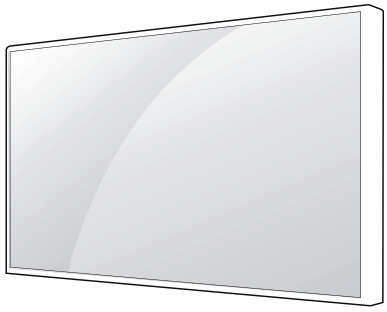
Internal Use Only

LG Digital Signage
SERVICE MANUAL

CHASSIS : LW56C

MODEL : 49VM5C 49VM5C-BD

CAUTION
BEFORE SERVICING THE CHASSIS, READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67237480 (1607-REV01)

CONTENTS

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.)

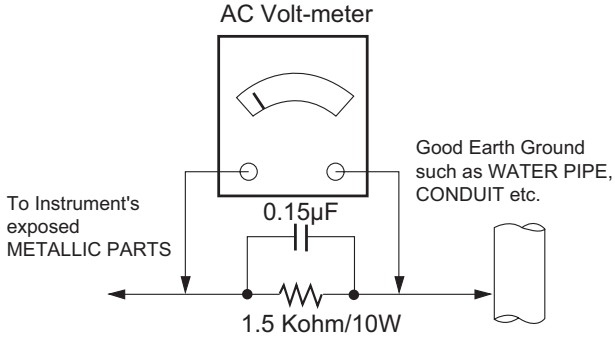
⚠ CAUTION
Please use only a plastic screwdriver to protect yourself from shock hazard during service operation.

⚠ WARNING

BE CAREFUL ELECTRIC SHOCK !

- If you want to replace with the new backlight or inverter circuit, must disconnect the AC adapter 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
*Base on Adjustment standard

- **Replaceable batteries**

⚠ CAUTION
RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.
DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.
REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE.

ADVARSEL
Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering.
Udskiftning må kun ske med batteri af samme fabrikat og type.
Levér det brugte batteri tilbage til leverandøren.

注意

電池を誤って交換すると爆発する危険があります。

必ず同一又は同等のタイプのものと交換して下さい。

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 reconnecting 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) isopropyl 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 500 ˚F to 600 ˚F.
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. (500 ˚F to 600 ˚F)
   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 (500 ˚F to 600 ˚F)
   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.

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 Transistor

Removal/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.*

SPECIFICATION

1. Application range

This specification is applied to the LW56C chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F),
   CST: 40 °C ± 5 °C
2) Relative Humidity: 65 % ± 10 %
3) Power Voltage
   : Standard input voltage (AC 100-240 V~, 50/60 Hz)

* Standard Voltage of each products is marked by models.

4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. General Specification

3.1. RGB, DVI-D, HDMI, Display Port (PC) Specification

No.	Item	Specification			Remarks
1	Supported Sync. Type	Separate Sync, Digital			
2	Operating Frequency	Analog	Horizontal	30 ~ 83 kHz	
			Vertical	56 ~ 75 Hz	
		DVI/OPS	Horizontal	30 ~ 83 kHz	
			Vertical	56 ~ 60 Hz	
		HDMI	Horizontal	30 ~ 83 kHz	
			Vertical	56 ~ 60 Hz	
		Display Port	Horizontal	30 ~ 83 kHz	
			Vertical	56 ~ 60 Hz	
3	Resolution	Input	RGB.	1920×1080 @ 60Hz	
			DVI/OPS	1920×1080 @ 60Hz	
			HDMI	3840x2160 @ 30Hz	Recommend : 1920*1080@60Hz
			Display Port	3840x2160 @ 30Hz	Recommend : 1920*1080@60Hz
		Output	Display Port	3840x2160 @ 30Hz	

3.2. General Specification

No.	Item		Content		Remark
1	Input	HDMI Input (V2.0)	1	4K/30P	HDCP2.2 4K/30P Supporting color format - RGB444 / YCbCr444 / YCbCr422(8/10/12bit)
		DP Input(V1.2)	1	4K/30P, DP1.2a	HDCP1.3 4K/30P Supporting color format - RGB444 / YCbCr444 (8bit)
		DVI Input(V1.0)	1	DVI-D	HDCP2.2 Supporting color format - RGB444 (10bit)
		RGB Input	1	Aanlog	Analog (D-SUB 15Pin) Supporting color format - RGB444 (8 Bits)
		OPS	1		Supporting color format - RGB444 (10 Bits)
		USB Input(v3.0)	1	EMF, DVIX HD, For SVC(Download), Picture, Music, Movie, SVC	USB3.0, Device: Memory stick, Mouse, Key-board, Software Update + Picture + Music + Movie
		Wifi USB Input(v2.0)	1	For Wifi Device	
		Component Input	1	Y/Pb/Pr Shared with D-SUB 15Pin	
		Composite(AV) Inputt	1	PAL, SECAM, NTSC Shared with D-SUB 15Pin	
		Audio In	1	PC/DVI Audio In(L/R), Stereo	3P, 3.5mm Phone Jack
2	Output	DP Out	1	4K/30P	HDCP1.3 4K/30P Supporting color format - RGB444 / YCbCr444 (8bit)
		Audio Out	1	SE, Stereo L/R, 0.5Vrms	3P, 3.5mm Phone Jack
3	External Control	RS-232C Input / Output	1/1	UART Comm. w/ IR Daisy Chain, Display Control	
		IR In	1	IR Receiver	3P, 3.5mm Phone Jack
		RJ45 Input/ Output(1EA)	1/1	RJ45, 100Base-T	SuperSign W/C
4	Special Feature	OPS IN	1	OPS	
		Media Player Compatibility	OPS Ready External Media player Attachable		
5	Remote control		Wireless Remote Control		LG Code
6	Local Key		Tact Key(INPUT, MENU, ∧, ∨, <, >, AUTO/ SET, Φ/I)		8 keys
7	Set Installation		Wall Mount		
8	PIP / PBP Mode		X		
9	SSC (Split Screen) Mode		X		
10	Beacon		Distance within 20m		Dongle(AN-WF500)

4. Signal Timing (Supporting Resolution)

4.1. RGB (PC Mode)

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480
	V(Lines)	-		59.94	525	480	10	2	33	
2	H(Pixels)	-	31.5	37.5	840	640	16	64	120	640 x 480
	V(Lines)	-		75	500	480	1	3	16	
3	H(Pixels)	-	28.321	31.468	900	720	18	108	54	720 X 400
	V(Lines)	+		70.8	449	400	12	2	35	
4	H(Pixels)	+	40	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	625	600	1	3	21	
6	H(Pixels)	+/-	57.283	49.725	1152	832	32	64	224	832 x 624
	V(Lines)	+/-		74.55	667	624	1	3	39	
7	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768
	V(Lines)	-		60	806	768	3	6	29	
8	H(Pixels)	-	78.75	60.023	1312	1024	16	96	176	1024 x 768
	V(Lines)	-		75.029	800	768	1	3	28	
9	H(Pixels)	-	81.75	53.783	1520	1152	64	120	184	1152 x 864
	V(Lines)	+		59.959	897	864	3	4	26	
10	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720
	V(Lines)	+		60	750	720	5	5	20	
11	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024
	V(Lines)	+		60.02	1066	1024	1	3	38	
12	H(Pixels)	+	135	79.98	1688	1280	16	144	248	1280 x 1024
	V(Lines)	+		75.02	1066	1024	1	3	38	
13	H(Pixels)	+	85.5	47.712	1792	1360	64	112	256	1360 x 768
	V(Lines)	+		60.015	795	768	3	6	18	
14	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900
	V(Lines)	+		60	1000	900	1	3	96	
15	H(Pixels)	-	146.25	65.29	2240	1680	104	176	280	1680 x 1050
	V(Lines)	+		59.954	1089	1050	3	6	30	
16	H(Pixels)	+	148.5	67.5	2200	1920	88	44	88	1920 x 1080
		+		60	1125	1080	4	5	46	

4.2. HDMI, Display Port (PC Mode)

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480
	V(Lines)	-		59.94	525	480	10	2	33	
2	H(Pixels)	+	40	37.879	1056	800	40	128	88	800 x 600
	V(Lines)	+		60.317	628	600	1	4	23	
3	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768
	V(Lines)	-		60	806	768	3	6	29	
4	H(Pixels)	-	81.75	53.783	1520	1152	64	120	184	1152 x 864
	V(Lines)	+		59.959	897	864	3	4	26	
5	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720
	V(Lines)	+		60	750	720	5	5	20	
6	H(Pixels)	-	83.5	49.702	1680	1280	72	128	200	1280 X 800
	V(Lines)	+		59.81	831	800	3	6	22	
7	H(Pixels)	+	85.5	47.712	1792	1366	70	143	213	1366 x 768
	V(Lines)	+		59.79	798	768	3	3	24	
8	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024
	V(Lines)	+		60.02	1066	1024	1	3	38	
9	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900
	V(Lines)	+		60	1000	900	1	3	96	
10	H(Pixels)	-	146.25	65.29	2240	1680	104	176	280	1680 x 1050
	V(Lines)	+		59.954	1089	1050	3	6	30	
11	H(Pixels)	+	148.5	67.5	2200	1920	88	44	88	1920 x 1080
	V(Lines)	+		60	1125	1080	4	5	46	
12	H(Pixels)	+	154	74.038	2080	1920	48	32	80	1920 x 1200
	V(Lines)	-		59.95	1235	1200	3	6	26	
13	H(Pixels)	+	297	67.5	4400	3840	176	88	296	3840 x 2160
	H(Pixels)	+		30	2250	2160	8	10	72	

4.3. HDMI, Display Port (DTV Mode)

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	Proposed	
1	31.5	60	EDTV 480p	480/60P	
2	31.25	50	EDTV 576p	576/50P	
3	37.5	50	HDTV 720p	720/50P	
4	45	60	HDTV 720p	720/60P	
5	28.1	50	HDTV 1080i 50Hz	1080/50i	
6	33.75	60	HDTV 1080i 60Hz	1080/60i	
7	56.25	50	HDTV 1080P 50Hz	1080/50P	
8	67.432	59.94	HDTV 1080P 60Hz	1080/60P	
9	67.5	60	HDTV 1080P 60Hz	1080/60P	
10	54	24	UDTV 2160P 24Hz	2160/24P	
11	56.25	25	UDTV 2160P 25Hz	2160/25P	
12	67.5	30	UDTV 2160P 30Hz	2160/30P	

4.4. DVI-D (PC Mode)

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480
	V(Lines)	-		59.94	525	480	10	2	33	
2	H(Pixels)	+	40	37.879	1056	800	40	128	88	800 x 600
	V(Lines)	+		60.317	628	600	1	4	23	
3	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768
	V(Lines)	-		60	806	768	3	6	29	
4	H(Pixels)	-	81.75	53.783	1520	1152	64	120	184	1152 x 864
	V(Lines)	+		59.959	897	864	3	4	26	
5	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720
	V(Lines)	+		60	750	720	5	5	20	
6	H(Pixels)	+	85.5	47.712	1792	1366	70	143	213	1366 x 768
	V(Lines)	+		59.79	798	768	3	3	24	
7	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024
	V(Lines)	+		60.02	1066	1024	1	3	38	
8	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900
	V(Lines)	+		60	1000	900	1	3	96	
9	H(Pixels)	-	146.25	65.29	2240	1680	104	176	280	1680 x 1050
	V(Lines)	+		59.954	1089	1050	3	6	30	
10	H(Pixels)	+	148.5	67.5	2200	1920	88	44	88	1920 x 1080
	V(Lines)	+		60	1125	1080	4	5	46	

4.5. OPS (PC Mode)

No.	Section	Pol.	Dot Clock [MHz]	Frequency [kHz]/[Hz]	Total Cycle (E)	Display (A)	Front Porch(B)	Sync. (D)	Back Porch(F)	Resolution
1	H(Pixels)	-	25.175	31.469	800	640	16	96	48	640 x 480
	V(Lines)	-		59.94	525	480	10	2	33	
2	H(Pixels)	+	40	37.879	1056	800	40	128	88	800 x 600
	V(Lines)	+		60.317	628	600	1	4	23	
3	H(Pixels)	-	65	48.363	1344	1024	24	136	160	1024 x 768
	V(Lines)	-		60	806	768	3	6	29	
4	H(Pixels)	-	81.75	53.783	1520	1152	64	120	184	1152 x 864
	V(Lines)	+		59.959	897	864	3	4	26	
5	H(Pixels)	+	74.25	45	1650	1280	110	40	220	1280 x 720
	V(Lines)	+		60	750	720	5	5	20	
6	H(Pixels)	-	83.5	49.702	1680	1280	72	128	200	1280 X 800
	V(Lines)	+		59.81	831	800	3	6	22	
7	H(Pixels)	+	85.5	47.712	1792	1366	70	143	213	1366 x 768
	V(Lines)	+		59.79	798	768	3	3	24	
8	H(Pixels)	+	108	63.981	1688	1280	48	112	248	1280 x 1024
	V(Lines)	+		60.02	1066	1024	1	3	38	
9	H(Pixels)	+	108	60	1800	1600	24	80	96	1600 x 900
	V(Lines)	+		60	1000	900	1	3	96	
10	H(Pixels)	-	146.25	65.29	2240	1680	104	176	280	1680 x 1050
	V(Lines)	+		59.954	1089	1050	3	6	30	
11	H(Pixels)	+	148.5	67.5	2200	1920	88	44	88	1920 x 1080
	V(Lines)	+		60	1125	1080	4	5	46	

4.6. Component(Y/Pb/Pr)

	Resolution	H-freq(kHz)	V-freq(Hz)		
1	720*576	15.625	50.00	SDTV, DVD 576i	
2	720*576	31.25	50.00	EDTV 576p	
3	1280*720	45.00	60.00	HDTV 720p	
4	1280*720	37.5	50	HDTV 720p	
5	1280*720	44.96	59.94	HDTV 720p	
6	1920*1080	31.25	50.00	HDTV 1080i 50Hz	For Australian
7	1920*1080	56.25	50	HDTV 1080P 50Hz	
8	1920*1080	33.75	60.00	HDTV 1080i 60Hz (ATSC)	
9	1920*1080	33.72	59.94	HDTV 1080i 59.94Hz	
10	1920*1080	67.5	60	HDTV 1080P 60Hz	

4.7. CVBS(AV, Composite)

	Resolution	H-freq(kHz)	V-freq(Hz)		
1	NTSC, PAL	-	-	All of NTSC and PAL	

ADJUSTMENT INSTRUCTION

1. Application Range

This spec. sheet applies to LW56C Chassis applied all of Signage Monitors manufactured in SIGNAGE SET factory.

2. Specification

1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
2) Adjustment must be done in the correct order.
3) The adjustment must be performed in the circumstance of 25 °C ± 5 °C of temperature and 65 % ± 10 % of relative humidity if there is no specific designation.
4) The input voltage of the receiver must keep AC 100-240 V~, 50/60 Hz.
5) At first Worker must turn on the SET by using Power Only key.
6) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15.

In case of keeping module is in the circumstance of 0 °C, it should be placed in the circumstance of above 15 °C for 2 hours.

In case of keeping module is in the circumstance of below -20 °C, it should be placed in the circumstance of above 15 °C for 3 hours.

Caution) When still image is displayed for a period of 20 minutes or longer (especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area

3. Adjustment items

3.1. Main PCBA Adjustments MAC Address Download

- Adjust RGB (ADC)
- EDID/DDC download
- MAC Address Download
- Above adjustment items can be also performed in Final Assembly if needed. Both Board-level and Final assembly adjustment items can be check using In-Star Menu 1.ADJUST CHECK.. RGB-PC Adjust will be calculated by 480i adjust value.

3.2. Final Assembly adjustment

- White Balance adjustment
- RS-232C functionality check
- Factory Option setting per destination
- Ship-out mode setting (In-Stop)

3.3. Etc.

- Ship-out mode
- Service Option Default
- Tool option menu, USB Download(S/W Update, Option, Service only)
- ISP Download(Option)

4. Automatic Adjustment

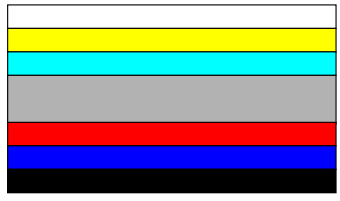
4.1. ADC Adjustment

4.1.1. Overview

ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

4.1.2. Equipment & Condition

1) JIG (RS-232C protocol)
2) MSPG-925 Series Pattern Generator(MSPG-925FA, pattern -65)
- Resolution : 1080p (Inner Pattern)
  1024*768 RGB (Inner Pattern)
- Pattern : Horizontal 100% Color Bar Pattern
- Pattern level : 0.7±0.1 Vp-p
- Image



4.1.3. Adjustment

4.1.3.1. Adjustment method

- Using RS-232C, adjust items listed in 3.1 in the other shown in “4.1.3.3”

4.1.3.2. Adj. protocol

Protocol	Command	Set ACK
Enter adj. mode	aa 00 00	a 00 OK00x
Source change	xb 00 60 xb 00 10	b 00 OK04x (Adjust 480i, 1080p Comp1) b 00 OK06x (Adjust 1920*1080 RGB)
Begin adj.	ad 00 10	
Return adj. result		OKx (Case of Success) NGx (Case of Fail)
Read adj. data	(main) ad 00 20	(main) 00000000000000000000000007c007b006dx
	(sub) ad 00 21	(Sub) 00000007000000000000000007c00830077x
Confirm adj.	ad 00 99	NG 03 00x (Fail) NG 03 01x (Fail) NG 03 02x (Fail) OK 03 03x (Success)
End adj.	aa 00 90	a 00 OK90x

Ref.) ADC Adj. RS232C Protocol_Ver1.0

4.1.3.3. Adj. order

- aa 00 00 [Enter ADC adj. mode]
- xb 00 60 [Change input source to RGB(1024*768)]
- ad 00 10 [Adjust 1024*768RGB]
- aa 00 90 End adj.

Ref) ADC adj. RS232C Protocol_Ver1.0

4.2. MAC address & HDCP2.2 D/L

4.2.1. Equipment & Condition

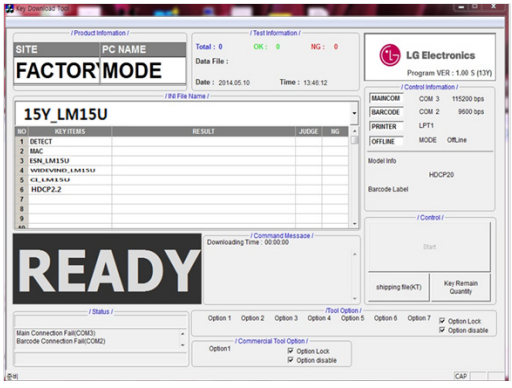
1) Play file: keydownload.exe

4.2.2. Communication Port connection

1) Key Write: Com 1,2,3,4 and 115200 (Baudrate)
2) Barcode: Com 1,2,3,4 and 9600 (Baudrate)

4.2.3. Download process

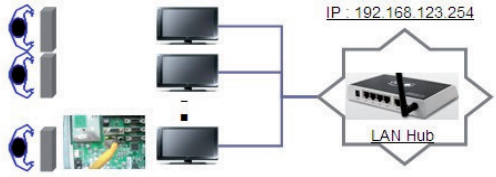
1) Select the download items.
2) Mode check: Online Only
3) Check the test process : DETECT -> MAC -> HDCP2.2
4) Play: Press Enter key
5) Check of result: Ready, Test, OK or NG



4.3. LAN Inspection

4.3.1. Equipment & Condition

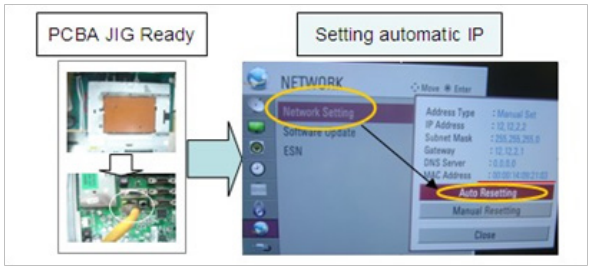
▪ Each other connection to LAN Port of IP Hub and Jig



4.3.2. LAN inspection solution

1) LAN Port connection with PCB
2) Network setting at MENU Mode of SET (Installer Menu → 119 → 253 → Menu)
3) Setting automatic IP
4) Setting state confirmation

→ If automatic setting is finished, you confirm IP and MAC Address.



4.4. LAN PORT INSPECTION(PING TEST)

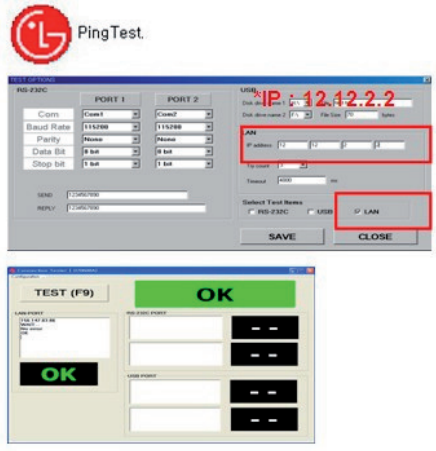
4.4.1. Equipment setting

1) Play the LAN Port Test PROGRAM.
2) Input IP set up for an inspection to Test Program.
*IP Number : 12.12.2.2

Connect: SET-> LAN Port == PC-> LAN Port

4.4.2. LAN PORT inspection(PING TEST)

1) Play the LAN Port Test Program.
2) Connect each other LAN In Port Jack.
3) Play Test (F9) button and confirm OK Message.
4) Remove LAN CABLE
5) Connect each other LAN Out Port Jack.
6) Play Test (F9) button and confirm OK Message.
7) Remove LAN CABLE



4.5. Serial number download

Connect Bar Code scan equipment and set by RS-232C cable.

1) E2PROM Data Write

CMD	LENGTH	ID_1	ID_2	DATA_1	. . .	DATA_N	CR

❖ CMD : A0h
❖ LENGTH : 85 ~ 94h(1~16 BYTES)
❖ ID_1 : 73h('s')
❖ ID_2 : 1) Serial Number - 61h('a') 2) Model Name – 62h('b')
❖ CR : 0Dh
❖ RETURN : A0h + CR

2) E2PROM Data Read

CMD	LENGTH	ID_1	ID_2	CR

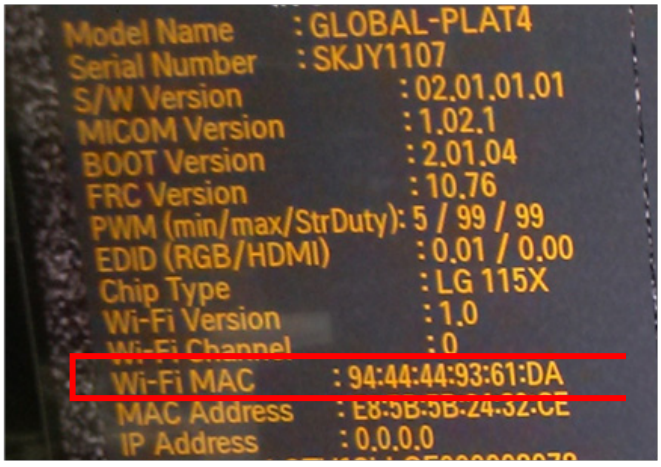
❖ CMD : A1h
❖ LENGTH : 85 ~ 94h(1~16 BYTES)
❖ ID_1 : 73h('s')
❖ ID_2 : 1) Serial Number - 61h('a') 2) Model Name – 62h('b')
❖ CR : 0Dh
❖ RETURN : DATA + CR

4.5. WIFI MAC ADDRESS CHECK

4.5.1. Using RS232 Command

	Command	Set ACK
Transmission	[A][I][][Set ID][][20][Cr]	[O][K][x] or [N][G]

- check the menu on in-start



5. Manual Adjustment

5.1. ADC adjustment

5.1.1. Overview

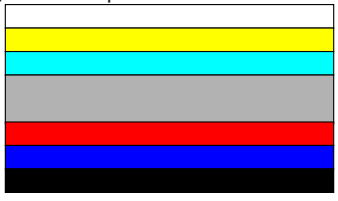
▪ ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation.

5.1.2. Equipment & Condition

▪ Adjust Remote control

▪ 801GF(802B, 802F, 802R) or MSPG925FA Pattern Generator

- Resolution: 480i Comp1 (MSPG-925FA: model-209, pattern-65)
- Resolution : 1024*768 RGB (Inner Pattern)
- Pattern : Horizontal 100% Color Bar Pattern
- Pattern level: 0.7±0.1 Vp-p
- Image or Inner pattern.



▪ Must use standard cable

5.1.3. Adjust method

5.1.3.1. ADC RGB

1) Press the In-start Key on the ADJ remote after at least 1 min of signal reception. Then, select ADC Calibration. And Press OK Button on the menu “Start”. The adjustment will start automatically.
2) If ADC RGB is successful, “ADC RGB Success” is displayed and ADC RGB is completed. If ADC calibration is failure, “ADC RGB Fail” is displayed.
3) If ADC calibration is failure, after rechecking ADC pattern or condition, retry calibration

5.2. EDID / DDC Download(EDID PCM)

5.2.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of “Plug and Play”.

5.2.2. Equipment

▪ Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.

▪ Adjust remocon

5.2.3. Download method

1) Press Adj. key on the Adj. R/C,
2) Select EDID D/L (PCM) menu.
3) By pressing Enter key, EDID download will begin
4) If Download is successful, OK is display, but If Download is failure, NG is displayed.
5) If Download is failure, Re-try downloads.

For Analog EDID	For DVI EDID	For HDMI EDID
D-sub to D-sub	DVI to DVI	DVI-D to HDMI or HDMI to HDMI
		

* Caution) When EDID Download, must remove HDMI / D-sub Cable.

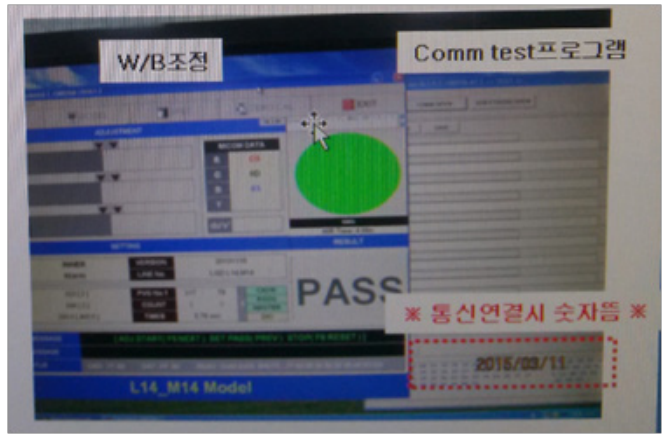
5.2.4. RS232 IN / OUT INSPECTION

1) Connect RS232 In/Out cable with daisy chain. You can control several products at one time by connecting them to a single PC.,
2) Check the RS232 command.

i) RS232S Out Setting to PC
- Set device port “COM” (check control panel on PC)
- Set Baud Rate “115200”

ii) Run RS232C Command program (ex. W/B adjust Program) and Comm Test Program for RS232C Out Check.

iii) After Running Rs232C Command (ex. W/B adjust), Check Data from RS232C out on Comm Test Program Window.



5.2.5. EDID DATA

5.2.5.1. EDID

Input	RGB	DVI	HDMI	Display-Port	OPS
Check-Sum	0xFC	0x96	0x72, 0xAE	0xEB, 0x5B	0x60, 0XC5

* Checksum(HDMI/RGB/DVI/Displayport/OPS)

1) RGB (Check Sum : 0xFC)

	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	75	9E	01	01	01	01
10	1A	19	01	03	6C	7A	45	78	EA	7C	5B	A6	54	4E	9A	26
20	0F	47	4A	A5	4B	00	B3	00	81	C0	81	80	71	40	61	40
30	45	40	31	40	A9	C0	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	BF	AE	42	00	00	1E	66	21	50	B0	51	00	1B	30
50	46	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	32
60	4B	1E	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	53	49	47	4E	41	47	45	0A	20	20	00	FC

2) DVI (Check Sum : 0x96)

	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	76	9E	01	01	01	01
10	1A	19	01	03	80	7A	45	78	EA	7C	5B	A6	54	4E	9A	26
20	0F	47	4A	A1	08	00	B3	00	81	C0	81	80	71	40	61	40
30	45	40	31	40	A9	C0	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	BF	AE	42	00	00	1E	66	21	56	AA	51	00	1E	30
50	46	8F	33	00	BF	AE	42	00	00	18	00	00	00	FD	00	38
60	3C	1E	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	53	49	47	4E	41	47	45	0A	20	20	00	96

3) HDMI (Check Sum : 0x72, 0xAE)

	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	AE	C4	01	01	01	01
10	1A	19	01	03	80	7A	45	78	EA	7C	5B	A6	54	4E	9A	26
20	0F	47	4A	A1	08	00	B3	00	81	00	81	80	71	40	61	40
30	45	40	31	40	A9	C0	04	74	00	30	F2	70	5A	80	B0	58
40	8A	00	A2	0B	32	00	00	18	02	3A	80	18	71	38	2D	40
50	58	2C	45	00	BF	AE	42	00	00	1A	00	00	00	FD	00	38
60	3E	1E	53	1E	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	53	49	47	4E	41	47	45	0A	20	20	01	72

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	32	F2	51	90	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	5D	5E	5F	29	3D	06	C0	15	07	50	09	57	07
20	83	01	00	00	6D	03	0C	00	10	00	B8	3C	20	00	80	01
30	02	03	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84
40	63	00	00	1E	28	3C	80	A0	70	B0	23	40	30	20	36	00
50	06	44	21	00	00	1A	66	21	56	AA	51	00	1E	30	46	8F
60	33	00	BF	AE	42	00	00	18	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

4) DP (Check Sum : 0xEB, 0x5B)

	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	AF	C4	01	01	01	01
10	1A	19	01	04	B5	7A	45	78	EA	3B	F3	A6	54	4F	94	26
20	0D	48	49	A1	08	00	B3	00	81	00	81	80	71	40	61	40
30	45	40	31	40	A9	C0	04	74	00	30	F2	70	5A	80	B0	58
40	8A	00	A2	0B	32	00	00	18	02	3A	80	18	71	38	2D	40
50	58	2C	45	00	BF	AE	42	00	00	1A	00	00	00	FD	00	38
60	3E	1E	53	1E	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	53	49	47	4E	41	47	45	0A	20	20	01	EB

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	34	E1	52	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	5D	5E	5F	00	29	3D	06	C0	15	07	50	09	57
20	07	83	01	00	00	6E	03	0C	00	30	00	98	3C	20	00	60
30	01	02	03	00	66	21	56	AA	51	00	1E	30	46	8F	33	00
40	BF	AE	42	00	00	18	01	1D	00	72	51	D0	1E	20	6E	28
50	55	00	40	84	63	00	00	1E	28	3C	80	A0	70	B0	23	40
60	30	20	36	00	06	44	21	00	00	1A	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	5B

5) OPS (Check Sum : 0X60, 0xC5)

	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	B0	C4	01	01	01	01
10	1A	19	01	03	80	7A	45	78	EA	7C	5B	A6	54	4E	9A	26
20	0F	47	4A	A1	08	00	B3	00	81	00	81	80	71	40	61	40
30	45	40	31	40	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	BF	AE	42	00	00	1A	66	21	56	AA	51	00	1E	30
50	46	8F	33	00	BF	AE	42	00	00	18	00	00	00	FD	00	38
60	3C	1E	53	0F	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	53	49	47	4E	41	47	45	0A	20	20	01	60

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1F	F1	4A	90	05	04	14	1F	12	03	13	02	11	23
10	09	07	07	83	01	00	00	67	03	0C	00	40	00	80	1E	02
20	3A	80	18	71	38	2D	40	58	2C	45	00	BF	AE	42	00	00
30	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	BF	AE	42
40	00	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	BF
50	AE	42	00	00	1E	30	2A	40	C8	60	84	64	30	18	50	13
60	00	BF	AE	42	00	00	18	02	3A	80	D0	72	38	2D	40	10
70	2C	45	20	BF	AE	42	00	00	1E	00	00	00	00	00	00	C5

5.3. White Balance Adjustment

5.3.1. Overview

▪ W/B adj. Objective & How-it-works

- Objective: To reduce each Panel's W/B deviation
- How-it-works: When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
- Adj. condition: normal temperature

1) Surrounding Temperature: 25 ± 5 °C
2) Warm-up time: About 5 Min
3) Surrounding Humidity: 20 % ~ 80 %
4) Before White balance adjustment, Keep power on status, don't power off

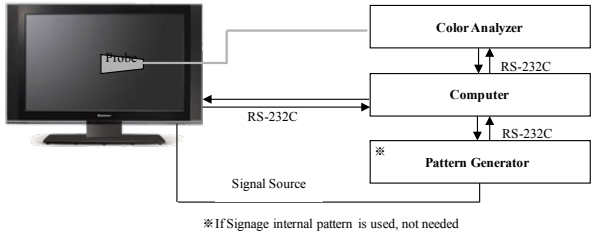
5.3.1.1. Adj. condition and cautionary items

1) Lighting condition in surrounding area surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location: Color Analyzer (CA-210) probe should be within 10cm perpendicular of the module surface (80° ~100°)
3) Aging time
   - After Aging Start, Keep the Power ON status during 5 Minutes
   - In case of LCD Back-Light on should be checked using no signal or Full-White pattern

5.3.2. Equipment

1) Color Analyzer: CA-210 (LED Module : CH 14)
2) Adj. Computer(During auto adj., RS-232C protocol is needed)
3) Adjust Remocon
4) Video Signal Generator MSPG-925F 720p/204-Gray(Model:217, Pattern:49)
   → Only when internal pattern is not available

5.3.3. Equipment connection MAP



5.3.4. Adj. Command (Protocol)

▪ RS-232C Command used during auto-adjustment.

RS-232C COMMAND [CMD ID DATA]			Explantion
wb	00	00	Begin White Balance adj.
wb	00	10	Gain adj.(internal white pattern)
wb	00	1f	Gain adj. completed
wb	00	20	Offset adj.(internal white pattern)
wb	00	2f	Offset adj. completed
wb	00	ff	End White Balance adj. (internal pattern disappears)

Ex) wb 00 00 -> Begin white balance auto-adj.
wb 00 10 -> Gain adj.
ja 00 ff -> Adj. data
jb 00 c0
...
...
wb 00 1f → Gain adj. completed
*(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.

▪ Adj. Map

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	172
	G Gain	j	h	00	C0	172
	B Gain	j	i	00	C0	192
	R Cut					64
	G Cut					64
	B Cut					64
Medium	R Gain	j	a	00	C0	192
	G Gain	j	b	00	C0	172
	B Gain	j	c	00	C0	172
	R Cut					64
	G Cut					64
	B Cut					64
Warm	R Gain	j	d	00	C0	192
	G Gain	j	e	00	C0	172
	B Gain	j	f	00	C0	172
	R Cut					64
	G Cut					64
	B Cut					64

5.3.5. Adj. method

5.3.5.1. Auto WB calibration

1) Set in adj. mode using POWER ON(P-ONLY) key
2) Zero calibrate probe then place it on the center of the Display
3) Connect Cable (RS-232C)
4) Select mode in adj. Program and begin adj.
5) When adj. is complete (OK Sing), check adj. status pre mode(Warm, Medium, Cool)
6) Remove probe and RS-232C to USB cable to complete adj.

▪ W/B Adj. must begin as start command “wb 00 00” , and finish as end command “wb 00 ff”, and Adj. offset if need

5.3.5.2. Manual adjustment Method.

1) Set in Adj. mode using POWER ON
2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10cm of the surface..
3) Press ADJ key → EZ adjust using adj. R/C → White-Balance then press the cursor to the right (KEY►). When KEY (►) is pressed 204 Gray (80IRE) internal patterns will be displayed.
4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
5) Adj. is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 7.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 204 Gray pattern.

*. Adj. condition and cautionary items
1) Lighting condition in surrounding area Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location
- LCD: Color Analyzer (CA-210) probe should be within 10cm and perpendicular of the module surface (80°~ 100°)
3) Aging time
- After Aging Start, Keep the Power ON status during 5 Minutes.
- In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

5.3.6. Reference (White balance Adj. coordinate and color temperature)

▪ Luminance: 255 Gray
▪ Standard color coordinate and temperature using CS-1000 (over 26 inch) [applied only LGD Module]

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.269	0.273	13,000K	0.0000
Medium	0.279	0.292	10,000K	0.0000
Warm	0.313	0.329	6,500K	0.0000

▪ Standard color coordinate and temperature using CA-210(CH 14) [applied only LGD Module]

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.269±0.001	0.273±0.001	13,000K	0.0000
Medium	0.279±0.001	0.292±0.001	10,000K	0.0000
Warm	0.313±0.001	0.329±0.001	6,500K	0.0000

5.3.7. Color coordination according to aging time

▪ Luminance: 255 Gray, 100IRE
▪ Standard color coordinate and temperature using CA-210(CH-14) – by aging time

		Cool		Medium		Warm	
	Aging time (Min)	X	Y	X	Y	X	Y
	Target	269	273	279	292	313	329
1	0~1	274	281	284	300	318	335
2	2~3	273	280	283	299	317	334
3	4~5	272	279	282	298	316	333
4	6-9	272	278	281	296	316	332
5	10-19	271	277	281	295	314	331
6	20-35	270	275	280	294	313	330
7	36-49	270	275	279	294	313	330
8	50-79	269	274	279	293	313	329
9	80-119	269	273	279	293	313	329
10	Over 120	269	273	279	292	313	329

5.4. Ship-out mode check (In-stop)

▪ After final inspection, press In-Stop key of the Adj. R/C and check that the unit goes to Stand-by mode

6. GND and HI-POT Test

6.1 Method

1) GND & HI-POT auto-check preparation
- Check the Power Cable and Signal Cable insertion condition.
2) GND & HI-POT auto-check
a. Pallet moves in the station. (POWER CORD / AV CORD is tightly inserted)
b. Connect the AV JACK Tester.
c. Controller (GWS103-4) on.
d. GND Test (Auto)
- If Test is failed, Buzzer operates.
- If Test is passed, execute next process (Hi-pot test). (Remove A/V CORD from A/V JACK BOX)
e. HI-POT test (Auto)
- If Test is failed, Buzzer operates.
- If Test is passed, GOOD Lamp on and move to next process automatically

6.2 Check Point

1) Test voltage
- GND: 1.5KV/min at 100mA
- SIGNAL: 3KV/min at 100mA
2) TEST time: 1 second
3) TEST POINT
- GND Test = POWER CORD GND and SIGNAL CABLE GND.
- Hi-pot Test = POWER CORD GND and LIVE & NEUTRAL.
4) LEAKAGE CURRENT: At 0.5mArms

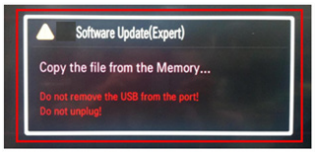
7. Audio Output Check

No.	Item	Min	Typ	Max	Unit	Remark
1	Audio Line Out	0.4	0.5	0.6	Vrms	RGB, DVI, HDMI, DP, OPS, USB (No load)
		0.25	0.35	0.45	Vrms	AV, Component (No load)

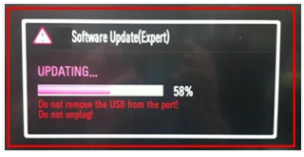
8. USB S/W Download (option, Service only)

1) Put the USB Stick to the USB socket
2) Automatically detecting update file in USB Stick
- If your downloaded program version in USB Stick is Lower, it didn't work. But your downloaded version is Higher, USB data is automatically detecting (Download Version High & Power only mode, Set is automatically Download)

3) Show the message "Copying files from memory"



4) Updating is starting.



5) Updating Completed, The Signage Set will restart automatically

6) If your SIGNAGE SET is turned on, check your updated version and Tool option. (explain the Tool option, next stage)

* If downloading version is more high than your SIGNAGE SET have, SIGNAGE SET can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ATV test on production line.

*** After downloading, have to adjust TOOL OPTION again.**

1) Push "IN-START" key in service remote control.
2) Select "Tool Option 1" and Push "OK" button.
3) Punch in the number. (Each model has their number.)

9. Optional adjustments

9.1. Manual ADC Calibration

9.1.1. Equipment & Condition

1) Adjustment Remocon
2) 801GF (802B, 802F, 802R) or MSPG925FA Pattern Generator
- Resolution: 480i Comp1 (MSPG-925FA: model-209, pattern-65)
- Resolution: 1080p Comp1 (MSPG-925FA: model-225, pattern-65)
- Resolution : 1080p RGB (MSPG-925FA: model-225, pattern-65)
- Pattern: Horizontal 100% Color Bar Pattern
- Pattern level: 0.7±0.1 Vp-p

9.1.2. Adjust method

9.1.2.1. ADC 480i/1080p Comp

1) Check connected condition of Comp cable to the equipment
2) Give a 480i Mode, Horizontal 100% Color Bar Pattern to Comp1. (MSPG-925FA → Model: 209, Pattern: 65)
3) Change input mode as Component1 and picture mode as "Standard"
4) Press the In-start Key on the ADJ remote after at least 1 min of signal reception. Then, select 7.External ADC. And Press OK or Right Button for going to sub menu.
5) Press OK in Comp 480i menu
6) Give a 1080p Mode, Horizontal 100% Color Bar Pattern to Comp1. (MSPG-925FA → Model: 225, Pattern: 65)
7) Press OK in Comp 1080p menu
8) If ADC Comp is successful, "ADC Component Success" is displayed.
9) If ADC calibration is failure, "ADC Component Fail" is displayed.
10) If ADC calibration is failure, after rechecking ADC pattern or condition, retry calibration
11) If ADC calibration is failure, after recheck ADC pattern or condition, retry calibration

9.2. Manual White balance Adjustment

9.2.1. Adj. condition and cautionary items

1) Lighting condition in surrounding area surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
2) Probe location: Color Analyzer (CA-210) probe should be within 10cm and perpendicular of the module surface (80°~100°)
3) Aging time
- After Aging Start, Keep the Power ON status during 5 Minutes.
- In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

9.2.2. Equipment

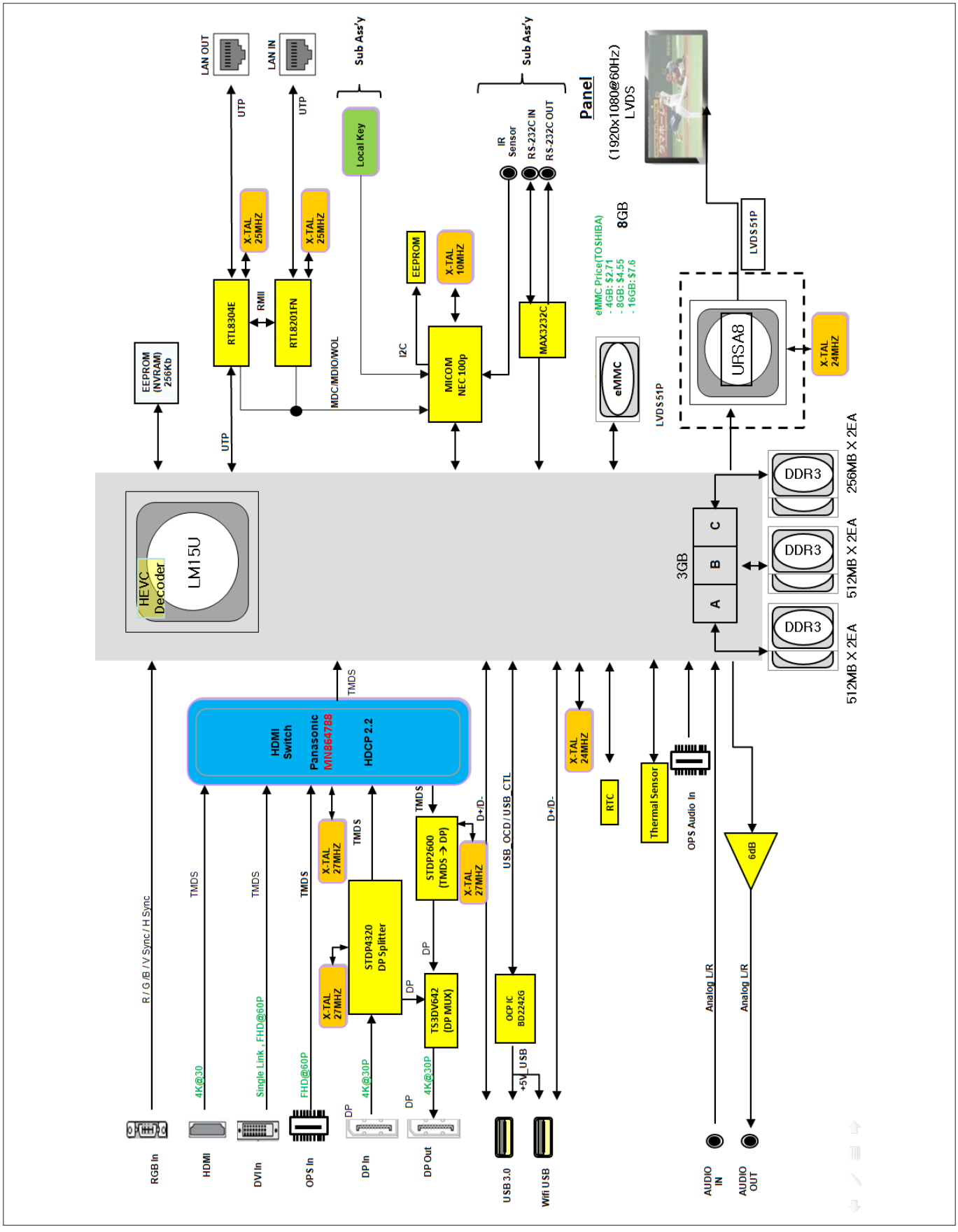
1) Color Analyzer: CA-210 (NCG: CH 9 / WCG: CH12 / LED: CH14)
2) Adj. Computer (During auto adj., RS-232C protocol is needed)
3) Adjust Remocon
4) Video Signal Generator MSPG-925F 720p/204-Gray (Model: 217, Pattern: 49)

9.2.3. Adjustment

1) Set in Adj. mode using POWER ON
2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10cm of the surface.
3) Press ADJ key → EZ adjust using adj. R/C → 6. White-Balance then press the cursor to the right (KEY►). When KEY(►) is pressed 216 Gray internal pattern will be displayed.
4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
5) Adj. is performed in COOL, MEDIUM, WARM 3 modes of color temperature.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 216 Gray pattern.

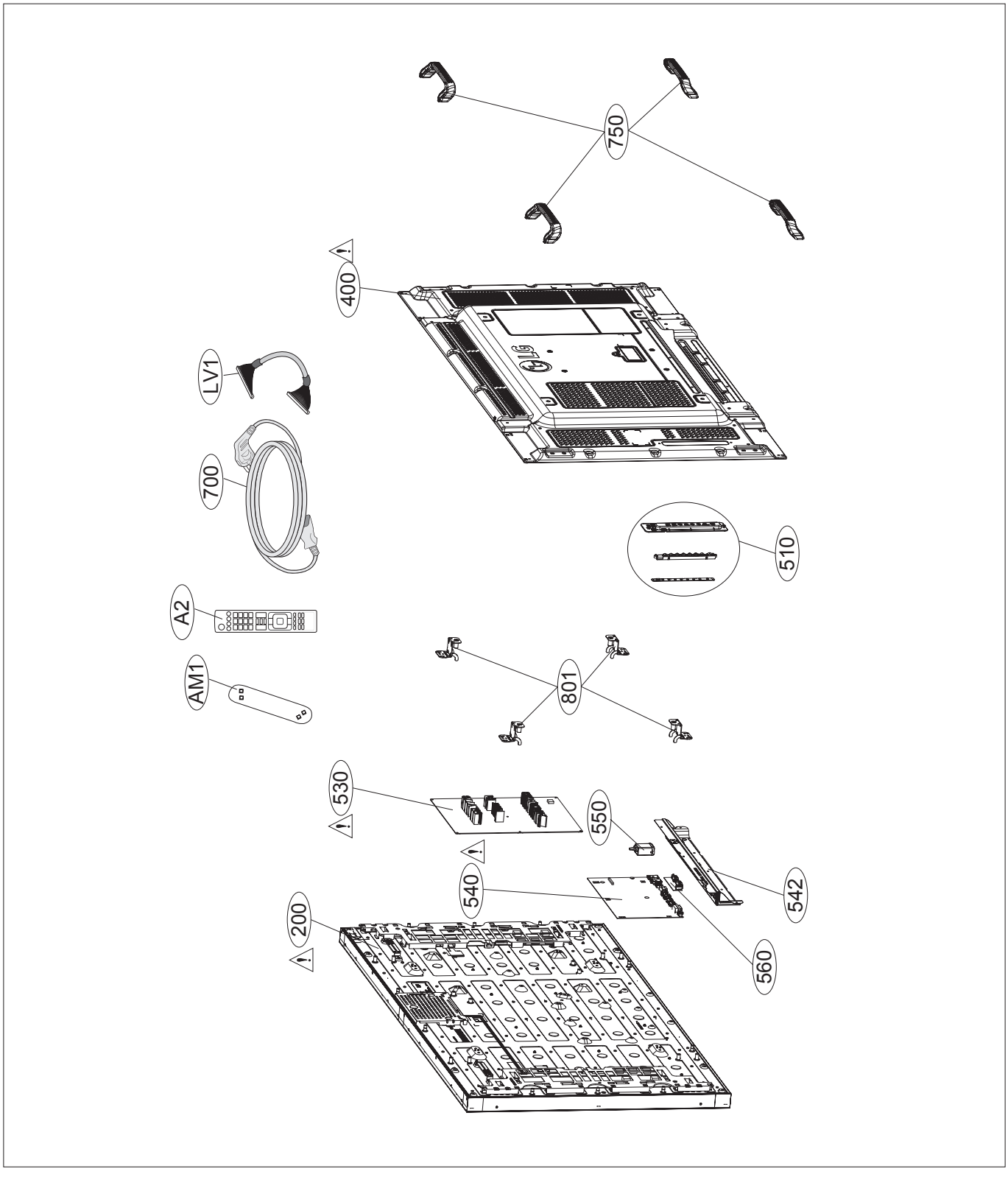
BLOCK DIAGRAM



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 Shock, Fire, or other Hazards.
Do not modify the original design without permission of manufacturer.

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TROUBLESHOOTING GUIDE

Contents of Monitor Signage Standard Repair Process

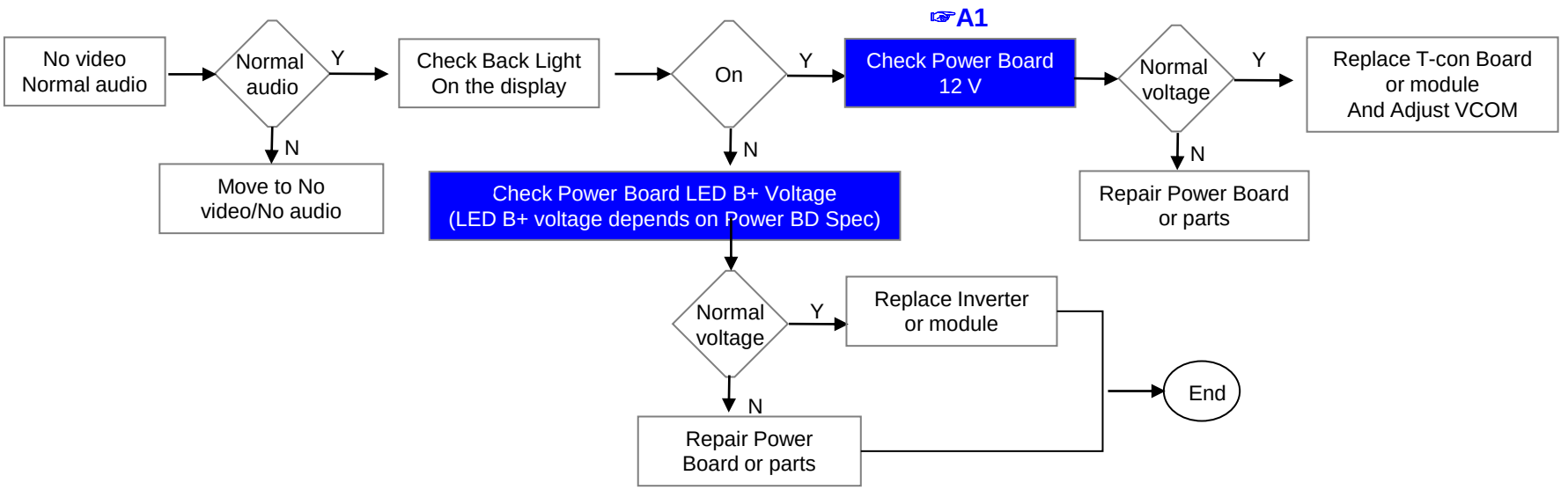
No.	Error symptom (High category)	Error symptom (Mid category)	Remarks
1	A. Video error	No video/Normal audio	
2		No video/No audio	
3		Color error	
4		Vertical/Horizontal bar, residual image, light spot, external device color error	
5	B. Power error	No power	
6		Off when on, off while viewing, power auto on/off	
7	C. Function error	Remote control & Local switch checking	
8		External device recognition error	
9	D. Noise	Circuit noise, mechanical noise	
10	E. Exterior error	Exterior defect	

First of all, Check whether there is SVC Bulletin in GSCS System for these model.

Standard Repair Process

Signage Monitor	Error symptom	A. Video error	Established date		
		No video/ Normal audio	Revised date		

First of all, Check whether all of cables between board is inserted properly or not.
(Main B/D↔ Power B/D, Power Cable, FFC LVDS Cable, Key Cable,,,)

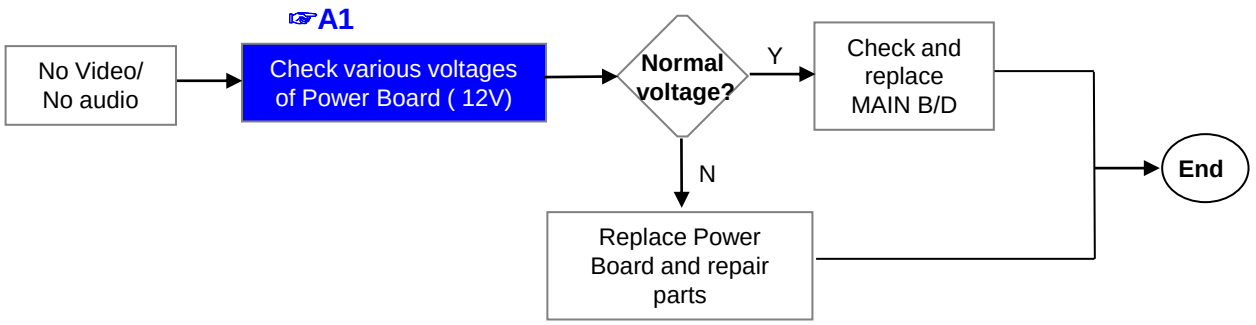


※Precaution ☞ A0 & A2

Always check & record S/W Version and White Balance value before replacing the Main Board → Replace Main Board → Re-enter White Balance value

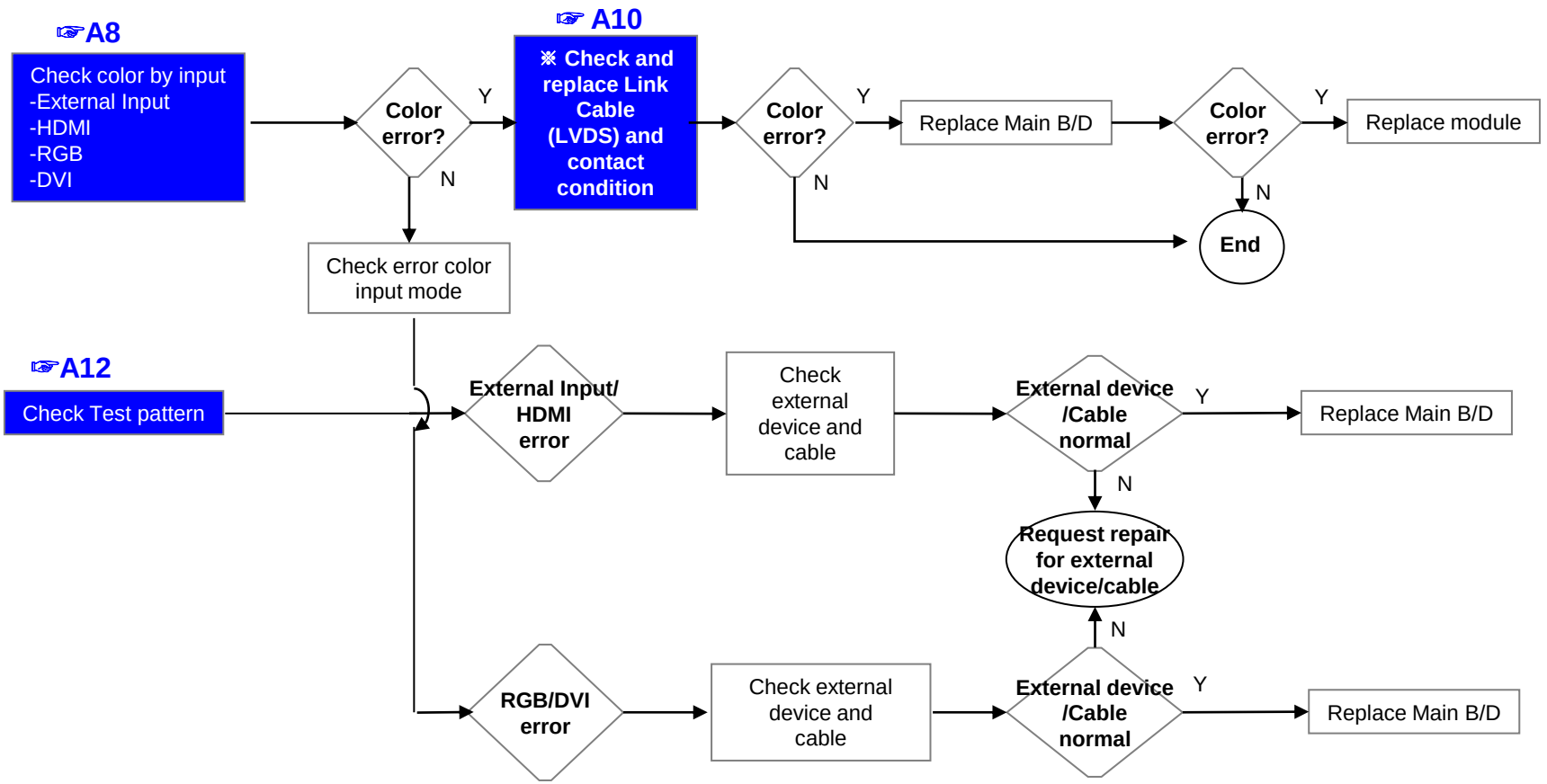
Standard Repair Process

Signage Monitor	Error symptom	A. Video error	Established date		
		No video/ No audio	Revised date		



Standard Repair Process

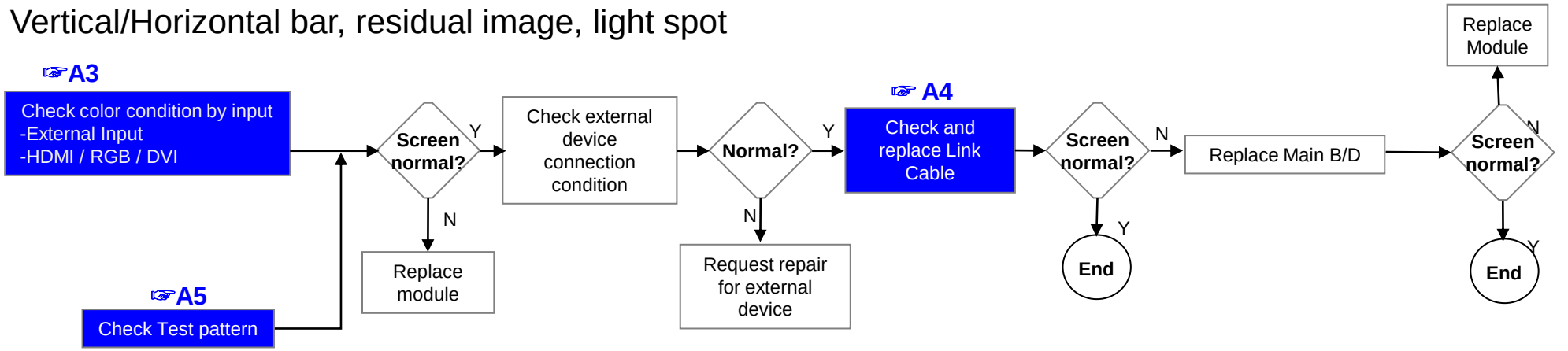
Signage Monitor	Error symptom	A. Video error	Established date		
		Color error	Revised date		



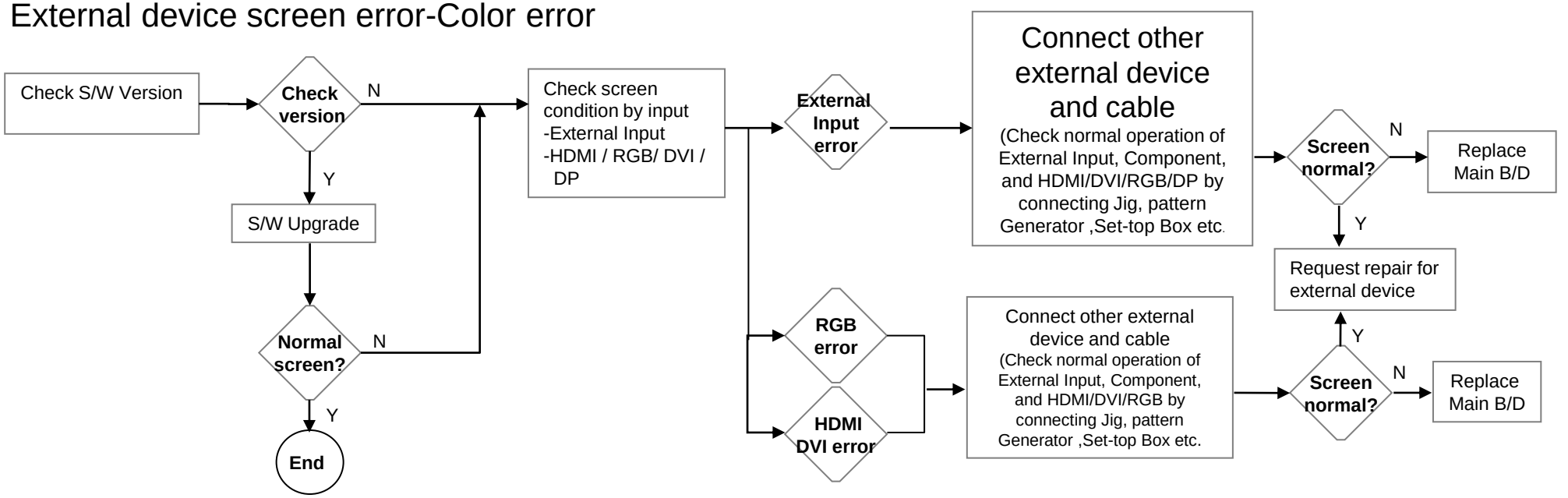
Standard Repair Process

Signage Monitor	Error symptom	A. Video error	Established date		
		Vertical / Horizontal bar, residual image, light spot, external device color error	Revised date		

Vertical/Horizontal bar, residual image, light spot

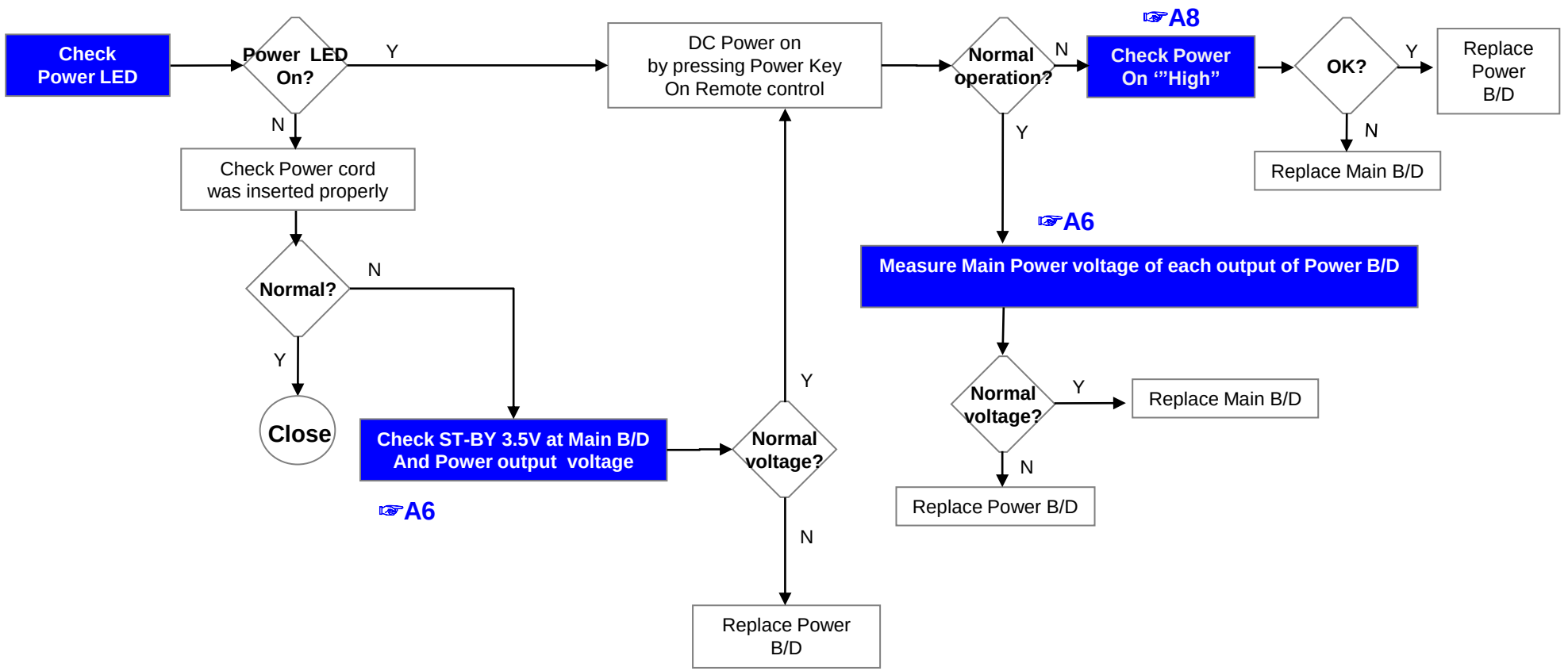


External device screen error-Color error



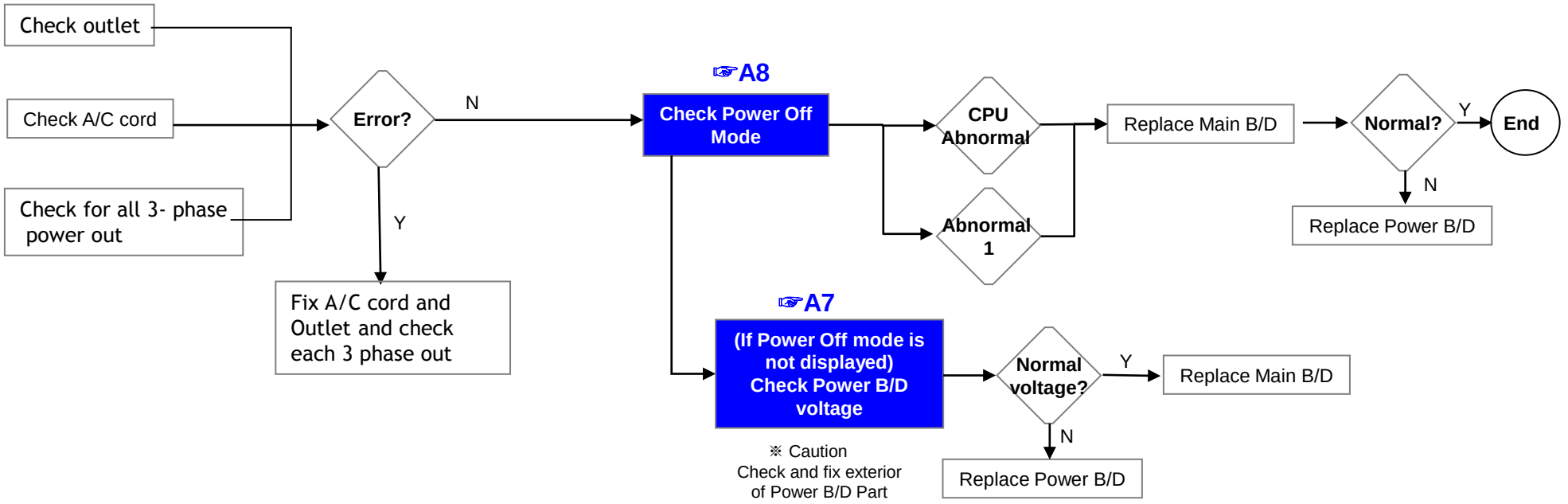
Standard Repair Process

Signage Monitor	Error symptom	B. Power error	Established date		
		No power	Revised date		



Standard Repair Process

Signage Monitor	Error symptom	B. Power error	Established date		
		Off when on, off while viewing, power auto on/off	Revised date		



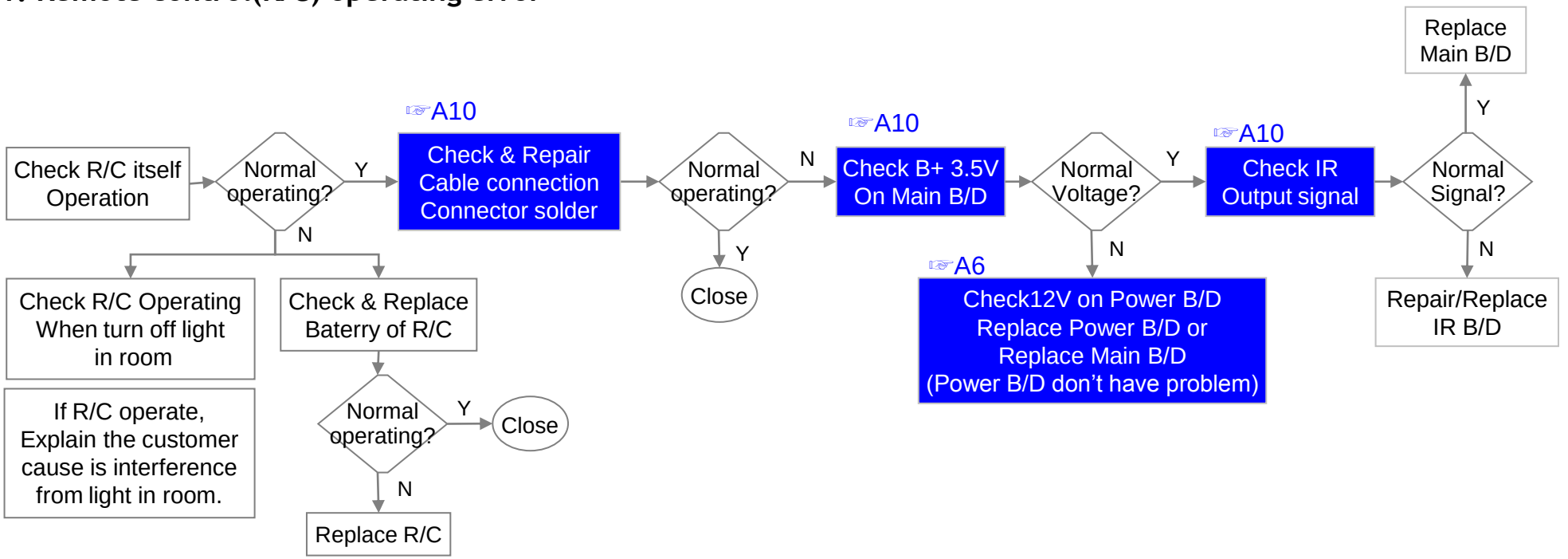
*** Please refer to the all cases which can be displayed on power off mode.**

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reservated Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
Abnormal	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal

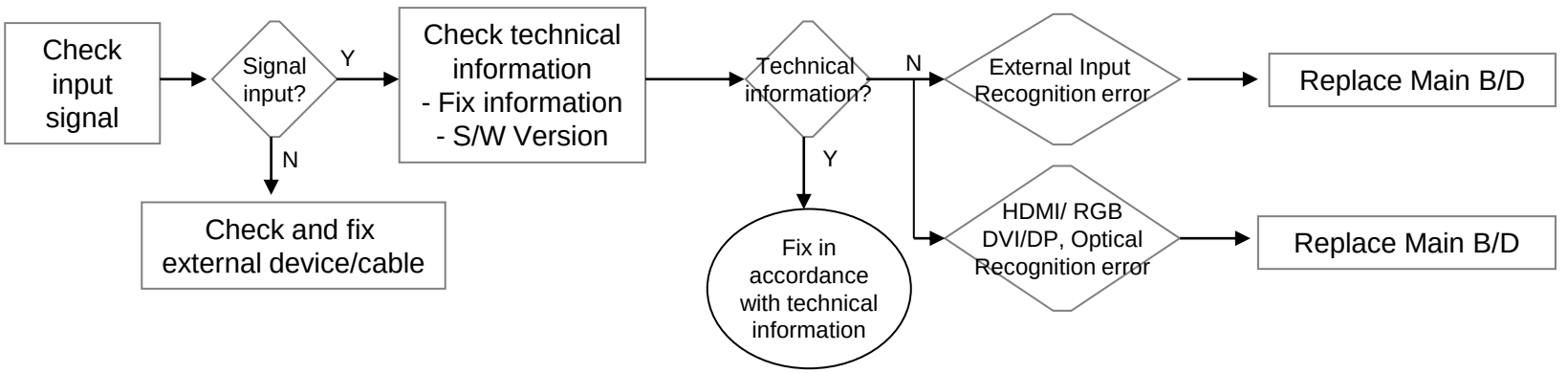
Standard Repair Process

Signage Monitor	Error symptom	C. Function error	Established date		
		Remote control & Local switch checking	Revised date		

1. Remote control(R/C) operating error

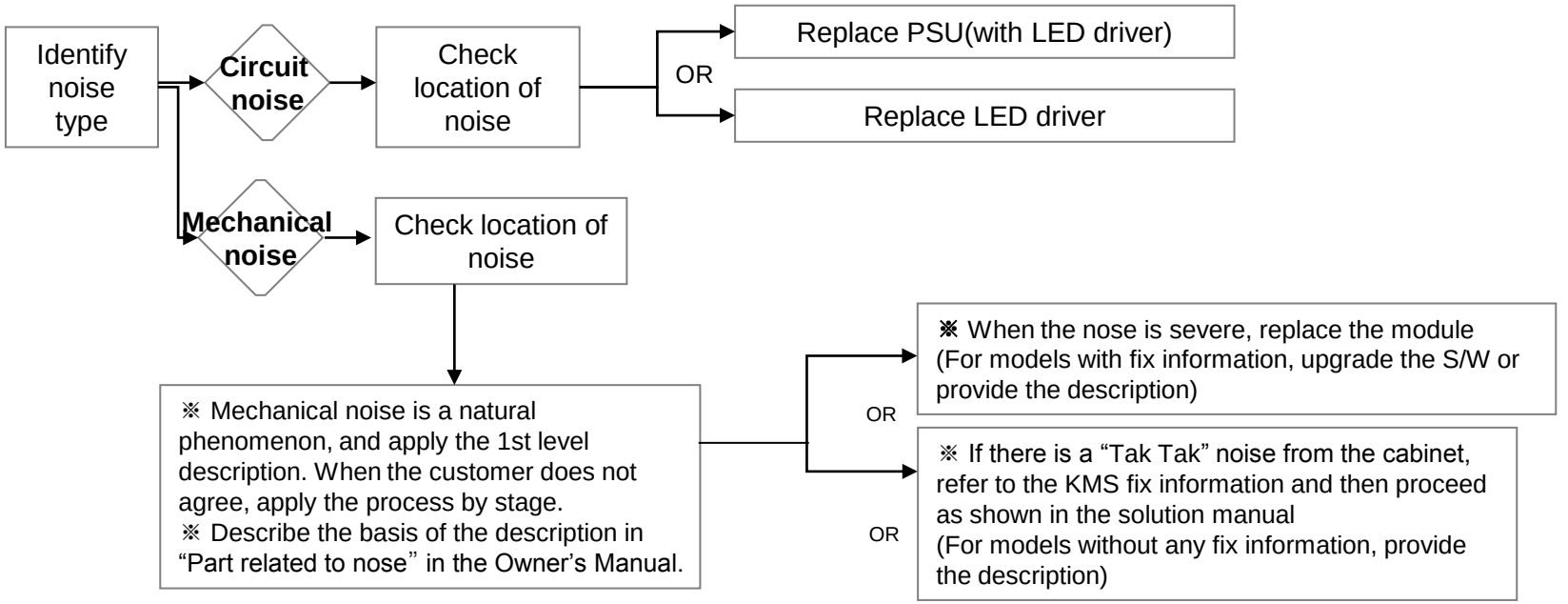


Signage Monitor	Error symptom	C. Function error	Established date		
		External device recognition error	Revised date		



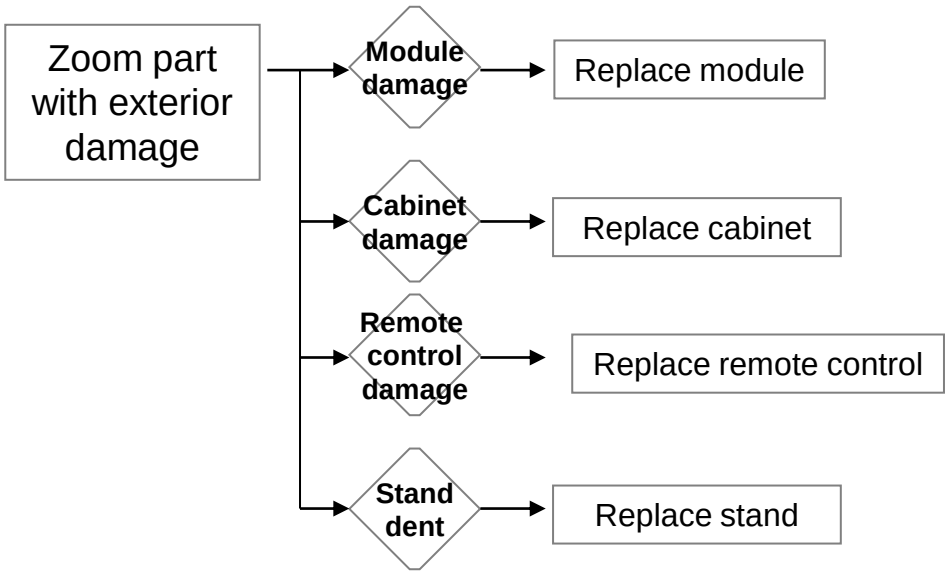
Standard Repair Process

Signage Monitor	Error symptom	D. Noise	Established date		
		Circuit noise, mechanical noise	Revised date		



Standard Repair Process

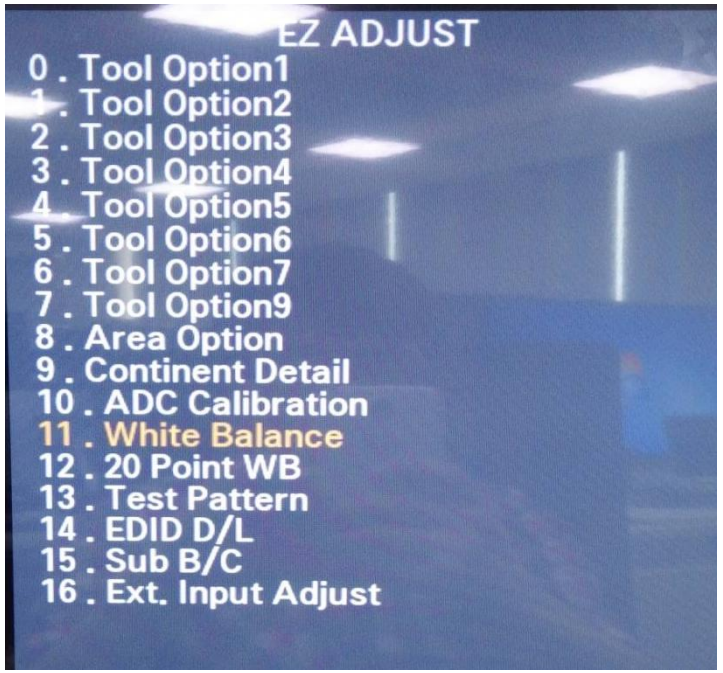
Signage Monitor	Error symptom	E. Exterior error	Established date		
		Exterior defect	Revised date		

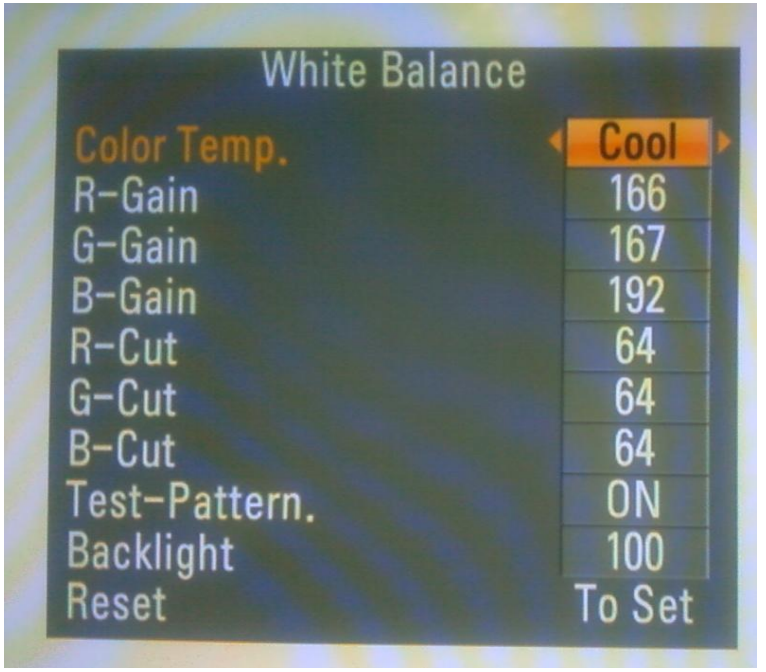


Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error_No video/Normal audio	Established date		
	Content	Check White Balance value	Revised date		

<ALL MODELS>





Entry method

1. Press the ADJ button on the remote control for adjustment.

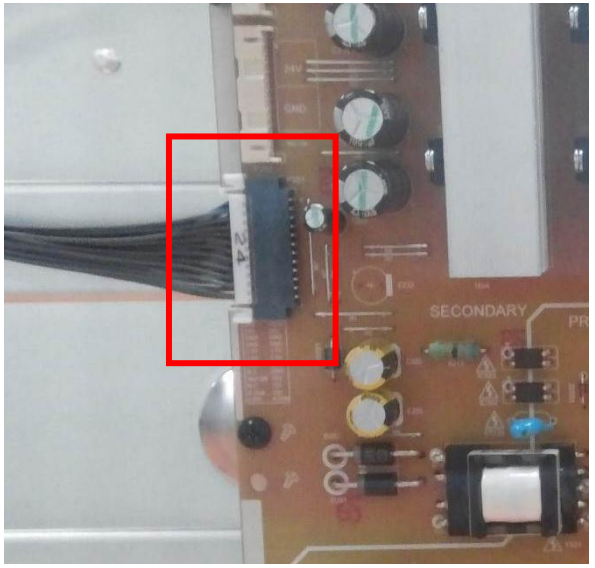
2. Enter into White Balance of item 11.

3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

A0

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error_No video/ Audio	Established date		
	Content	Power Board voltage measuring method	Revised date		



Check the 12V

24 Pin (Power Board ↔ Main Board) Type : SMAW200-H24S5K (BLACK) Maker : YEONHO			
Pin No.	Signal	Pin No.	Signal
1	PWR	2	24V
3	24V	4	24V
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	N.C
17	12V	18	INV-ON
19	12V	20	N.C
21	12V	22	P-DIM
23	A-DIM	24	ERR

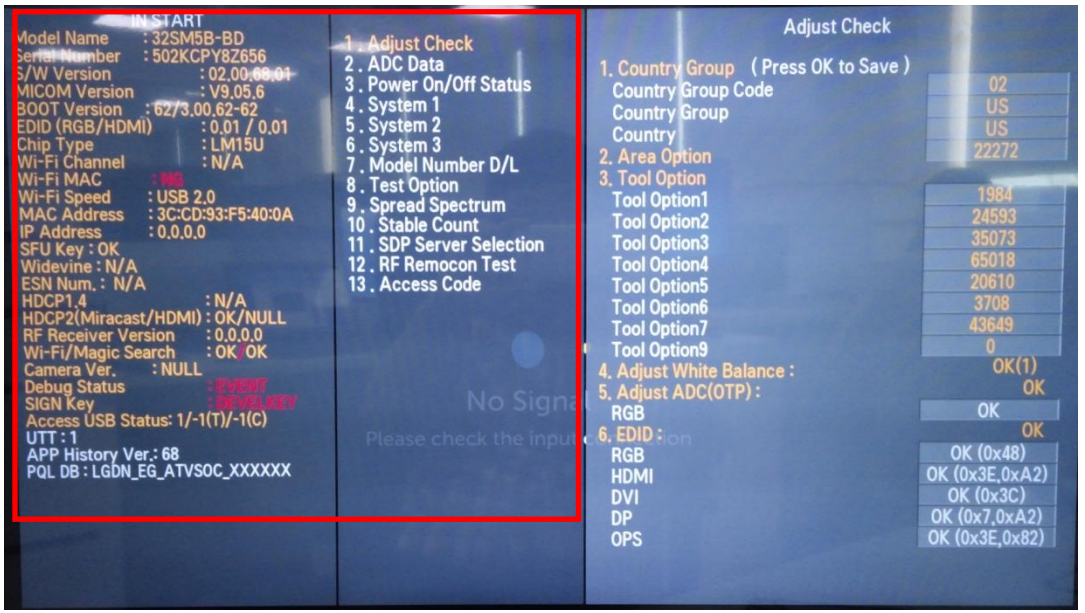
Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error_Video error, video lag/stop	Established date		
	Content	Version checking method	Revised date		

<ALL MODELS>

1. Checking method for remote control for adjustment

Version

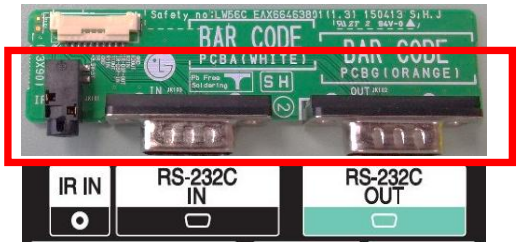


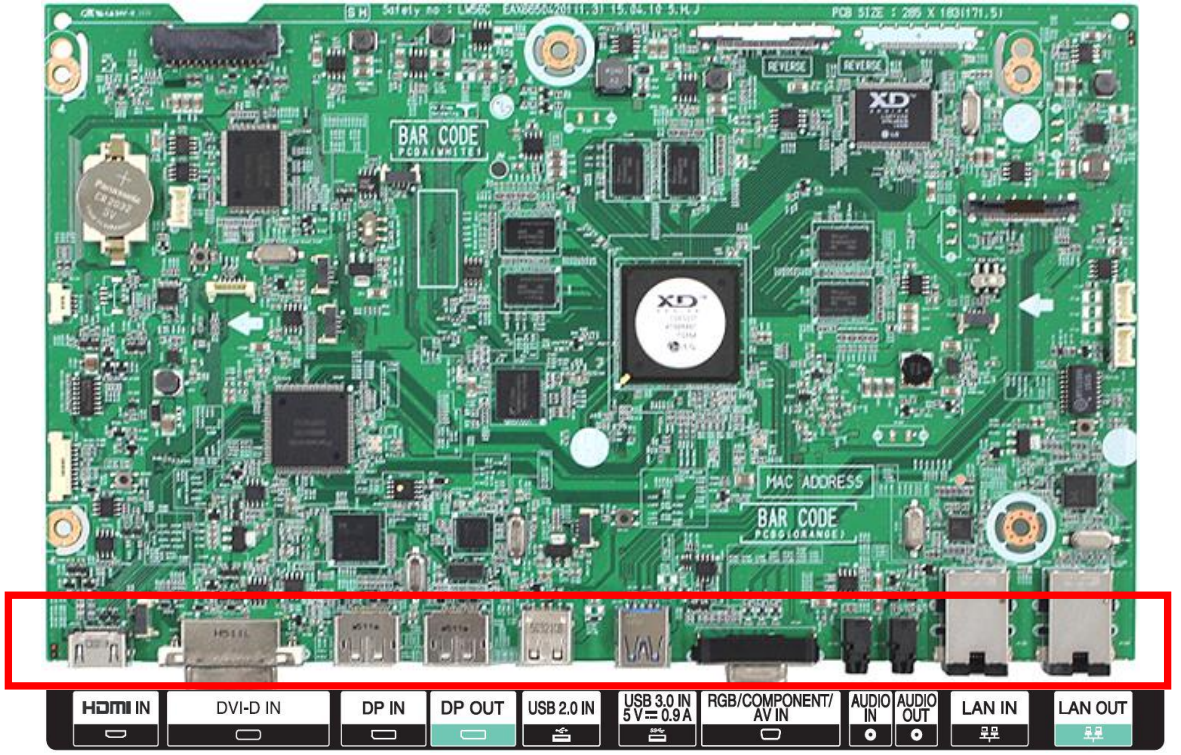
Press the IN-START with the remote control for adjustment

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date		
	Content	LCD Monitor connection diagram	Revised date		

[55VH7B/55VM5B/49VM5C]



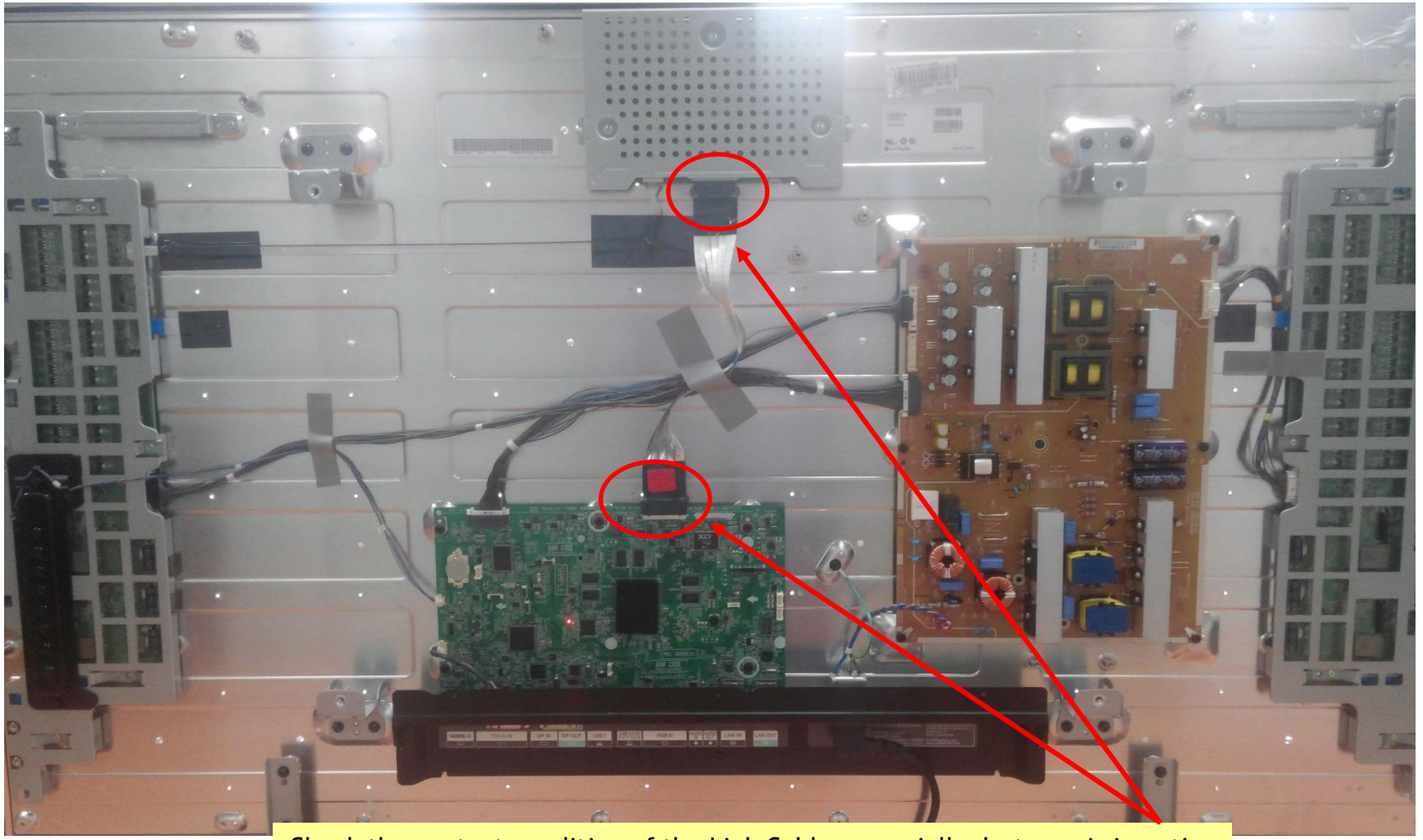


As the part connecting to the external input, check the screen condition by signal

A3

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error_Color error	Established date		
	Content	Check Link Cable reconnection condition	Revised date		

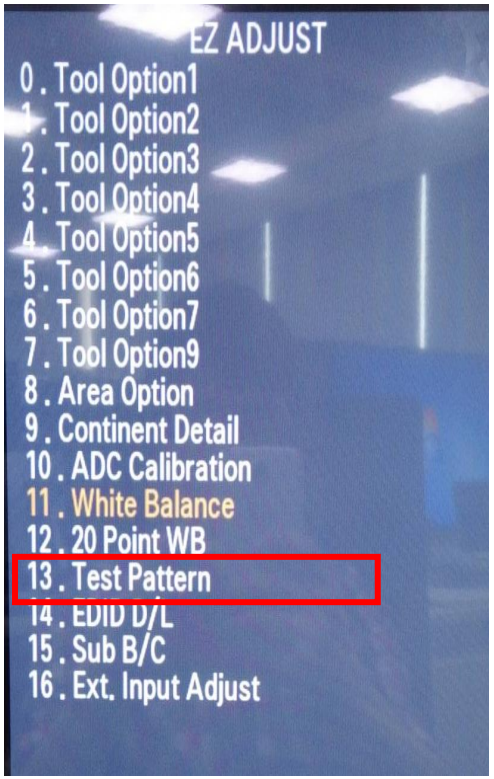


Check the contact condition of the Link Cable, especially dust or mis insertion.

A4

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	A. Video error_Color error	Established date		
	Content	Adjustment Test pattern - ADJ Key	Revised date		

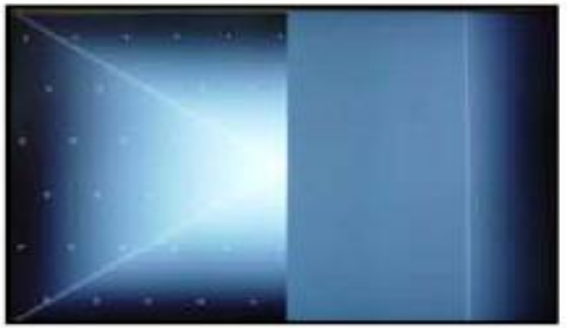


You can view 6 types of patterns using the ADJ Key

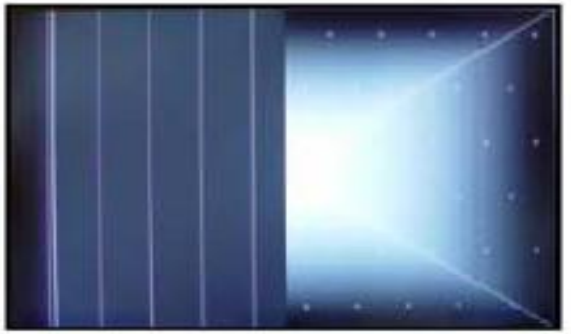
Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)

Appendix : Exchange LVDS Cable or Main B/D (1)

Solder defect, CNT Broken

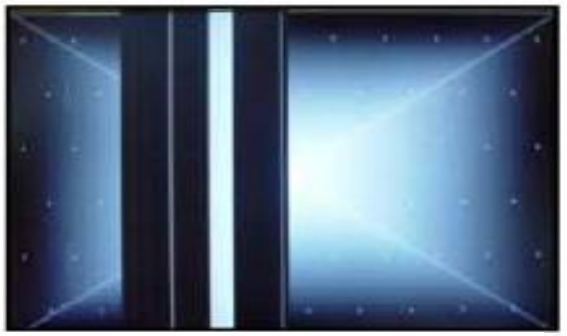


Solder defect, CNT Broken



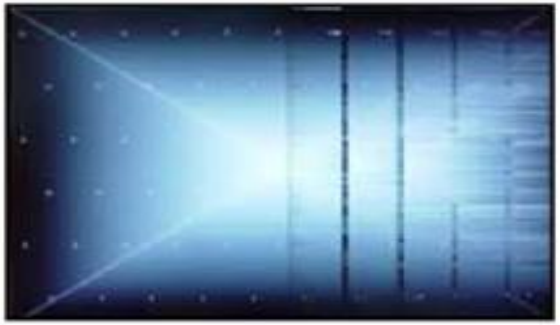
Solder defect, CNT Broken

Solder defect, CNT Broken



Solder defect, CNT Broken

Abnormal Power Section

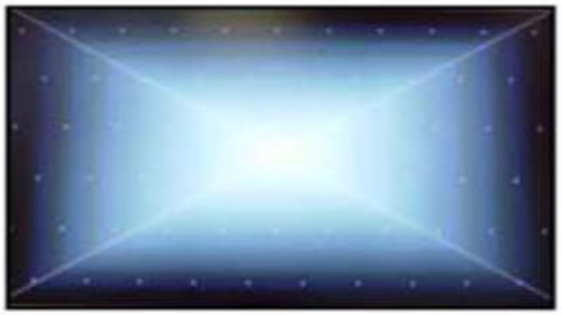


Solder defect, Short/Crack

Abnormal Power Section

Solder defect, Short/Crack

Appendix : Exchange LVDS Cable or Main B/D (2)



Abnormal Power Section

Abnormal Power Section

Solder defect, Short/Crack

Solder defect, Short/Crack

Fuse Open, Abnormal power section

Abnormal Display

GRADATION

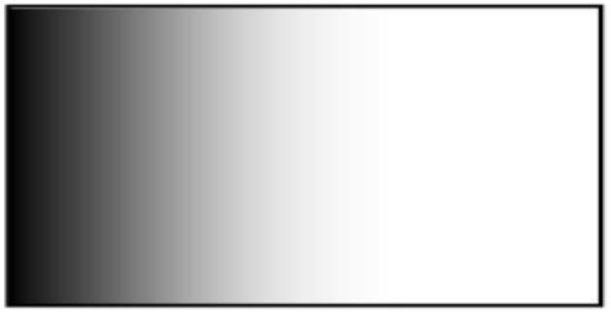
Noise

GRADATION

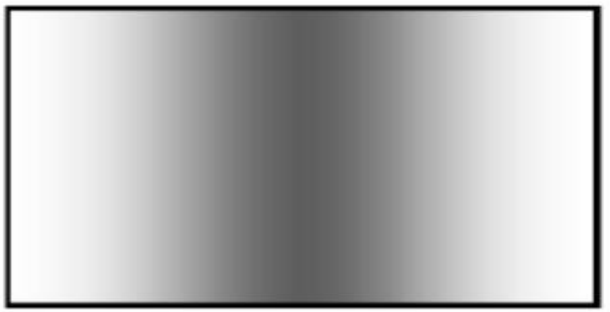
Appendix : Exchange Power Board

No Light

Dim Light



Dim Light



Dim Light

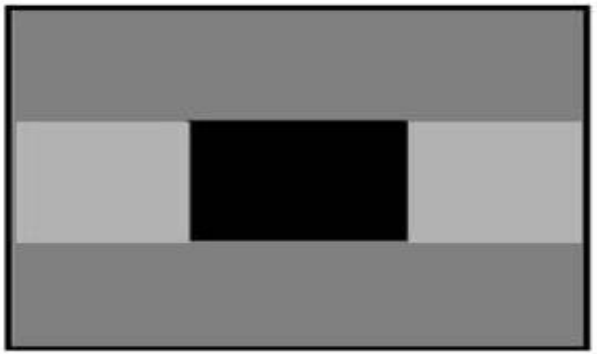
No picture/Sound Ok

Appendix : Exchange the Module (1)

Panel Mura, Light leakage

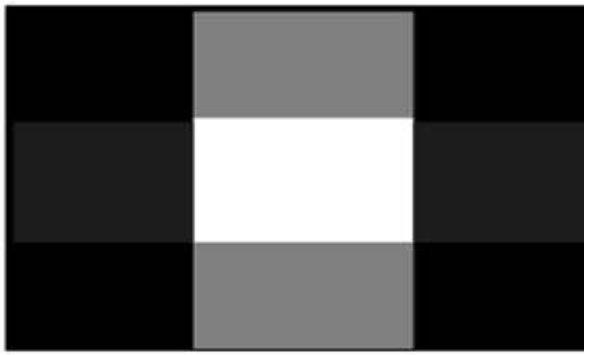
Panel Mura, Light leakage

Press damage



Crosstalk

Press damage



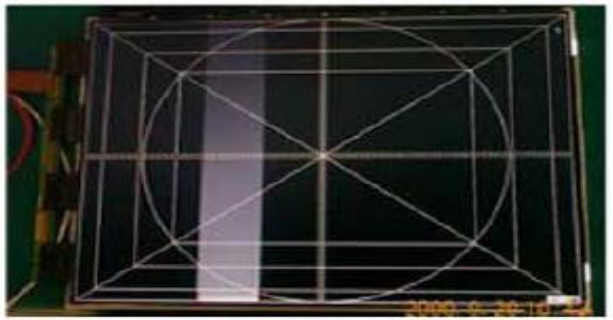
Crosstalk

Press damage

Un-repairable Cases

In this case please exchange the module.

Appendix : Exchange the Module (2)



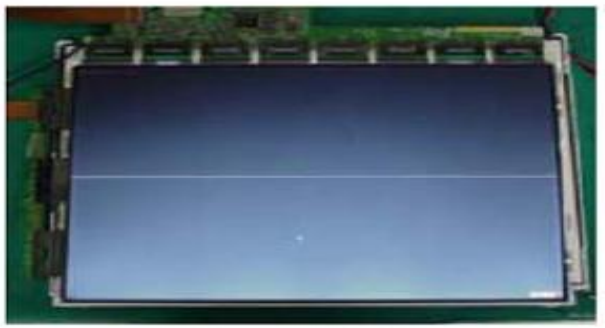
Vertical Block
Source TAB IC Defect

Vertical Line
Source TAB IC Defect

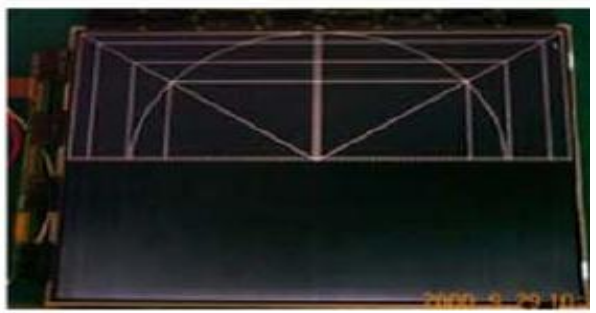
Vertical Block
Source TAB IC Defect

Horizontal Block
Gate TAB IC Defect

Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect



Horizontal Block
Gate TAB IC Defect

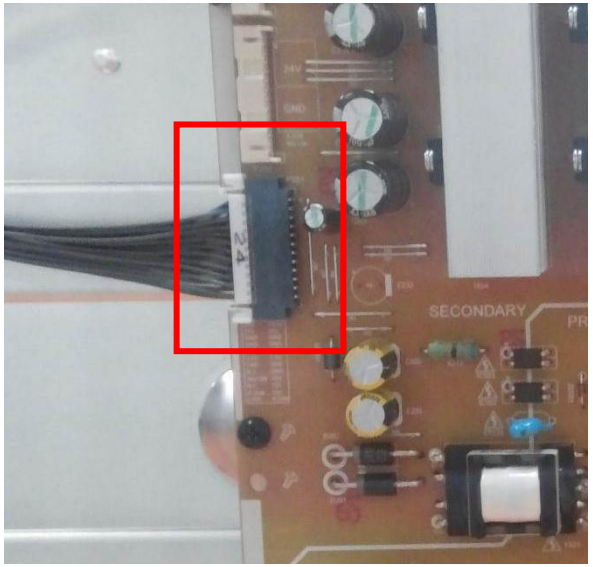
Un-repairable Cases

In this case please exchange the module.

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	B. Power error _No power	Established date		
	Content	Check power input voltage and ST-BY 3.5V	Revised date		

Check the Main Power Voltage (2,3,4 9, 10,11,12,17,18, 19, 21Pin)

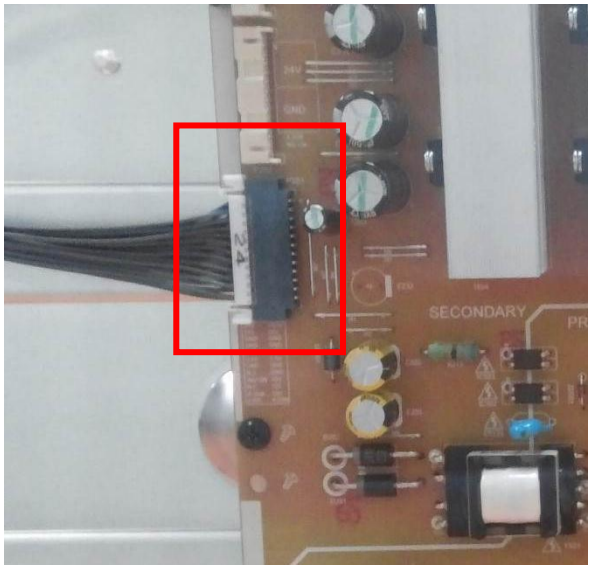


24 Pin (Power Board ↔ Main Board)			
Type : SMAW200-H24S5K (BLACK) Maker : YEONHO			
Pin No.	Signal	Pin No.	Signal
1	PWR	2	24V
3	24V	4	24V
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	N.C
17	12V	18	INV-ON
19	12V	20	N.C
21	12V	22	P-DIM
23	A-DIM	24	ERR

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	B. Power error _No power	Established date		
	Content	Checking method when power is ON	Revised date		

Check “power on(Pin 1)” pin is high

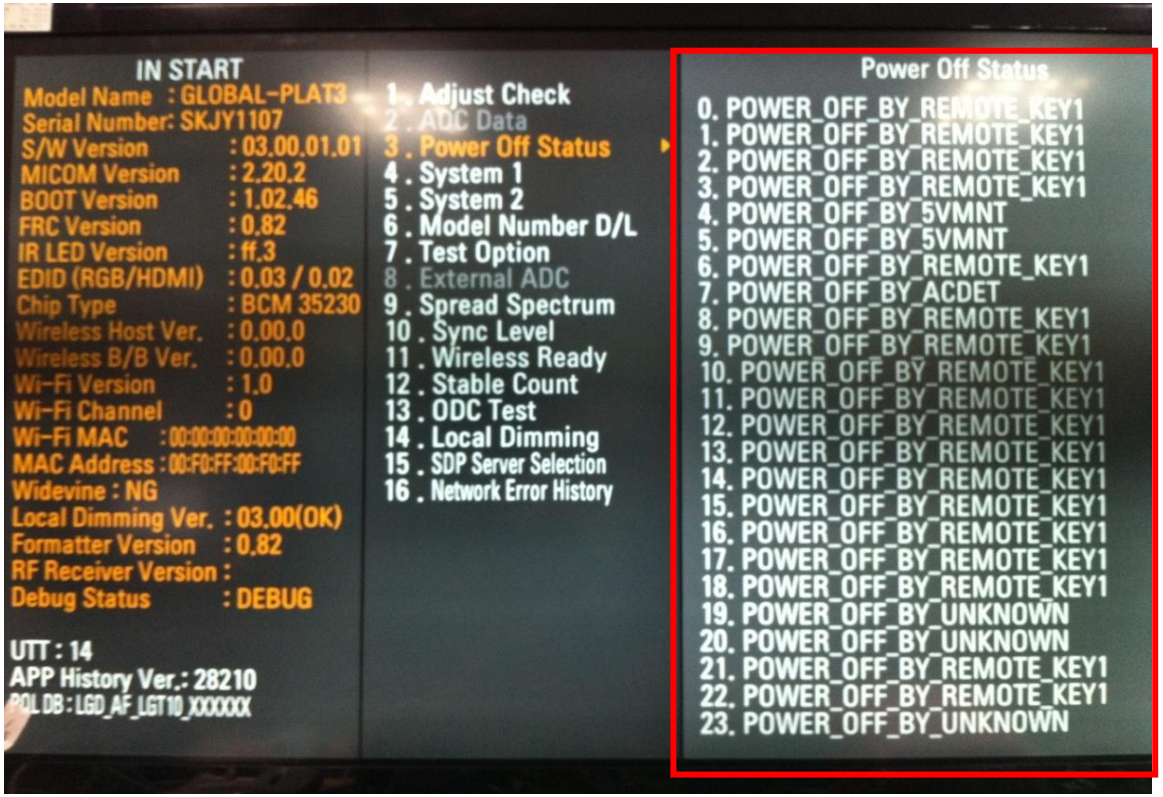


24 Pin (Power Board ↔ Main Board)			
Type : SMAW200-H24S5K (BLACK) Maker : YEONHO			
Pin No.	Signal	Pin No.	Signal
1	PWR	2	24V
3	24V	4	24V
5	GND	6	GND
7	GND	8	GND
9	3.5V	10	3.5V
11	3.5V	12	3.5V
13	GND	14	GND
15	GND	16	N.C
17	12V	18	INV-ON
19	12V	20	N.C
21	12V	22	P-DIM
23	A-DIM	24	ERR

Standard Repair Process Detail Technical Manual

Signage Monitor	Error symptom	B. Power error _Off when on, off whiling viewing	Established date		
	Content	POWER OFF MODE checking method	Revised date		

<ALL MODELS>



Entry method

1. Press the IN-START button of the remote control for adjustment

2. Check the entry into adjustment item 3

A8

Standard Repair Process Detail Technical Manual

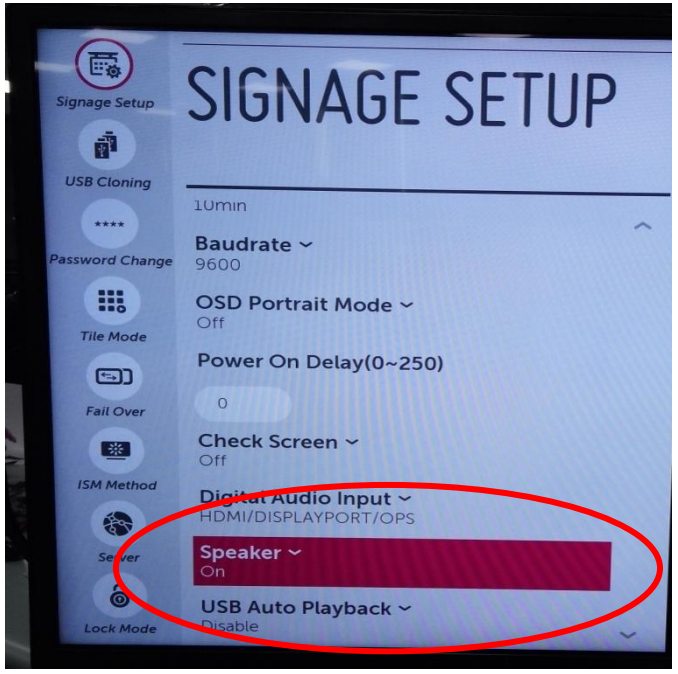
Signage Monitor	Error symptom	C. Audio error_No audio/Normal video	Established date		
	Content	Checking method in menu when there is no audio	Revised date		

<ALL MODELS>

Press the “Settings” or “Menu” Button over then 5 Sec

Appear square on top-right

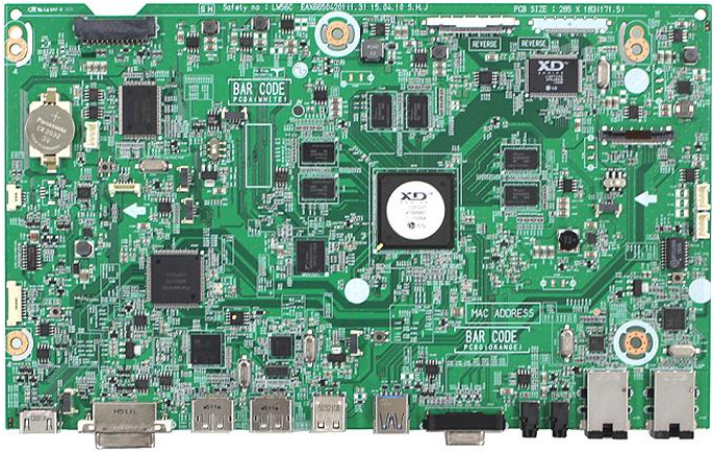
1. Press the “0” 4 times.
2. Press the “OK” Button



Checking method

1. Press the MENU button on the remote control for five seconds.
2. When the square appear on top-right, press the “0” 4 times and press “OK”.
3. Select the Speaker of Signage Setup
4. Select “ON”

[55VH7B/55VM5B/49VM5C Models]



JK101

JK101	
M1	IR
M2	NC
M3	+3.5V_ST

Checking order

1. Check IR cable condition between IR & Main board
2. Check the stand-by 3.5V on the terminal M3.
3. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.