



# LCD-Monitor

Model 920NW

## *SERVICE* Manual

### LCD Monitor

### Fashion Feature

- 19" LCD Monitor (1440x 900 )
- Response Time (5ms)
- Simple Stand
- Silver / Black ColorVariation



## Copyright

©2007 by Samsung Electronics Co., Ltd.

All rights reserved.

This manual may not, in whole or in part, be copied, photocopied, reproduced, translated, or converted to any electronic or machine readable form without prior written permission of Samsung Electronics Co., Ltd.

920NW Service Manual

First edition July 20067.

Printed in Korea.

## Trademarks

Samsung is the registered trademark of Samsung Electronics Co., Ltd.

920NW and MacMaster Cable Adapter are trademarks of Samsung Electronics Co., Ltd.

Macintosh, Power Macintosh are trademarks of Apple Computer, Inc.

All other trademarks are the property of their respective owners.

# Contents

<b>1. Precautions</b> .....	<b>1-1</b>
1-1 Safety Precautions .....	1-1
1-2 Servicing Precautions .....	1-2
1-3 Electrostatically Sensitive Devices (ESD) Precautions .....	1-2
1-4 Installation Precautions .....	1-3
<b>2. Product specifications</b> .....	<b>2-1</b>
2-1 Fashion Feature .....	2-1
2-2 Specifications .....	2-1
2-3 Option Specification .....	2-2
<b>3. Alignments and Adjustments</b> .....	<b>3-1</b>
3-1 Required Equipment .....	3-1
3-2 Automatic Color Adjustment .....	3-1
3-3 DDC EDID Data Input .....	3-1
3-4 How to execute DDC .....	3-2
3-5 How to execute MCU Code .....	3-3
<b>4. Troubleshooting</b> .....	<b>4-1</b>
4-1 Common Acknowledge .....	4-1
4-2 No Power & Power LED Off .....	4-2
4-3 DC output voltage is unstable .....	4-3
4-4 Output power is unstable .....	4-4
4-5 Backlight can't be turned on .....	4-5
4-6 Black Screen and backlight turn on .....	4-6
4-7 White Screen .....	4-7
4-8 Bad Screen .....	4-8
<b>5. Exploded View and Parts List</b> .....	<b>5-1</b>
<b>6. Electrical Parts List</b> .....	<b>6-1</b>
<b>7. Block Diagram</b> .....	<b>7-1</b>
7-1 Power tree .....	7-1
7-2 Mainboard part .....	7-2
7-3 IP Board Part(SMPS Part) .....	7-2
7-4 IP BOARD part(Inverter Part) .....	7-3
<b>8. Wiring Diagram</b> .....	<b>8-1</b>

---

# Contents

<b>9. Schematic Diagrams</b> .....	<b>9-1</b>
9-1 INPUT .....	9-1
9-2 DCINPUT .....	9-2
9-3 SCALER .....	9-3
9-4 POWER .....	9-4
9-5 POWER .....	9-5
9-6 KEYPAD .....	9-6
<b>10. Operating Instructions and Installation</b> .....	<b>10-1</b>
10-1 Front .....	10-1
10-2 Rear .....	10-2
10-3 Monitor Assembly .....	10-3
10-4 Attaching a Base .....	10-4
<b>11. Disassembly and Reassembly</b> .....	<b>11-1</b>
11-1 Disassembly Block .....	11-1
11-2 Reassembly .....	11-4
<b>12. PCB Diagram</b> .....	<b>12-1</b>
<b>13. Circuit Descriptions</b> .....	<b>13-1</b>
13-1 Overall Block Structure .....	13-1
13-2 IP BOARD part(Inverter Part) .....	13-4
<b>14. Reference Infomation</b> .....	<b>14-1</b>
14-1 Technical Terms .....	14-1
14-2 Connecting the monitor .....	14-3
14-3 Pin Assignments .....	14-4
14-4 Timing Chart .....	14-5
14-5 Preset Timing Modes .....	14-6
14-6 Panel Description .....	14-7

---



-This Service Manual is a property of Samsung Electronics Co., Ltd.  
Any unauthorized use of Manual can be punished under applicable International and/or domestic law.

Samsung Electronics Co.,Ltd.  
416, Maetan-3Dong, Yeongtong-Gu, Suwon City,  
Gyeonggi-Do, Korea, 443-742  
Printed in Korea  
P/N : BN82-  
URL : <http://itself.sec.samsung.co.kr/>

# 1 Precautions

Follow these safety, servicing and ESD precautions to prevent damage and to protect against potential hazards such as electrical shock.

## 1-1 Safety Precautions

### 1-1-1 Warnings

1. For continued safety, do not attempt to modify the circuit board.
2. Disconnect the AC power and DC power jack before servicing.

### 1-1-2 Servicing the LCD Monitor

1. When servicing the LCD Monitor, Disconnect the AC line cord from the AC outlet.
2. It is essential that service technicians have an accurate voltage meter available at all times. Check the calibration of this meter periodically.

### 1-1-3 Fire and Shock Hazard

Before returning the monitor to the user, perform the following safety checks:

1. Inspect each lead dress to make certain that the leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the monitor.
2. Inspect all protective devices such as nonmetallic control knobs, insulating materials, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacitor networks, mechanical insulators, etc.
3. Leakage Current Hot Check (Figure 1-1):

**WARNING :** Do not use an isolation transformer during this test.

Use a leakage current tester or a metering system that complies with American National Standards Institute (*ANSI C101.1, Leakage Current for Appliances*), and Underwriters Laboratories (*UL Publication UL1410, 59.7*).

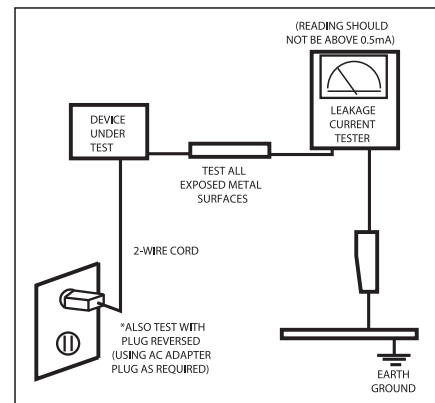


Figure 1-1. Leakage Current Test Circuit

4. With the unit completely reassembled, plug the AC line cord directly into a 120V AC outlet. With the unit's AC switch first in the ON position and then OFF, measure the current between a known earth ground (metal water pipe, conduit, etc.) and all exposed metal parts, including: metal cabinets, screwheads and control shafts. The current measured should not exceed 0.5 milliamp. Reverse the power-plug prongs in the AC outlet and repeat the test.

### 1-1-4 Product Safety Notices

Some electrical and mechanical parts have special safety-related characteristics which are often not evident from visual inspection. The protection they give may not be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by  $\triangle$  on schematics and parts lists. A substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards. Product safety is under review continuously and new instructions are issued whenever appropriate.

## 1 Precautions

### 1-2 Servicing Precautions

---

**WARNING:** An electrolytic capacitor installed with the wrong polarity might explode.

**Caution:** Before servicing units covered by this service manual, read and follow the Safety Precautions section of this manual.

**Note:** If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions, always follow the safety precautions.

#### 1-2-1 General Servicing Precautions

1. Always unplug the unit's AC power cord from the AC power source and disconnect the DC Power Jack before attempting to:  
(a) remove or reinstall any component or assembly, (b) disconnect PCB plugs or connectors, (c) connect a test component in parallel with an electrolytic capacitor.
2. Some components are raised above the printed circuit board for safety. An insulation tube or tape is sometimes used. The internal wiring is sometimes clamped to prevent contact with thermally hot components. Reinstall all such elements to their original position.
3. After servicing, always check that the screws, components and wiring have been correctly reinstalled. Make sure that the area around the serviced part has not been damaged.
4. Check the insulation between the blades of the AC plug and accessible conductive parts (examples: metal panels, input terminals and earphone jacks).
5. Insulation Checking Procedure: Disconnect the power cord from the AC source and turn the power switch ON. Connect an insulation resistance meter (500 V) to the blades of the AC plug.  
The insulation resistance between each blade of the AC plug and accessible conductive parts (see above) should be greater than 1 megohm.
6. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the positive lead; always remove the instrument's ground lead last.

### 1-3 Static Electricity Precautions

---

Some semiconductor (solid state) devices can be easily damaged by static electricity. Such components are commonly called Electrostatically Sensitive Devices (ESD). Examples of typical ESD are integrated circuits and some field-effect transistors. The following techniques will reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist-strap device. To avoid a shock hazard, be sure to remove the wrist strap before applying power to the monitor.
2. After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of an electrostatic charge.
3. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ESDs.
4. Use only a grounded-tip soldering iron to solder or desolder ESDs.
5. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ESDs.
6. Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are packaged with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.
7. Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.  
**Caution:** Be sure no power is applied to the chassis or circuit and observe all other safety precautions.
8. Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together, or lifting your foot from a carpeted floor can generate enough static electricity to damage an ESD.

## 1-4 Installation Precautions

---

1. For safety reasons, more than two people are required for carrying the product.
2. Keep the power cord away from any heat emitting devices, as a melted covering may cause fire or electric shock.
3. Do not place the product in areas with poor ventilation such as a bookshelf or closet. The increased internal temperature may cause fire.
4. Bend the external antenna cable when connecting it to the product. This is a measure to protect it from being exposed to moisture. Otherwise, it may cause a fire or electric shock.
5. Make sure to turn the power off and unplug the power cord from the outlet before repositioning the product. Also check the antenna cable or the external connectors if they are fully unplugged. Damage to the cord may cause fire or electric shock.
6. Keep the antenna far away from any high-voltage cables and install it firmly. Contact with the highvoltage cable or the antenna falling over may cause fire or electric shock.
7. When installing the product, leave enough space (10cm) between the product and the wall for ventilation purposes.  
A rise in temperature within the product may cause fire.



1 Precautions

Memo

## 2 Product Specifications

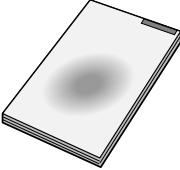
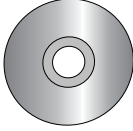
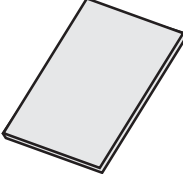

### 2-1 Fashion Feature

- 19" LCD Monitor (1440x 900 )
- Response Time (5ms)
- Simple Stand
- Silver / Black ColorVariation

### 2-2 Specifications

Features	Specifications
Size	19" Diagonal (41 x 27cm)
Pixel Pinch	0.285(H) x 0.285(V)
Frequency	
Horizontal / Vertical Bandwidth (MHz)	30 ~ 81 kHz/ 56 ~ 75 Hz 140MHz
Resolution	1440 x 900@60Hz
Color	Sliver & Black
Signal Input	
Sync. Type Video Input	Separate/Composite/No Sync. On Green Analog Signal Level
Power Consumption	Max 36 W Power saving <1W
Stand	Yes
Swivel ( left / right )	NO
Power Supply	AC 100 ~ 240 VAC(+/-10 % ) , 60/50 Hz ± 3 Hz
Dimension (W x D x H)	439.006 x 289.006 x 65.45 mm <sup>3</sup> (Without Stand) 439.006x355.452x81.12 mm <sup>3</sup> (With Simple Stand)

2-3 Option Specification

Item	Item Name	CODE.NO	Remark
	GUIDE, QUICK SETUP	BH68-00376L-04	
	MNL User's(CD)	BN59-00537A-00	
	CARS, WARRANTY	BH68-70438A-10	
	D-Sub Cable	N/A	

---

## 3 Alignments and Adjustments

---

This section of the service manual explains how to use the RS232 JIG.  
This function is needed for AD board change.

### 3-1 Required Equipment

The following equipment is necessary for adjusting the monitor:

- Computer with Windows 95, Windows 98, Windows NT, Windows 2000, or Windows XP.
- MTI-2031 DDC MANAGER JIG

### 3-2 Automatic Color Adjustment

To Analog video, In 16gray or any pattern using black and white and any mode.(16gray and XGA mode recommend)

1. Push the OSD Menu button to open the OSD
2. Select language English
3. Push enter button during 5 seconds.
4. See the screen flashing

### 3-3 DDC EDID Data Input

1. Input DDC EDID data when replacing AD PCB.
2. Receive/Download the proper DDC file for the model from HQ quality control department.  
Install the below jig (Figure 1) and enter the data.



Figure 1.

## 3-4 VGA EDID table

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	4C	2D	2B	02	XX	XX	XX	XX
1	XX	XX	01	03	6C	22	1B	78	2A	DC	55	A3	59	48	9E	24
2	11	50	54	BF	EF	80	81	80	71	4F	81	40	01	01	01	01
3	01	01	01	01	01	01	30	2A	00	98	51	00	2A	40	30	70
4	13	00	52	0E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
5	51	0E	00	0A	20	20	20	20	20	20	00	00	00	FC	00	53
6	79	6E	63	4D	61	73	74	65	72	0A	20	20	00	00	00	FF
7	00	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	0A	20	20	00	CS

Details:

Byte(Hex)	Field Name and Comments	Description	EDID
00-07(8 byte)	Head Information		00,FF,FF,FF, FF, FF, FF,00
08--09	ID Manufacturer Name	SAM	4C,2D
0A--0B	Product ID Code	022B	2B,02
0C--0F	Last 5 Digits of Serial Number	Used Notes1	XX,XX,XX,XX
10	Week of Manufacture	Notes2	XX
11	Year of Manufacture	Notes3	XX
12	EDID Version Number	1	01
13	EDID Revision Number	3	03
14	Video Input Definition	Analog Signal 0.700,0.000(0.700Vpp) Separate Sync Composite Sync	6C
15	Max Horizontal Image Size (cm)	34	22
16	Max Vertical Image Size (cm)	27	1B
17	Display Gamma	2.2	78
18	Power Management and Supported Feature(s)	Active Off Display Type = R/G/B Color Preferred Timing Mode	2A
19-22 (10 byte)	Chroma Info	Red X - 0.640, Red Y - 0.349, Green X - 0.284, Green Y - 0.617, Blue Y - 0.067, Blue X - 0.142, White X - 0.313, White Y - 0.329	DC,55,A3,59, 48,9E, 24,11, 50,54
23	Established Timing I	720x400@70Hz 720x400@88Hz(no) 640x480@60Hz 640x480@67Hz 640x480@72Hz 640x480@75Hz 800x600@56Hz 800x600@60Hz	BF

Byte(Hex)	Field Name and Comments	Description	EDID
24	Established Timing II	800x600@72Hz 800x600@75Hz 832x624@75Hz 1024x768@87Hz (no) 1024x768@60Hz 1024x768@70Hz 1024x768@75Hz 1280x1024@75Hz	EF
25	Manufacturers Reserved Timings	Support	80
26-35 (16 byte)	Standard Timing Identification	1280x1024@60Hz81,8071,4F 1152x864@75Hz 1280x960@60Hz Not Used Not Used Not Used Not Used Not Used	81,80 81,40 01,01 01,01 01,01 01,01 01,01
36--47 (18 byte)	Detailed Timing / Descriptor Block 1	1280X1024@60HZ Pixel Clock:108.00MHZ	30,2A,00,98, 51,00,2A,40, 30,70,13,00, 52,0E,11,00, 00,1E
48-59 (18 byte)	Detailed Timing / Descriptor Block 2	Monitor Range Limits: Min Vertical Freq - 56 Hz Max Vertical Freq - 75 Hz Min Horiz. Freq - 30 KHz Max Horiz. Freq - 81 KHz Pixel Clock - 140 MHz  Secondary GTF - Not Supported	38  4B  1E  51  0E  00
5A-6B (18 byte)	Detailed Timing / Descriptor Block 3	Monitor Name: SyncMaster	53,79,6E,63, 4D,61,73,74, 65,72
6C-7D (18 byte)	Detailed Timing / Descriptor Block 4	Serial Number: Notes4	XX,XX--- XX,XX
7E	Extension flag		00
7F	Checksum		CS

## Remark:

Notes1: Get SerialNumber(10----14Digit) from BarCode and transfer it to HEX

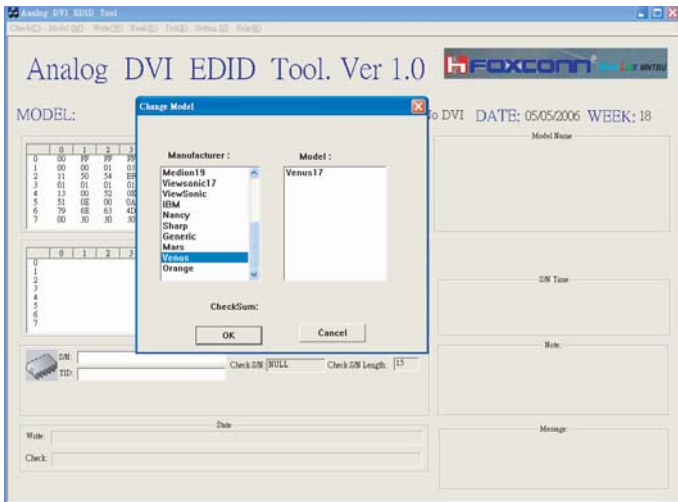
Notes2: Week(1---53),

Notes3: Year , HEX(Year-1990) ,

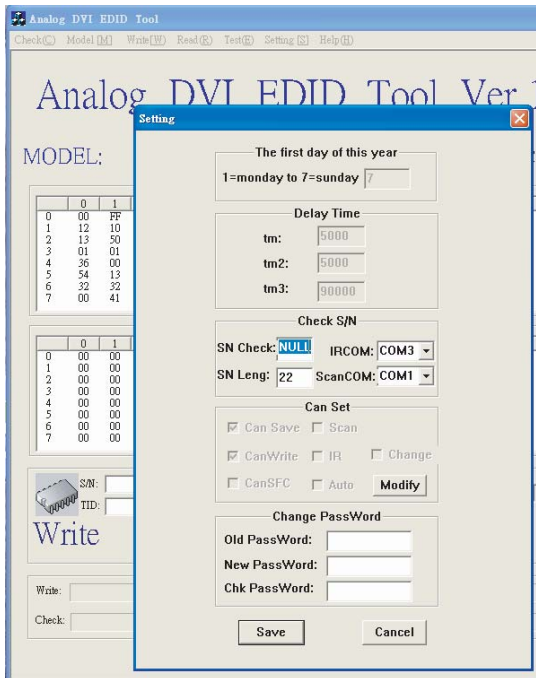
Notes4: Get Barcode(5----14Digit), and save as ASCII

### 3 Alignments and Adjustments

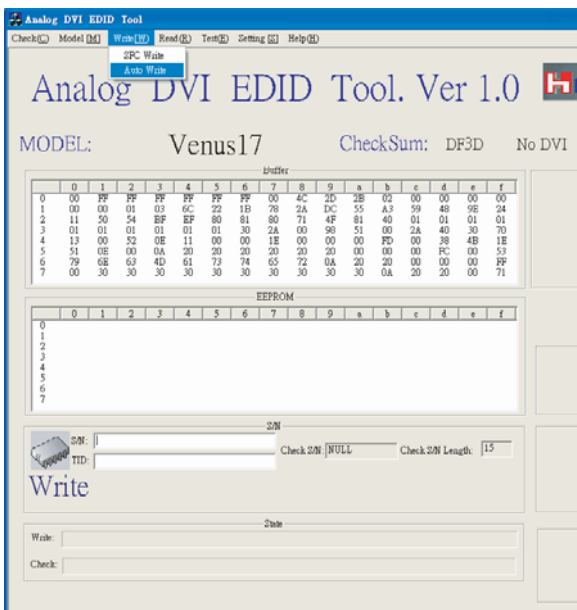
### 3-5 How to execute DDC



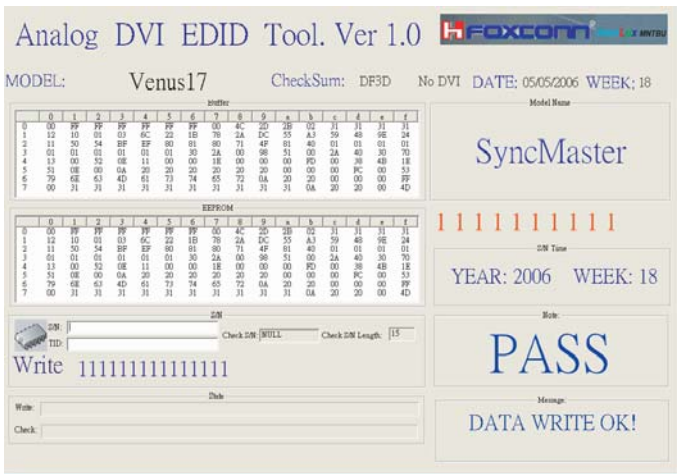
1. Install Analog DVI EDID Tool Program
2. Click the Analog DVI EDID Tool icon.
3. Select mode The password is 1234. Select the manufacture is Venus and the model name is Venus 17.



4. Setting  
The password is 1234. Select the port1 and the SN Leng is 22. Save the change.

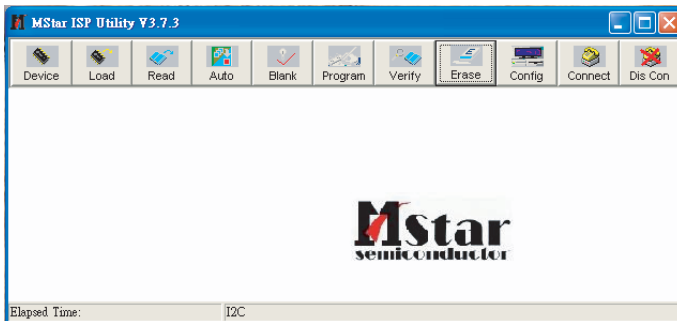


5. Select Write-Auto Write  
The SN number is a 22 random numbers.



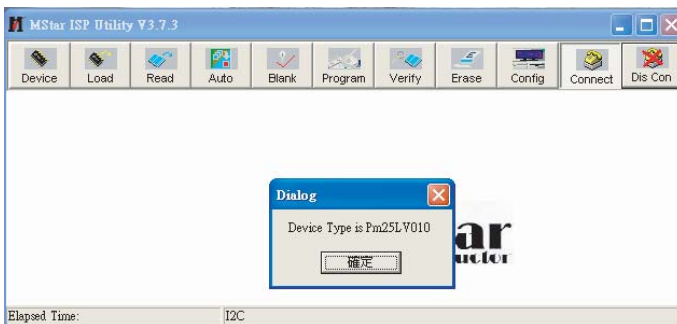
6. Write DDC ok.

### 3-5 How to execute MCU Code

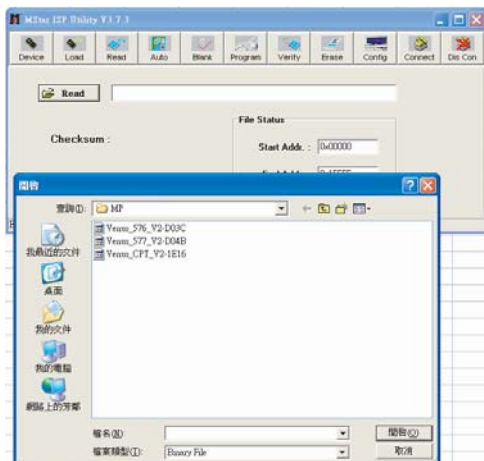


1. Set the options.

- Manufacture: MSTAR
- Device Type: TSUM16\_ROM128K\_ext\_flash
- Communication Port: DSUB15 (Analog)
- External Memory: PM25LV010E



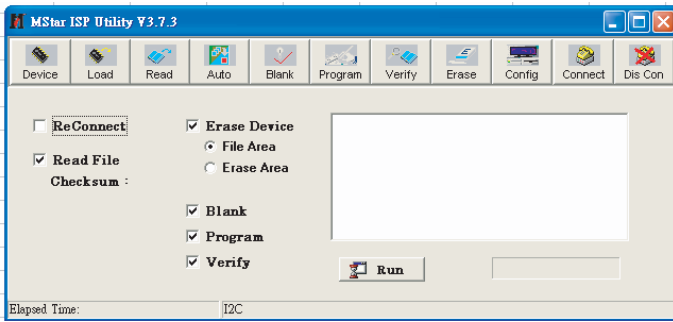
2. Click 'Connect File' button, and select the MCU code.



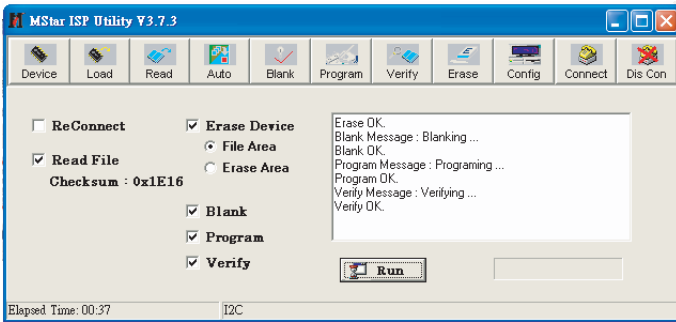
3. Click 'Read File' button, and select the MCU code.



### 3 Alignments and Adjustments



4. Click 'Auto Program' button.



5. If Program and Verify is OK, turn off the hard power and than turn on again.

---

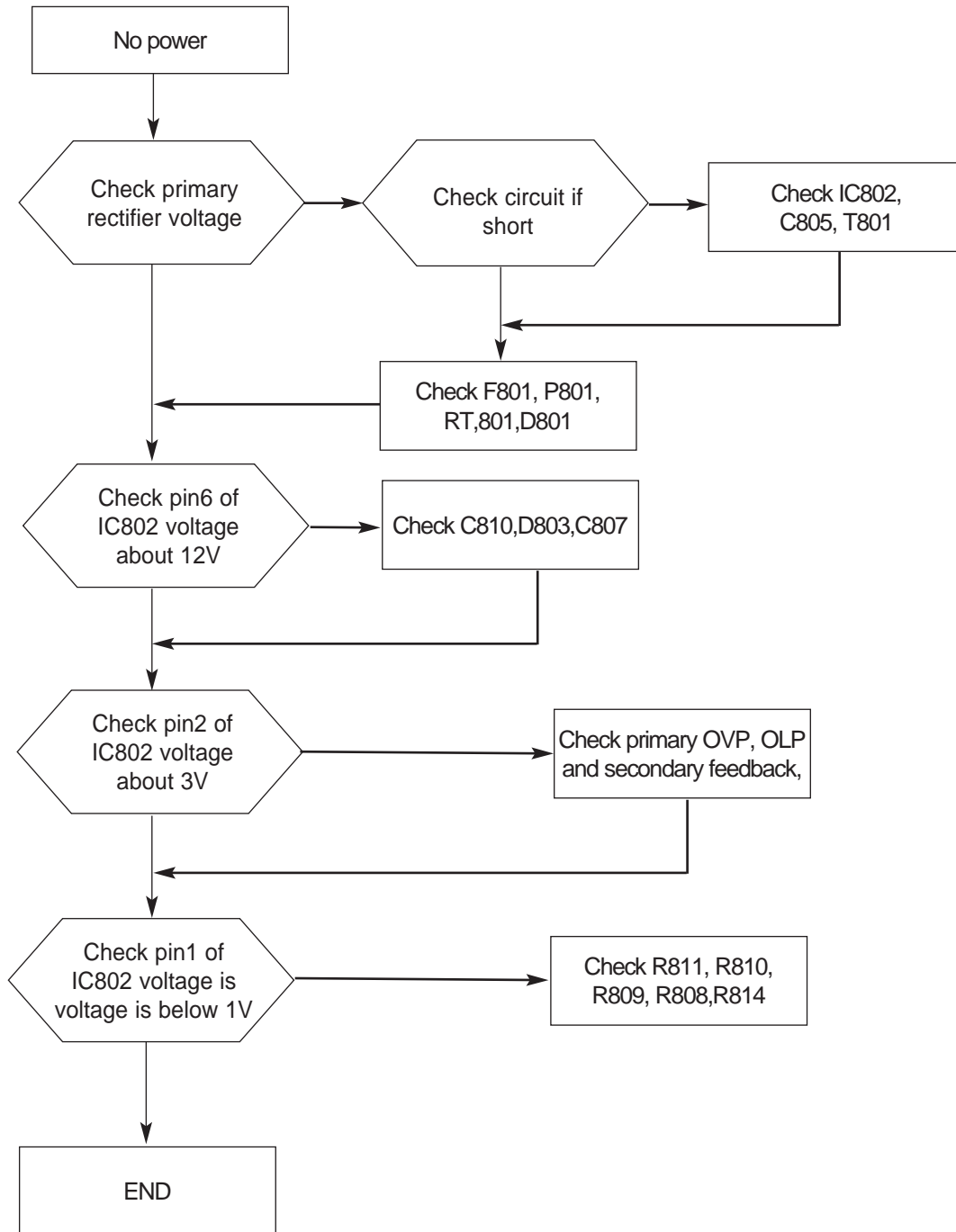
## 4 Troubleshooting

---

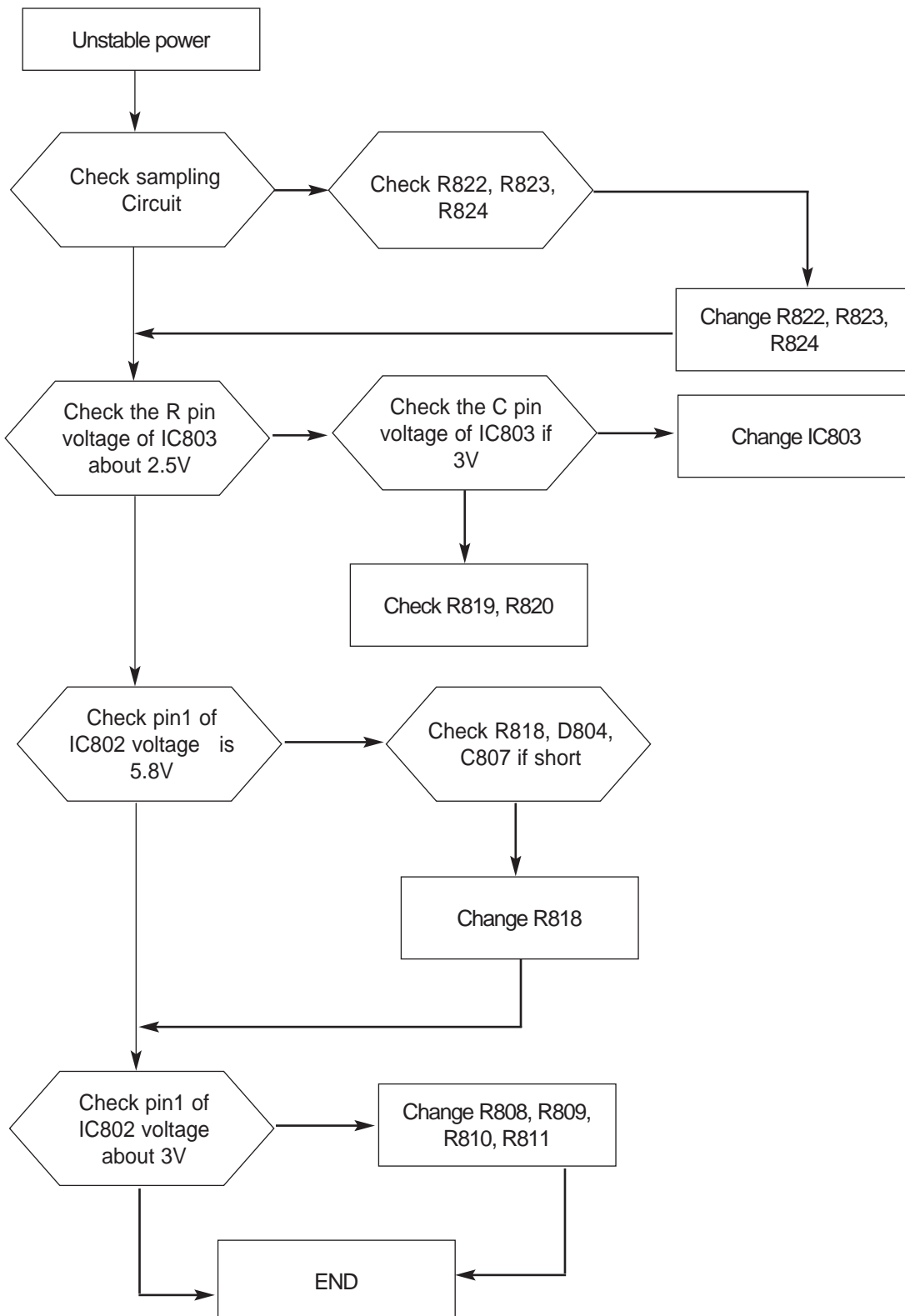
### 4-1 Common Acknowledge

- If you change the interface board, be sure that the U105, U106 and U103 these three components also changed to the new I/F board because there was program inside. If not, please re-write EDID or upload firmware into Flash memory via VGA Cable.
- If you adjust clock and phase, please do it at the condition of Windows shut down pattern.
- If you confirm the R.G.B. color is normal or not, please do it under 16-grey scalar pattern.
- This LCM is analog interface. So if the entire screen is an abnormal color that means the problem happen in the analog circuit part, if only some scale appears abnormal color that stand the problem happen in the digital circuit part.
- If you check the H/V position, please use the crosshatch pattern.
- This LCM support more than 30 timing modes, if the input timing mode is out of specification, the picture may appears abnormally.
- If brightness uneven, repairs Inverter circuit or change a new panel.
- If you find the vertical line or horizontal line lost on the screen, please change panel.

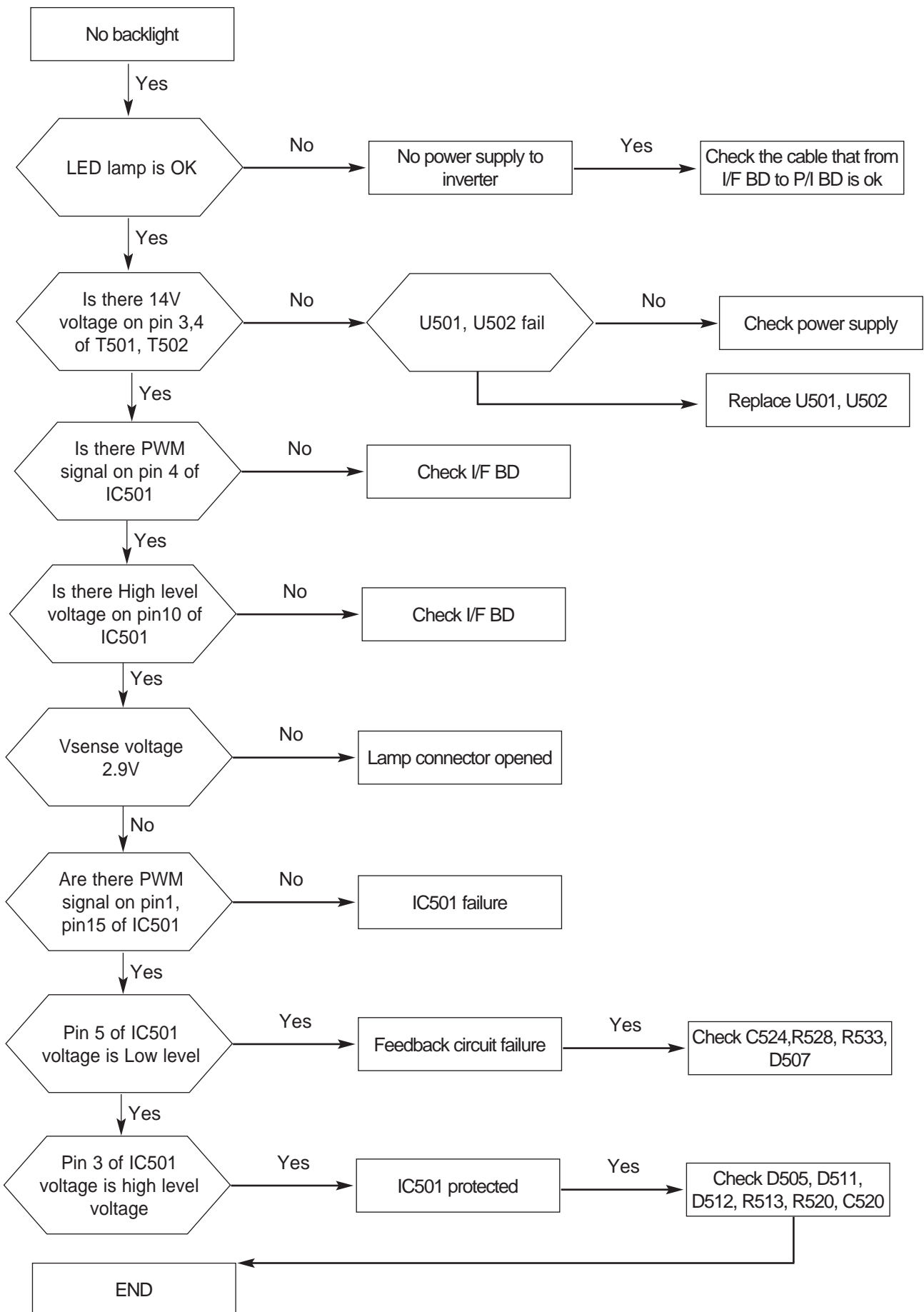
### 4-2 No Power & Power LED Off



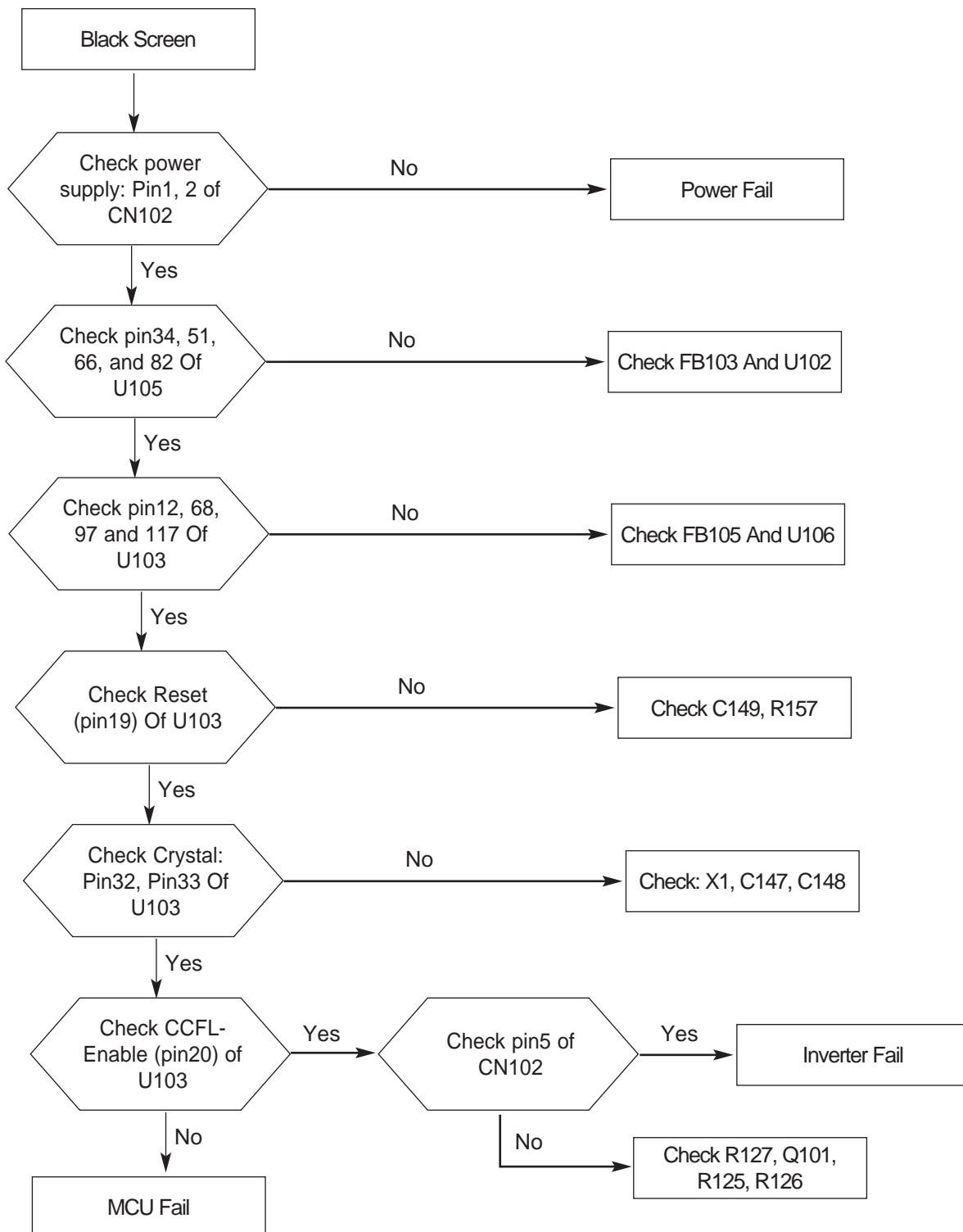
## 4-3 Output power is unstable



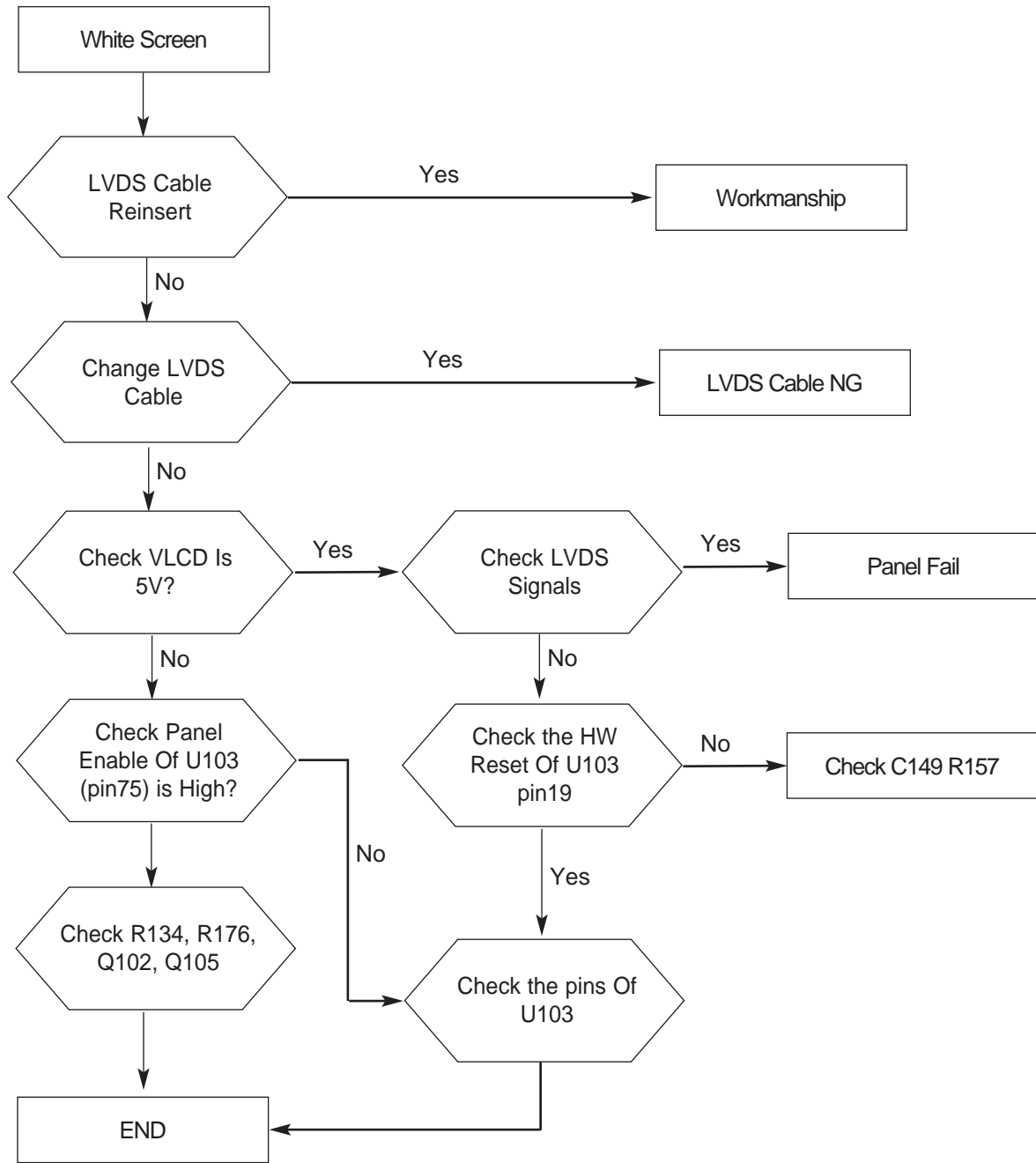
4-4 Backlight can't be turned on



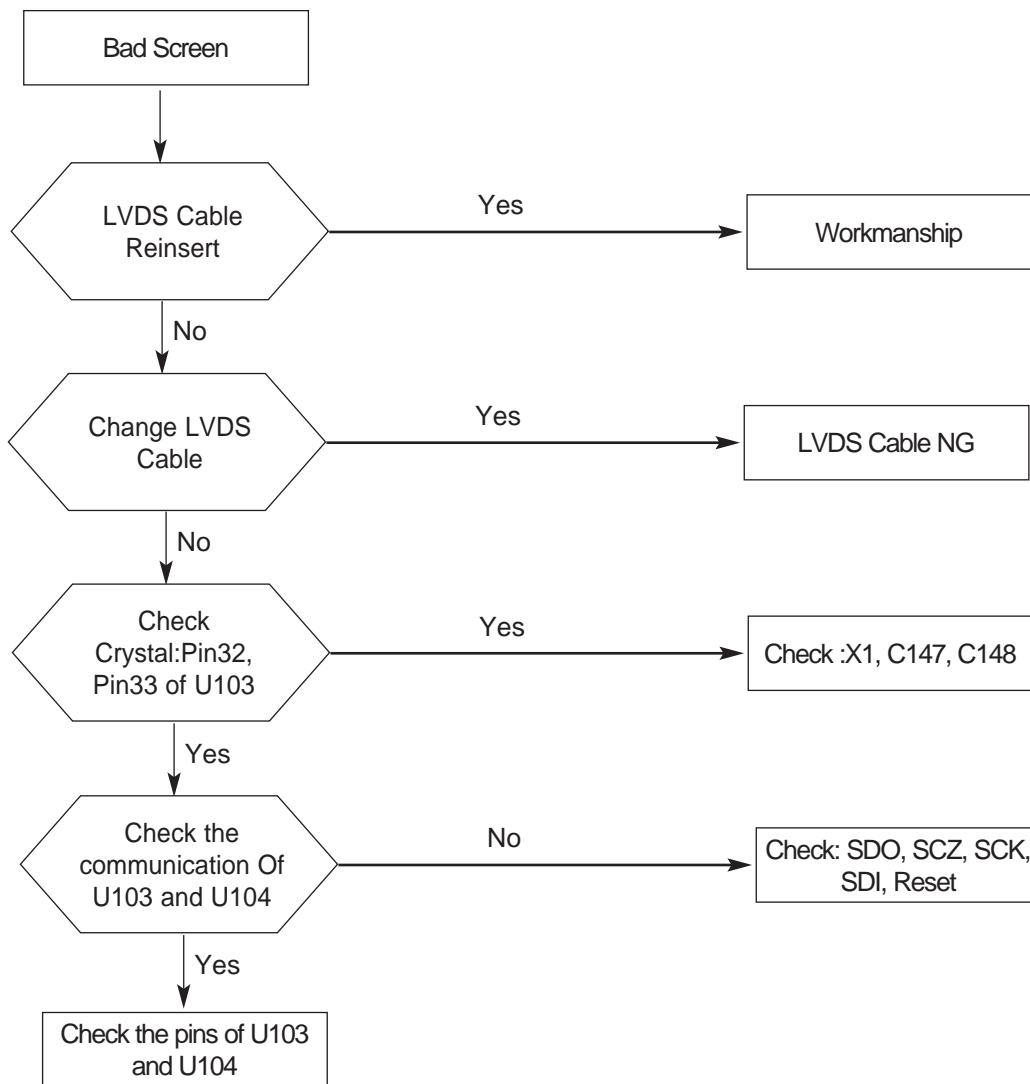
## 4-5 Black Screen and backlight turn on



### 4-6 White Screen



## 4-8 Bad Screen





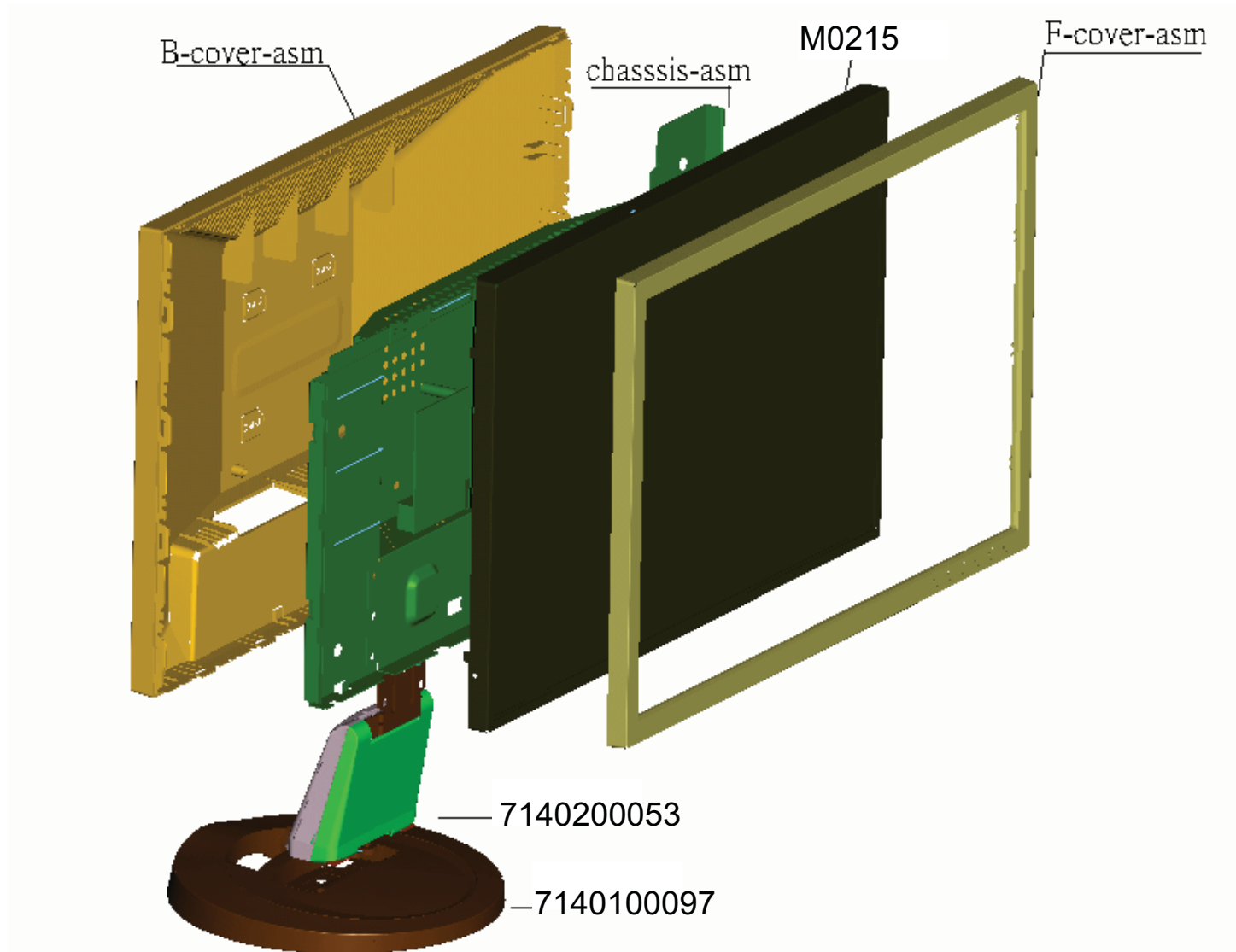
## Memo

## 5 Exploded View and Parts List

-You can search for updated part codes through ITSELF web site.

URL : <http://itself.sec.samsung.co.kr>

### 5-1 Exploded View



Location.No	CODE-NO	SPECIFICATION & DESCRIPTION	Q'TY	SA/SNA	REMARK
M0215	BN07-00406A	LCD-PANEL;MT190AWO1 V2,Haydn,6bit FRC,42	1	S.A	
7140200053	BN82-00152A	A/S MATERIAL ASSY-BASE;LE1729	1	S.A	
7140100097	BN82-00188B	A/S MATERIAL ASSY-STAND;LE1961	1	S.A	

## 6 Electrical Parts List

-You can search for updated part codes through ITSELF web site.

URL : <http://itself.sec.samsung.co.kr/>

### 6-1 LS19HANKSM/EDC Parts List

Level	Loc. No.	Code No.	Description & Specification	Q'ty	SA/SNA
		LS19HANKSM/EDC	920NW SILVER, TCO99		
0.1	M0215	BN07-00406A	LCD-PANEL;MT190AWO1 V2,Haydn,6bit FRC,42	1	S.A
0.1	4530101001	BN81-00270A	A/S-CABLE;D-SUB 15P MALE 6FT,ROHS,BLACK/	1	S.N.A
0.1	7909714006	BN81-00544A	A/S-PCB;P/I BOARD,LE1961-610 ROHS,790971	1	S.A
0.1	7909713006	BN81-00545A	A/S-PCB;I/F BOARD,LE1961-610 ROHS,790971	1	S.A
0.1	7909715000	BN81-00546A	A/S-PCB;KEYPAD BOARD,LE1961 ROHS,7909715	1	S.A
0.1	5010102104	BN81-00547A	A/S-BEZEL FRONT;LE1961,501010210400R	1	S.A
0.1	5010302063	BN81-00548A	A/S-BUTTON FUNCTION KEY;LE1961,501030206	1	S.A
0.1	4530708001	BN81-00549A	A/S-PWR CORD;BLK 6FT UL/CSA,10A/125V,453	1	S.A
0.1	4303030009	BN81-00550A	A/S-HRN LVDS;30P,120mm,ROHS,430303000920	1	S.A
0.1	7030000059	BN81-00551A	A/S-KIT ACCESSORY;920NW,US,LE1961,703000	1	S.A
0.1	4303008002	BN81-00555A	A/S-HRN ASSY;2*4P to 5P,265mm,UL1571#28	1	S.A
0.1	7140200053	BN82-00152A	A/S MATERIAL ASSY-BASE;LE1729	1	S.A
0.1	7140500095	BN82-00188A	A/S MATERIAL ASSY-BACK COVER;LE1961	1	S.A
0.1	7140100097	BN82-00188B	A/S MATERIAL ASSY-STAND;LE1961	1	S.A

6 Electrical Parts List

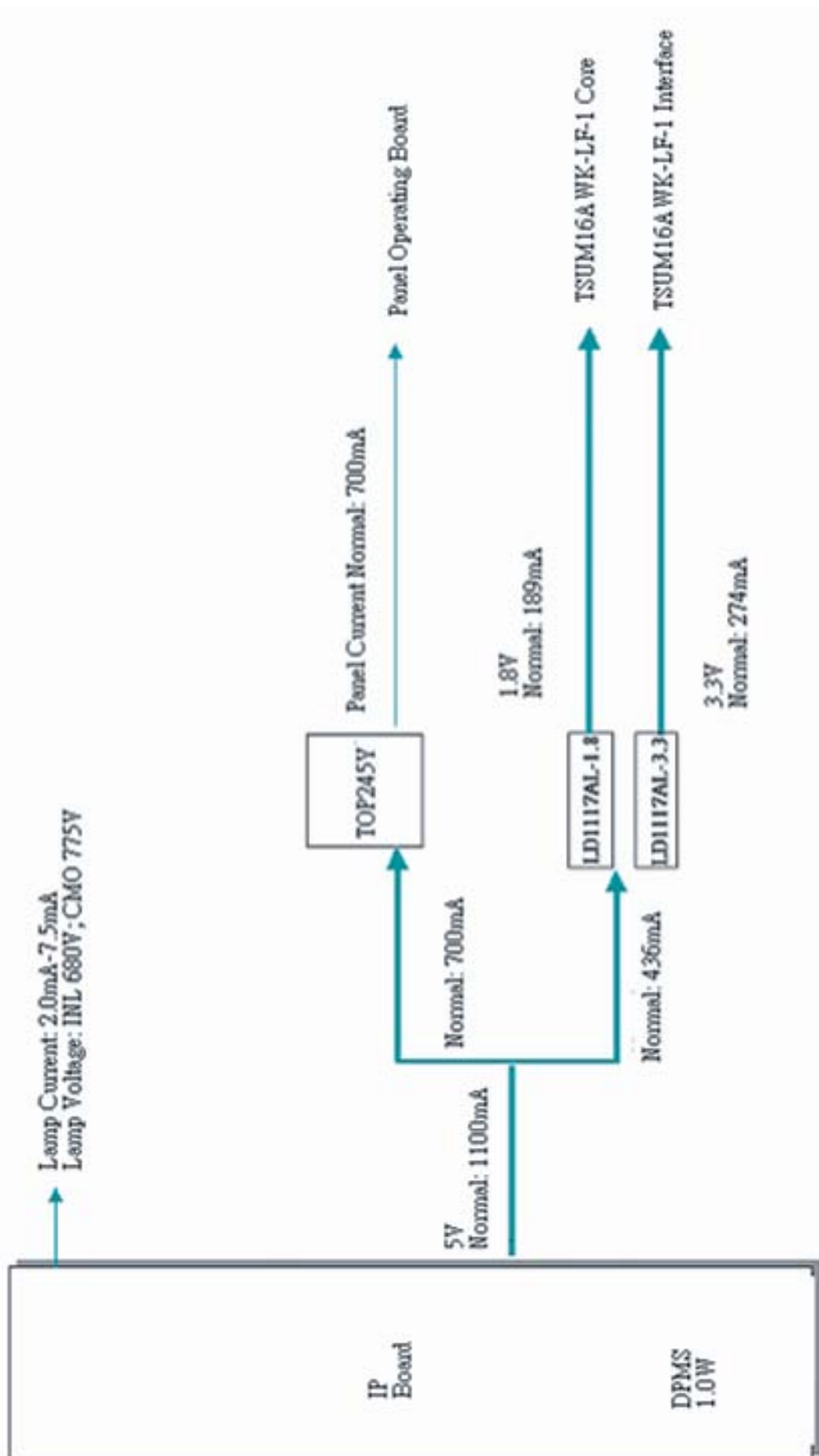
Memo

---

## 7 Block Diagram

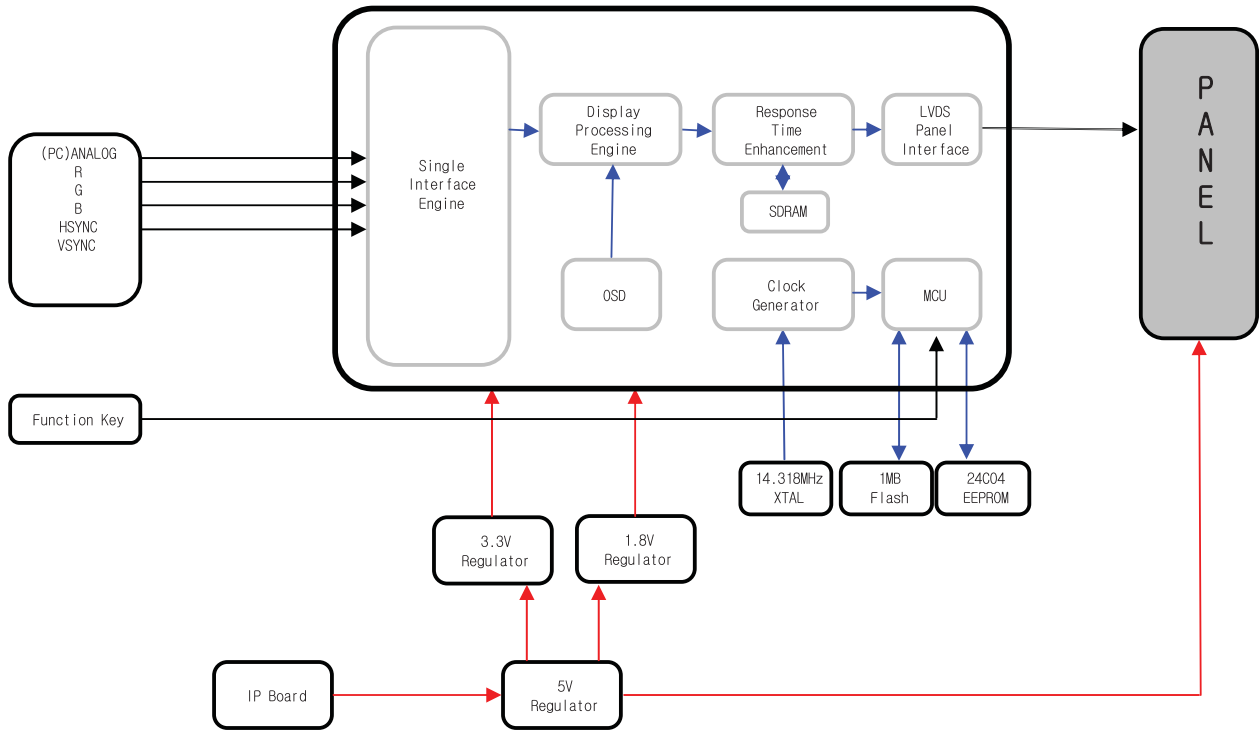
---

### 7-1 Power tree

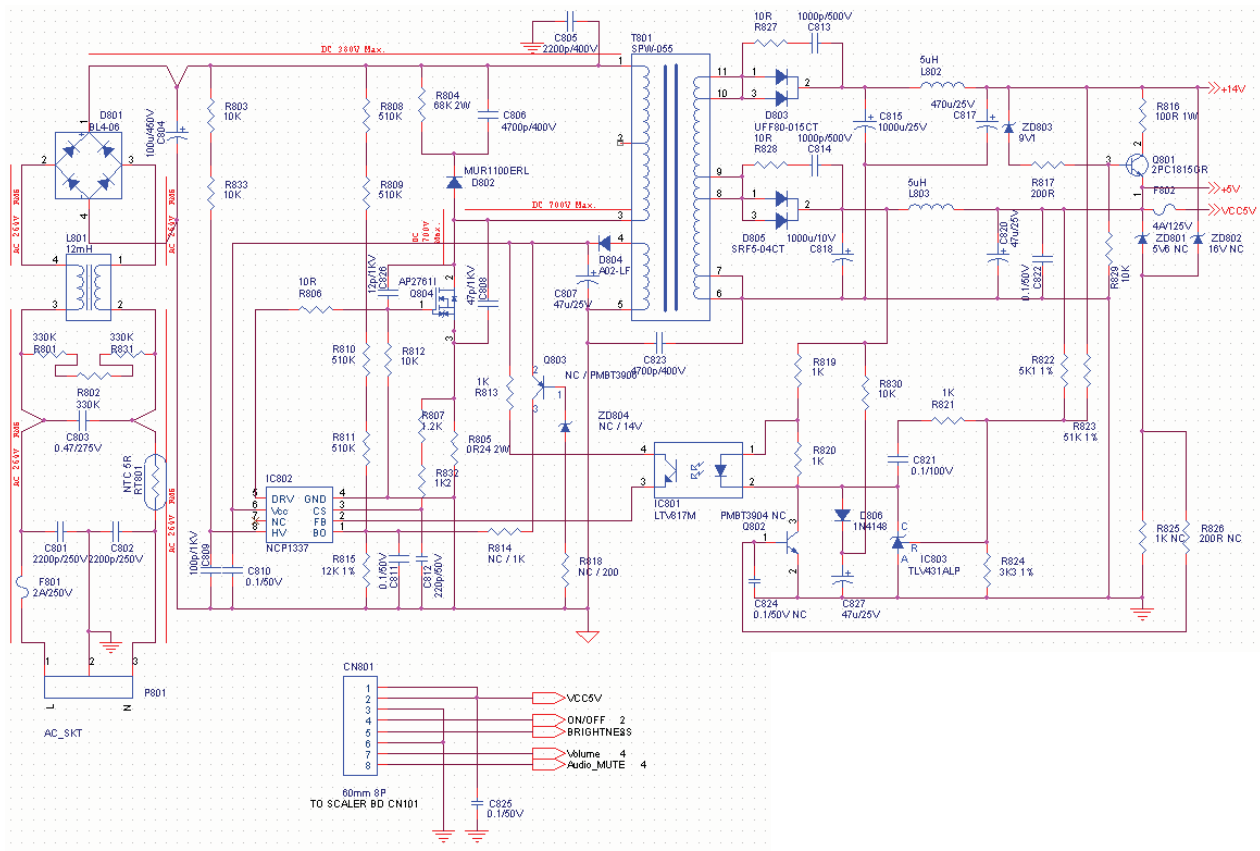


## 7 Block Diagrams

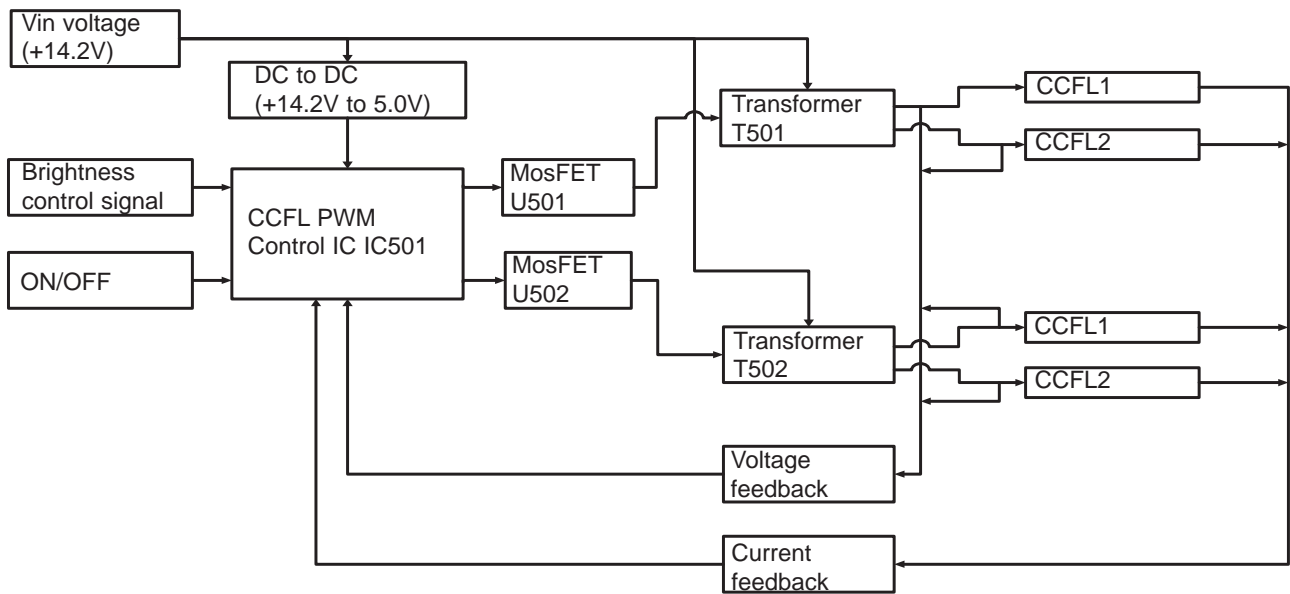
### 7-2 Main Board part



### 7-3 IP Board Part (Power part)



## 7-4 IP BOARD part(Inverter Part)





# Memo

# 8 Block Diagram

30	VLCD5V
29	VLCD5V
28	VLCD5V
27	NC
26	NC
25	NC
24	GND
23	RXE3+
22	RXE3-
21	RXEC+
20	RXEC-
19	RXE2+
18	RXE2-
17	GND
16	RXE1+
15	RXE1-
14	GND
13	RXE0+
12	RXE0-
11	RXO3+
10	RXO3-
9	RXOC+
8	RXOC-
7	GND
6	RXO2+
5	RXO2-
4	RXO1+
3	RXO1-
2	RXO0+
1	RXO0-

CN104( Connected with LVDS Cable)

CN101( Connected with the Inverter Cable)

6	GND
5	GND
4	ON/OFF
3	Brightness
2	VCC5V
1	VCC5V

( Connected with function wire) CN106

Led	1
Power	2
Key Right	3
Key Left	4
GND	5

Main board

CN103( Connected with the D-Sub Cable)

Data clock line (SC	15
VSYNC	14
H / H+V SYNC	13
Serial data (SDA)	12
NC	11
Cable Detect	10
NC	9
Blue GND	8
Green GND	7
Red GND	6
GND	5
NC	4
Blue video input	3
Green video input	2
Red video input	1

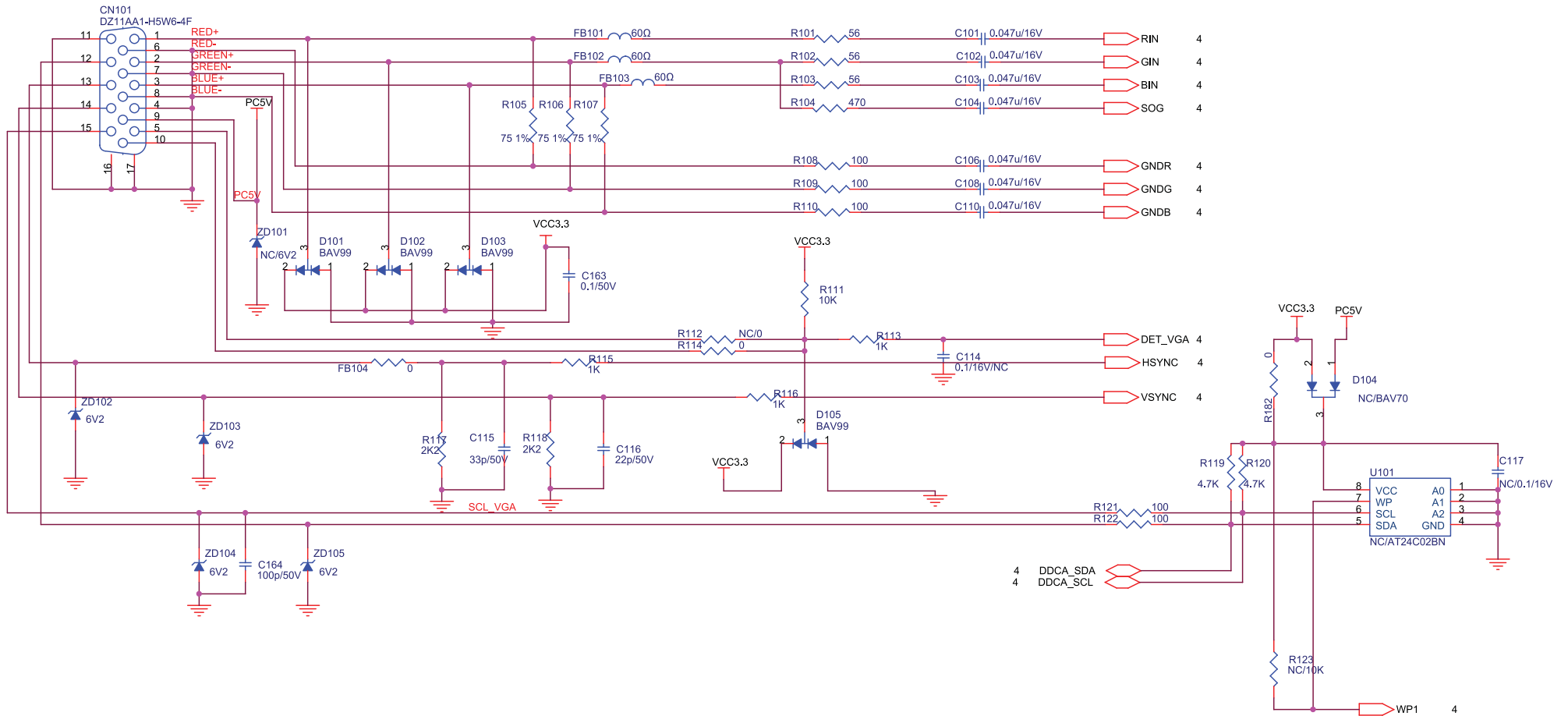
8 Wiring Diagram

Memo

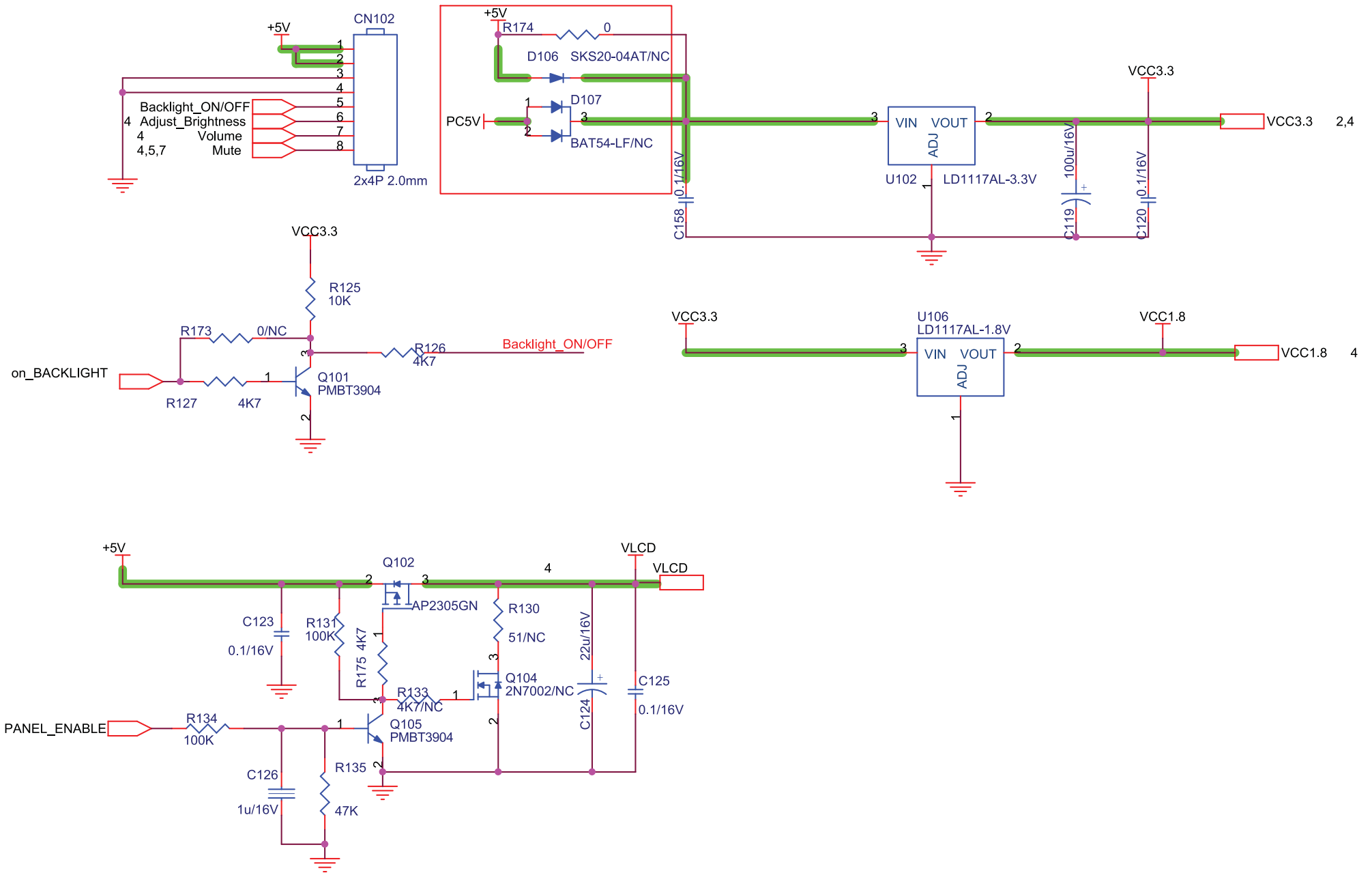
# 9 Schematic Diagrams

- This Document can not be used without Samsung's authorization.

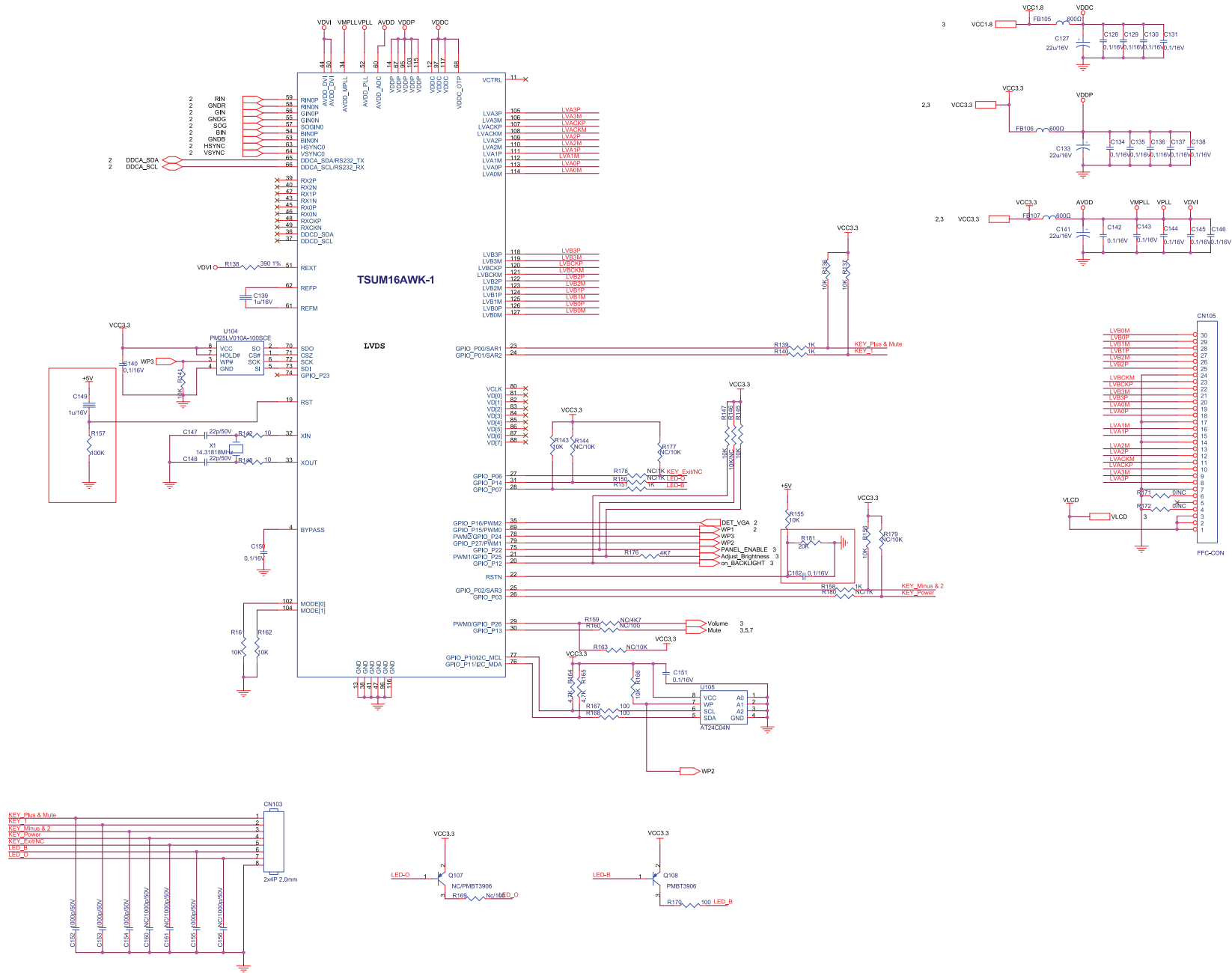
## 9-1 INPUT



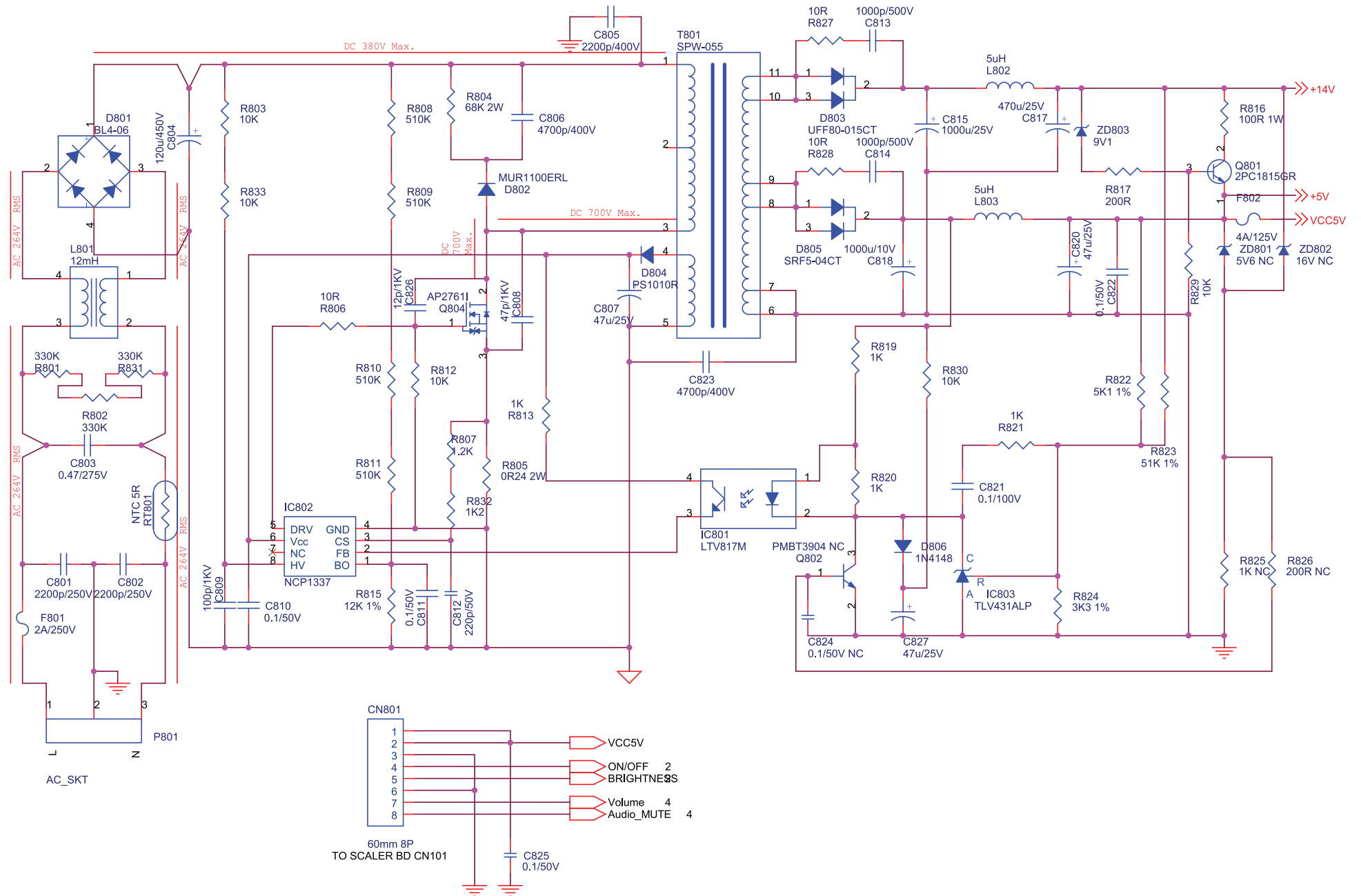
9-2 DCINPUT



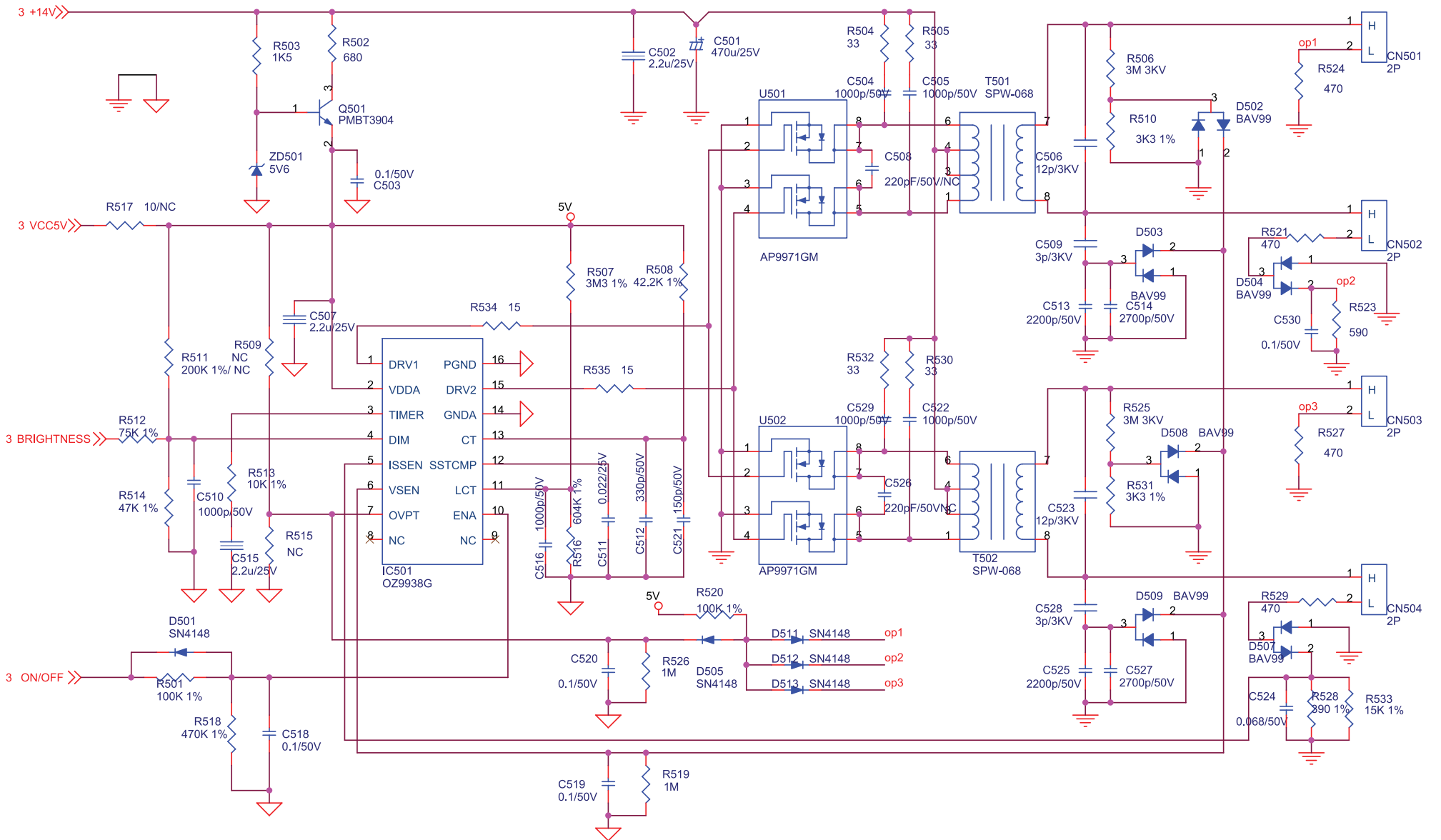
9-3 SCALER



9-4 POWER

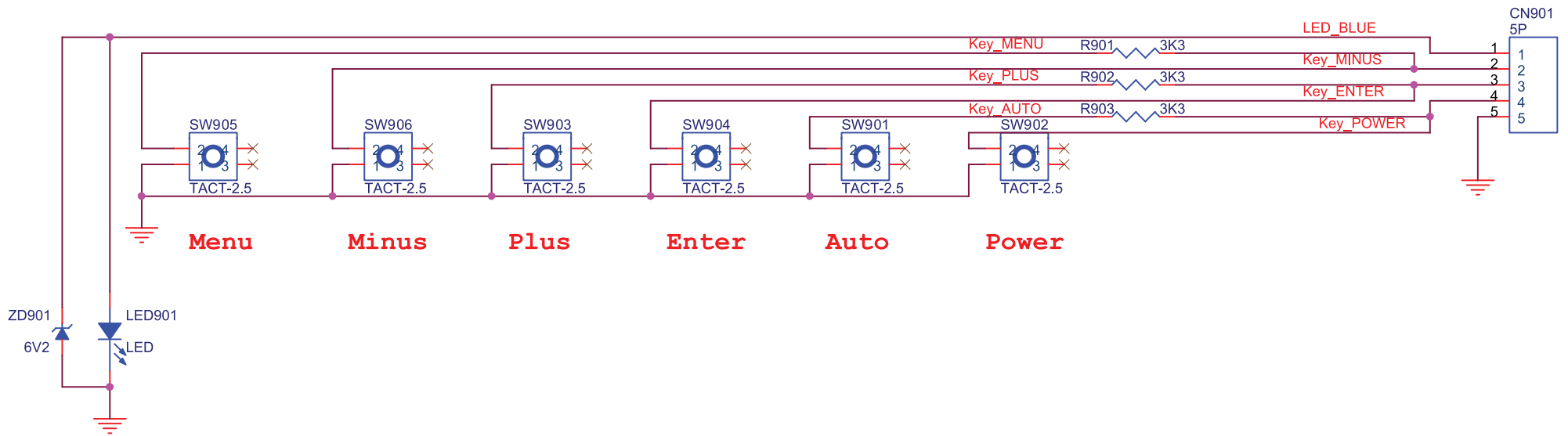


9-5 POWER



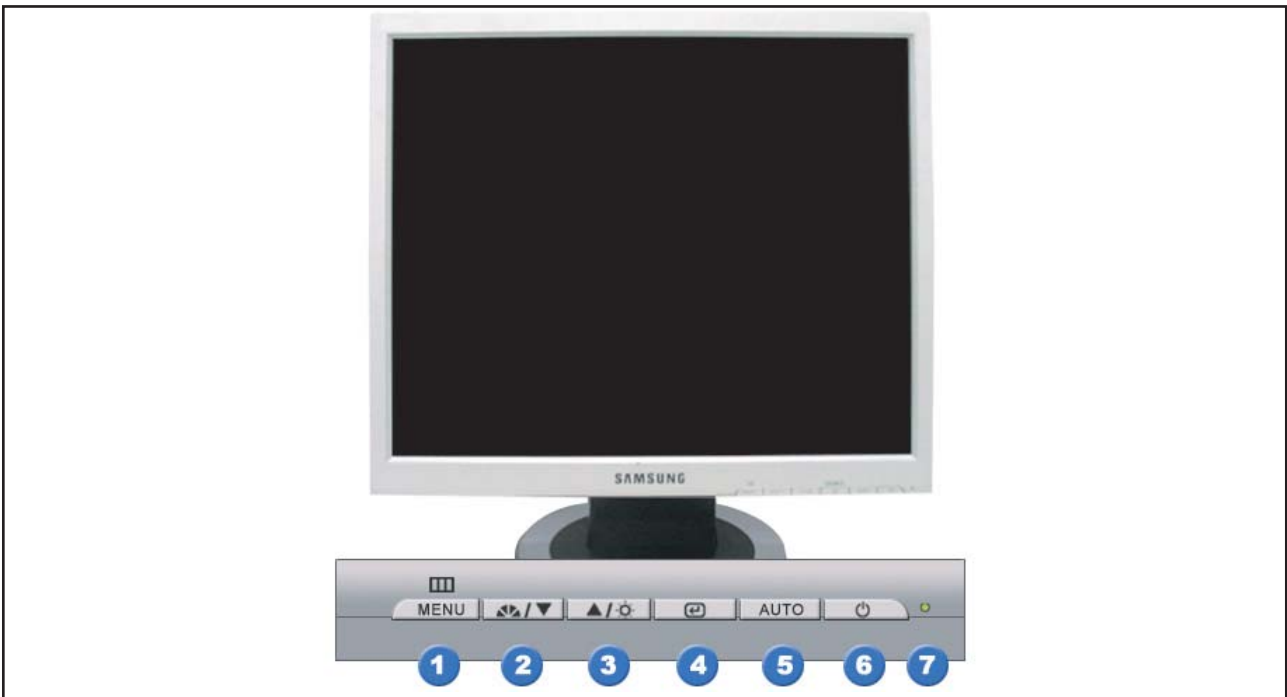


9-6 KEYPAD



## 10 Operating Instructions and Installation

### 10-1 Front



#### 1. Menu button

Opens the OSD menu. Also use to exit the OSD menu or return to the previous menu.

#### 2. MagicBright button

MagicBright is a new feature providing optimum viewing environment depending on the contents of the image you are watching. Currently six different modes are available: Custom, Text, Internet, Game, Sport and Movie. Each mode has its own pre-configured brightness value. You can easily select one of six settings by simply pressing MagicBright control buttons.

##### 1) Custom

Although the values are carefully chosen by our engineers, the pre-configured values may not be comfortable to your eyes depending on your taste. If this is the case, adjust the brightness and contrast by using the OSD menu.

##### 2) Text : Normal brightness

For documentations or works involving heavy text.

##### 3) Internet : Medium brightness

For working with a mixture of images such as text and graphics.

##### 4) Entertain

For watching motion pictures such as a DVD or Video CD

#### 3. Brightness button

When OSD is not on the screen, push the button to adjust brightness.

#### 2,3. Adjust buttons

Adjust items in the menu.

#### 4. Enter button

Activates a highlighted menu item.

#### 5. Auto button

Use this button for auto adjustment.

#### 6. Power button / Power indicator

Use this button for turn the monitor on and off.  
/This light glows green during normal operation, and blinks green once as the monitor saves your adjustments.

## 10-2 Rear



### 1. Power port

Connect the power cord for your monitor to the power port on the back of the monitor.

### 2. D-sub 15-pin port

Connect the signal cable to the 15-pin, D-sub connector on the back of your monitor.

### 3. Power on/off Switch(option)

Use this button for turn the monitor on and off.

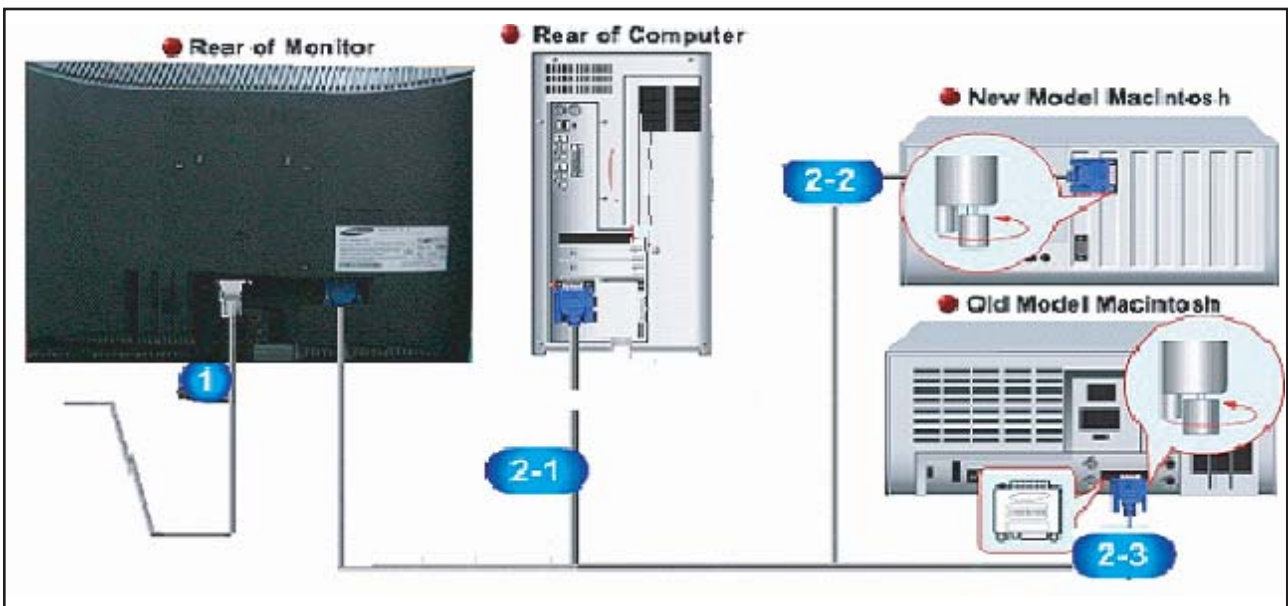
### 4. Kensington Lock

The Kensington lock is a device used to physically fix the system when using it in a public place.

(The locking device has to be purchased separately. )

To get the information on using the Kensington Lock, contact an authorized dealer.

## 10-3 Connecting the monitor



1. Connect the power cord for your monitor to the power port on the back of the monitor. Plug the power cord for the monitor into a nearby outlet.
- 2-1. Using the D-sub (Analog) connector on the video card.  
Connect the signal cable to the 15-pin, D-sub connector on the back of your monitor.



- 2-2. Connected to a Macintosh.  
Connect the monitor to the Macintosh computer using the D-SUB connection cable.
- 2-3. In the case of an old model Macintosh, you need to connect the monitor using a special Mac adapter.
3. Turn on your computer and monitor. If your monitor displays an image, installation is complete.

## 10-4 Monitor Assembly



## 10-5 Attaching a Base



### A. Monitor

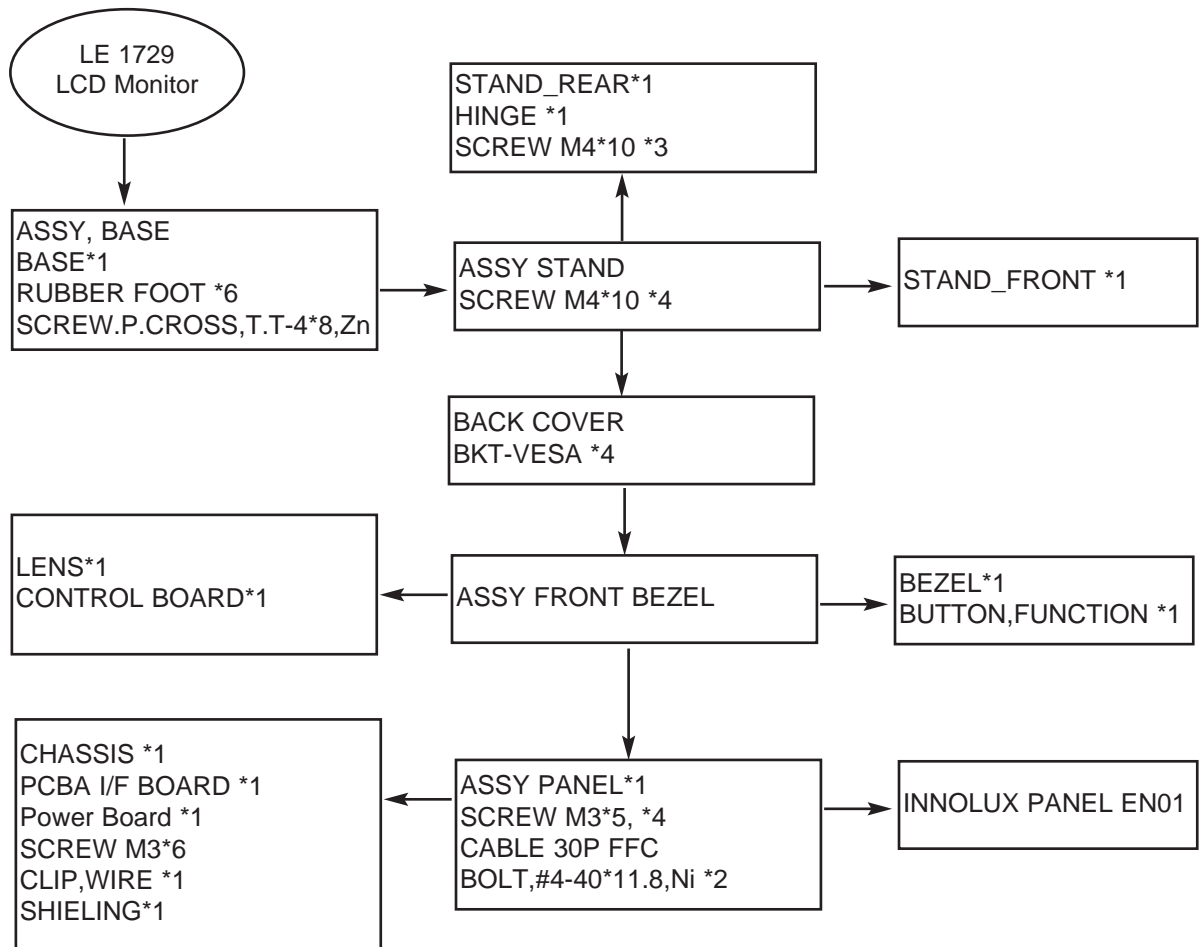
### B. Mounting interface pad

1. Turn off your monitor and unplug its power cord.
2. Lay the LCD monitor face-down on a flat surface with a cushion beneath it to protect the screen.
3. Remove four screws and then remove the stand from the LCD monitor.
4. Align the mounting interface Pad with the holes in the rear cover mounting pad and secure it with four screws that came with the arm-type base, wall mount hanger or other base.

## Memo

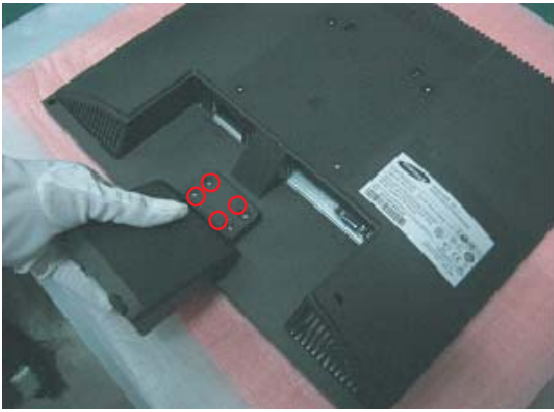

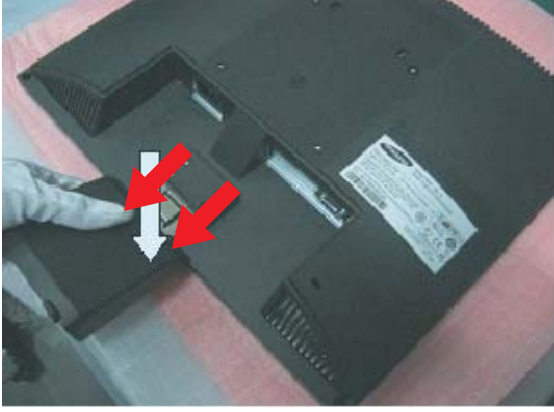
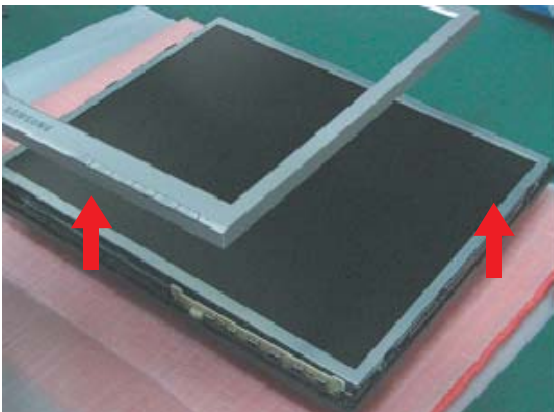
# 11 Disassembly and Reassembly

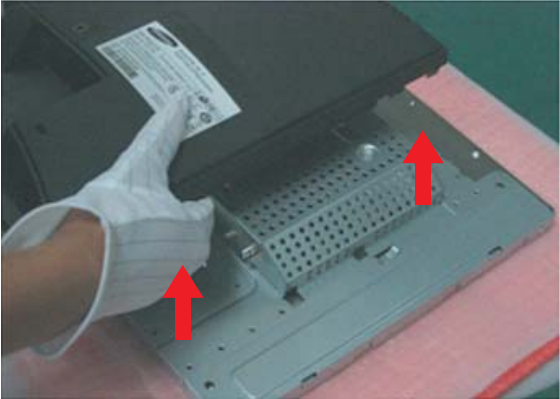

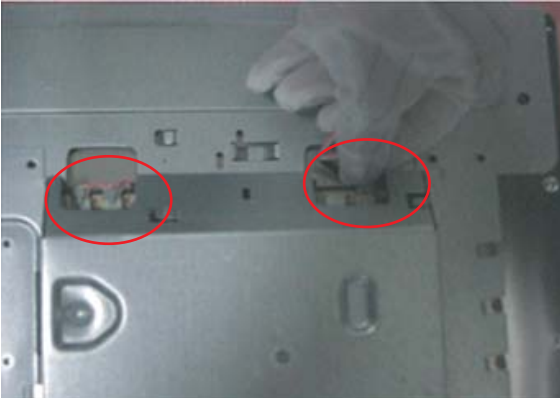

## 11-1 Disassembly Block




**Note:** The DIS assembly direction please following direction of arrowhead



Description	Picture Description
<p>1. Remove 4 screw from the stand</p>	
	
<p>2. Remove the stand and front color</p>	
	

Description	Picture Description
3. Lift the back cover and use the jig to remove the shield lamp.	 
4. Disconnect cables	
5. Lift up the shield and disconnect LVDS cables	

Description	Picture Description
6. Lift up the LCD panel	

## 11-2 Reassembly

---

Reassembly procedures are in the reverse order of disassembly procedures.

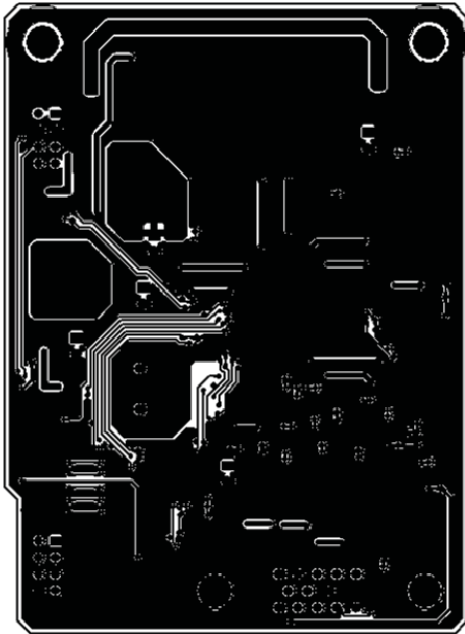
---

## 12 PCB Diagram

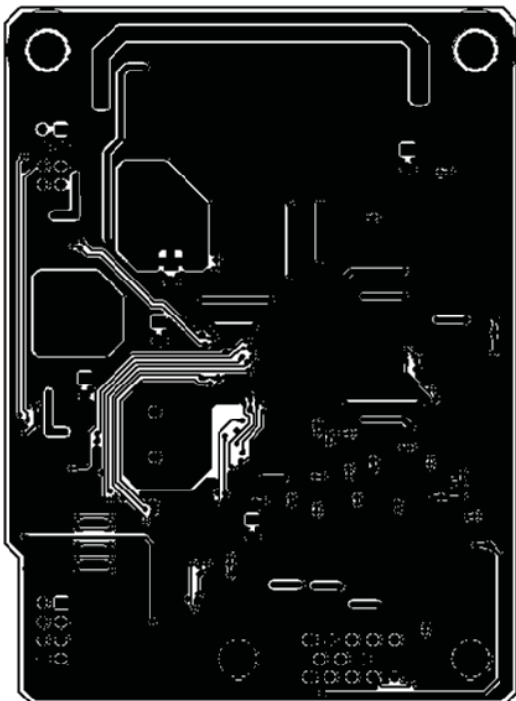
---

### 12-1 Main Board

#### 12-1-1 Main Board Top Layer



#### 12-1-2 Main Board Bottom Layer



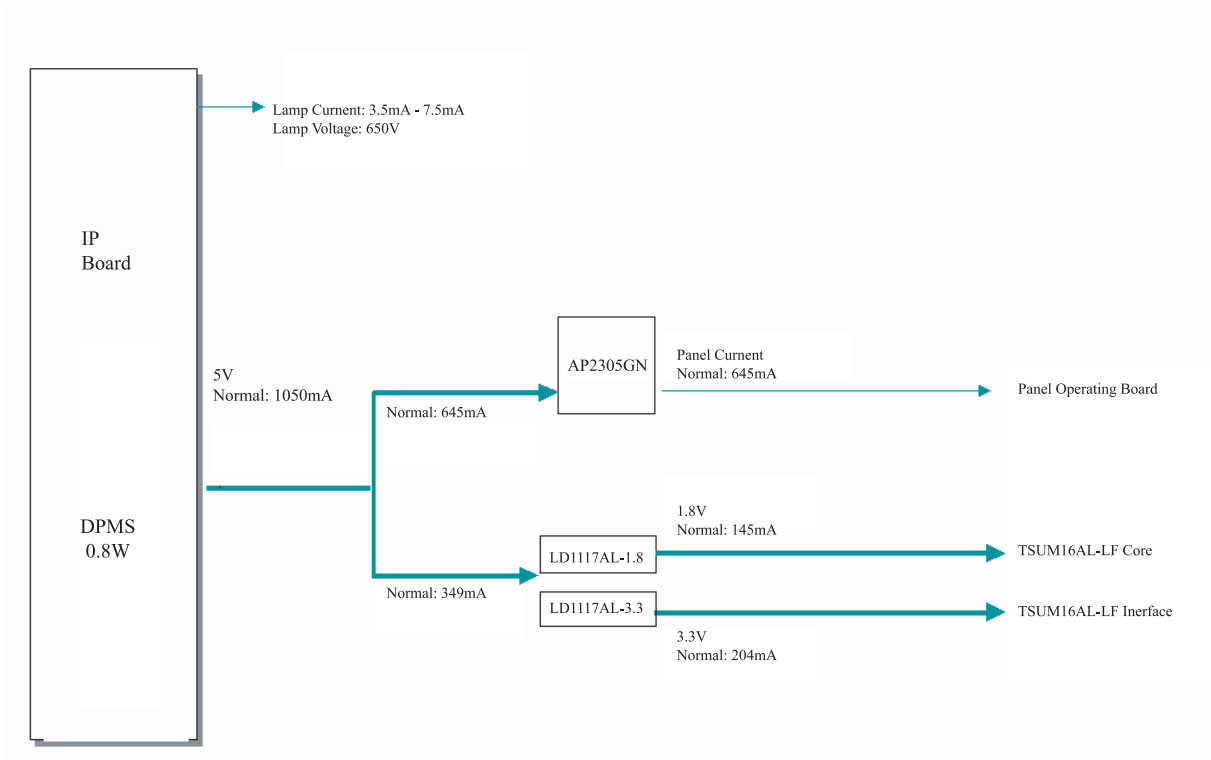
12 PCB Diagram

Memo

## 13 Circuit Descriptions

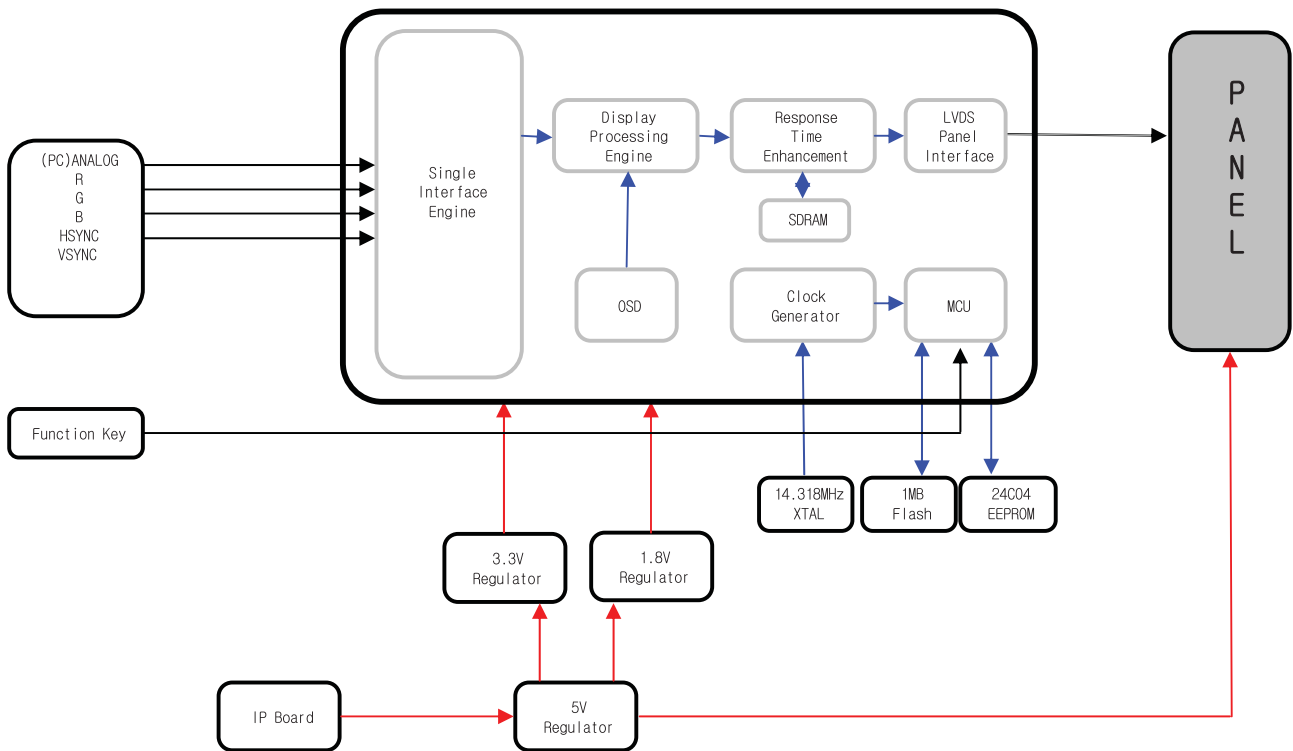
### 13-1 Overall Block Structure

#### 13-1-1 Power Tree



1. When the AD board is in DPMS state:
  - 1.1 The IP has been designed so that it operates with a power consumption of less than 0.6W of.
  - 1.2 The Scaler consumes power up to 37mA
  - 1.3 The power to the panel is switched off
2. When the AD board is operating normally:
  - 2.1 The maximum power consumption of the panel lamps is described below (It may vary depending on the panel manufacturer)
 
$$17'' : 4 * (7.0mA * 650V_{rms}) = 4 * 4.55W = 18.2W$$
  - 2.2 The power consumption of the Panel Control board is as follows:  $5V * 645mA = 3.23W$
  - 2.3 The power consumption of the Scaler is as follows:  $3.3V * 204mA + 1.8V * 145mA = 0.93W$

13-1-2 Main board Parts



1. Inverter: A conversion device that converts DC rated voltage/current to high ones necessary for the panel lamp.

2. DC/DC(Regulator): General term for DC to DC converting devices. The IP board receives 5V and outputs 1.8 or 3.3V that is supplied to the scaler (TSUM16AL-LF).

3. Power MosFET: The IP board receives 5V and outputs a lower voltage in DPMS mode and supplies the whole 5V for the panel operating board in normal conditions. In that case, the switching of Power MosFET is controlled by Micom.

4. Scaler: Receives the analog R,G,B signals and convert them to proper resolutions using up- or down- scaling that are transferred to the panel in the LDVS formats.

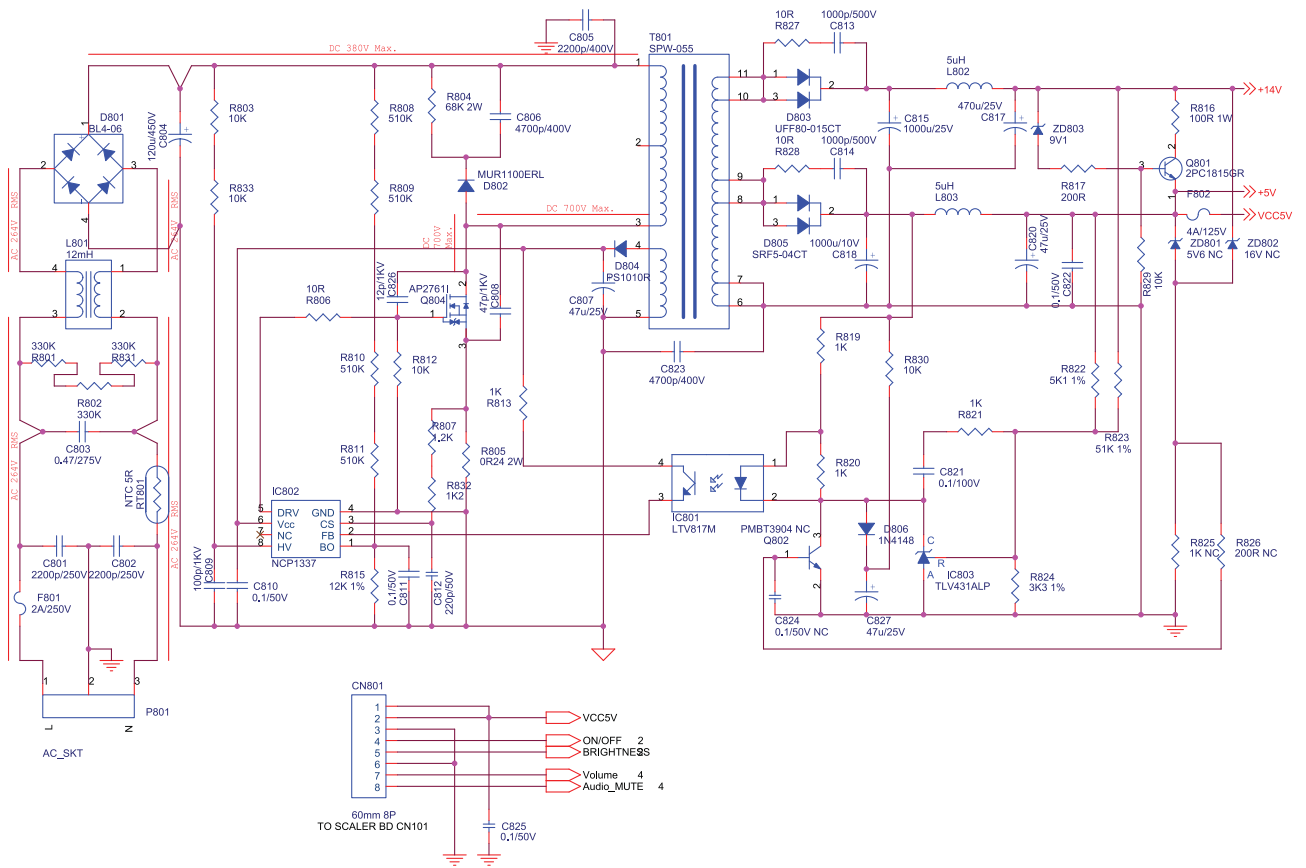
5. Crystal(Oscillator): Use one 14.318MHz oscillator externally to supply power to both MCU and Scaler at the same time.

6. Scaler & EEPROM: I2C is a two-way serial bus of two lines that supports communications across the integrated circuits as well as between FLASH and EEPROM.

In particular, MCU(TSUM16AL-LF) and use the SDR direct bus for mutual communications, which is an effective, speedy system because it allows 4 additional address/data lines compared to the old serial systems.

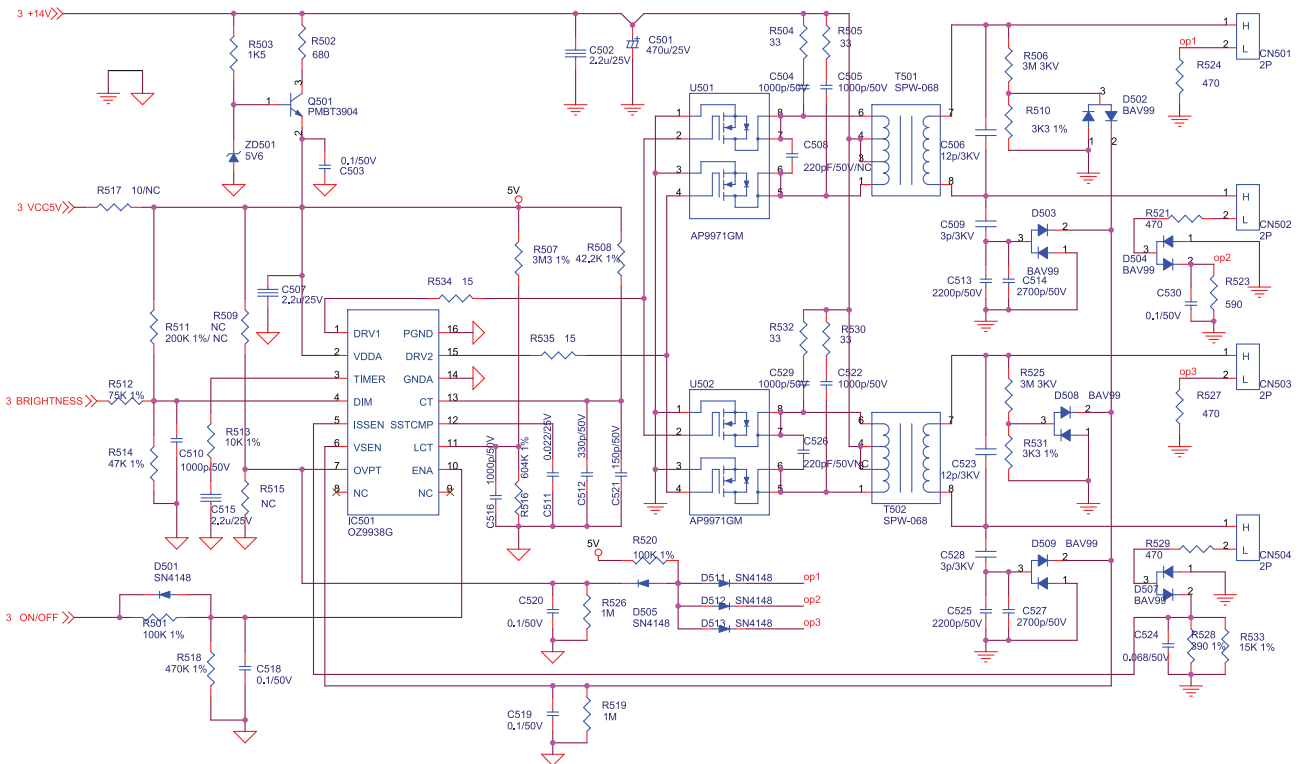
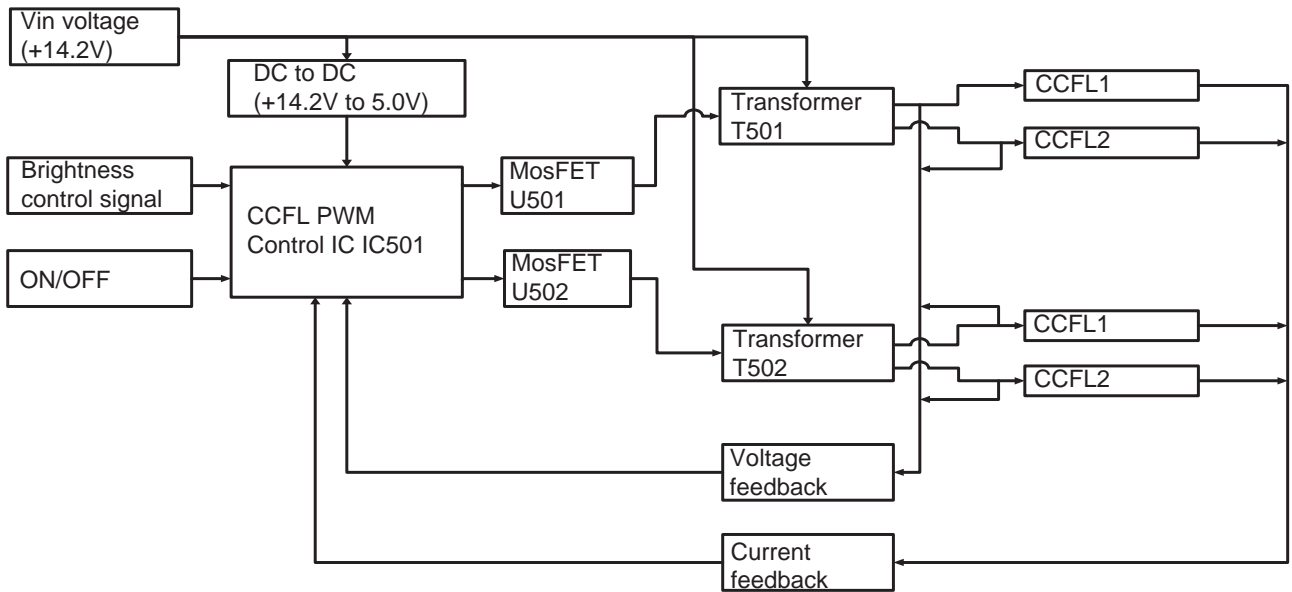
7. Function Key: A certain keystroke generates a certain electrical potential, which is transferred into ADC input port of the MCU and then converted to a digital value by the A/D converter of the chip. The digital value (data) is a clue to which key is entered.

13-1-3 IP Board Part(Power) Schematic Diagrams





### 13-3 IP BOARD part(Inverter Part)



---

## 14 Reference Information

---

### 14-1 Technical Terms

#### **-TFT-LCD**

Thin film Transistor Liquid Crystal Display

#### **-ADC(Analog to Digital Converter)**

This is a circuit that converts from analog signal to digital signals.

#### **-PLL(Phase Locked Loop)**

During progressing ADC, Device makes clock synchronizing HSYNC with Video clock

#### **-Inverter**

Device that supplies Power to LCD panel lamp. This device generates about 1,500~2,000V.

#### **AC Adapter**

Device that converts AC(90V~240V) to DC(+12V or 14V)

#### **-SMPS(Switching Mode Power Supply)**

Switching Mode Power supply. This design technology is used to step up/down the input power by switching on/off

#### **-FRC(Frame Rate Controller)**

Technology that changes the number of frames displayed on screen per second. TFT-LCD panel requires 60 frames per second. This technology is needed to convert input image to 60 frames per second regardless input frame quantity.

#### **-Image Scaler**

Technology that convert various input resolution to other resolution.(ex. 640\* 480 to 1024\*768)

#### **-Auto Configuration(Auto adjustment)**

This is an algorithm to adjust monitor to optimum condition by pushing one key.

#### **-OSD(On Screen Display)**

Customers can easily control the screen settings using the OSD.

#### **-FINE**

The "Fine" adjustment is used to adjust visibility by controlling phase difference.

#### **-COARSE**

This adjustment adjusts the display by tuning Video clock and PLL clock.

#### **-L.V.D.S.(Low Voltage Differential Signaling)**

A kind of transmission method for Digital. It can be used from Main PBA to Panel.

#### **-DDC(Display data channel)**

It is a communication method between a Host Computer and related equipment. It enables Plug and Play between PC and Monitor.

#### **-EDID**

Extended Display Identification Data PC can recognize monitor information, such as Product data, Product name, Display mode, Serial number, Signal source, etc. Data is recognized via DDC Line linking PC and Monitor.

#### **-Dot Pitch**

The image on a monitor is composed of red, green and blue dots. The closer the dots, the higher the resolution. The distance between two dots of the same color is called the 'Dot Pitch'. Unit: mm

#### **-Vertical Frequency**

The screen must be redrawn several times per second in order to create and display an image for the user. The frequency of this repetition per second is called Vertical Frequency or Refresh Rate. Unit: Hz Example: If the same light repeats itself 60 times per second, this is regarded as 60 Hz.

#### **-Horizontal Frequency**

The time to scan one line connecting the right edge to the left edge of the screen horizontally is called Horizontal Cycle. The inverse number of the Horizontal Cycle is called Horizontal Frequency. Unit: kHz

**-Interlace and Non-Interlace Methods**

Showing the horizontal lines of the screen from the top to the bottom in order is called the Non-Interlace method while showing odd lines and then even lines in turn is called the Interlace method. The Non-Interlace method is used for the majority of monitors to ensure a clear image. The Interlace method is the same as that used in TVs.

**-Plug & Play**

This is a function that provides the best quality screen for the user by allowing the computer and the monitor to exchange information automatically. This monitor follows the international standard VESA DDC for the Plug & Play function.

**-Resolution**

The number of horizontal and vertical dots used to compose the screen image is called 'resolution'. This number shows the accuracy of the display. High resolution is good for performing multiple tasks as more image information can be shown on the screen.

**Example:** If the resolution is 1280 x 1024 , this means the screen is composed of 1280 horizontal dots (horizontal resolution) and 1024 vertical lines (vertical resolution).

## 14-2 Pin Assignments

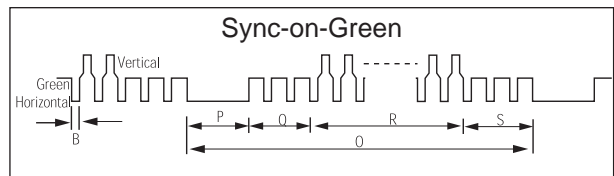
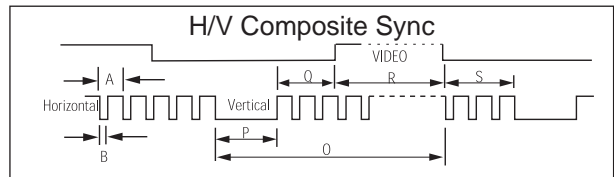
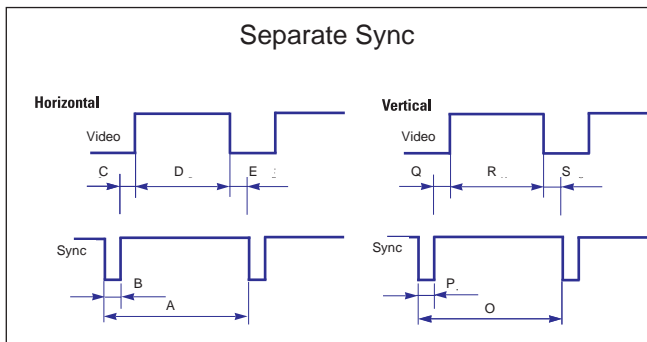
Pin No.	Sync Type	15-Pin D-Sub Signal Cable Connector	
		Separate	Sync-on-green
1		Red	Red
2		Green	Green + H/V Sync.
3		Blue	Blue
4		NC	NC
5		DDC Return (GND)	DDC Return (GND)
6		GND-R	GND-R
7		GND-G	GND-G
8		GND-B	GND-B
9		NC	NC
10		Cable Detect	Cable Detect
11		NC	NC
12		Bi-Dr Data (SDA)	Bi-Dr Data (SDA)
13		H-Sync.	Not Used
14		V-Sync.	Not Used
15		DDC Clock (SCL)	DDC Clock (SCL)

## 14-3 Timing Chart

- This section of the service manual describes the timing that the computer industry recognizes as standard for computer-generated video signals.

Table 1 Timing Chart

No	Name	Timing ID	dot_clk (MHz)	h_freq (kHz)	v_freq (Hz)
1	IBM 640*350/70Hz	640*350/70Hz	25.175	31.469	<b>70</b>
2	IBM 720*400/70Hz	720*400/70Hz	28.322	31.469	<b>70</b>
3	IBM 640*480/60Hz	640*480/60Hz	25.175	31.469	<b>60</b>
4	MAC 640*480/67Hz	640*480/67Hz	30.240	35.000	<b>66.7</b>
5	VESA 640*480/72Hz	640*480/72Hz	31.500	37.861	<b>72</b>
6	VESA 640*480/75Hz	640*480/75Hz	31.500	37.500	<b>75</b>
7	VESA 800*600/56Hz	800*600/56Hz	36.000	35.156	<b>56</b>
8	VESA 800*600/60Hz	800*600/60Hz	40.000	37.879	<b>60</b>
9	VESA 800*600/72Hz	800*600/72Hz	50.000	48.077	<b>72</b>
10	VESA 800*600/75Hz	800*600/75Hz	49.500	46.875	<b>75</b>
11	MAC 832*624/75Hz	832*624/75Hz	57.284	49.726	<b>75</b>
12	VESA 1024*768/60Hz	1024*768/60Hz	65.000	48.363	<b>60</b>
13	VESA 1024*768/70Hz	1024*768/70Hz	75.000	56.476	<b>70</b>
14	VESA 1024*768/75Hz	1024*768/75Hz	78.750	60.023	<b>75</b>
15	VESA 1152*864/75Hz	1152*864/75Hz	108.000	67.500	<b>75</b>
16	MAC 1152*870/75Hz	1152*870/75Hz	100.000	68.681	<b>75</b>
17	VESA 1280*1024/60Hz	1280*1024/60Hz	108.000	63.981	<b>60</b>
18	VESA 1280*1024/75Hz	1280*1024/75Hz	135.000	79.976	<b>75</b>



A : Line time total  
 B : Horizontal sync width  
 C : Back porch  
 D : Active time  
 E : Front porch

O : Frame time total  
 P : Vertical sync width  
 Q : Back porch  
 R : Active time  
 S : Front porch

## 14-4 Preset Timing Modes

- If the signal transferred from the computer is the same as the following Preset Timing Modes, the screen will be adjusted automatically. However, if the signal differs, the screen may go blank while the power LED is on. Refer to the video card manual and adjust the screen as follows.

TIMING	FH(KHZ) FV(HZ)	SYNC POLARITY	TOTAL (DOT/LINE)	ACTIVE (DOT/LINE)	SYNC WIDTH (DOT/LINE)	FRONT PORCH (DOT/LINE)	BACK PORCH (DOT/LINE)	PIXEL FOREQ (MHZ)
IBM 640*350@70Hz	31.469 70	+ -	800 449	640 350	96 2	8 31	40 54	25.175
IBM 720*400@70Hz	31.469 70	- +	900 449	720 400	108 2	9 6	45 27	28.322
IBM 640*480@60Hz	31.469 60	- -	800 525	640 480	96 2	8 2	40 25	25.175
MAC 640*480@67Hz	35 66.7	- -	864 525	640 480	64 3	64 3	96 39	30.24
VESA 640*480@72Hz	37.861 72	- -	832 520	640 480	40 3	16 1	120 20	31.5
VESA 640*480@75Hz	37.5 75	- -	840 500	640 480	64 3	16 1	120 16	31.5
VESA 800*600@56Hz	35.156 56	+ +/-	1024 625	800 600	72 2	24 1	128 22	36
VESA 800*600@60Hz	37.879 60	+ +	1056 628	800 600	128 4	40 1	88 23	40
VESA 800*600@72Hz	48.077 72	+ +	1040 666	800 600	120 6	56 37	64 23	50
VESA 800*600@75Hz	46.875 75	+ +	1056 625	800 600	80 3	16 1	160 21	49.5
MAC 832*624@75Hz	49.726 75	- -	1152 667	832 632	64 3	32 1	224 39	57.284
VESA 1024*768@60Hz	48.363 60	- -	1344 806	1024 768	136 6	24 3	160 29	65
VESA 1024*768@70Hz	56.476 70	- -	1328 806	1024 768	136 6	24 3	144 29	75
VESA 1024*768@75Hz	60.023 75	+ +	1312 800	1024 768	96 3	16 1	176 28	78.75
VESA 1152*864@75Hz	67.5 75	+ +	1600 900	1152 864	128 3	64 1	256 32	108
MAC 1152*870@75Hz	68.681 75	- -	1456 915	1152 870	128 3	32 3	144 39	100
VESA 1280*1024@60Hz	63.981 60	+ +	1688 1066	1280 1024	112 3	48 1	248 38	108
VESA 1280*1024@75Hz	79.976 75	+ +	1688 1066	1280 1024	144 3	16 1	248 38	135

### Horizontal Frequency

The time to scan one line connecting the right edge to the left edge of the screen horizontally is called Horizontal Cycle and the inverse number of the Horizontal Cycle is called Horizontal Frequency. Unit: kHz

### Vertical Frequency

Like a fluorescent lamp, the screen has to repeat the same image many times per second to display an image to the user. The frequency of this repetition is called Vertical Frequency or Refresh Rate. Unit: Hz

14 Reference Information

14-5 Panel Description

Maker	VENDOR P/N	PANEL_CODE	PANEL_ABB	STICKER_CODE	Remarks
INL CPT	631102071830r 631102070680r				LCD PANEL 17" MT170EN01 LCS PANEL 17" CLAA170EA07Q(CPT)