
Service Manual

LCD Monitor Acer V193W

Table of Contents

Important Safety Notice01

01 Product Specification03

02 Flat Panel Specification13

03 Exploded Diagram27

04 Troubleshooting32

05 Spare Parts List35

06 Schematics and Layouts.....36

07 Assembly and Disassembly38

Appendix : User’s manual

Copyright
Copyright 2006 InnoLux Tech. Corp. 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 InnoLux Tech. Corp. Ltd.

Acer V193W Service Manual

Important Safety Notice

1. Safety precautions

This monitor is manufactured and tested on a ground principle that a user's safety comes first. However, improper use or installation may cause damage to the monitor as well as to the user.

Warning:

- This monitor should be operated only at the correct power sources indicated on the label on the rear of the monitor. If you're unsure of the power supply in your residence, consult your local dealer or Power Company.
- Do not try to repair the monitor by yourself, as it contains no user-serviceable parts. This monitor should only be repaired by a qualified technician.
- Do not remove the monitor cabinet. There are high-voltage parts inside that may cause electric shock to human bodies.
- Stop using the monitor if the cabinet is damaged. Have it checked by a service technician.
- Put your monitor only in a lean, cool, dry environment. If it gets wet, unplug the power cable immediately and consult your closed dealer.
- Always unplug the monitor before cleaning it. Clean the cabinet with a clean, dry cloth. Apply non-ammonia based cleaner onto the cloth, not directly onto the glass screen.
- Do not place heavy objects on the monitor or power cord.

2. Product safety notice

Many electrical and mechanical parts in this chassis have special safety visual inspections and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Before replacing any of these components read the parts list in this manual carefully. The use of substitute replacement parts, which do not have the same safety characteristics as specified in the parts list, may create shock, fire, or other hazards.

3. Service notes

- When replacing parts or circuit boards, clamp the lead wires around terminals before soldering.
- Keep wires away from high voltage, high temperature components and sharp edges.
- Keep wires in their original position so as to reduce interference.
- Adjustment of this product please refers to the user's manual.

01 Product Specification

1. General:

Acer V 193W is designed with LVDS interface and dual (analog and digital signal) input, it featured with embedded universal AC power supplies and audio input. It's a green product and meets all ROHS standard. The power button and display control buttons are on the front of the monitor. The monitors shall automatically to display lower resolution video modes into 1440x900 full screen display. The image can be adjusted through OSD control.

1.1 Main Features

Features		Specifications
Panel source		INL MT190AW01(V-5)
Maximum resolution		1440 x 900
Back light system		4 CCFL (top & bottom edge side)
Actual Resolution display		WXGA+(1440x900)
Pixel pitch		0.285(H) x 0.285(V)
Display area		410.4 (H) x256.5 (V) , 19.05" diagonal
Contrast ratio		700:1 (min.), 1000:1 (typ.)
Response time (Tr+Tf)		5ms (typ.),
Viewing angle		80°(L)/ 80°(R), 80°(U)/80°(D) typ. CR>=10)
Input interface		Analog(D-sub 15 pin) Digita(DVI-D connector)----option
Audio-In		Reserved
Earphone		Reserved
Speakers		Reserved
Video Signal Inputs		D-sub, DVI-D
Knobs and Indicators		Power switch button, MENU button, Auto button, eColour, Down button, Down button
Security Features		Kensington® lock port, VESA® Wall-mountable interface, 100 mm
Power management		Compatible with VESA,EPA,NUTEK,DPMS
Plug & Play		VESA
University AC power supply		YES
OSD language	For Non-EMEA	English (US), French, Italian, Finnish, Spanish, German, Dutch, Russian
	For EMEA	English (US), French, Italian, Simplified Chinese, Spanish, German a Dutch, Traditional Chinese, Japanese
	Russia	English (US), French, Italian, Finnish, Spanish, German, Dutch, Russian

1.2 Accessories

Items	VGA cable	DVI cable	User's manual	Warranty card	Quick-start Guide	Installation Guide
Description	1.8m	1.8m	Multi	English		
	•	•	•	•		

2. Operation Specifications

The unit should suffer no visible cosmetic damage and should operate with no degradation in display quality during exposure to the operating conditions and after exposure to the non-operating conditions, in any sequence.

2.1 Environmental conditions

Operating	Specification
Temperature range	0°C to 50°C
Relative humidity	20% to 80%
Altitude	0 to 3048M (10000 ft)
Storage	
Temperature range	-25°C to 60°C
Relative humidity	5% to 80%
Altitude	0 to 9144M (30000 ft)

2.2 Safety, EMC, Ergonomics and Compatibility Requirements

Items	Description						
Safety	UL/cUL	CB	TUV/GS	CCC			Other
	•	•	•	•			
EMC	FCC	CE	CCC	VCCI-B			
	•	•	•	•			
Ergonomics	TCO99	TCO03					
	•	•					
Compatibility	Windows 95/98/Me		Windows 2000		Windows XP		vista
	•		•		•		•
Power Management	Energy Star						
	•						

2.3 Electrostatic Discharge Requirements

Item	Condition	Spec	
Electrostatic Discharge	IEC61000-4-2(EN55024)	Contact discharge : $\pm 4KV$	
		Contact discharge : $\pm 8KV$	•

2.4 Reliability

Items	Condition	Spec	Note
MTBF		40,000 Hours	Excluding the LCD, CCFL
CCFL Life time	Luminance becomes 50%	40,000 Hours(min)	Note1

Note1. Display an all WHITE field at mid Brightness and Contrast settings.

3. Electrical and Optical Characteristics and Performance

3.1 Main Power Supply

Items	Condition	Spec	Note
-------	-----------	------	------

AC Input Voltage Range	Universal input full range	100~240VAC /50~60Hz	
AC Input Current	100Vac 240Vac	1.2A(max) 0.6A(max)	
AC Frequency Range	100Vac 240Vac	50Hz – 60Hz	
Inrush Current	100Vac,cold star,25°C 240Vac,cold star,25°C	40A (max) 60A(max)	See Note2
Regulator Efficiency	DC output full loading	≥75%	
Ripple and Noise	+16V output	<500mv	
	+5V output	<150mv	
DC Output Voltage and Current	VCC16V(15.2~18V) VCC5V(4.95~5.45V)	1.6A(typ.),2.0A(max) 1.1A(typ.),1.5A(max)	
Power consumption	with Audio	≤45W	
Protection			See Table-1
Power management			See Table-2

Note2. Before each test, the buck capacitor need to be discharged.
Before each test, it must be 10 minutes at least after the latest test.

Table-1

Protection	Condition	Spec
OPP(Over power protection)	nominal AC input	50W (min)
SCP(short circuit protection)	with auto-recovery function	

Table-2

Status	H-sy nc	V-sy nc	Video	Power	LED
Power On	on	on	active	≤ 45W	BLUE
Power Saving	off	on	blanked	< 2W	Amber
	on	off	blanked	< 2W	Amber
	off	off	blanked	< 2W	Amber
Power Off	--	--	--	< 1W	Off

3.2 Backlight Power Supply

Panel: INL MT190AW01 V.5

Items	Specification
Lamp	4 CCFL
Input Voltage	15.2V~18V
Input current	1.6A (Typ.), 2.0A (Max.)
On/Off switch level	5.5V ≥ Von 2.0 V (on) -0.3v ≤ Voff ≤ 0.8 V (off)
Brightness PWM duty	35%~100% PWM:High=3.3V(3.0~3.6V),Low=0.0V
CCFL operating Voltage	680Vrms (Typ.),
CCFL Current	2.0 mA (min.)(With PWM Dim)
	7.0mA (Typ.)
	7.5mA (Max.)

CCFL startup voltage	1700 Vrms (0°C)
Operating frequency	40~80 KHz
Protect delay time	> 1 second
Efficiency	≥70%(with dummy load)

3.3 Brightness output

The test to verify specifications in this section shall be performed under the following standard conditions unless otherwise noted.

Temperature	: 25 ± 5°C
Test pattern	: white
Video Resolution	: 1440 x 900
Video input level	: 700 mV ± 2%
Warm-up time	: 30 minutes

LCD Module	BL
INL MT190AW01(V-5)	≥250 cd/m ²

Set brightness control and also contrast control at maximum, to measure the screen center, the light output shall ≥ BL cd/m² (as panel spec)

3.4 White balance

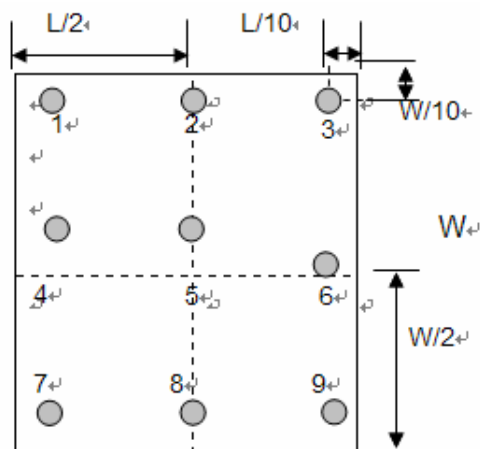
Mode		Chromaticity Coordinate	
		x	y
Cool	9300K	0.283 ± 0.030	0.297 ± 0.030
Warm	6500K	0.313 ± 0.030	0.329 ± 0.030
User		Panel While x	Panel While y

The test standard conditions refer to Sec 3.3. (Brightness and contrast are under default value)

3.5 Brightness uniformity

The test standard conditions refer to Sec 3.3.

Min. luminance of nine points (backlight) ≥ 75%
Max. luminance of nine points (backlight)



4. Input / Output Signal Specifications

4.1 Video signals

Items	Condition	Specification
Analog RGB signal	Input impedance = 75 Ohm	0.7Vp-p
Sync	Input impedance 1k Ohm	TTL level, Separate H/V-sync(+/-)

4.2 Signal Timing

4.2.1 D-SUB Inputs

Through D-SUB connectors, this unit can support $F_H = 31.5 \sim 80$ KHz, $F_v = 56 \sim 75$ Hz and SXGA display modes as below:

VESA MODES							
Mode	Resolution	Total	Horizontal		Vertical		Nominal Pixel Clock (MHz)
			Nominal Frequency +/-0.5KHz	Sync Polarity	Nominal Frequency +/-1Hz	Sync Polarity	
VGA	640*480@60Hz	800*525	31.469	N	59.941	N	25.175
	640*480@72Hz	832*520	37.861	N	72.809	N	31.500
	640*480@75Hz	840*500	37.500	N	75.000	N	31.500
SVGA	800*600@56Hz	1024*625	35.156	P	56.250	P	36.000
	800*600@60Hz	1056*628	37.879	P	60.317	P	40.000
	800*600@72Hz	1040*666	48.077	P	72.188	P	50.000
	800*600@75Hz	1056*625	46.875	P	75.000	P	49.500
XGA	1024*768@60Hz	1344*806	48.363	N	60.004	N	65.000
	1024*768@70Hz	1328*806	56.476	N	70.069	N	75.000
	1024*768@75Hz	1312*800	60.023	P	75.029	P	78.750
	1152*864@75Hz	1600*900	67.500	P	75.000	P	108.000
	1280*960@60Hz	1800*1000	60.000	P	60.000	P	108.000
SXGA	1280*1024@60Hz	1688*1066	63.981	P	60.020	P	108.000
	1280*1024@75Hz	1688*1066	79.976	P	75.025	P	135.000
WXGA+	1440*900(Red)@60Hz	1600*926	55.469	P	59.901	N	88.75
	1440*900@60Hz	1904*934	55.935	P	59.987	N	106.5
	1440*900@75Hz	1936*942	70.635	N	74.984	P	136.75
IBM MODES							
EGA	720x400@70Hz	900*449	31.469	N	70.087	P	28.322
MAC MODES							
VGA	640*480@66.7Hz	864*525	35.000	P	66.667	P	30.240
SVGA	832*624@75Hz	1152*667	49.725	N	74.550	N	57.283
XGA	1024*768@75Hz	1328*804	60.241	N	74.927	N	80.000
	1152*870@75Hz	1456*915	68.681	N	75.062	N	100.00
Other MODES							
XGA	1024*768@72Hz	1360*800	57.669	N	72.086	N	78.434
SXGA	1280*1024@70Hz	1696*1072	74.882	P	69.853	P	127.000

- Note: 1. Non-interlace signals only (An interlace signal cannot be display)
2. Please refer to F/W specification for more detail
3. Each frequency of Power Macintosh and Sun Ultra is a reference value

For DVD Player Input, Attached timing is supported: (Optional)

Mode	Resolution (active dot)	Resolution (total dot)	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Nominal Pixel Clock (MHz)	Remark
DVD Player	480P@60Hz	858x525	31.5	60.000	27.027	
	576P@50Hz	864x625	31.250	50.000	27.000	
	720P@60Hz	1650x750	45.000	60.000	74.250	

4.2.2 Digital signals

TMDS Signal: (min) $\pm 200\text{mVpp}@24\text{Bit}$

4.2.3 DDC signals

DDC signals: 5V@50mA TTL level

4.3 Timing requirements

Scan Frequency	Condition	Specification
Horizontal	Sync polarity: (+) or (-)	31.5 ~ 80 KHz.
Vertical	Sync polarity: (+) or (-)	56-75Hz
Out of range	Excluding Horizontal 31.5~80 KHz or Vertical 56-75 Hz	Message "Input Not Supported" on screen

4.4 DDC data

4.4.1 EDID Standard Compliance

EDID File Format: VESA's EDID Standard Version #3, Revision #0,

EDID Structure : Version #1, Revision #3.

EDID Data Table : See the attached table (for example)

V193W 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	04	72	1A	00	00	00	00	00
1	00	00	01	03	08	29	1A	78	EA	D7	A5	A2	59	4A	96	24
2	14	50	54	BF	EF	90	95	00	95	0F	81	80	81	40	71	4F
3	01	01	01	01	01	01	9A	29	A0	D0	51	84	22	30	50	98
4	36	00	9A	00	11	00	00	1C	00	00	00	FF	00	30	30	30
5	30	30	30	30	30	30	30	30	30	0A	00	00	00	FD	00	32
6	4B	1E	52	0E	00	0A	20	20	20	20	20	20	00	00	00	FC
7	00	56	31	39	33	57	0A	20	20	20	20	20	20	20	00	CS

V193W DVI 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	04	72	1A	00	00	00	00	00
1	00	00	01	03	80	29	1A	78	EA	D7	A5	A2	59	4A	96	24
2	14	50	54	BF	EF	90	95	00	95	0F	81	80	81	40	71	4F
3	01	01	01	01	01	01	9A	29	A0	D0	51	84	22	30	50	98
4	36	00	9A	00	11	00	00	1C	00	00	00	FF	00	30	30	30
5	30	30	30	30	30	30	30	30	30	0A	00	00	00	FD	00	32
6	4B	1E	52	0E	00	0A	20	20	20	20	20	20	00	00	00	FC
7	00	56	31	39	33	57	0A	20	20	20	20	20	20	20	00	CS

4.5 Audio signal

Items	Specification
Input impedance	10K ohm
Frequency response range	200Hz – 10kHz
Signal to noise ratio	40 dB

Output power

1.0 W + 1.0 W (10%THD)

5. Function Specifications

All the tests to verify specifications in this section shall be performed under the following standard conditions unless otherwise noted. The standard conditions are:

Temperature : 25 ± 5°C
 Warm-up time : 30 minutes minimum
 Checking display modes : All the specified modes

5.1 Panel general specifications

A General specifications

Supplier	InnoLux
Model name	INL MT190AW01(V-5)
Display Area	410.4 (H) x256.5 (V)
Pixel Pitch	0.285(H) x 0.285(V)
Display Colors:	16.7 Million (6-bit + HI-- FRC)
Number of Pixel	1440x900 pixels
Pixel Arrangement	RGB vertical stripe
Brightness	300cd/m ² (Typ.) 250cd/m ² (Min.)
Contrast Ratio	700:1 Typical
Viewing Angle	Hor:160°, Ver: 160° (Typical, CR>10)
Display Mode	Normally White
Frame rate	75Hz
Response Time	Tr + Tf = 5ms Typical
Surface Treatment	Anti-glare, Haze = 25%, Hard coating (3H)
Lamp	4 CCFL
Outline Dimension	427.2(W)x277.4(H)x16(D) Typ

5.2 Keypad Function

5.2.1 Control buttons on the front bezel

CONTROL KEY	KEYS FUNCTION
[AUTO]	A. When OSD un-displays, press [AUTO] to perform auto-adjustment B. When OSD displays, press [AUTO] to return to previous level menu C. When "e Color OSD" OSD displays, press [AUTO] to exit the OSD
[MENU]	A. When OSD isn't shown on screen, press [MENU] to enter OSD interface. The OSD interface uses "ACER e Color Management" and "User" to instead "Contrast" and "Brightness" separately. When press "ACER e Color Management" to show "e Color OSD", and press "User" to show OSD interface before. The translations of "ACER e Color Management" and "User" are always English. B. When OSD displays, press [MENU] to perform function of menu icon that is highlight or enter next level menu
[▶], [◀]	A. When "MENU OSD" displays, press these keys to change the contents of an adjustment item, or change an adjustment value B. When "MENU OSD" un-displays, if it is with audio, press [▶] to show "Audio" OSD and increase the volume, press [◀] to show "Audio" OSD and decrease the volume; else it has no use to press these keys.

[e Color]	A. When OSD un-displays, press [e Color] to show “e Color OSD”, and press again the OSD can not disappear, but the time of “e Color OSD” disappearing is reset 10 second again. B. When OSD disappear not including “e Color OSD”, press [e Color] to show “e Color OSD” OSD, the OSD before disappears, but the parameters of it should be saved
[POWER]	Power on or power off the monitor

5.2.2 Hot Key Operation

FUNCTION	HOT KEY OPERATION						
	AUTO	e Color	◀	▶	MENU	POWER	
FACTORY MODE		●			●	ON	Press [e Color] & [MENU] at the same time, and then press [POWER] for DC power on. OSD menu will be shown with “F” on the left top. Select “F” for entering factory mode.

5.3 OSD Structure

The On-Screen Display (OSD) shall be an easy to use icon based menu through keypad OSD buttons or remote control unit. The unit shall leave the factory with all OSD controls set to their default values.

First	Second	Third	Control Range	Default Value	
Brightness	ACER e COLOR Management	Empowering Technology			
User		Contrast		User mode	50
				Text mode	50
				Standard mode	50
				Graphics mode	60
				Movie mode	56
		Brightness		User mode	77
				Text mode	44
				Standard mode	77
				Graphics mode	97
				Movie mode	77
		ACM		OFF	
Image	Focus	---	0 ~ 100	Depend on each timing	
	Clock	---	0 ~ 100	50 Φ	
Position	Horizontal	---	0 ~ 100	50	
	Vertical	---	0 ~ 100	Depend on each timing	

Color	Warm (6500K)		---	---	
	Cool (9300K)		---	---	
	User		Red	0 ~ 100	80
			Green	0 ~ 100	80
			Blue	0 ~ 100	80
Language	NO-EMEA	EMEA			
	English	English	---	---	English
	Deutsch	Deutsch	---	---	
	Español	Español	---	---	
	简体中文	Hollands	---	---	
	繁體中文	Русский	---	---	
	Français	Français	---	---	
	Italiano	Italiano	---	---	
	日本語	Suomalain	---	---	
OSD	Hor. Position		---	0 ~ 100	50
	Ver. Position		---	0 ~ 100	50
	OSD Timeout		---	10~ 120	20
Input (Dual)	Analog		---	---	---
	Digital		---	---	---
	DDCCI ON/OFF				ON
Input (Analg only)	DDCCI ON/OFF				ON
Info	Resolution		---	---	---
	H. Freq		---	---	---
	V. Freq		---	---	---
	S/N				ETL000....0000(22)
Reset	---		---	---	---
Exit	---		---	---	---

Notes; ⌀ Clock default 50 is for Visa timing. Others depend on timing.

6.0 SOP of firmware upgrade -----Manufacturer of Scaler is RealTek

6.1 Operational condition

Equipment: PC, ISP card, signal cable and power cable.

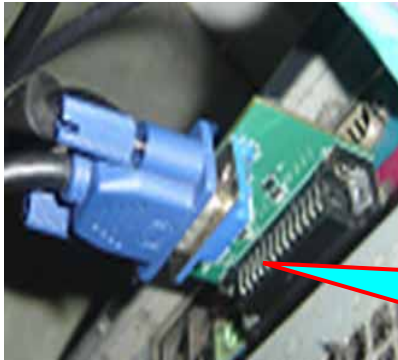
ESD requirements: antistatic wrists, antistatic gloves (fingers), and connecting cable

Name of ISP program: RTDTool_4.6.exe

Manufacture of FW IC : RTD 2525L

6.2 Operational steps:

1. Connection: connect PC to PCBA with signal cable, and then keep AC and DC in open state.



signal cable



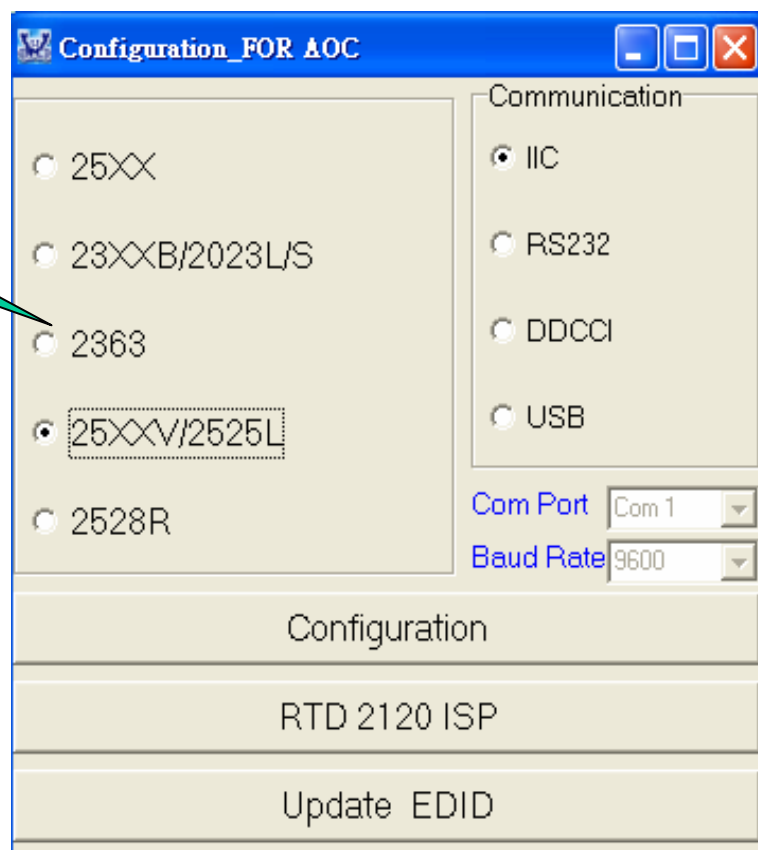
One port of ISP program card is connected to PC print port.



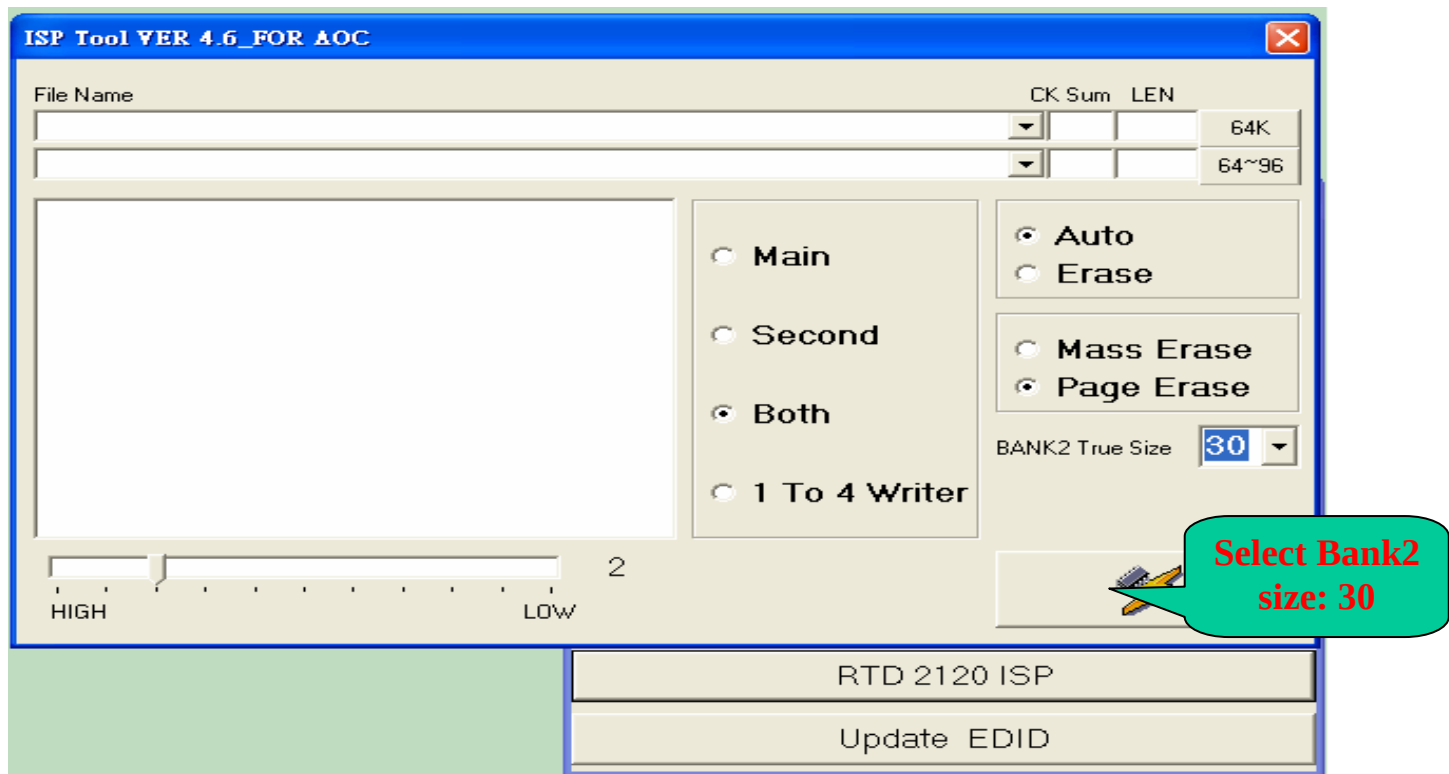
2. Adjust ISP programming

Firstly, double click RTDTool_4.6.exe and open ISP program, then select "25XXV/2525L", and RTD 2120 ISP button

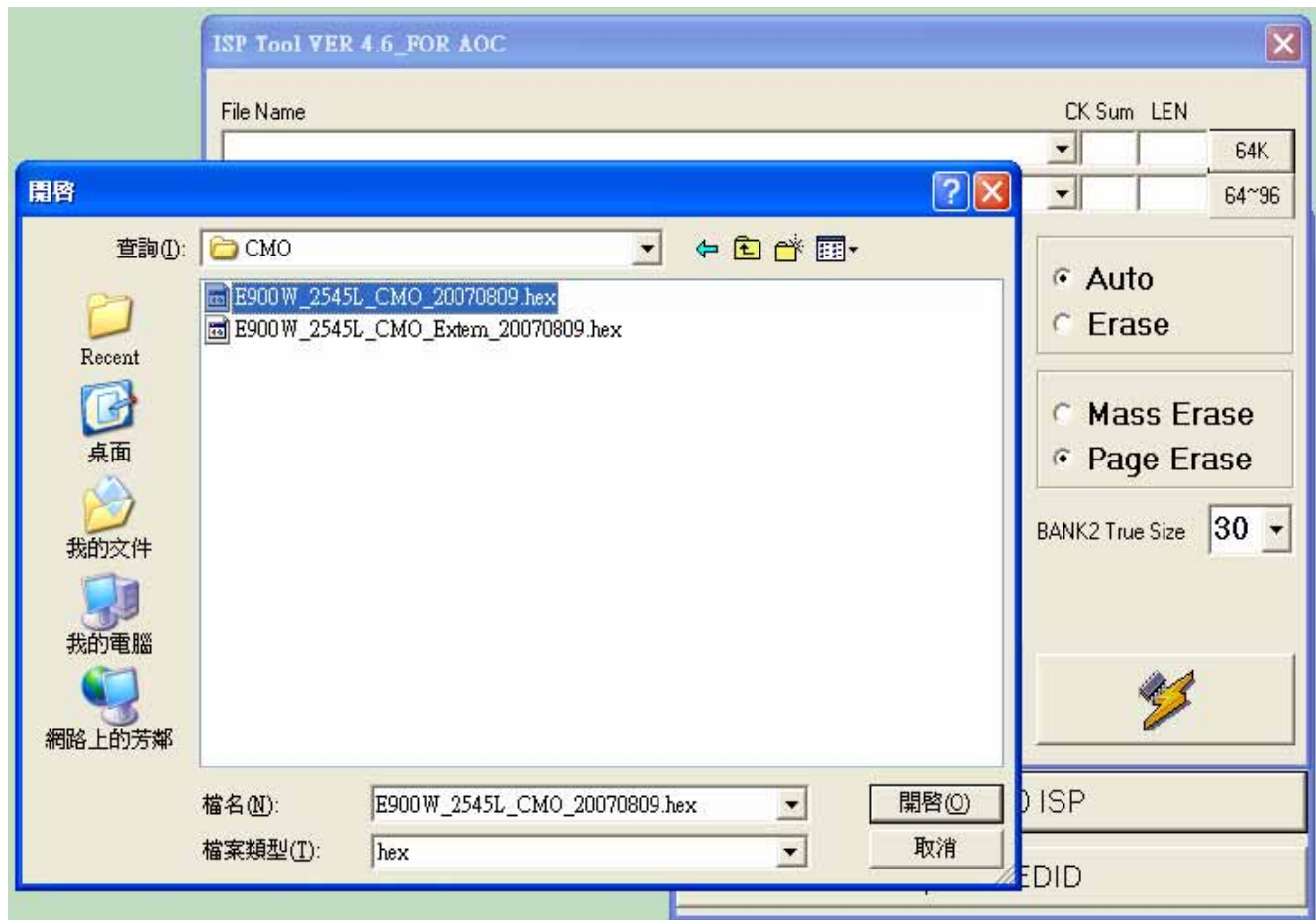
Click ISP button



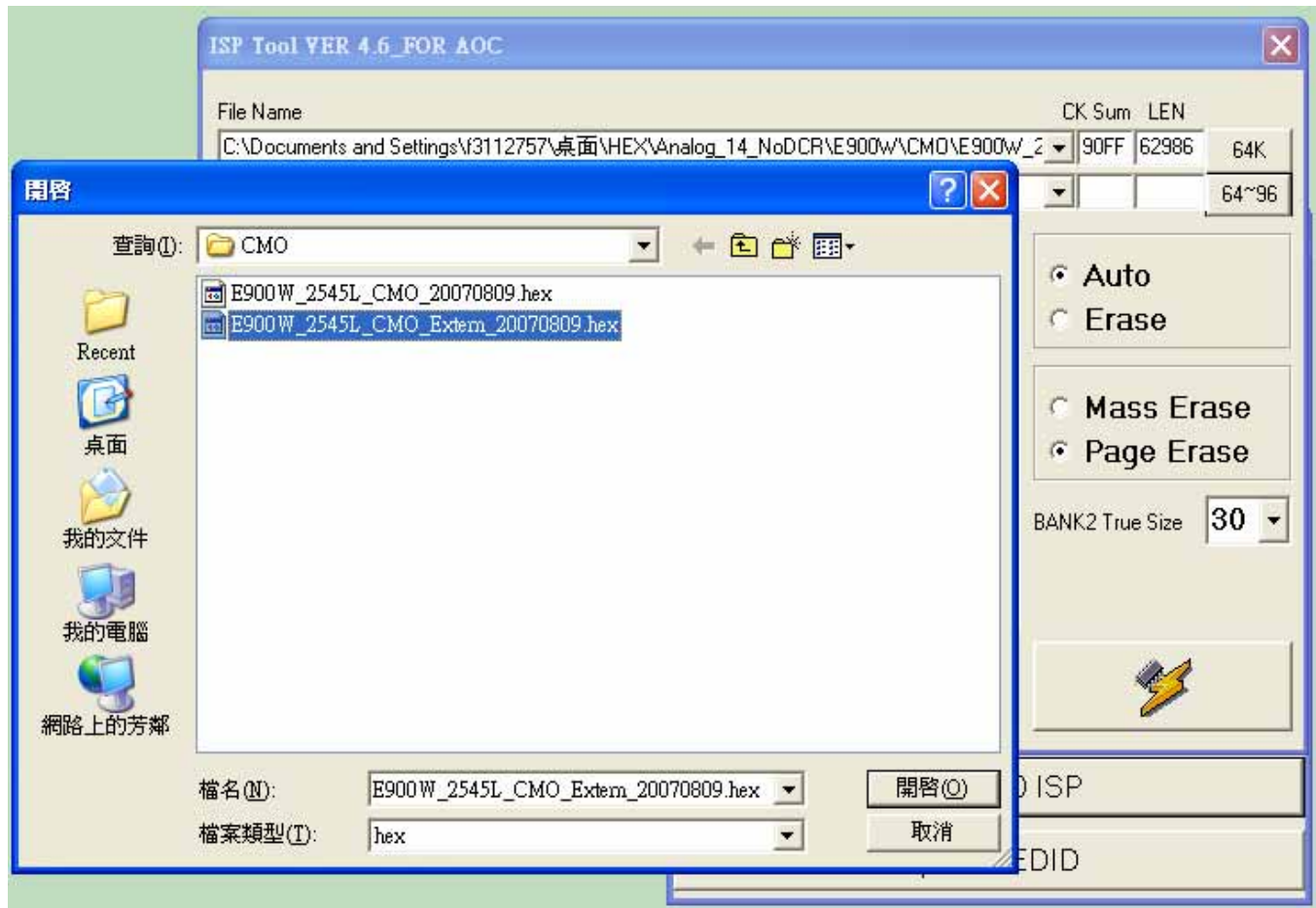
Secondly, select Bank2 size which is 30.



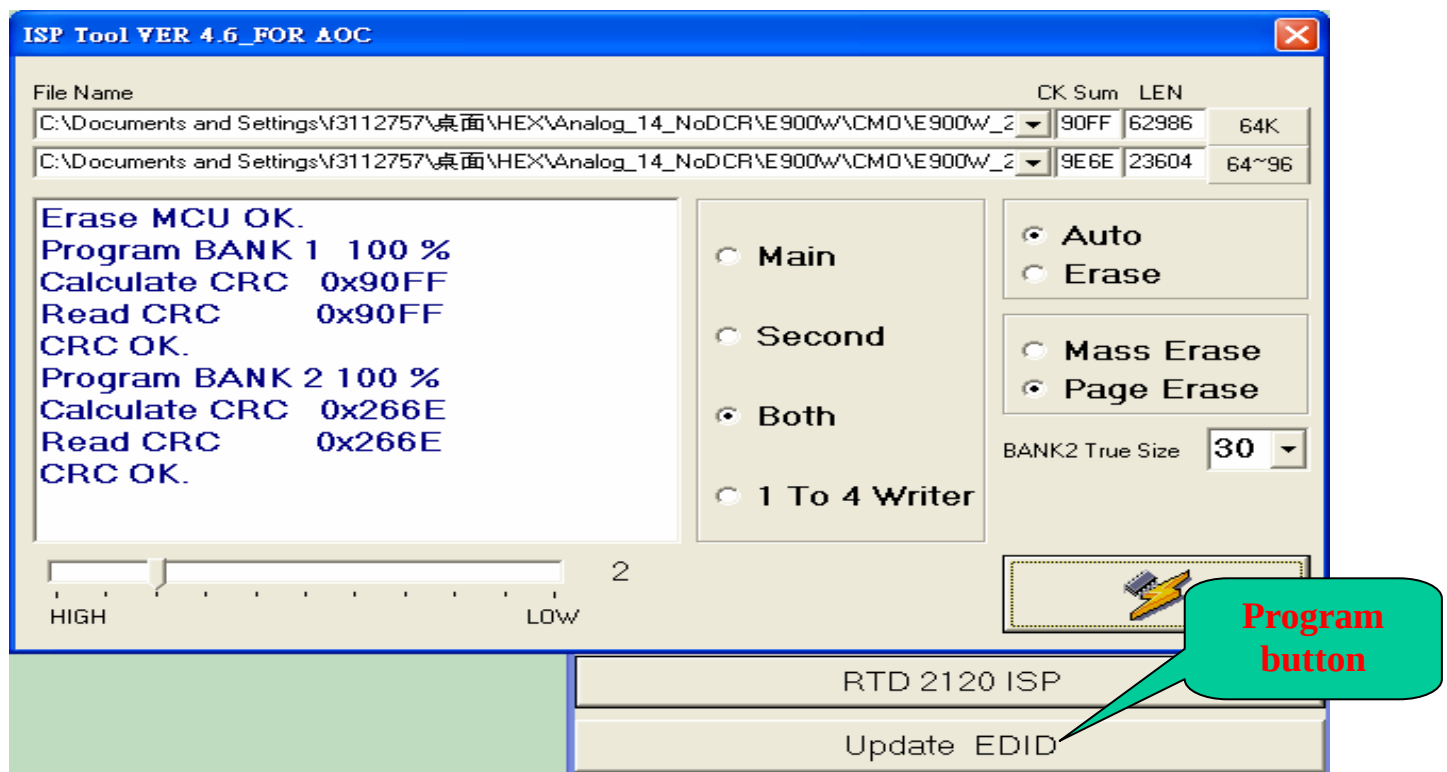
Thirdly, click “64K” button and download FW file as below Figure 3.



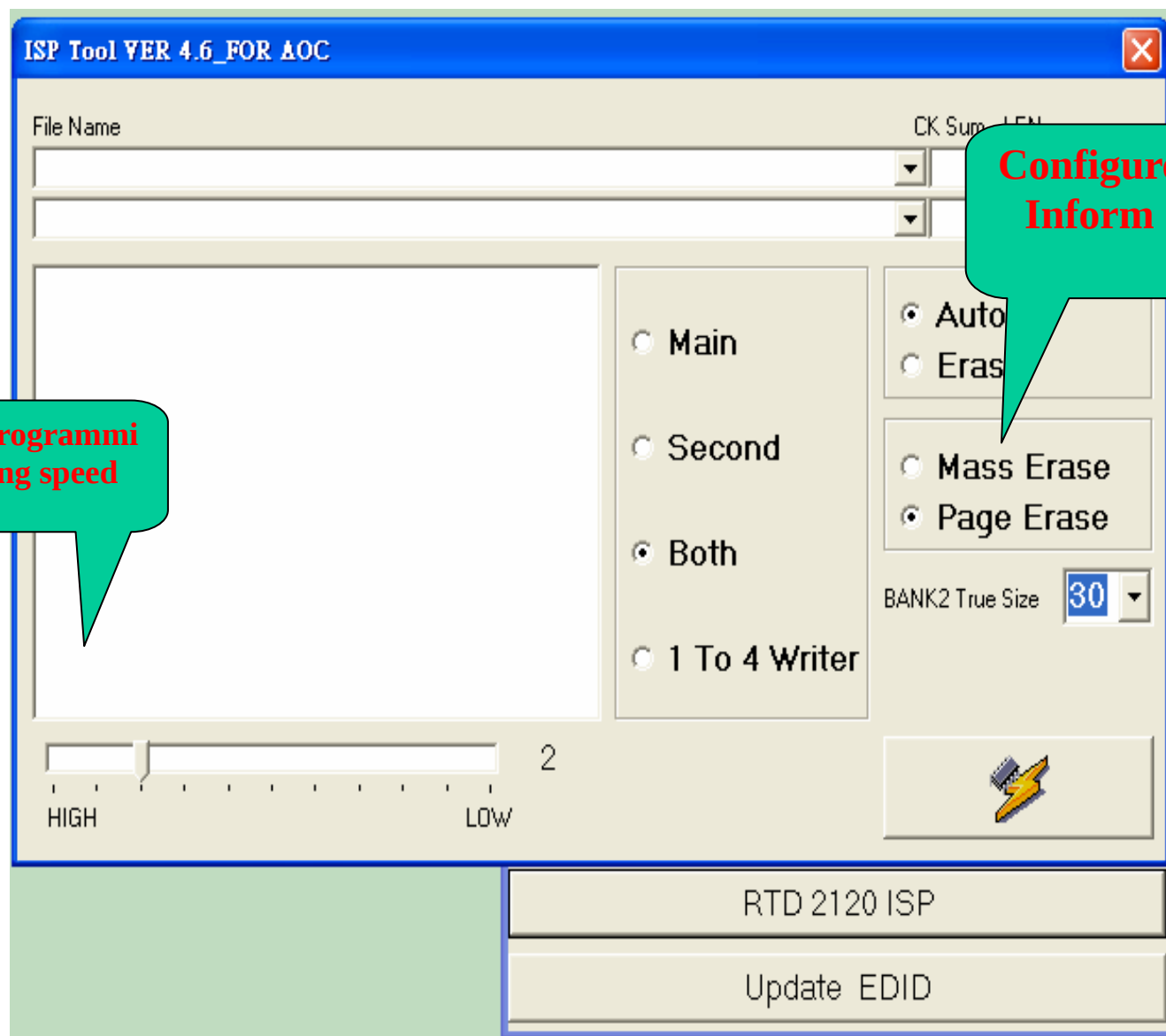
Fourthly, click “64~96”button, and download extern FW file as below Figure 4 .

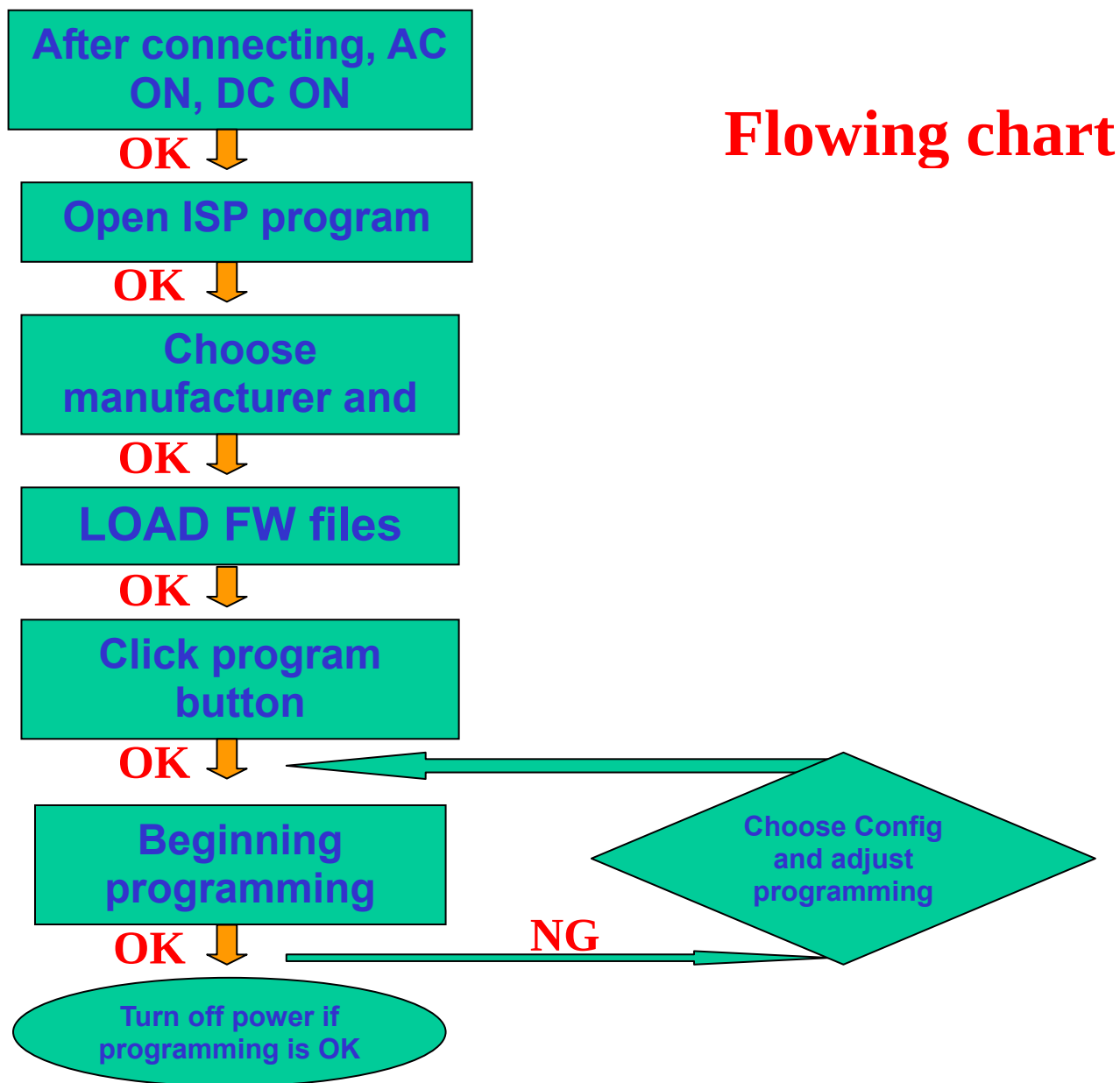


Fifthly, click “program”button as below,then you will see ISP will going on. There will be prompting if programming is OK.



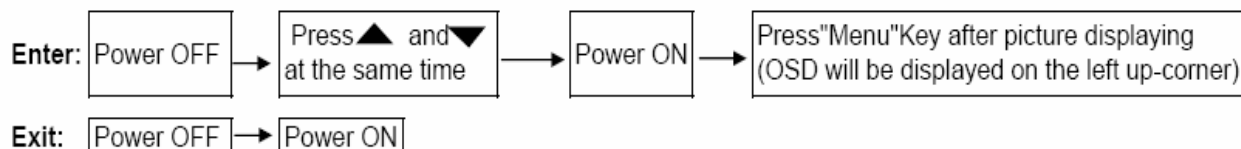
Note: Please see the configure as below Figure 6.





6.3 Factory Mode

FUNCTION	HOT KEY OPERATION						
	AUTO	e Color	◀	▶	MENU	POWER	
FACTORY MODE		•			•	ON	Press [e Color] & [MENU] at the same time, and then press [POWER] for DC power on. OSD menu will be shown with "F" on the left top. Select "F" for entering factory mode.



02. Flat Panel Specification

A. General specification

NO.	Item	Specification	Remark
1	Display resolution (pixel)	1,440(H) X 900(V), WXGA+ resolution	
2	Active area (mm)	410.4(H) X 256.5(V)	
3	Screen size (inch)	19 inches diagonal	
4	Pixel pitch (mm)	0.285(H) X 0.285(V)	
5	Color configuration	R, G, B vertical stripe	
6	Overall dimension (mm)	427.2(W) X 277.4(H) X 16(D) (typ.)	
7	Weight (g)	2200 (max)	
8	Surface treatment	Anti-Glare, Haze=25%, Hard coating (3H)	
9	Input color signal	8 bit LVDS	
10	Display colors	16.7M (6 bit with Hi-FRC)	
11	Optimum viewing direction	6 o'clock	
12	Backlight	4 CCFL	
13	TCO'03 & RoHS	RoHS compliance	

B. Electrical specifications

1.Pin assignment

Connector

JAE FI-X30SSL-HF or mechanical interface equivalent connector.

Pin No	Symbol	Description
Frame	VSS	Ground
1	RXinO0-	-LVDS differential data input, Chan 0-Odd
2	RXinO0+	+LVDS differential data input, Chan 0-Odd
3	RXinO1-	-LVDS differential data input, Chan 1-Odd
4	RXinO1+	+LVDS differential data input, Chan 1-Odd
5	RXinO2-	-LVDS differential data input, Chan 2-Odd
6	RXinO2+	+LVDS differential data input, Chan 2-Odd
7	VSS	Ground
8	RXOC-	-LVDS differential Clock input (Odd)
9	RXOC+	+LVDS differential Clock input (Odd)
10	RXinO3-	-LVDS differential data input, Chan 3-Odd
11	RXinO3+	+LVDS differential data input, Chan 3-Odd
12	RXinE0-	-LVDS differential data input, Chan 0-Even
13	RXinE0+	+LVDS differential data input, Chan 0-Even
14	VSS	Ground
15	RXinE1-	-LVDS differential data input, Chan 1-Even
16	RXinE1+	+LVDS differential data input, Chan 1-Even
17	VSS	Ground
18	RXinE2-	-LVDS differential data input, Chan 2-Even
19	RXinE2+	+LVDS differential data input, Chan 2-Even
20	RXEC-	-LVDS differential Clock input (Even)
21	RXEC+	+LVDS differential Clock input (Even)
22	RXinE3-	-LVDS differential data input, Chan 3-Even
23	RXinE3+	+LVDS differential data input, Chan 3-Even
24	VSS	Ground
25	VSS	Ground
26	NC	No Connection
27	VSS	Ground
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply
Frame	VSS	Ground

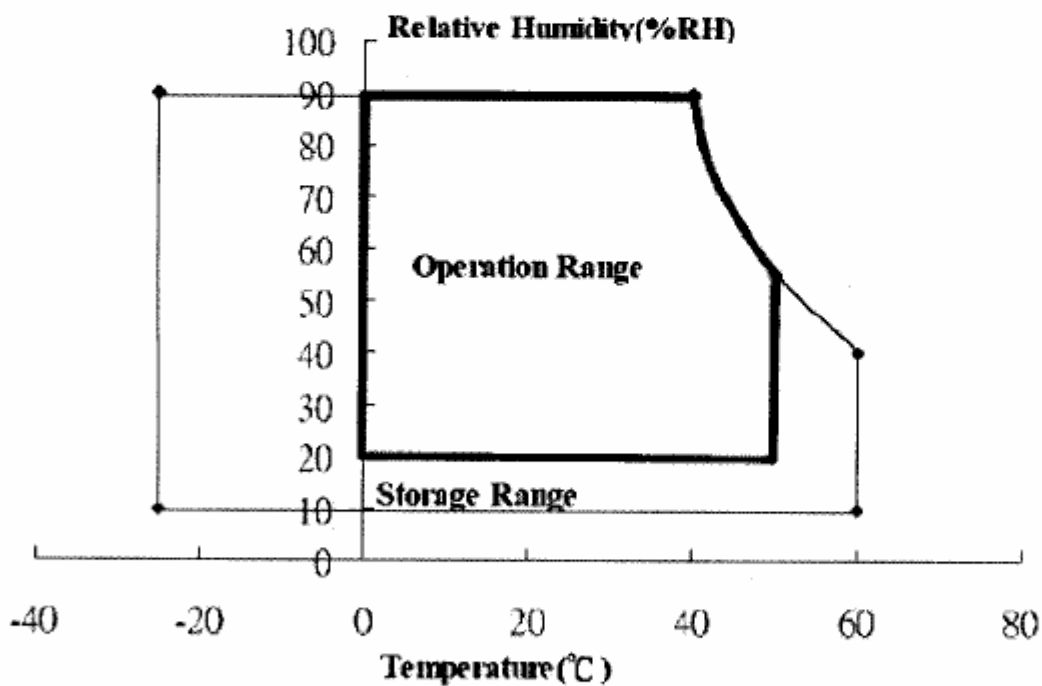
2. Absolute maximum ratings

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{cc}	-0.3	-	6.0	V	At 25°C
Input signal voltage	V_{IH}	-0.3	-	4.3	V	At 25°C
Operating temperature	T_{op}	0	-	50	°C	Note 1
Storage temperature	T_{ST}	-25	-	60	°C	Note 2
CCFL Current	ICFL	2	7	7.5	[mA]	

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less.

At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

Note 2: The unit should not be exposed to corrosive chemicals.



3. Electrical characteristics

a. Typical operating conditions

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Input Voltage		V_{CC}	4.5	5	5.5	V	
Permissive Power Input Ripple		V_{RF}	-	-	0.15	V	
Input Current	Black	I_{CC}	-	700	1000	mA	Note 1
	White	I_{CC}	-	500	700		Note 2
	Mosaic	I_{CC}	-	700	1000		Note 3
Rush Current		I_{Rush}	-	1.6	3	A	Note 4
Logic Input	Common Mode Voltage	VCM	-	1.2	-	V	
Voltage LVDS: IN+, IN-	Differential Input Voltage	VID	100	-	600	mV	
	Threshold Voltage (High)	VTH	-	-	100	mV	Note 5
	Threshold Voltage (Low)	VTL	-100	-	-	mV	Note 5

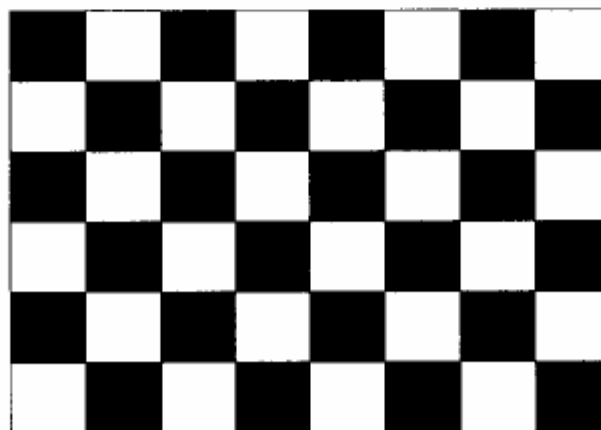
Note 1 : The specified current is under the $V_{CC} = 5V$, $25^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas black pattern is displayed.

Note 2 : The specified current is under the $V_{CC} = 5V$, $25^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas white pattern is displayed.

Note 3 : The specified current is under the $V_{CC} = 5V$, $25^{\circ}C$, $f_v = 60Hz$ (frame frequency) condition whereas mosaic pattern(black & white [8*6]) is displayed.

White : 255 Gray

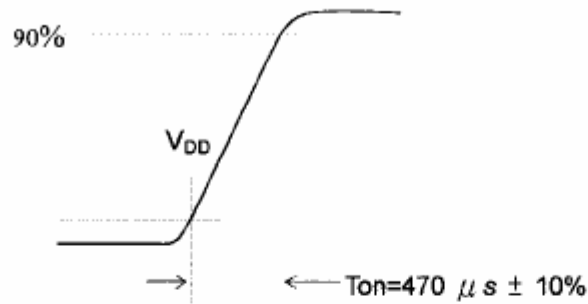
Black : 0 Gray



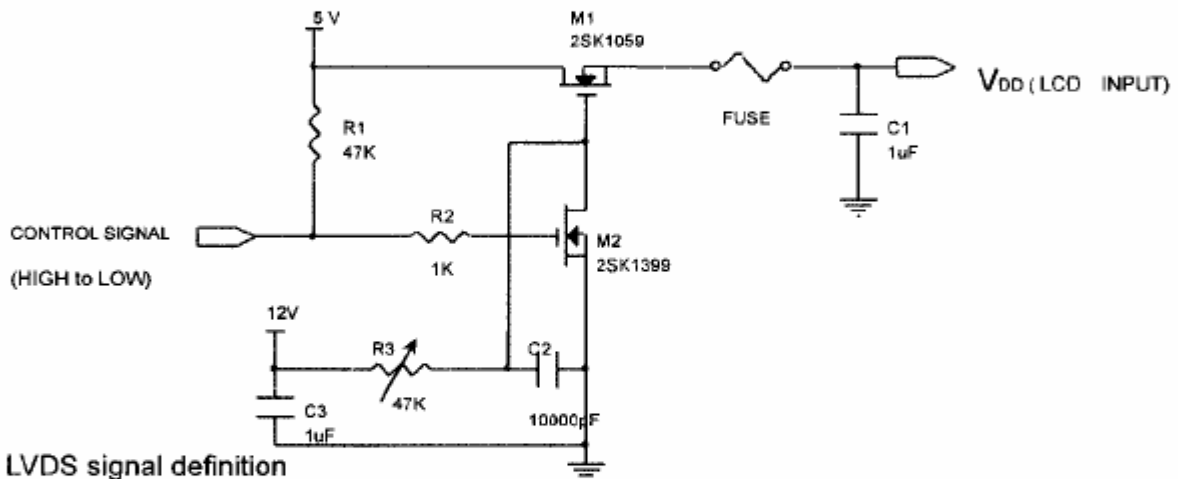
Note 4 : test condition :

(1) $V_{DD} = 5\text{ V}$, V_{DD} rising time = $470\text{ }\mu\text{s} \pm 10\%$

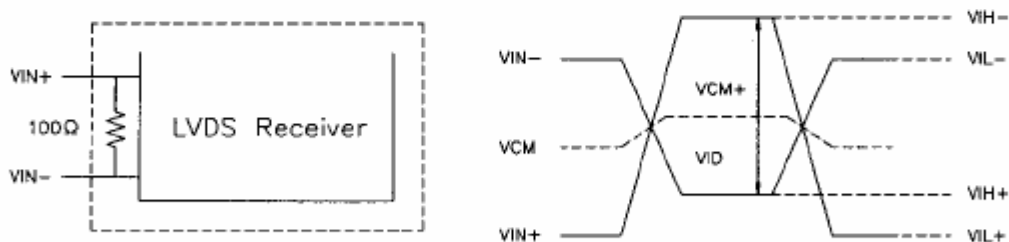
(2) Pattern: Mosaic pattern



(3) Test circuit



Note 5: LVDS signal definition



$VIN+$ = Positive differential DATA & CLK Input

$VIN-$ = Negative differential DATA & CLK Input

$VID = VIN+ - VIN-$,

$\Delta VCM = |VCM+ - VCM-|$,

$\Delta VID = |VID+ - VID-|$,

$VID+ = |VIH+ - VIH-|$,

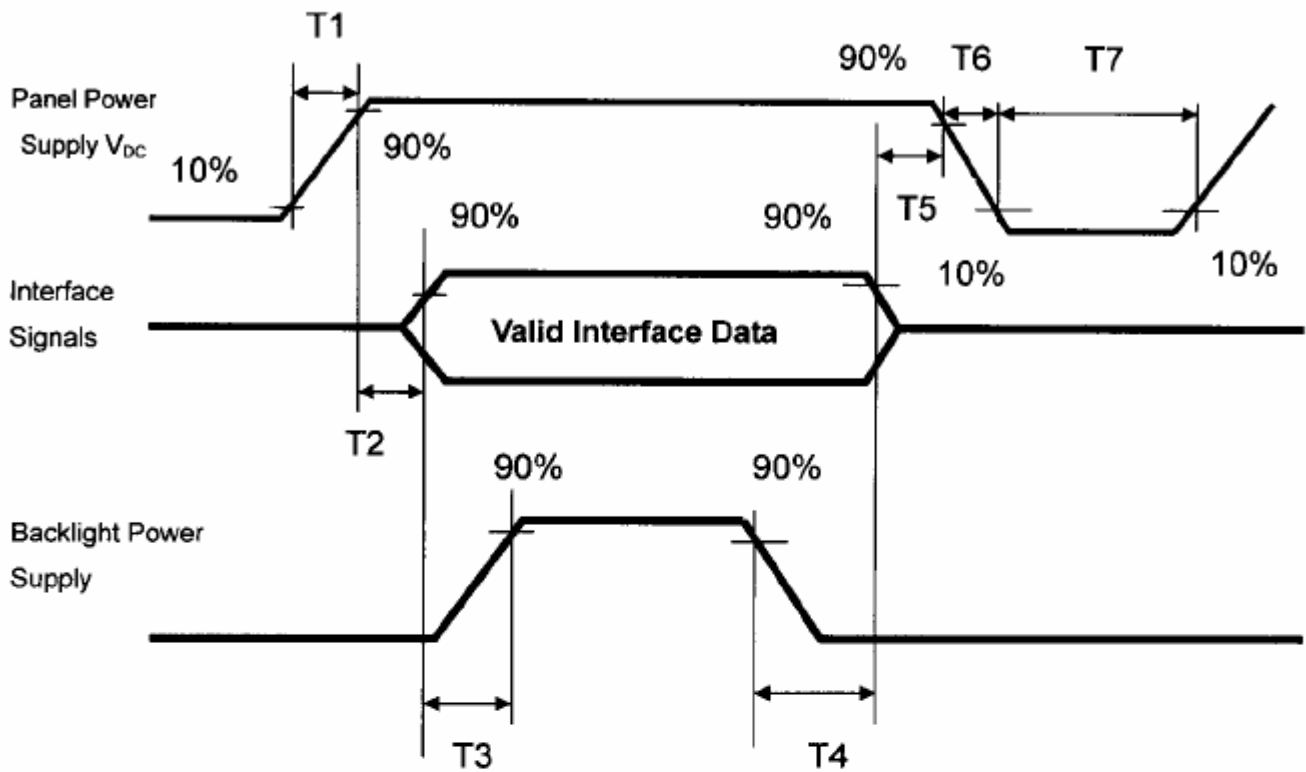
$VID- = |VIL+ - VIL-|$,

$VCM = (VIN+ + VIN-)/2$,

$VCM+ = (VIH+ + VIH-)/2$,

$VCM- = (VIL+ + VIL-)/2$,

Note 6 : Power on sequence for LCD V_{DD}



Parameter	Value			Unit
	Min	Typ	Max	
T1	0.1	-	10	ms
T2	0	30	50	ms
T3	200	250	-	ms
T4	100	250	-	ms
T5	0	20	50	ms
T6	0.1	-	-	ms
T7	1000	-	-	ms

b. Display color vs. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Input color data																							
		Red								Green								Blue							
		MSB				LSB				MSB				LSB				MSB				LSB			
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000)dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(000) dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

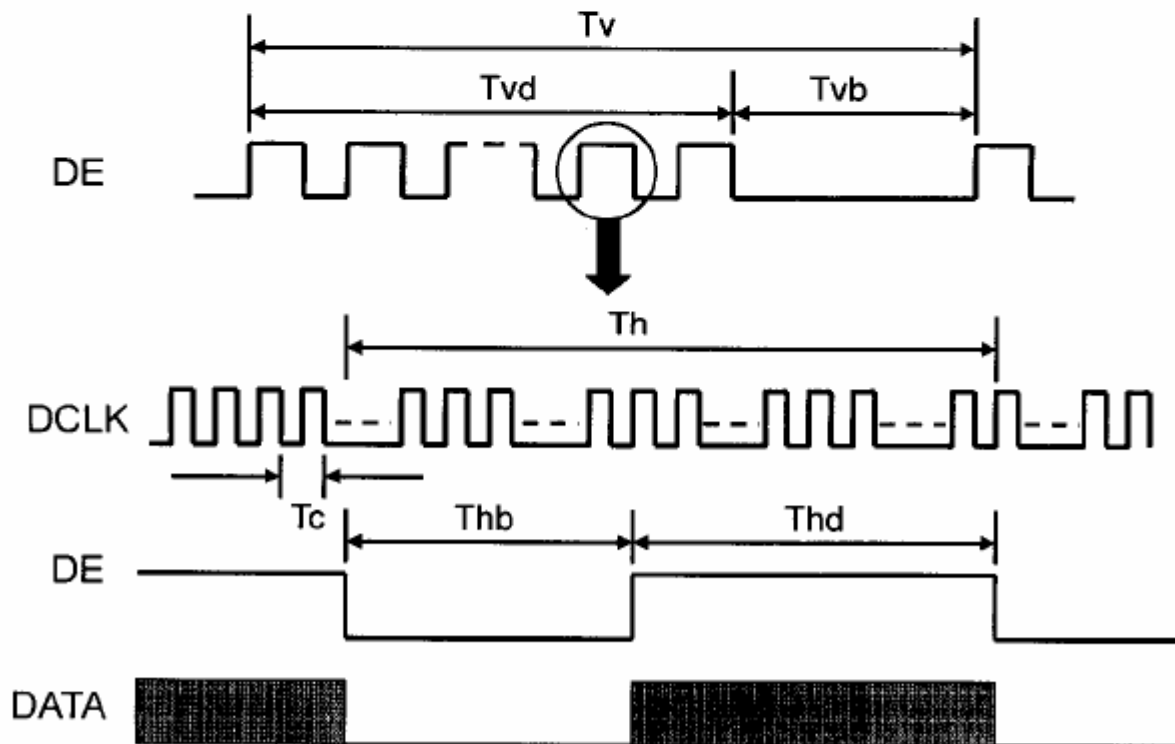
c. Input signal timing

Support Input Timing Table

	Item	Description	Min.	Typ.	Max.	Unit
Clock	Dclk	period	14.63	22.5	40	nS
		frequency	25	44.5	68.4	MHz
Vertical	T_{V_TOTAL}	V total line number	905	926	942	T_{H_TOTAL}
	T_{V_DATA}	Data duration	—	900	—	T_{H_TOTAL}
	T_{VB}	V-blank	5	26	—	T_{H_TOTAL}
	f_V	frequency	56	60	75	Hz
Horizontal	T_{H_TOTAL}	H total pixel number	752	800	968	DClk
	T_{H_DATA}	Data duration	—	720	—	DClk
	T_{HB}	H-blank	32	80	—	DClk

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low Logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



d. Display Position

D(1, 1)	D(2, 1)	.....	D(720, 1)	.....	D(1439, 1)	D(1440, 1)
D(1, 2)	D(2, 2)	.....	D(720, 2)	.....	D(1439, 2)	D(1440, 2)
⋮			⋮		⋮	⋮
D(1, 450)	D(2, 450)	.....	D(720, 450)	.....	D(1439, 450)	D(1440, 450)
⋮			⋮		⋮	⋮
D(1, 899)	D(2, 899)	.....	D(720, 899)	.....	D(1439, 899)	D(1440, 899)
D(1, 900)	D(2, 900)	.....	D(720, 900)	.....	D(1439, 900)	D(1440, 900)

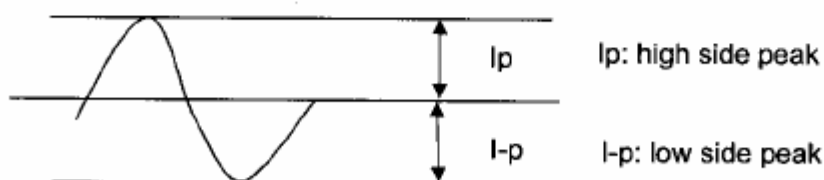
e. Backlight driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark	Remark
Lamp voltage	VL	660	730	800	Vrms		
Lamp operation current	IL	2	7.0	7.5	mA		Note 1
Lamp starting voltage	VLstart	1450	-	-	Vrms	T = 25°C	Note 2,3,4,5
		1700	-	-		T = 0°C	Note 2,3,4,5
Frequency	F	40	-	80	KHZ		Note 5
Lamp life time		-	50000	-	Hr		Note 6

Note: The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

Note 1: The degree of unbalance: less than 10%

The ratio of wave height: less than $\sqrt{2} \pm 10\%$



The degree of unbalance = $|Ip - I-p| / Irms \times 100(\%)$

The ratio of wave height = Ip (or $I-p$) / $Irms$

Lamp should be completely turned on.

Note 2: Test equipment: AS-114B

Note 3: The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise, the lamp may not be turned on normally.

Note 4: Inverter should provide more than min. value, and then lamp could be completely turned on

Note 5: Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note 6: Life time (Hr) is defined as the time when brightness of a lamp unit itself becomes 50% or less than its original value at the condition of $T_a = 25 \pm 2^\circ\text{C}$ and $I_L = 7.0\text{mA}_{\text{rms}}$.

Backlight connector: 3500IHS-02L

Pin no.	Symbol	Function	Remark
1	VIH	Lamp high voltage input	Cable color: Pink
2	VIL	Lamp low voltage input	Cable color: White
3	VIH	Lamp high voltage input	Cable color: Blue
4	VIL	Lamp low voltage input	Cable color: Black

C. Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time	Tr	$\theta = 0^\circ$	-	1.5	4	ms	Note 4
	Tf		-	3.5	6		
	Tr+Tf		-	5	10		
Contrast ratio	CR	$\theta = 0^\circ$	700	1000	-		Note 3,5
Viewing angle	Top	$CR \geq 10$	70	80	-	deg.	Note 3,5,7
		$CR \geq 5$	75	85	-		
	Bottom	$CR \geq 10$	70	80	-		
		$CR \geq 5$	75	85	-		
	Left	$CR \geq 10$	70	80	-		
		$CR \geq 5$	75	85	-		
	Right	$CR \geq 10$	70	80	-		
		$CR \geq 5$	75	85	-		
Brightness (Center)	Y_L		250	300	-	nit	Note 3,6
Color chromaticity(CIE)	Wx	$\theta = 0^\circ$	-0.02	0.313	+0.02		Note 3
	Wy			0.329			
	Rx			0.640			
	Ry			0.349			
	Gx			0.284			
	Gy			0.617			
	Bx			0.142			
	By			0.067			
White uniformity (9)	δ_w		0.75	0.80	-		Note 3,8
Cross talk	Ct		-	-	1.5%		Note 9
Gamma			2.0	2.2	2.4		Note 3

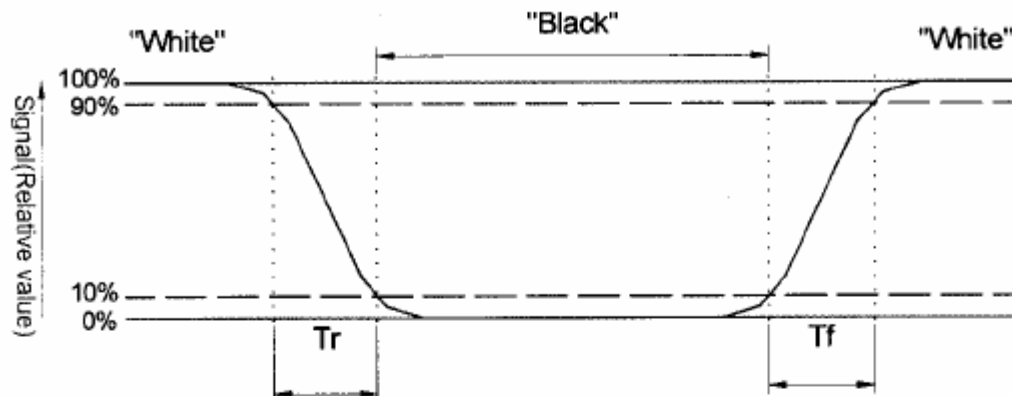
Note 1: Ambient temperature = 25°C.

Note 2: To be measured in dark room after backlight warm up 30 minutes.

Note 3: To be measured with a viewing cone of 2° by Topcon luminance meter BM-5A.

Note 4: Definition of response time:

The output signals of BM-7 are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval is between the 10% and 90% of amplitudes. Refer to figure as below.



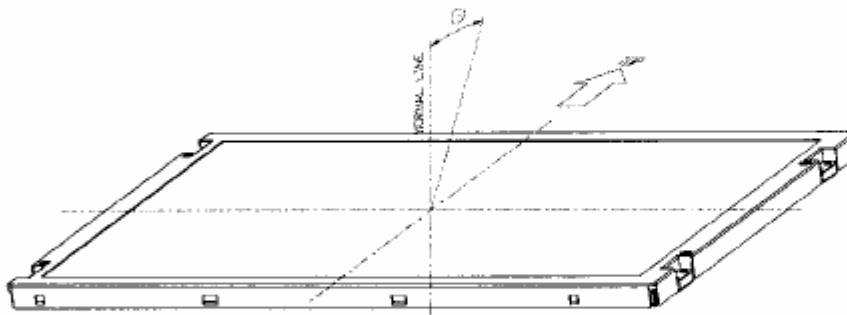
Note 5: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 6: Driving conditions for CCFL: $I_L = 7 \text{ mA}$, 50 KHz Frequency.

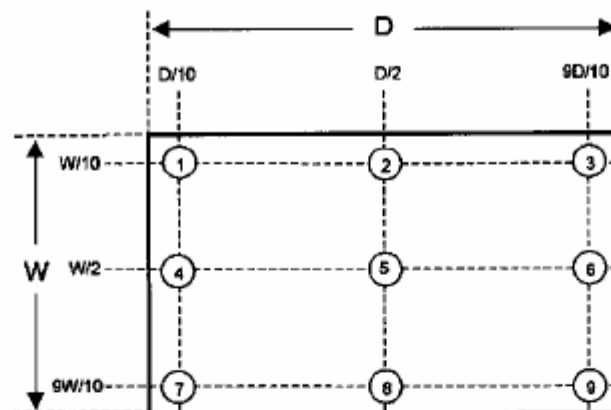
Note 7: Definition of viewing angle



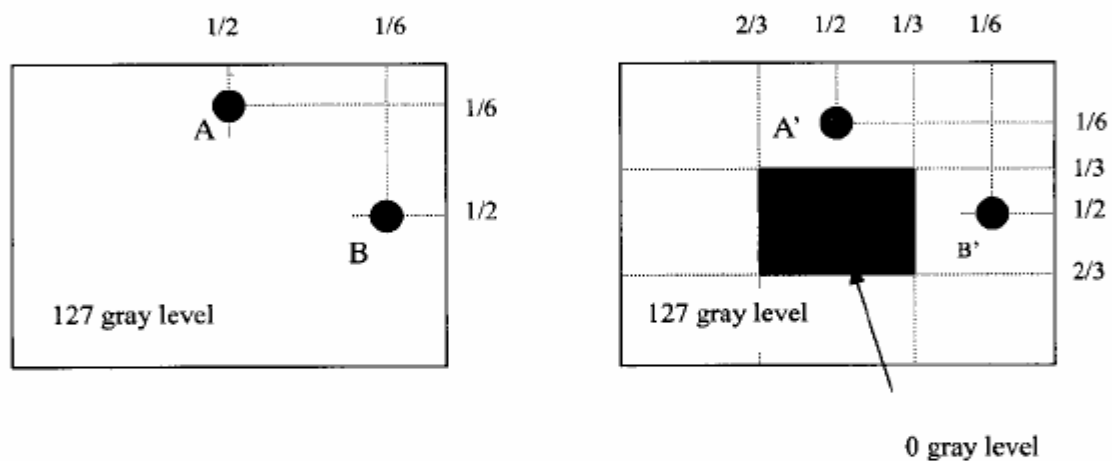
Note 8: Definition white uniformity:

Luminance are measured at the following nine points (P1~P9).

$$\delta_w = \frac{\text{Minimum Brightness of nine points (P1~P9).}}{\text{Maximum Brightness of nine points (P1~P9).}}$$



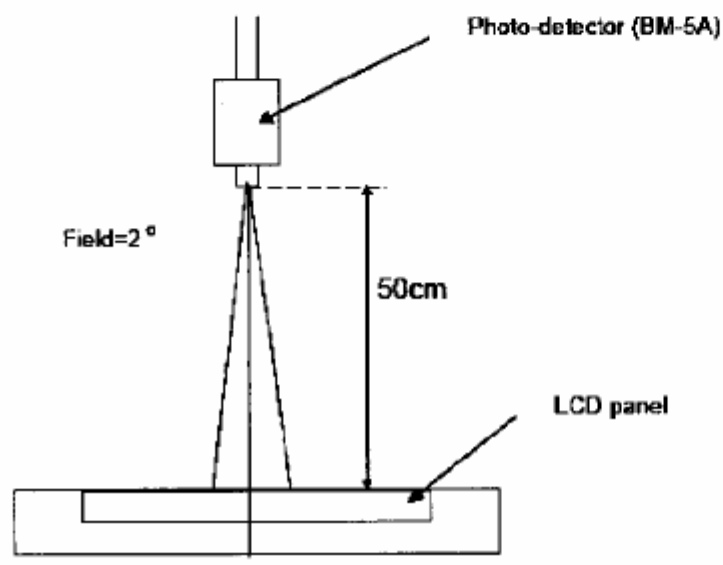
Note 9:



$$|L_A - L_{A'}| / L_A \times 100\% = 1.5\% \text{ max.}, L_A \text{ and } L_{A'} \text{ are brightness at location A and A'}$$

$$|L_B - L_{B'}| / L_B \times 100\% = 1.5\% \text{ max.}, L_B \text{ and } L_{B'} \text{ are brightness at location B and B'}$$

Note 10: Optical characteristic measurement setup.



D. Reliability test items

Test Item	Test Condition	Judgment	Remark
High temperature storage	60°C, 240Hrs	Note 1	Note 2
Low temperature storage	-25°C, 240Hrs	Note 1	Note 2
High temperature & high humidity operation	40°C, 90%RH, 240Hrs (No condensation)	Note 1	Note 2
High temperature operation	50°C, 240Hrs	Note 1	Note 2
Low temperature operation	0°C, 240Hrs	Note 1	Note 2
Thermal Shock (non-operation)	-20°C~60°C 1Hr, 10mins, 1Hr, 100cycles	Note 1	Note 2
Electrostatic discharge (ESD) (non-operation)	Contact: +/-8kV, 150pF(330ohms), 25 times/1 point, 1 time/1 sec Air discharge: +/-15kV, 150pF(330ohms), 25 times/1 point, 1 time/1 sec	Note 1	Note 2
Vibration (non-operation)	Vibration level : 1.5G Bandwidth : 10-300Hz Waveform : sine wave, sweep rate : 10min 30 min for each direction X, Y, Z (1.5 Hrs in total)	Note 1	Note 2
Mechanical Shock (non-operation)	Shock level : 50G, 11ms Waveform : Half sine wave Direction : ±X, ±Y, ±Z One time each direction	Note 1	Note 2
MTBF Demonstration	50,000 hours (Typ.) with confidence level 90%	Note 1	Note 3

Note1: Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

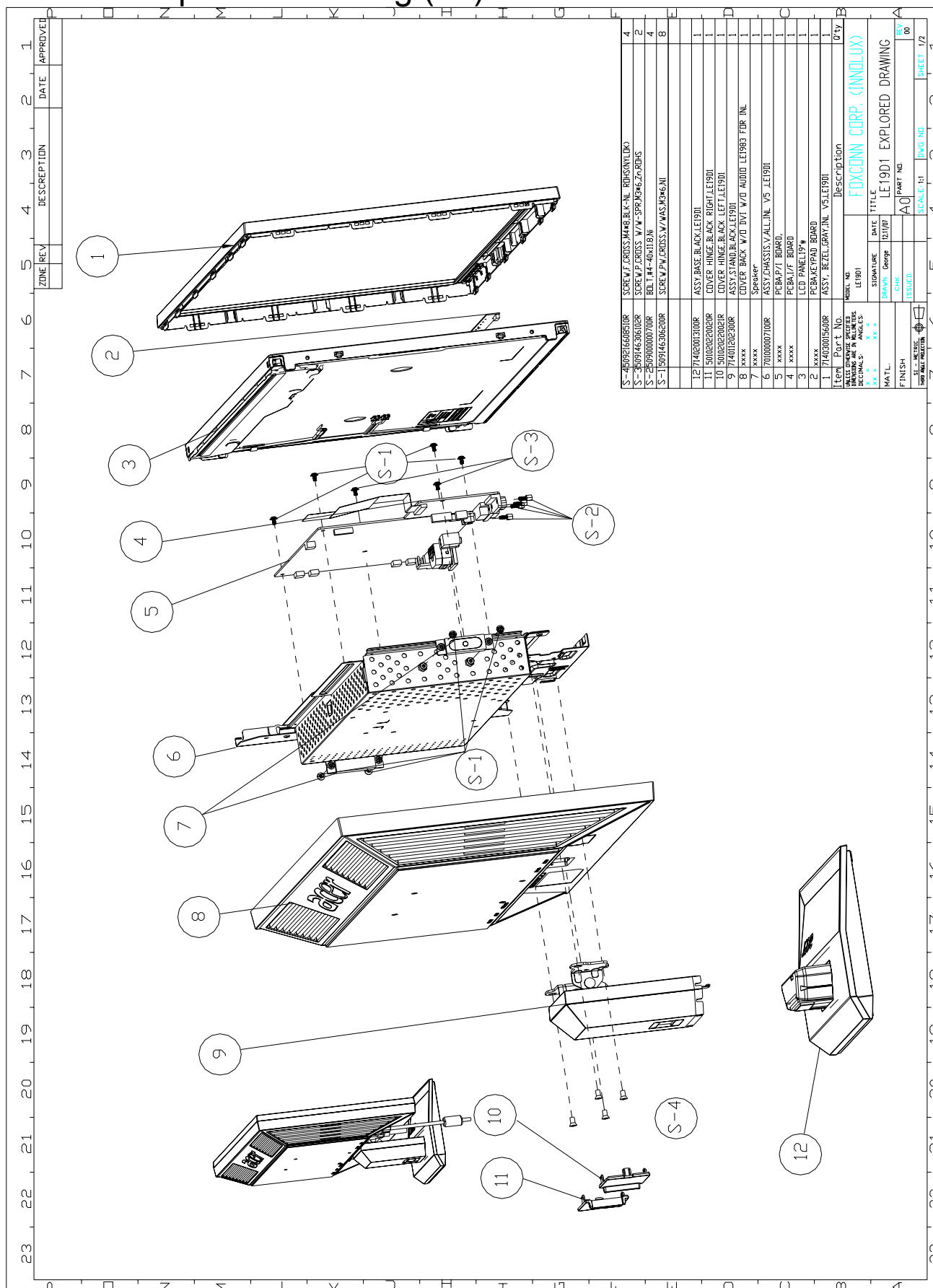
Note2: Evaluation should be tested after storage at room temperature for one hour.

Note 3: The MTBF calculation is based on the assumption that the failure rate distribution meets the Exponential Model (CCFL excluded)

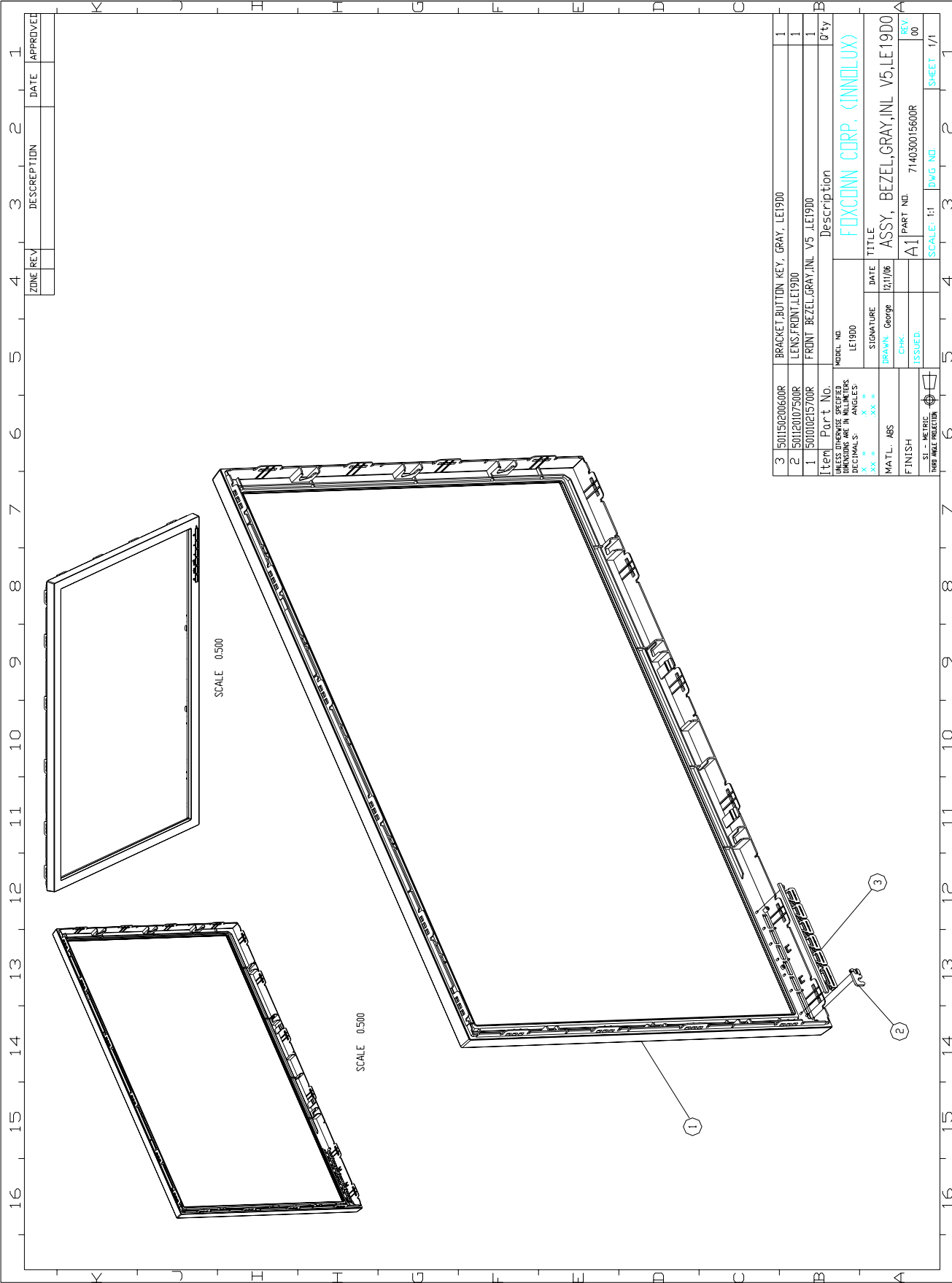
03 Exploded Diagram

3.1. LCD Exploded drawing (All)

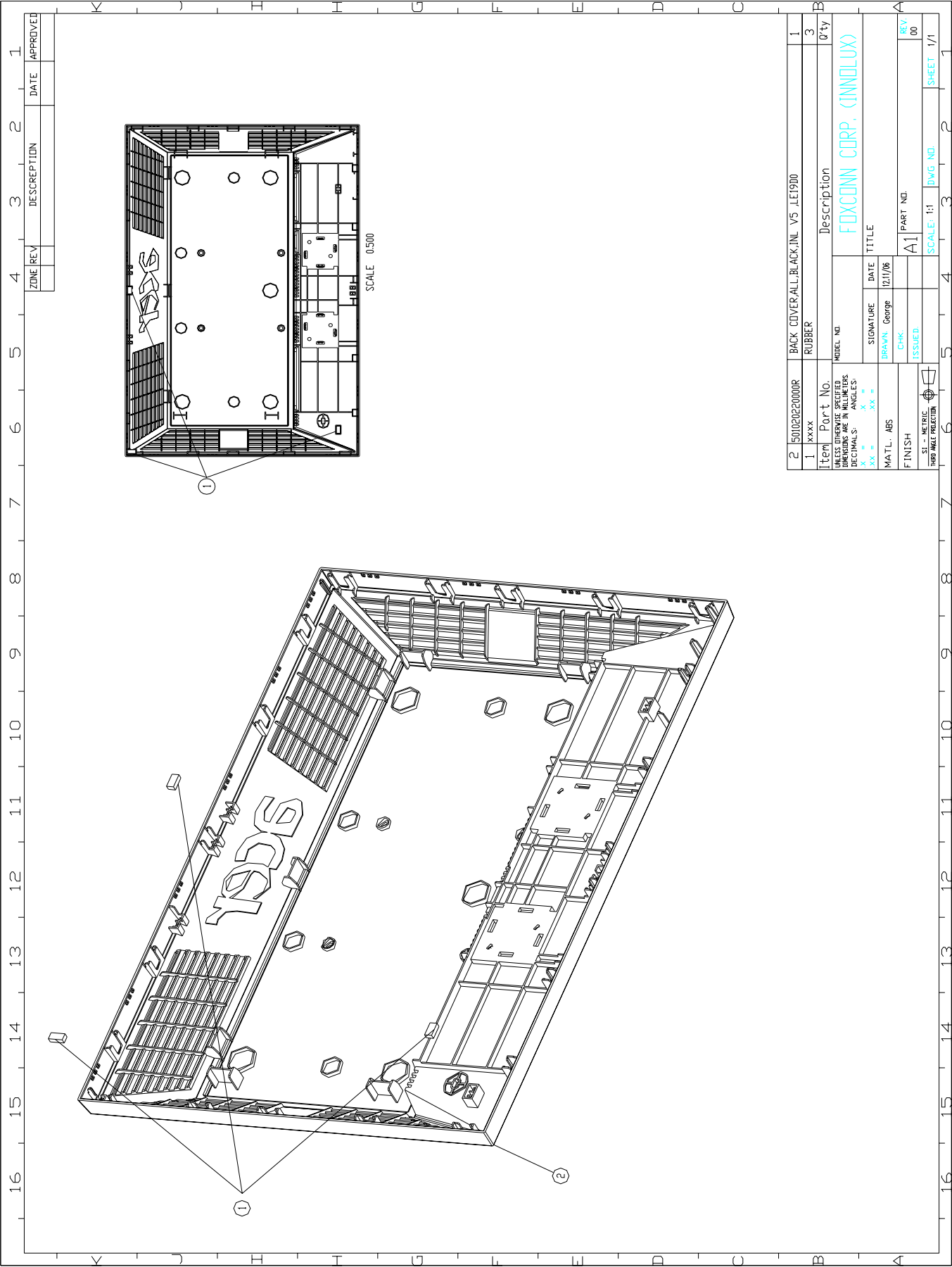
3.1. LCD Exploded drawing (All)



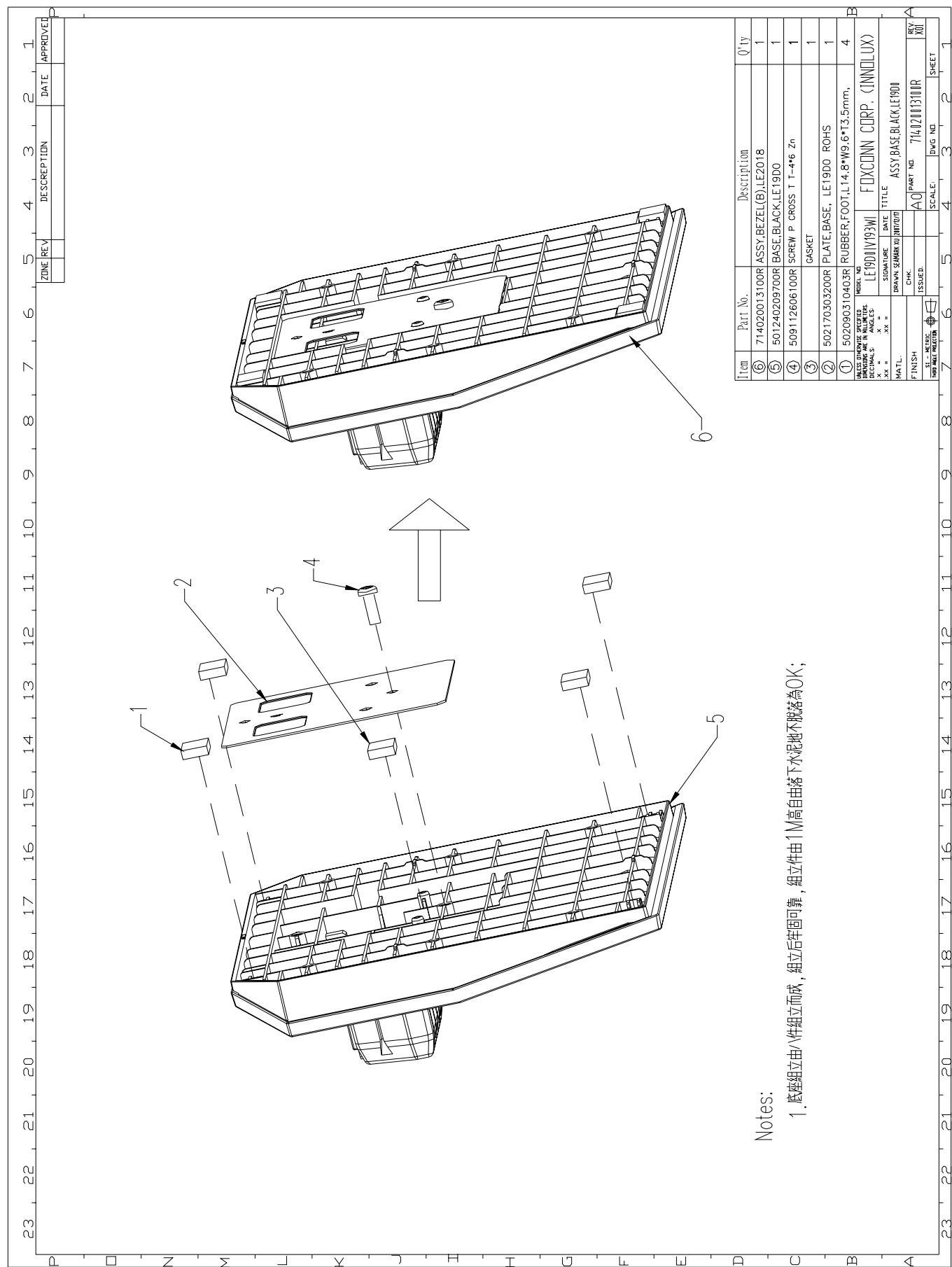
3.2 Assy Bezel Exploded drawing



3.3 Assy BACK COVER Exploded drawing For VC panel

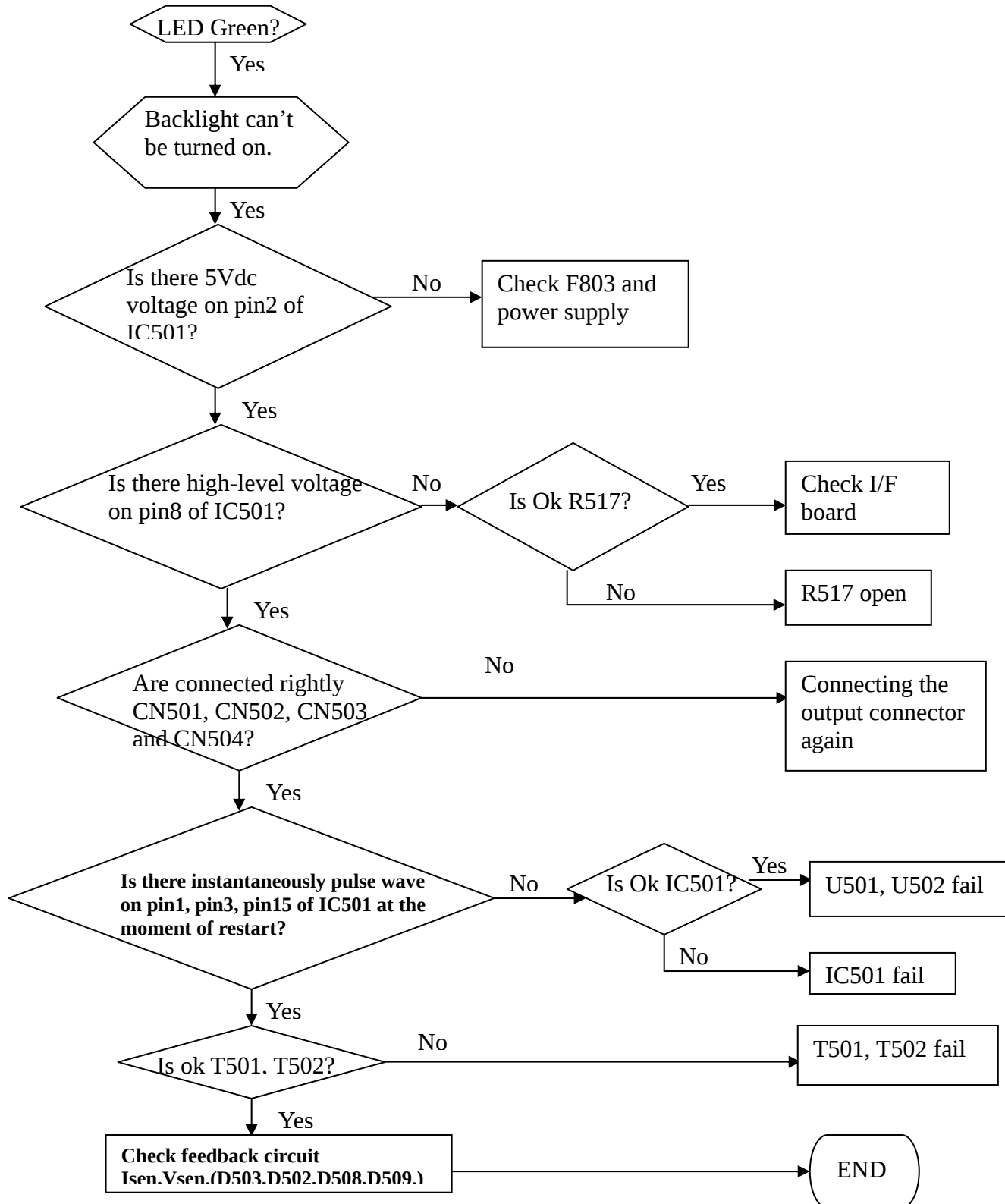


3.4 Assy Base Exploded drawing

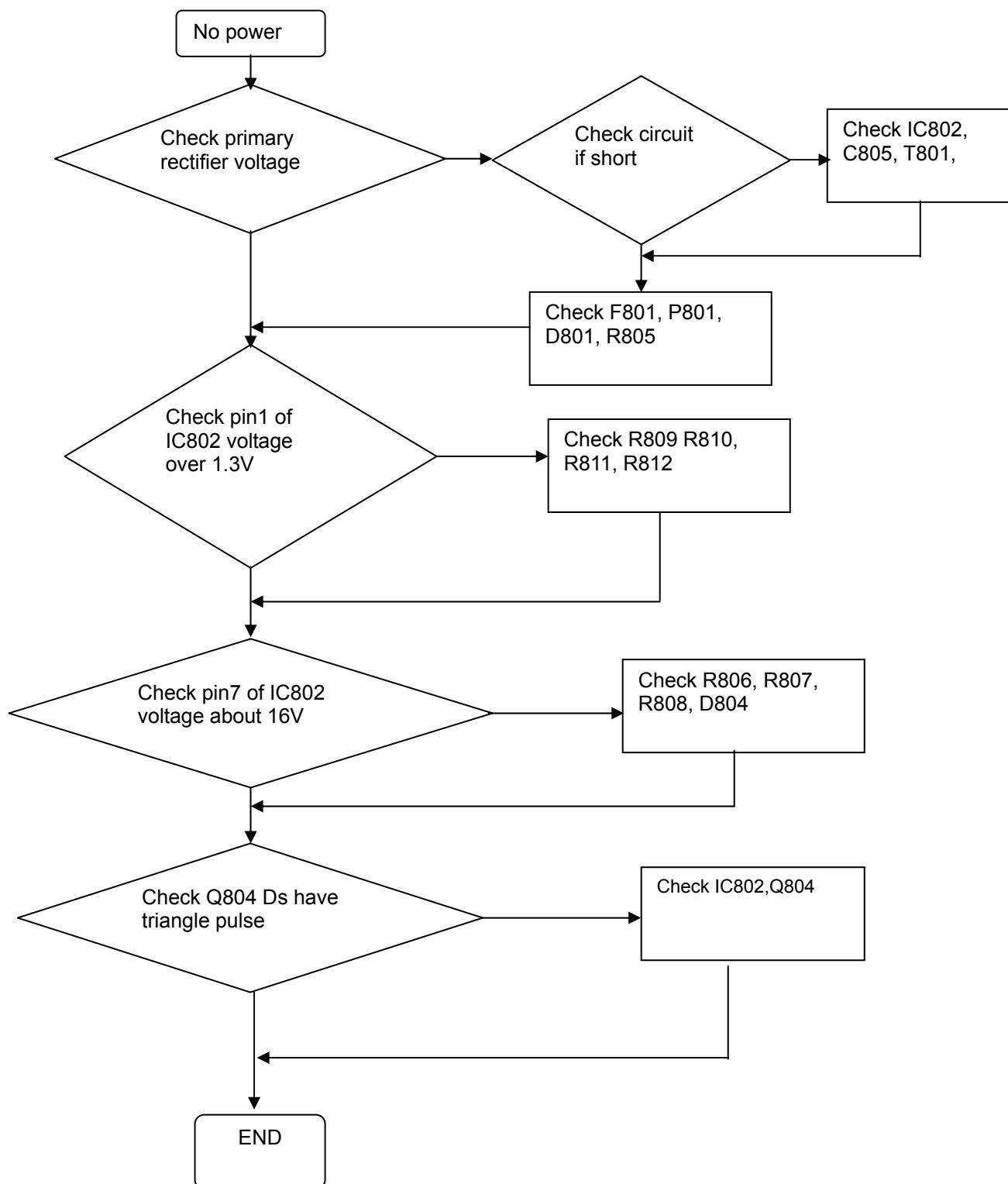


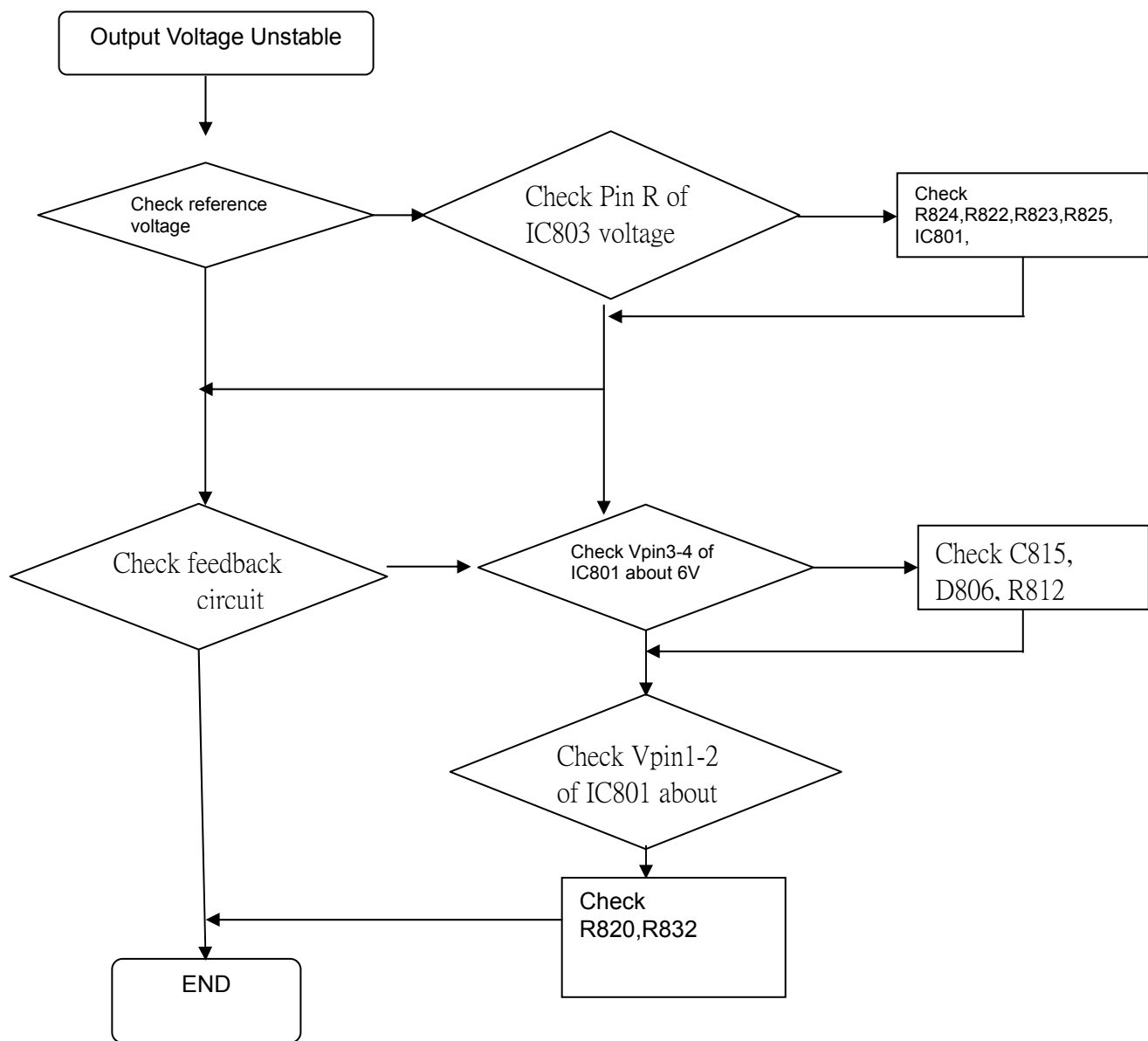
04 Troubleshooting

4.1 Inverter circuit on power board



4.2 power board



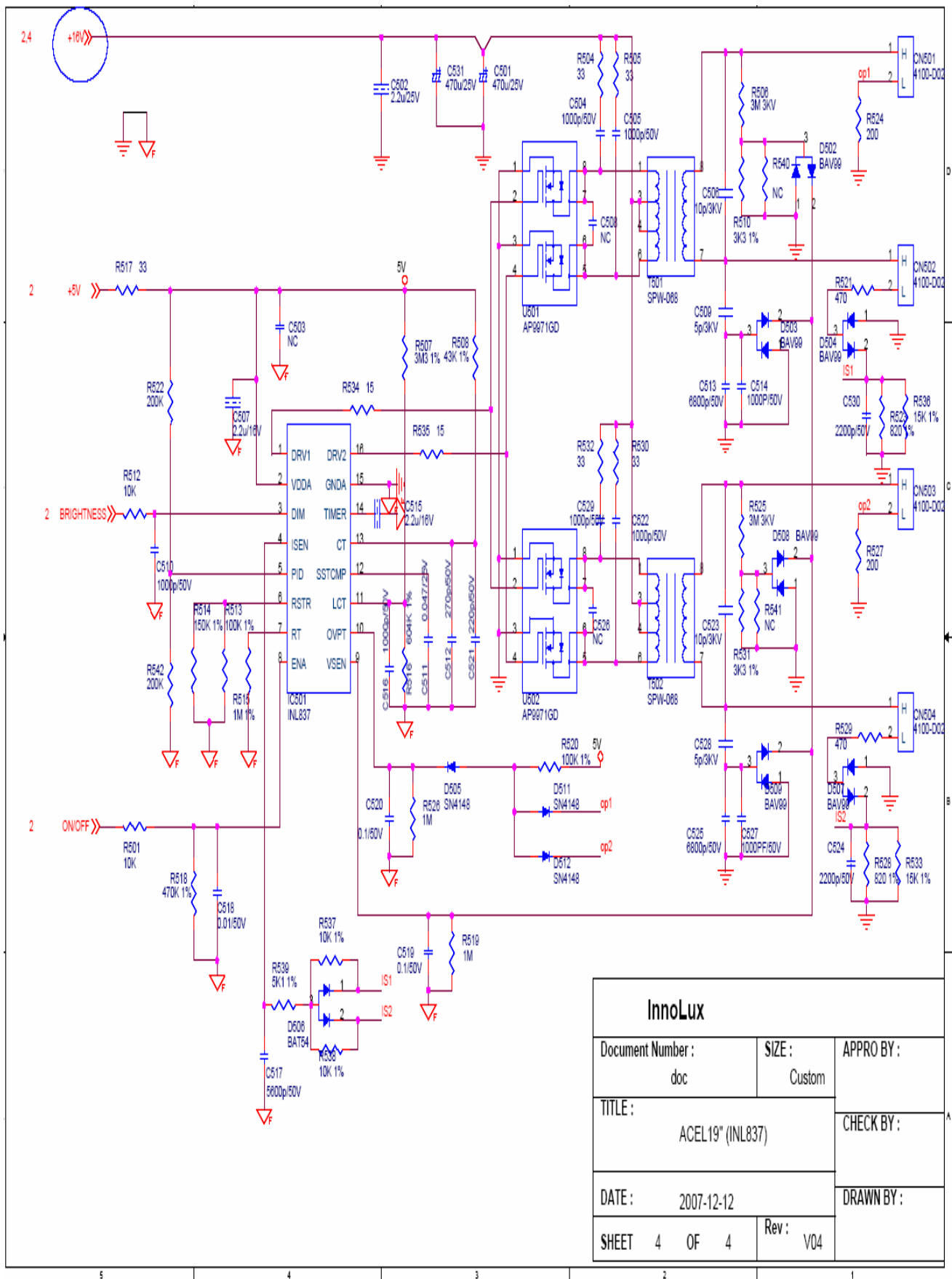


05 Spare parts List

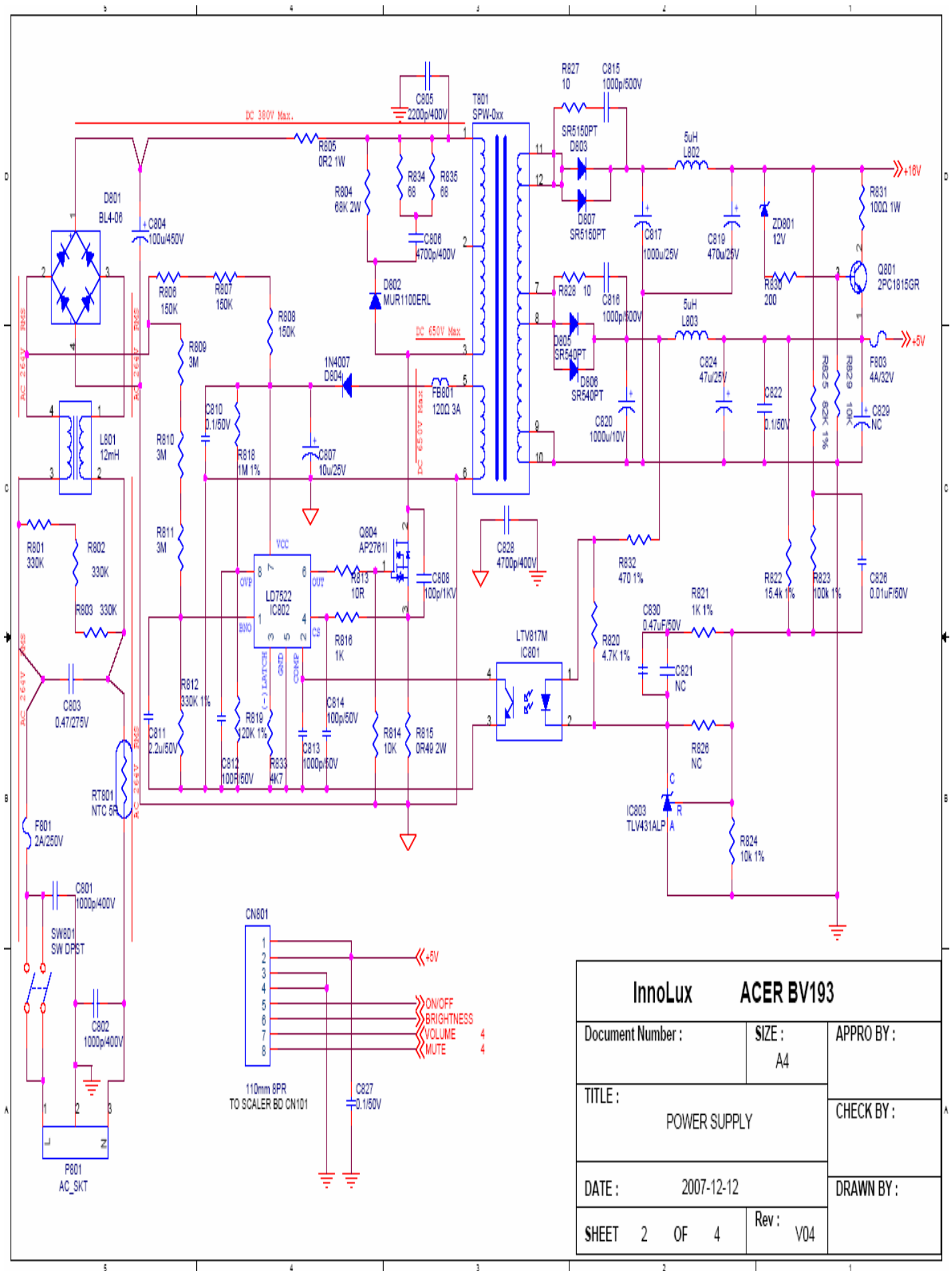
Level	Inl P/N	Description	Minimal order Q'ty	INL P/N: 8191D161A020R
1	791401300600R	PCBA,I/F BOARD(V5,EMEA,W/O),LE19D0-	50	1
1	791401401600R	PCBA,P/I BOARD,W/O SPK,LE19D1-612 ROHS	50	1
1	791401500000R	PCBA,KEYPAD BOARD,LE9D0-612 ROHS	50	1
1	453070800210R	PWR CORD 16A/250V BLK 6FT VDE H05VV-F 3G	50	1
1	453010100380R	CABLE,D-SUB 15P MALE 6FT BLACK/BLUE, ROH	50	1
1	453030300370R	CABLE,DVI-D 18+1P MALE 6FT BLACK , ROHS	50	1
1	430300801670R	HRN ASSY 2x4P 55mm UL1571#28,ROHS	50	1
1	430300801680R	HRN ASSY 2x4P to 8P 215mm UL1571#28,ROHS	50	1
1	430303001500R	HRN LVDS FFC 30P 182mm ROHS	50	1
1	714030015600R	ASSY, BEZEL,SLIVER,INL V5 I E19D1	50	1
1	714020013100R	ASSY,BASE,BLACK,LE19D1	50	1
1	714011202300R	ASSY,STAND,BLACK,LE19D1	50	1
1	501020220020R	COVER HINGE,BLACK RIGHT,LE19D1	50	1
1	501020220021R	COVER HINGE,BLACK LEFT,LE19D1	50	1
1	501020220000R	BACK COVER,ALL,BLACK,INL V5 ,LE19D1	50	1
1	701000007100R	ASSY,CHASSIS,V,ALL,INL V5 ,LE19D1	50	1
1	631102091401R	LCP 19" MT190AW01-V5-G1,AM1900004511(IN	50	1

06 Schematics and Layouts

6.1 Inverter PWM circuit



6.2 Switching Mode Power Supply circuit



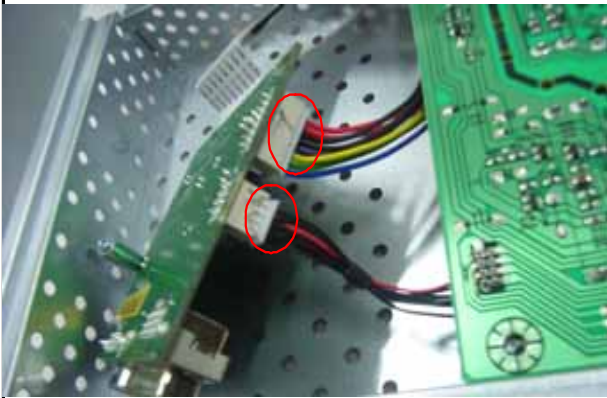
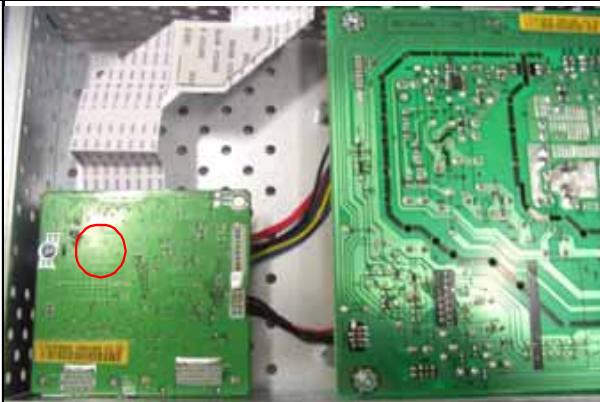
7.0 Assembly and Disassembly

Sequence	Item	Photo	Procedures	P/N	Description
S1	Place panel		(1).Take panel out of box and place it on the foam. (2).Tear open the PE bag and put it in the designated carton. (3).Place panel on the foam like the attached picture. Remark:Do not touch the lamp cord and place the surface of panel downsides on the cushion.	631102091401R	LCP 19" MT190AW01-V5-G1,AM1900004511(IN
S2	Insert Keypay's wrie		1.Check if the keypad and relevent wire you choose are OK. 2.Insert the wire into the keypad like the Picture	430300801680R	HRN ASSY 2x4P to 8P 215mm UL1571#28,ROH S
S3	Fix front bezel		1.Check if there is any lacquer missed or sctrash happened to the front bezel. 2.Insert the fixed keypad into the front bezel as picture	714030015600R	ASSY, BEZEL,SLIVER,INL V5,LE19D1

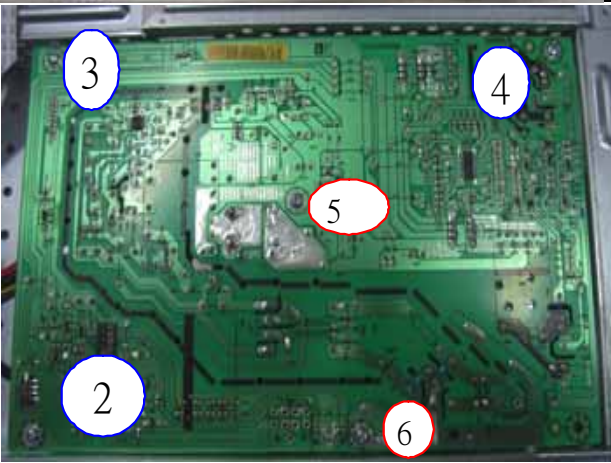
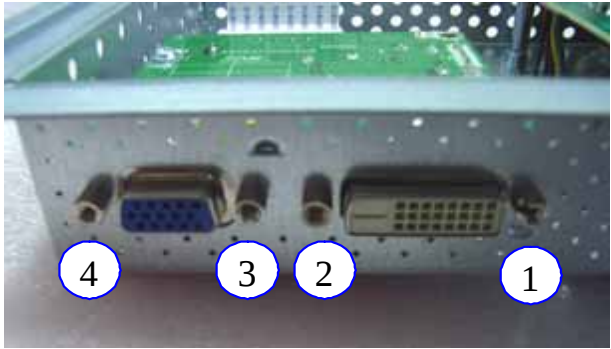
Assembly and Disassembly (continue)

S4	Assemble front bezel		1.Reverse the panel by 180 degree,put the surface of panel upsides and insert front bezel in the panel. 2.Reverse the panel by 180 degree using both hands,put the surface of panel downsides and make sure FFC interface is closer to operator. 3.Paste tinfoil on the position which refers to attached picture,in order to cover the gap in the panel completely. Remark:Make sure the fixed job is finished properly and lamp wire is closer to right hand;Make the tinfoil smooth in the corner of panel.	ASSY, BEZEL,SLIVER,INL V5,LE19D1	ASSY, BEZEL,SLIVER,INL V5,LE19D1
S5	Insert FFC wire into mainboard		(1).Insert FFC wire into its relevant interface of mainboard properly like attached picture1. (2).Insert the short keypad into its relevant interface like picture (2).Put the fixed mainboard in the right position.	430303001500R	HRN LVDS FFC 30P 182mm ROHS
S6	Fix chassis & power board		Place the chassis on the cushion after check,like the attached Picture	701000007100R	ASSY,CHASSIS,V,ALL,INL V5,LE19D1

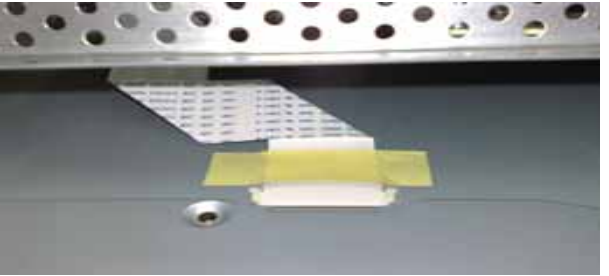
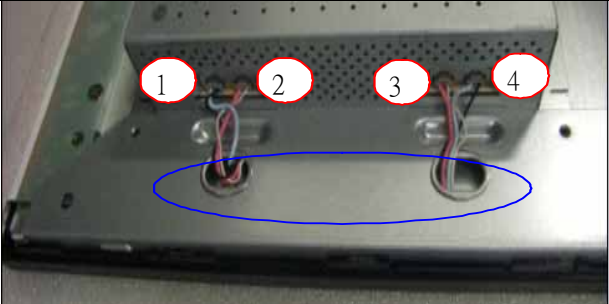
Assembly and Disassembly (continue)

S7	Fix chassis & power board		Insert powerboard into the designated location of chassis, like the attached Picture	791401401600 R	PCBA, P/I BOARD, W/O SPK, LE19D1-612 ROHS
S8	Connect mainboard & power board		Connect powerboard with the relevant PIN in the mainboard like the attached Picture		
S9	Twist PCBA screw		Handle electric opener and one pcs of M3*6 screw		

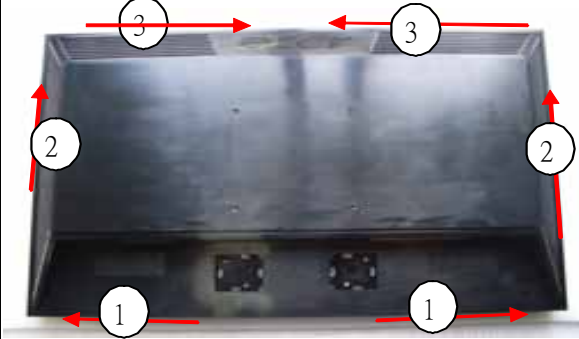
Assembly and Disassembly (continue)

S10	Twist PCBA screw		Fix 6 pcs of screws separately on the poweboard and mainboard like the attached Picture1	509146306200 R	SCREW,P,CROSS,W/WAS,M3*6,Zn-Cc
S11	Twist screw for ground-wire		Paste FFC wire on the disignated location like the attached Picture		
S12	Twist Hexagonal screws		(1). Handle hexagonal screws and electric opener (2). Twist screw in the interface like the attached Picture1. (3). Place cushion on the designated location after iron frame is taken away.		

Assembly and Disassembly (continue)

S13	Fix chassis		Thread lamp wire into the relevant hole of chassis like the attached Picture	701000007100 R	ASSY,CHASSIS ,V,ALL,INL V5 ,LE19D1
S14	Insert FFC cable		1.Tear off the adhensive tape of FFC wire; 2.Insert FFC wire into the interface of panel 3.Put FFC wire in order and paste them on the panel 4.Fix chassis on the back of panel		
S15	Insert light wire		1)Insert 4pcs light wire into the relevant position 2) put the balance light wire to the position as picture		
S16	Insert keypad Cable		1)Insert keypad wire into the relevant PIN in the keypad (2)Fix button on the relevant position of assemble (3)Confirm if keypad is inserted properly	430300801680 R	HRN ASSY 2x4P to 8P 215mm UL1571#28,RO HS

Assembly and Disassembly (continue)

S17	Fix back cover		Check if back cover is fixed properly	501020220000 R	BACK COVER,ALL,BL ACK,INL V5 ,LE19D1
S18	Fix stand		Use 4pcs screw fix stand on the back of assemble like attached Picture	714011202300 R	ASSY,STAND,B LACK,LE19D1
S19	Fix hinge cover&base		Check if base is qualified and insert it into the relevant location properly like the attached Picture	714020013100 R	ASSY,BASE,BL ACK,LE19D1
S20	Packing		(1)Release monitor to the packing line (2)Put monitor into carton like the attached picture		