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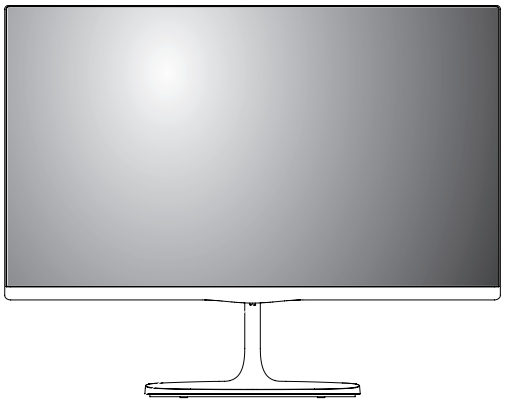
COLOR MONITOR
SERVICE MANUAL

CHASSIS NO. : LM68A

MODEL : FLATRON 27MP58VQ

CAUTION

BEFORE SERVICING THE UNIT,
READ THE **SAFETY PRECAUTIONS** IN THIS MANUAL.



P/NO : MFL67715296(1510-REV00)

Printed in China

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SVC. SHEET .....

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PRECAUTION

WARNING FOR THE SAFETY-RELATED COMPONENT.

- There are some special components used in LCD monitor that are important for safety. **These parts are marked ⚠ on the schematic diagram and the Exploded View.** It is essential that these critical parts should be replaced with the manufacturer's specified parts to prevent electric shock, fire or other hazard.
- Do not modify original design without obtaining written permission from manufacturer or you will void the original parts and labor guarantee.

TAKE CARE DURING HANDLING THE LCD MODULE WITH BACKLIGHT UNIT.

- Must mount the module using mounting holes arranged in four corners.
- Do not press on the panel, edge of the frame strongly or electric shock as this will result in damage to the screen.
- Do not scratch or press on the panel with any sharp objects, such as pencil or pen as this may result in damage to the panel.
- Protect the module from the ESD as it may damage the electronic circuit (C-MOS).
- Make certain that treatment person's body are grounded through wrist band.
- Do not leave the module in high temperature and in areas of high humidity for a long time.
- The module not be exposed to the direct sunlight.
- Avoid contact with water as it may a short circuit within the module.
- If the surface of panel become dirty, please wipe it off with a softmaterial. (Cleaning with a dirty or rough cloth may damage the panel.)

⚠CAUTION

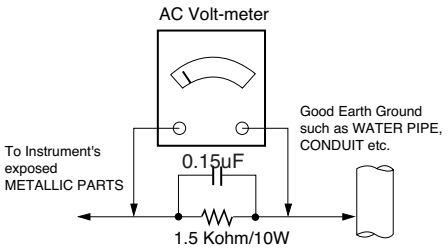
Please use only a plastic screwdriver to protect yourself from shock hazard during service operation.

⚠WARNING

BE CAREFUL ELECTRIC SHOCK !

- If you want to replace with the new backlight (CCFL) or LIPS part, must disconnect the AC power because high voltage appears at inverter circuit about 650Vrms.
- Handle with care wires or connectors of the inverter circuit. If the wires are pressed cause short and may burn or take fire.

Leakage Current Hot Check Circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω
*Base on Adjustment standard

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SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the **SAFETY PRECAUTIONS** on page 3 of this publication.

NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or re-connecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe.
   Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10% (by volume) Acetone and 90% (by volume) is opropyl alcohol (90%-99% strength)
   CAUTION: This is a flammable mixture.
   Unless specified otherwise in this service manual, lubrication of contacts in not required.
5. Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
6. Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
7. Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
   Always remove the test receiver ground lead last.
8. Use with this receiver only the test fixtures specified in this service manual.
   CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

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

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, 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 bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

1. Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range or 500ºF to 600ºF.
2. Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
3. Keep the soldering iron tip clean and well tinned.
4. Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25cm) brush with a metal handle.
   Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500ºF to 600ºF)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
   a. Allow the soldering iron tip to reach a normal temperature (500ºF to 600ºF)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   CAUTION: Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

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IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete TransistorRemoval/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.
   CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

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SPECIFICATIONS

1. General Specification

No	Item		Content	Remark
1	Customer		BRAND	
2	**User Model Name**		**xxMP58VQ, xxMP58D, xxMP58A**	
3	Sale region		Refer to Suffix standard	
4	Feature		21.5”/ 23.8” / 27” WIDE LCD MONITOR	
5	**Chassis Name**		**LM68A** **LM69A** **LM6AA**	**xxMP58VQ** **xxMP58D** **xxMP58A**
6	General Scope	External SW &Adj.	Joystick OSD (Menu, Picture Mode, Input, Power off)	
		Function	OSD,DDC2B,DDC2AB, HDCP, Control Lock, Original Ratio / Wide, Black level, Smart Energy Saving Screen Split, SUPER RESOLUTION+，Color Wizard, Reader mode, LG Color Cloning, Black Stabilizer	
7	Input	D-SUB IN	RGB Analog	**xxMP58VQ** **xxMP58D** **xxMP58A** 1ea at the back
		DVI IN	DVI IN	**xxMP58VQ** **xxMP58D** 1ea at the back
		HDMI IN	HDMI IN	**xxMP58VQ** 1ea at the back
		HP OUT	Audio L/R OUT	**xxMP58VQ** 1ea at the back
8	Power Cord		Length : 1.5±0.05 M Shape : Wall-out Color : Black	Refer to Suffix standard and power cord table
9	Cable	Signal Cable (D-SUB)	Length : 1.5m Shape : Detachable Type Color : Black Pin : Triple Row, 15 Pin D-Sub	**MP58VQ/D/A :** Refer to Suffix standard
		Signal Cable (DVI)	Length : 1.5m Shape : Detachable Type Color : Black Pin : Triple Row, 24 Pin DVI	**MP58VQ/D/A :** Do not Support
		Signal Cable (HDMI)	Length : 1.5m Shape : Detachable Type Color : Black Pin : 19Pin HDMI	**MP58VQ :** Refer to Suffix standard **MP58D/A :** Do not Support
		Audio	Length : 1.5 Color: Black , Pin:2P	**MP58VQ/D/A :** Do not Support
		TV	Length : ,Shape : ,Color: ,Pin	**MP58VQ/D/A :** Do not Support

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SPECIFICATIONS

1. General Specification

10	Power	Input: AC100~240V 50~60Hz,1.0A Max ; DC 19V 1.6A; DC 19V 1.3A Output: DC 19V 1.7 A Output: DC 19V 1.3 A		**MP58VQ/D/A : (22/24MP58VQ/A/A use 1.3A ,27MP58VQ/D/A use 1.7 A)** Refer to Suffix standard
11	**Applied Panel List**	**P/N: EAJ63109401**	**LM215WF3-SJJ5**	**22MP58VQ/D/A**
		P/N: EAJ62570001	**LM238WF1-SJE1**	**24MP58VQ/D**
		P/N: EAJ63370101	**LM270WF5-SJN1**	**27MP58VQ**
	Applied BLU List	**P/N: EBV61138104**		**22MP58VQ/D/A**
		P/N: EBV61158009(BLACK) P/N:EBV61158010(WHITE)		**24MP58VQ/D**
		P/N: EBV61138207(BLACK) P/N:EBV61138208(WHITE)		**27MP58VQ**

2. Mechanical specification

No	Item		Content			Remark
1	Product Dimension		Width (W)	Length (D)	Height (H)	
		Before Packing	634.1mm 634.1 mm	204.7 mm 91.1mm	469.5 mm 382.7 mm	With stand Without stand
		After Packing	703 mm	446 mm	135 mm	
2	Product Weight	Only SET	4.3kg			
		With BOX	**6.0kg**			

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3. Optical Character

No	Item	Criteria		Remark
1	Viewing Angle <CR≥10>	Horizontal(R/L) : 170(Min), 178(Typ)		
		Vertical(Top/Bottom) : 170º(Min), 178º(Typ)		
2	Luminance(휘도)	Max Luminance	200(min), 250(Typ) (Full white pattern, 0.7V)	Custom
		6500K Luminance	200 (min) (Full white pattern, 0.7V)	Warm
		8000K Luminance	180(min) (Full white pattern, 0.7V)	Medium
		9300K Luminance	150(min) (Full white pattern, 0.7V)	Cool
		Luminance Uniformity	75%(min),	
3	Contrast Ratio(명암 비)	600(MIN), 1000(TYP), DFC->5,000,000:1 (Typ.)		
4	Response Time	-.Off : 14ms -. Low : 9 ms ~ 11 ms -. Middle : 7 ms ~ 9 ms -. High : 5 ms ~ 6.5 ms		
5	Light Leakage	Condition: Do not visible at 300 Lux		

				Minimum	Normal	Maximum	
6	CIE Color Coordinates (색 좌표)	White	WX	Typ-0.03	0.313	Typ+0.03	**Warm (6500K)**
			WY		0.329		
			WX	Typ-0.03	0.295	Typ+0.03	**Medium (8000K)**
			WY		0.305		
			WX	Typ-0.03	0.283	Typ+0.03	**Cool (9300K)**
			WY		0.298		
			WX	Typ-0.03	0.365	Typ+0.03	**Read1**
			WY		0.360		
			WX	Typ-0.03	0.353	Typ+0.03	**Read2**
			WY		0.367		
		RED	RX	Typ-0.03	**0.651**	Typ+0.03	Warm (6500K)
			R_Y		**0.338**		
		GREEN	G_X		**0.318**		
			G_Y		**0.612**		
		BLUE	B_X		**0.151**		
			B_Y		**0.065**		

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4. Engineering Specification

1	Supported Sync. Type	Separate Sync., Digital				
2	Operating Frequency	Analog/ Digital/ HDMI	Horizontal	30 □ 83kHz		**Analog :** **-. MP58VQ/D/A** **Digital :** **-. MP58VQ/D** **HDMI :** **-. MP58VQ**
			Vertical	56 □ 75 Hz		
3	Resolution	Analog/ Digital/ HDMI	Max.	1920×1080 @ 60Hz		
			Recommend	1920×1080 @ 60Hz		
4	Input Voltage	Voltage :100 – 240 Vac, 50 or 60Hz, 1.0A				
5	Inrush Current	Cold Start : 50 A Hot : 120 A				
6	Operating Condition	Sync (H/V)	Video	LED	Wattage	
	On Mode	On/On	Active	White	**22MP58VQ/D/A** **typ: 24(W)** **max:28(W)** **24MP58VQ/D** **typ: 26(W)** **max:30(W)** **27MP58VQ** **typ: 29(W)** **max:34(W)**	Test condition 1.1920x1080@60Hz 2. burst pattern 3. 100~240V 4. After aging 30min
	Sleep Mode	Off/On On/Off Off/Off	Off	White Blinking	<0.3W **(this spec have to meet all inch)**	측정방법) 제어판 → 전원 옵션에서 디스플레이 끄기와 PC를 절전모드로 하기 두가지 설정이 있는데, PC를 절전모드로 하기만 선택하고 측정해야 함.
	Off Mode (Power switch off)	-	-	Off	<0.3W **(this spec have to meet all inch)**	
	Smart Energy Saving	High /Low/Off	Low	White	Efficiency : Low:10%~20% High:20%~30% Low:>1W(22) Low:>2W(24/27) High:>3W(22) High:>4W(24/27)	**-Test Condition (1)**
	EPA				**22MP58VQ/D/A** **<20(W)** **24MP58VQ/D** **<24(W)** **27MP58VQ** **<27(W)**	200nits : margin >7% Worst :margin>0

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7	**MTBF**		30,000 HRS with 90% Confidence level	Lamp Life : 30,000 Hours(Min)		
8	**Using Altitude**		5,000 m (for Reliability) 3,000m(for FOS)			
9	**Environment Condition**	**0peratin g**	Temperature	10 °C ~ 35 °C		
			Humidity	10% ~ 80%		
		Storage	Temperature	-20 °C ~ 60 °C		
			Humidity	5% ~ 90% non-condensing		
		OSD Menu	Quick Settings	Brightness	0~100	,
				Contrast	0~100	
				Volume	0~100	Only HDMI

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				Ratio	Original/Wide		Except 16:9 Ratio
				SES	Off/Low/High		
			Picture	Picture Mode	Custom/Reader1/Reader2/Photo/ Cinema/Color Weakness/Game		
				Picture Adjust	SUPER RESULUTION+	Off/Low/ Middle/High	
					Sharpness	0~100	
					Black Level	Low/High	Only HDMI RGB format – High YCbCr format - Low
					Response Time	Off/Low/Middle/ High	
					Overscan	Off/On	Only HDMI
					DFC	Off/On	
					Black Stabilizer	0~100	
				Color Adjust	Gamma	Off/Gamma0/Gamma1/Gamma2	
					Color Temp	Custom/Warm/Medium/Cool	
					Red	0~100	
					Green	0~100	
					Blue	0~100	
					Six Color	0~100	All Hue & Saturation
					Reset	Reset/Cancel	
				Display	Horizontal	0~100	Only D-sub
					Vertical	0~100	
					Clock	0~100	
					Phase	0~100	
			General	Language	English, Germanic, French, Spanish, Italian, Swedish, Finnish, Portuguese, Polish, Russian, Greek, Chinese, Japanese, Korean, Ukrainian, Portuguese(brazil), Hindi		Total 17ea Depend on BOM suffix (Country)
				Power LED	Off/On		
				Automatic Standby	4Hr – EU, EK, PD, MA, EW Off / 4H / 6H / 8H		Depend on BOM suffix (Country)
				Resolution	Off/similar resolution		Only D-sub
				OSD Lock	Off/On		
			Auto Configuration		Cancel/Yes		Only D-sub input
			Reset		Reset/Cancel		

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5. Applying module Character

No	Item			Content	Remark
1	LCD Module Feature	Maker		LGD	
		Type		TFT	
		Active Display Area		23 inches(58.42 cm) diagonal	
		Pixel Pitch [mm]		0.2652 mm x 0.2652(V) mm	
		Electrical Interface		2ch-LVDS	
		Color Depth		6-bit with A-FRC, 16.7M colors	
		Size (Outline) [mm]		527(H) x 309.8 (V) x 8.9 (D) mm	
		Surface Treatment		Hard coating(3H), Anti-glare treatment of the front polarizer	
		Operating Mode		Transmissive mode, normally Black	
		Back light Unit		White LED	
		R/T	Typical	14ms	
			Max.	25ms	

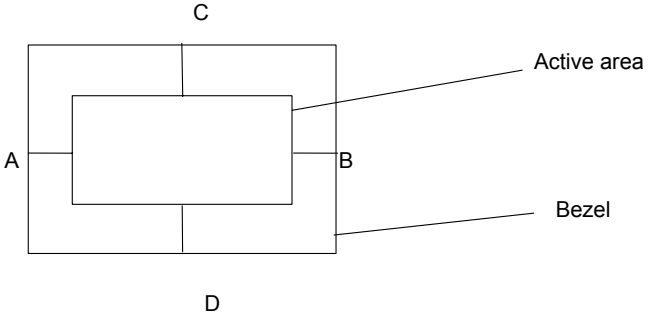
				Minimum	Normal	Maximum	
6	CIE Color Coordinates (색 좌표)	White	W_X	Typ-0.03	0.313	Typ+0.03	Warm (6500K)
			W_Y		0.329		
		White	W_X	Typ-0.03	0.302	Typ+0.03	Medium (8000K)
			W_Y		0. 311		
		White	W_X	Typ-0.03	0.283	Typ+0.03	Cool (9300K)
			W_Y		0.298		
		White	W_X	Typ-0.03	0.365	Typ+0.03	Read1
			W_Y		0.360		
		White	W_X	Typ-0.03	0.353	Typ+0.03	Read2
			W_Y		0.367		
		Red	R_X	Typ-0.03	0.653	Typ+0.03	
			R_Y		0.337		
		Green	G_X		0.322		
			G_Y		0.611		
		Blue	B_X		0.153		
			B_Y		0.061		

(1) Standard Measurement Condition
- Ambient Luminance Level : dark (< 10 lux)
- Ambient Temperature : Normal Temperature(10°C ~ 25°C)
- warm-up Time : More than 30 min (at Full White Pattern)
- Input Signal : VESA 1920 X 1080 @ 60 Hz
- Contrast : 70 (But, the contrast is 100 when we check response time)
- Brightness : Max. 100
- Color Temp : CUSTOM
- Clock/Clock Phase : The Best Setting

(2) Another Spec.: Product Specification Standard(LG(55)G1-1034)
(3) Cosmetic Spec. : LCD Module IIS Spec.

5.1 Display Area

1) Active Display Area of the LCD Monitor Should be within Cabinet's Bezel.
2) Distance Difference between Active Area and Bezel
   I A-BI<1.0 mm , I C-DI<1.0 mm
   A: The Distance from The Left of Active Area to the Bezel
   B: The Distance from The Right of Active Area to the Bezel
   C: The Distance from The Top of Active Area to the Bezel
   D: The Distance from The Bottom of Active Area to the Bezel



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6. EDID

6.1 2

No	Item	Content	16진 Data
1	Manufacturer ID	GSM	1E 6D
2	Product ID	(Analog) (DVI) (HDMI)	23222 (5AB6) 23223 (5AB7) 23224 (5AB8)
3	Year	2014	
4	Version	1	01
5	Revision	Analog : 3 Digital: 3 HDMI: 3	03
6	Serial Number	*	*
7	Week	**	**
8	Model Name	LG IPS Full HD	
9	Check Sum	****	****
10	Special Item	Need to Input Serial Number	

** Protocol : DDC 2AB

6.2 EDID Ver. 1.3 FOR ANALOG

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	B6	5A	01	01	01	01
10	01	18	01	03	6C	30	1B	78	EA	31	35	A5	55	4E	A1	26
20	0C	50	54	A5	4B	00	71	4F	81	80	95	00	B3	00	A9	C0
30	81	00	81	C0	90	40	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	E0	0E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
50	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC	00	4C
60	47	20	49	50	53	20	46	55	4C	4C	48	44	00	00	00	FF
70	00	0A	20	20	20	20	20	20	20	20	20	20	20	20	00	7B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	B7	5A	01	01	01	01
10	01	18	01	03	80	30	1B	78	EA	31	35	A5	55	4E	A1	26
20	0C	50	54	A5	4B	00	71	4F	81	80	95	00	B3	00	A9	C0
30	81	00	81	C0	90	40	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	E0	0E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
50	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC	00	4C
60	47	20	49	50	53	20	46	55	4C	4C	48	44	00	00	00	FF
70	00	0A	20	20	20	20	20	20	20	20	20	20	20	20	00	66

6.4 EDID Ver. 1.3 FOR HDMI (256Byte)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	B8	5A	01	01	01	01
10	01	18	01	03	80	30	1B	78	EA	31	35	A5	55	4E	A1	26
20	0C	50	54	A5	4B	00	71	4F	81	80	95	00	B3	00	A9	C0
30	81	00	81	C0	90	40	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	E0	0E	11	00	00	1E	00	00	00	FD	00	38	4B	1E
50	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC	00	4C
60	47	20	49	50	53	20	46	55	4C	4C	48	44	00	00	00	FF
70	00	0A	20	20	20	20	20	20	20	20	20	20	20	20	01	64

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1D	F1	4A	90	04	03	01	14	12	05	1F	10	13	23
10	09	07	07	83	01	00	00	65	03	0C	00	10	00	02	3A	80
20	18	71	38	2D	40	58	2C	45	00	E0	0E	11	00	00	1E	01
30	1D	80	18	71	1C	16	20	58	2C	25	00	E0	0E	11	00	00
40	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	E0	0E	11
50	00	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	E0
60	0E	11	00	00	18	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	AE

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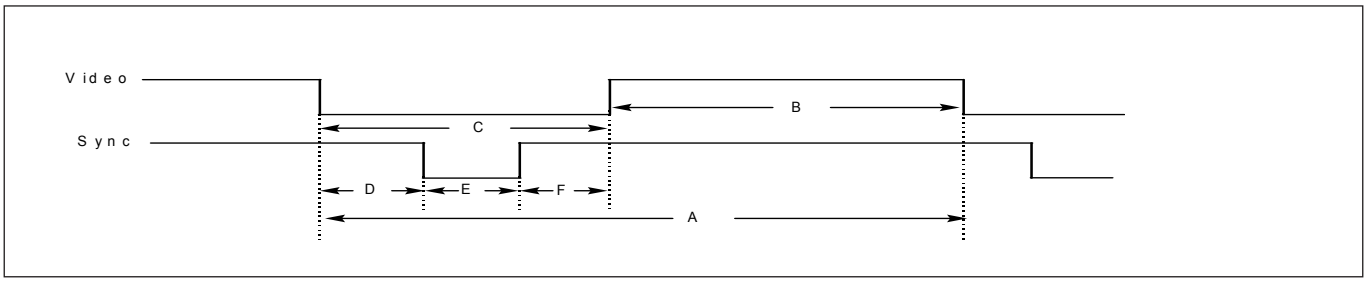
TIMING CHART

(1) Signal(Video & Sync)



(2) H/V Timing

MODE	CLASSIFICATION	Polarity	DOT CLOCK [MHz]	Frequency [kHz]/ [Hz]	Total Period (E)	Display (A)	Front Porch (D)	Sync. (C)	Back Porch (B)	Resolution
1	H(Pixels)	-	28.321	31.468	900	720	18	108	54	720 X 400
	V(Lines)	+		70.08	449	400	12	2	35	
2	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480
	V(Lines)	-		59.94	525	480	10	2	33	
3	H(Pixels)	-	31.5	37.5	840	640	16	64	120	640 x 480
	V(Lines)	-		75	500	480	1	3	16	
4	H(Pixels)	+	40.0	37.879	1056	800	40	128	88	800 x 600
	V(Lines)	+		60.317	628	600	1	4	23	
5	H(Pixels)	+	49.5	46.875	1056	800	16	80	160	800 x 600
	V(Lines)	+		75.0	625	600	1	3	21	
6	H(Pixels)	-	65.0	48.363	1344	1024	24	136	160	1024 x 768
	V(Lines)	-		60.0	806	768	3	6	29	
7	H(Pixels)	+	78.75	60.023	1312	1024	16	96	176	1024 x 768
	V(Lines)	+		75.029	800	768	1	3	28	
8	H(Pixels)	+	108.0	67.500	1600	1152	64	128	256	1152 x 864
	V(Lines)	+		75.000	900	864	1	3	32	
9	H(Pixels)	+	108.0	63.981	1688	1280	48	112	248	1280 x 1024
	V(Lines)	+		60.02	1066	1024	1	3	38	
10	H(Pixels)	+	135.0	79.976	1688	1280	16	144	248	1280 x 1024
	V(Lines)	+		75.035	1066	1024	1	3	38	
11	H(Pixels)	-	146.25	65.290	2240	1680	104	176	280	1680 x 1050
	V(Lines)	+		59.954	1089	1050	3	6	30	
12	H(Pixels)	+	148.50	67.50	2200	1920	88	44	148	1920 x 1080
	V(Lines)	+		60	1125	1080	4	5	36	

- D-SUB/DVI DTV Mode is not supported (interlace mode)

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	Factory support mode (Preset Mode)	Horizontal frequency (KHz)	Vertical frequency (Hz)	HDMI
1	480P	31.5	60	O
2	576P	31.25	50	O
3	720P	37.5	50	O
4	720P	45	60	O
5	1080i	28.12	50	O
6	1080i	33.75	60	O
7	1080P	56.25	50	O
8	1080P	67.5	60	O (Recommend Mode)

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ADJUSTMENT

1. Coverage

Apply to 58.4 cm (23 inch) Wide monitor made in Monitor Factory Gumi Korea) or made in accordance with the standard of Gumi Factory process.

2. Appointment

2.1 Adjustment must be done as fixed sequence, and adjustment sequence can be modified after agreement withthe responsible R&D engineer considering mass-production condition.
2.2 Power : AC 100 - 240 Voltage (Free)
2.3 Input signal:
2.3.1 RGB Input: As Product Standard (Signal ROM : LB800K Ver1.6)
2.3.2 RJ-45 input : As Product Standard (Ethernet connection through network from Host PC)
* PC spec for MK(Minikey) Loader (TBD): CPU - Dual core 2.0 GHz▲, Memory - 2 GByte▲
*PC spec for Host PC (TBD): CPU - Dual core 2.0 GHz▲, Memory - 2 GByte▲
2.4 Warm-up Time: Over than 30 minutes
2.5 Adjustment equipment : White balance equipment (CA-110), Display adjust equipment, VG-813(or VG819), Oscilloscope, PC (More than 486 computer) & White balance adjust program.

3. Adjustment

3.1 Overview

Use factory automation equipment and adjust automatic movement. But, do via passivity adjust in erroroccurrence.

3.2 Adjustment order

(refer to the Adjustment standard and adjustment command table)

3.2.1 Board Assembly Line

3.2.1.1 15pin D-sub (RGB)
· Connect input signal to 15pin D-sub.
· Check the firmware version & model name. And write the firmware code to the serial Flash ROM by ISP.
· Ready for adjustment : check whether adjustment command works normally or not and the operating state of each mode.
· Check the display state of gray color when 256 gray scale patterns is embodied.
· Read by EEPROM Read Command to check whether initial value is correct or not.
3.2.1.2 MK(Minikey) Loading
· Open MK Loader Tool on MK Loader PC.
(* MK Loader PC should be connected Internet)
· Connect input signal to RJ-45 input with LAN cable connected network devices such as routers.
· Turn on the Monitor set.
· Click the box when the °∞empty port °∞box is changed to “write mini-key” in MK Loader Tool.

3.2.1.2 RJ-45 input
· Connect input signal to RJ-45 input with LAN cable connected network devices such as routers.
· Check USB 1.1 Port (Keyboard/ Mouse) : @RJ-45 input
· Check USB 2.0 Port (USB Memory Stick 2port) : @RJ-45 input
· Check Audio (Ear-phone out/ Mic in/ Speaker) : @RJ-45 input,
PC audio volume : MAX
* LAN cable
* Router
* PC: vSpace S/W for N+ (Ver 4.5.xx.xx) --- Caution: Ver 4.4.xx.xx for N1742L family

3.2.2 Total Assembly Line

· Ready : Heat-run during5 minutes in the state with signal
· Connect input signal to D-sub.
· Default value before adjustment : Contrast “70” , Brightness ‘100(Max)”

3.2.3 Adjustment of Horizontal/Verticality screen position, Clock and Clock Phase at each Mode.

· There is no special factory mode adjustment. Writing initial value of EEPROM in Board Assembly line is adjusting Preset Mode and Reset mode. (EEPROM is initialized when AC Power is ON first.)
· If the change of FOS data is needed after M.P, it is possible by writing Mode Data with EEPROM write command or modifying the Mode Data in MICOM itself.

3.2.4 Color coordinates adjustment and Luminance adjustment.

3.2.4.1 Color coordinates adjustment
· Monitor Contrast / Brightness
- Contrast : 70
- Brightness : 100(Max)
· CA-110: Set “channel 9”
· Signal Generator : At cut-off and drive --> 16 step pattern for ADC (Program No.: 31)
- Output Voltage : 700 mVp-p
- Output Mode : Mode 12 (SXGA 60 Hz)mode Setting.

3.2.4.2.Adjustment : Board Assembly Line
· Select RGB mode
· Input 16 step pattern for ADC (Program No.31 (Mode 12,Pattern 11)). (Video level : 700 mVp-p)
· Adjust by commanding AUTO_COLOR_ADJUST
· Confirm “Success” message in Screen or Check the data of 0xFE, 0xFF address of EEPROM(0XA6) is 0xAA after waiting 5 seconds.
· If there is “FAULT” message or the data of 0xFE, 0XFF address of EEPROM(0xA6) is not 0xAA, do adjust again.
· If all Adjustment is completed, the values of 6500K, User Color and 9300K are saved automatically.
· Select RGB mode
· Input 16 step pattern for ADC (Program No.31 (Mode 12,Pattern 11)). (Video level : 700mVp-p)
· Adjust by commanding AUTO_COLOR_ADJUST
· Confirm “Success” message in Screen or Check the data of 0xFE,0xFF address of EEPROM(0xA6) is 0xAA after waiting 5 seconds.

3.2.4.3. Confirm at Total Assembly Line: adjustment
· Check the data of 0xFE, 0xFF address of EEPROM(0xA6) is 0xAA.
· If the data of 0XFE, FF address of EEPROM(0xA6) is not 0xAA, do adjust again by 3.2.4.2.

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3.2.4.4. Confirm PRESET 6500K Color coordinates and Adjust PRESET 9300K Color coordinates .

· Set as Aging mode ON, by commanding AGING_ON/OFF command code.
· Select Module that is being used in present production by commanding MODULE SELECT. (It is not needed so far. However, it will be needed to apply other modules)
· Send SYSTEM RESET command to set Module data.
· Input Full White Pattern (Video level : 700 mVp-p)
· Set as 9300K by commanding COLOR_MODE_CHANGE Command code.
· Check to meet x = 0.283 ± 0.03, y=0.298 ± 0.03, and confirm.
· Only if it does not meet, adjust as below steps.
· Adjust to meet x = 0.283 ± 0.01, y=0.298 ± 0.01 in 5 minutes. and confirm.
· Save 9300K Color by commanding COLOR SAVE Command code.
· Set as 6500K by commanding COLOR_MODE_CHANGE Command code.
· Check to meet x = 0.313 ± 0.03, y=0.329 ± 0.03, and confirm.
· Only if it does not meet, adjust as below steps.
· Adjust to meet x = 0.313 ± 0.01, y =0.329 ± 0.01, and confirm.
· Save 6500K Color by commanding COLOR SAVE Command code.
· Set as sRGB by commanding COLOR_MODE_CHANGE Command code.
· Adjust to meet Y = 150 ± 50, and confirm.
· Save sRGB Color by commanding COLOR SAVE Command code.

3.2.4.5. Confirm User color coordinates .

· Confirm Whether User color is saved same as 6500K.
· After confirming Color coordinates, Must return to 6500K

3.2.5 Confirm Operation state.

3.2.5.1 Operation mode : Confirm whether each appointed mode operate correctly or not.

3.2.5.2 Confirmation of Adjustment condition and operation : Confirm whether it meet Auto/Manual equipment Adjustment standard or not.

· Confirm Analog screen state : Confirm screen state at below mode.

Appointment mode (RGB input):
640*480 @60Hz (Mode 1),
800*600@75Hz(Mode 5),
1024*768@60Hz(Mode 8),
1280*1024@60Hz(Mode 12),
SMPTE pattern(Check 0%,5%,95%,100%)
–Mode can be added.

3.2.5.3. Confirm Auto adjustment operation.

· Input Analog 1 Dot on/off & Rectangle Pattern at Mode 12(1280x1024@60 Hz)
· Confirm adjustment operation by changing Clock, Phase, H/V Position.
· Check Clock, Phase by pressing AUTO Key.
· Confirm first set of new lot by periods

3.2.5.4 Other quality

· Confirm that each items satisfy under standard condition that was written product spec.
· Confirm Applying Module & MICOM Setting --> Confirm with Service OSD
- Confirm at Service OSD by “Menu + Power key” on .(from Power off)
- Confirm first set of new lot by periods, and confirm periodically when there is Process change or Adjustment setting change.

3.2.5.5. OSD & Adjustment device Confirmation : Confirm operation mentioned as product spec.

· Vary Brightness and Contrast and confirm the variation of Luminance and display status.
· Operate the f-engine function and confirm variation of Luminance.
· Make sure to do FACTORY RESET after confirmation of OSD function.

3.2.5.6. Confirm the display state by inputting 8 color Bar Pattern & 256 Gray Scale pattern.

3.2.5.7. DPM operation confirmation : Check if Power LED Color and Power Consumption operates as standard.

· Measurement Condition : 230 V@ 50 Hz (Analog)
· Confirm DPM operation at the state of screen without Video Signal.

3.2.5.8. RJ-45 input

· Connect input signal to RJ-45 input with LAN cable connected network devices such as routers.
· Check USB 1.1 Port (Keyboard/ Mouse) : @RJ-45 input
· Check USB 2.0 Port (USB Memory Stick 2port) : @RJ-45 input
· Check Audio (Ear-phone out/Mic in/Speaker) : @RJ-45 input, PC audio volume : MAX

* LAN cable
* Router
* PC: vSpace S/W for N+ (Ver 4.5.xx.xx) --- Caution: Ver 4.4.xx.xx for N1742L family

3.2.5.9. DDC EDID Write

(Set as Aging mode ON, by commanding AGING_ON/OFF command code.)

1) SUFFIX: xxxxxPN

· Connect analog Signal Cable to D-sub wafer.
· Write EDID DATA to EEPROM(24C08) by using DDC2AB protocol.
· Check whether written EDID data is correct or not. (refer to Product spec).

--> After writing EDID, send Elapsed Time Clear command.
(Elapsed time should not be displayed, after EDID writing)
: Confirm periodically (in the first set of new lot, process change) whether module name and aging time disappeared on the self-diagnostics OSD with signal cable disconnected.
--> If Elapsed Time Clear command isn°Øt executed, module name, aging time and TCO word appear on the self-diagnostics OSD.(Module name and aging time should not appear after writing EDID)
--> Make sure to do FACTORY RESET at the final process.

3.2.5.10. Shipping condition

· Contrast : 70
· Power Switch : Off
· Brightness : “100(Max)”
· Color Select : Preset (6500K)
· Language Select : Refer to product spec.
· OSD Position : Center
· Power indicator : ON
· Flatron f-engine : Normal

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4.Standard of Auto/Manual equipment adjustment

No.	Item			Adjustment & measurement standard	Operation mode	Operation Pattern	Measurement Position
1	Voltage(V)			12V± 0.6V 5V± 0.3V / 3.3V± 0.25V 2.5V± 0.2V	MODE 13	Pattern4	TP of Each power
2	Color coordinates (9300/6500K)	Black Level		Auto Adjustment	MODE 12	Pattern 0	Center of Screen
3	Color coordinates (6500K)	DRIVE1			MODE 12	Pattern1	Center of Screen
			u	uí= 0.198 ± 0.00 5			
			v	ví=0.468± 0.005			
	Color coordinates (9300K)	DRIVE2	X Y	0.283± 0.004 0.298± 0.004			
	Luminance	6500K		More than 220 cd/m2	MODE 12 (700 mVp-p)	Pattern1	Center of Screen
4	Screen Position	H V		FULL SIZE	MODE 1 - 13	Pattern4	Full Screen
5	Screen Compensation	CLOCK PHASE		FULL SIZE	MODE 12-13	Pattern 4	Full screen
		AUTO		FULL SIZE	MODE 12-13	Pattern 4	Full screen
6	DPM Confirmation (RGB/LAN)	Normal Mode		40W(Typ)	MODE 12	Pattern 4	Blue
		Stand By Mode		≤ 1W/-		Pattern 6	Flicker
		Suspend Mode		≤ 1W/-		Pattern 7	Flicker
		DPMS Off		≤ 1W/15W		Pattern 8	Flicker
		Power Switch Off		≤ 1W			off
7	Gray scale Confirmation			Linear gray Scale	MODE 12	Pattern 9	Full screen
8	Withstanding Voltage confirmation			When 1500Vac or 2121Vdc is impressed between the first of power (Live/Neutral) and ground (Earth) for 1 second, check whether something wrong happens or not.			
9	Ground Confirmation			When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω			
10	Cutoff /ADC Adjustment Pattern			16 step pattern for ADC 1280*1024@60Hz (700mVp-p)	MODE 12	Pattern11	
11	Network Test with PC			CPU : Dual core 2.0 GHz↑ , Memory : 2 GByte↑ , Teradiciís PCoIP Host Card LAN cable	1280 * 1024		

*Check items No. 2, 3, 4, 5 and 7 at RGB input.

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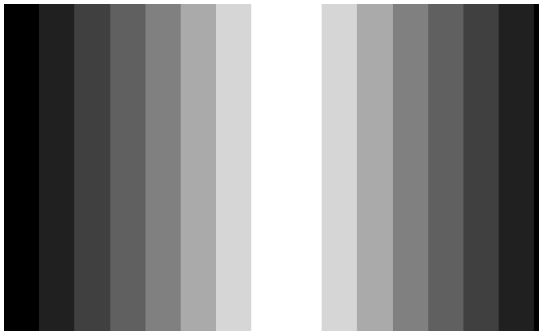
5. Pattern for Adjustment

Pattern 0 : FULL BLACK (State of without video signal)
Pattern 1 : FULL WHITE (Don't display other Character except for White Pattern)
Pattern 3 : FULL WHITE
Pattern 4 : Cross hatch pattern (Horizontal 10Line, Vertcial 8Line) & Rectangle Pattern
Pattern 5 : 1 Dot on, 1 Dot off & Rectangle Pattern
Pattern 6 : Vertical Sync only input (Use signal cable of which Pin #5 is GND)
Pattern 7 : Horizontal Sync only input (Use signal cable of which Pin #5 is GND)
Pattern 8 : State of without Vertical/Horizontal Sync and Video Signal. (Use signal cable of which Pin #5 is GND)
Pattern 9 : 8 Color Bar Pattern + 16 Gray Level Pattern
Pattern 10 : SMPTE Pattern
Pattern 11 : 16 Gray Step Pattern (700mV)



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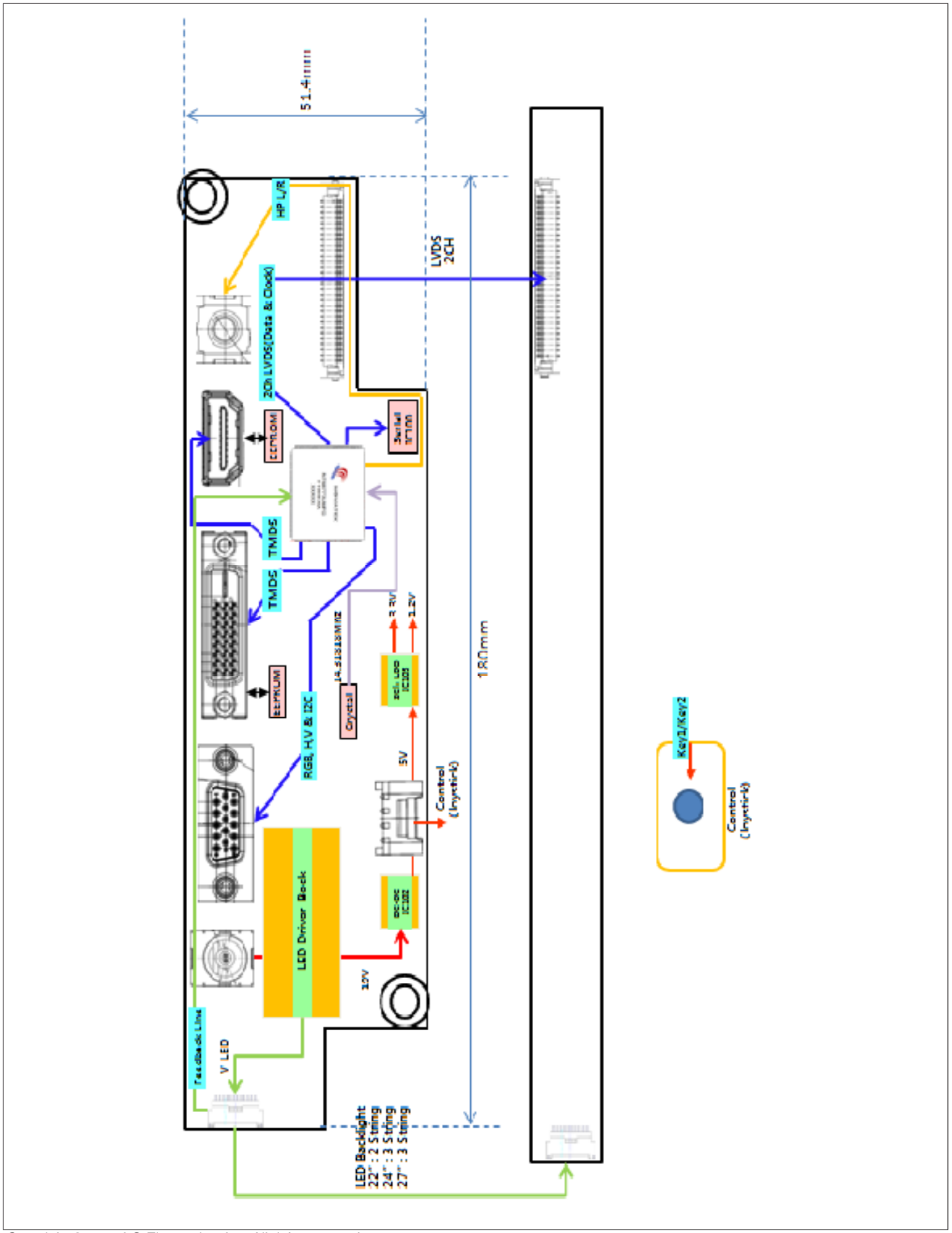
BLOCK DIAGRAM (Main)



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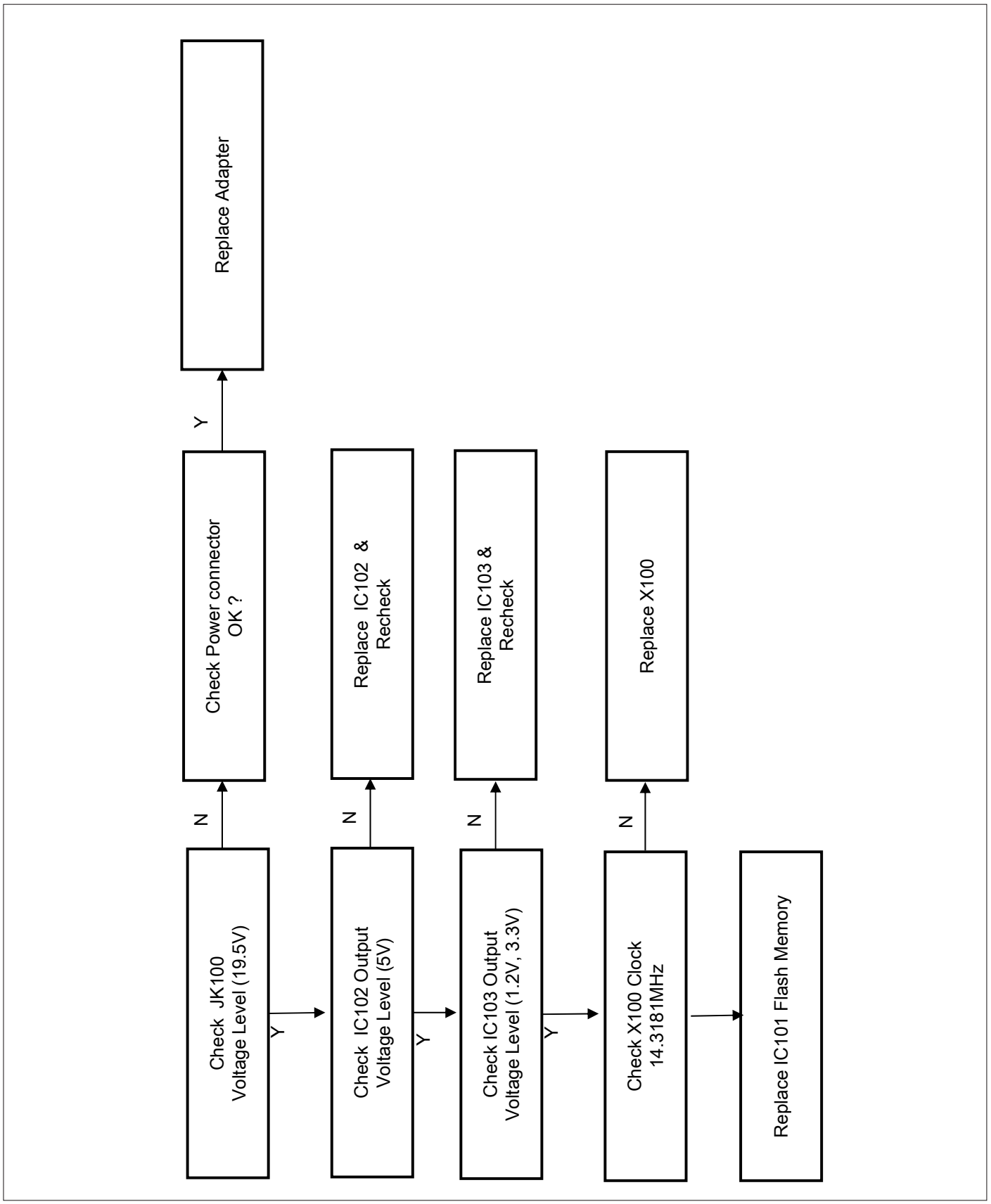
TROUBLESHOOTING GUIDE

1. NO POWER



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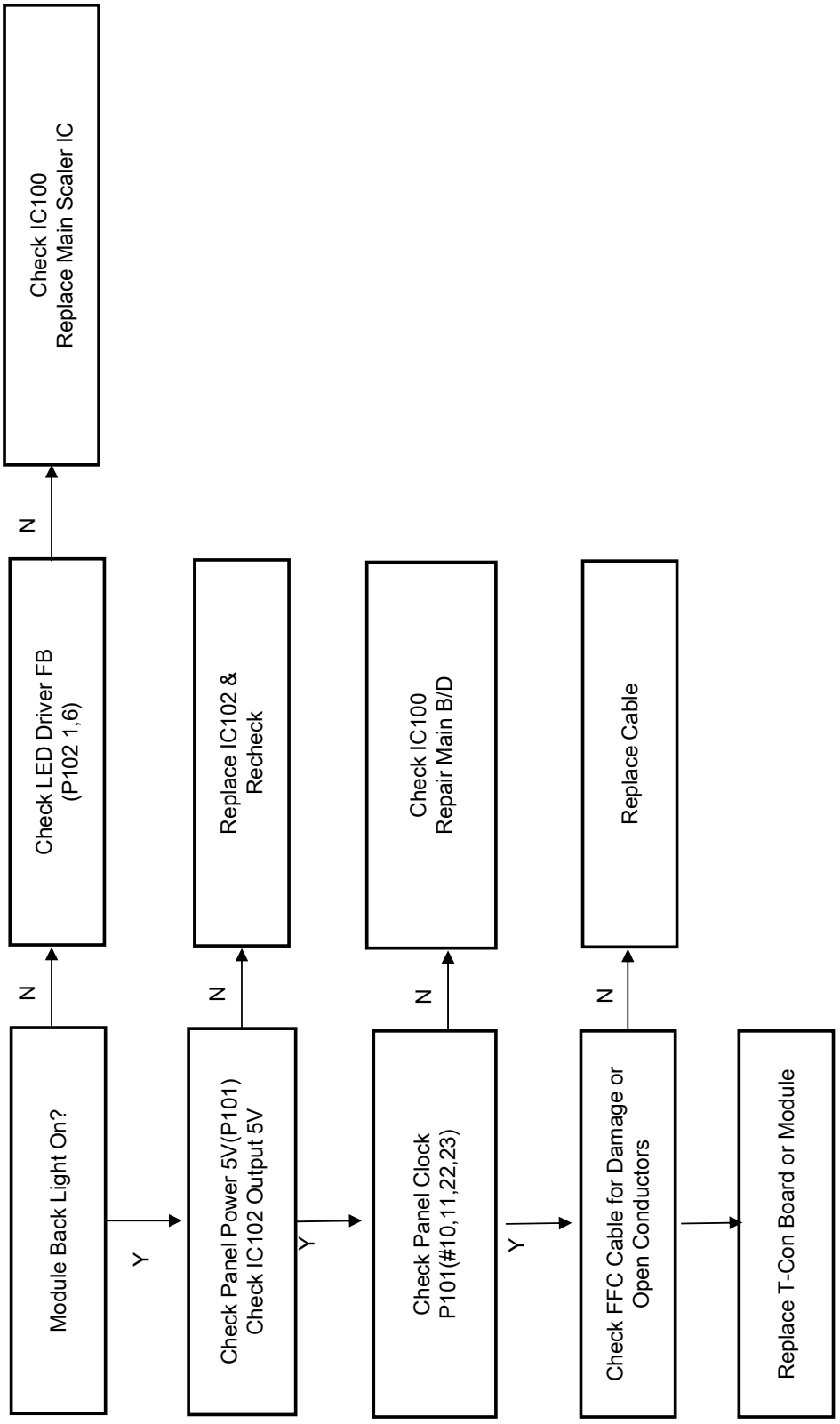
2. NO SCREEN ON



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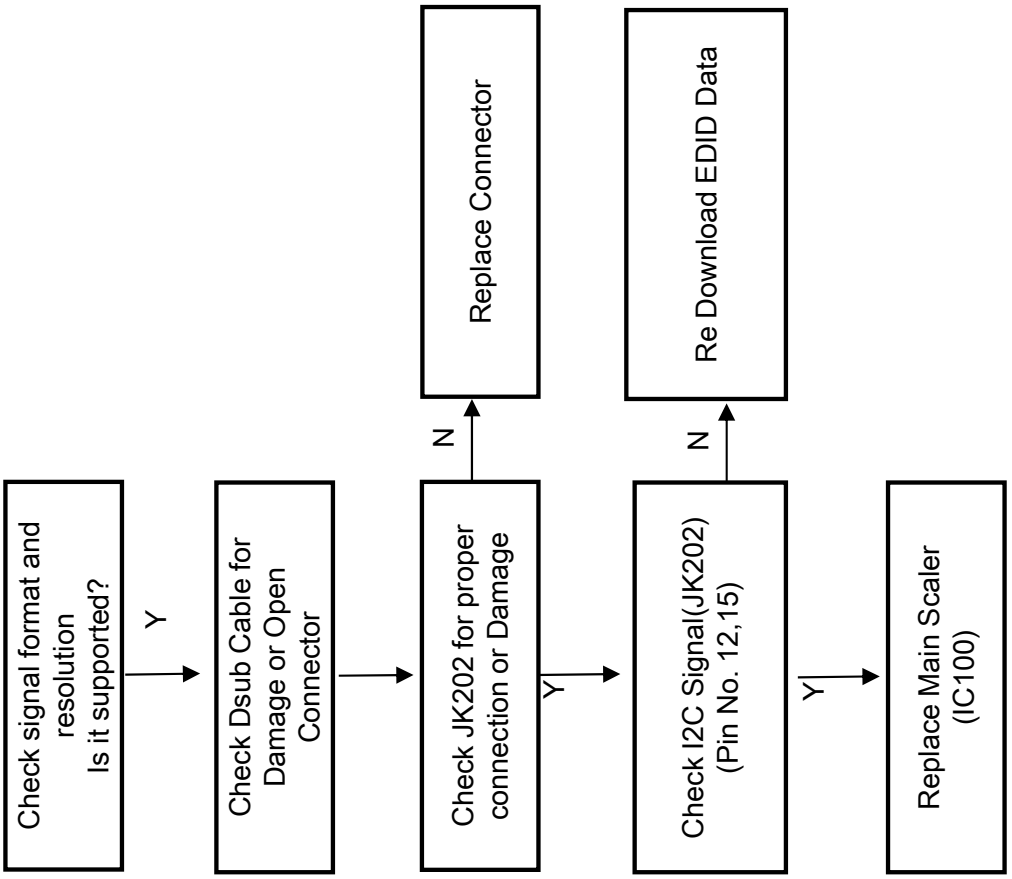
3. NO VIDEO_D-SUB



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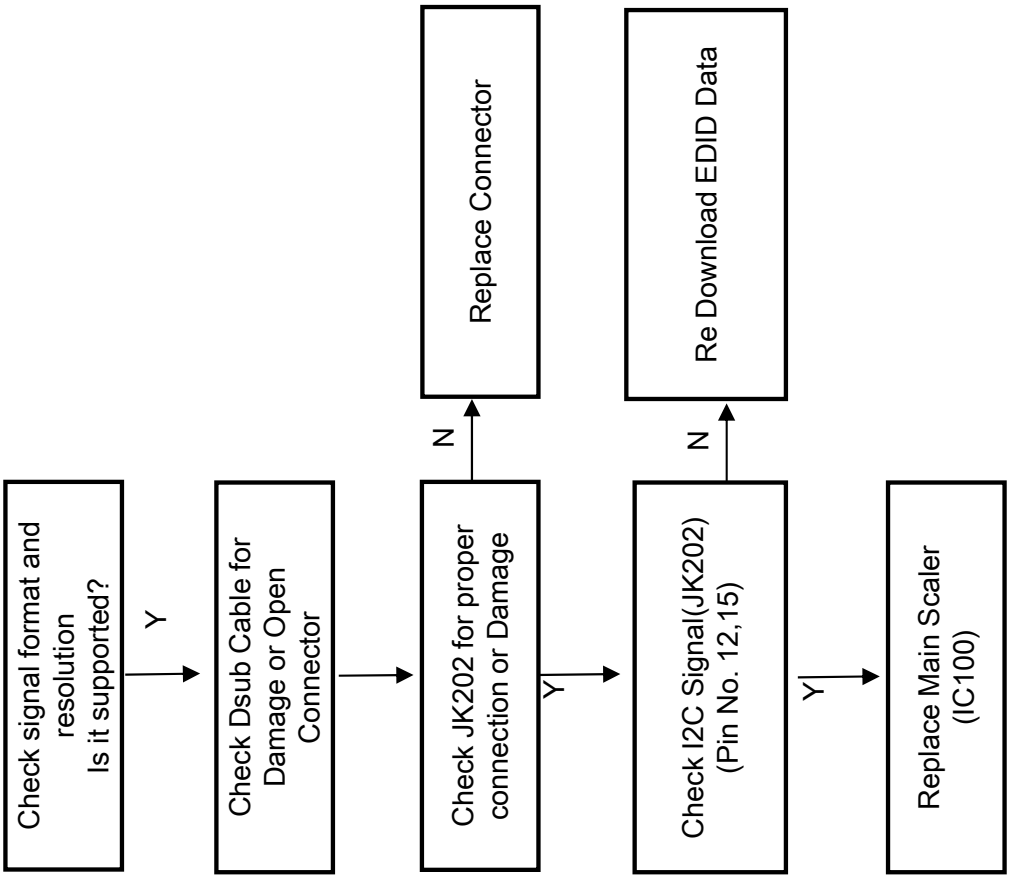
4. NO VIDEO_DVI



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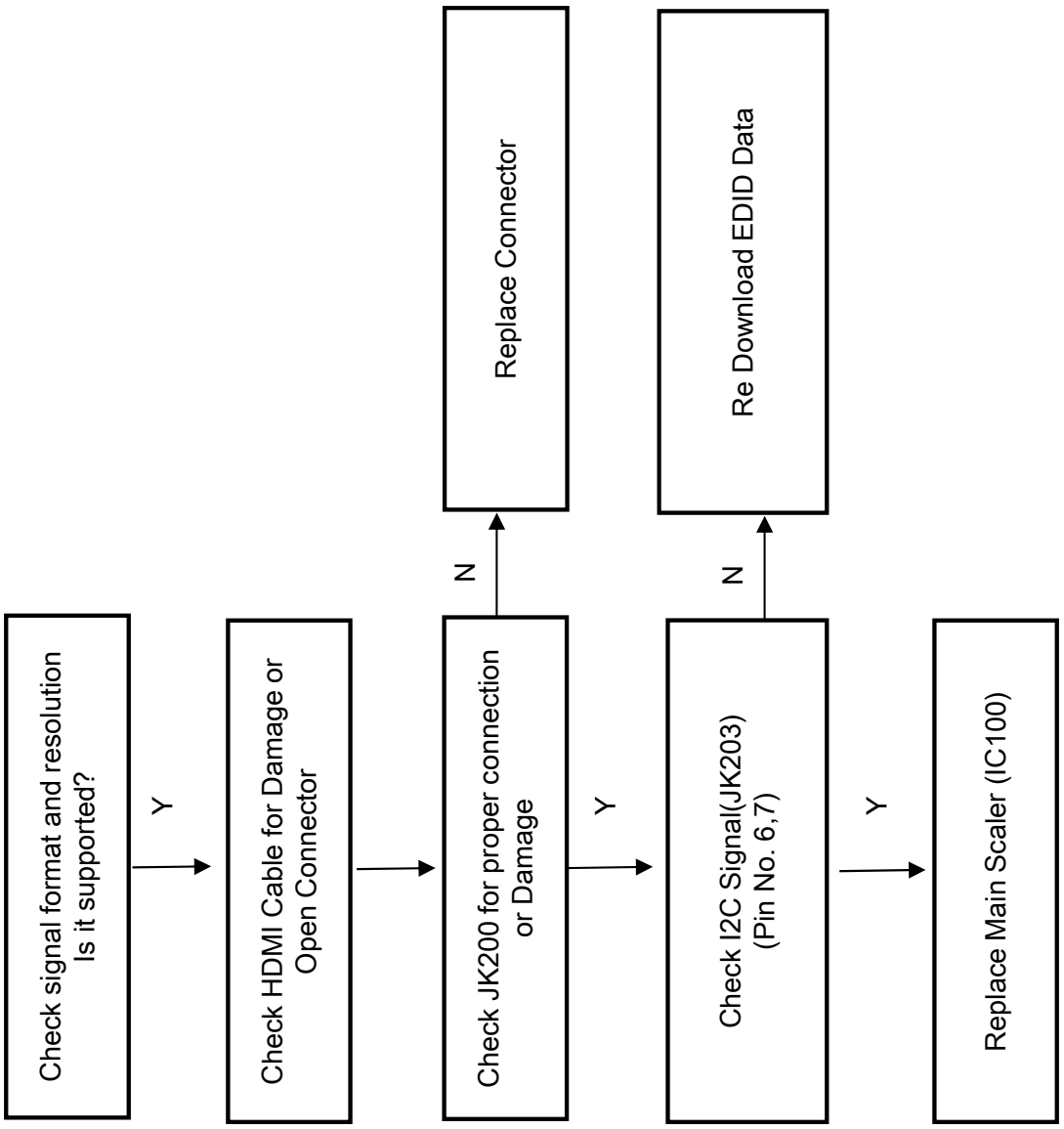
5. NO VIDEO_HDMI



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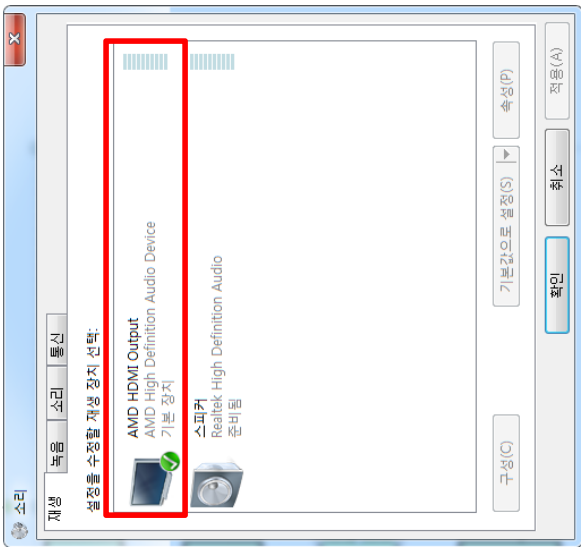
6. NO SOUND_HDMI



Check the Input source.
(D-sub & DVI don't support sound)

Y

Check HDMI Cable for Damage or Open Connector

Check the sound setting in PC

N

Setting like a right image.

Y

Check JK201 Soldering

N

Do re-soldering

Y

Replace Main Scaler (IC100)

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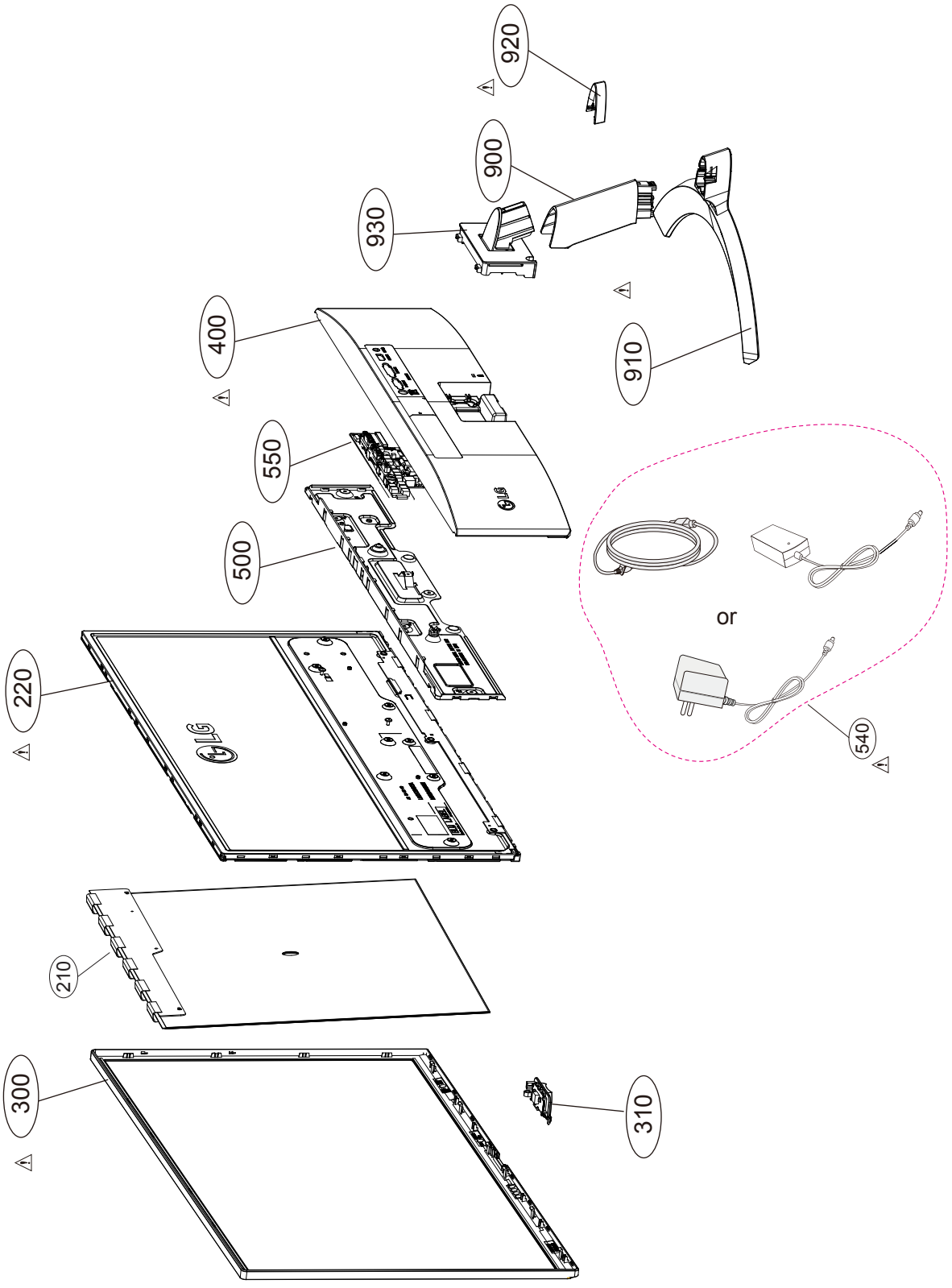
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

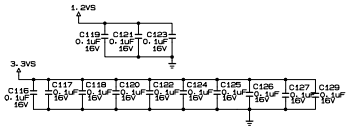
Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by ⚠ in the Schematic Diagram and EXPLODED VIEW.
It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

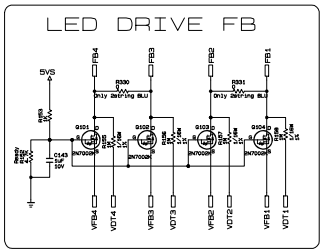


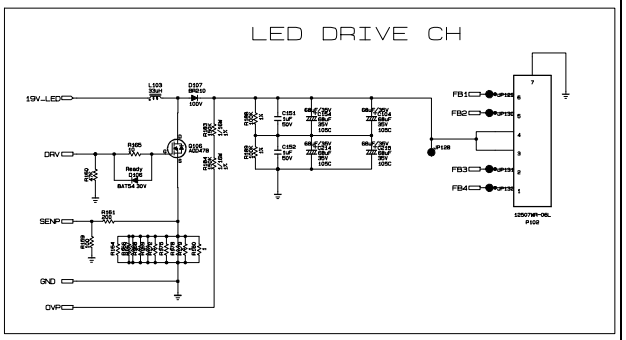
PCB P/N: EAX66723604 (LM68A)

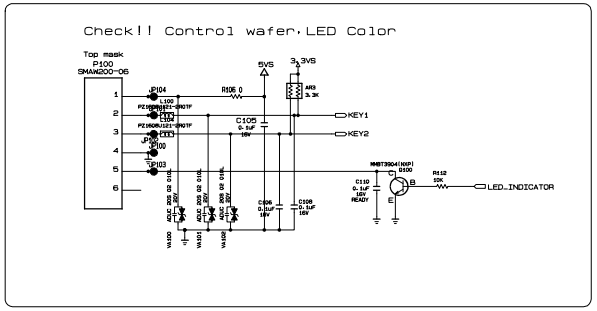
Date : 2015.05.26

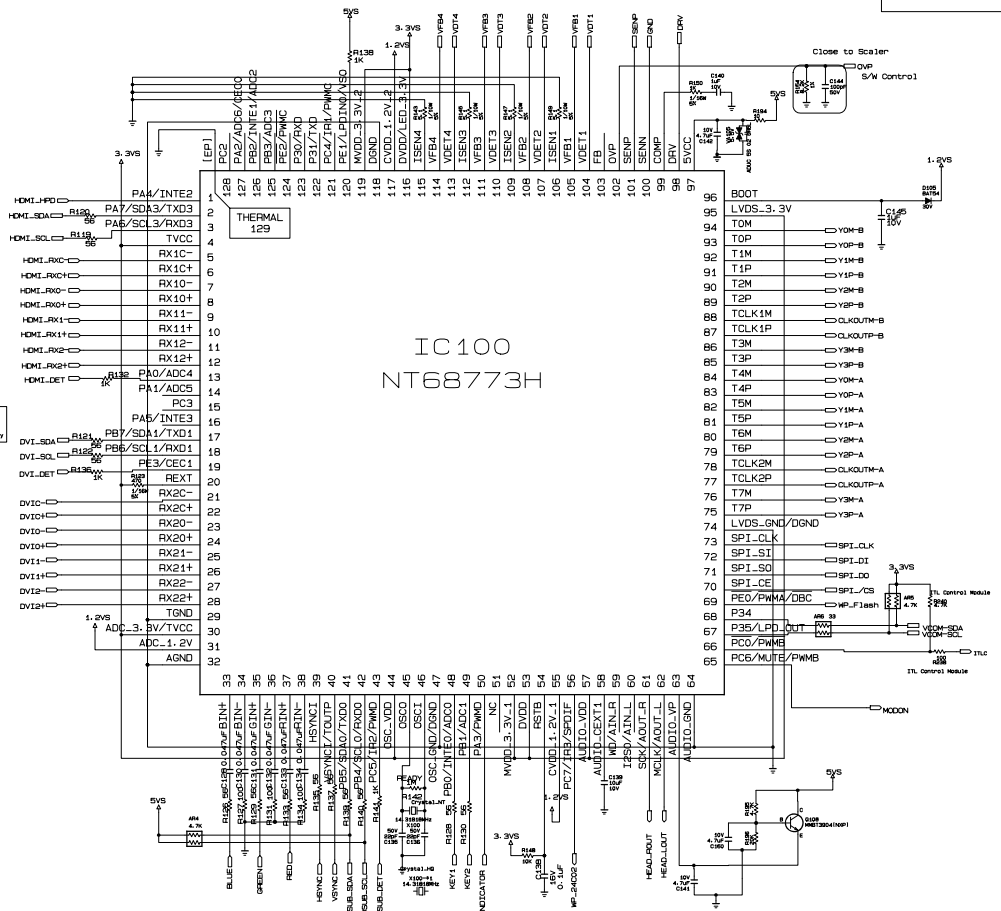
V-com:R115,R116,R117,R118(Ready)
Only used for LGD Panelbiz model



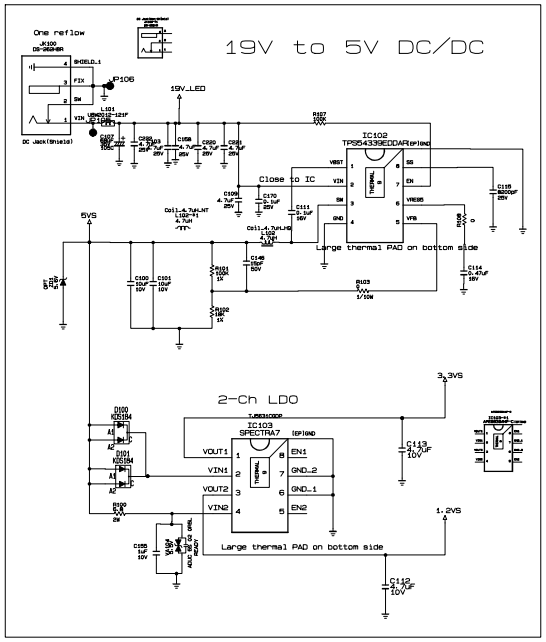


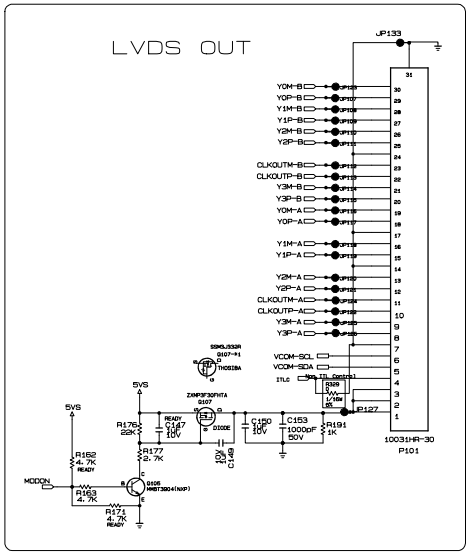


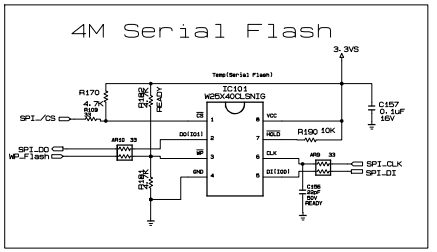




When apply LGD panel, with ITLC pin :
Interface mode fuse R238 & R240
Normal model use R239
Other panel (Keep R238 R239 R240 Ready







THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

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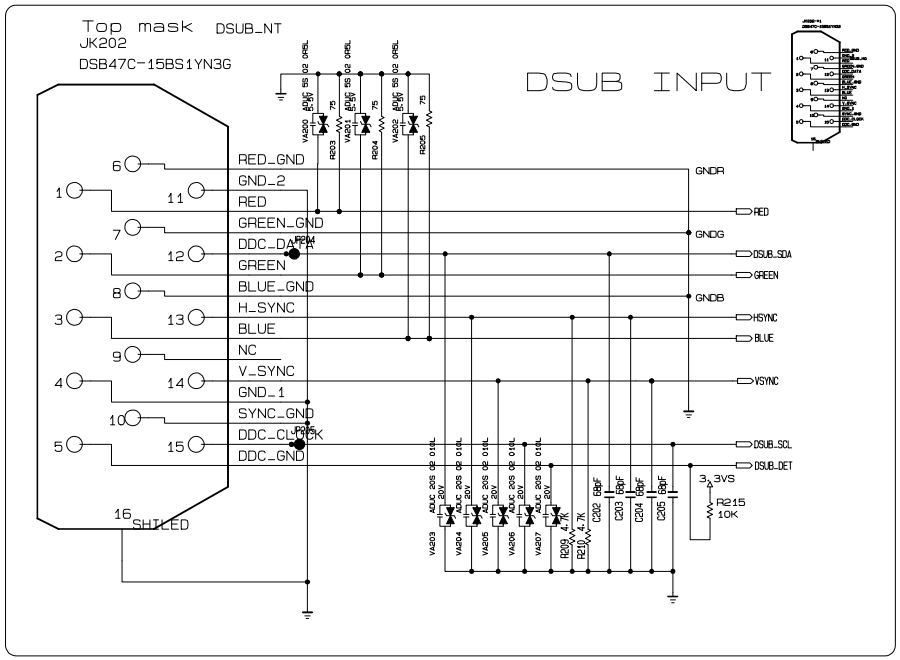
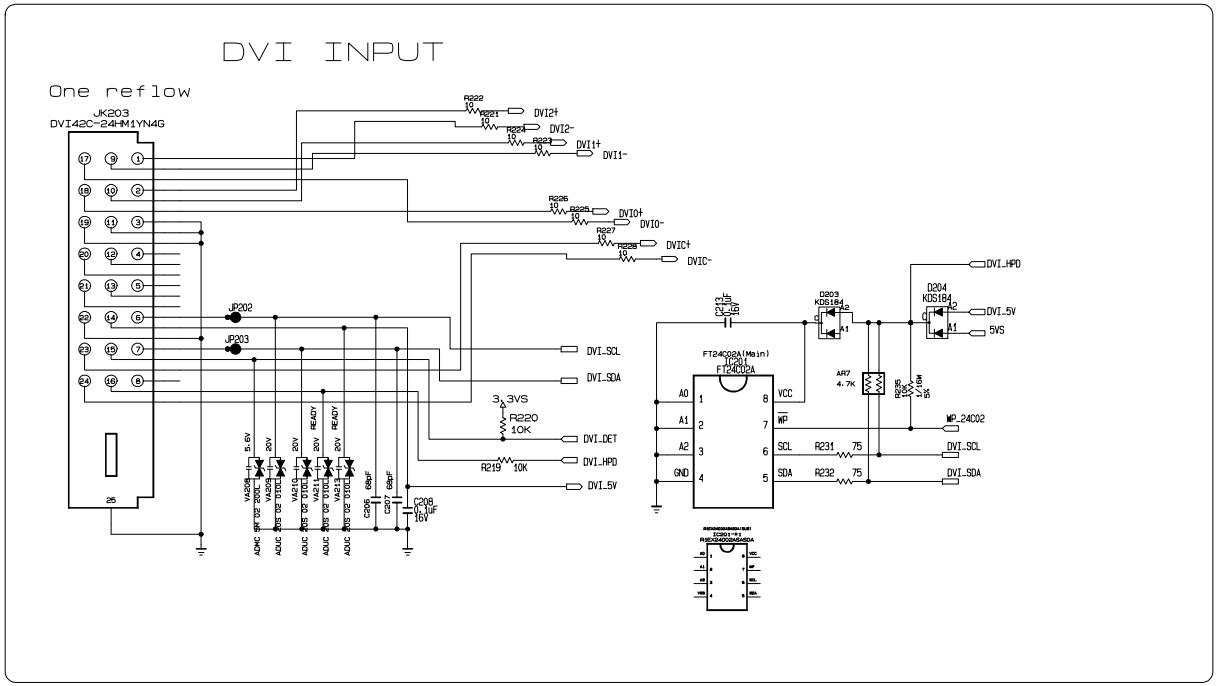
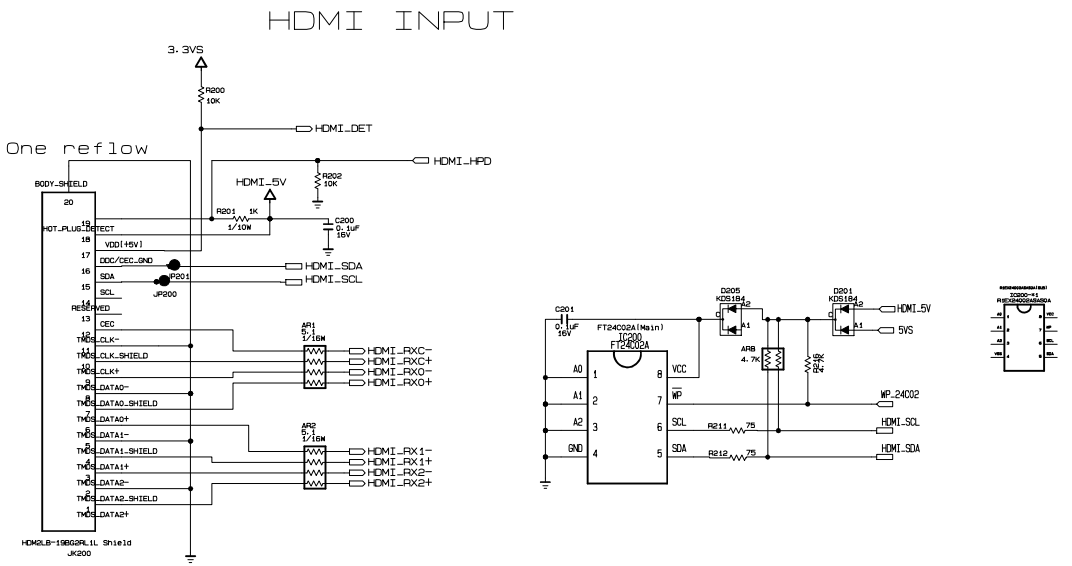
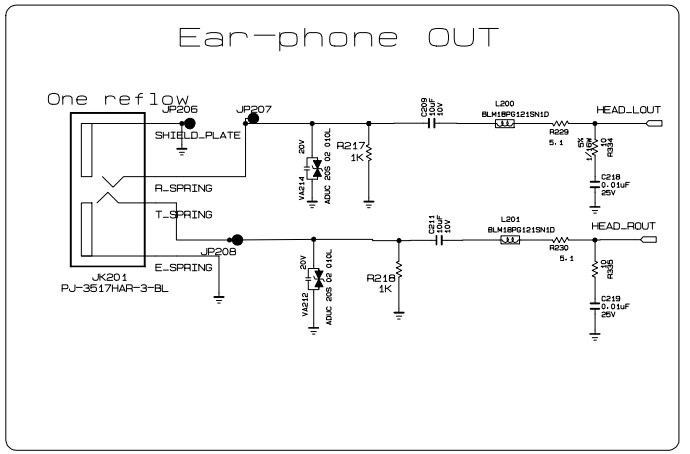
MODEL	27MP35VQ	DATE	2014-01-09
BLOCK	SCALER	SHEET	1 / 2









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SECRET

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LG ELECTRONICS

MODEL	27MP35VQ	DATE	2014-01-09
BLOCK	Interface	SHEET	2 / 2

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