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LED TV

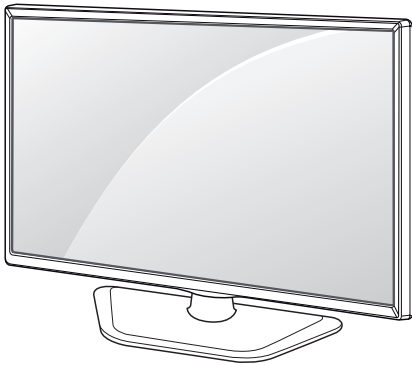
SERVICE MANUAL

CHASSIS : LM91M

MODEL : 22LN41** 22LN41**-T*

CAUTION

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



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SCHEMATIC CIRCUIT DIAGRAM	

SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by \triangle 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.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M Ω and 5.2 M Ω .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.

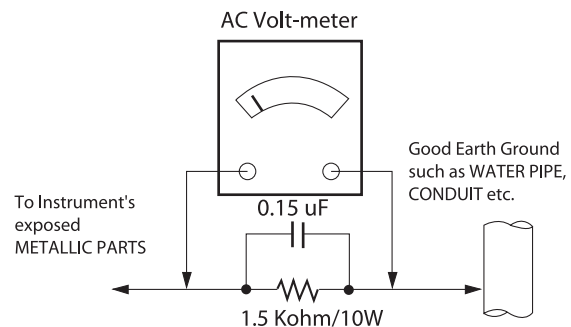
Connect 1.5 K / 10 watt resistor in parallel with a 0.15 uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

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

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;

- Removing or reinstalling any component, circuit board module or any other receiver assembly.
- Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
- 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.

- 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".
- Do not spray chemicals on or near this receiver or any of its assemblies.
- 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 is not required.
- Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
- 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.
- 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.
- 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.

- 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.

- 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.
- Use only a grounded-tip soldering iron to solder or unsolder ES devices.
- 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.
- Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
- 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).
- 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.
- 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

- Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range of 500 °F to 600 °F.
- Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
- Keep the soldering iron tip clean and well tinned.
- Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
- Use the following unsoldering technique
 - Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
 - Heat the component lead until the solder melts.
 - 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.
- Use the following soldering technique.
 - Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
 - First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
 - 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.
 - 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

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LB35B 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 5 minutes prior to the adjustment.

3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
 - Safety : CE, IEC specification
 - EMC : CE, IEC

4. Model General Specification

* HDMI 1.4 with Deep Color is only apply for FHD Model

No.	Item	Specification			Remarks
1.	Market	NON EU			
2.	Broadcasting system	PAL/SECAM B/G/D/K PAL-I NTSC-M			
3.	Channel Storage	BAND	PAL(BG,I)	NTSC(M)	China(DK)
		VHF/UHF	01-C69	2~78	C1~C69
		Cable	S1~S47	1~71	S1~S47
4.	Receiving system	Upper Heterodyne			
5.	Video Input	PAL, SECAM, NTSC			Rear (2EA)
6.	Component Input	Y/Cb/Cr, Y/Pb/Pr			Rear (1EA)
7.	USB Input	MP3, JPEG,Movie			Side(1EA)
8.	AV Audio Output	RF/AV/HDMI Audio Output			Rear (1EA)
9.	D-SUB INPUT	S/W Upgrade Only			Rear (1EA)
10.	HDMI Input	HDMI-DTV, Only PCM MODE			Rear (2EA)
11.	Audio Input (1EA)	AV&Component			L/R Input(2EA)

5. Component Video Input (Y, P_B, P_R)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)	Proposed
1.	720*480	15.73	59.94	13.500	SDTV, DVD 480I(525I)
2.	720*480	15.75	60.00	13.514	SDTV, DVD 480I(525I)
3.	720*576	15.625	50.00	13.500	SDTV, DVD 576I(625I) 50Hz
4.	720*480	31.47	59.94	27.000	SDTV 480P
5.	720*480	31.50	60.00	27.027	SDTV 480P
6.	720*576	31.25	50.00	27.000	SDTV 576P 50Hz
7.	1280*720	44.96	59.94	74.176	HDTV 720P
8.	1280*720	45.00	60.00	74.250	HDTV 720P
9.	1280*720	37.50	50.00	74.25	HDTV 720P 50Hz
10.	1920*1080	28.125	50.00	74.250	HDTV 1080I 50Hz,
11.	1920*1080	33.72	59.94	74.176	HDTV 1080I
12.	1920*1080	33.75	60.00	74.25	HDTV 1080I
13.	1920*1080	56.25	50	148.5	HDTV 1080P
14.	1920*1080	67.432	59.94	148.350	HDTV 1080P
15.	1920*1080	67.5	60.00	148.5	HDTV 1080P

6. HDMI Input

6.1. PC Mode

* Spec. out but it can be shown the picture at only HDMI/DVI IN 1 via DVI to HDMI Cable

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	Remarks
1.	640×480	31.469	59.94	25.17	VESA(VGA)	
2.	800×600	37.879	60.317	40.00	VESA(SVGA)	
3.	1024×768	48.363	60.004	65.00	VESA(XGA)	
4.	1280×768	47.776	59.87	79.5	VESA(WXGA)	
5.	1360×768	47.72	59.799	84.62	VESA(WXGA)	
6.	1366×768	47.7	60.00	84.62	WXGA	
7.	1280×1024	63.595	60.00	108.875	SXGA	
8.	1920×1080	66.647	59.988	138.625	WUXGA	

* Monitor Range Limits

Min Vertical Freq - 58 Hz / Max Vertical Freq - 63 Hz

Min Horiz. Freq - 28 kHz / Max Horiz. Freq - 68 kHz

Pixel Clock - 150 MHz

6.2. DTV Mode

No.	Resolution	H-freq(kHz)	V-freq.(kHz)	Pixel clock(MHz)	Proposed	Remarks
1.	720*480	15.73	59.94	13.500	SDTV, DVD 480I(525I)	Spec. out but display.
2.	720*480	15.75	60.00	13.514	SDTV, DVD 480I(525I)	
3.	720*576	15.625	50.00	13.500	SDTV, DVD 576I(625I) 50Hz	
4.	720*480	31.47	59.94	27	SDTV 480P	
5.	720*480	31.5	60.00	27.027	SDTV 480P	
6.	720*576	31.25	50.00	27	SDTV 576P	
7.	1280*720	44.96	59.94	74.176	HDTV 720P	
8.	1280*720	45	60.00	74.25	HDTV 720P	
9.	1280*720	37.5	50.00	74.25	HDTV 720P	
10.	1920*1080	28.125	50.00	74.25	HDTV 1080I	
11	1920*1080	33.72	59.94	74.176	HDTV 1080I	
12	1920*1080	33.75	60.00	74.25	HDTV 1080I	
13	1920*1080	56.25	50.00	148.5	HDTV 1080P	
14	1920*1080	67.432	59.94	148.350	HDTV 1080P	
15	1920*1080	67.5	60.00	148.5	HDTV 1080P	
16	1920*1080	27	24.00	74.25	HDTV 1080P	
17	1920*1080	33.75	30.00	74.25	HDTV 1080P	
18	1920*1080	26.97	23.97	74.25	HDTV 1080P	
19	1920*1080	33.716	29.976	74.25	HDTV 1080P	

ADJUSTMENT INSTRUCTION

1. Application Range

This specification sheet is applied to all of the LED TV with LB35B chassis.

2. Designation

- (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 100-220 V, 50/60Hz.
- (5) The receiver must be operated for over 5 minutes prior to the adjustment when module is in the circumstance of above 15 °C.
 - ▶ 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 a still image is displayed for 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. MAIN PCBA Adjustments

3.1. ADC Calibration

3.1.1. Using D/L Jig

- An ADC calibration is automatically adjusted from DFT-Jig
- If it needs to adjust manually, refer to appendix.

* ADC Calibration Protocol (RS232)

NO	Item	CMD 1	CMD 2	Data 0	
Enter Adjust MODE	Adjust 'Mode In'	A	A	0 0	When transfer the 'Mode In', Carry the command.
ADC adjust	ADC Adjust	A	D	1 0	Automatically adjustment (The use of a internal pattern)

Adjust Sequence

- aa 00 00 [Enter Adjust Mode]
- xb 00 40 [Component1 Input (480i)]
- ad 00 10 [Adjust 480i Comp1]
- aa 00 90 End Adjust mode

3.2. EDID Download

▪ HD MODEL

** HDMI 1 : 256Bytes																
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	F3	30	A4	54	46	96	26
20	0F	49	4B	21	08	00	45	40	01	01	61	40	01	01	01	01
30	01	01	01	01	01	01	01	1D	00	72	51	D0	1E	20	6E	28
40	55	00	C4	8E	21	00	00	1E	1B	21	50	A0	51	00	1E	30
50	48	88	35	00	BC	77	21	00	00	1C	00	00	00	FC	00	4C
60	47	20	54	56	0A	20	20	20	20	20	20	20	00	00	00	FD
70	00	3A	3F	1C	44	0F	00	0A	20	20	20	20	20	20	01	(a)
80	02	03	28	F1	4F	84	07	01	16	02	03	11	12	13	14	05
90	20	22	1F	10	26	11	07	50	09	7F	07	83	01	00	00	68
A0	03	0C	00	10	00	80	1E	00	01	1D	00	80	51	D0	1C	20
B0	40	80	35	00	BC	88	21	00	00	1E	8C	0A	D0	8A	20	E0
C0	2D	10	10	3E	96	00	13	8E	21	00	00	18	8C	0A	A0	14
D0	51	F0	16	00	26	7C	43	00	C4	8E	21	00	00	98	01	1D
E0	80	18	71	1C	16	20	58	2C	25	00	C4	8E	21	00	00	9E
F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	(a)

▪ 8BIT FHD MODEL

** HDMI 1 : 256Bytes																
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	D9	B0	A3	57	49	9C	25
20	11	49	4B	21	08	00	01	01	45	40	61	40	01	01	81	80
30	01	01	D1	C0	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	08	44	21	00	00	1E	1B	21	50	A0	51	00	1E	30
50	48	88	35	00	BC	88	21	00	00	1C	00	00	00	FC	00	4C
60	47	20	54	56	0A	20	20	20	20	20	20	20	00	00	00	FD
70	00	3A	3F	1C	44	0F	00	0A	20	20	20	20	20	20	01	(a)
80	02	03	28	F1	4F	90	07	01	16	02	03	11	12	13	04	14
90	05	20	22	1F	26	11	07	50	09	7F	07	83	01	00	00	68
A0	03	0C	00	10	00	80	1E	00	01	1D	00	80	51	D0	1C	20
B0	40	80	35	00	BC	88	21	00	00	1E	8C	0A	D0	8A	20	E0
C0	2D	10	10	3E	96	00	13	8E	21	00	00	18	8C	0A	A0	14
D0	51	F0	16	00	26	7C	43	00	C4	8E	21	00	00	98	01	1D
E0	80	18	71	1C	16	20	58	2C	25	00	C4	8E	21	00	00	9E
F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	(a)

a. White Balance Adjustment

EDID C/S data		HD	FHD (8Bit)
		HDMI	HDMI
Check sum (Hex)	Block 0	A5	C1
	Block 1	44(HDMI1)	44 (HDMI1)
		34(HDMI2)	34 (HDMI2)

4. White Balance Adjustment

4.1. Overview

4.1.1. W/B adj. Objective & How-it-works

- (1) Objective: To reduce each Panel's W/B deviation
- (2) 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.
- (3) Adj. condition: normal temperature
 - 1) Surrounding Temperature: 25 °C ± 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

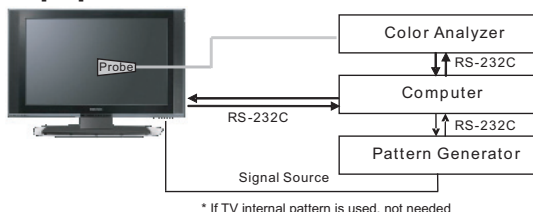
4.1.2. Adj. condition and cautionary items

- (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 10 cm and perpendicular of the module surface (80°~ 100°)
- (3) Aging time
 - 1) After Aging Start, Keep the Power ON status during 5 Minutes.
 - 2) In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

4.2. 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)
- * Color Analyzer Matrix should be calibrated using CS-1000.

4.3. Equipment connection



4.4. Adjustment Command (Protocol)

- (1) RS-232C Command used during auto-adj.

RS-232C COMMAND			Explanation
CMD	DATA	ID	
wb	00	00	Begin White Balance adjustment
wb	00	ff	End White Balance adjustment (internal pattern disappears)

(2) Adjustment Map

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

4.5. Adjustment method

4.5.1. Auto WB calibration

- (1) Set TV in ADJ mode using P-Only key(or POWER ON key).
- (2) Place optical probe on the center of the display.
- It need to check probe condition of zero calibration before adjustment.
- (3) Connect RS-232C Cable
- (4) Select mode in ADJ Program and begin a adjustment.
- (5) When WB adjustment is completed with OK message, check adjustment status of pre-set mode. (Cool, Medium, Warm)
- (6) Remove probe and RS-232C cable.
 - W/B Adj. must begin as start command "wb 00 00" , and finish as end command "wb 00 ff" , and Adj. offset if need.

4.5.2. LED White balance table

- If Model is Polaris Model, G-gain fix is applied.

- (1) Cool Mode
 - 1) Purpose : Adjust the color temperature to reduce the deviation of the module color temperature.
 - 2) Principle : To adjust the white balance without the saturation, Fix the G gain to 172 (default data) and change the others (R/B Gain).
 - 3) Adjustment mode : mode - Cool
- (2) Medium / Warm Mode
 - 1) Purpose : Adjust the color temperature to reduce the deviation of the module color temperature.
 - 2) Principle : To adjust the white balance without the saturation, Fix the one of R/G/B gain to 192 (default data) and decrease the others.
 - 3) Adjustment mode : Two modes - Medium / Warm

4.6. Reference(White Balance Adjustment coordinate and color temperature)

- (1) Luminance: 204 Gray, 80IRE
- (2) Standard color coordinate and temperature using CS-1000 (over 26 inch)

■ The spec of color temperature and coordinate.

Mode	Color Temp	Color coordinate	Remark
Cool (C50)	13,000 K	x = 0.269 (±0.002) y = 0.273 (±0.002)	* Test signal - Inner pattern for W/B adjust - External white pattern (85IRE, 204gray)
Medium (0)	9,300 K	x = 0.285 (±0.002) y = 0.293 (±0.002)	
Warm (W50)	6,500 K	x = 0.313 (±0.002) y = 0.329 (±0.002)	

* Note : x,y coordinates are drifted about 0.007 after 30 mins heat-run. So checking color coordinate within 5-min at total assembly line, consider x,y coordinates might be up to 0.007 than x,y target of each color temperature.

5. Tool Option setting & Inspection per countries

- (1) Press 'IN START' key at Factory Service remote control.
- (2) Select 'Tool Option 1'.
- (3) Punch in the number and press 'OK'. (Each of models has their number)
- (4) Correct 'Tool Option2' ~ 'Tool Option5'.
- (5) Completed adjusting Tool option.

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

- After final inspection, press In-Stop key of the Adjustemnt Remote Control and check that the unit goes to Stand-by mode.

7. AUDIO output check

7.1. Audio input condition

- (1) RF input: Mono, 1KHz sine wave signal, 100% Modulation
- (2) CVBS, Component: 1KHz sine wave signal (0.4Vrms)
- (3) RGB PC: 1KHz sine wave signal (0.7Vrms)

7.2. Specification

Item	Min	Typ	Max	Unit	Remark
Audio practical max Output, L/R (Distortion=10% max Output)	4.5	5.0	6.0	W Vrms	(1) Measurement condition - EQ/AVL/Clear Voice: Off (2) Speaker (8Ω Impedance)

8. GND and HI-POT Test

8.1. GND & HI-POT auto-check preparation

- (1) Check the POWER CABLE and SIGNAL CABLE insertion condition

8.2. GND & HI-POT auto-check

- (1) Pallet moves in the station. (POWER CORD / AV CORD is tightly inserted)
- (2) Connect the AV JACK Tester.
- (3) Controller (GWS103-4) on.
- (4) 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)
- (5) HI-POT test (Auto)
 - If Test is failed, Buzzer operates.
 - If Test is passed, GOOD Lamp on and move to next process automatically.

8.3. Checkpoint

- (1) Test voltage
 - GND: 1.5 KV / min at 100 mA
 - SIGNAL: 3 KV / min at 100 mA
- (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 0.5 mArms

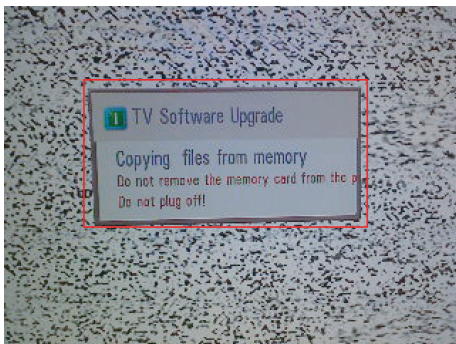
9. USB S/W Download

* optional, Service only

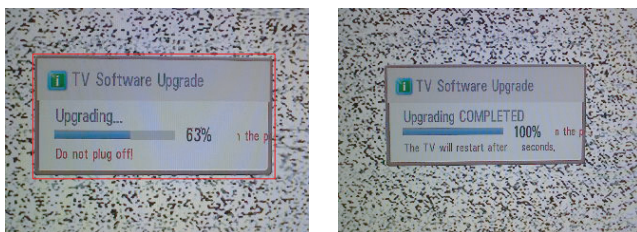
- (1) Put the USB Stick to the USB socket.
- (2) Automatically detecting update file in USB Stick.
- If your downloaded program version in USB Stick is lower than that of TV set, it didn't work.

Otherwise USB data is automatically detected.

- (3) Show the message "Copying files from memory".



- (4) Updating is starting.



- (5) Updating Completed, The TV will restart automatically.
- (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
* If downloading version is more high than your TV have, TV 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.

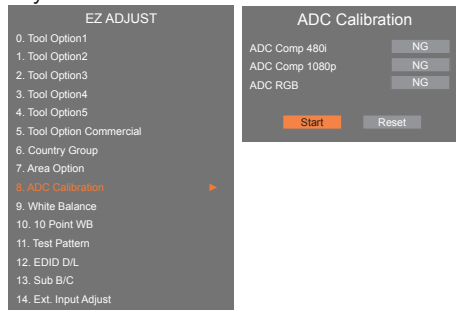
* After downloading, have to adjust TOOL OPTION again.

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

10. Optional adjustments

10.1. Manual ADC Calibration

- Enter 'EZ ADJUST' mode by pressing 'ADJ' key.
- Enter Internal ADC calibration mode by pressing " " or 'OK' key at '7. ADC Calibration'



- ▶ Caution : Using 'P-ONLY' key of the Factory Service remote control when turns TV on.

10.2. Manual White balance Adjustment

10.2.1. Adjustment 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
 - 1) After Aging Start, Keep the Power ON status during 5 Minutes.
 - 2) In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

10.2.2. 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 Remot control
- (4) Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)

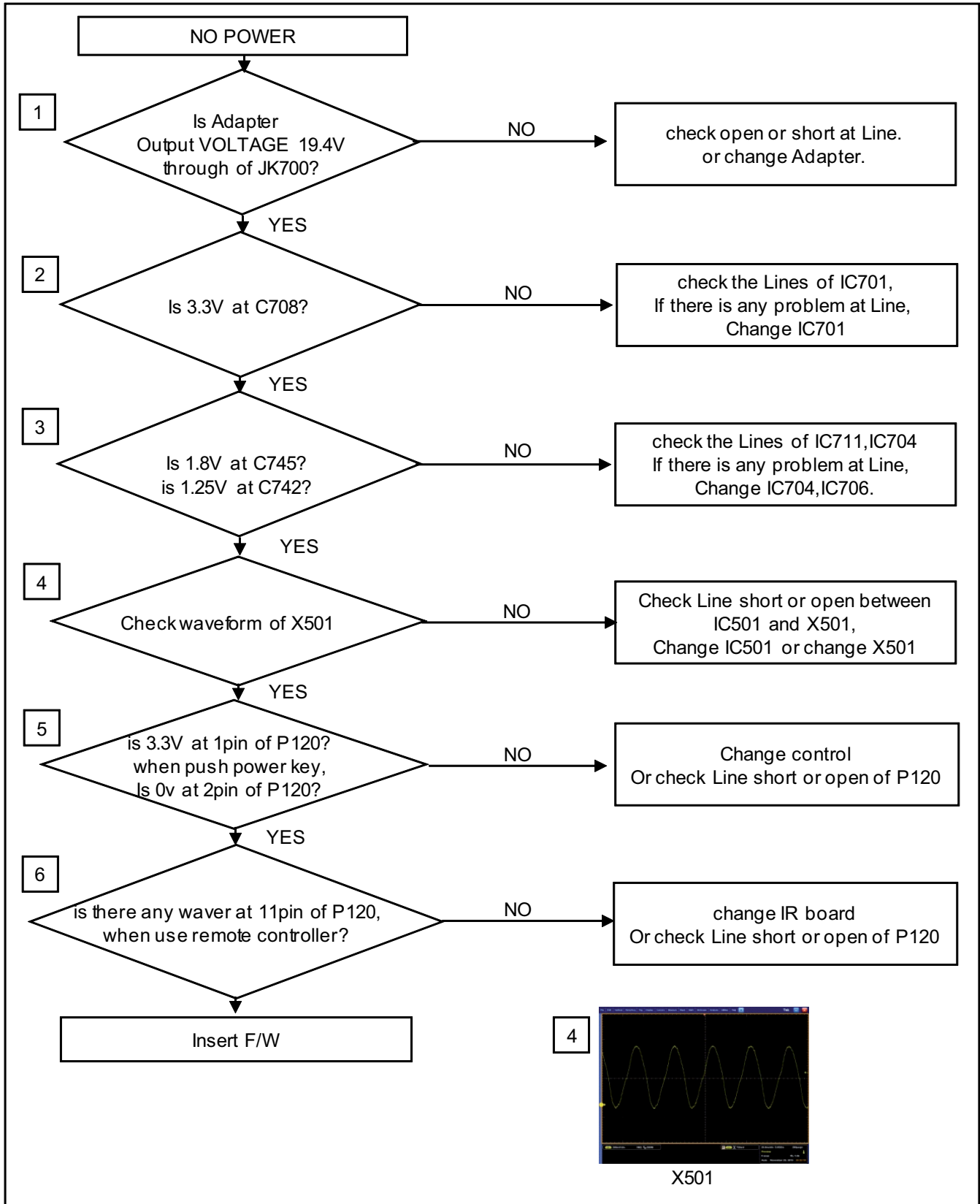
10.2.3. Adjustment

- (1) Set TV 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.

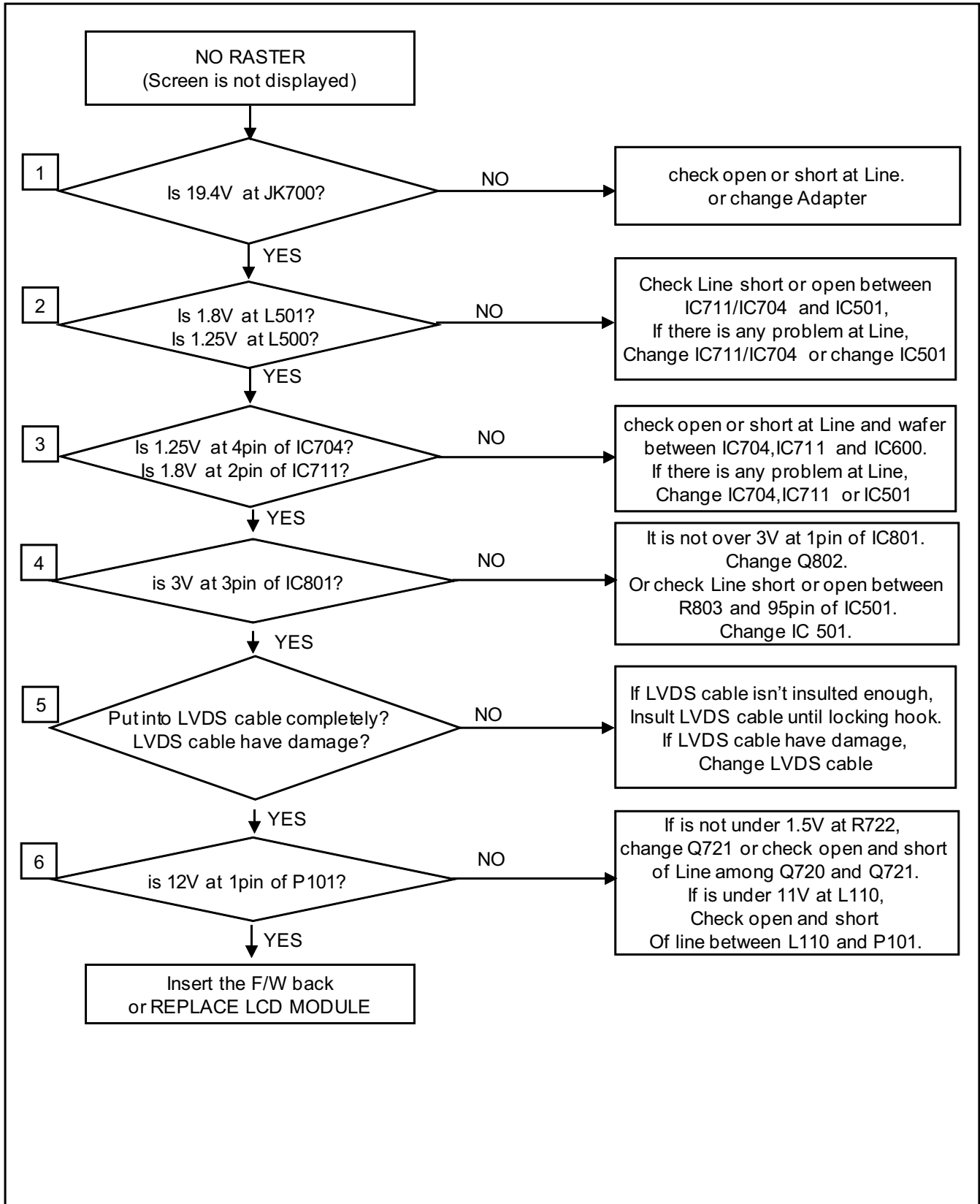
- If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 216 Gray pattern.

TROUBLE SHOOTING

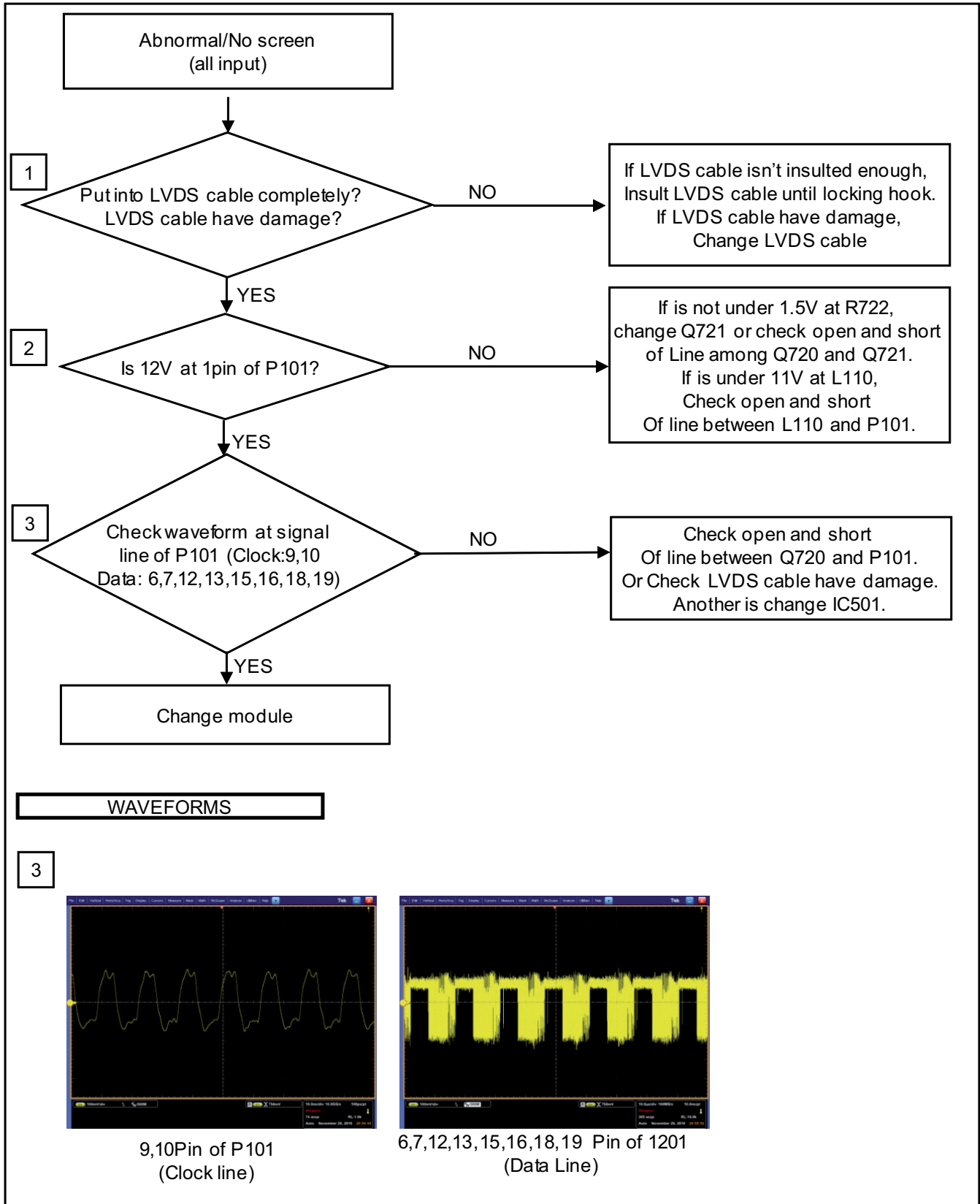
1. NO POWER-Main PCBA



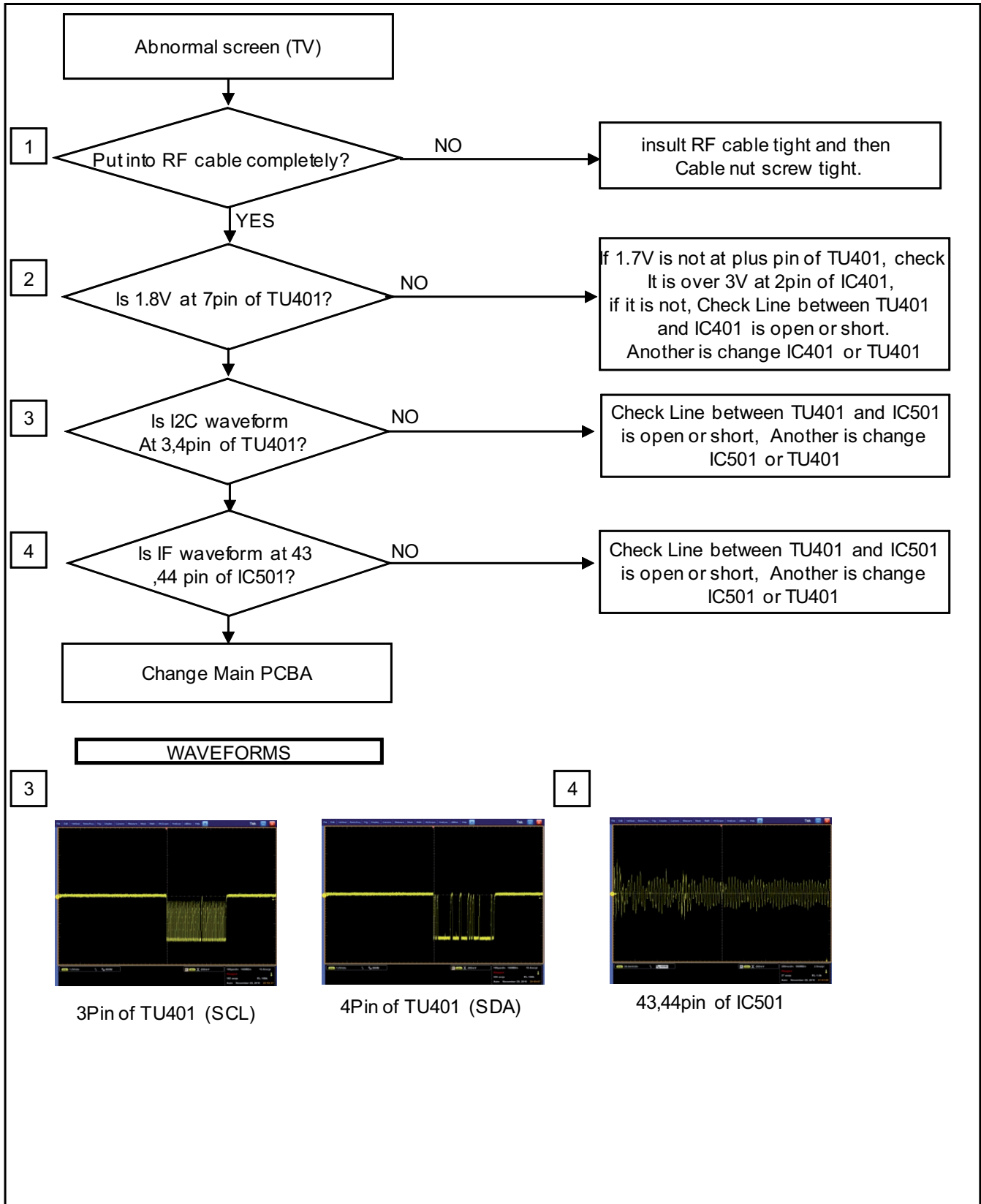
2. No raster (Power LED blue, black screen)



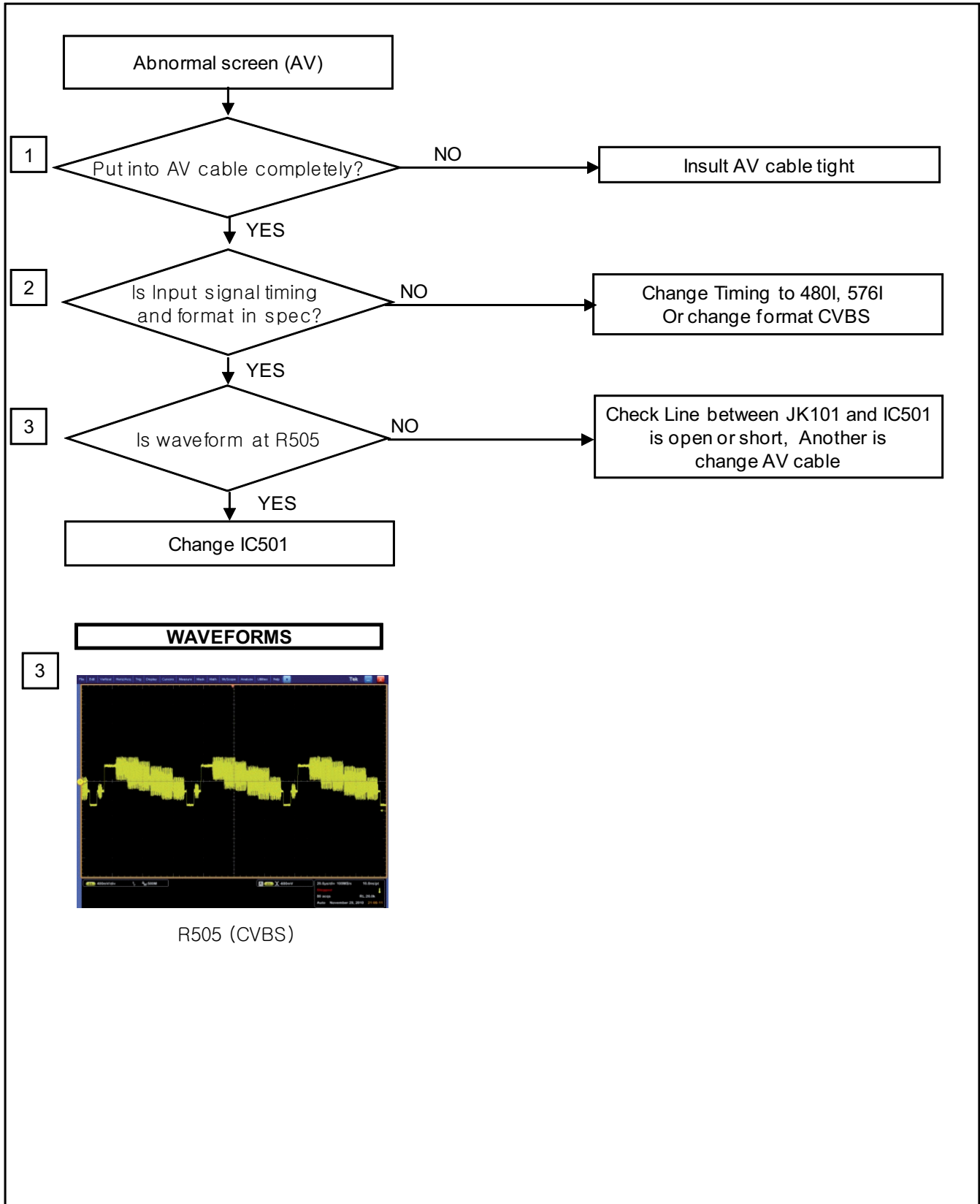
3. Abnormal/No screen (All input)-Main PCBA



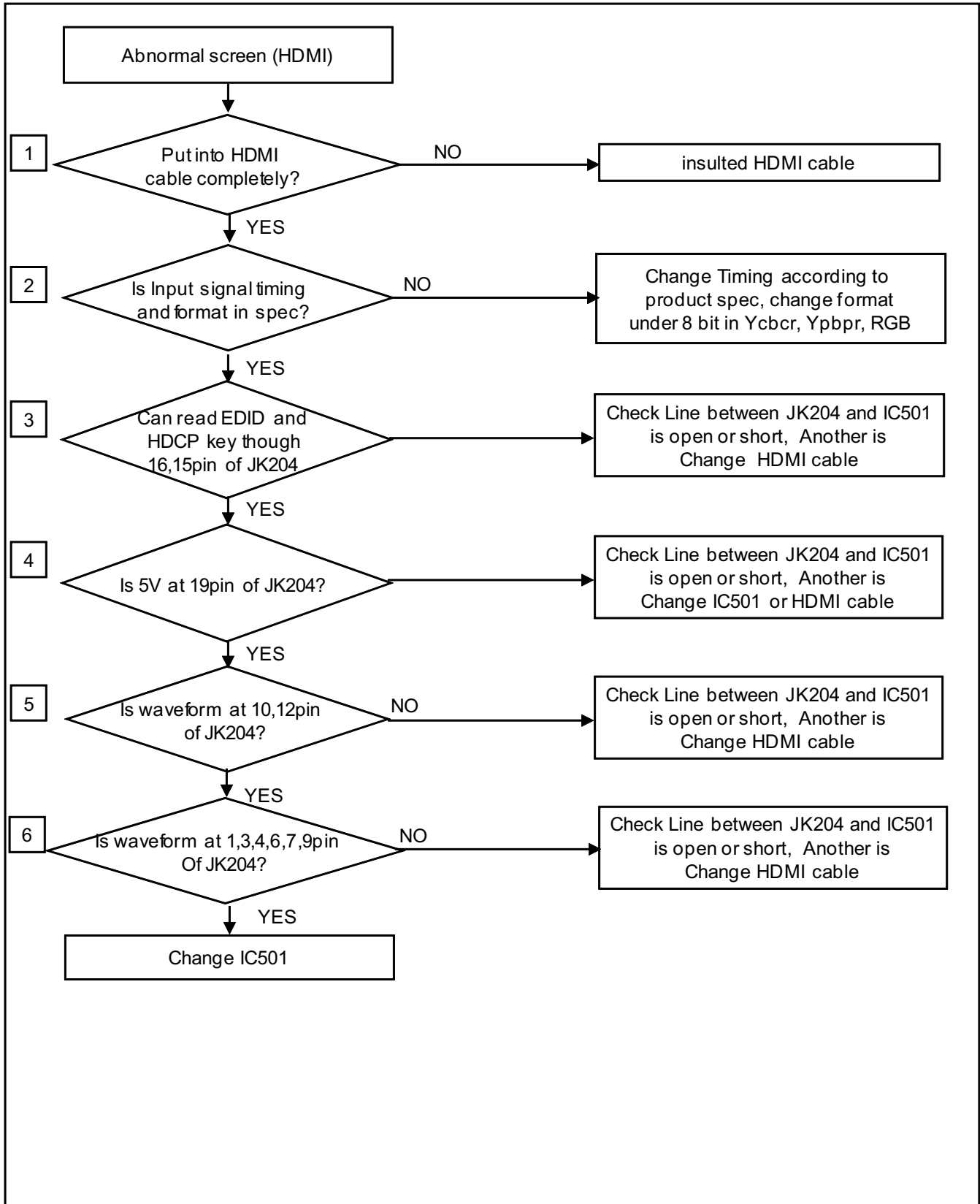
4. Abnormal screen (TV)-Main PCBA



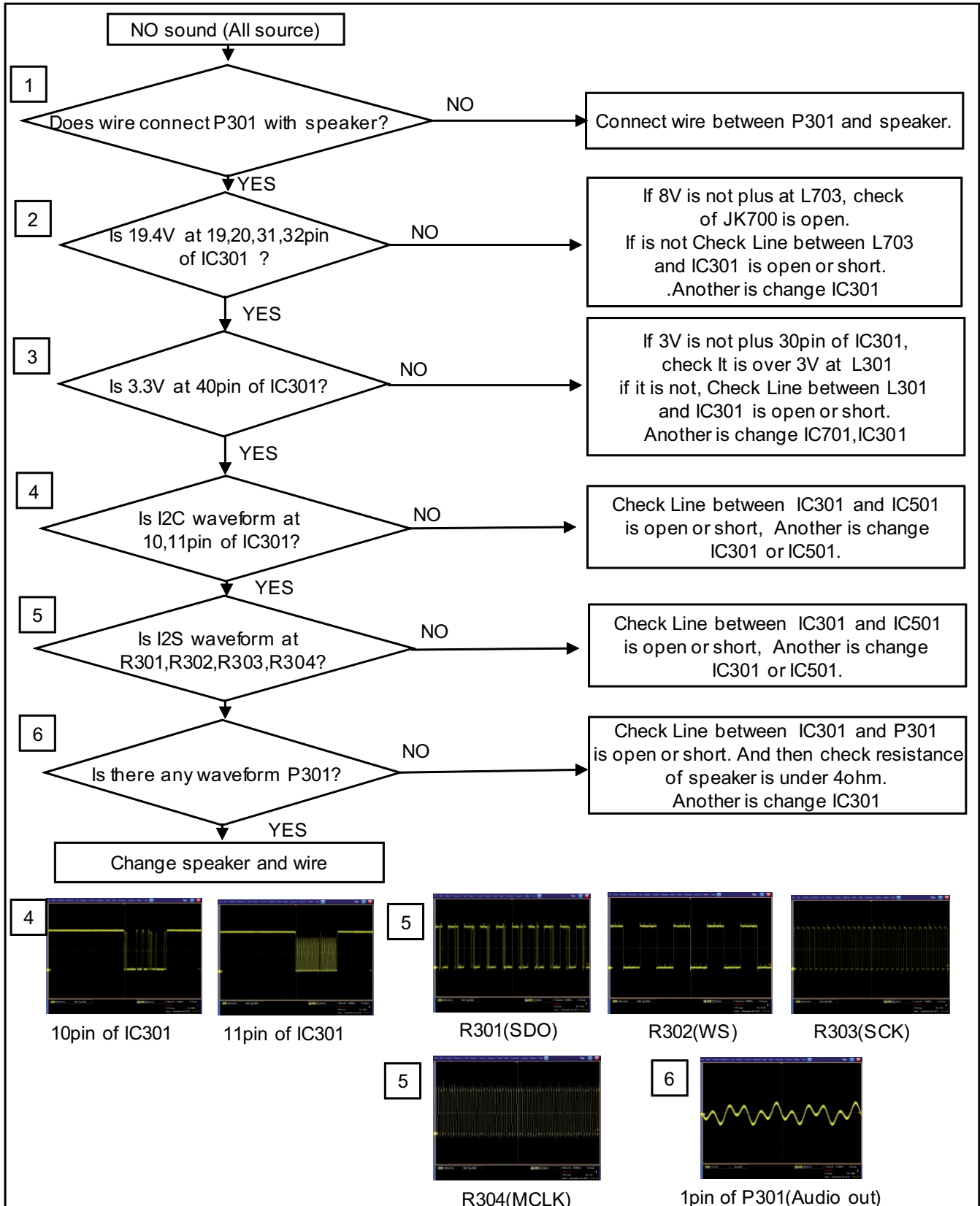
5. Abnormal screen (AV)-Main PCBA



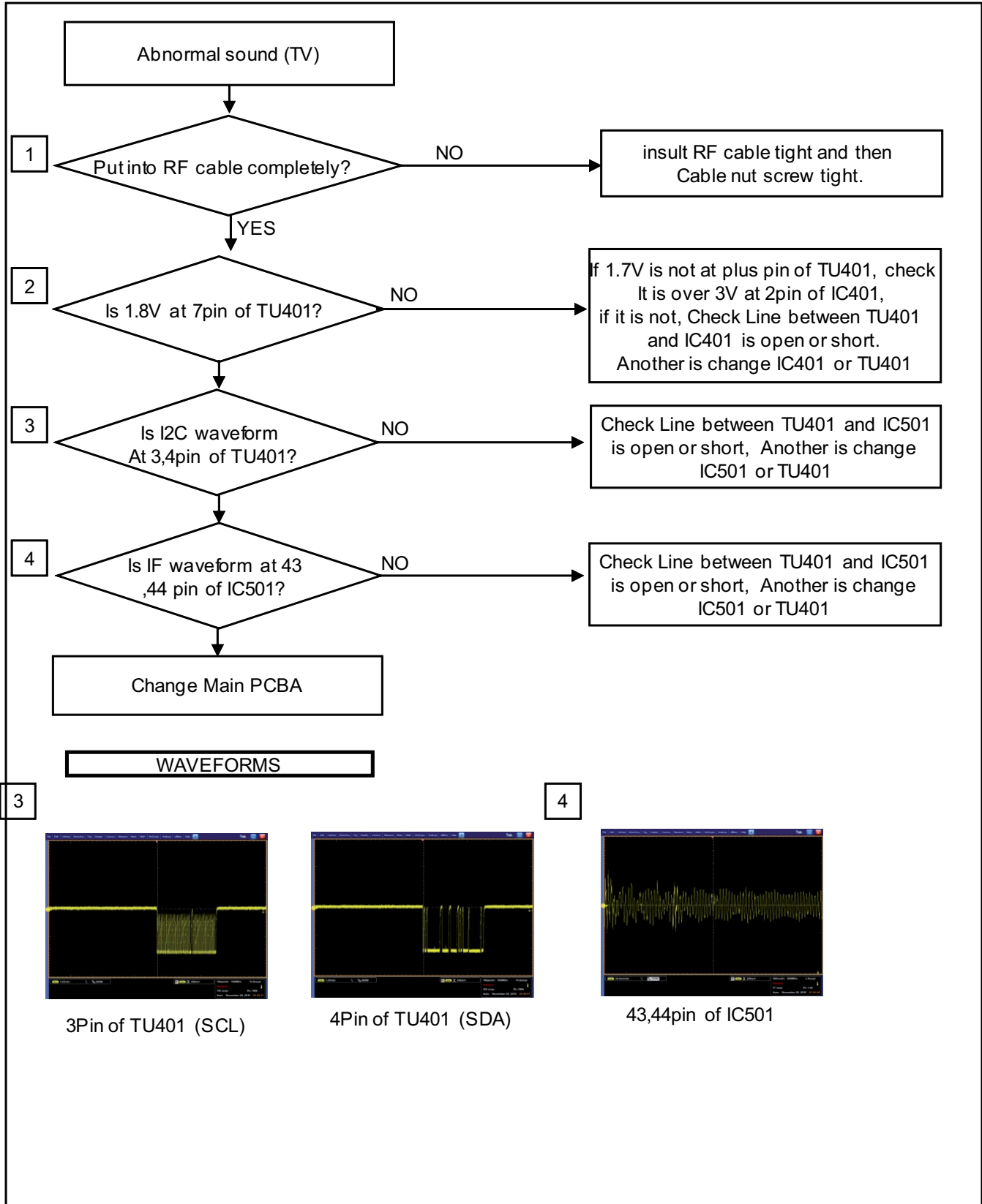
6. Abnormal screen (HDMI)-Main PCBA



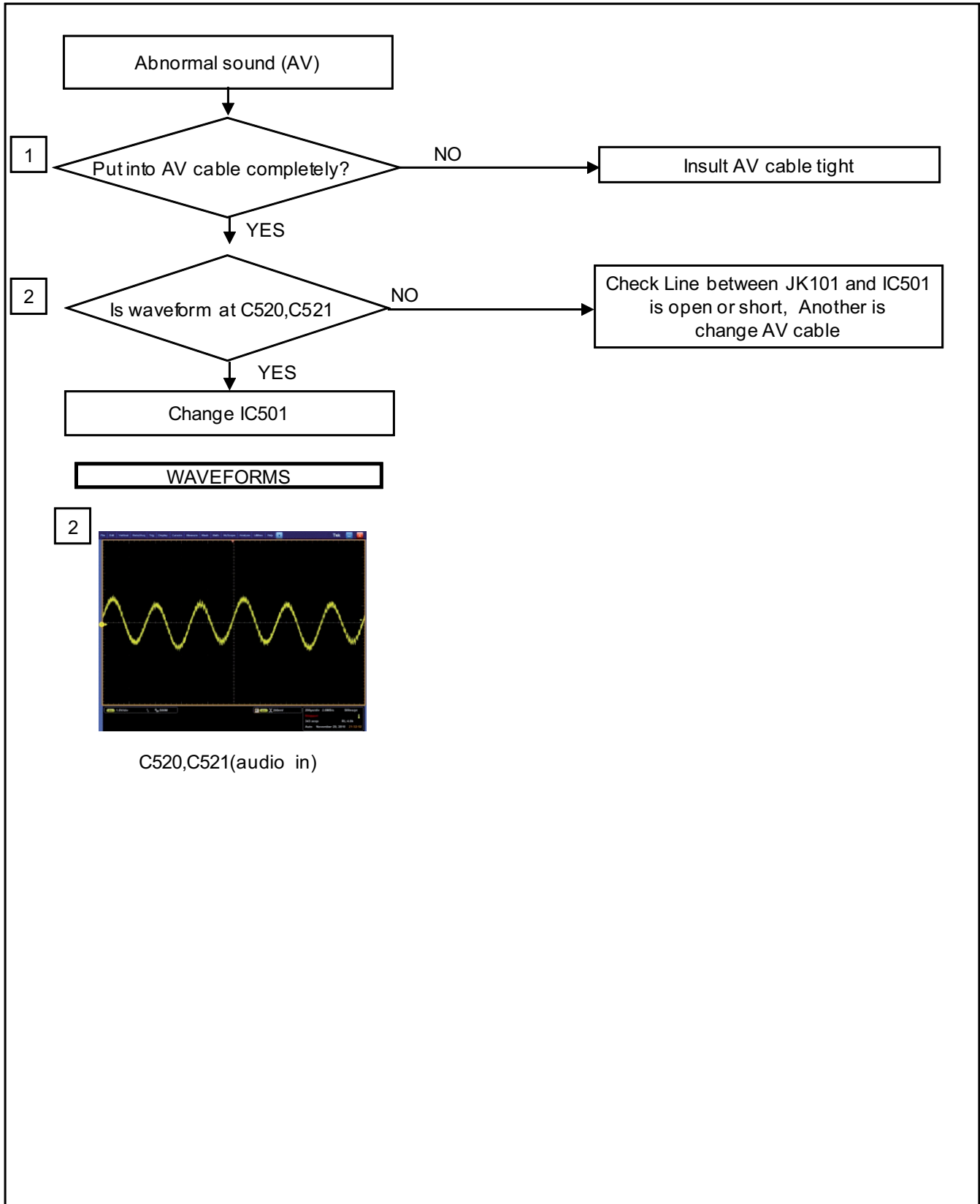
7. No sound (all source)-Main PCBA



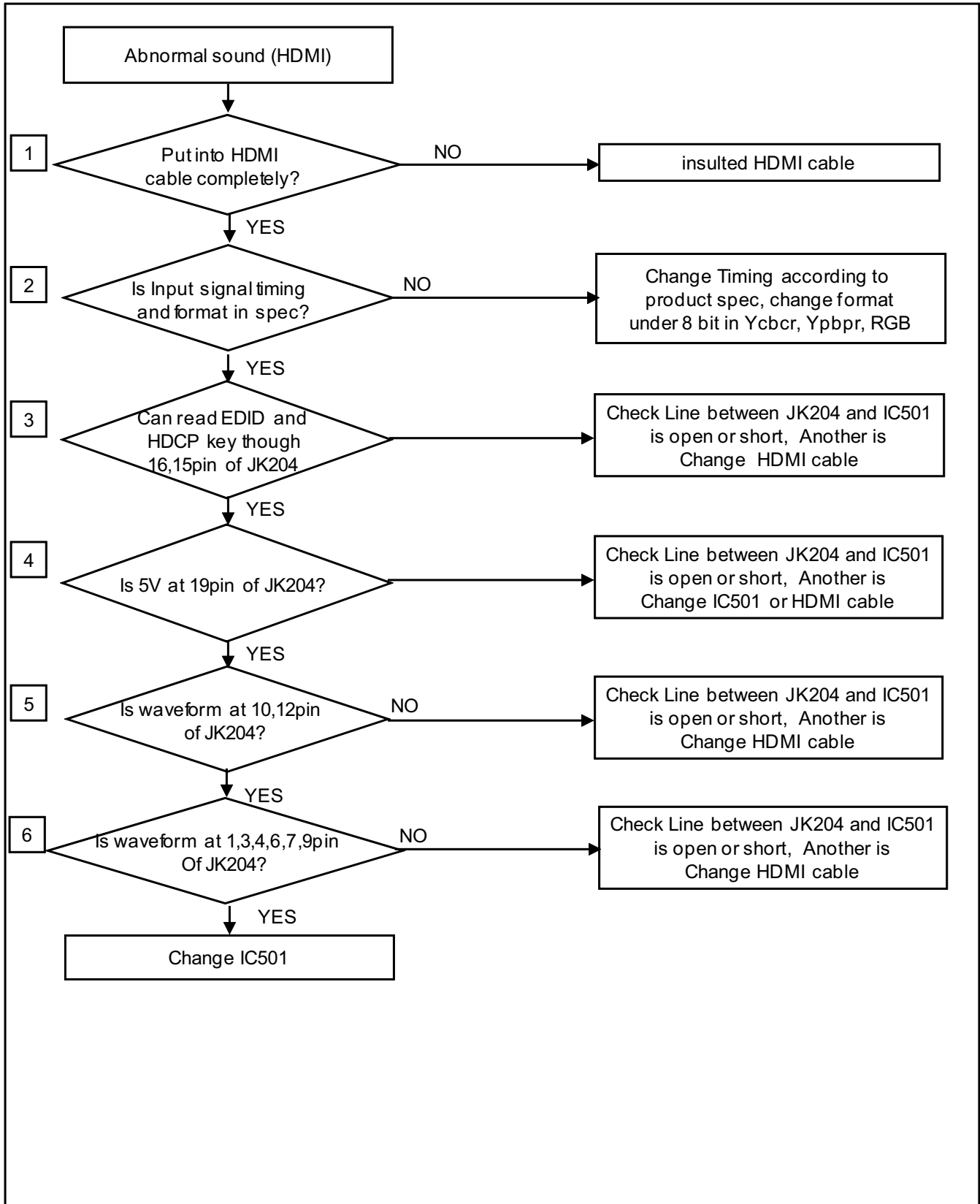
8. Abnormal sound (TV)-Main PCBA



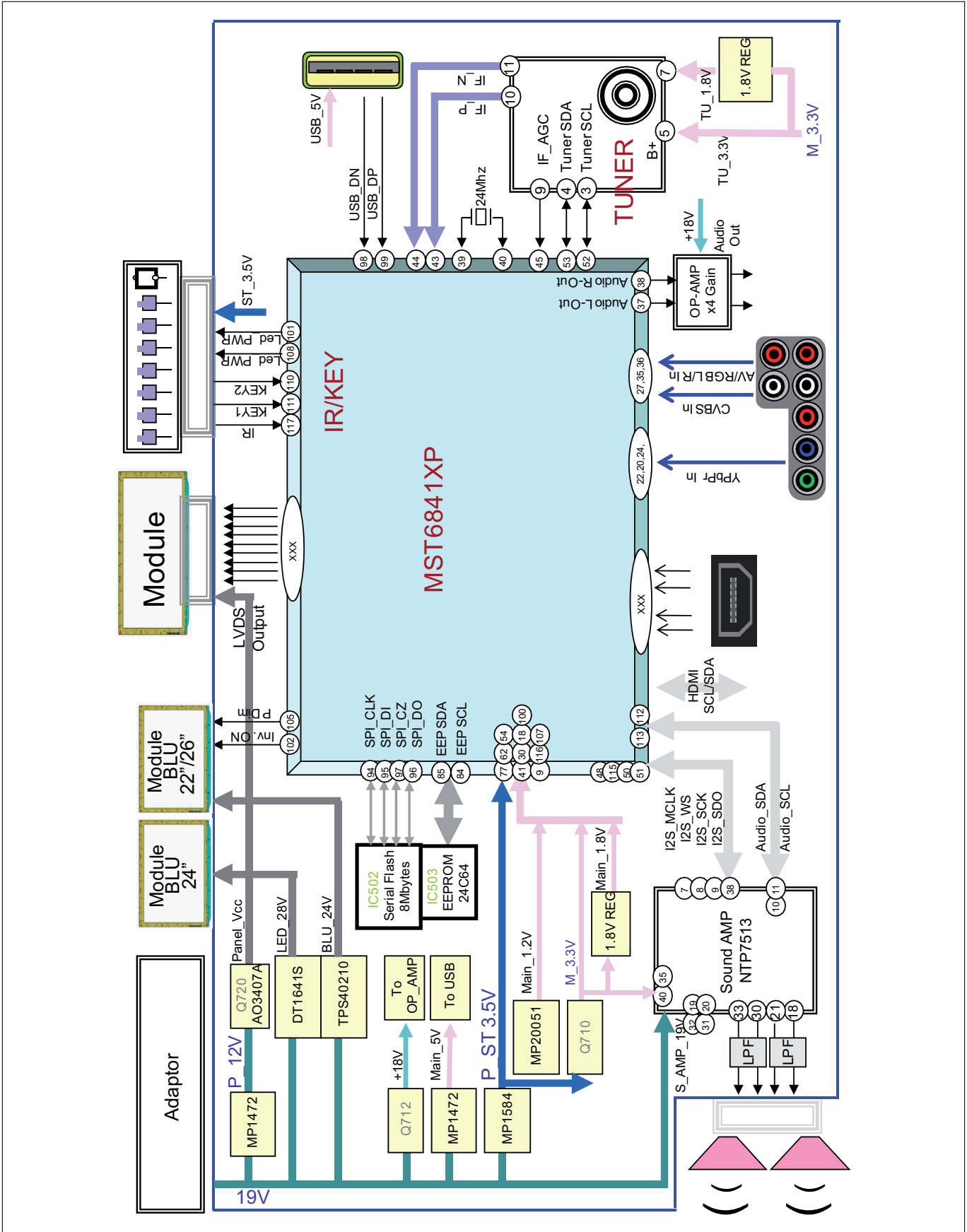
9. Abnormal sound (AV)-Main PCBA



10. Abnormal sound (HDMI)-Main PCBA



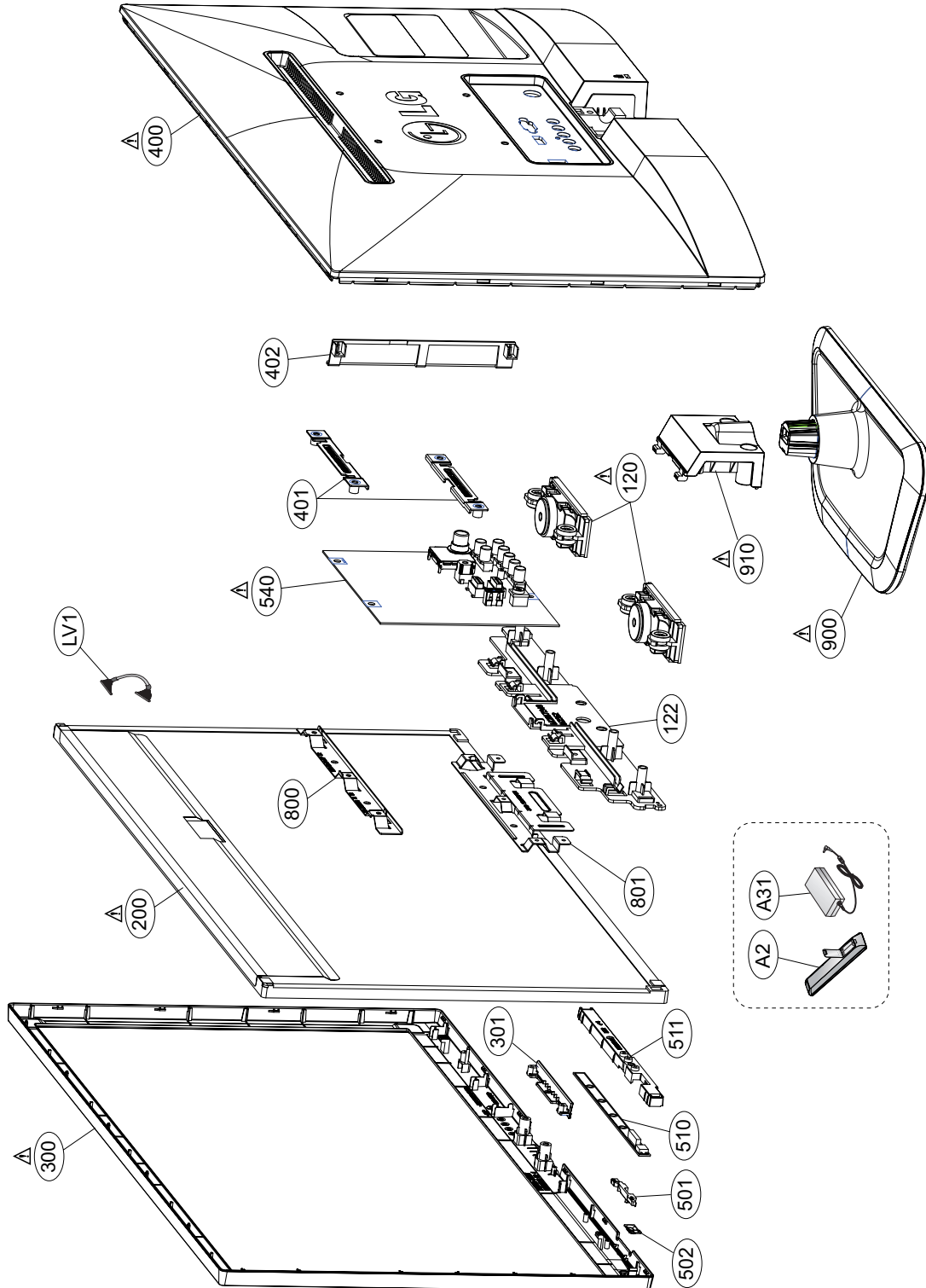
BLOCK DIAGRAM

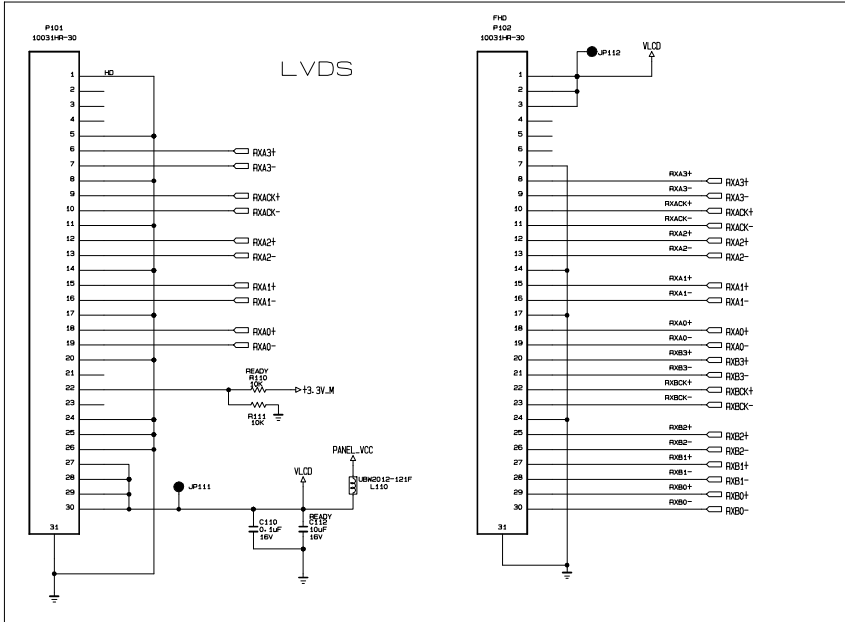
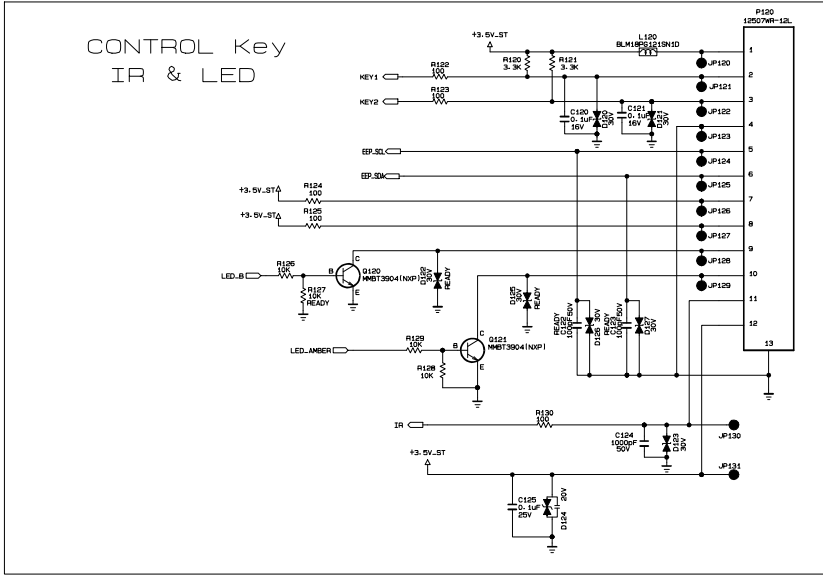
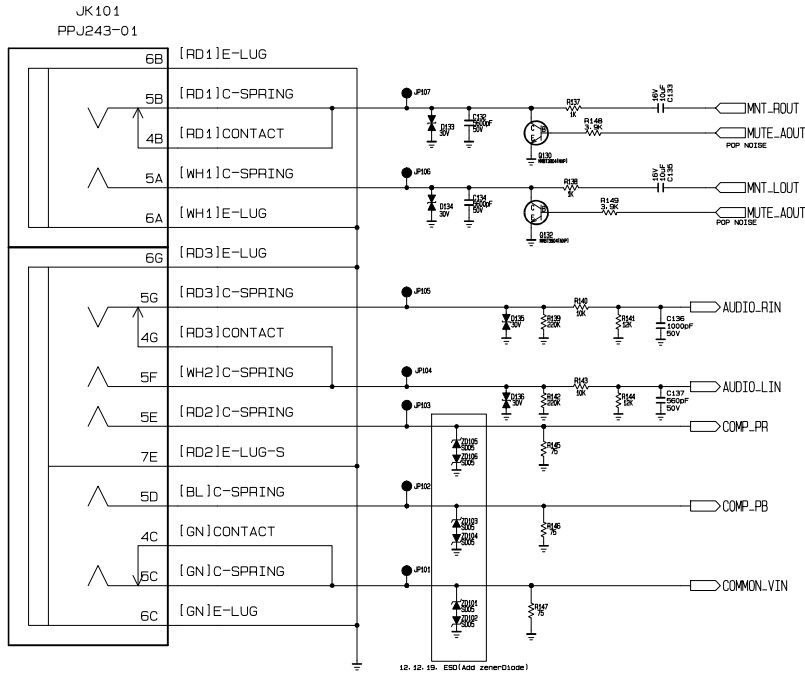


EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by Δ 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.



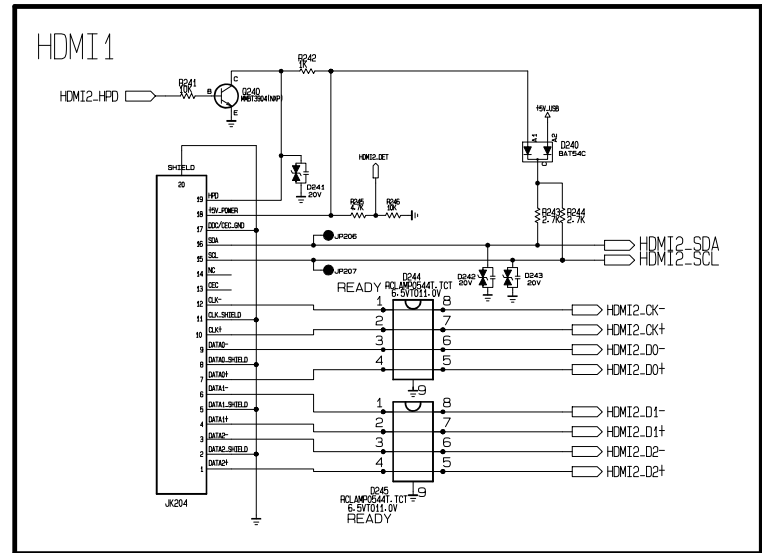
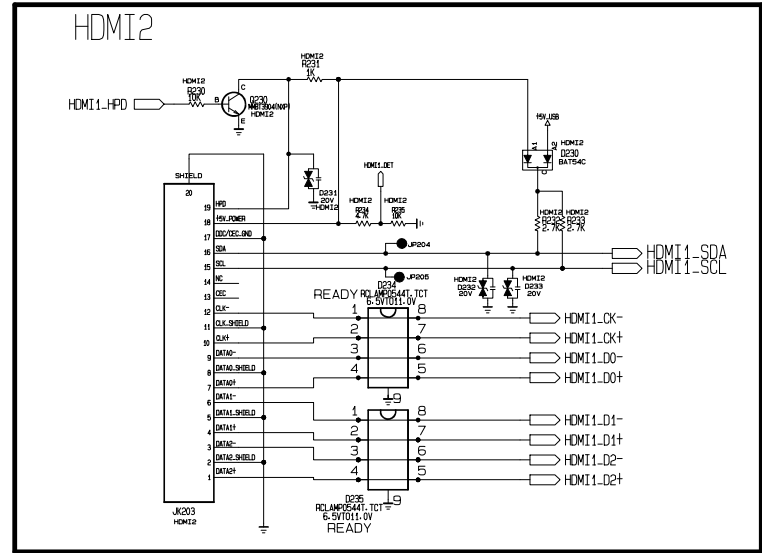
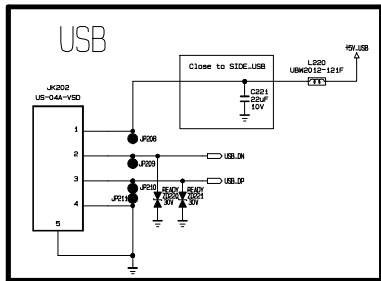
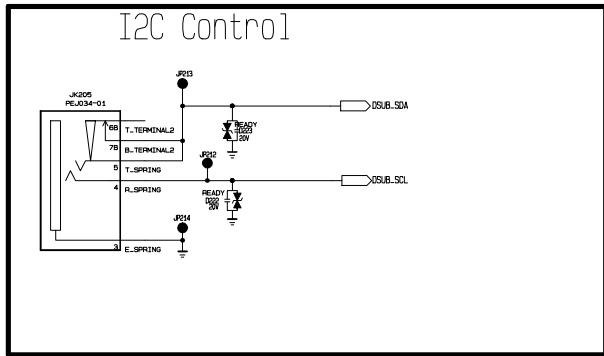


THE Δ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTR AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE Δ SYMBOL MARK OF THE SCHEMATIC.

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MODEL	LN4100	DATE	2012/12/20
BLOCK	INPUT1/LVDS	SHEET	1/8

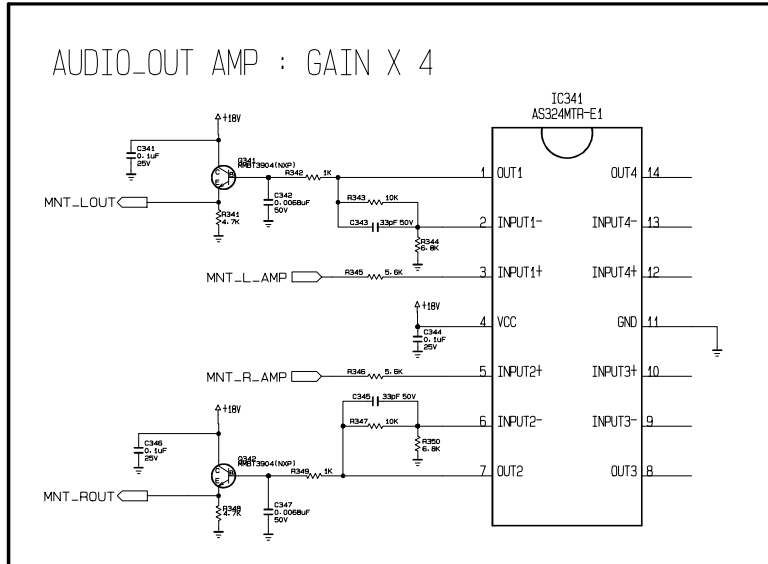
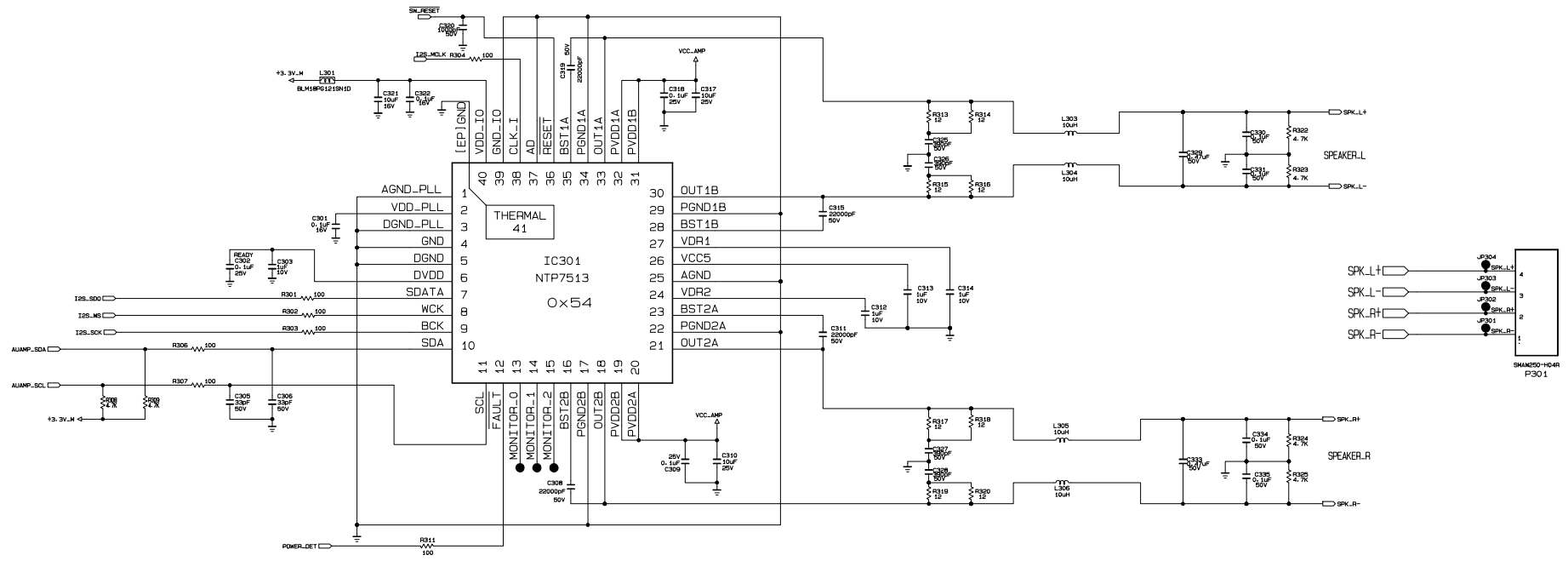


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LG ELECTRONICS

MODEL	LN4100	DATE	2012/12/20
BLOCK	INPUT2	SHEET	2 / 8



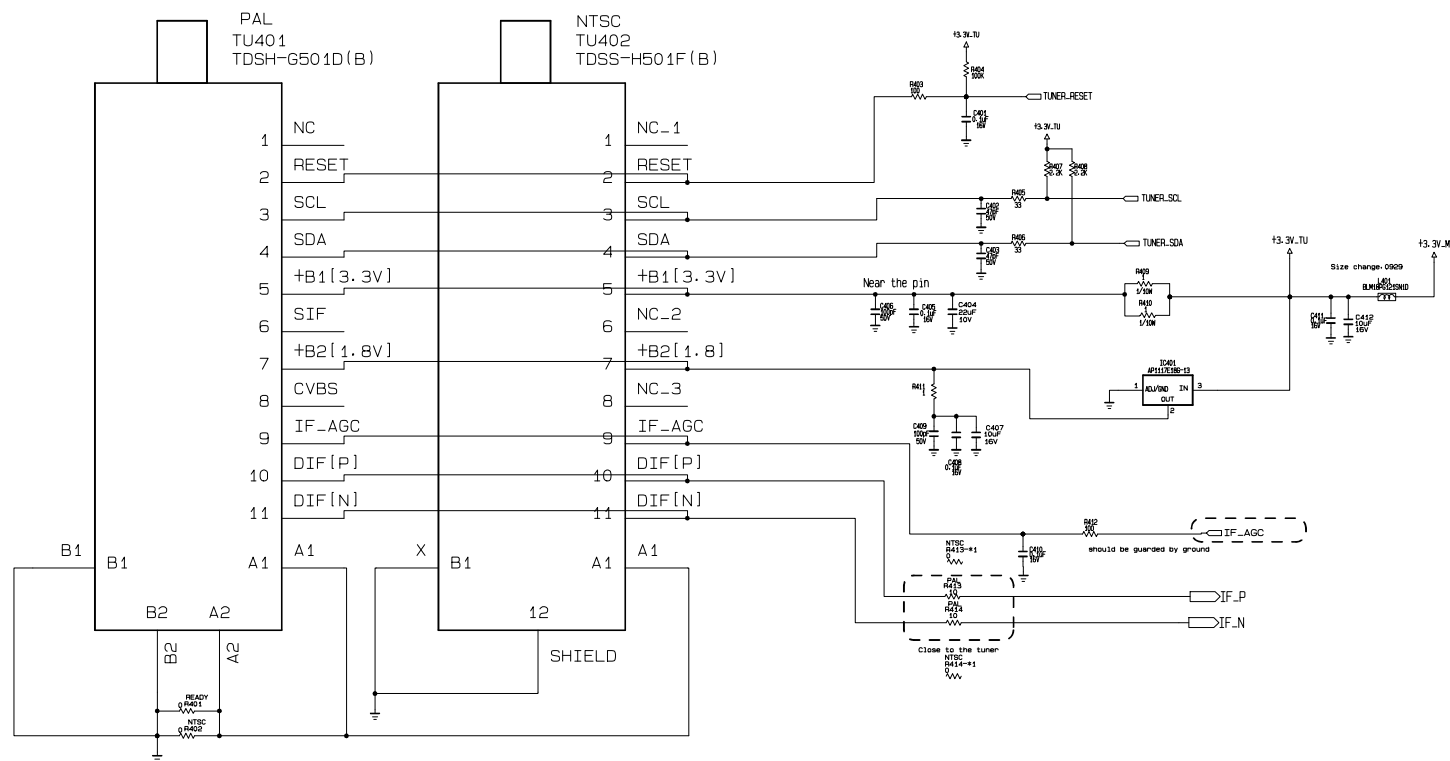
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

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MODEL	LN4100	DATE	2012/12/20
BLOCK	AUDIO	SHEET	3 / 8

IF

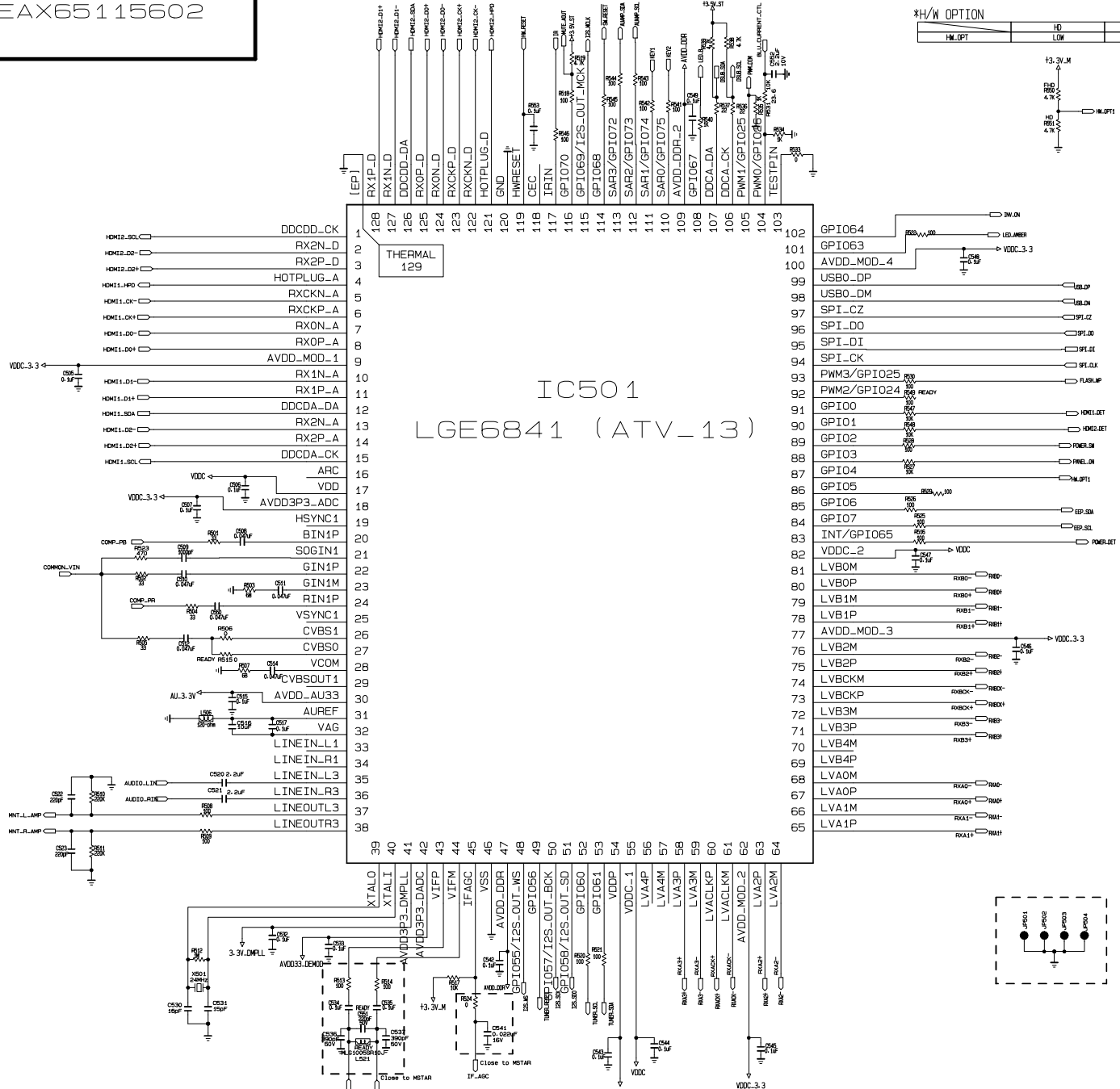


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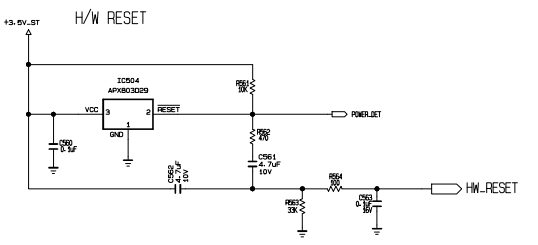
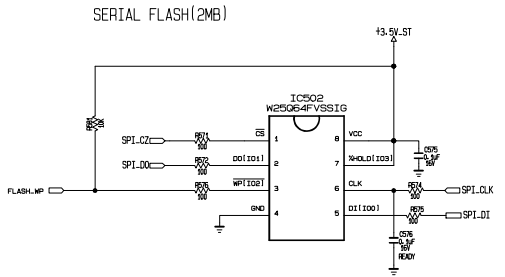
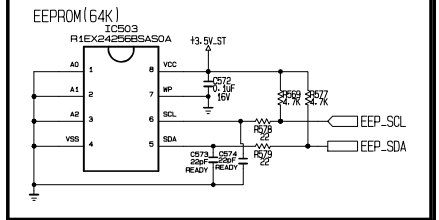
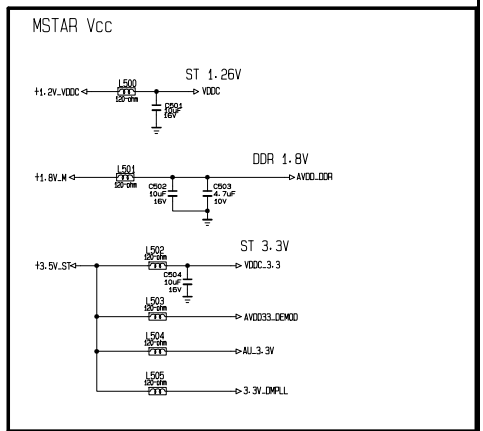
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MODEL	LN4100	DATE	2012/12/20
BLOCK	TUNER & IR	SHEET	4 / 8



IC501
LGE6841 (ATV_13)

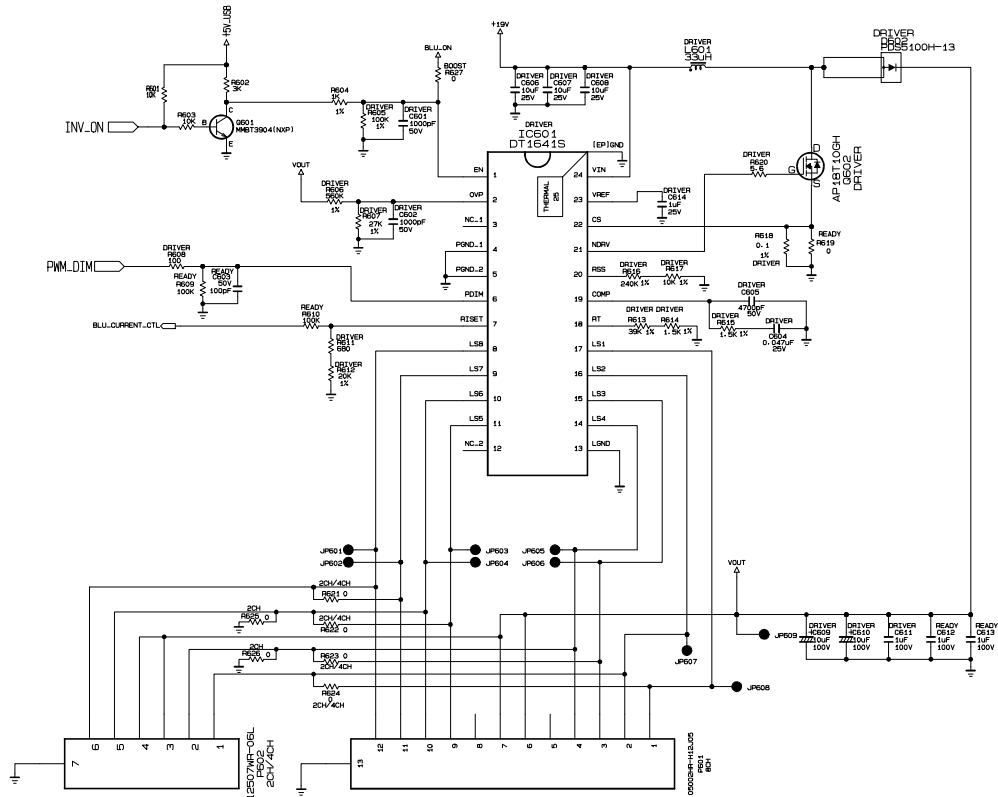


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MODEL	LN4100	DATE	2012/12/20
BLOCK	MAIN SOC	SHEET	5 / 8



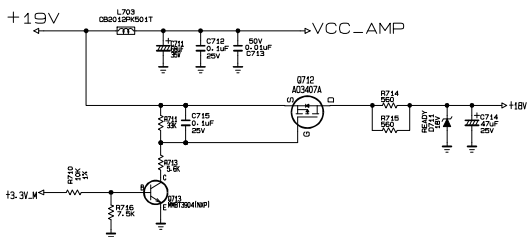
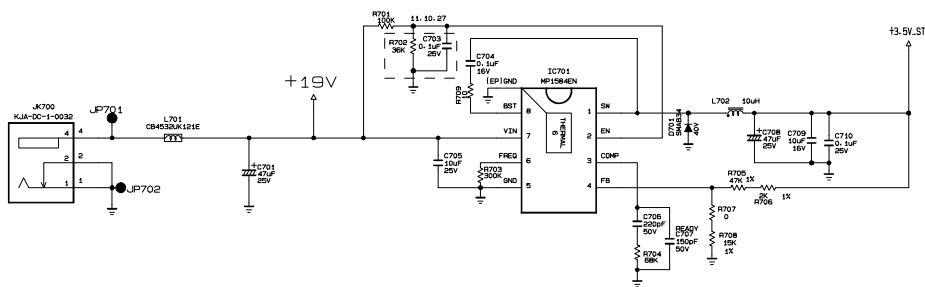
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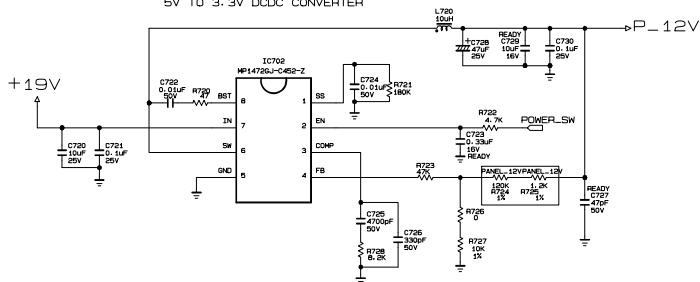


MODEL	LN4100	DATE	2012/12/20
BLOCK	LED_Driver	SHEET	6/8

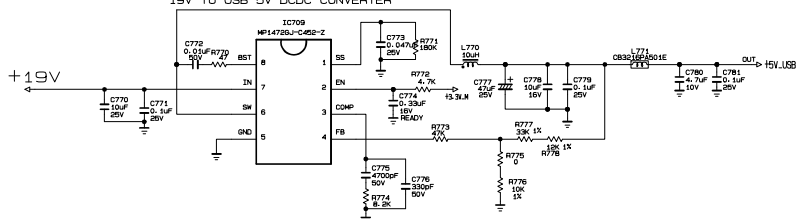
19V TO ST3.3V DCDC CONVERTER



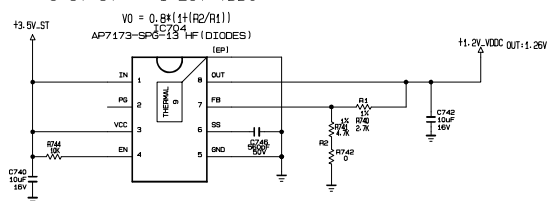
5V TO 3.3V DCDC CONVERTER



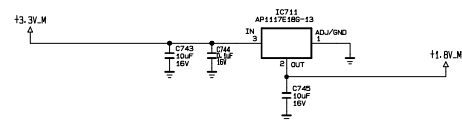
19V TO USB 5V DCDC CONVERTER



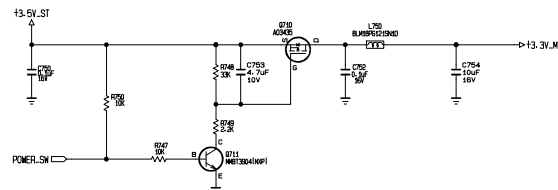
** 3.5V-ST -> 1.26V VDDC



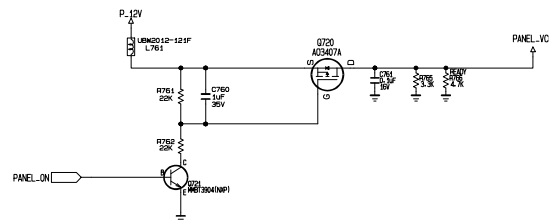
** 3.3V_M -> 1.8V_M



** +3.5V-ST -> 3.3V_M



** Switch Panel-Vcc

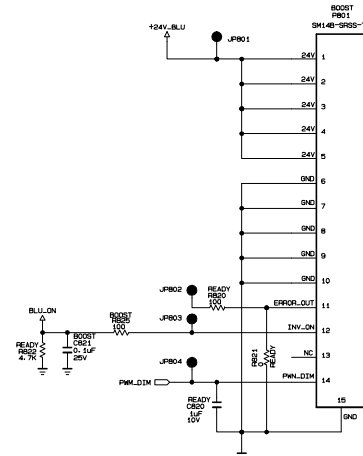
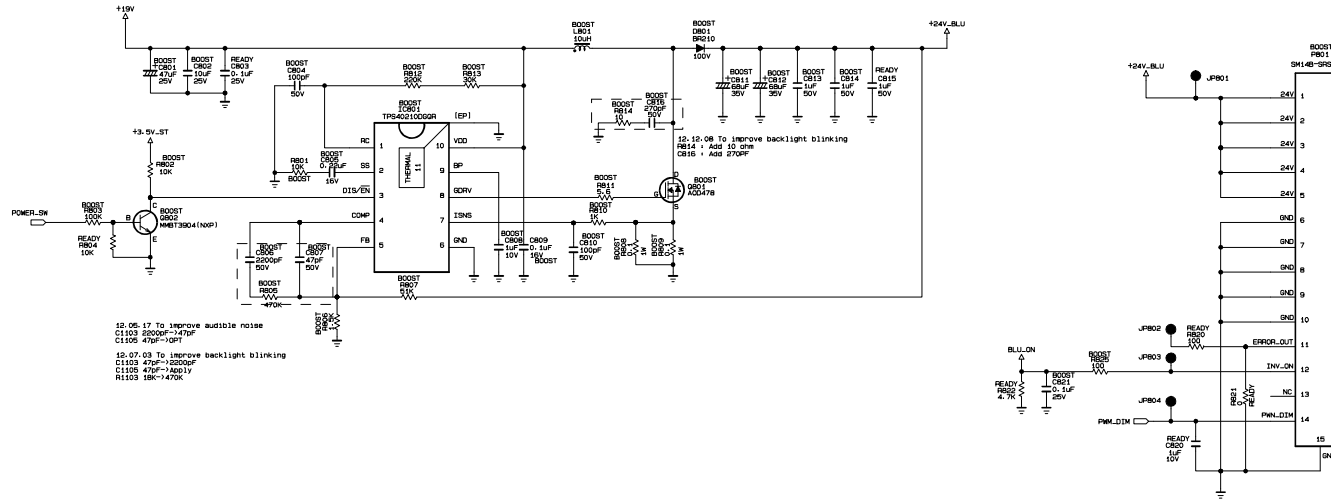


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MODEL	LN4100	DATE	2012/12/20
BLOCK	POWER	SHEET	7 / 7



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 LGElectronics



MODEL	LN4100	DATE	2012/12/20
BLOCK	DC BOOST UP	SHEET	8 / 8

