Service Manual

15-inch LCD Monitor
vf15 / FP15 / f1523 / FP5315

Service Manual Versions and Revision

No.	Version	Release Date	Revision
1.	1.0	Mar 17, 2003	Original release

vf15 / FP15 / f1523 / FP5315 Service Manual.

1) Circuit

2) Trouble shooting

3) Recommended Parts List

1. Power Board Operation Therory

1.1 Line filter consists of C801, T801, C802, C803, C804, C837, C838. It eliminates high frequency interference to meet EMI's requirement.

1.2 Rec & Filter

Bridge diode D801 converts AC source into pulsed DC. This pulsed DC is smoothed and filtered by C805. R802 is an NTC (negative thermal coefficient) resistor, used to reduce inrush current to be within safe range.

1.3 Power transformer :

T802 converts energy for square wave from power source C805 to secondary side to generate +12V and +15V.

1.4 Output :

The square wave from T802 is rectified by D809, D810, then filtered by C817, C822 to generate +15V and +12V respectively.

1.5 Driver :

Q803 drive T802 from PWM control of I801 for power converted.

1.6 FB :

Negative feedback CKT consists of photo coupler I802 and adjustable regulator I803. It can maintain output voltages +15V and +12V at a stable level.

1.7 PWM :

1.7.1 Start : When power is turned on. C807 is charged a 15 volt and a starting current above 40uA to pin 7 of I801. I801 starts to oscillate and outputs a pulse train through pin 6 to drive Q803.

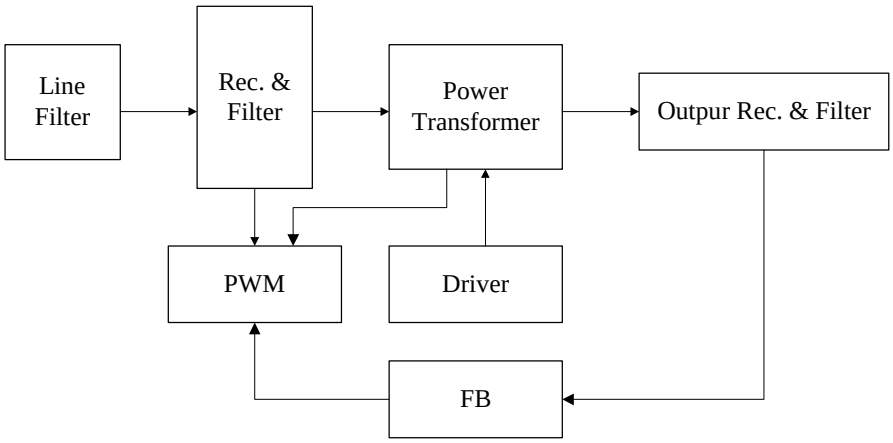
1.7.2 OPP : When Q803 turns on, C805 supplies a linearly increasing triangle current through the primary inductance of T802 to the driver Q803, once the peak value of this current multiplied by R811 exceeds1 volt, pulse train will be turn off immediately to protect Q803, T802 from being burned out.

1.7.3 Regulation : If output voltage +15V goes up, the R terminal of I803 gets more bias, accordingly photo transistor and photo diode flows more current. The voltage of pin 2 goes up too, making the pulse width of pin 6 to become narrower. So the output voltage +15V will be pulled down to a stable value.

1.7.4 OVP : If +15V goes up too much, the induced voltage on pin 4 of T802 becomes large also. Suppose that it is over 18 volts, ZD801 conducts, pin 3 of I801 is pulled up over 1 volt. The pulse train at pin 6 goes down to zero, shutting Q803 off immediately.

1.7.5 SCP : If output terminal is short to ground, photo transistor does not conduct, hence Q806 does not conduct either. Then oscillation of I801 is stop, shutting Q803 off immediately.

HPD-K15AA Power Board Block Diagram



2. Inverter

This unit operates on an output voltage of 15V from power source.

2.1 Regulator: Q101 get a +5VDC for I101 power supply.

2.2 UVP: Q106 turns off when the Vin is under 10V. Then pin 3 of I101 is pulled low and inverter off immediately. That is the under voltage protection.

2.3 Control IC: I101 (OZ960S)

2.3.1 Enable : When pin 3 of I101 is over 1.5V, I101 works. If it is under 1.5V, I101 turns off.

2.3.2 OSC: When I101 enabled, R108/C115 (pin 17/pin18 of I101) determine the operating frequency.

2.3.3 SST: C104 (pin 4 of I102) provides soft start function.

2.3.4 Ignition: R109 (pin 8 of I101) provides higher operating frequency for more striking voltage until regulation of feedback of lamp current. C103 (pin 1 of I101) determine the striking time.

2.3.5 Dimming control: The divided voltage of R106/R105/R104 control the duty pulse of burst-mode to drive Q105 and perform a wide dimming control for the CCFL. The burst-mode frequency is determined by C116.

2.3.6 Regulation: Pin 9/pin 10 of I101 provide regulation of the CCFL current from feedback. The non-inverting reference (pin 10 of I101) is at 1.25V nominal.

2.3.7 Protection: Open-lamp protection in the ignition period is provided through both pin1 and pin 2 of I101. Removal of the CCFL during normal operation will trigger Q107 to turns on and shuts off the inverter. This is latch function.

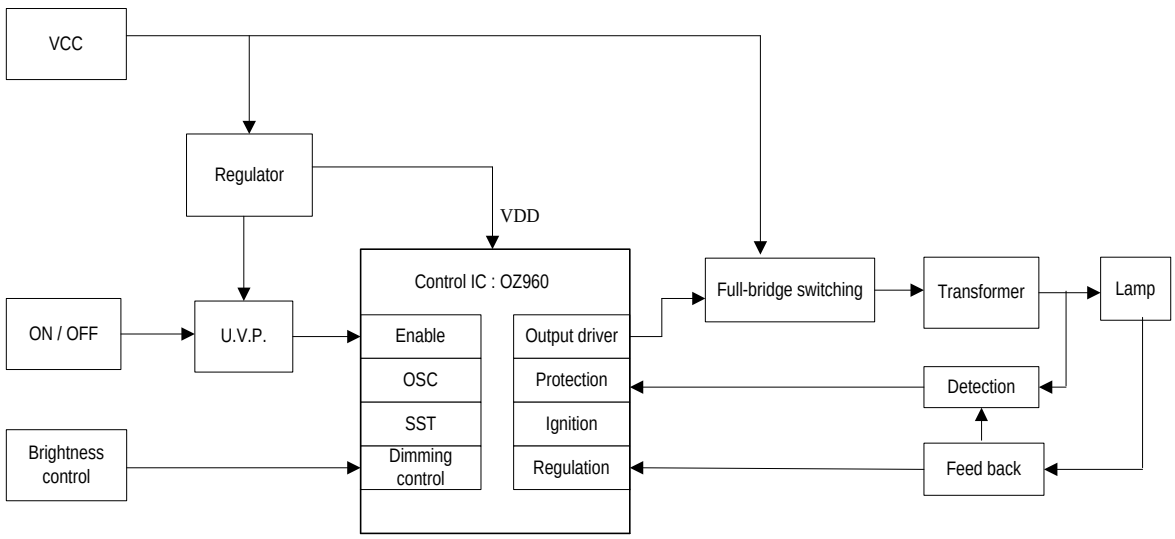
2.3.8 Output drivers: The configuration prevents any shoot-through issue associated with bridge-type power conversion applications. Adjusting the overlap conduction between I102 P-MOSFET and I103 N-MOSFET, I102 N-MOSFET and I103 P-MOSFET, the CCFL current regulation is achieved.

2.4 Full-bridge swit ching/Transformer: I102/I103 /C123/I104/I105/C137/C125/T101/T102 compose full-bridge swit ching to convert DC into AC for driver the CCFL.

2.5 Detection: C124/C125/C126 detect the output voltage and ensure a rated voltage by pin2 of I101. Q108/Q109 ensure not a open-lamp.

2.6 Feedback: D119/R123/D120 sense the lamp current for negative feedback and regulation.

Inverter Circuit



3. Power supply (Circuit diagrams Main PWB)

3.1 Line filter consists of FB326, FB327, FB328. It eliminates high frequency interference to meet EMI's requirement.

3.2 I309 3.3V and 2.5V DC-DC requlator
A 3.3V and 2.5V DC power supply for LCD module and ASIC.

3.3 A 9.2V DC power supply for LCD module source IC is generated from I311.

3.4 A 6V DC power supply for LCD module to control gate IC OFF is generated from I311.

3.5 A 18V DC power supply for LCD module to control gate IC ON is generated from I311.

3.6 A 3.6V DC power supply for LCD module to control panel Gamut of V-Com.

4. On-screen circuit (Circuit diagrams Main PWB)

I303 (gm2115) Embeded function.

On-screen menu screen is established and the resultant data are output from I303 (Circuit diagram MAIN PWB , gm2115).

5. Video input circuit (Circuit diagram MAIN PWB)

The AC-coupled video signal is used to clamp the black level at 0V).

6. Definition converter LSI peripheral circuit (Circuit diagram MAIN PWB)

I303 gm2115 is the definition converter LSI.

The analog R, G, B signal input entered from the video input circuit is converted into the digital data of video signal through the incorporated A/D converter. Based on this conversion, this device performs interpolation during pixel extension. The source voltage for this device is 3.3V and 2.5V the system clock frequency is 14. 318MHz.

The withstand voltage level for the input signal voltage is 3.3V and 5V.

7. System reset, LED control circuit (Circuit diagram MAIN PWB)

7.1 System reset

System reset is performed by detecting the rising of the 5V source voltage at I305.

7.2 LED control circuit

Green / amber is lit with the control signal of the LED GREEN and LED AMBER signal pin 49, 48 from I303 (Circuit diagram MAIN PWB).

8. E²PROM for PnP (Circuit diagram MAIN PWB 3/7)

Data transfer between I308 and host.

There are two forms of communications protocal. In both, display capabilities are retrieved by the system software during the boot-up and configuration time.

For the PC platform, this software layer is defined in the VESA BIOS Extension / Display Data Channel, DDC2, standard.

9. E²PROM (Circuit diagram MAIN PWB 4/7)

Data transfer between I306 (24LC16B) and I303 (Circuit diagram MAIN PWB page 4/7 (I306) is effected through the IIC bus SCL (pin 52) and SDA (pin 51) of I303. The data to be transferred to each device are stored in I306.

- I303 control data.
- OSD related setting data.
- Other control data for service menu.

10. CPU circuit (Circuit diagram MAIN PWB 4/7)

I303 (gm2115) embeded microcontroller with parallel ROM interface (I302).

The source voltage for the device is 3.3V and 2.5Vthe system clock frequency is 14.318MHz.

10.1 Detection of POWER switch status

The I303 identifies the ON status of the two power supplies. The identification is made when the power supply is turned off. For example, if the power supply is turned off with the POWER switch, the POWER switch must be turned on when activating the power supply again. If the power supply is turned off by pulling out the power cord, then this power supply can be turned on by connecting the power cord, without pressing the POWER switch.

10.2 Display mode identification

10.2.1Functions

(1) Display mode identification

- The display mode of input signal is identified based on Table 1, and according to the frequency and polarity (HPOL, VPOL) of horizontal or vertical sync signal, presence of the resolution or vertical sync signal, and the discrimination signal (HSYNC_DETECT, VSYNC_DETECT).
- When the mode has been identified through the measurement of horizontal and vertical frequencies, the total number of lines is determined with a formula of " Horizontal frequency / Vertical frequency = Total number of lines. "Final identification can be made by examining the coincidence of the obtained figure with the number of lines for the mode identified from the frequency.
- When the detected frequency if the sync signal has changed, the total number of lines should be counted even through it is registor identified frequency in the same mode. Then, it is necessary to examine whether the preset value for the vertical display position has exceeded the total number of lines. If exceeded, a maximum value should be set up, which does not exceed the vertical display position.

(2) Out-of -range

This out-of-range mode is assumed when the frequency of the vertical signal is as specified below.

- Vertical frequency equal to 85Hz into fail save mode.
- Vertical frequency over 85Hz into out of range.

(3) Power save mode

The power save mode is assumed when the horizontal / vertical signals are as specified below.

- If there is no horizontal sync signal input.
- If there is no vertical sync signal input.

- If the horizontal sync signal is outside the measuring range of gm2115.
- If the vertical sync signal is outside the measuring range of gm2115.

Table 1

Mode	No	Resolution	H-freq (KHz)	Band Width (MHz)	Polarity	
					H	V
1.	102	VGA 720 x 400 70Hz	31.47	28.322	-	+
2.	103	VGA 640 x 480 60Hz	31.47	25.175	-	-
3.	173	VESA 640 X 480 72Hz	37.86	31.5	-	-
4.	109	VESA 640 X 480 75Hz	37.5	31.5	-	-
5.	116	VESA 800 x 600 60Hz	37.88	40	+	+
6.	110	VESA 800 x 600 75Hz	46.88	49.5	+	+
7.	117	VESA 800 x 600 72Hz	48.08	50	+	+
8.	108	MAC 832 x 624 75Hz	49.72	57.283	-	-
9.	118	VESA 1024 x 768 60Hz	48.36	65	-	-
10.	157	VESA 1024 x 768 70Hz	56.48	75	-	-
11.	141	VESA 1024 x 768 75Hz	60.02	78.75	+	+

10.3 User Control

1. Select MENU: To enter OSD menu.
2. ▼(Down): To decrease the value of the parameter in the OSD, which has been selected for adjustment.
   ▼(Down): Choose the next OSD ICON.
3. ▲(Up): To increase the value of the parameter in the OSD, which has been selected for adjustment.
   ▲(Up): Choose the previous OSD ICON.

10.3.1Related ports of I303

Port	Pin No.	I/O	Signal name	Function	Remarks
GPIO21	47	I	Power		Power Switch Key
GPIO3	43	I	MANUAL	Menu Switch input	MENU key
GPIO7	47	I	Down	- switch input	Down / AUTO key
GPIO6	46	I	Up	+ switch input	Up / BRI key

10.3.2Functions

Control is effected for the push-switches to be used when the user changes the parameters, in order to modify the respective setting values. Whether the switch has been pressed is identified with the switch input level that is turned “L”.

Each switch input port is pulled up at outside of I303.

Each parameter is stored in the EEPROM, the contents of which are updated as required.

10.4 Control of definition converter gm 2115 (I303).

10.4.1Ports related to control

Pin No.	I/O	Signal name	Function
51	I/O	SDA	Gm2115 serial data
52	O	SCL	Gm2115 serial clock
207	I/O	HDATA2	Gm2115 Address input
208	I/O	HDATA1	Gm2115 Address input

10.4.2Functions

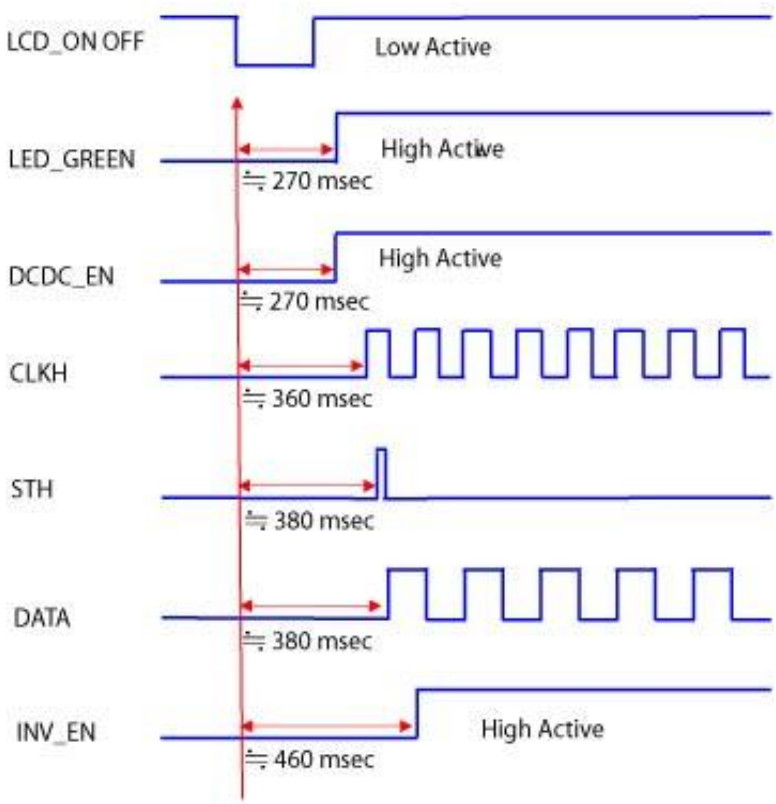
Major function of I303 are as follows:

(1) Expansion of the display screen.

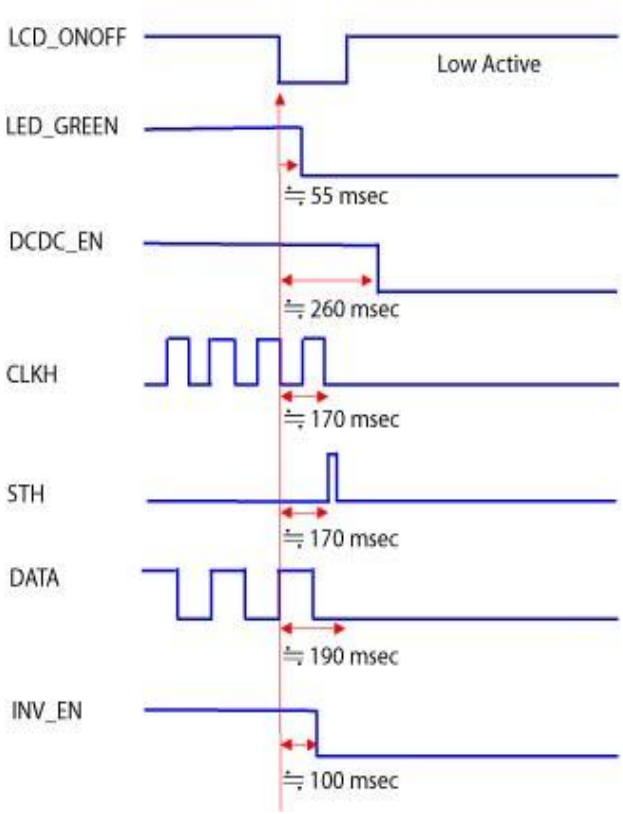
(2) Timing control for various signal types.

(3) Power-supply sequence (LCD panel).

10.5 Power ON sequence



10.6 Power OFF sequence



11. Audio circuit (Circuit diagrams Main PWB)

11.1 Audio input

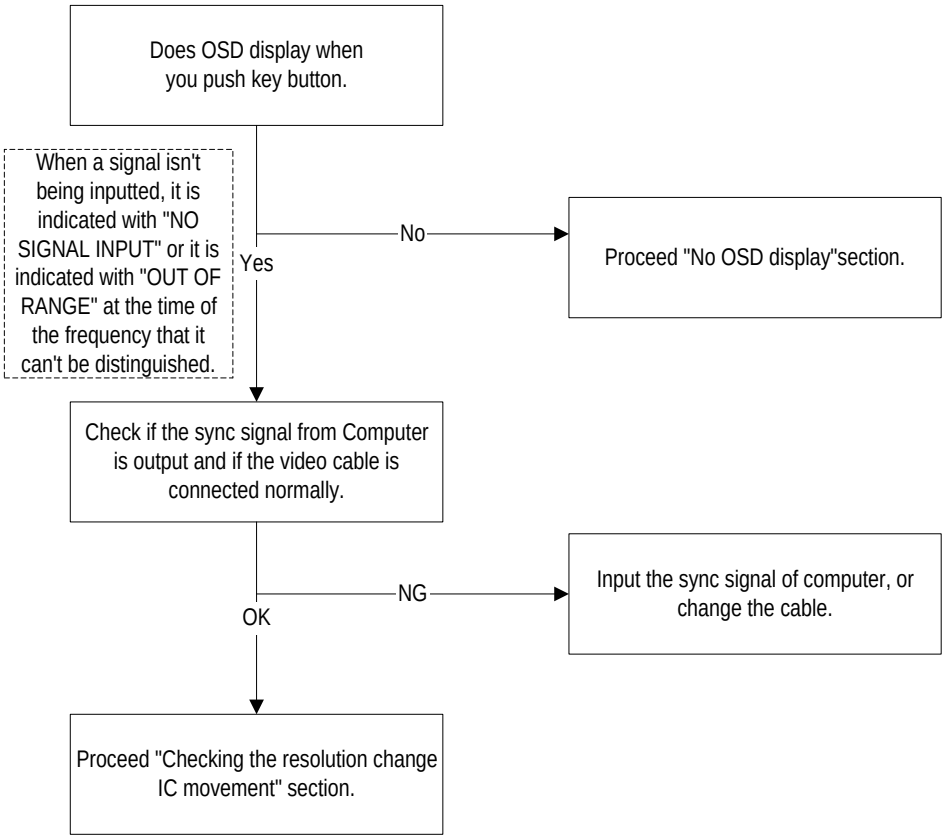
The audio signal input received from the audio input terminal (P302) is applied to the amplifier I301 of 1 and 9 through the low-pass filter consisting of R305, R306, C314 and C315.

In this amplifier, controls of Volume are availavle. The audio signal controlled at the VR601 determines the attenuation of output of the amplifiers. Since then, the signal is output to the jack P303.

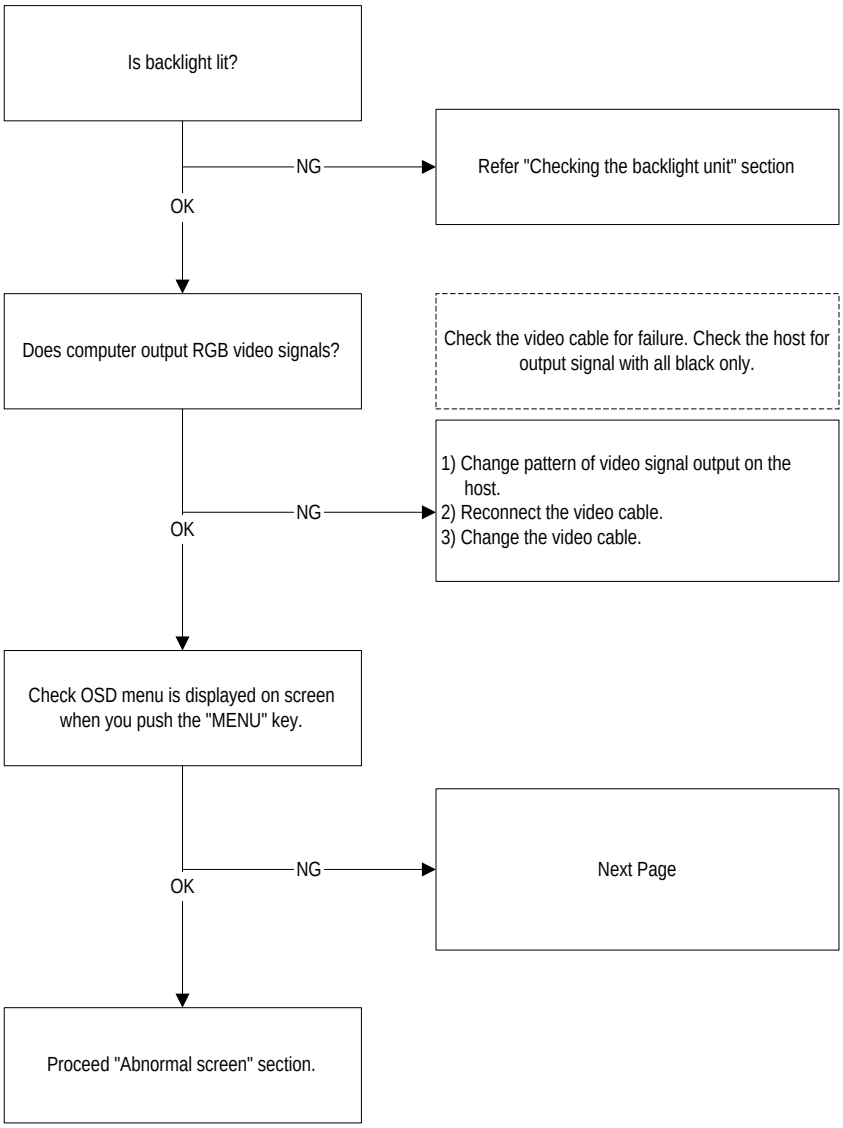
11.2 Audio output

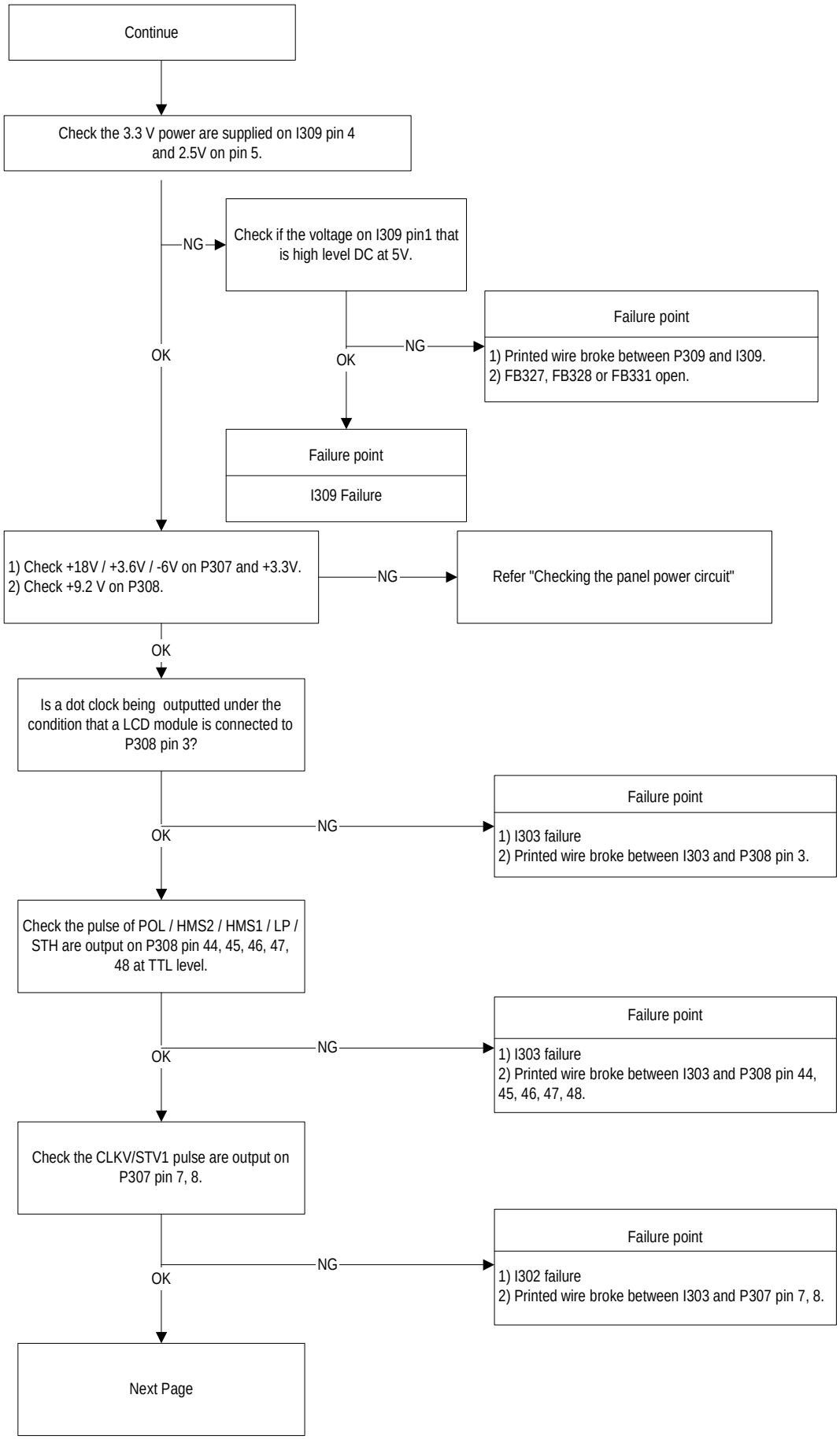
The audio signal is output from the jack output terminal (P303) of the jack board to the internal speaker system.

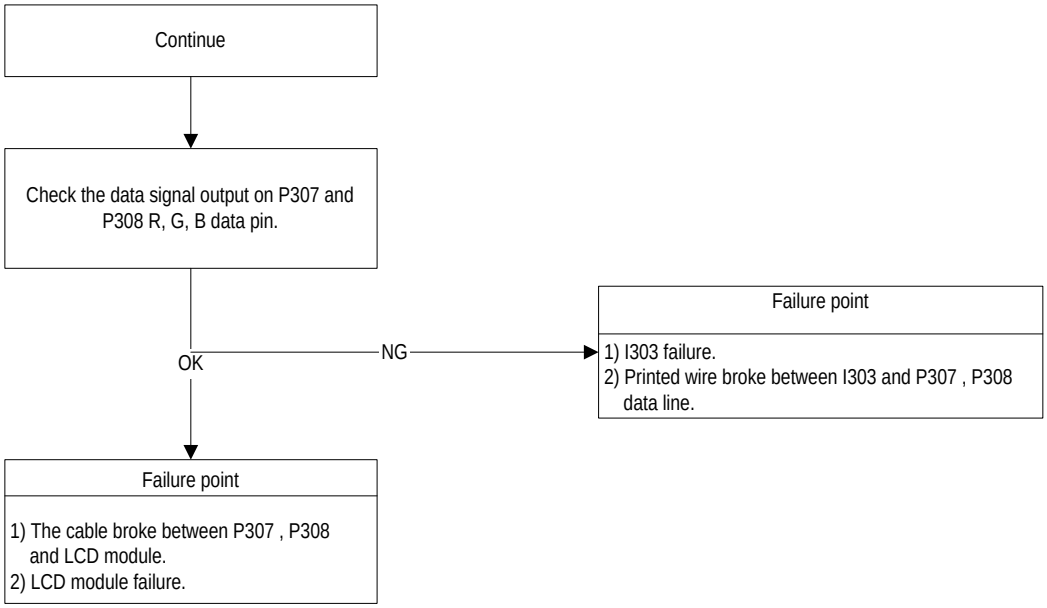
1. No display of screen (Screen is black, color of LED is amber)



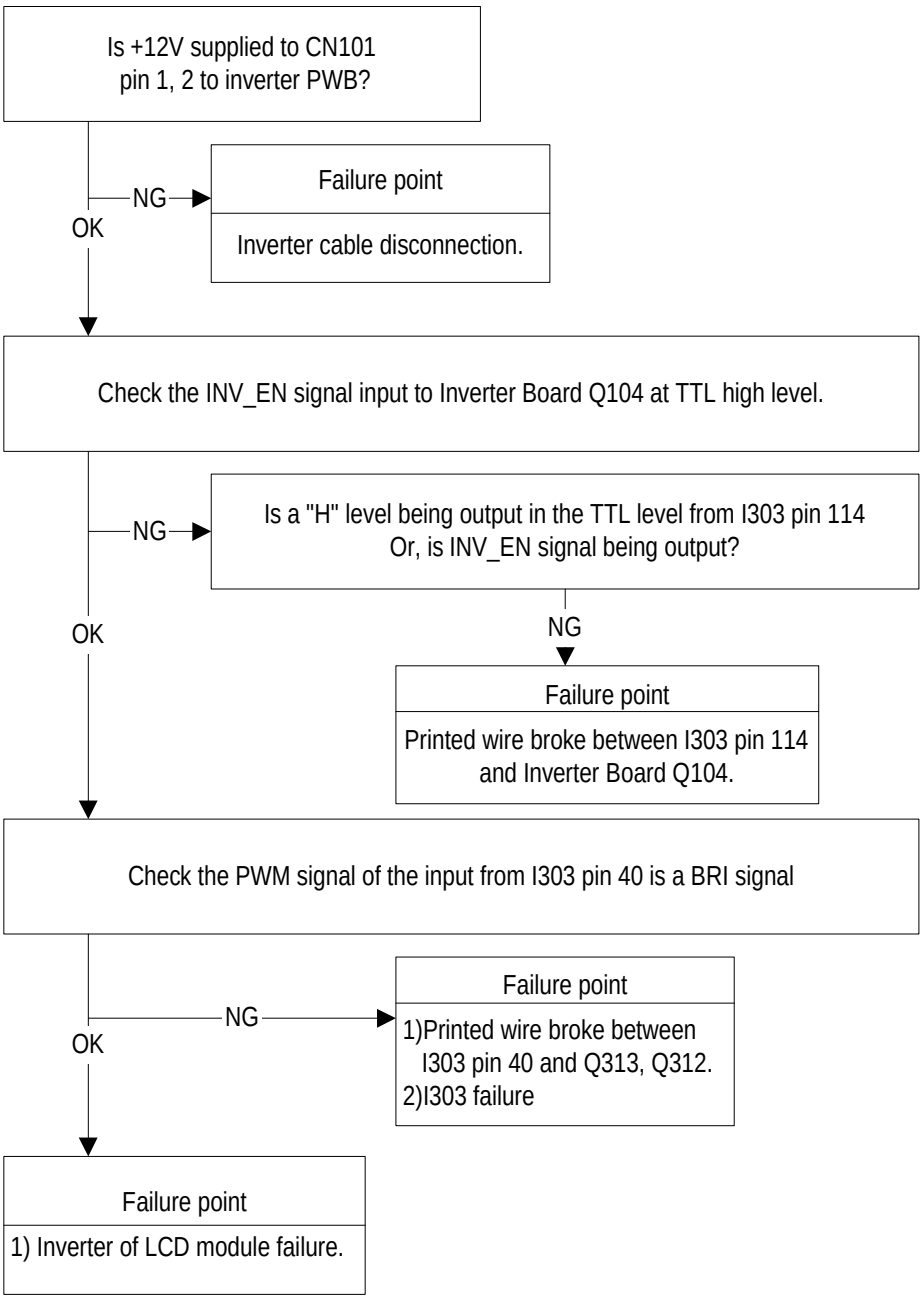
2. Nothing displays on screen (Screen is black, color of LED is green)



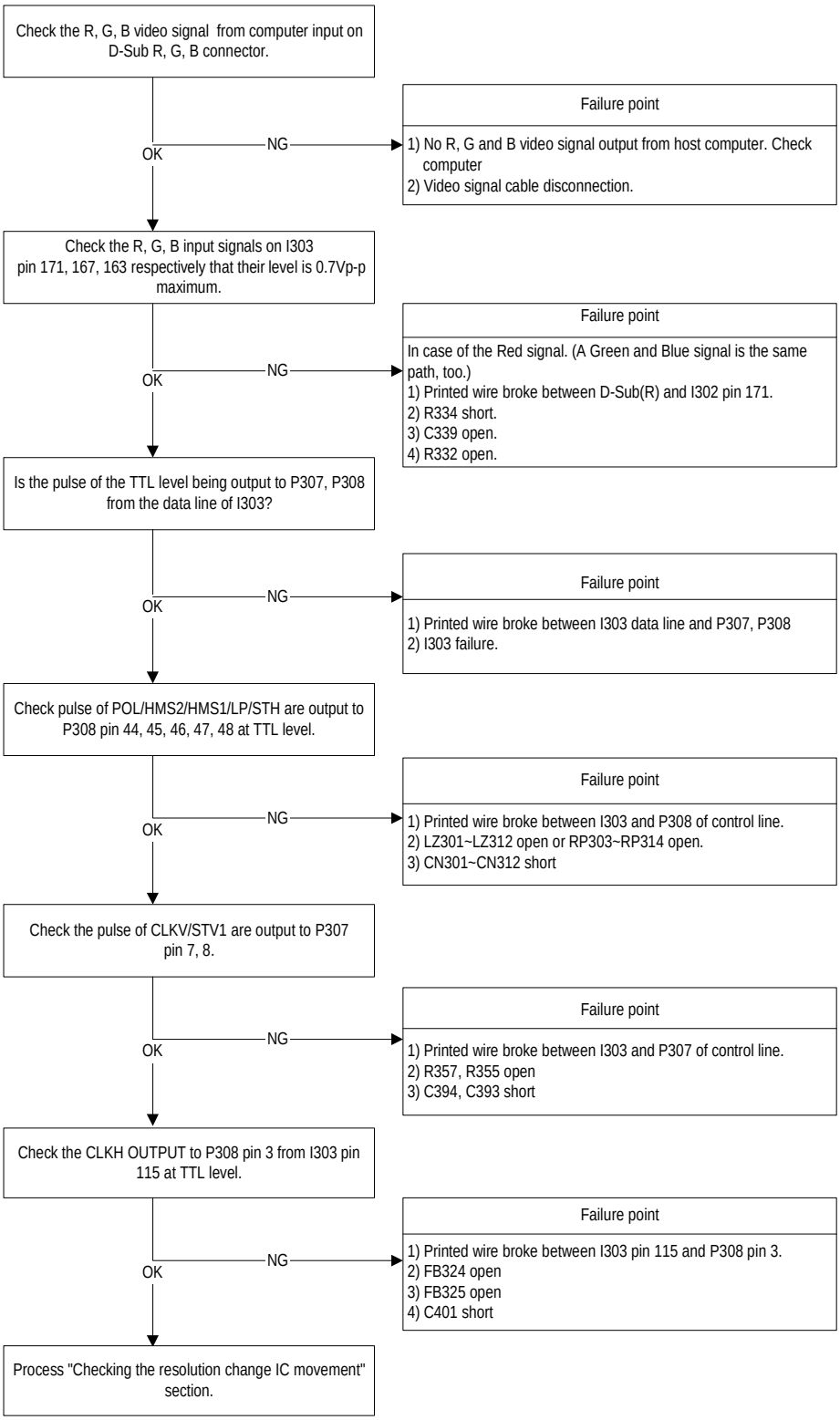

Continue
Check the 3.3 V power are supplied on I309 pin 4 and 2.5V on pin 5.
NG
Check if the voltage on I309 pin1 that is high level DC at 5V.
OK
NG
Failure point
1) Printed wire broke between P309 and I309.
2) FB327, FB328 or FB331 open.
OK
Failure point
I309 Failure
1) Check +18V / +3.6V / -6V on P307 and +3.3V.
2) Check +9.2 V on P308.
NG
Refer "Checking the panel power circuit"
OK
Is a dot clock being outputted under the condition that a LCD module is connected to P308 pin 3?
OK
NG
Failure point
1) I303 failure
2) Printed wire broke between I303 and P308 pin 3.
Check the pulse of POL / HMS2 / HMS1 / LP / STH are output on P308 pin 44, 45, 46, 47, 48 at TTL level.
OK
NG
Failure point
1) I303 failure
2) Printed wire broke between I303 and P308 pin 44, 45, 46, 47, 48.
Check the CLKV/STV1 pulse are output on P307 pin 7, 8.
OK
NG
Failure point
1) I302 failure
2) Printed wire broke between I303 and P307 pin 7, 8.
Next Page


Continue
Check the data signal output on P307 and P308 R, G, B data pin.
NG
OK
Failure point
1) I303 failure.
2) Printed wire broke between I303 and P307 , P308 data line.
Failure point
1) The cable broke between P307 , P308 and LCD module.
2) LCD module failure.

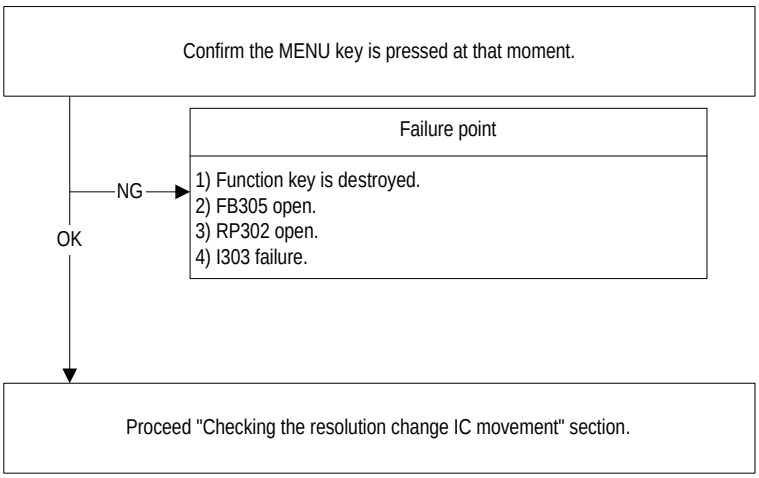
3. Checking the back light unit



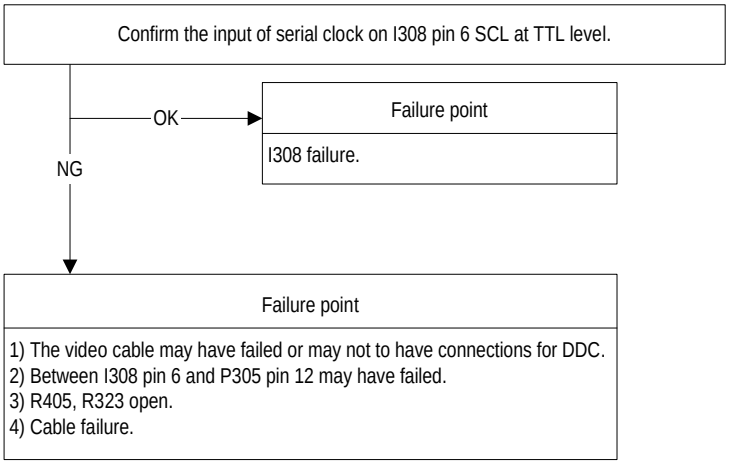
4. Abnormal screen

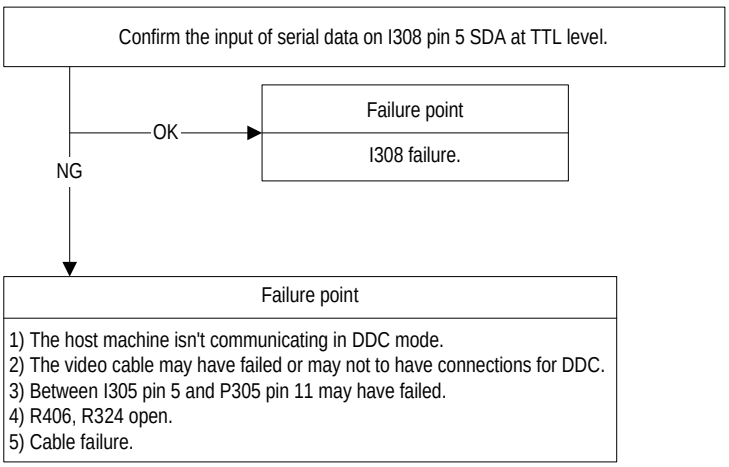


5. NO OSD display



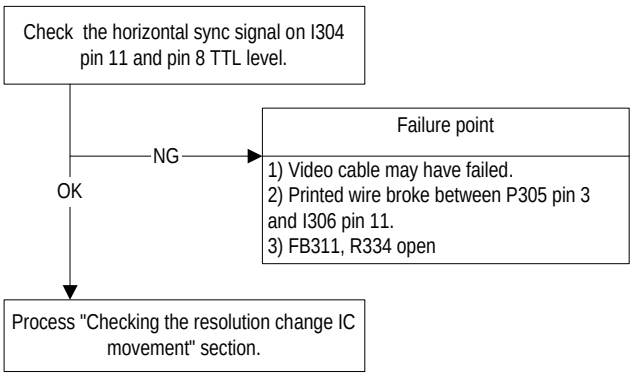
6. Abnormal plug and play operation



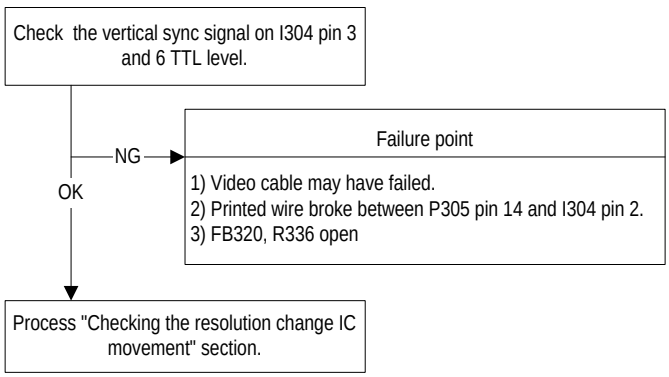


7. Checking the interface circuit of sync signal

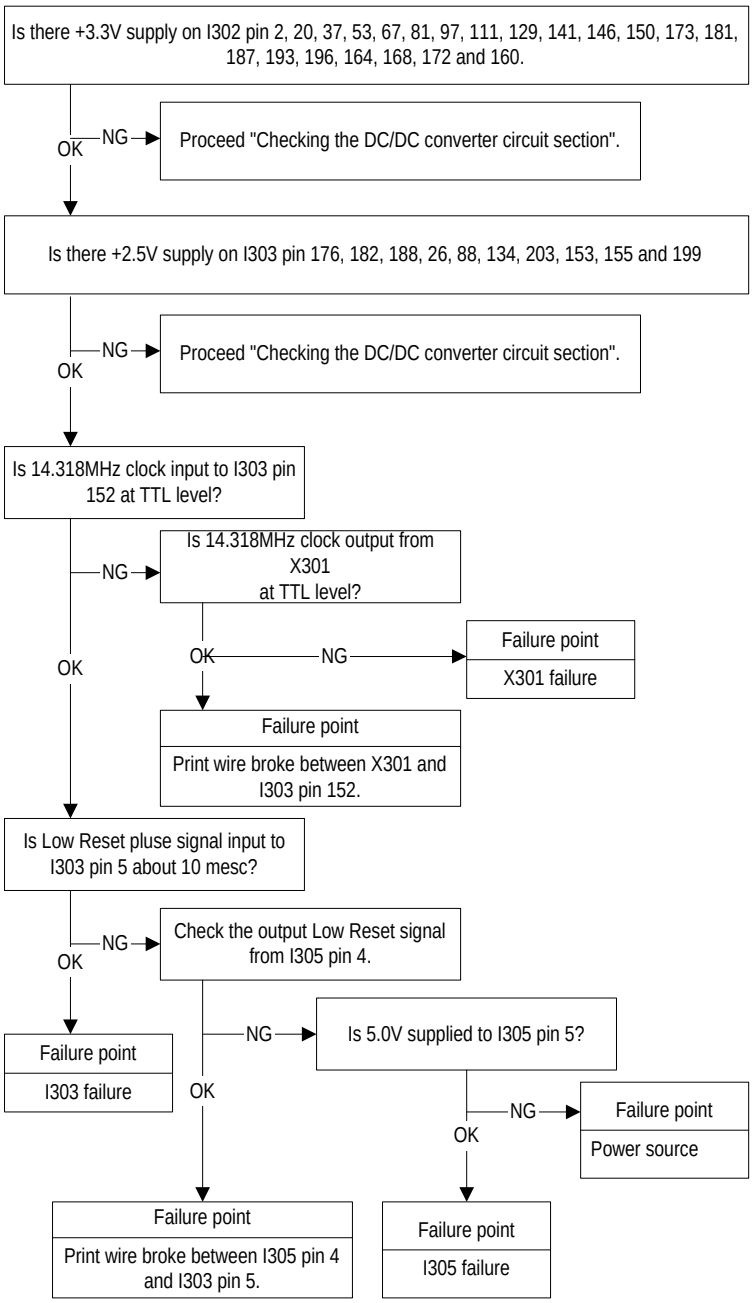
7.1 Checking the control circuit of horizontal sync pulse



7.2 Checking the control circuit of vertical sync pulse

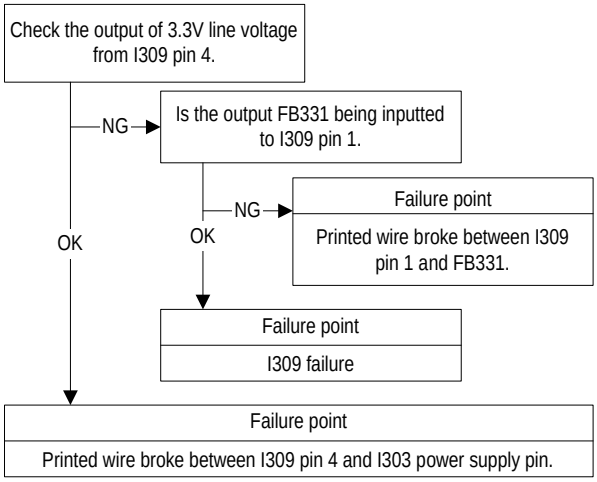


8. Checking the resolution change IC movement

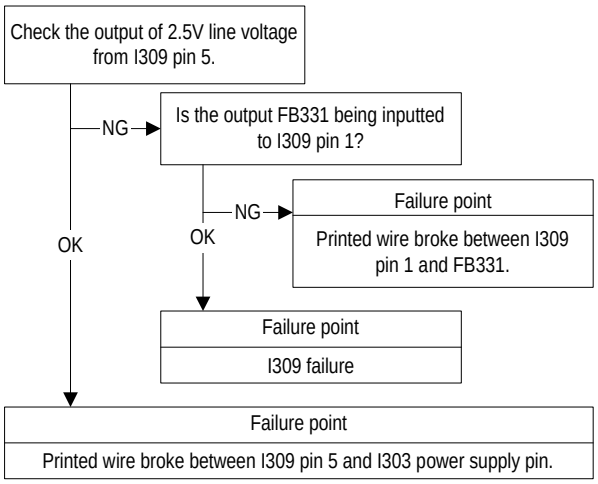


9 Checking the DC/DC converter circuit

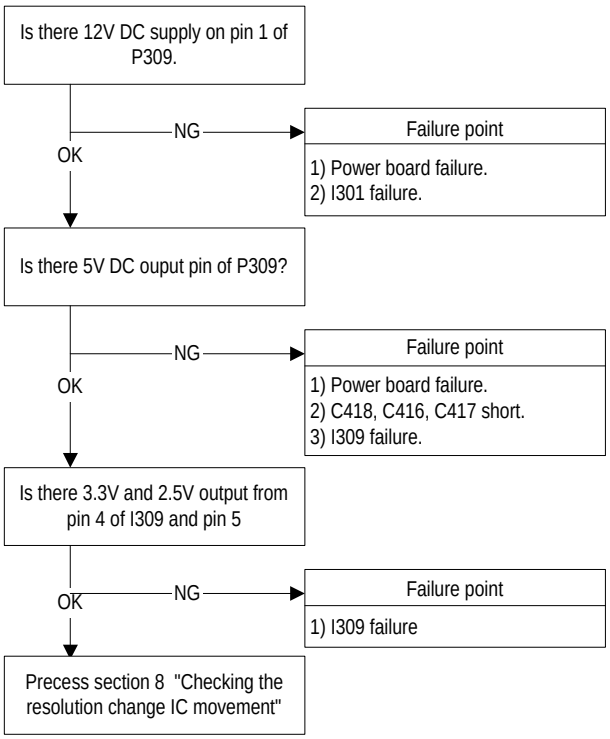
9.1



9.2

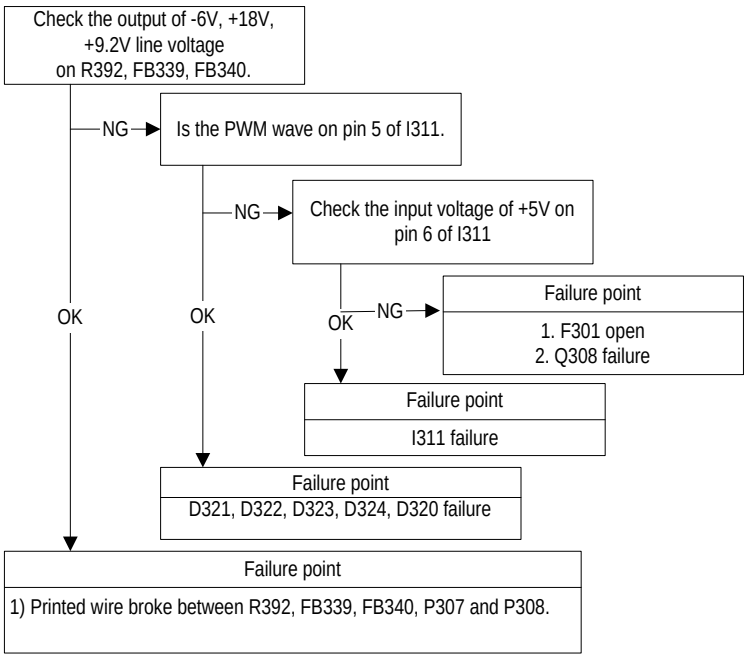


10 No power ON

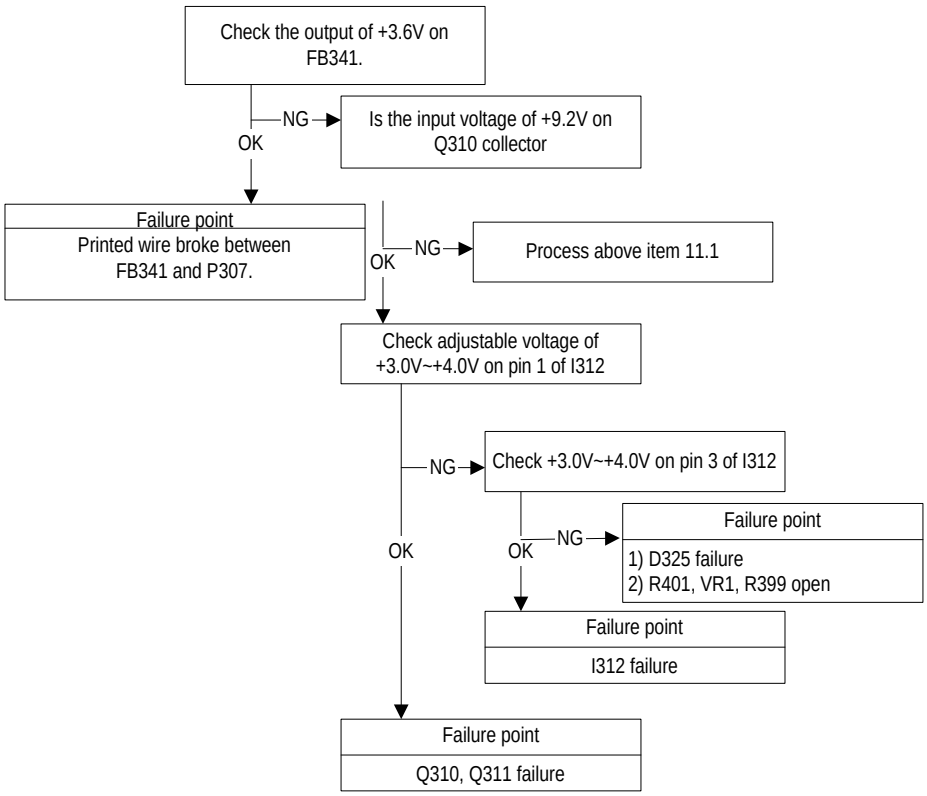


11. Checking the panel power circuit

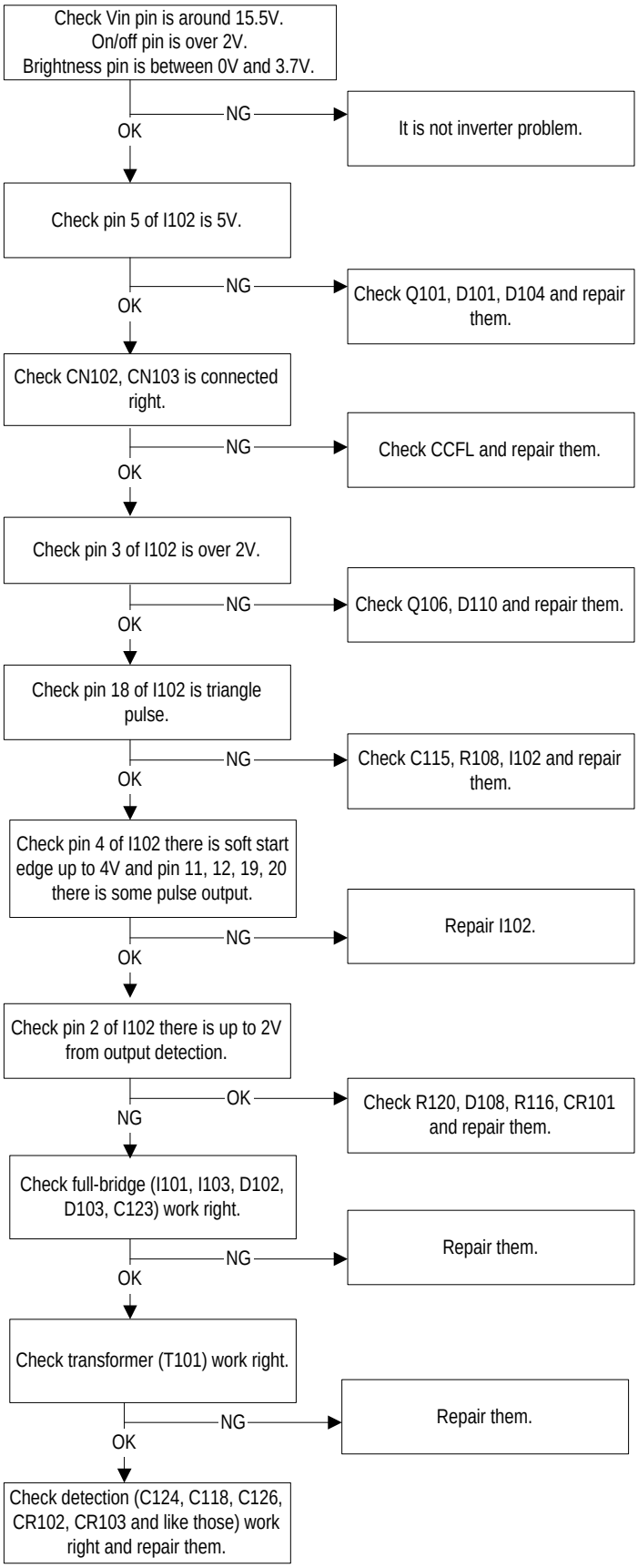
11.1



11.2



12. Checking inverter board circuit



1. Recommended Parts List

Note: 1. The components identified by " ⚠ " mark are critical for X-ray safety. Replace these with only the same parts specified.

2. If you have spare parts need, please check BOM to get the last release part number of flash ROM and related information.

No.	Location	Part Number	Description
1	D101	6414056098	DIODE ZNR RLZ TE 11 5.6C LL 34
2	D104	6414075018	DIODE ZNR RLZ TE 11 7.5B LL 34
3	D107	6412001738	DIODE RLS4148 LL 34 SMD RO
4	I101	6442033118	IC SI4532DY 8PIN SMD FAIRCHILD
5	I102	6442032808	IC OZ960S 20P SSOP 02
6	Q101	6422007308	TRANSISTOR NPN SST3904T116 T11
7	Q105	6426010708	FET N CHNL 2N7002 SOT 23 FRCHL
8	Q106	6423000708	TRANSISTOR PNP SST3906 T116
9	I308	6448018208	IC 24L C02B 8P SOP MICROCHIP
10	I304	6446006218	IC 74LBC14 14P TSSOP TI (DB Package)
11	I303	6444010616	IC gm2115 CG 208P PQFP Genesis
12	I307	6444011108	IC NC7WB3125 FAIRCHILD
13	I306	6448016508	IC 24LC16B/SN 8P SOP Microchip
14	I305	6442033808	IC Linear BD4743G 5Pin ROHM
15	I309	6442033908	IC Linear FAN1537PA 5PIN
16	I311	6442033608	IC Linear LM2622 8PIN MSOP NS
17	I312	6442033708	IC Linear TL062C 8PIN SIO ST
18	Q306 3080	6427002708	FET NDS356AP P-Chanel SOT-23
19	Q310	6422007218	TR NPN MMBT2222A SMD DIODES
20	Q311	6423002308	TR PNP 2SA1037AK T146/R ROHM
21	D316 D318 D312 D310	6414056108	DIODE ZENER MMSZ5232B 5.6B DIODES
22	D311 D313 D314 D315	6412019518	DUAL DIODE MMBD7000 DIODES
23	D324	6413040138	DIODE SCHOTTKY B140 1A/40V SMA
24	D325	6414068098	DIODE ZENER MMSZ5235B 6.8B DIODES

LITE-ON TECHNOLOGY CORP.

5 F, No. 16, Sec. 4, Nanking E. Road, Taipei, Taiwan

Tel: 886-2-25706999 Fax: 886-2-25706888

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