU, for mixing and amplification with 5.1 signal, so that speakers can produce corresponding sounds when being tested and thus determining if each speaker is normal.

Section 4 CPU Board

Achieve overall control, automatically search input signal and analyze spectrum

CPU Overall Control

N100, the overall CPU, is the overall control center, inputting all kinds of control instructions to controlled circuits to achieve all kinds of control functions. It adopts +5V supply with pin 40 as its supply pin. Pin 18 and pin 19 connect externally with 12M crystal oscillator to provide working clock frequency for itself. Pin 9 is its reset pin. When starting, +5V charges C106 via R100. The voltage of two ends of capacitance cannot be mutated, thus B-pole of triode V100 is low level, that is, V100 conduction gives a high-level reset signal to CPU. When capacitance C106 finishes charge, V100 stops and then reset finishes. The form of this reset circuit is to reset high level and keep low level.

When the machine is working, the static information of start log in the screen and Chinese characters are stored in CPU internal static memory. N101, a status memory, can record the current working status of machine when cutting off and show the status when next starting up, avoiding users to re-adjust. The sound mode set by users is also stored in it and can be activated when necessary.

Detect Input Signal and Automatically Search Circuits

DISPLAY signal from volume board is sent to N103A to amplify and limit level, and then sent to inverse end of voltage comparator N103B after

capacitance coupling. It inputs from pin 7 of N103B and then is sent to pin 16 of CPU via VD103, V101, R109 and R107. When N103B inputs a high level, VD103 is in reverse cut-off status, B-pole of switch tube V101 is high level and is in conducting status, then gets an about +5V high level (signal input) to CPU after VD101's stabilization and stop searching. When the output end of N103B outputs a low level, VD103 is in conducting status, B-pole of switching tube V101 is low level and is in cut-off status, and then CPU detects the low level (no signal input). Its working principles are:

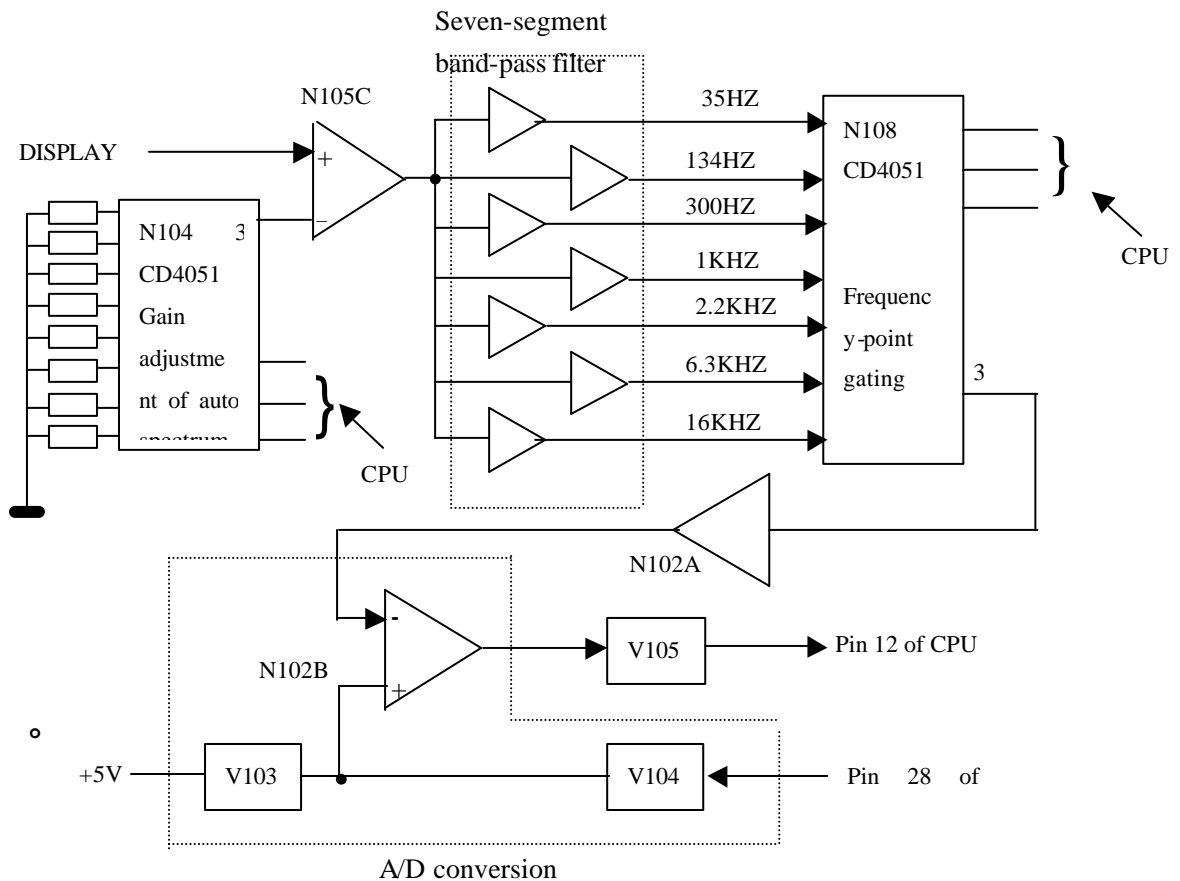
After starting up, under CPU internal program's control, a data signal is outputted via pin 23 to M62446, and then M62446 scans each input port of N101, N102 and N103 by emitting high and low levels. When the input ports have no signal input, it automatically becomes standby status. When any of ports has signal input, track paths of input N101, N102 and N103 has A/C signal which is amplified and limited level by N108B and N103A of CPU board, then compares with pin 5 of N103B and gets plus-minus level close to supply power. The cophase voltage of N103B is about 0.1V. After the direct current voltage is over 0.1V, the output end of N103B outputs low level is close to negative-power voltage, VD103 positive-bias conducts, switch tube V101 (S9014) stops, emitter outputs a low level to pin 16 of CPU which by controlling IC M62446 makes search level lock on the port through which signal inputs, to enter normal play.

When pressing "search" key of remote controller, it is converted from

optical signal to electric signal by the remote receiving head of panel. Pin 14 of CPU emits a high level to conduct V102 and search according to the same previous process.

Spectrum Analysis Circuit (See Following Diagram)

There are three parts for spectrum analysis circuit:



- 1, Automatic spectrum gain adjustment circuit:** to avoid two situations that spectrum display amplitude is too low when input signal is too weak

or spectrum display is in full screen when input signal is too strong, AV230 (RU) sets automatic spectrum gain adjustment circuit, using a single-channel one-from-eight electronic analog switch, its true value diagram is as following:

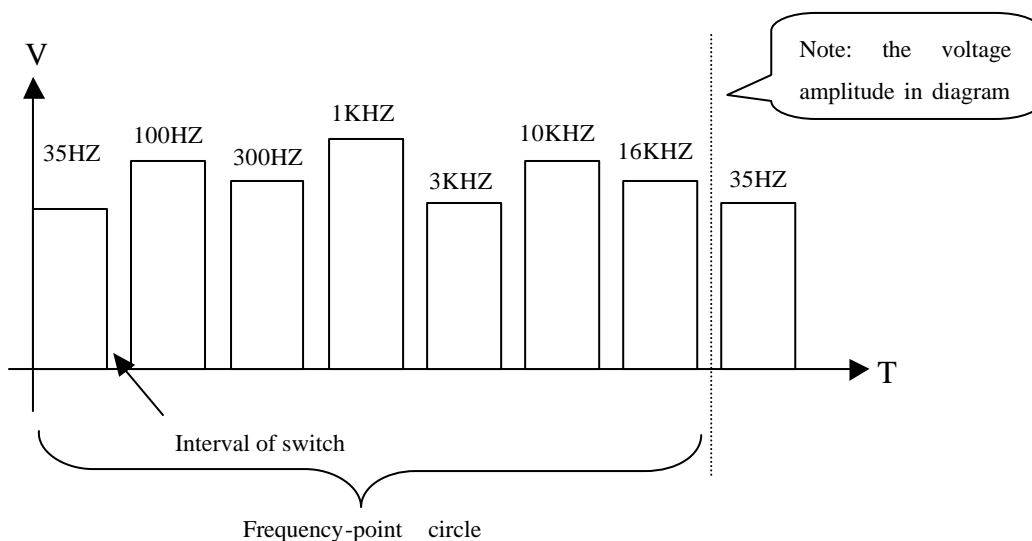
CD4051 Truth Value List

| | X0 | X1 | X2 | X3 | X4 | X5 | X6 | X7 |
|---|----|----|----|----|----|----|----|----|
| A | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| B | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| C | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

Its main working principle is to change the value of inverse ground resistance of transmittal N104 to change the transmittal gain multiple. Let's see the detailed work of the whole circuit. We've referred that spectrum analysis signal source (display) is sent to the cophase input end of transmittal N105C to amplify. Its amplification factor is determined by the value of the resistance connecting with the electronic switch of its inverse end N104. When the main volume is large, CPU will automatically increase the value of ground resistance and decrease the amplification factor; when the main volume is small, CPU will automatically decrease the value of ground resistance and increase the amplification factor.

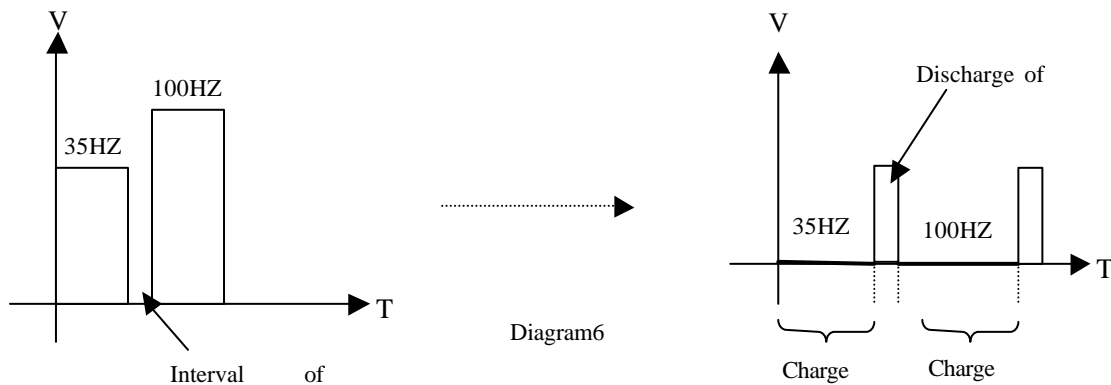
2、 Frequency-point gating circuit: signal amplified by N105C is sent via C115 coupling to seven band-pass filters composed of transmittals. By setting its capacity of feedback capacitance, its frequency-band range can

be determined. The frequency value of superscript of the output points is the central frequency-point of the frequency band. The output end of each band-pass filter is connected with a half-wave rectifier circuit. The amplified A/C signal is rectified to direct current. The circuit is mainly to achieve frequency-point sample. It can display the amplitude of all frequency-points of the whole sound signal via direct-current voltage. If the low frequency of sound signal is stronger, the current voltage of output end of 35HZ and 100HZ band-pass filter is higher. When high frequency is stronger, the current voltage of 10K and 16K band-pass filter is higher. The output ends of the seven band-pass filter are connected with the seven input ends of electronic switch N108 (CD4051). These electronic switches will quickly circularly-switch among frequency points (refer to previous true value diagram). Pin 3 output end of N108 will output a string voltage value representing frequency point signal amplitude (see next diagram).



3、 A/D conversion and output circuit display (two situations):

1、 When no signal input, pin 28 of CPU sends a high level to B-pole of V104. The positive end of N102B is low voltage, the inverse end of N102B gets partial voltage of R189 and R172, making N102B output a low level, that is, triode V105 stops and C-pole of V105 will give a high level to pin 12 of CPU to let CPU not conduct AD conversion (pin 6/7/8 of CPU are inactive and keep high level).

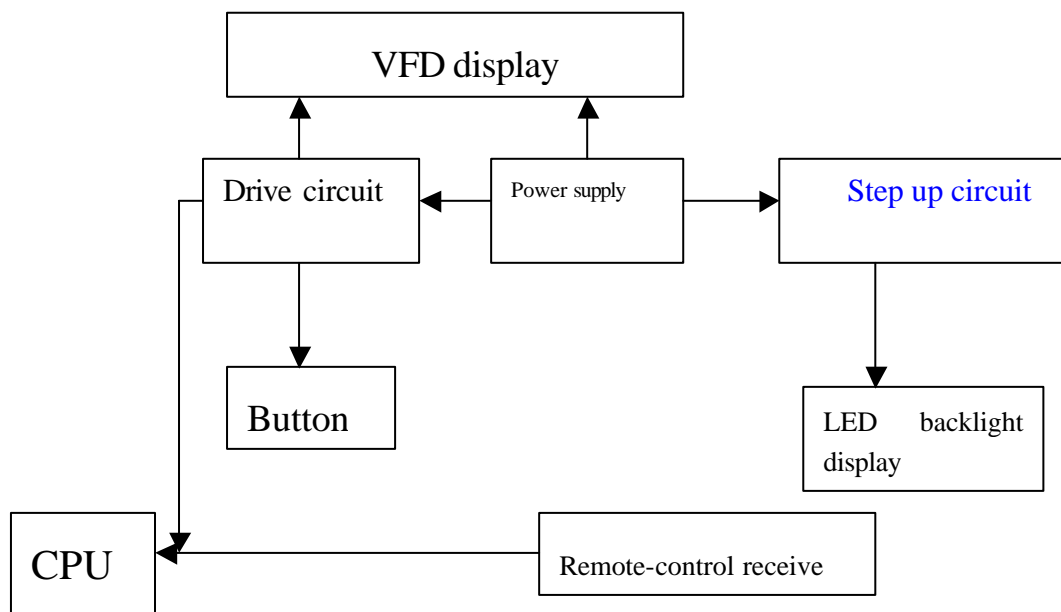


2、 When the machine has detected the signal (the inverse end of N102B has a current voltage representing 35HZ signal amplitude), pin 28 of CPU is converted into low level and +5V voltage charges for C137 via V103. When reaching the voltage value of inverse end, the comparator converts and N102B outputs high level. Once CPU receives low-level signal, it stops 35HZ level gating and converts into next frequency point 100HZ. During conversion, pin 28 of CPU outputs an instant high level to conduct V104, leak the voltage capacity of C137 and make the cophase end of N102B restart to charge

100HZ from 0-level. When the charge of 100HZ finishes, the charge and discharge of next frequency point begin, and such process occurs circularly under the control of CPU. The charge time form 0-level to the occurrence of output conversion represents the signal amplitude of current frequency point—the larger the amplitude, the longer the time and the amplitude displaying in screen is higher; the smaller the amplitude, the shorter the time and the amplitude displaying in screen is lower. Digital pulse outputted from N102B output end is added by V105's inverse to pin 12 of CPU which handle it and output to panel to display dynamic frequency in screen. The display of original frequency points is sequential. However, the above circular process is extremely quick, thus, what we see in screen is the progress of the whole spectrum displaying synchronously.

Chapter 5 Control Panel

The panel control circuit is the window for man-machine interaction. It can communicate the operation command with CPU to finish kinds of artificial operations. At the same time, it is the window of the complete machine by which human can predominate the complete machine's working status. It is also the important element to its appearance. The AV230 (RU) panel control circuit block diagram are showed as follows:



Power supply circuit

1. The AV230 (RU) control panel have +5V , -30V , ~ 2.8V power supply。 The circuit consists of VD109 , VD110 , VD102 , VD103 , V107 and V108。

Operating principal :

After the AC current from the transformer was rectified and filtered by VD109 and VD110 , the series regulated power supply

made up of V107 and V108 supply +5V for the next. With the VD102 for rectification and VD103 for stabilized voltage at the same time, the -30V for display driving was supplied to 16311. In addition, another ~2.8v was delivery to display filament to make VFD filament brighten.

Circuit for VFD display drive and push button

The circuit consists of N101, N102, touchscreen and VFD. The tact switch of touchscreen was made of glass which the backlight can transmit through to play the role of ornament.

Operating principal :

When displaying, the 16311 receive the signal for displaying from CPU through VFD communication port, and make the corresponding VFD field point lighten by internal processing. If there is any push button be operated, corresponding signal would be output to CPU through the inner push button matrix code of 16311.

Step up circuit and backlight circuit

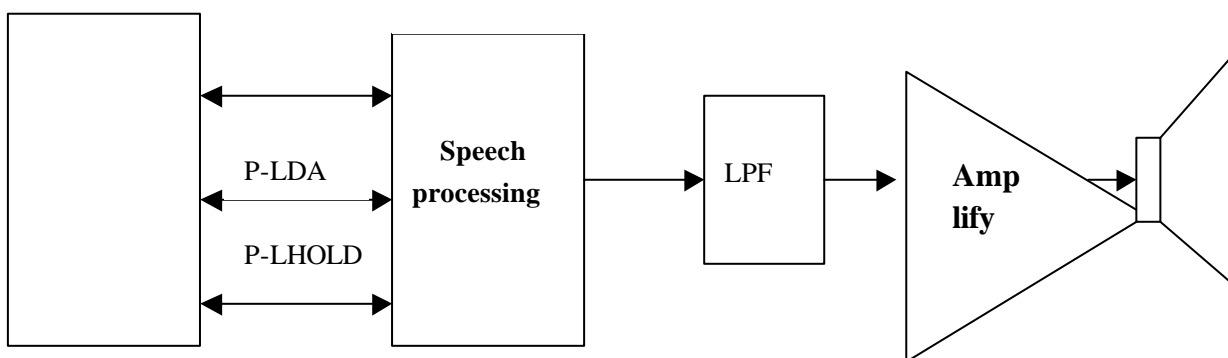
This circuit consists of N104MP8004 step up IC, step-up coil, V104, V105 control triode and backlight.

Operating principal :By control the first pin and the third pin of IC8004, system controls the PWM signal of inner IC, then control V104 and V105 to make the step-up coil store energy and step up, and supply the backlight for lighten ulterioriy.

Section 6: Speech Board

AV230 (RU) amplifier circuit, comparing with previous amplifiers, has a greatest feature of adding a speech navigation system, making the whole machine more intelligent and humanistic.

一、 Block Diagram



When CPU receives the instruction, it immediately communicates with speech processing chip N100 (HT86384) to send the instruction to N100. The speech chip connects with EPROM. The speech is stored in the EPROM and after internal processing, couples via C127 from pin 30 output analog audio signal to low-pass filter circuit composed of N108A, then after filtering noise, couples by C126 to pin 2 of N106 (HT82V733) for power amplification and the amplified signal outputs from pin 1 and pin 7 ends to push the loudspeaker to emit speech signal.

CPU takes communications by P-LBCK, P-LDA and P-LHOLD.

二、 Working Conditions of HT86384

Pin 33 and 34 are clock pins, adopting 8MHZ working clock. Pin 27 and 28 are supply pins. Pin 22/23/24 respectively takes communications with P-LBCK, P-LDA, P-LHOLD and CPU. Pin 31 is reset-input pin, keeping high level for the resetting of low level (V100 with R103, R105 and R106 together forms reset circuit).

HT86384 is bonding IC. If the IC is damaged, please change the whole bonding board.

三、 Functions of HT82V733 Pin

| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------|--------------------|-------|---------------------------------|--------|--------------------------|-------------|--------------------|-----------------|
| Function | Output Negative | Input | External filter capacitor | Ground | Enable control end | Null pin | Output positive | Power supply |

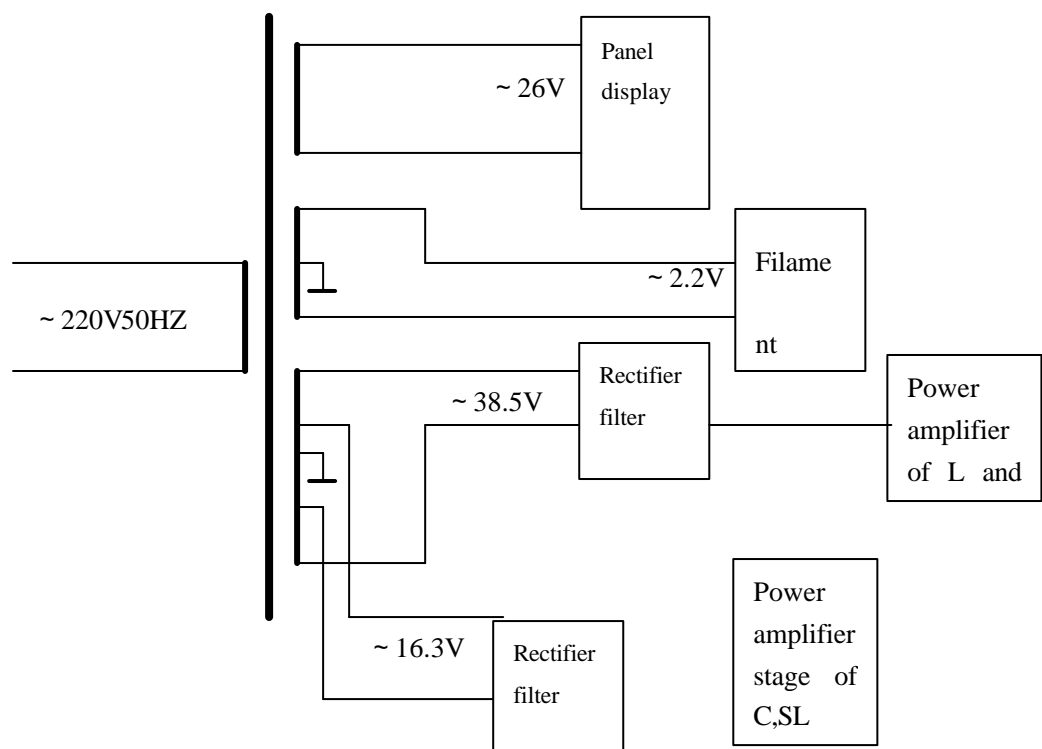
Note: pin 5 is enable control end. It is normally working when high level and forbidden to run when low level. By using it, the function of speech switch may be achieved.

Section 6 Power Board

It is used for providing all kinds of needed working voltage for units of the whole machine. AV230 (RU) adopts a ring transformer with 335W power. The middle and surround track of AV230 (RU) respectively adopt LM1875 and LM1876. LM1876, the dual-track power amplification IC, supplies power by separate positive power, ensuring there is high separating degree between

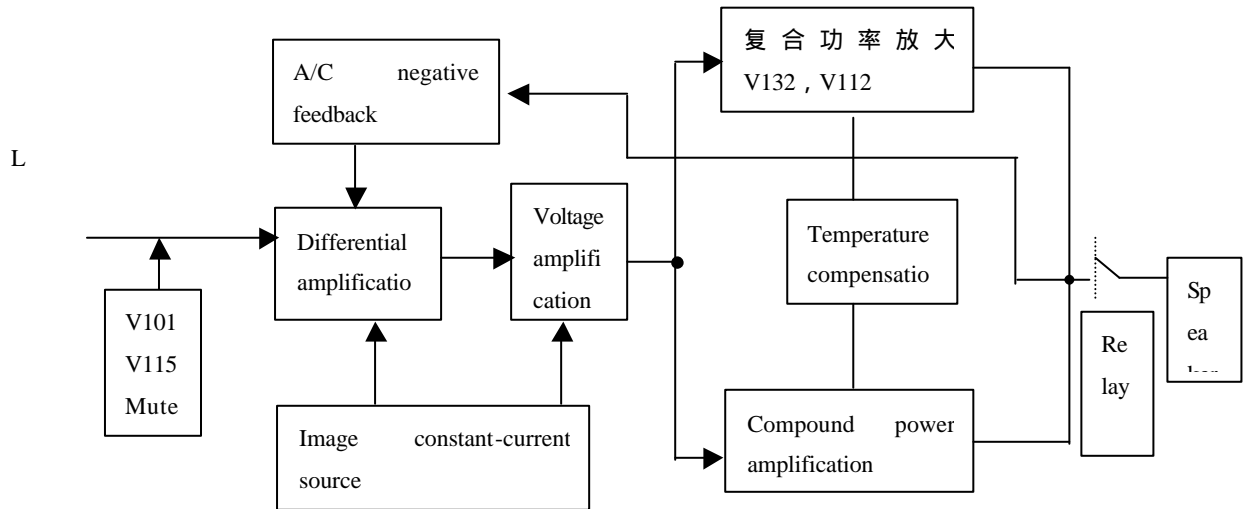
two surrounds. It adds +VSS supply comparing with previous machines. The diagram of power supply circuit is as following:

- 一、 Two A/C 38V of transformer first level output is rectified and filtered by four IN5404 and two big electrolytic capacitors (15000uF/68V) and gets plus-minus 53V power to supply for right and left sound tracks.
- 二、 Two A/C 21V voltage of transformer second level output is rectified and filtered by four IN5404 and two electrolytic capacitors (4700uF/35V) and gets plus-minus 28V power to supply for SL/SR/C sound tracks. Other IC and operational amplifiers are stabilized by stabilizing tube L7812 and L7912 and gets power to supply for other IC.



Power-amplification Board and Protective Circuit

一、Power amplification circuit of L and R sound tracks: L and R main power amplification circuits of AV230 (RU) are composed of separate elements. The block diagram is as following (taking L sound track for example)



L-track signal is sent by coupling of R101, R103 and C101 to B-pole of differential amplification stage V102. V102 and V103 compose of differential amplification circuit of single-end input and output. Speech signal is outputted from C-pole of V102 to B-pole of voltage amplification stage V105, and then to compound power amplification stage after amplifying voltage. V104, V107, VD102 and VD103 compose of image constant-current source circuit. VD102 and VD103 provide constant base current for V104 and V107. The emitter resistance of V104 decides the working current of differential amplification stage and the emitter resistance of V107 decides the working current of voltage amplification stage. V132 and V112 compose of compound tube amplification, making the final stage of power amplification with strong

current amplification, which compose of wave plus half-circle amplification. V133 and V113 compose of wave minus half-circle amplification, whose circuit structure is completely same to the previous tube. Two functions of temperature compensation tube V106 are: firstly, it is the base-level bias of upper and lower tubes. Its working status determines the static working current of compound power amplification. That is, we can set the static working point of compound power amplification stage by adjusting V106 conduction. The common way is to change the base resistance of V107. It can also automatically adjust the working status of compound power amplification stage when the temperature arises. The adjusting process is:

Total current of output stage = working current + leakage current

When temperature arises, leakage current also arises, causing the static working point flow (bad). At the same time, the leakage current of V106 arises and U_{ce} decreases, causing the bias current of output stage decreases, working status changes and working current of back pole decreases, in order to compensate temperature.

Voltage negative feedback is introduced in power amplification circuit of AV230 (RU), composing of R121, R109 and C105, stabilizing the static working point of differential stage. AV230 (RU) adopts direct output. R111 and C116 of its output end compose of Rubeier network, preventing high-frequency self-excitation caused by A/C inductive reactance of loudspeaker speech coil.

二、 The principle of R-track is same to that of L-track. No more words here.

三、 Mute circuit: when pressing mute key of remote controller, a photoelectric conversion mute signal by remote receiving head is sent to CPU, whose pin 35 and 36 emit a high-level mute instruction to conduct V115, V101 and V116 and L and R-track signal short pass ground, achieving the mute control.

四、 C, SR and SL power amplification circuit: comparing with previous machines, these three tracks of AV230 (RU) adopts special power amplification LM1876 and IC LM1875. LM1876 has 15 pins. The pin 2, 15 and 4 are respectively its plus-minus power pin. The pin 7/8/12/13 is its cophase and inverse input end. The rated output power of each track of the power IC can reach 20W with automatic mute function when starting up. 1875, five pins, is a power amplification IC with better performance and extremely simple application circuit which has 15W power output in rated status. Its pin 5 and 3 is plus-minus power supply pin.

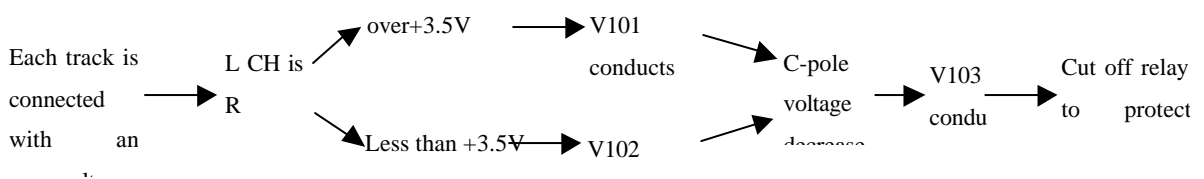
五、 Protective circuit

The protective way of L, R and C tracks is to cut off relay Y100 when starting up to cut off its output. SR and SL tracks protect by mute. AV230 (RU) has functions of starting delay protection, mid-point over-voltage and over-current protection and standby protection.

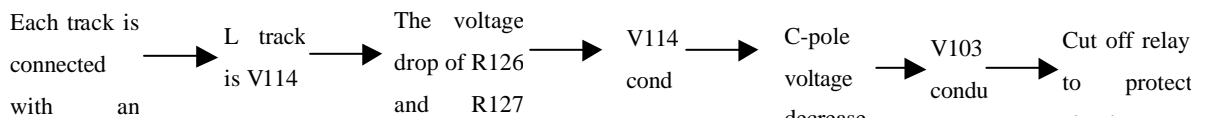
4、 Starting delay response protective circuit: because the circuit is unstable

when starting up and its dash current does great harm to sound box and power amplification circuit, the delay response protective circuit is set. There are two steps for starting delay response protective circuit: firstly, C, L and R. Its working process is: the A/C of transformer is rectified and filtered by VD113 and C110 to form a 22V voltage, then R108 charges C115 to inversely breakdown VD111 and V105 and V104 forward conduct, finally the Y100 responses and delay forms. Secondly, L and R surround tracks take starting anti-dash protection by following ways: when the system resets, pin 33 of CPU outputs a high level, passing R164 to pin 9 and 14 of LM1876 which outputs mute. After machine successes in delay starting, pin 33 of CPU switches into low level and SL/SR path normally outputs.

- 5、Mid-point over-voltage protection: the output end of each track is connected with a over-voltage sampling resistance. L-track is R116, R-track is R117, C is R118 and SR and SL are respectively R119 and R120. As long as any mid-point voltage of tracks is over +3.5V or lower than -3.5V, V101 or V102 conducts to decrease their C-pole voltage, then V103 conducts to finally cut off relay to protect circuit starting.



6、 Over-current and short-circuit protection: output load resistances of L and R-track are connected with an over-current sampling triode. The sampling tube of L-track is V114 and load resistance is R126 and R127. The power amplification IC of other three tracks has functions of over-current protection. As long as over-current occurs in L-track, the voltage drop of R126 and R127 will rapidly increase. Once the voltage drop of R129 is over 0.7V, V114 will conduct, and then V103 conducts and finally relay cuts off to protect circuit starting.



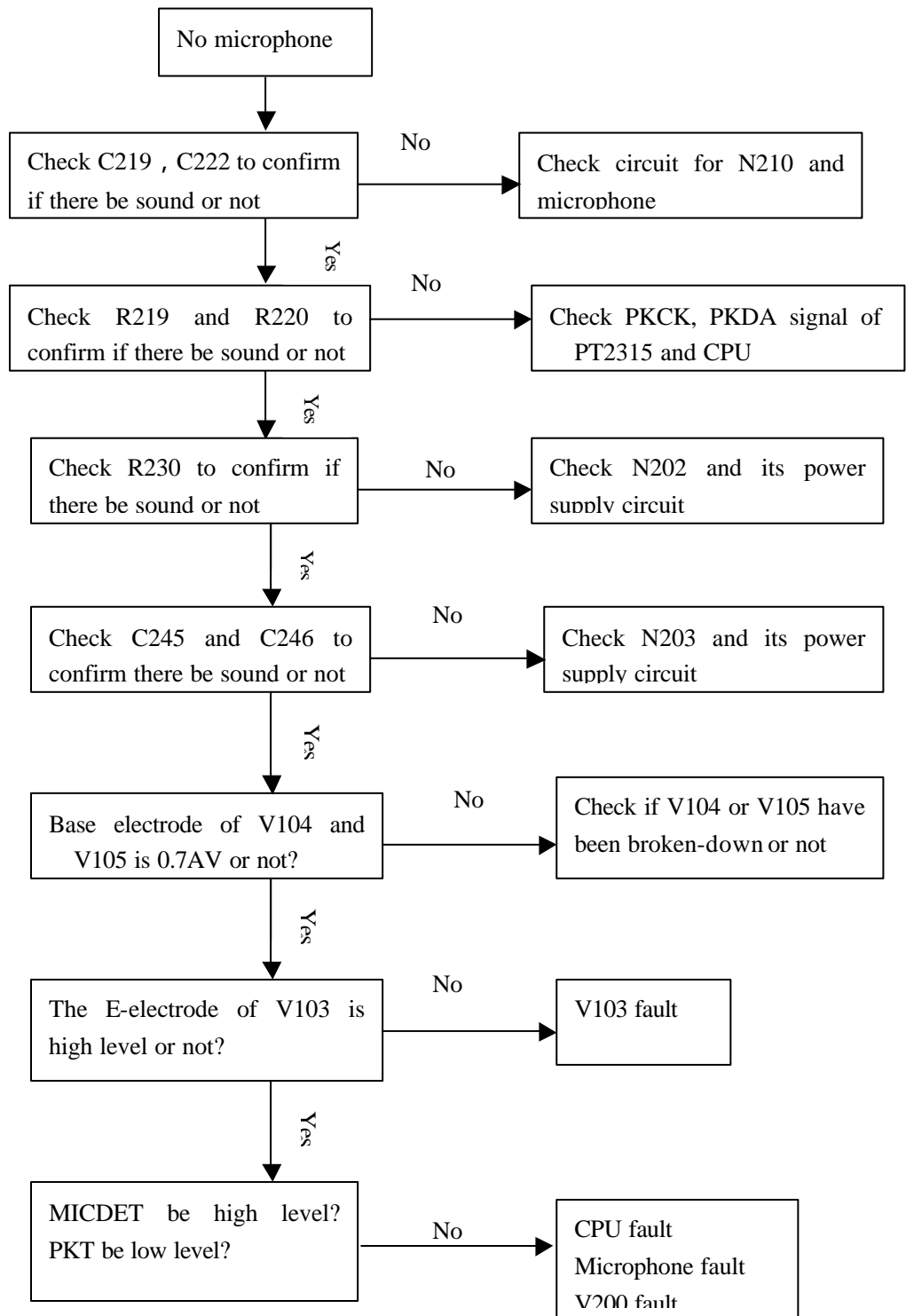
In same manner, voltage of R159 will be over 0.7V to conduct V129, then conduct V103 and finally cut off relay to protect loudspeaker.

7、 Energy-saving protection: when standby time reaches 10 minutes and still needs continuing, CPU pin 34 output PRC signal is high level which saturates and conducts V100 via VD108 and R101, then conducts V103 and finally cuts off relay to save standby energy.

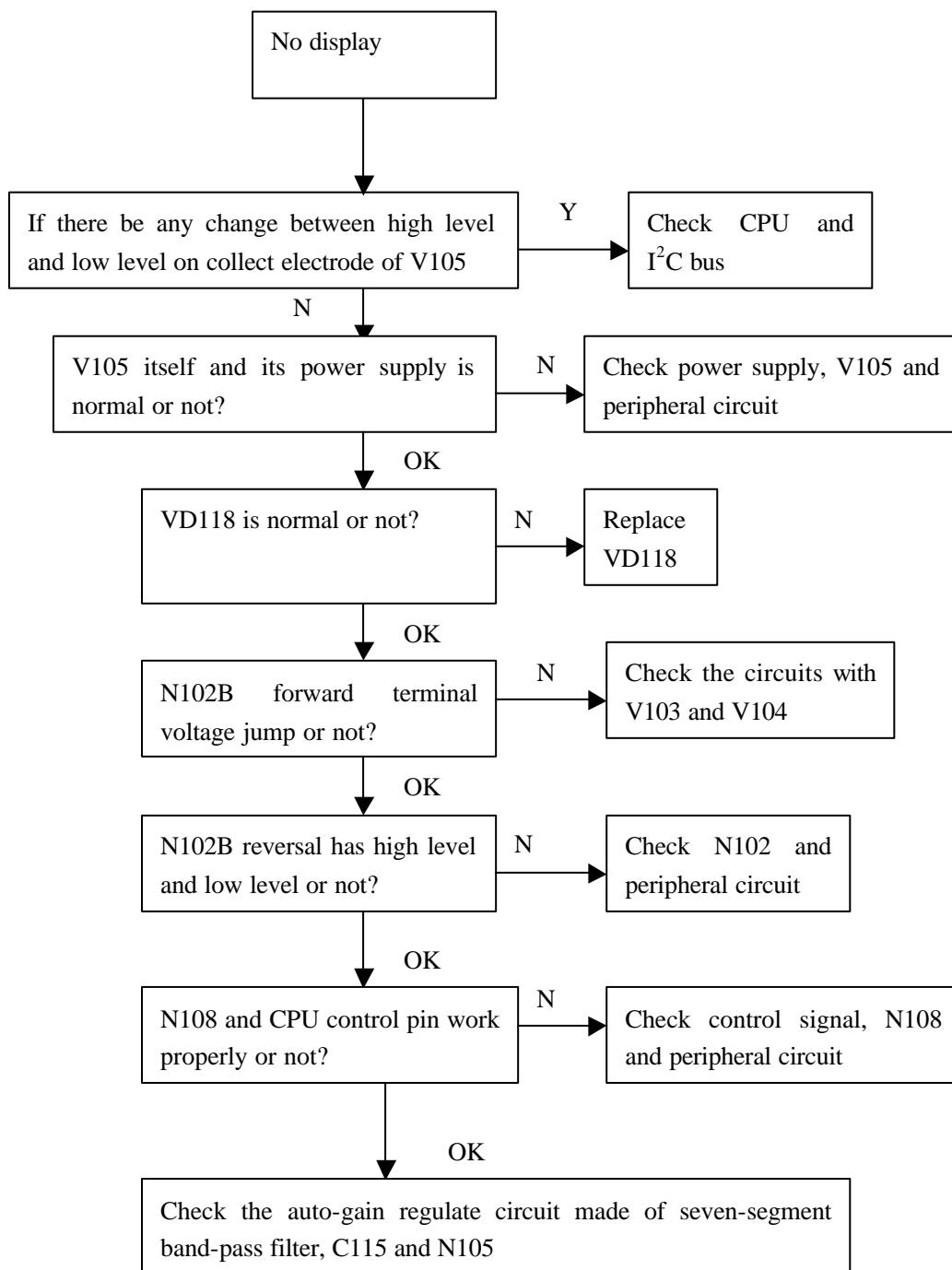
Maintenance and repair flow

Malfunction Phenomenon : Sound fault

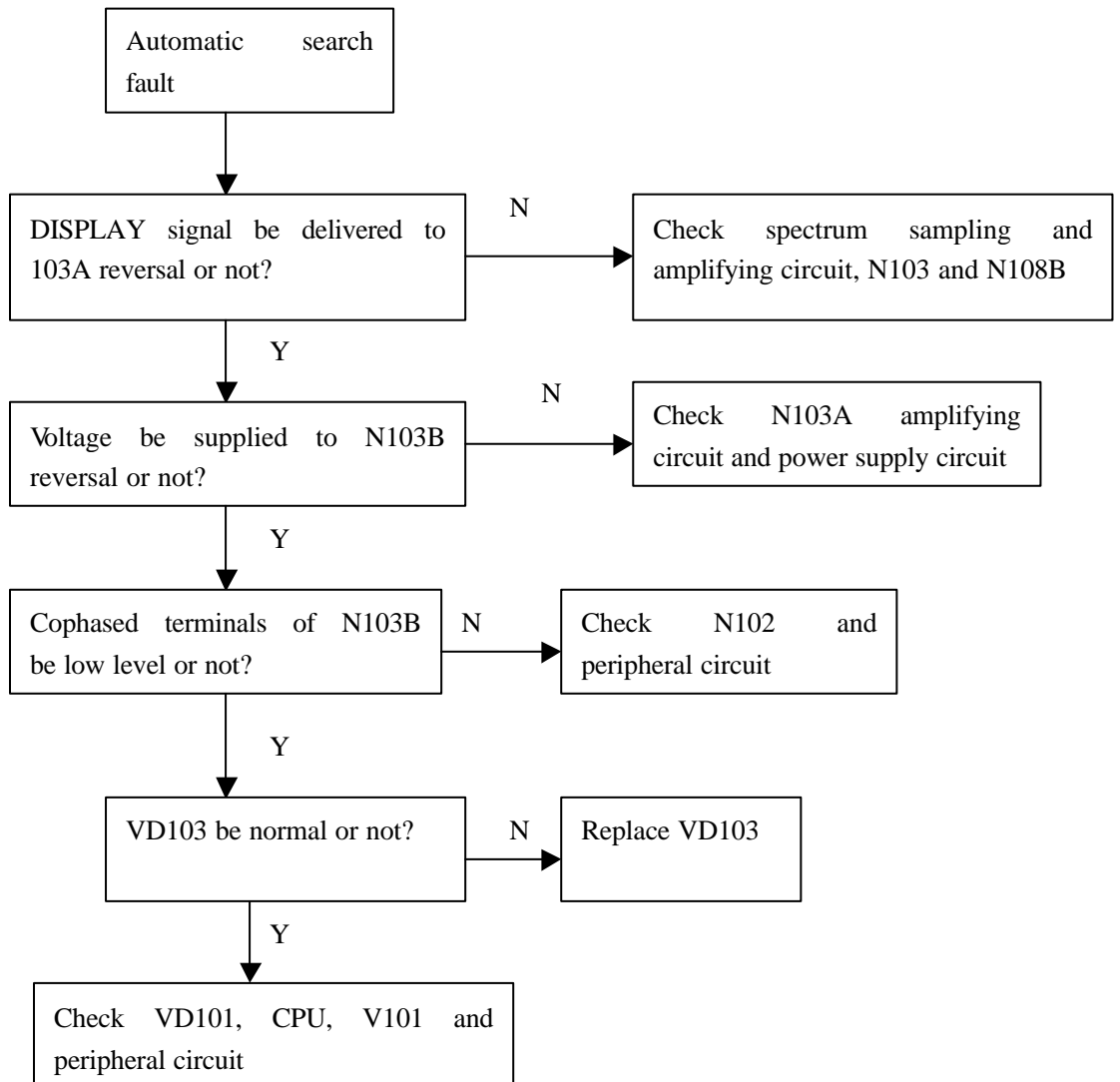
Analysis : Generally, such fault can be checked by signal injection step by step. If the speaker of any step has no disturbance, there must be problems with this step. In general, this method should be carried out from rear step to front step. Another method is signal detection, which is carried out from front step to rear step. If there be no sound with any step, this step must be the fault point. Specific examine and repair flow for this fault is showed as follows :



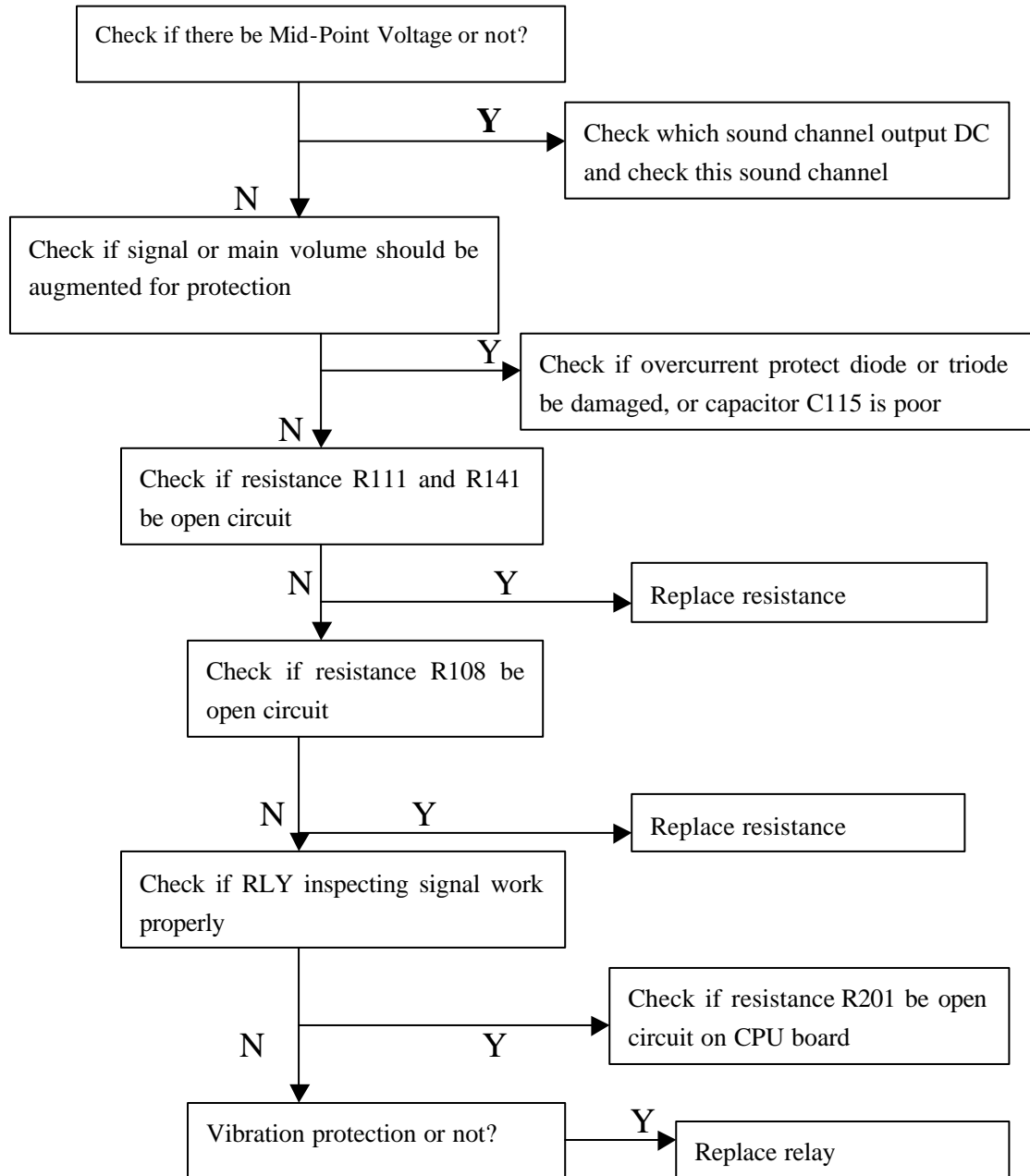
二、 Fault phenomenon: No display

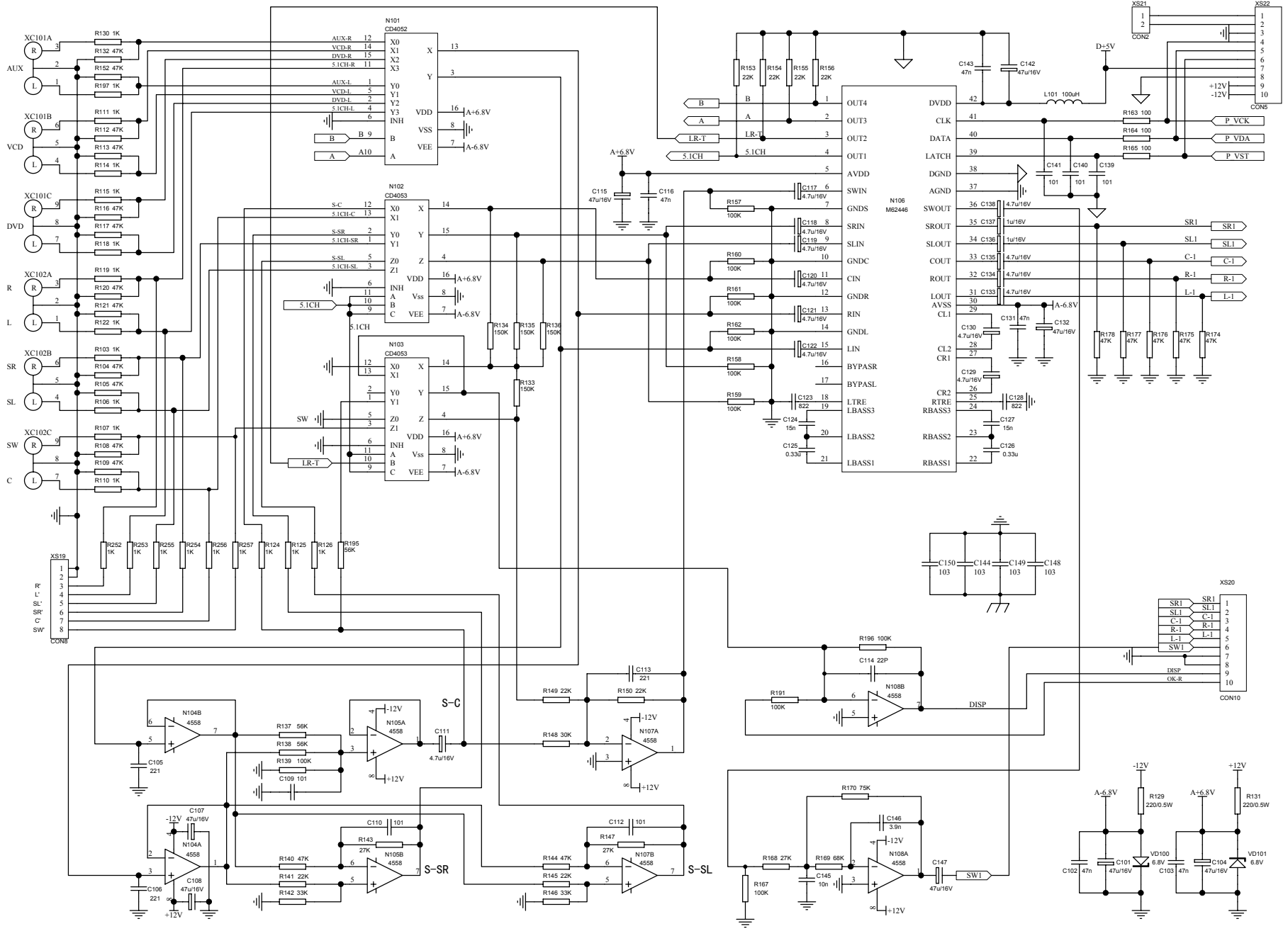


三、 Fault phenomenon : Automatic search fault



四、 Starting up protection





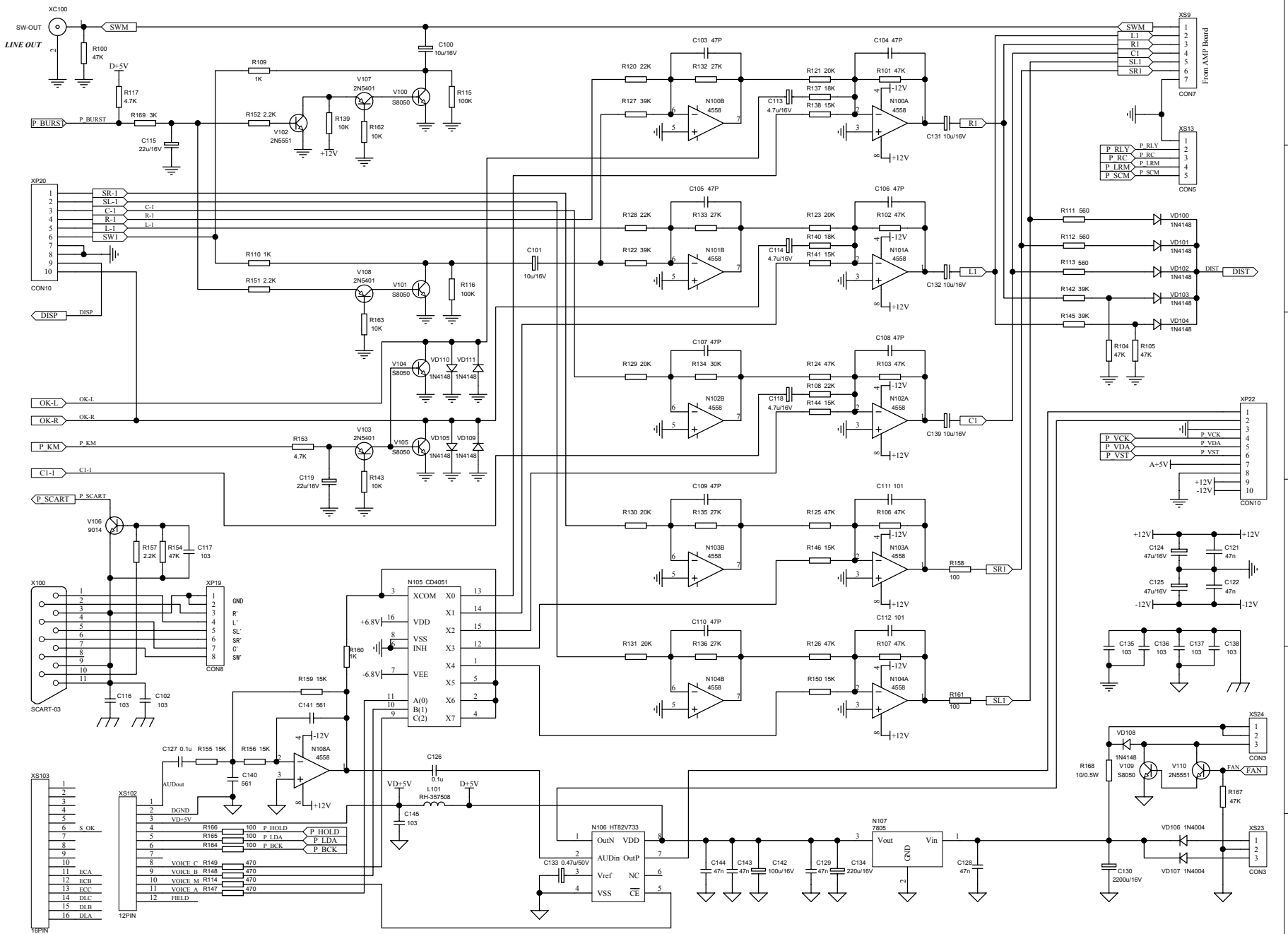
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AV230音量板电原理图

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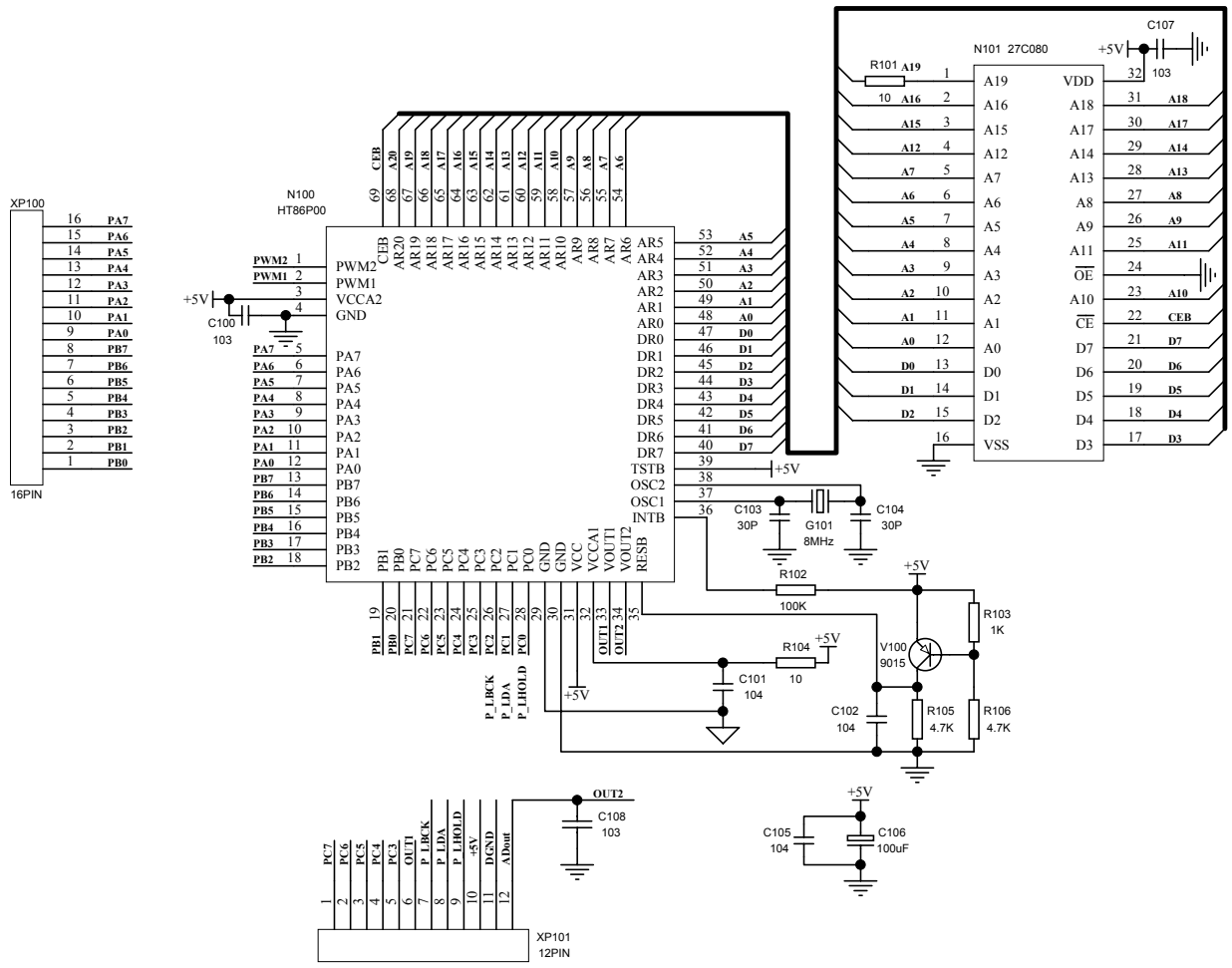
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| | | 日期 | 批准 | |
| 3 | AV230信号板原理图 | | | |
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| 刘梅昌 | | | | | | 东莞市步步高视听电子有限公司 | | |
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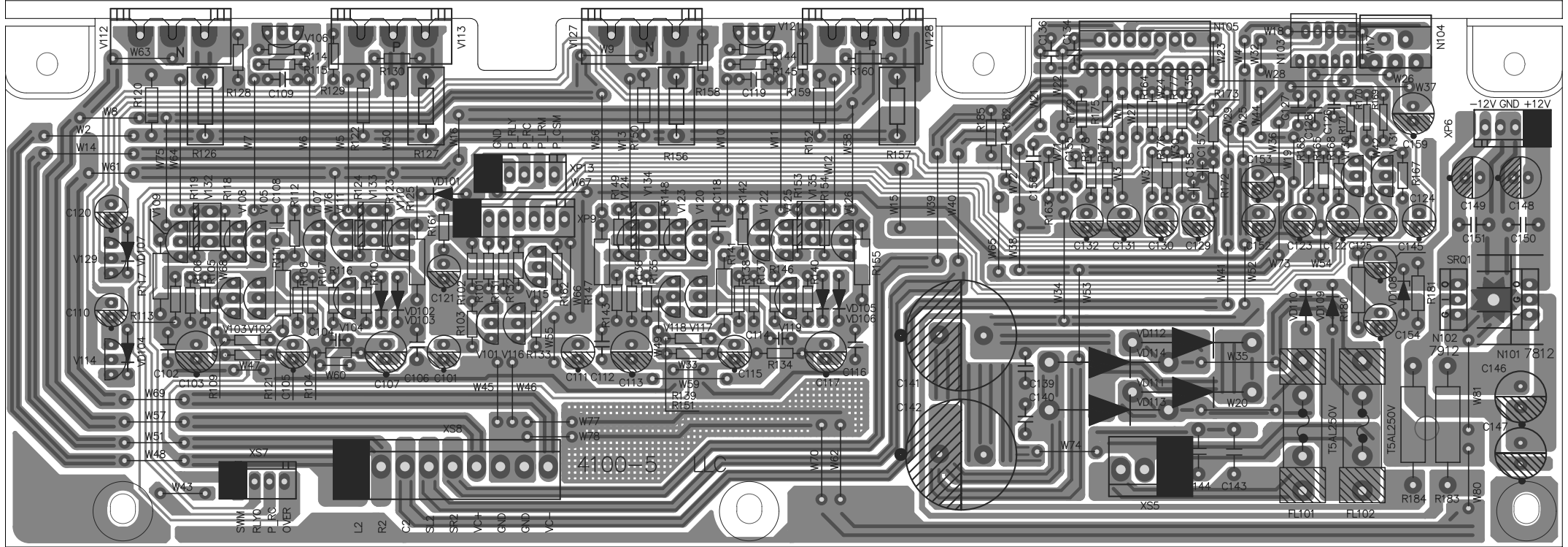
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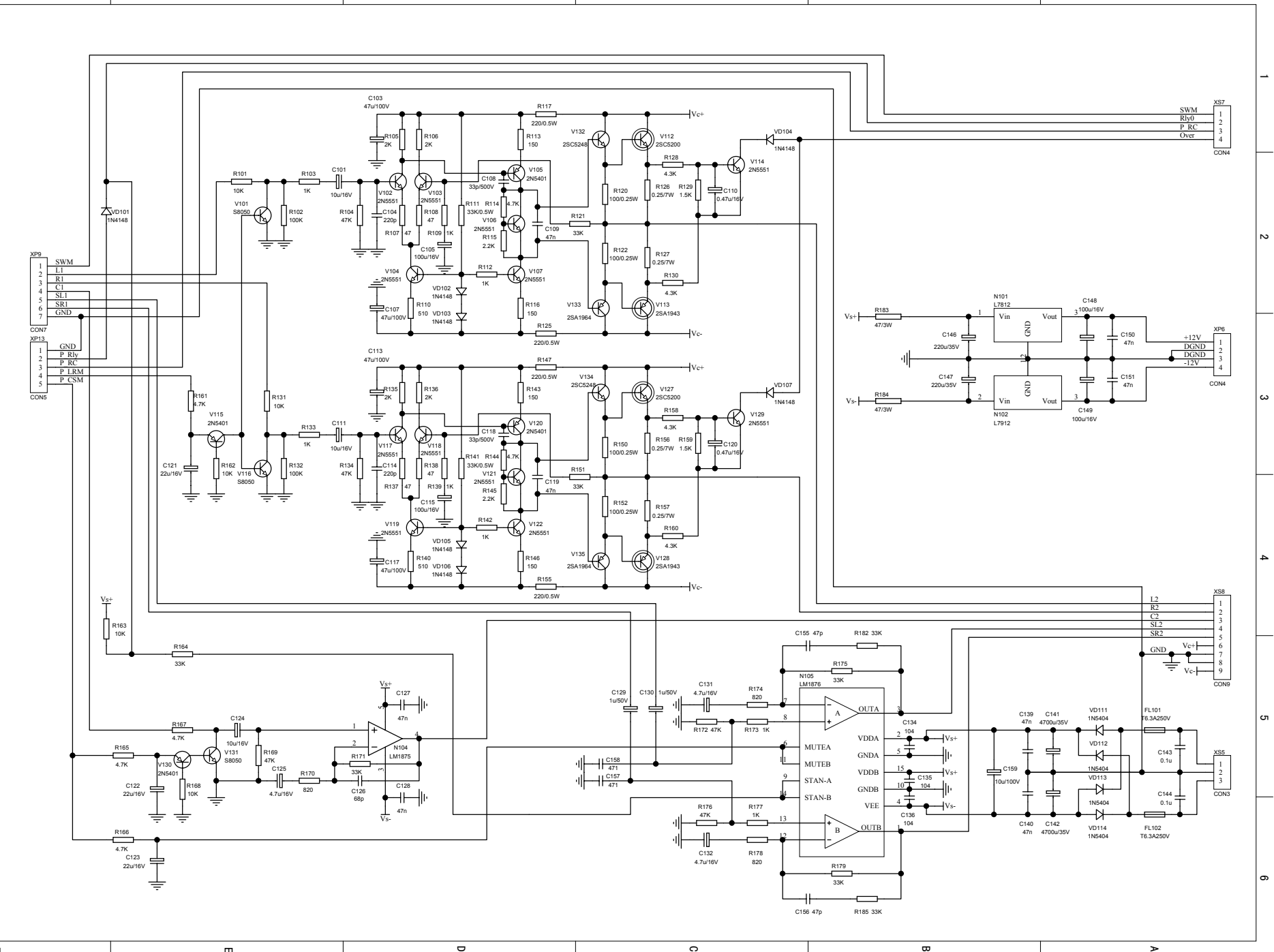
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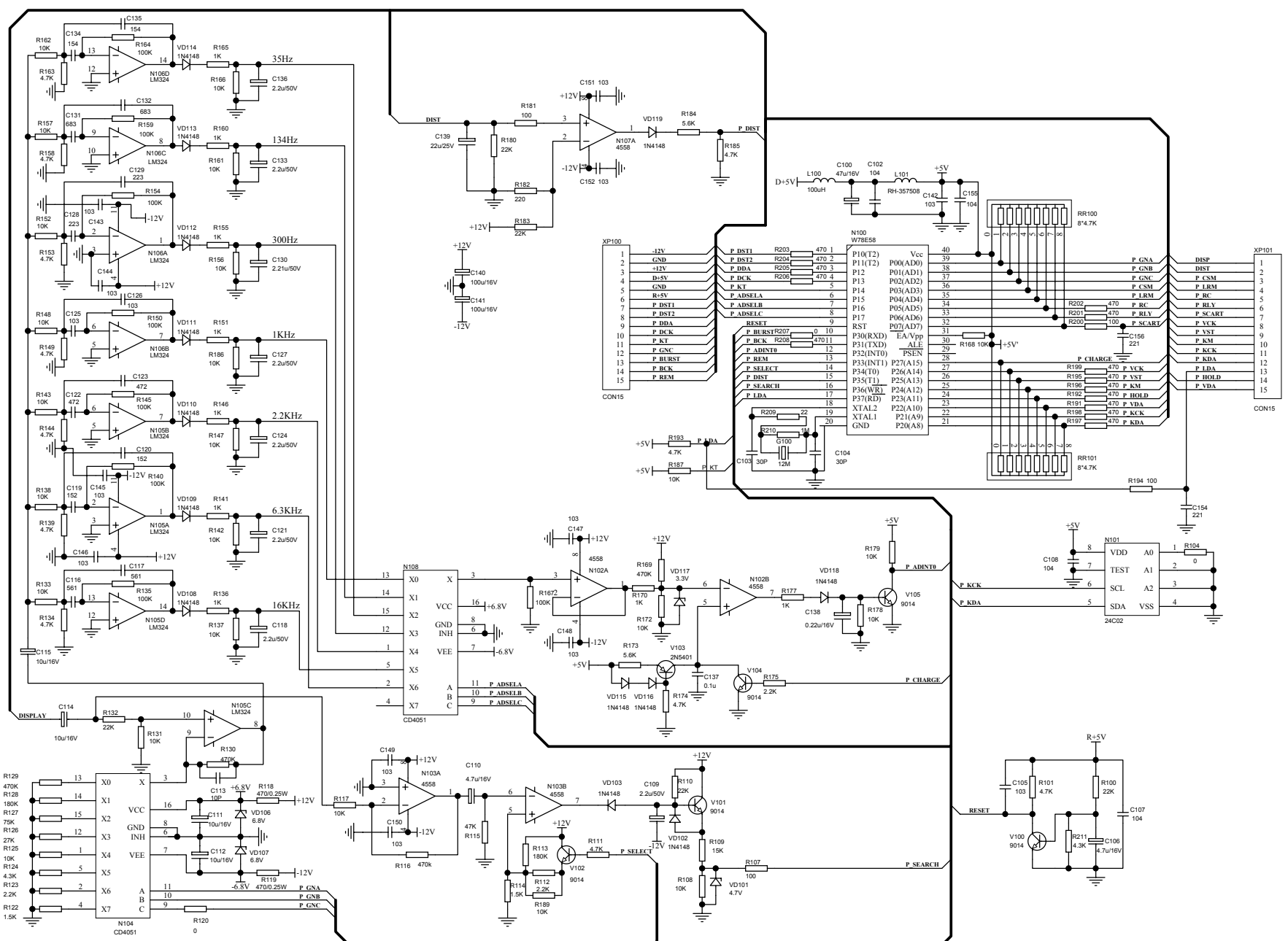
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| 3-1-Mar-2004 | 设计 | 数量 | 更改单号 | 签名 | 日期 | AM230功放板原理图 | 第 5 张 | BRK | 共 12 张 | 版次: 0.0 | 东莞市步步高视听电子有限公司 |
| 1 | 审核 | 标准化 | 批准 | | | | 5 | | | | |





| Pin | Symbol | Value | Pin | Symbol | Value |
|-----|----------|-------|-----|-----------|-------|
| 1 | -12V | | 40 | Vcc | |
| 2 | GND | | 39 | P00(A0) | |
| 3 | +12V | | 38 | P11(AD1) | |
| 4 | D+5V | | 37 | P02(A2) | |
| 5 | GND | | 36 | P03(A3) | |
| 6 | P.DST1 | | 35 | P04(A4) | |
| 7 | P.DST2 | | 34 | P05(A5) | |
| 8 | P.DDA | | 33 | P06(A6) | |
| 9 | P.DDA | | 32 | P07(A7) | |
| 10 | P.DCK | | 31 | EA/Vpp | |
| 11 | P.BURST | | 30 | P30(RXD) | |
| 12 | P.GNC | | 29 | P31(TXD) | |
| 13 | P.BURST | | 28 | P32(INT0) | |
| 14 | P.SELECT | | 27 | P33(INT1) | |
| 15 | P.DIST | | 26 | P34(T0) | |
| | | | 25 | P35(T1) | |
| | | | 24 | P36(WRL) | |
| | | | 23 | P37(R1) | |
| | | | 22 | P22(A10) | |
| | | | 21 | P21(A9) | |
| | | | | P20(A8) | |

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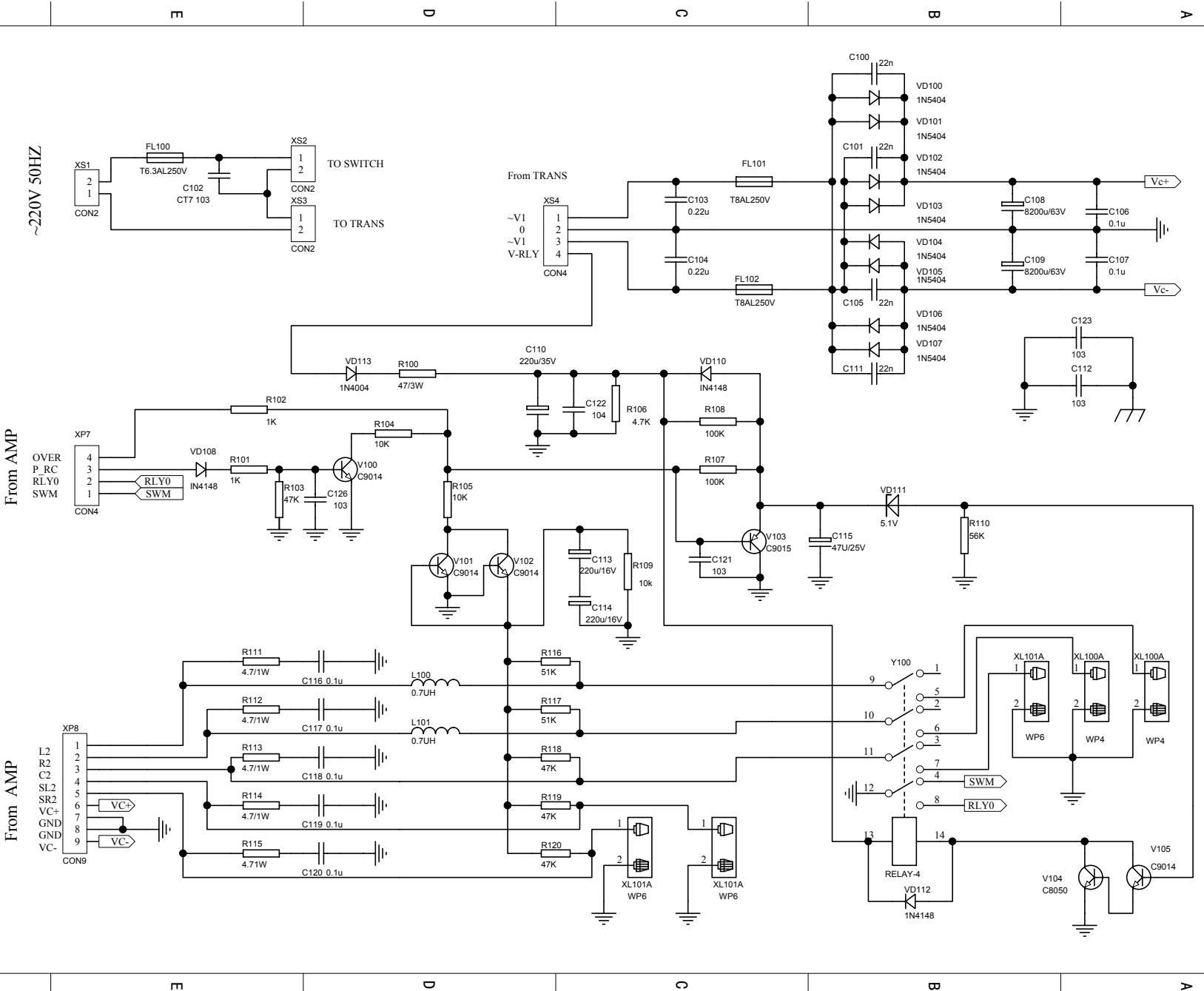
AV230 CPU板电原理图

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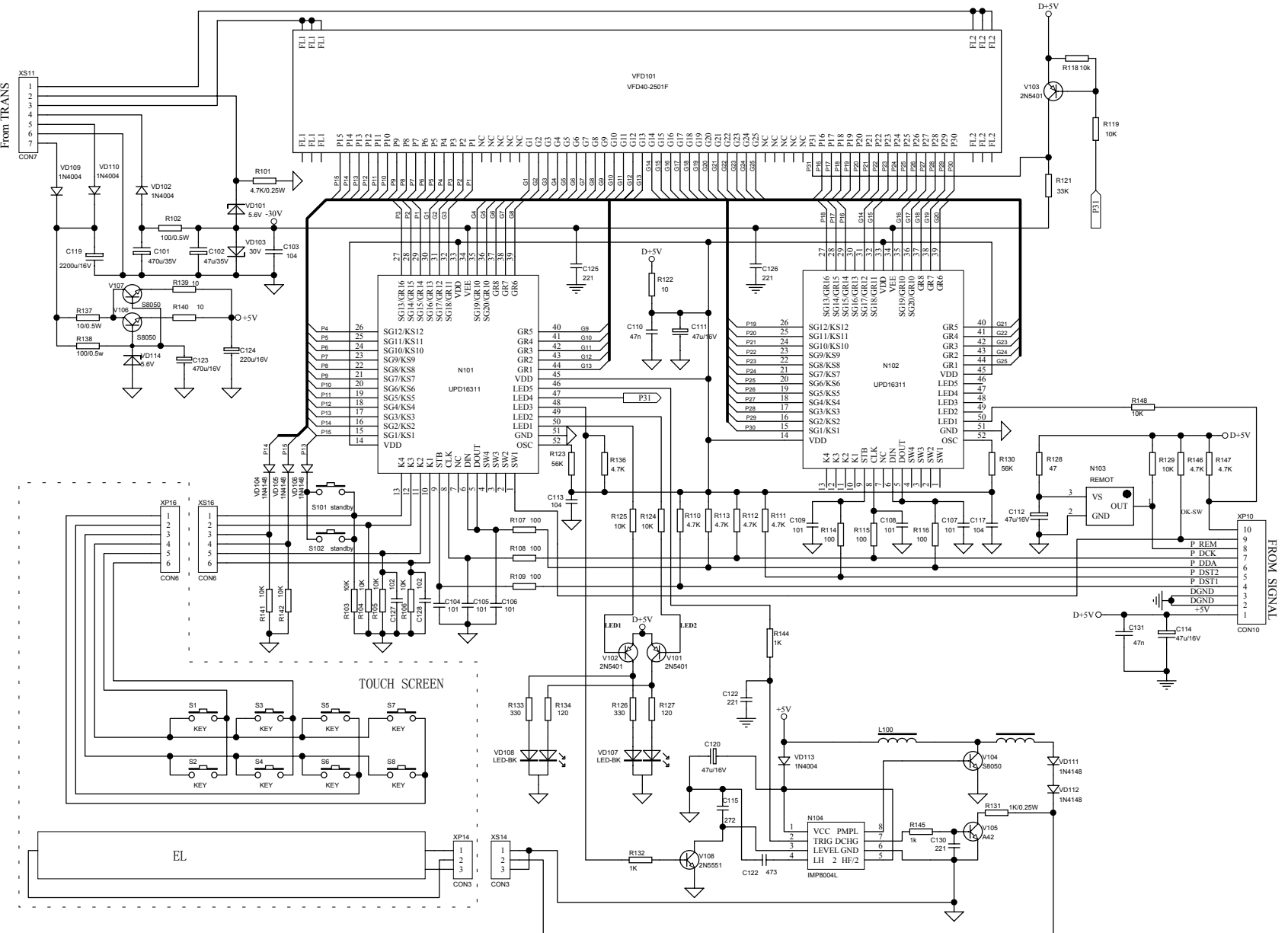
李林存 31-Mar-2004



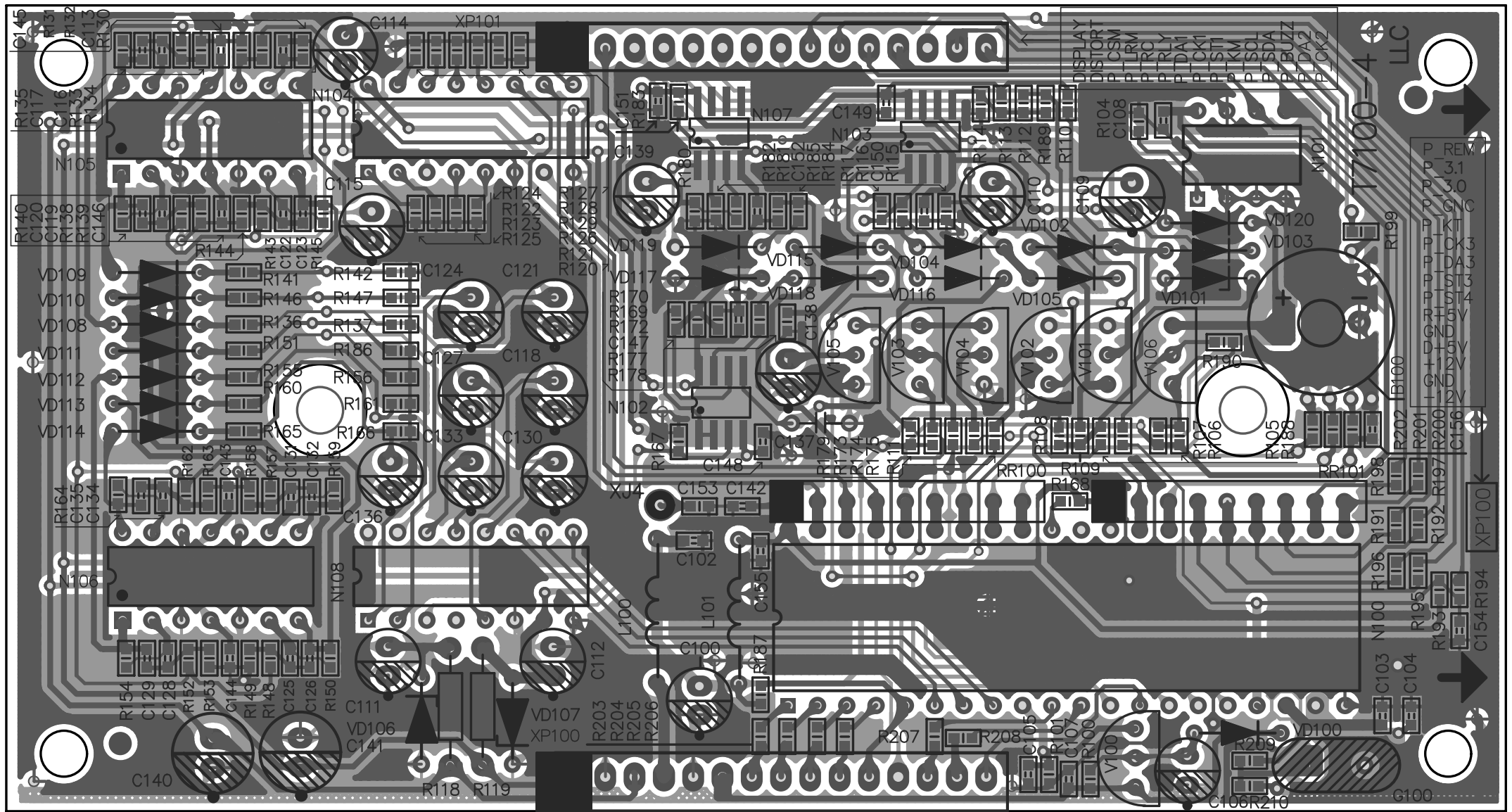
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| | 卢建强 | | | | |
| 2 | 31-Mar-2004 | | | | |
| | POWER BOARD | | | | |
| | BK1 | | | | |
| 3 | From AMP | | | | |
| | From TRANS | | | | |
| | From AMP | | | | |
| 4 | From AMP | | | | |
| | From AMP | | | | |
| | From AMP | | | | |
| 5 | From AMP | | | | |
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| 6 | From AMP | | | | |
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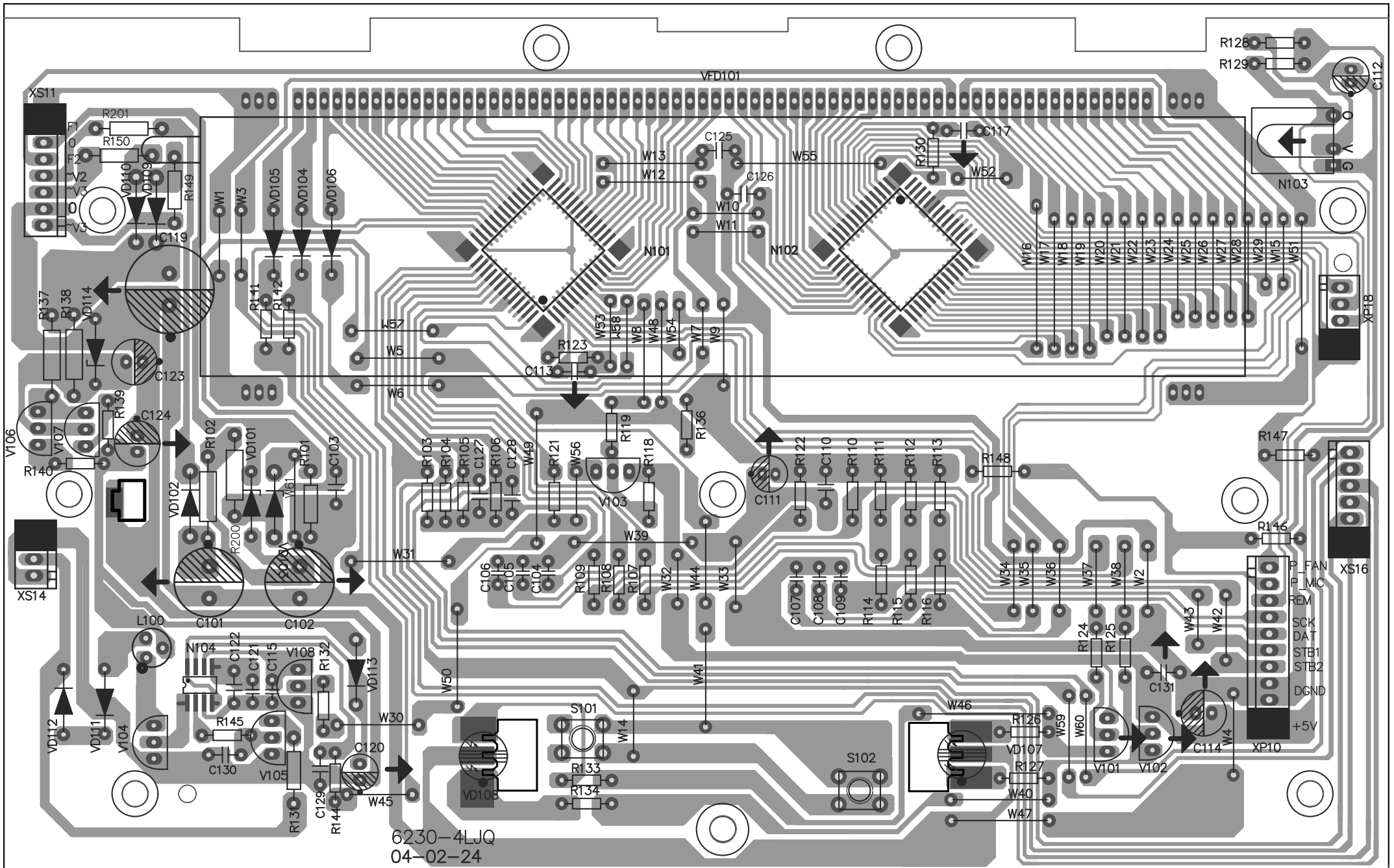
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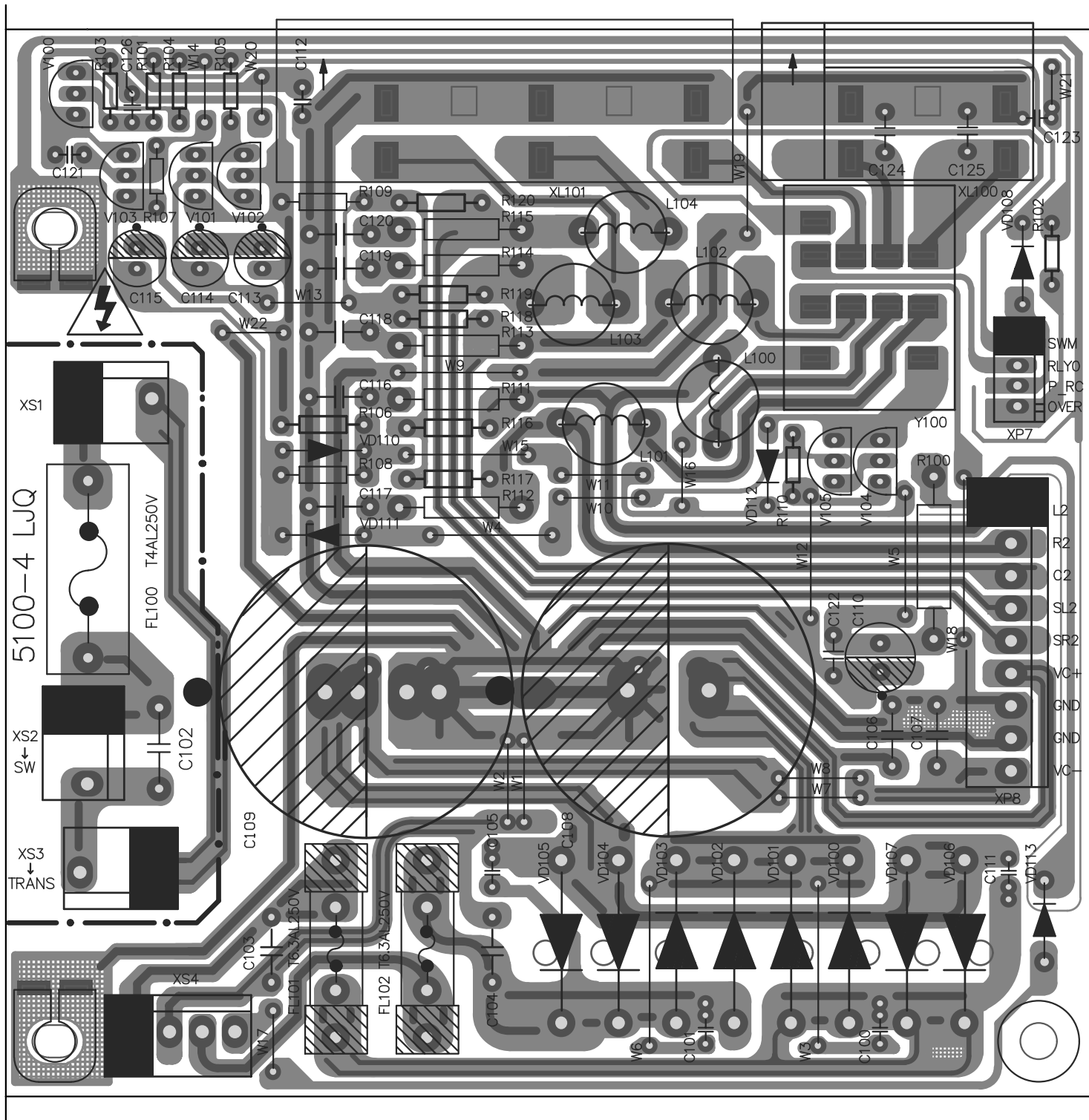
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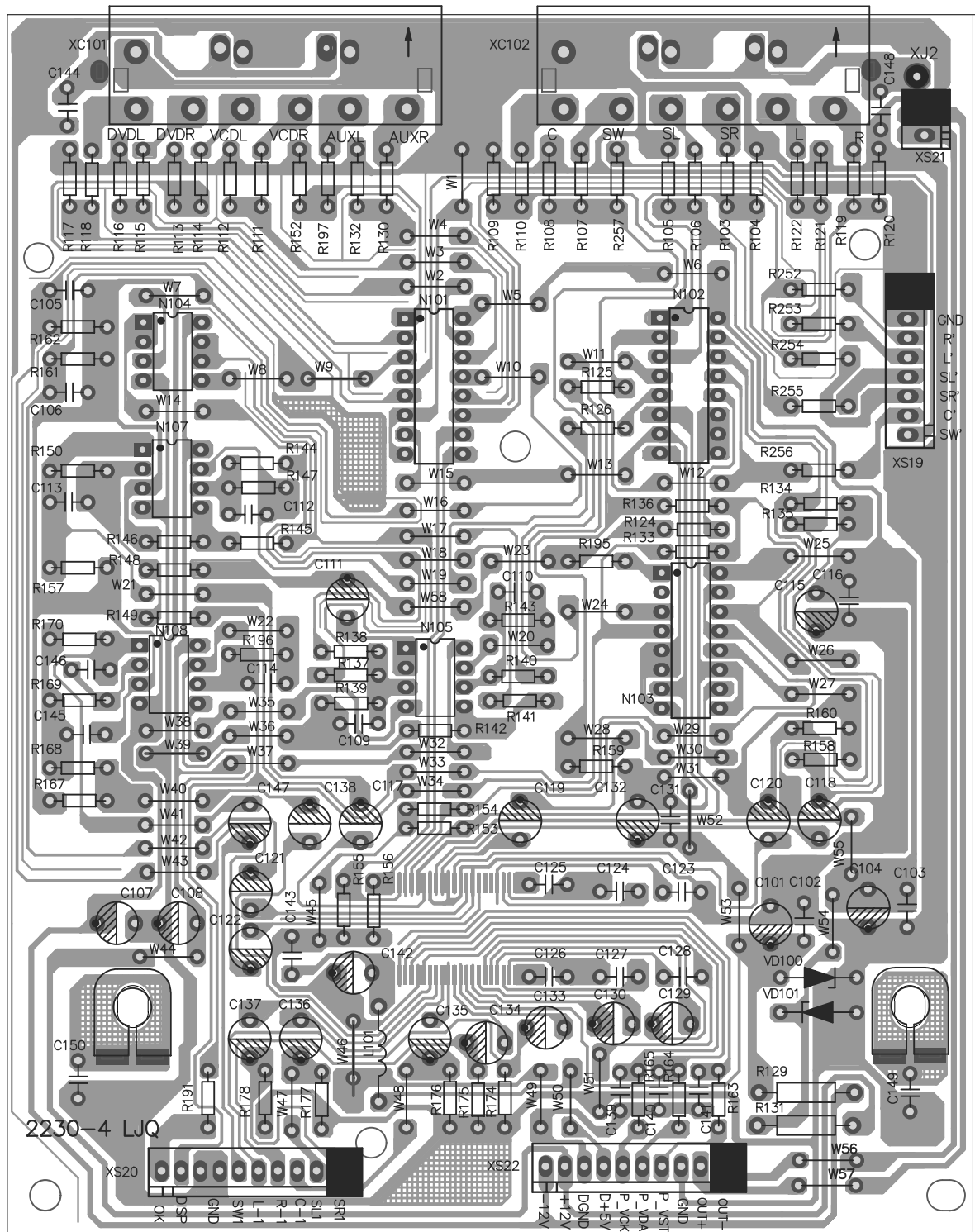


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| 张广胜 | | 标准化 | | | |
| 30-Mar-2004 | | | | | |
| AV230 FRONT PANEL BOARD | | | BK1 | | |
| 第 1 张 | | | 共 1 张 | | |
| 版本号 | | | 版次: 1.0 | | |
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| 30-Mar-2004 | | | | | |









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