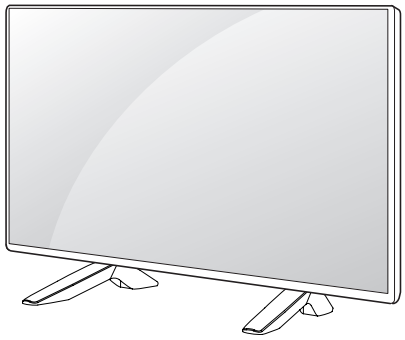
Internal Use Only

LED TV
SERVICE MANUAL

CHASSIS : LA66L

MODEL : 43LH570* 43LH570*-U*
49LH570* 49LH570*-U*

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



P/NO : MFL69442202 (1602-REV00)

CONTENTS

SAFETY PRECAUTIONS

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.

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 it's 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,

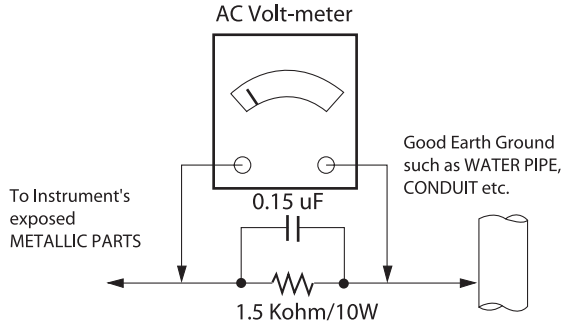
always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

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 MΩ and 5.2 MΩ.
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 is 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;
   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 1.25 cm) 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

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

1. Application range

This spec sheet is applied to the LED TV used LA66L chassis

2. Test condition

Each part is tested as below without special notice.

(1) Temperature : 25 ºC±5 ºC (77 ºC±9ºC), CST : 40 ºC±5 ºC
(2) Relative Humidity: 65 % ± 10 %
(3) Power Voltage
Standard input voltage (100~240V@ 50/60Hz)
(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. Test method

(1) Performance: LGE TV test method followed
(2) Demanded other specification
- Safety : UL, CSA, IEC specification
- EMC: FCC, ICES, IEC specification

4. General Specification

No	Item	Specification	Result	Remark
1.	Receiving System	ATSC / NTSC-M / 64 & 256 QAM		
2.	Available Channel	VHF : 02~13 UHF : 14~69 DTV : 02-69 CATV : 01~135 CADTV : 01~135		
3.	Input Voltage	AC 100 ~ 240V 50/60Hz		Mark : 110V, 60Hz
4.	Market	NORTH AMERICA		
5.	Screen Size	32", 43”, 49", 55”		
6.	Aspect Ratio	16:9		
7.	Tuning System	FS		
8.	Module	LC550DUE-FJA1	LGD	FHD
		NC550DUE-VCCP3	CSOT	FHD
		NC490DUE-SADP3	LGD	FHD
		NC490DUE-ABEX1	BOE	FHD
		HC430DUN-SLVX1	LGD	FHD
		HC430DUN-ABVX1	BOE	FHD
		HC320DXN-ABVS1	BOE	HD
		HC320DXN-SLVS5	LGD	HD
		HC320DXN-VHVS1	SHARP	HD
9.	Operating Environment	Temp : 0 ~ 40 deg Humidity : ~ 80 %		
10.	Storage Environment	Temp : -20 ~ 60 deg Humidity : ~ 85 %		

5. Supported video resolutions

5.1. Component 2D input(Y, C_B/P_B, C_R/P_R)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed
1	720*480	15.730	60.000	13.513	SDTV ,DVD 480I
2	720*480	15.730	59.940	13.500	SDTV ,DVD 480I
3	720*480	31.500	60.000	27.027	SDTV 480P
4	720*480	31.470	59.940	27.000	SDTV 480P
5	1280*720	45.000	60.000	74.250	HDTV 720P
6	1280*720	44.960	59.940	74.176	HDTV 720P
7	1920*1080	33.750	60.000	74.250	HDTV 1080I
8	1920*1080	33.720	59.940	74.176	HDTV 1080I
9	1920*1080	67.500	60.000	148.500	HDTV 1080P
10	1920*1080	67.432	59.940	148.352	HDTV 1080P
11	1920*1080	27.000	24.000	74.250	HDTV 1080P
12	1920*1080	26.970	23.976	74.176	HDTV 1080P
13	1920*1080	33.750	30.000	74.250	HDTV 1080P
14	1920*1080	33.710	29.970	74.176	HDTV 1080P

5.2. HDMI Input (PC/DTV)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	
	PC					
1	640*350	31.46	70.09	25.17	EGA	
2.	720*400	31.46	70.08	28.32	DOS	
3.	640*480	31.46	59.94	25.17	VESA(VGA)	
4	800*600	37.87	60.31	40.00	VESA(SVGA)	
5	1024*768	48.36	60.00	65.00	VESA(XGA)	
6	1152*864	54.34	60.05	80.00	VESA	
7	1280*1024	63.98	60.02	108.00	VESA (SXGA)	FHD only
8	1360*768	47.71	60.01	85.50	VESA (WXGA)	
9	1920*1080	67.5	60.00	148.5	WUXGA (Reduced Blanking)	FHD only
	DTV					
1	640 * 480	31.46	59.94	25.125	SDTV 480P	
2	640 * 480	31.5	60.00	25.125	SDTV 480P	
3	720 * 480	15.73	59.94	13.500	SDTV 480I	Spec. out but display
4	720 * 480	15.75	60.00	13.514	SDTV 480I	Spec. out but display
5	720 * 480	31.47	59.94	27.00	SDTV 480P	
6	720 * 480	31.5	60	27.027	SDTV 480P	
7	1280*720	44.96	59.94	74.176	HDTV 720P	
8	1280*720	45	60.00	74.25	HDTV 720P	
9	1920*1080	33.72	59.94	74.176	HDTV 1080I	
10	1920*1080	33.75	60.00	74.25	HDTV 1080I	
11	1920*1080	26.97	23.97	63.296	HDTV 1080P	
12	1920*1080	27.00	24.00	63.36	HDTV 1080P	
13	1920*1080	33.71	29.97	79.120	HDTV 1080P	
14	1920*1080	33.75	30.00	79.20	HDTV 1080P	
15	1920*1080	67.43	59.94	148.350	HDTV 1080P	
16	1920*1080	67.5	60.00	148.50	HDTV 1080P	

ADJUSTMENT INSTRUCTION

1. Application

This spec. sheet applies to LA66L Chassis applied LED TV all models manufactured in TV 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 ±5 ºC of temperature and 65±10% of relative humidity if there is no specific designation
(4) The input voltage of the receiver must keep 100~240V, 50/60Hz
(5) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over 15 ºC
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

(1) ADC adjustment(OTP) : Component
(2) EDID downloads for HDMI

3.2. Final assembly adjustment

(1) White Balance adjustment
(2) RS-232C functionality check
(3) Factory Option setting per destination
(4) Shipment mode setting (In-Stop)
(5) GND and HI-POT test

3.3. Appendix

(1)Tool option menu, USB Download (S/W Update, Option and Service only)
(2) Manual adjustment for ADC calibration and White balance.
(3) Shipment conditions, Channel pre-set

4. MAIN PCBA Adjustments

4.1. ADC Calibration

- An ADC calibration is not necessary because MAIN SoC (LGExxxx) is already calibrated from IC Maker
- If it needs to adjust manually, refer to appendix.

4.2. MAC Address, ESN Key and Widevine Key download

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
- US, Canada models: DETECT -> MAC_WRITE -> WIDEVINE_WRITE
- Korea, Mexico models: DETECT -> MAC_WRITE -> WIDEVINE_WRITE

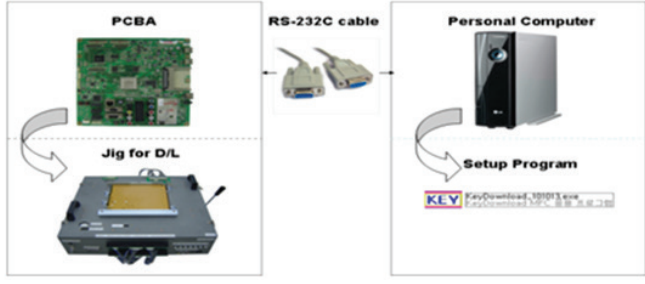
(4) Play : START
(5) Check of result: Ready, Test, OK or NG

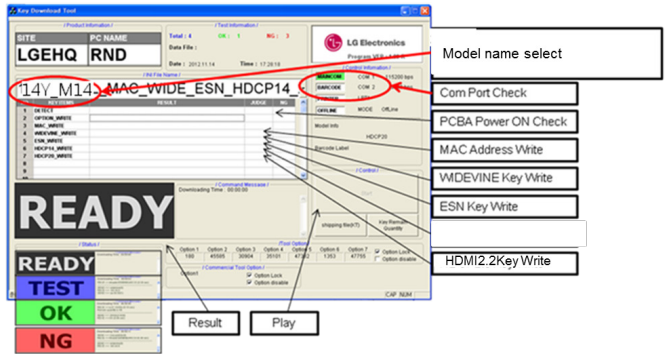
4.2.4. Communication Port connection

(1) Connect: PCBA Jig -> RS-232C Port == PC -> RS-232C Port

4.2.5. Download

(1) All models (16Y LCD TV + MAC + Widevine + ESN Key and HDCP2.2)





4.2.6. Inspection

- In INSTART menu, check these keys.

4.3. LAN port Inspection (Ping Test)

4.3.1. Equipment setting

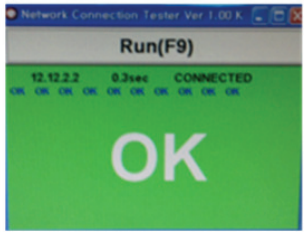
(1) Play the LAN Port Test PROGRAM.
(2) Input IP set up for an inspection to Test Program.
* IP Number : 12.12.2.2.

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

4.3.2. LAN PORT inspection (PING TEST)

(1) Play the LAN Port Test Program.
(2) connect each other LAN Port Jack.
(3) Play Test (F9) button and confirm OK Message.
(4) remove LAN CABLE

Step 1)



Step 3) Check 'OK' Signal

4.4. EDID Download

4.4.1 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".

4.4.2 Equipment

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

4.4.3. EDID DATA

4.4.3.1. HD PCM (2D 8bit xvYCC : off) : 32LH57

(1) HDMI1 (6D , 08)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	19	F1	48	10	22	20	05	84	03	02	01	23	09	57
10	07	67	03	0C	00	10	00	80	1E	02	3A	80	18	71	38	2D
20	40	58	2C	04	05	40	84	63	00	00	1E	01	1D	80	18	71
30	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D	00
40	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E	8C
50	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00	00
60	18	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	08

(2) HDMI2 (6D , F8)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	19	F1	48	10	22	20	05	84	03	02	01	23	09	57
10	07	67	03	0C	00	20	00	80	1E	02	3A	80	18	71	38	2D
20	40	58	2C	04	05	40	84	63	00	00	1E	01	1D	80	18	71
30	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D	00
40	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E	8C
50	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00	00
60	18	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	F8

4.4.3.2. HD AC3 (2D 8bit xvYCC : off) : 32LH57

(1) HDMI1 (6D , 96)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1C	F1	48	10	22	20	05	84	03	02	01	26	15	07
10	50	09	57	07	67	03	0C	00	10	00	80	1E	02	3A	80	18
20	71	38	2D	40	58	2C	04	05	40	84	63	00	00	1E	01	1D
30	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E
40	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00
50	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84
60	63	00	00	18	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	96

(2) HDMI2 (6D , 86)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1C	F1	48	10	22	20	05	84	03	02	01	26	15	07
10	50	09	57	07	67	03	0C	00	20	00	80	1E	02	3A	80	18
20	71	38	2D	40	58	2C	04	05	40	84	63	00	00	1E	01	1D
30	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E
40	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00
50	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84
60	63	00	00	18	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	86

4.4.3.3. HD DTS (2D 8bit xvYCC : off) : 32LH57

(1) HDMI1 (6D , 8D)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1F	F1	48	10	22	20	05	84	03	02	01	29	3D	06
10	C0	15	07	50	09	57	07	67	03	0C	00	10	00	80	1E	02
20	3A	80	18	71	38	2D	40	58	2C	04	05	40	84	63	00	00
30	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63
40	00	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40
50	84	63	00	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96
60	00	40	84	63	00	00	18	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	8D

(2) HDMI2 (6D , 7D)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01	01
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26	30
50	18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	6D

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1F	F1	48	10	22	20	05	84	03	02	01	29	3D	06
10	C0	15	07	50	09	57	07	67	03	0C	00	20	00	80	1E	02
20	3A	80	18	71	38	2D	40	58	2C	04	05	40	84	63	00	00
30	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63
40	00	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40
50	84	63	00	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96
60	00	40	84	63	00	00	18	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	7D

4.4.3.4. FHD PCM (2D 8bit xvYCC : off) : 43/49/55LH57

(1) HDMI1 (E5 , CC)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	19	F1	48	90	22	20	05	04	03	02	01	23	09	57
10	07	67	03	0C	00	10	00	80	1E	02	3A	80	18	71	38	2D
20	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18	71
30	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D	00
40	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E	8C
50	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00	00
60	18	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	CC

(2) HDMI2 (E5 , BC)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	19	F1	48	90	22	20	05	04	03	02	01	23	09	57
10	07	67	03	0C	00	20	00	80	1E	02	3A	80	18	71	38	2D
20	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18	71
30	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D	00
40	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E	8C
50	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00	00
60	18	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	BC

4.4.3.5. FHD AC3 (2D 8bit xvYCC : off) : 43/49/55LH57

(1) HDMI1 (E5 , 5A)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1C	F1	48	90	22	20	05	04	03	02	01	26	15	07
10	50	09	57	07	67	03	0C	00	10	00	80	1E	02	3A	80	18
20	71	38	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D
30	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E
40	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00
50	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84
60	63	00	00	18	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	5A

(2) HDMI2 (E5 , 4A)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1C	F1	48	90	22	20	05	04	03	02	01	26	15	07
10	50	09	57	07	67	03	0C	00	20	00	80	1E	02	3A	80	18
20	71	38	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D
30	80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E
40	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00
50	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84
60	63	00	00	18	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	4A

4.4.3.6. FHD DTS (2D 8bit xvYCC : off) : 43/49/55LH57

(1) HDMI1 (E5 , 51)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1F	F1	48	90	22	20	05	04	03	02	01	29	3D	06
10	C0	15	07	50	09	57	07	67	03	0C	00	10	00	80	1E	02
20	3A	80	18	71	38	2D	40	58	2C	45	00	40	84	63	00	00
30	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63
40	00	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40
50	84	63	00	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96
60	00	40	84	63	00	00	18	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	51

(2) HDMI2 (E5 , 41)

	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	01	00	01	01	01	01
10	01	1A	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E5

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	1F	F1	48	90	22	20	05	04	03	02	01	29	3D	06
10	C0	15	07	50	09	57	07	67	03	0C	00	20	00	80	1E	02
20	3A	80	18	71	38	2D	40	58	2C	45	00	40	84	63	00	00
30	1E	01	1D	80	18	71	1C	16	20	58	2C	25	00	40	84	63
40	00	00	9E	01	1D	00	72	51	D0	1E	20	6E	28	55	00	40
50	84	63	00	00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96
60	00	40	84	63	00	00	18	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	41

5. Final Assembly Adjustment

5.1. White Balance Adjustment

5.1.1. Overview

5.1.1.1. 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

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

5.1.1.2. 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 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.

5.1.2. Equipment

(1) Color Analyzer: CA-210 (NCG: CH 9 / WCG: CH12 / LED: CH14)

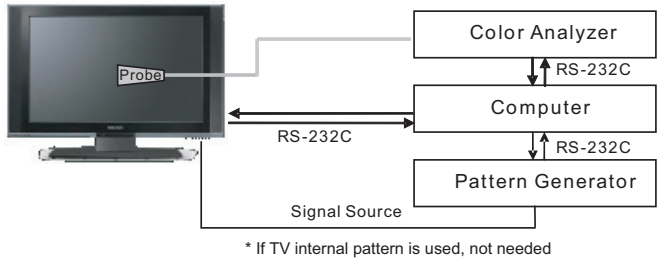
(2) Adj. Computer (During auto adj., RS-232C protocol is needed)

(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

5.1.3. Equipment connection



* If TV internal pattern is used, not needed

5.1.4. Adjustment Command (Protocol)

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

RS-232C COMMAND			Explanation
CMD	DATA	ID	
Wb	00	00	Begin White Balance adj.
Wb	00	ff	End White Balance adj. (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	TBD
	G Gain	j	h	00	C0	TBD
	B Gain	j	i	00	C0	TBD
	R Cut					TBD
	G Cut					TBD
	B Cut					TBD
Medium	R Gain	j	a	00	C0	TBD
	G Gain	j	b	00	C0	TBD
	B Gain	j	c	00	C0	TBD
	R Cut					TBD
	G Cut					TBD
	B Cut					TBD
Warm	R Gain	j	d	00	C0	TBD
	G Gain	j	e	00	C0	TBD
	B Gain	j	f	00	C0	TBD
	R Cut					TBD
	G Cut					TBD

5.1.5. Adjustment method

5.1.5.1. 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

5.1.5.2. Manual 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 à 9. White-Balance then press the cursor to the right (KEY►). When KEY(►) is pressed 206 Gray internal pattern will be displayed.

(4) Adjust Cool modes

(i) Fix the one of R/G/B gain to 192 (default data) and decrease the others.
(If G gain is adjusted over 172 and R and B gain less than 192 , Adjust is O.K.)

(ii) If G gain is less than 172,
Increase G gain by up to 172, and then increase R gain and G gain same amount of increasing G gain.

(iii) If R gain or B gain is over 255,
Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255

(5) Adjust two modes (Medium / Warm) Fix the one of R/G/B gain to 192 (default data) and decrease the others.

(6) Adj. is completed, Exit adjust mode using “EXIT” key on Remote controller.

5.1.6. Reference (White Balance Adj. coordinate and color temperature)

(1) Luminance: 204 Gray, 80IRE

(2) Standard color coordinate and temperature using CS-1000 (over 26 inch)

5.1.7. Reference (White Balance Adj. coordinate and color temperature)

▪ Luminance: 204 Gray

▪ Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	△uv
	X	Y		
Cool	0.271	0.270	13,000K	0.0000
Medium	0.286	0.289	9,300K	0.0000
Warm	0.313	0.329	6,500K	0.0000

▪ Standard color coordinate and temperature using CA-210(CH-14) – by aging time

(1) Normal line in Korea (From January to February)

	Aging time (Min)	Cool		Medium		Warm	
		X	Y	X	Y	X	Y
		271	270	286	289	313	329
1	0-2	286	295	301	314	328	354
2	3-5	284	290	299	309	326	349
3	6-9	282	287	297	306	324	346
4	10-19	279	283	294	302	321	342
5	20-35	276	278	291	297	318	337
6	36-49	274	275	289	294	316	334
7	50-79	273	272	288	291	315	331
8	80-119	272	271	287	290	314	330
9	Over 120	271	270	286	289	313	329

▪ Standard color coordinate and temperature using CA-210(CH-14) – by aging time

(2) Normal line in Korea (From March to December) : LGD
Normal line in Mexico : LGD

	Aging time (Min)	Cool		Medium		Warm	
		X	Y	X	Y	X	Y
		271	270	286	289	313	329
1	0-2	282	289	297	308	324	348
2	3-5	281	287	296	306	323	346
3	6-9	279	284	294	303	321	343
4	10-19	277	280	292	299	319	339
5	20-35	275	277	290	296	317	336
6	36-49	274	274	289	293	316	333
7	50-79	273	272	288	291	315	331
8	80-119	272	271	287	290	314	330
9	Over 120	271	270	286	289	313	329

(3) O/S Module(AUO, INX, Sharp, CSOT, BOE)

	cool		med		warm	
	x	y	x	y	x	y
spec	271	270	286	289	313	329
target	278	280	293	299	320	339

5.2. Option selection per country

5.2.1. Overview

(1) Tool option selection is only done for models in Non-USA North America due to rating

(2) Applied model: LA42B Chassis applied to CANADA and MEXICO

5.2.2. Country Group selection

(1) Press ADJ key on the Adj. R/C, and then select Country Group Menu

(2) Depending on destination, select US, then on the lower Country option, select US, CA, MX.
Selection is done using +, - KEY

5.2.3. Tool Option inspection

▪ Press Adj. key on the Adj. R/C, then select Tool option

* Tool option can be reconstructed by Software

5.2.3. Country Group Code

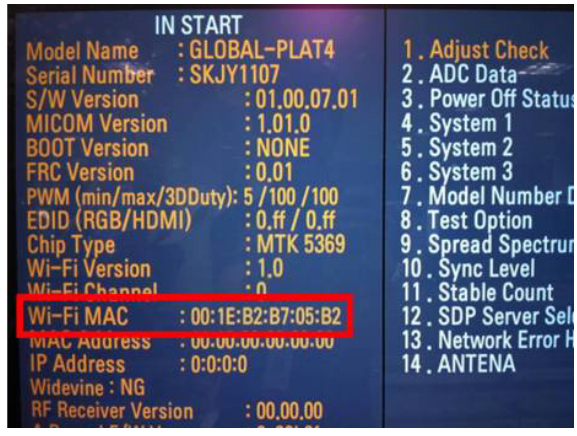
Country	Area Option
US	02

5.3. Wi-Fi MAC Address Check

5.3.1. Using RS232 Command

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

5.3.2. Check the menu on in-start



5.4. HDMI ARC Function Inspection

5.4.1. Test equipment

- Optic Receiver Speaker
- MSHG-600 (SW: 1220 ↑)
- HDMI Cable (for 1.4 version)

5.4.2. Test method

(1) Insert the HDMI Cable to the HDMI ARC port from the master equipment (HDMI1)

(2) Check the sound from the TV Set

(3) Check the Sound from the Speaker or using AV & Optic TEST program (It's connected to MSHG-600)

Flow Line

Cell Line

* Remark: Inspect in Power Only Mode and check SW version in a master equipment

5.5. 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. AUDIO output check

6.1. Audio input condition

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

6.2. Specification

No	Item	Min	Typ	Max	Unit	Remark
1	Audio practical max Output, L/R (Distor-tion=10% max Output)	4.5 6.0	5.0 6.32	6.0 6.93	W Vrms	(1) Measurement condition - EQ/AVL/Clear Voice: Off (2) Speaker (6Ω Impedance) (3) 49/43LH57
2		2.7 4.03	3.0 4.24	3.6 4.64	W Vrms	(1) Measurement condition - EQ/AVL/Clear Voice: Off (2) Speaker (6Ω Impedance) (3) 32LH57

7. GND and HI-POT Test

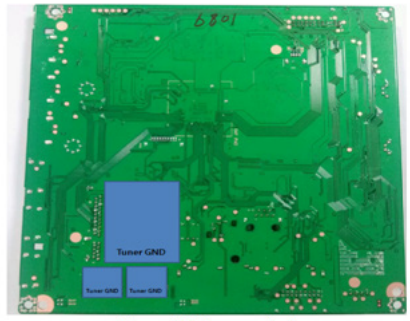
7.1. GND & HI-POT auto-check preparation

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

7.2. 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 automatica



<Tuner GND is separated>

7.3. Checkpoint

(1) Test voltage

Products/Model		TV
2Poles	Other	3000V(AC)/ 4242V(DC)
3Poles	Other	1500V(AC)/ 2121V(DC)
Cut off current		100mA(AC)/100mA(DC)
Earth Continutiy test (3Poles only)		≤0.1`Ω at 25A/1 sec

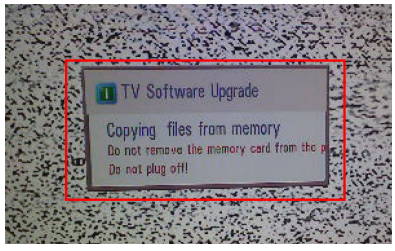
(2) TEST time: 1 second
(3) TEST POINT
- GND Test = POWER CORD GND and SIGNAL CABLE GND.
- Hi-pot Test = POWER CORD GND and LIVE & NEUTRAL.

(4) LEAKAGE CURRENT: At 0.5mArms

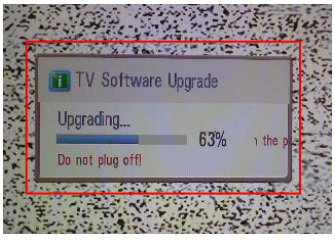
8. USB S/W Download (optional, Service only)

(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 staring.



(5) Updating Completed, The TV will restart automatically
(6) If your TV is turned on, check your updated version and Tool option.

* 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, TOOL OPTION setting is needed again.
(1) Push "IN-START" key in service remote controller.
(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 White balance Adjustment

9.1.1. 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 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

9.1.2. 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/216-Gray (Model: 217, Pattern: 78)

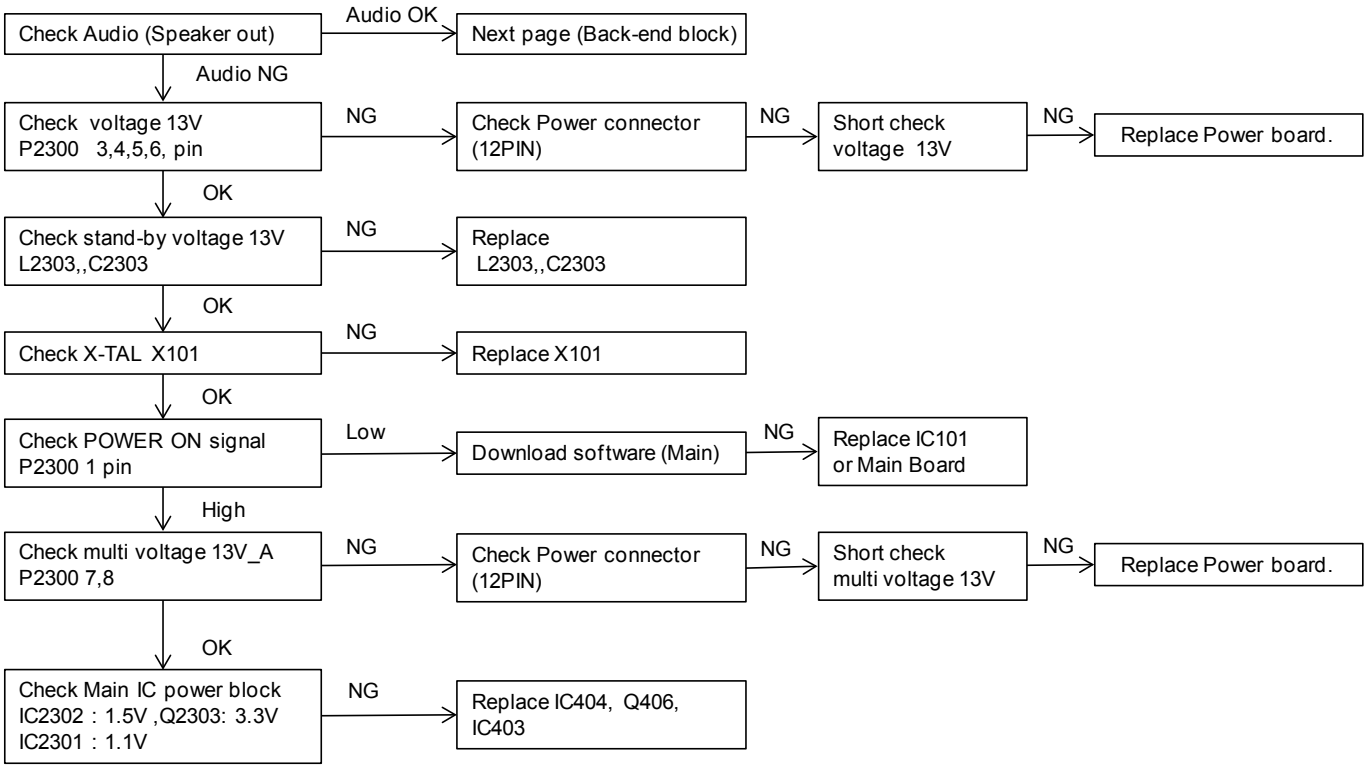
9.1.3. Adjustment

(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.

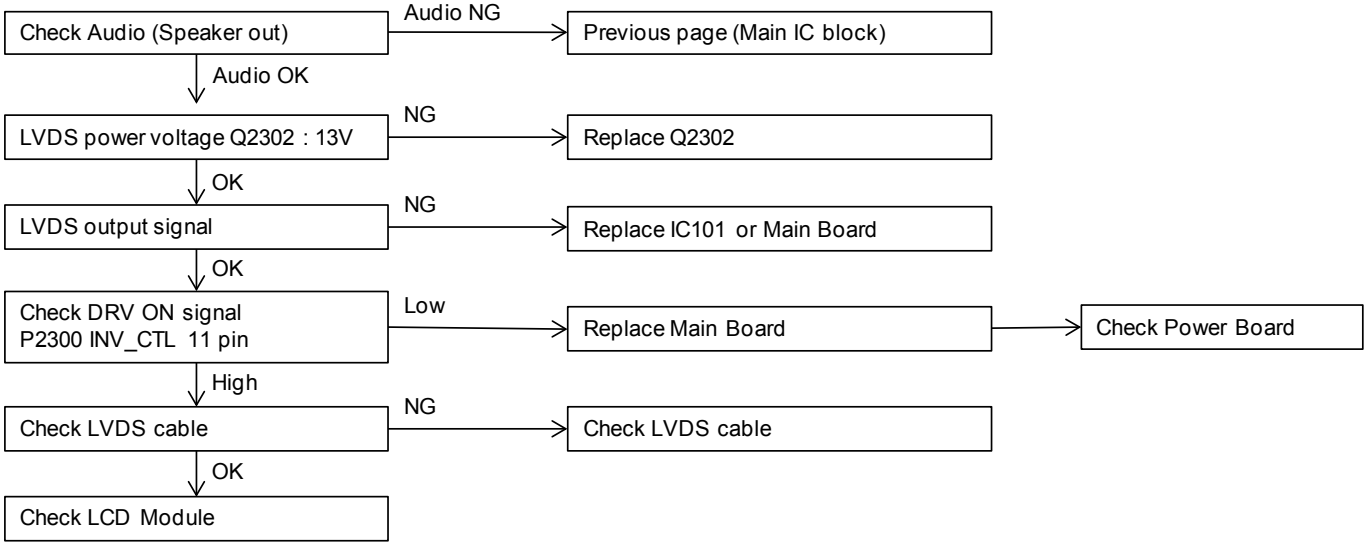
▪ If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 216 Gray pattern.

TROUBLE SHOOTING GUIDE

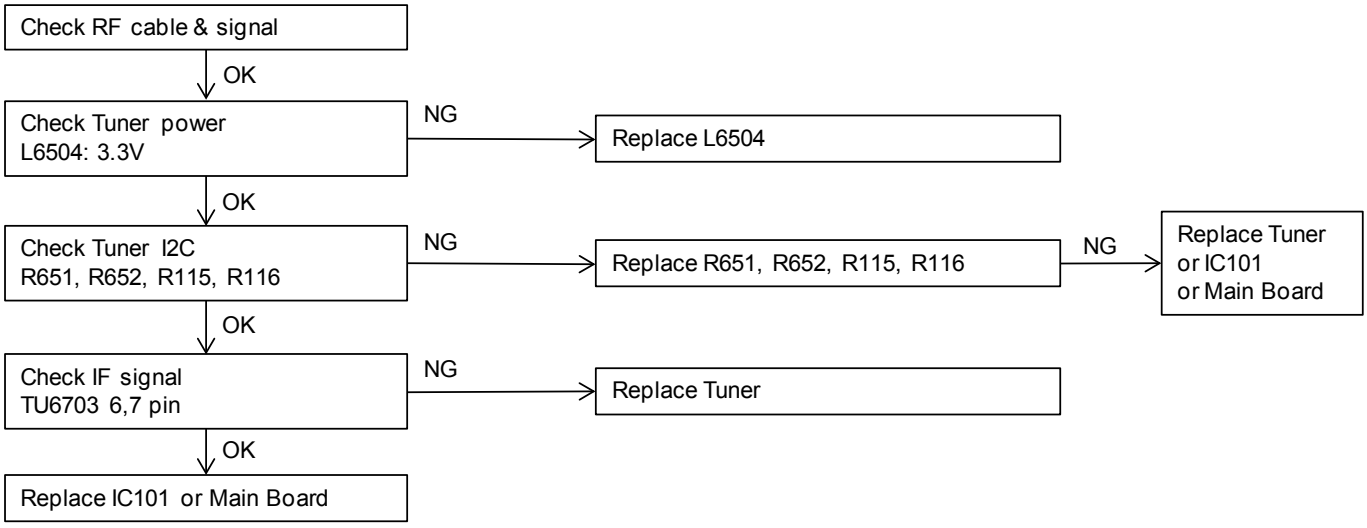
1. No video (Main IC Block)



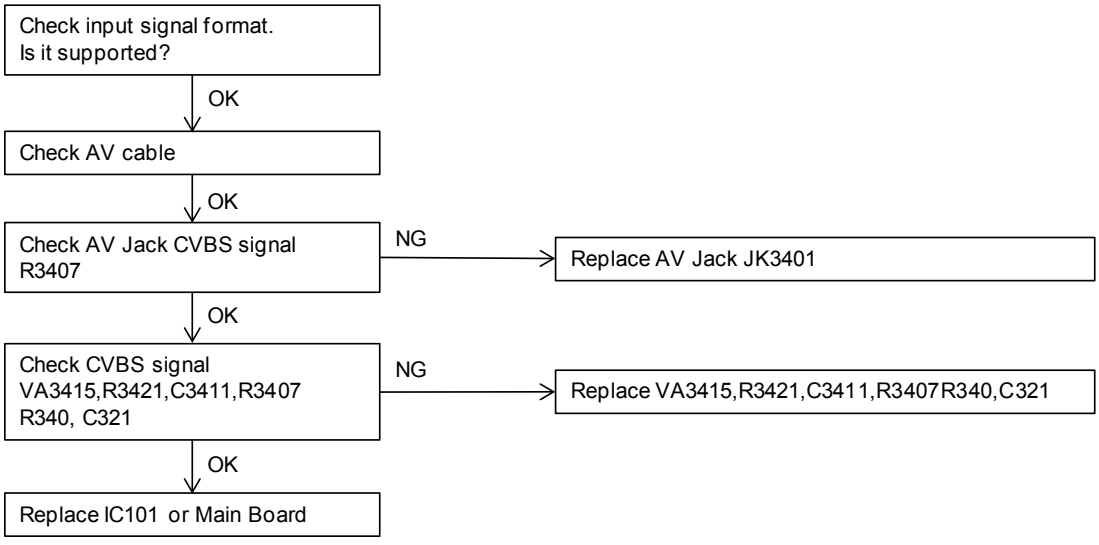
2. No video (Back-end Block)



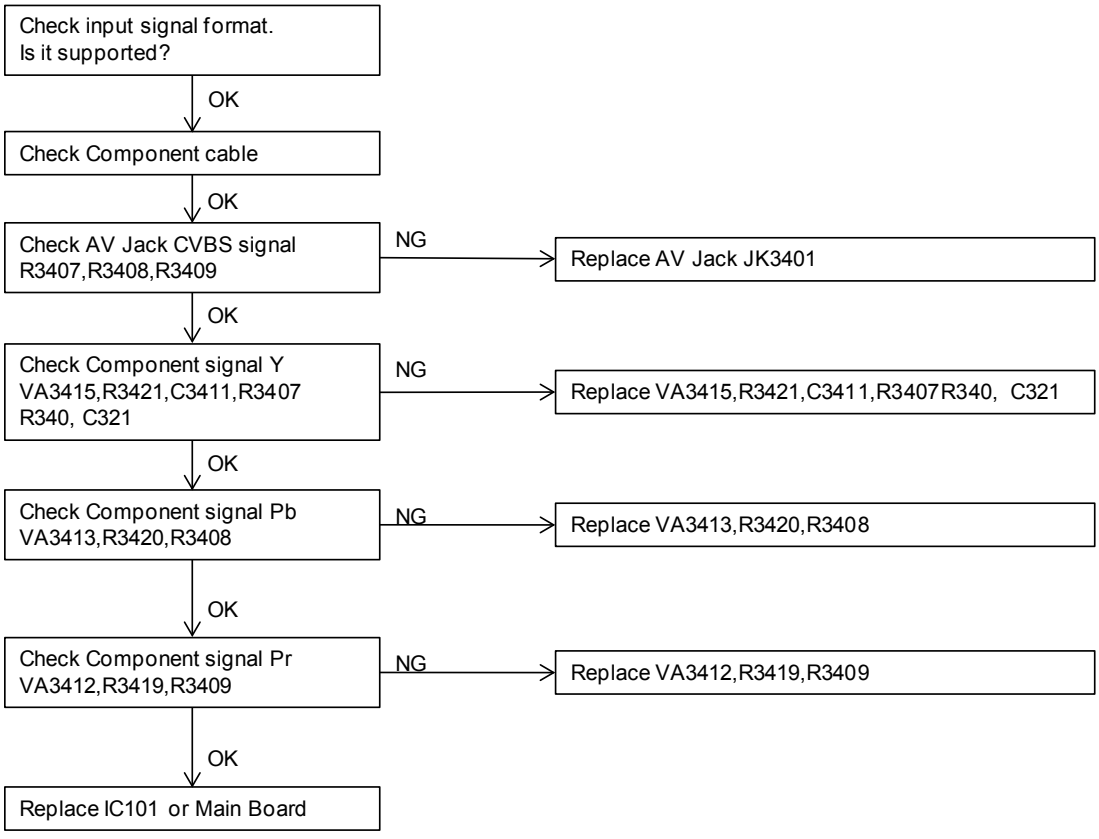
3. Digital / Analog TV Video No signal



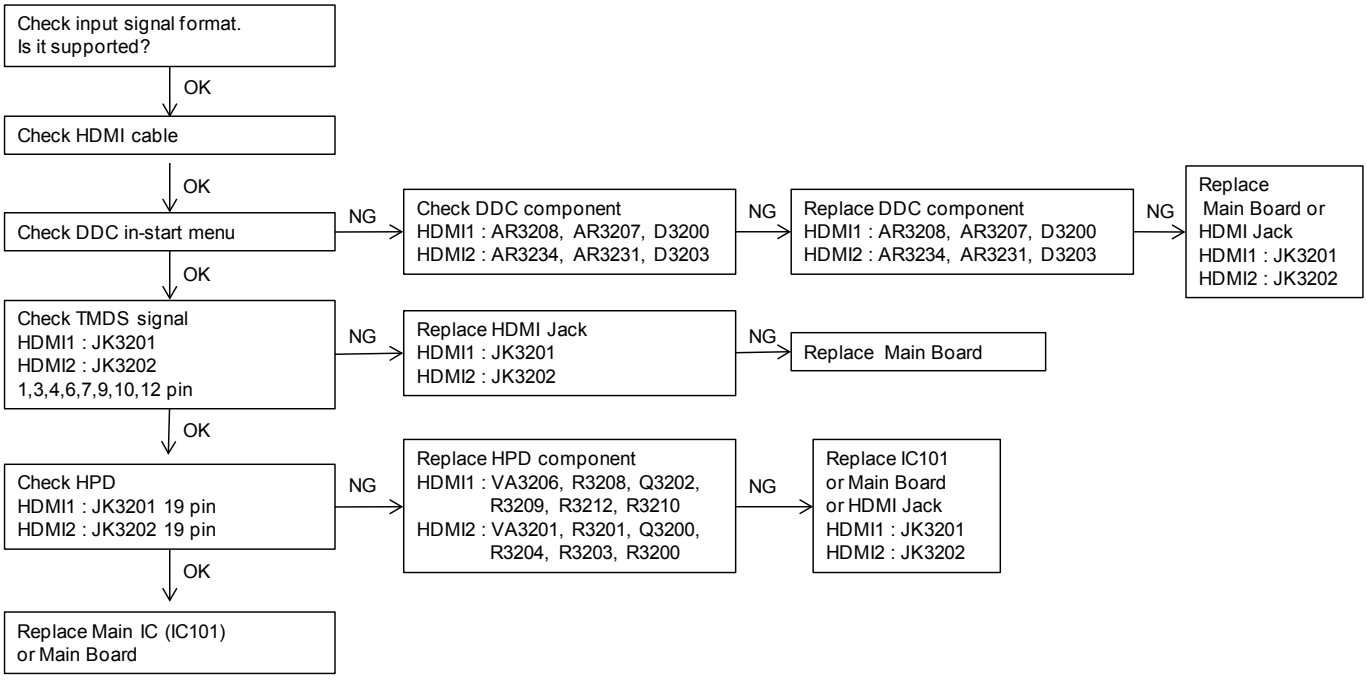
4. AV Video No signal



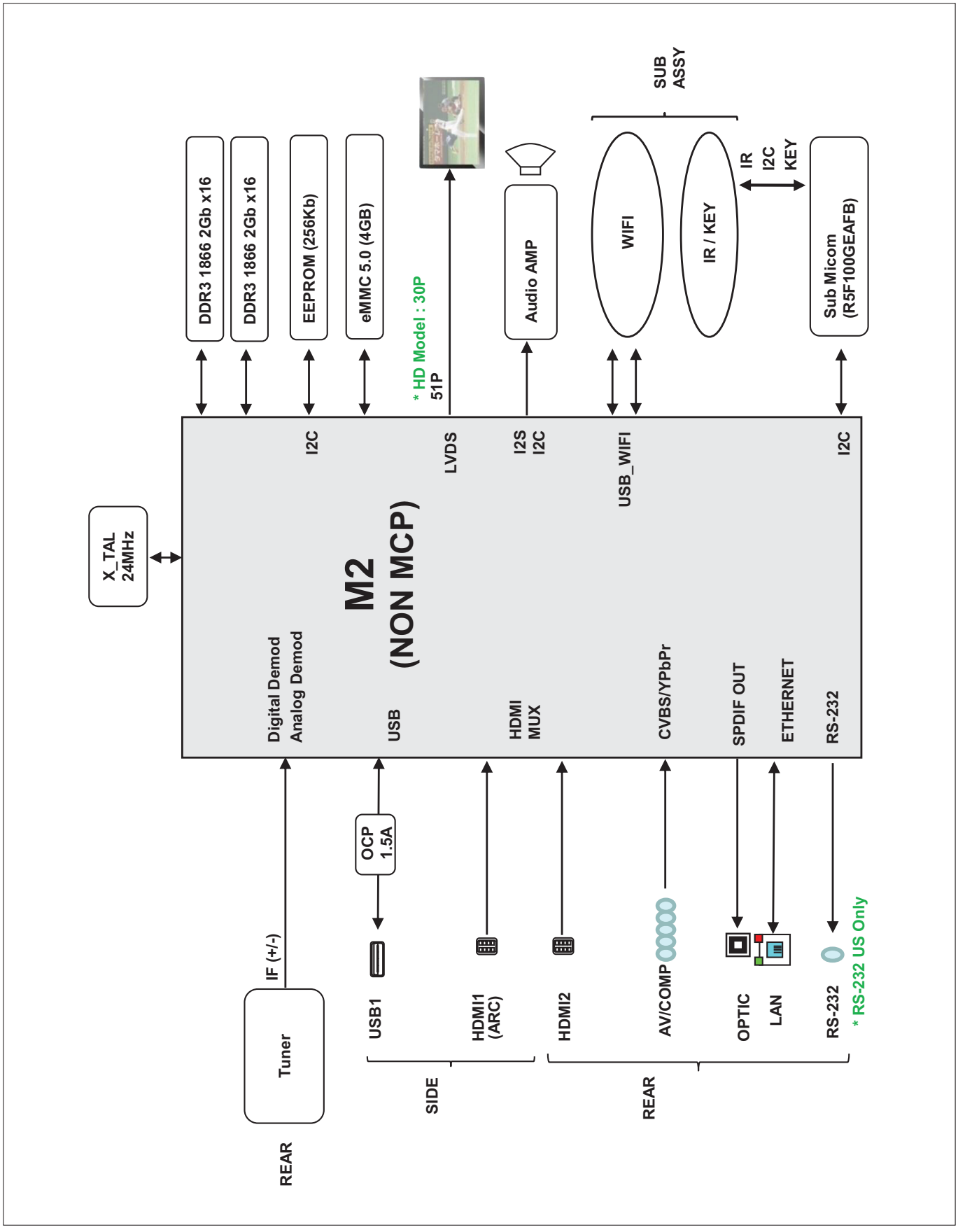
5. Component Video No signal



6. HDMI Video No signal



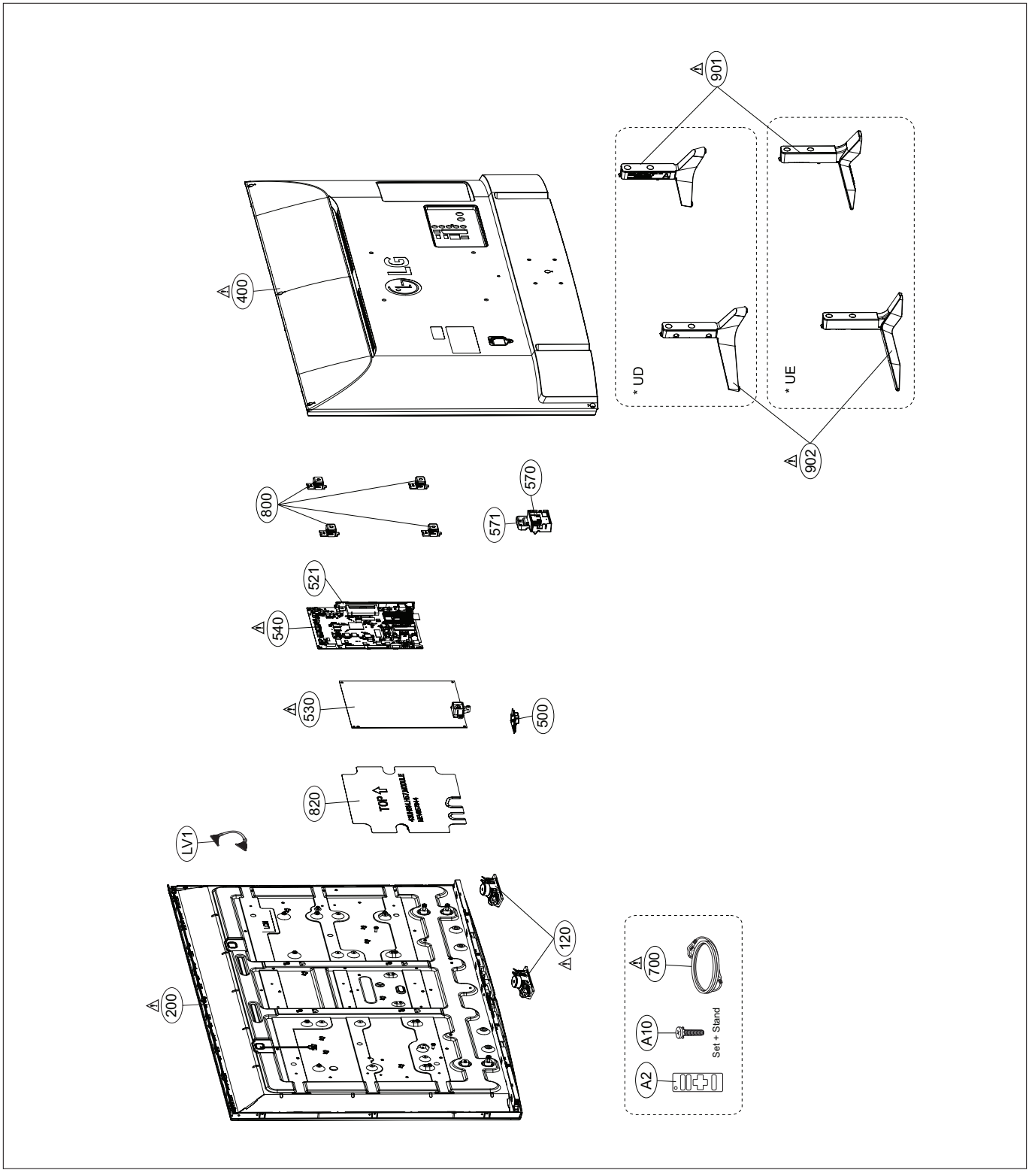
BLOCK DIAGRAM



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.

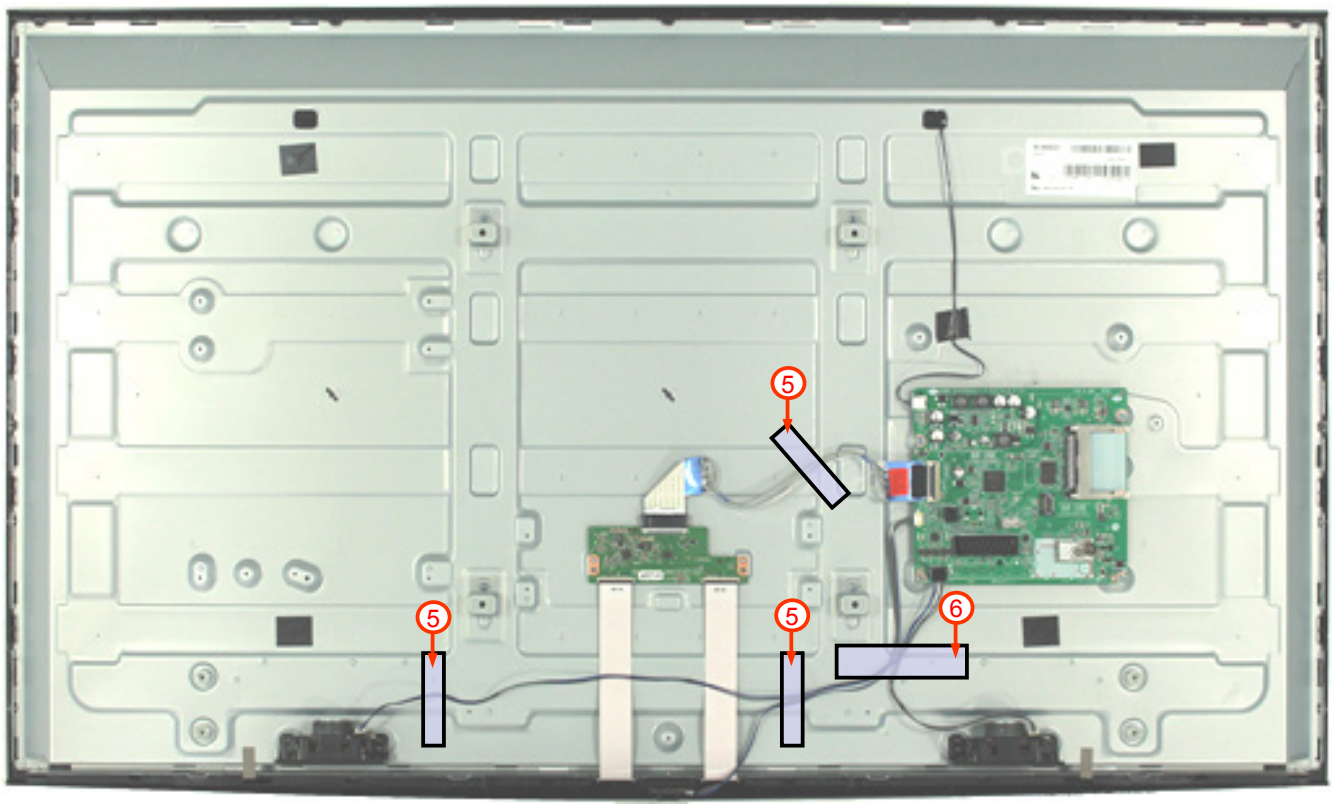


DISASSEMBLY

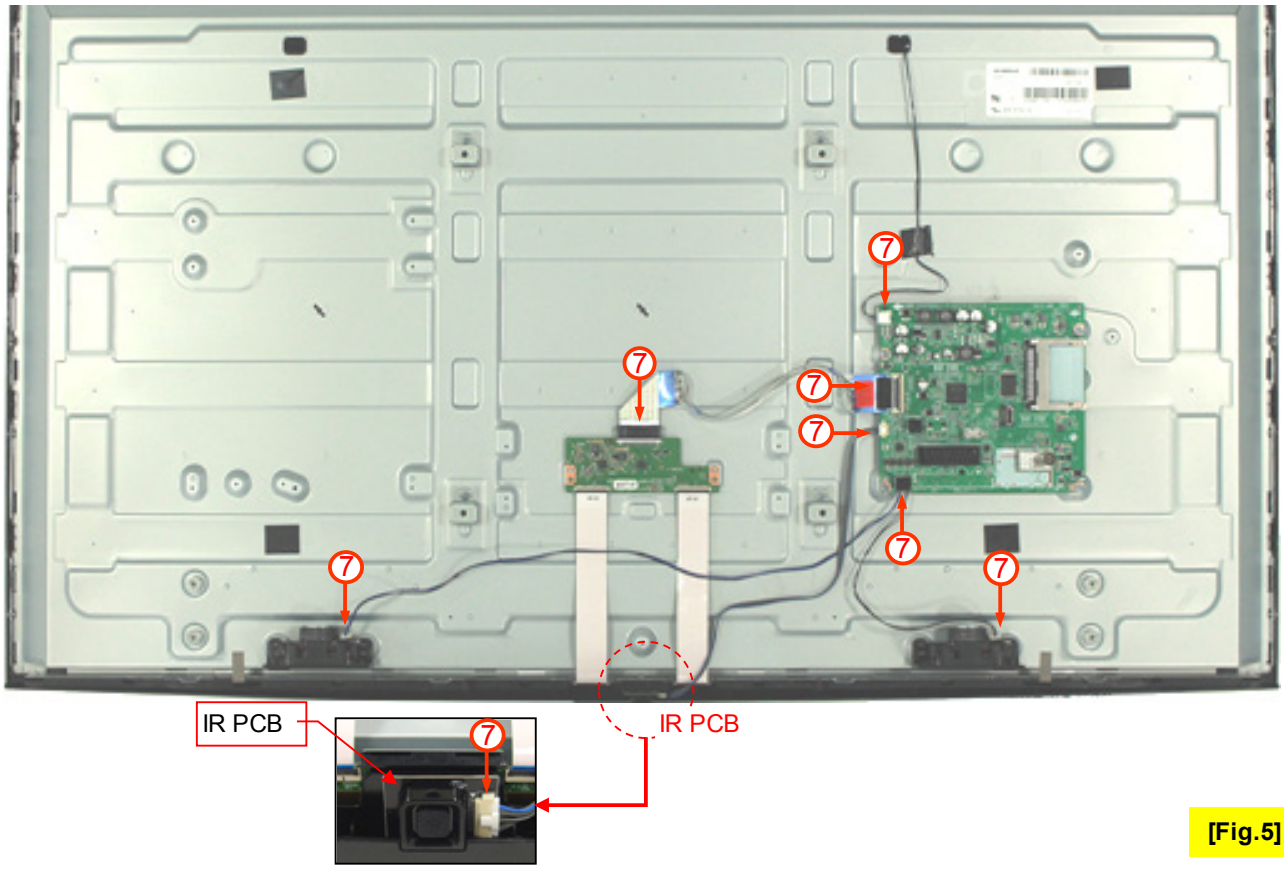
[Fig.1]

[Fig.2]

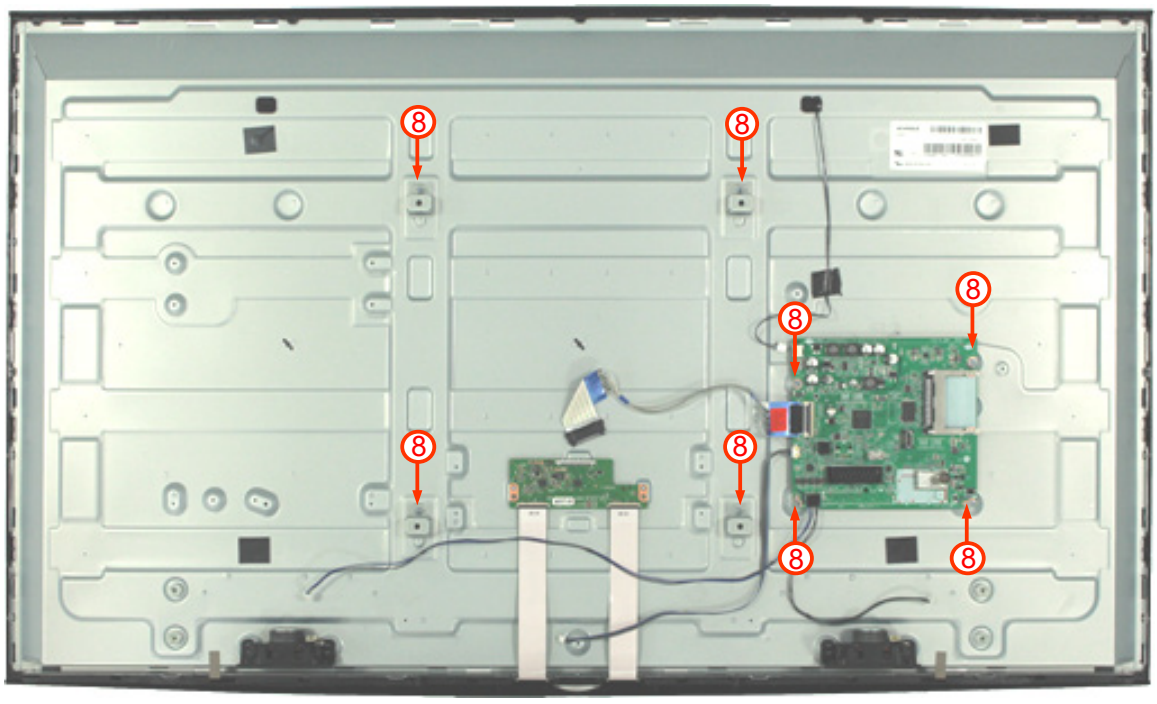
[Fig.3]



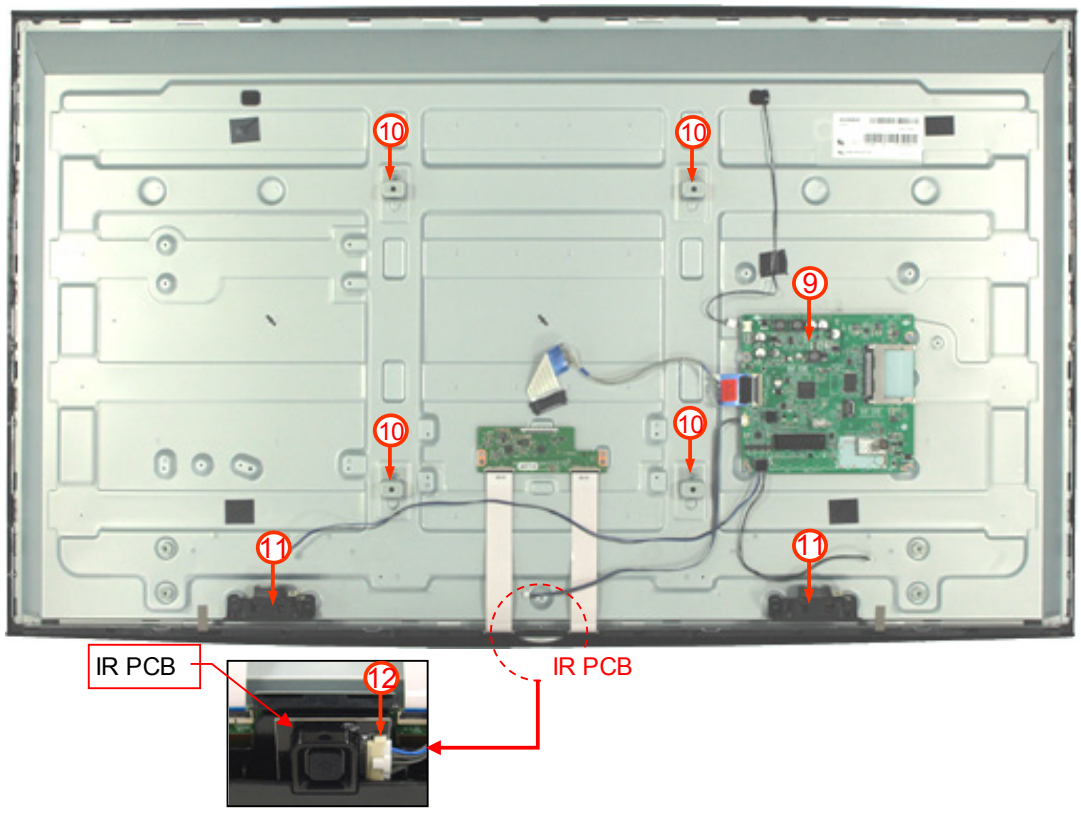
[Fig.4]



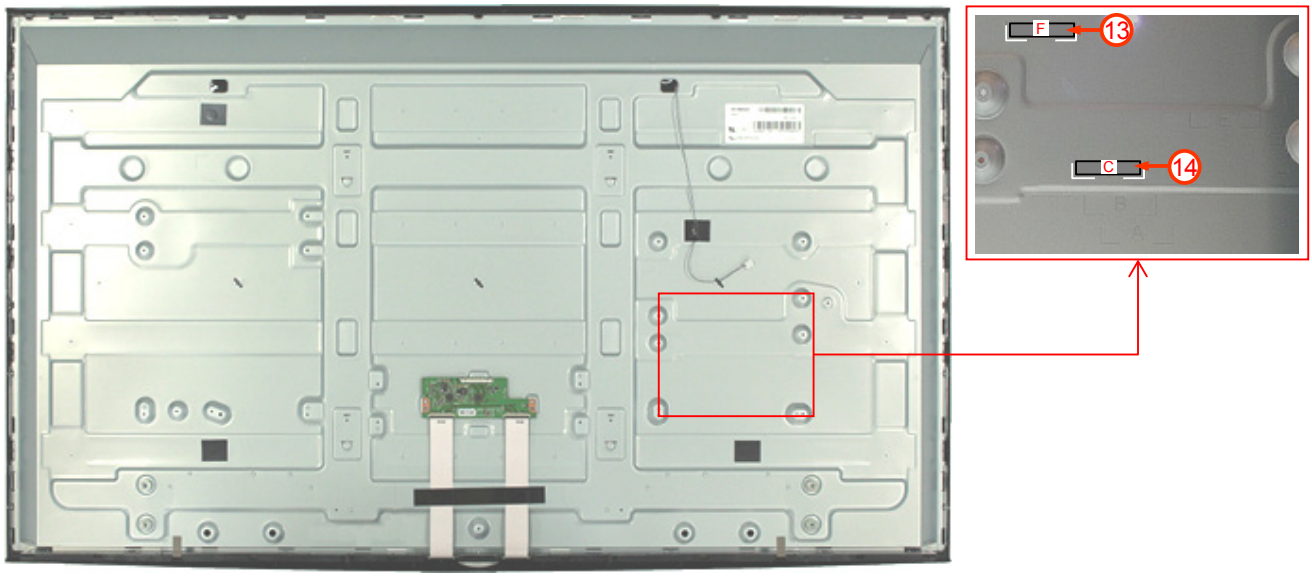
[Fig.5]



[Fig.6]

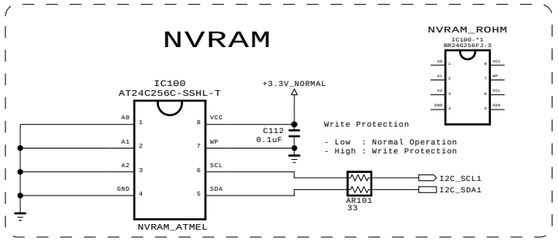


[Fig.7]

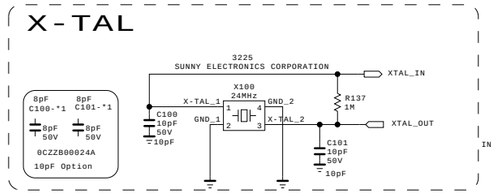


[Fig.8]

NVRAM



X-TAL

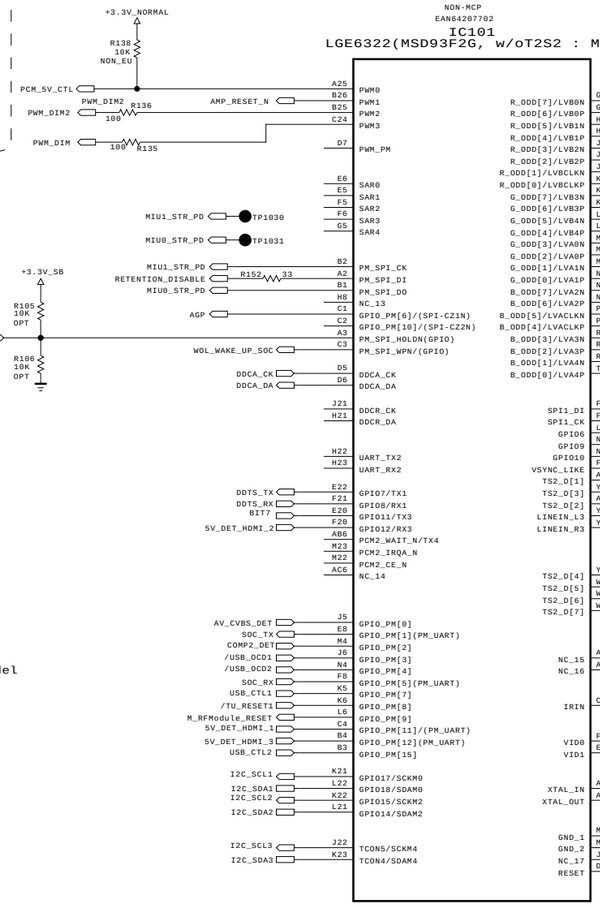


I2C

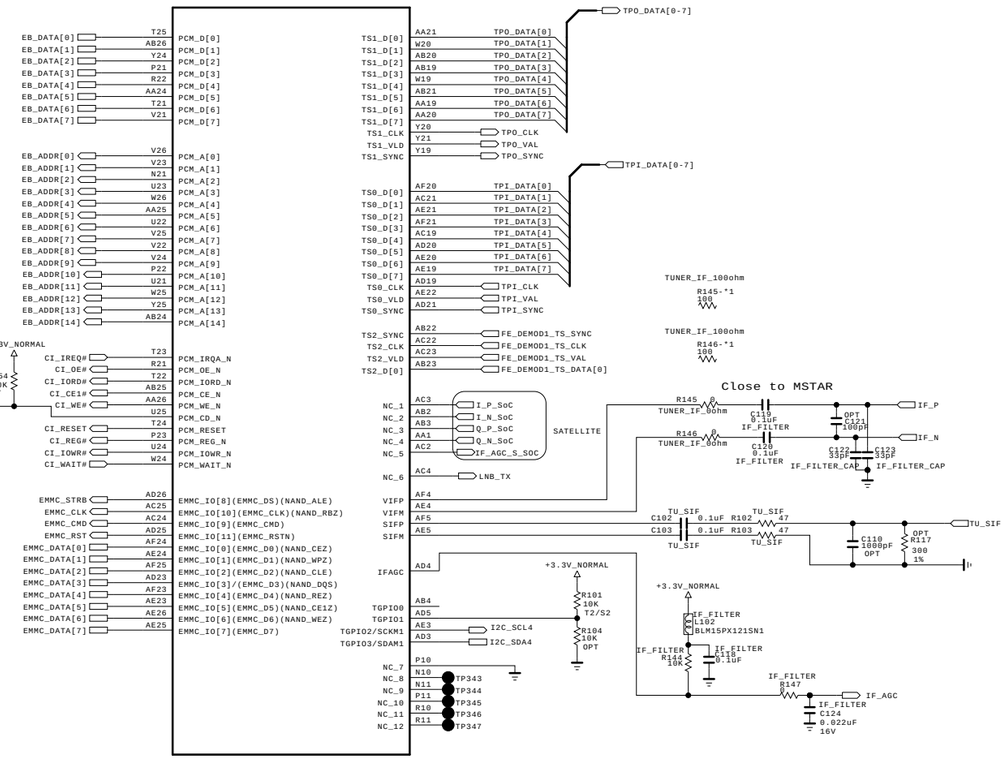
I2C_1 : AMP, L/D, NVM, TCON
I2C_2 : TUNER
I2C_3 : MICOM
I2C_4 : S/Demod,T2/Demod, LNB ==> only for LNB - Satellite Model

P/NO
MCP : EAN64207701 (MSD93F2GW)
NON MCP : EAN64207702 (MSD93F2G)

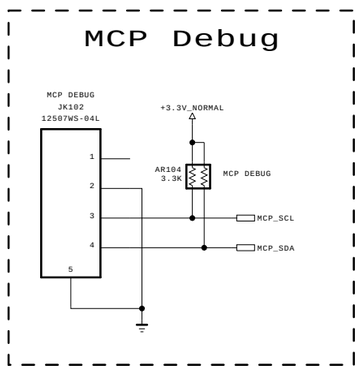
NON-MCP
EAN64207702
IC101
LGE6322(MSD93F2G, w/oT2S2 : M2)



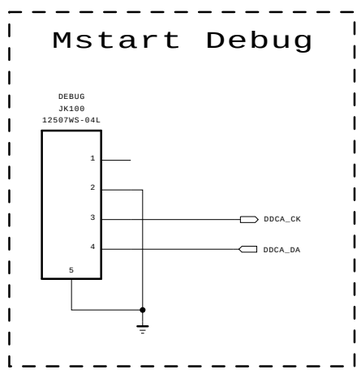
NON-MCP
IC101
LGE6322(MSD93F2G, w/oT2S2 : M2)



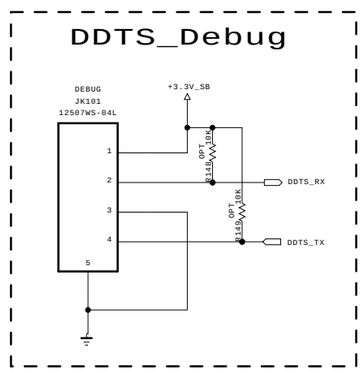
MCP Debug



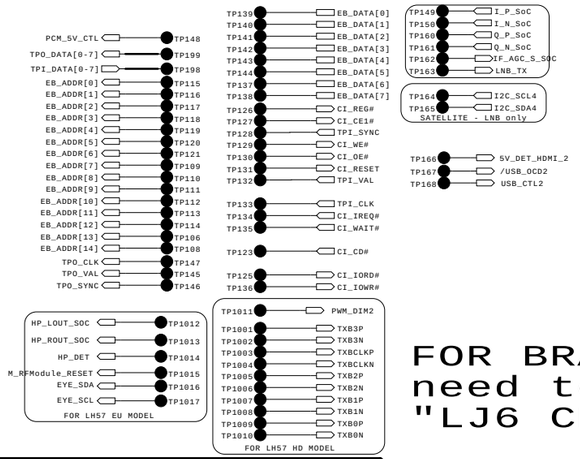
Mstart Debug



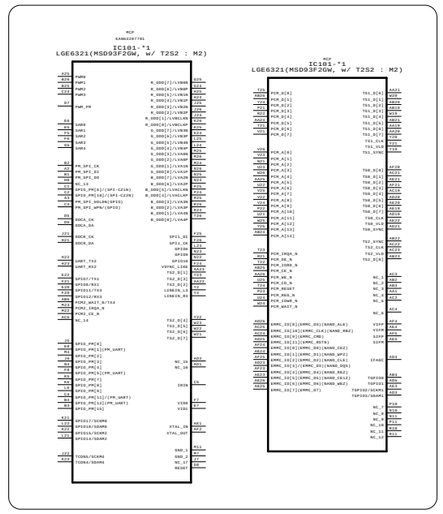
DDTS_Debug



SATELLITE



MCP for T2/S2



FOR BRAZIL Energy Regulation need to ADD SILK "LJ6 CHASSIS"

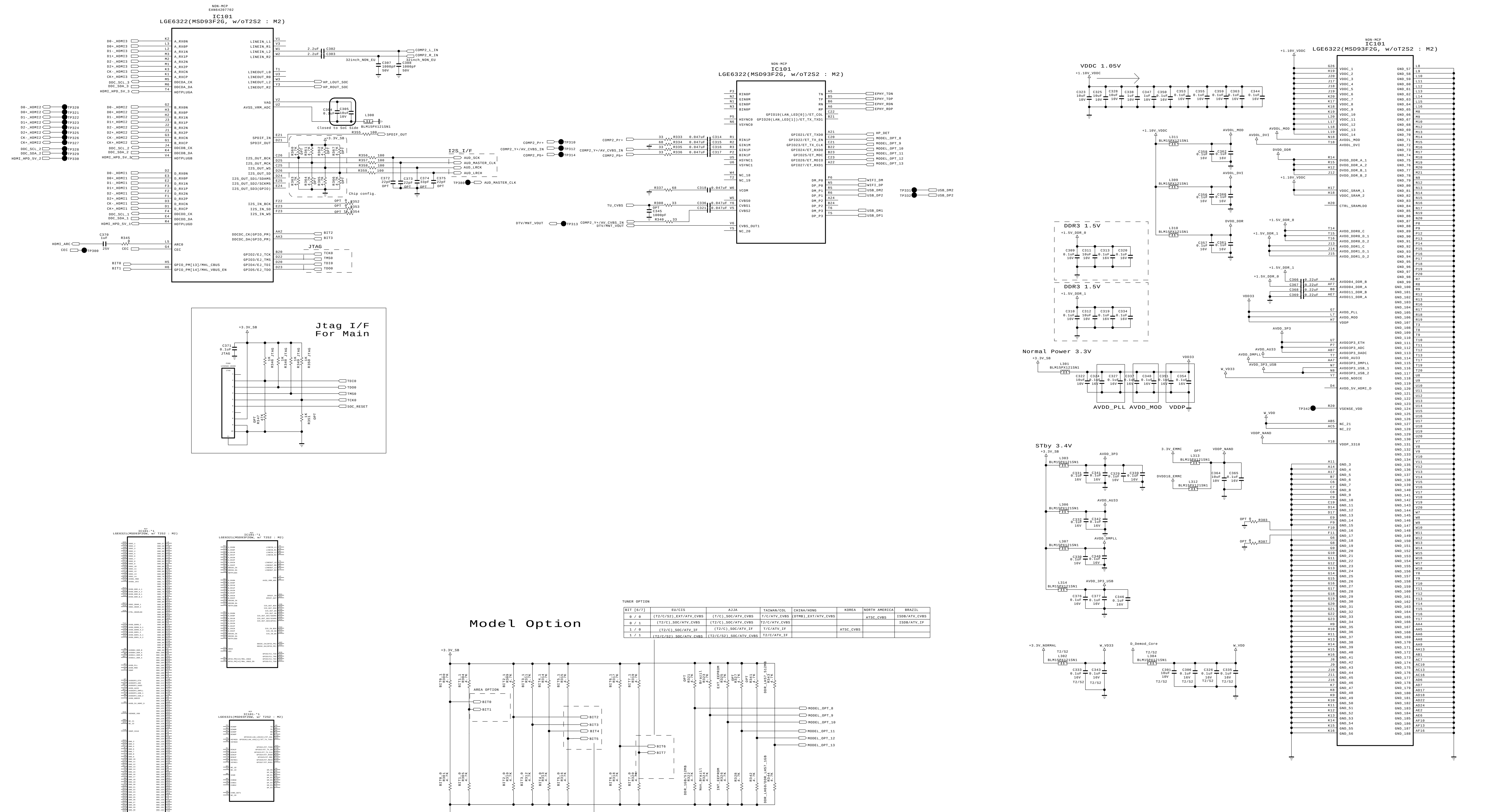
THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.10.02
BLOCK	MAIN1	SHEET	1

LGE Internal Use Only



TUNER OPTION

BIT [6/7]	EU/CIS	AJJA	TAIWAN/COL	CHINA/HONG	KOREA	NORTH AMERICA	BRAZIL
0 / 0	(T2/C/S2)_EXT/ATV_CVBS	(T/C)_SOC/ATV_CVBS	T/C/ATV_CVBS	(DTMB)_EXT/ATV_CVBS		ATSC_CVBS	ISDB/ATV_CVBS
0 / 1	(T2/C)_SOC/ATV_CVBS	(T2/C)_SOC/ATV_CVBS	T2/C/ATV_CVBS				ISDB/ATV_IF
1 / 0	(T2/C)_SOC/ATV_IF	(T2/C)_SOC/ATV_IF	T/C/ATV_IF		ATSC_CVBS		
1 / 1	(T2/C/S2)_SOC/ATV_CVBS	(T2/C/S2)_SOC/ATV_CVBS	T2/C/ATV_IF				

AREA OPTION

BIT [0/1]	DVB	ATSC	JP
0 / 0	EU/CIS	N/AMERICA	
0 / 1	CHINA/HONGKONG	KOREA	JAPAN
1 / 0	TAIWAN/COLOM	S/AMERCIA	
1 / 1	ASIA/AFRICA		

BACK-END OPTION

BIT[2/3/4/5]	TYPE	FHD	FRC	PANEL TYPE
0 / 0 / 0 / 0	LVDS	FHD,	60Hz	
0 / 0 / 0 / 1	~~EPI~~	~~FHD,~~	~~120Hz,~~	~~V14_32inch (6 lane)~~
0 / 0 / 1 / 0	~~EPI~~	~~FHD,~~	~~120Hz,~~	~~V13 (6 lane)~~
0 / 0 / 1 / 1	~~EPI~~	~~FHD,~~	~~120Hz,~~	~~V12 (6 lane)~~
0 / 1 / 0 / 0	~~EPI~~	~~FHD,~~	~~60Hz,~~	~~V14_32 inch (6lane)~~
0 / 1 / 0 / 1	~~LVDS~~	~~FHD,~~	~~120Hz~~	
0 / 1 / 1 / 0	~~EPI~~	~~FHD,~~	~~120Hz,~~	~~V14 (8 lane)~~
0 / 1 / 1 / 1	LVDS	HD,	60Hz	
1 / 0 / 0 / 0	LVDS	FHD,	60Hz,	CP BOX
1 / 0 / 0 / 1	~~LVDS~~	~~HD,~~	~~60Hz~~	~~SMALL SMART~~
1 / 0 / 1 / 0	~~Vby1~~	~~FHD,~~	~~120Hz~~	~~OLED~~
1 / 0 / 1 / 1	~~LVDS~~	~~FHD,~~	~~120Hz~~	~~OLED~~
1 / 1 / 0 / 0				
1 / 1 / 0 / 1				
1 / 1 / 1 / 0				
1 / 1 / 1 / 1				

LH60 DDR OPTION

MODEL_OPT_8 / MODEL_OPT_12	DDR
0 / 0	1GB
1 / 0	768MB
0 / 1	-
1 / 1	-

LH57 DDR OPTION

MODEL_OPT_8 / MODEL_OPT_13	DDR
0 / 0	1GB
1 / 0	768MB
0 / 1	512MB
1 / 1	-

DDR Brazil OPT_LH60/LH57 COMMON

MODEL_OPT_9	DDR Country OPT
0	Non Brazil
1	Brazil

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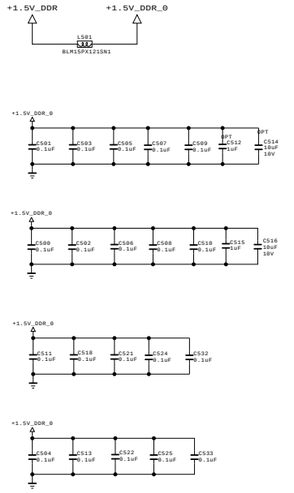
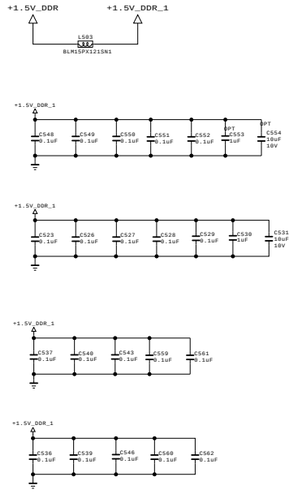
SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION.
FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS
ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR
THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

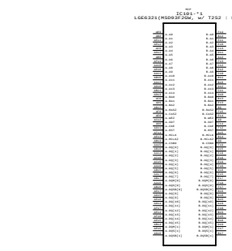
SECRET
LGElectronics

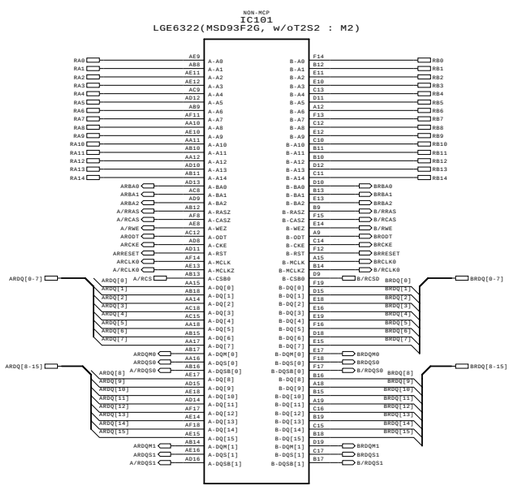
LG ELECTRONICS

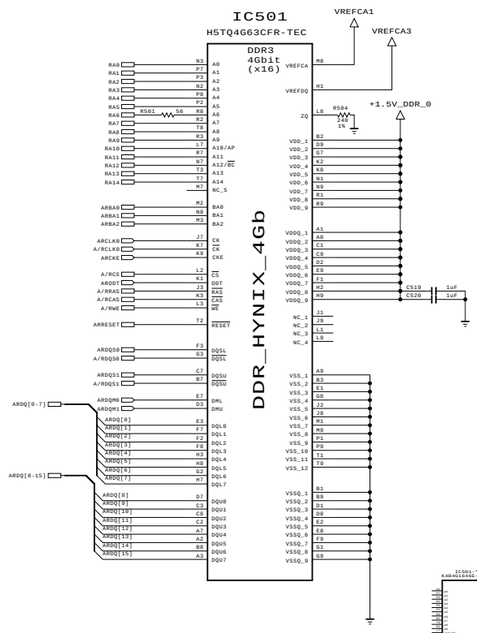
MODEL	16Y_M2	DATE	2015.10.02
BLOCK	MAIN2	SHEET	3

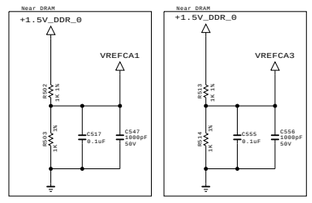


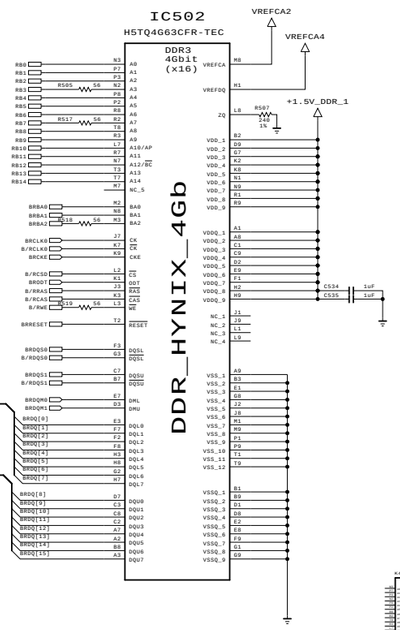


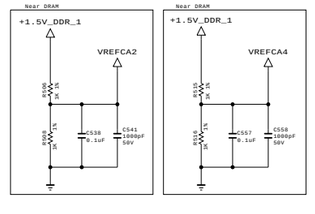


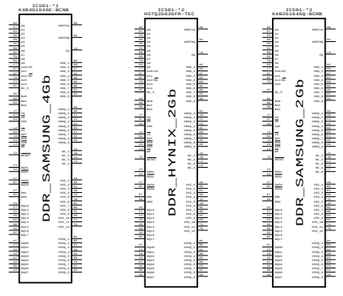


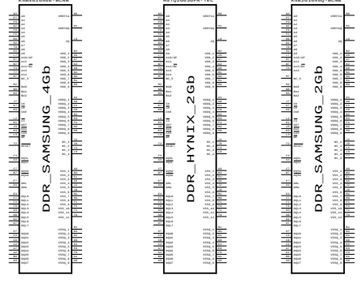












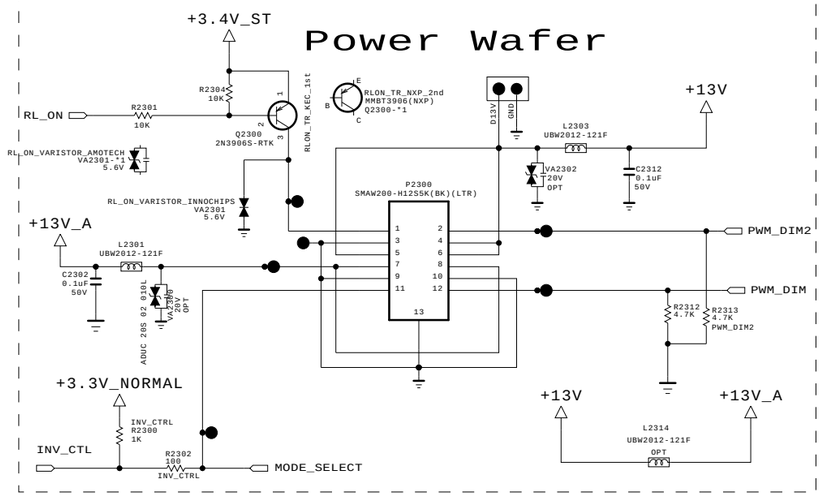
THE ⚠ SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FIRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMETIC.

SECRET
LGElectronics

LG ELECTRONICS

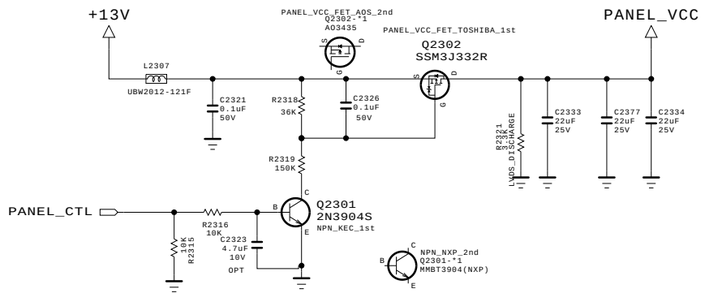
MODEL	16Y_M2	DATE	2015.10.02
BLOCK	DDR	SHEET	5

Power Wafer

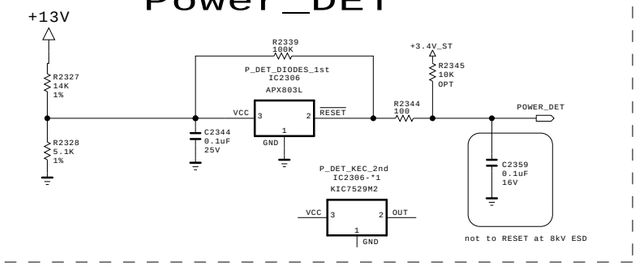


PANEL_POWER

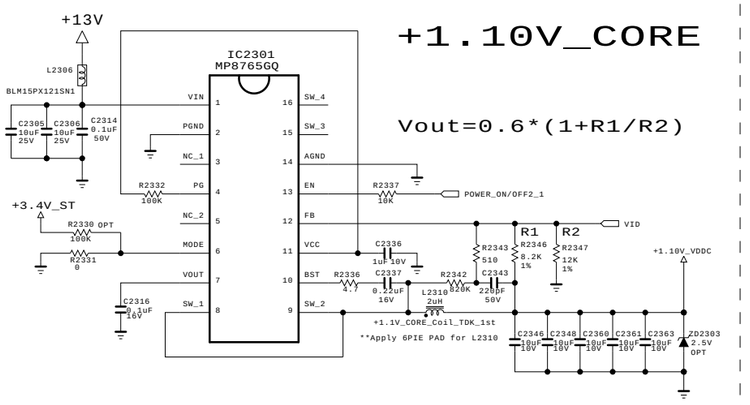
Q2302 Change: Diodes --> NXP 131118



Power_DET

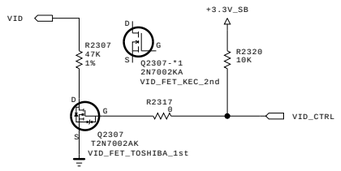


+1.10V_CORE



Vout=0.6*(1+R1/R2)

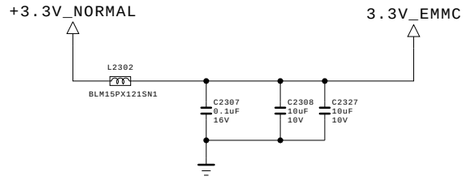
VID_CTRL



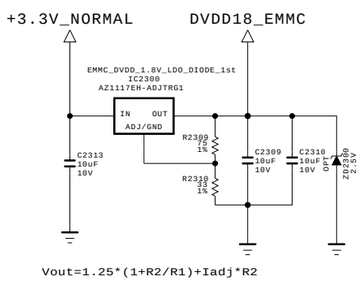
R1:8.2K/R2:12K//47K, V=1.1V(VID_CONTROL=HIGH)

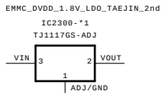
R1:8.2K/R2:12K, V=1.0V(VID_CONTROL=LOW)

+3.3V - eMMC 4.41/4.51

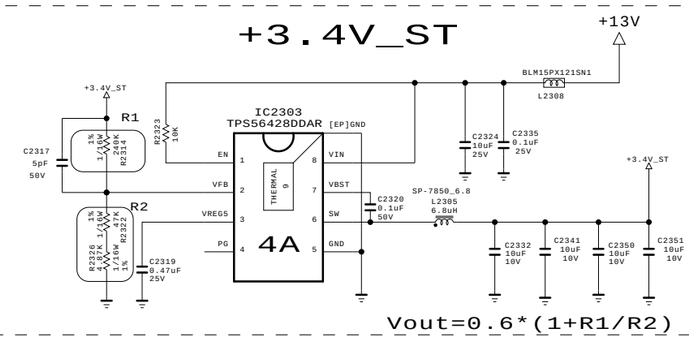


+1.8V - eMMC 4.51



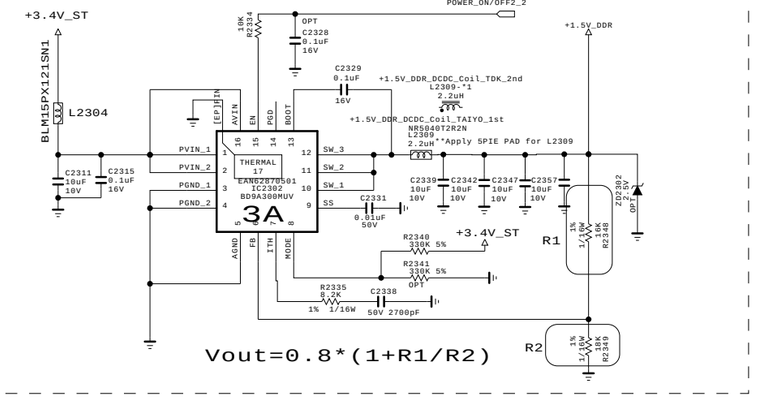


+3.4V_ST



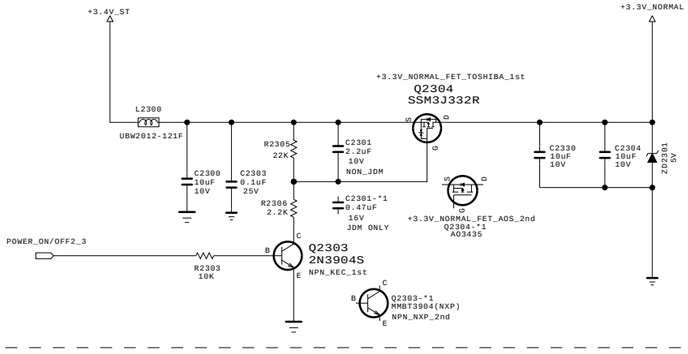
Vout=0.6*(1+R1/R2)

+1.5V DDR

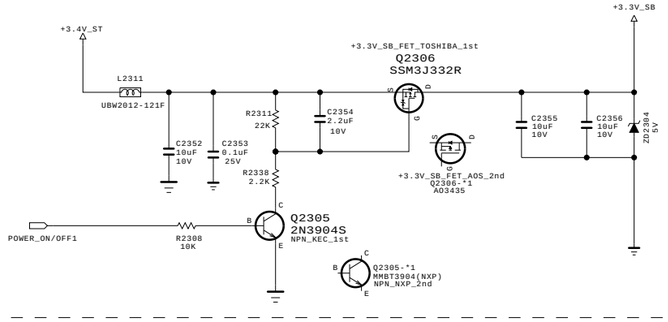


Vout=0.8*(1+R1/R2)

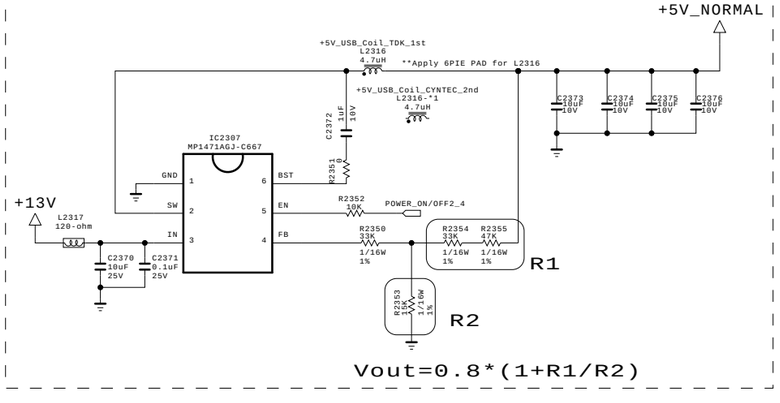
+3.3V_NORMAL



+3.3V_SB



+5.0V normal & USB



Vout=0.8*(1+R1/R2)

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SECRET

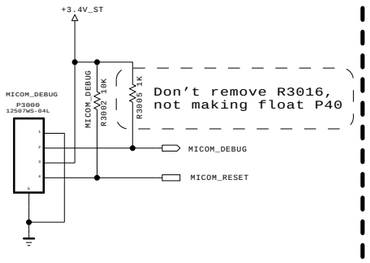
LGElectronics

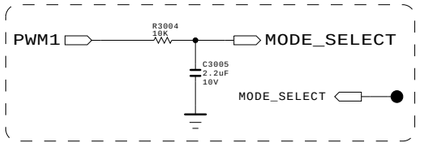
LG ELECTRONICS

MODEL	M2_Simple Smart	DATE	2015.07.07
BLOCK	POWER	SHEET	23

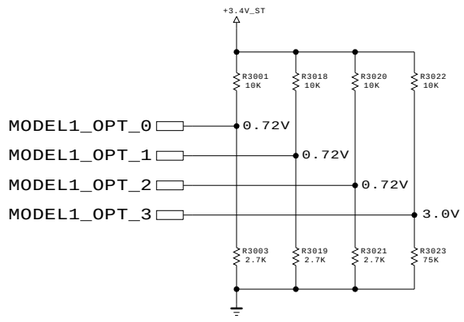
Renesas MICOM

For Debug



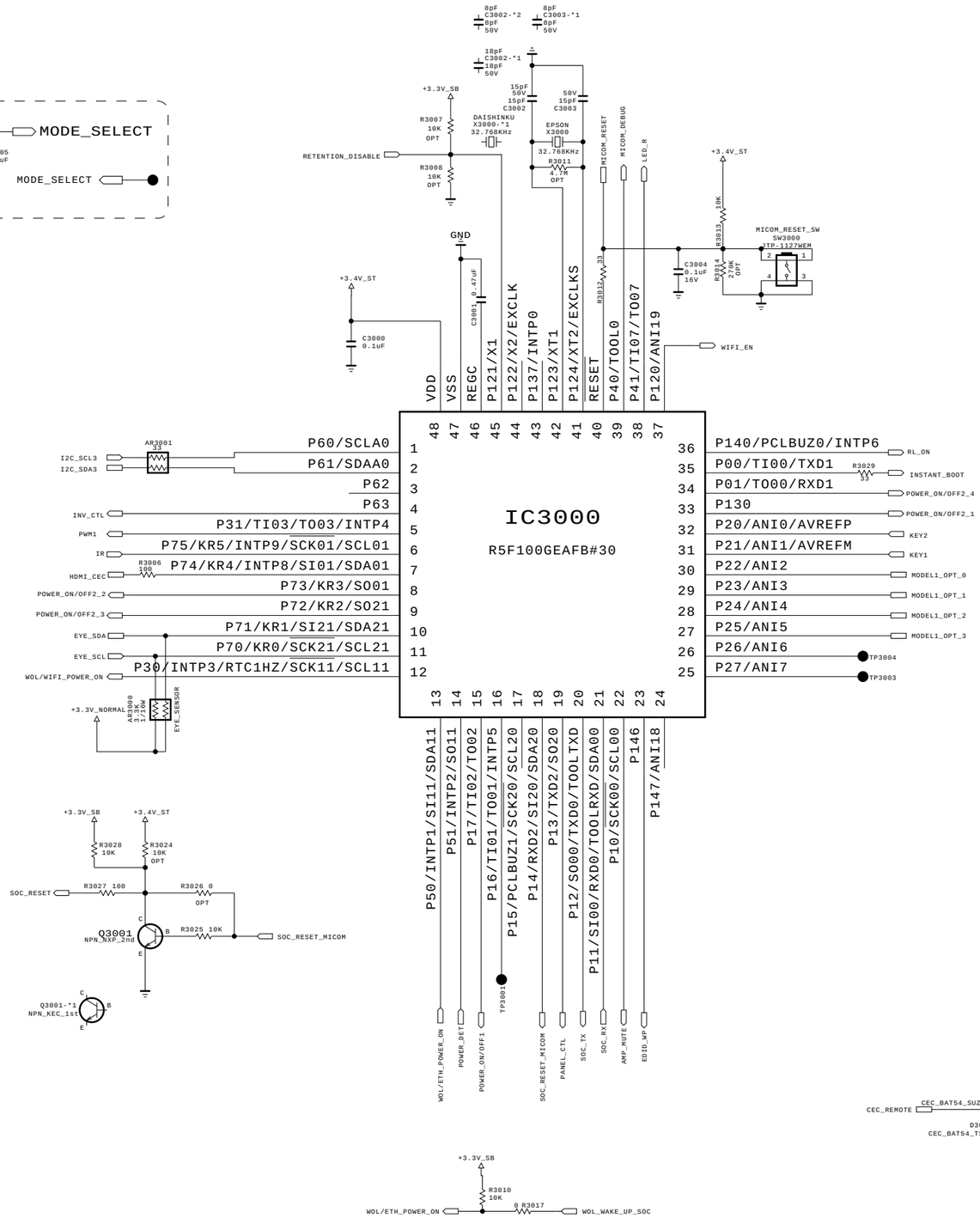


MICOM MODEL OPTION

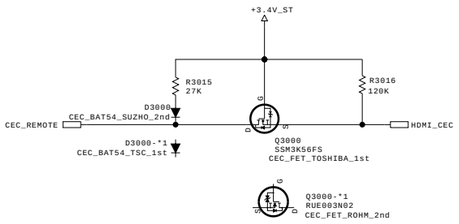


MICOM MODEL OPTION

	00 (0.72V)	01 (1.53V)	10 (2.27V)	11 (3.0V)
MODEL_OPT_0	NON LOGO / LCD	LOGO / LCD	NON LOGO / OLED	LOGO / OLED
MODEL_OPT_1	TV			BOX
MODEL_OPT_2	FHD	-	UD	8K
MODEL_OPT_3 FHD	M16	-	A5LR	M2
MODEL_OPT_3 UD/8K	M16	RTK	H15	-



For CEC



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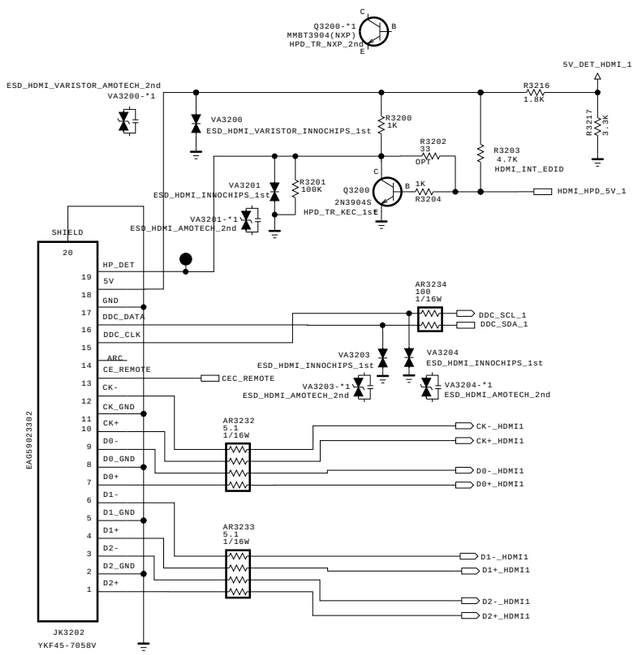
SECRET
LGElectronics

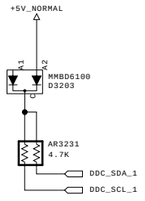
LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	MICOM	SHEET	30

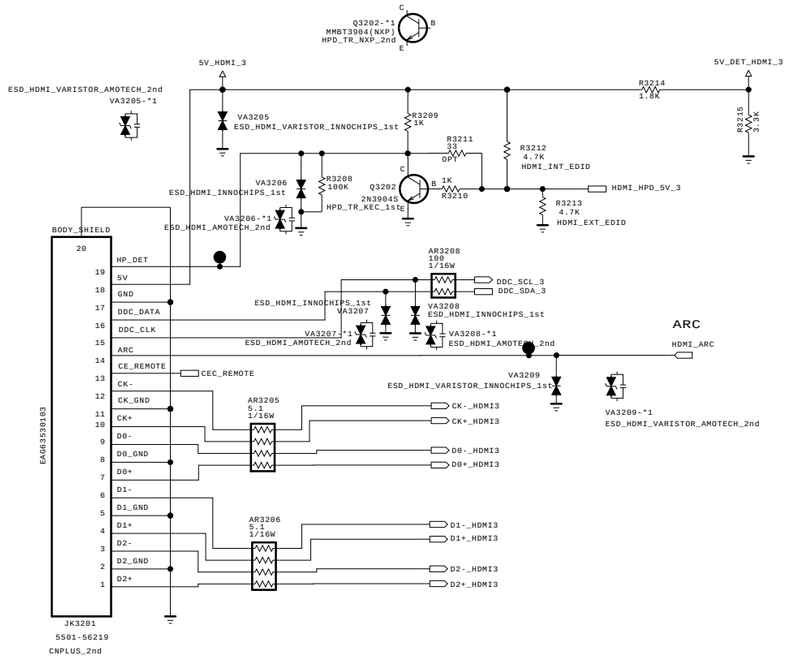
LGE Internal Use Only

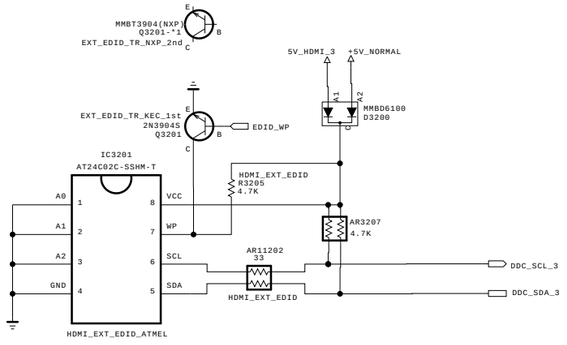
HDMI2_REAR

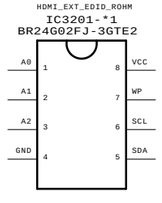




HDMI1_Side With ARC/EXT EEPROM







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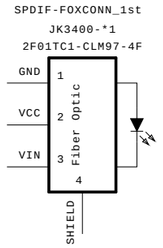
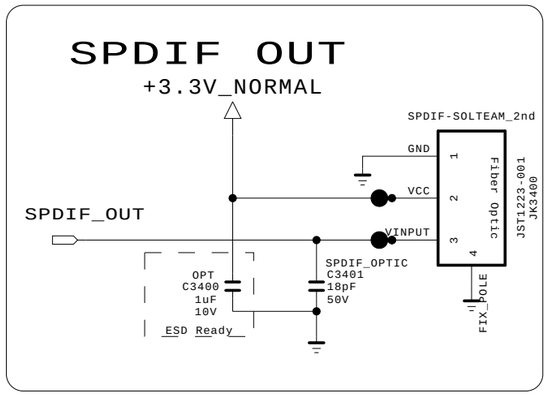
SECRET
LGElectronics

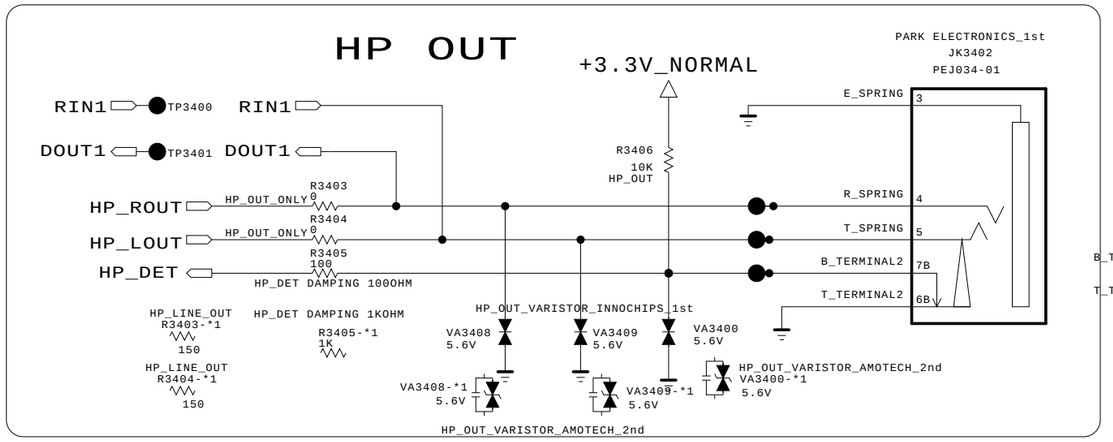
LG ELECTRONICS

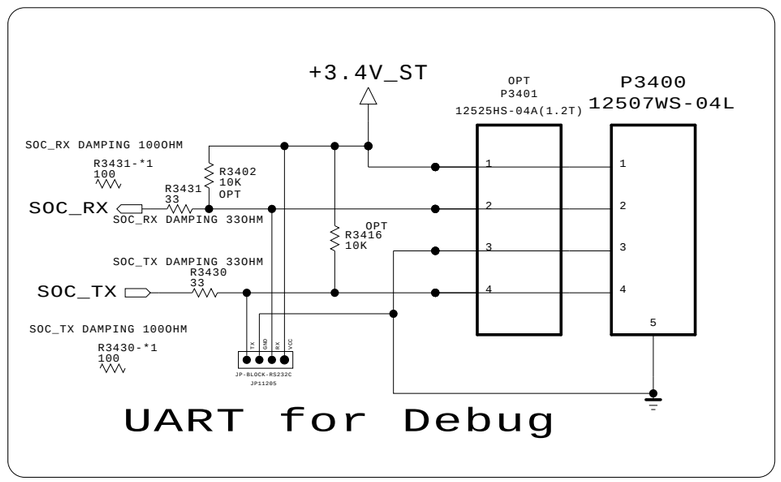
MODEL	M2_Simple Smart	DATE	2015.07.07
BLOCK	HDMI	SHEET	32

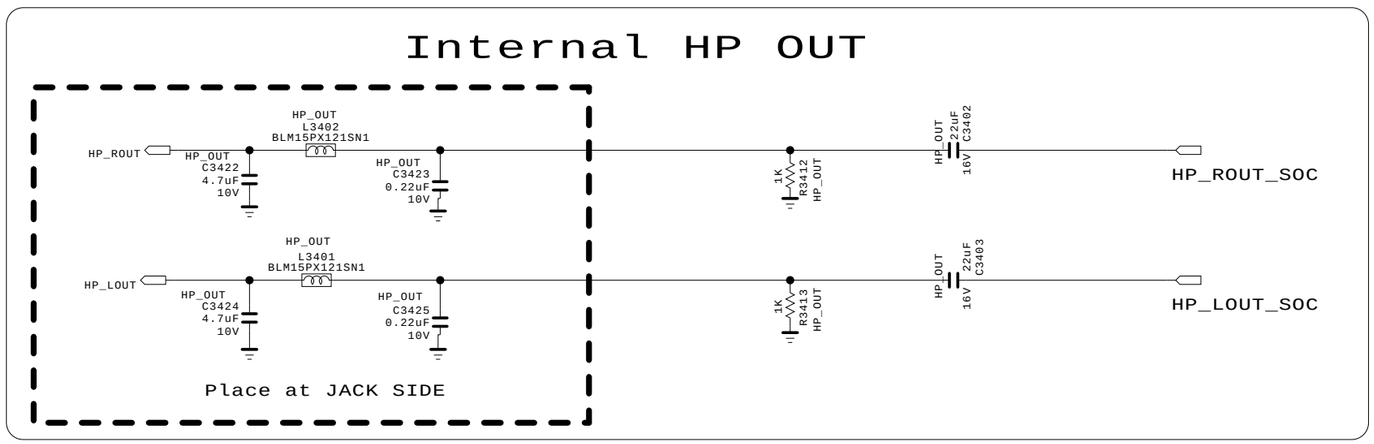
LGE Internal Use Only



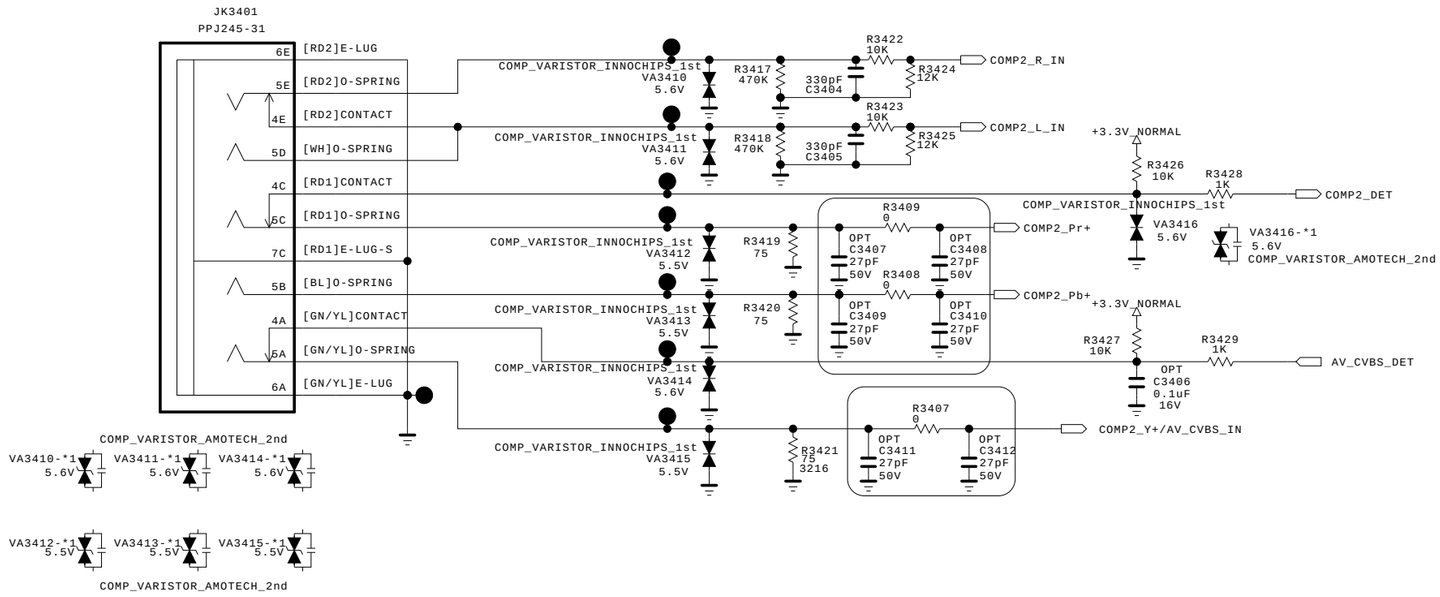








AV/COMPONENT REAR



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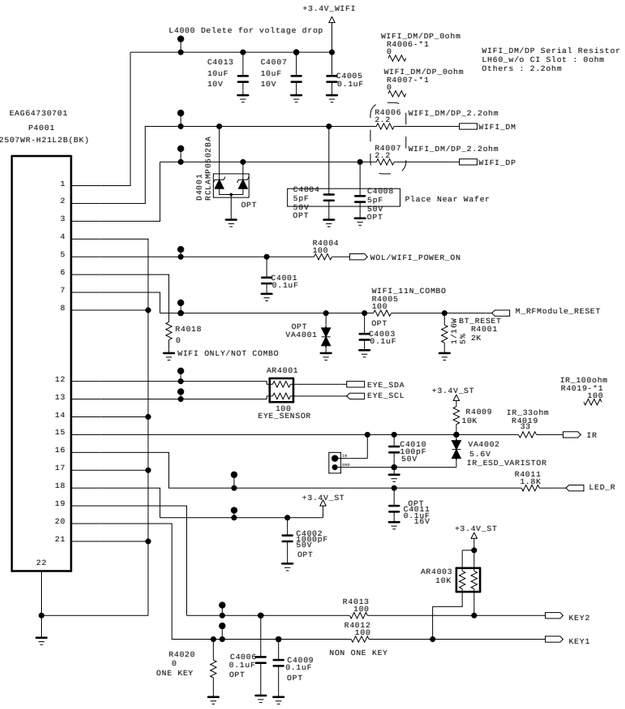
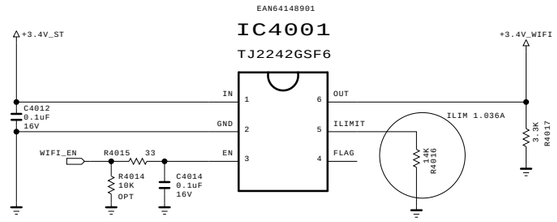
SECRET

LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.11.13
BLOCK	JACK	SHEET	34 / 01





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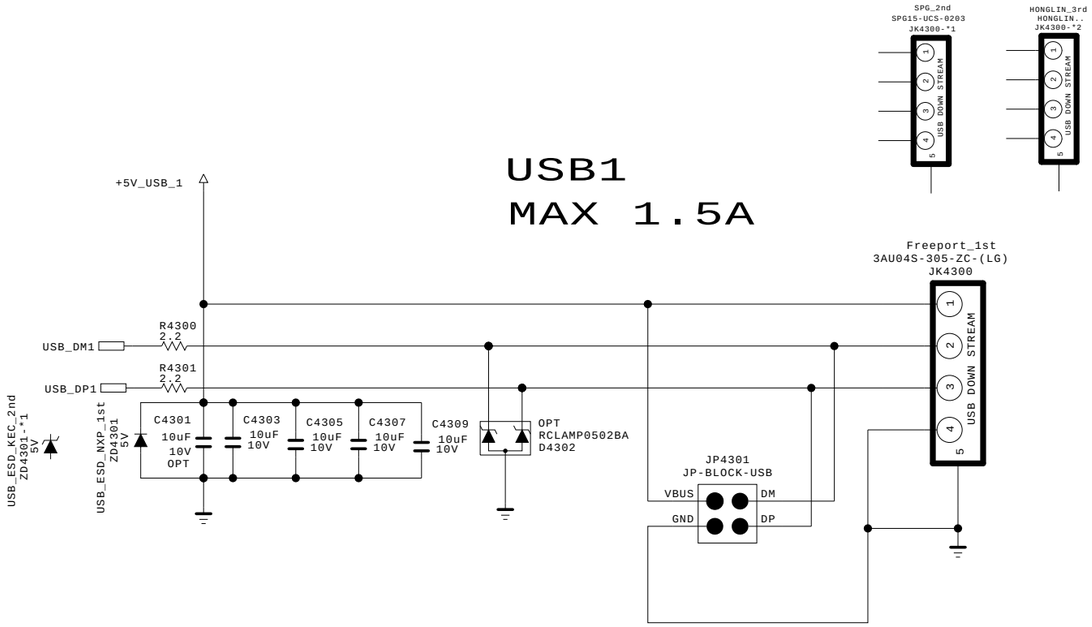
SECRET
LGElectronics

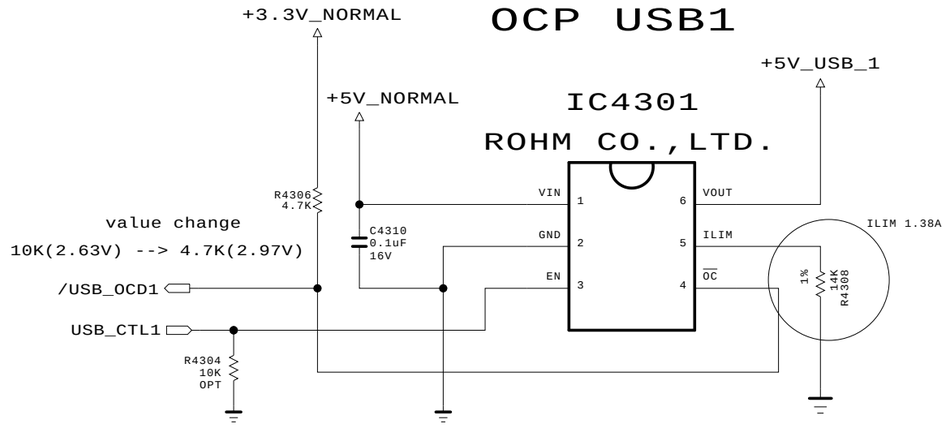
LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	IR / KEY / WIFI	SHEET	40

USB1
MAX 1.5A



OCP USB1



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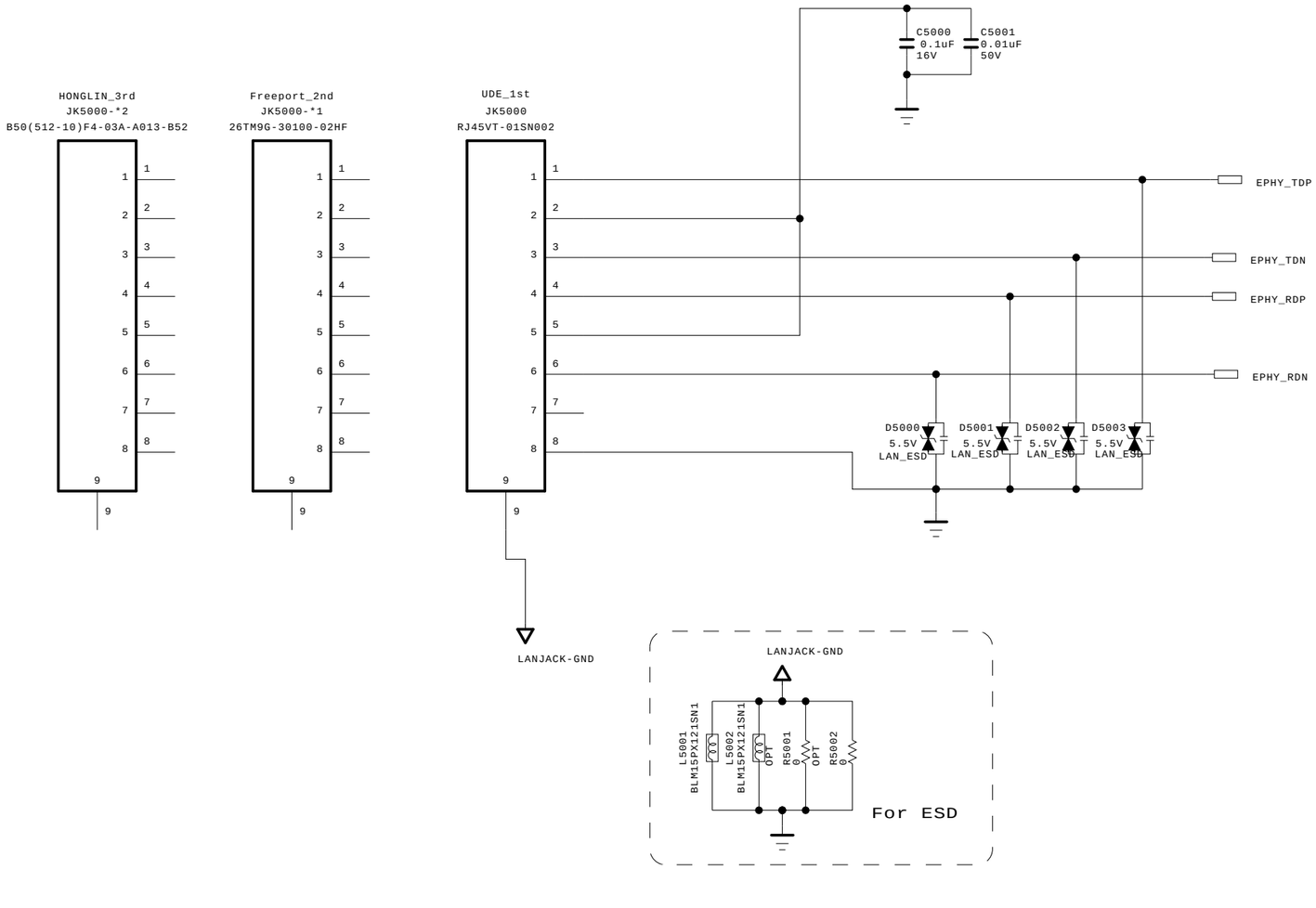
SECRET

LGElectronics

LG ELECTRONICS

MODEL	M2_Simple Smart	DATE	2015.07.07
BLOCK	USB	SHEET	43

Ethernet Block



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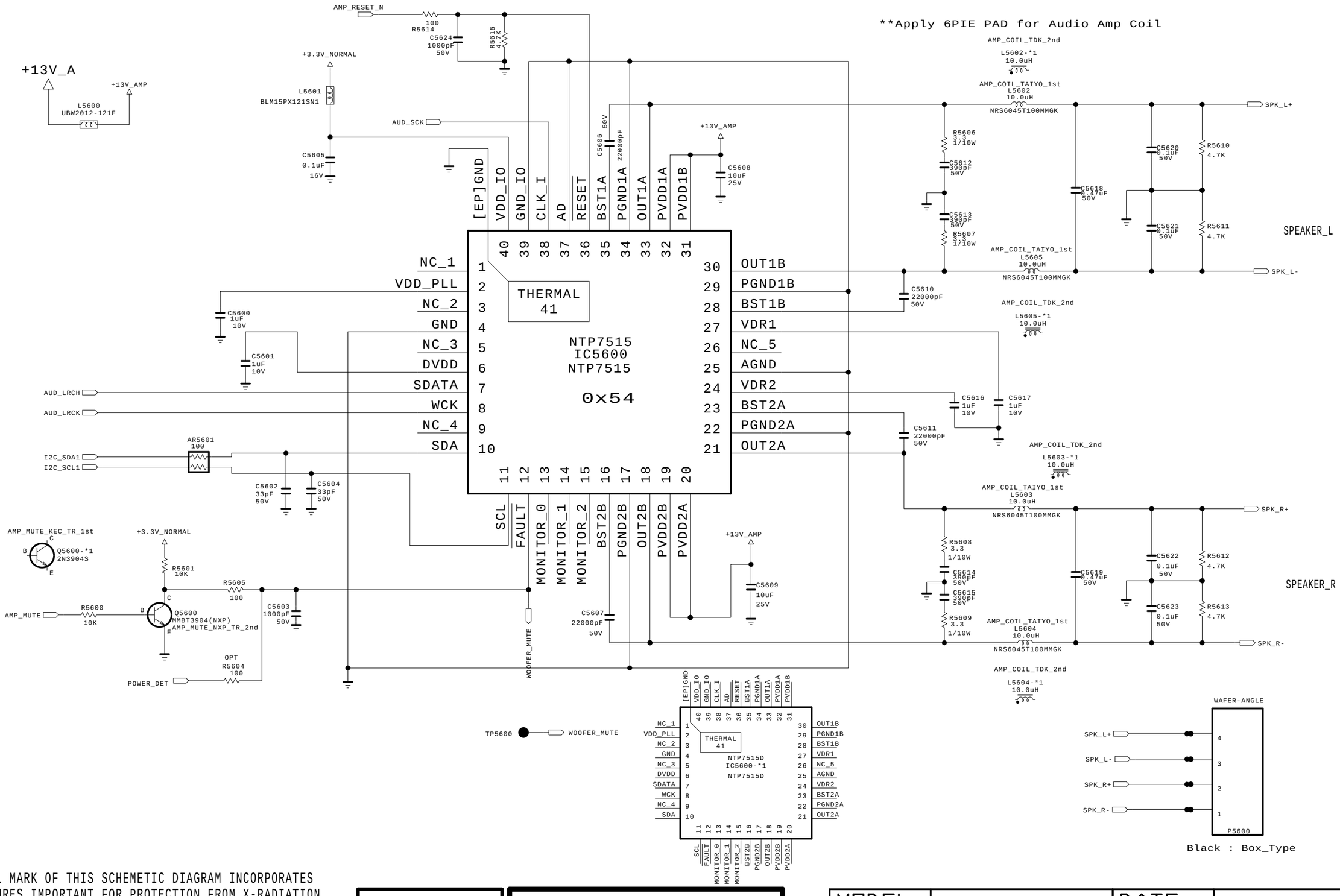
SECRET

LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	ETHERNET	SHEET	50

AUDIO AMP(NTP7515)



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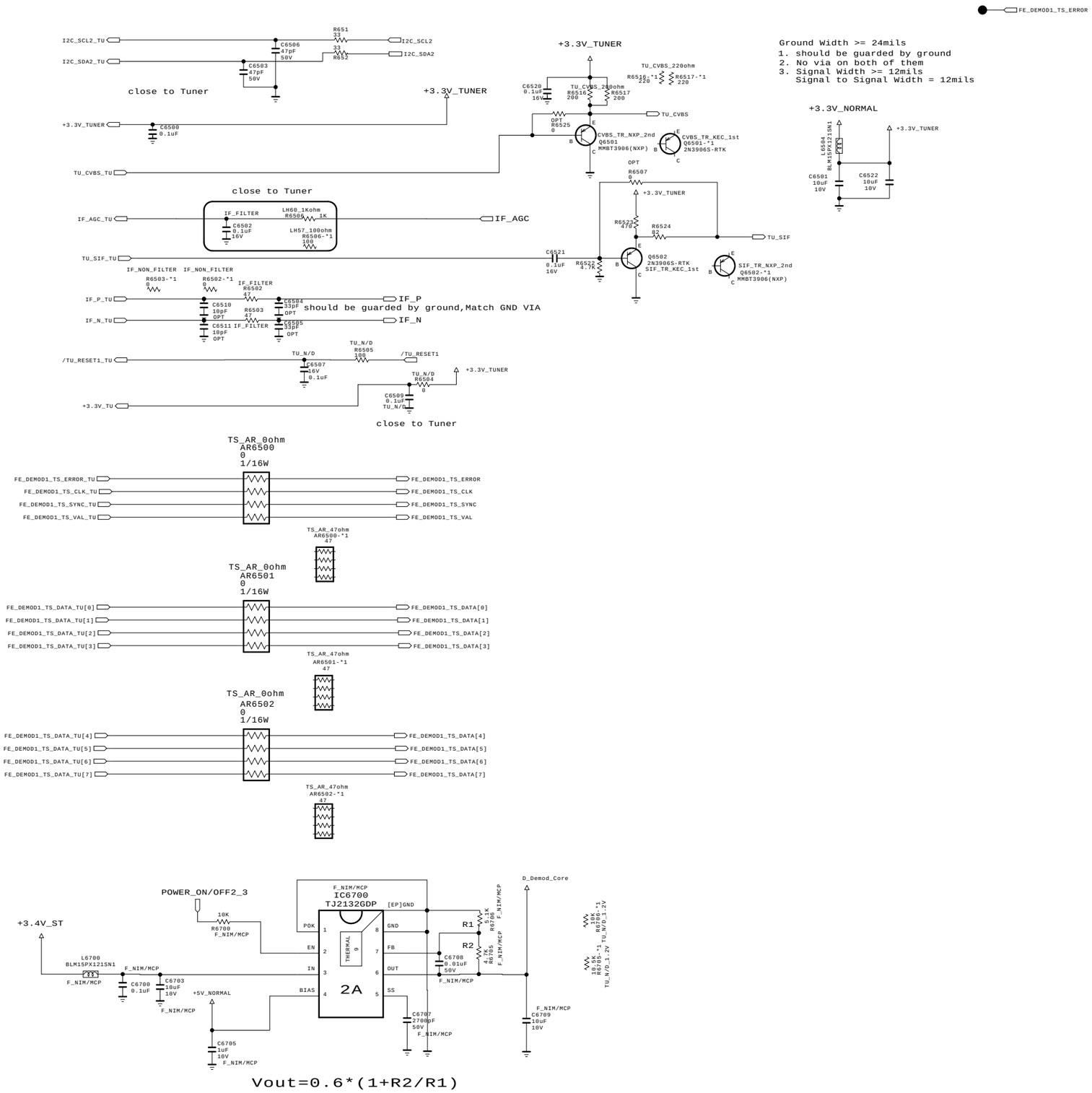
SECRET

LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	AUDIO AMP	SHEET	56



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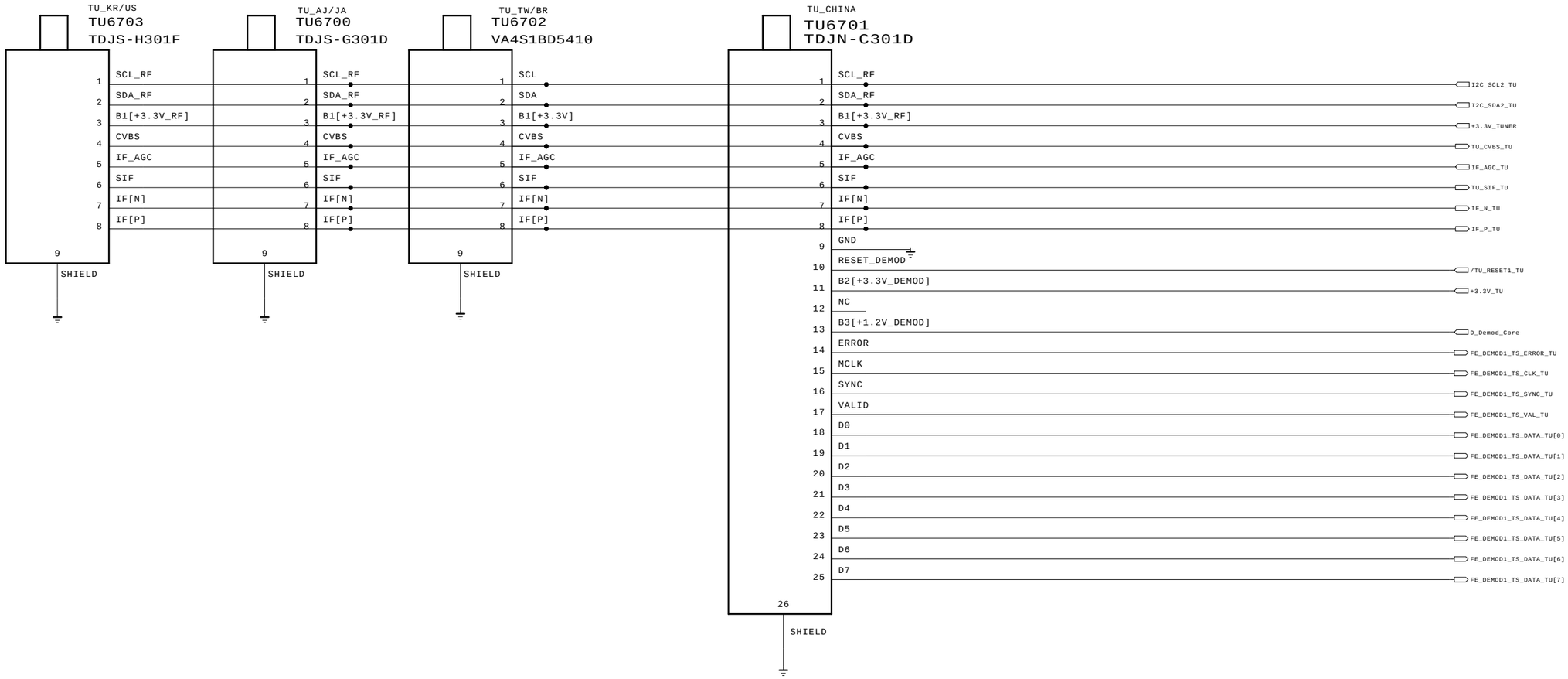
SECRET
LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	TUNER_1	SHEET	65



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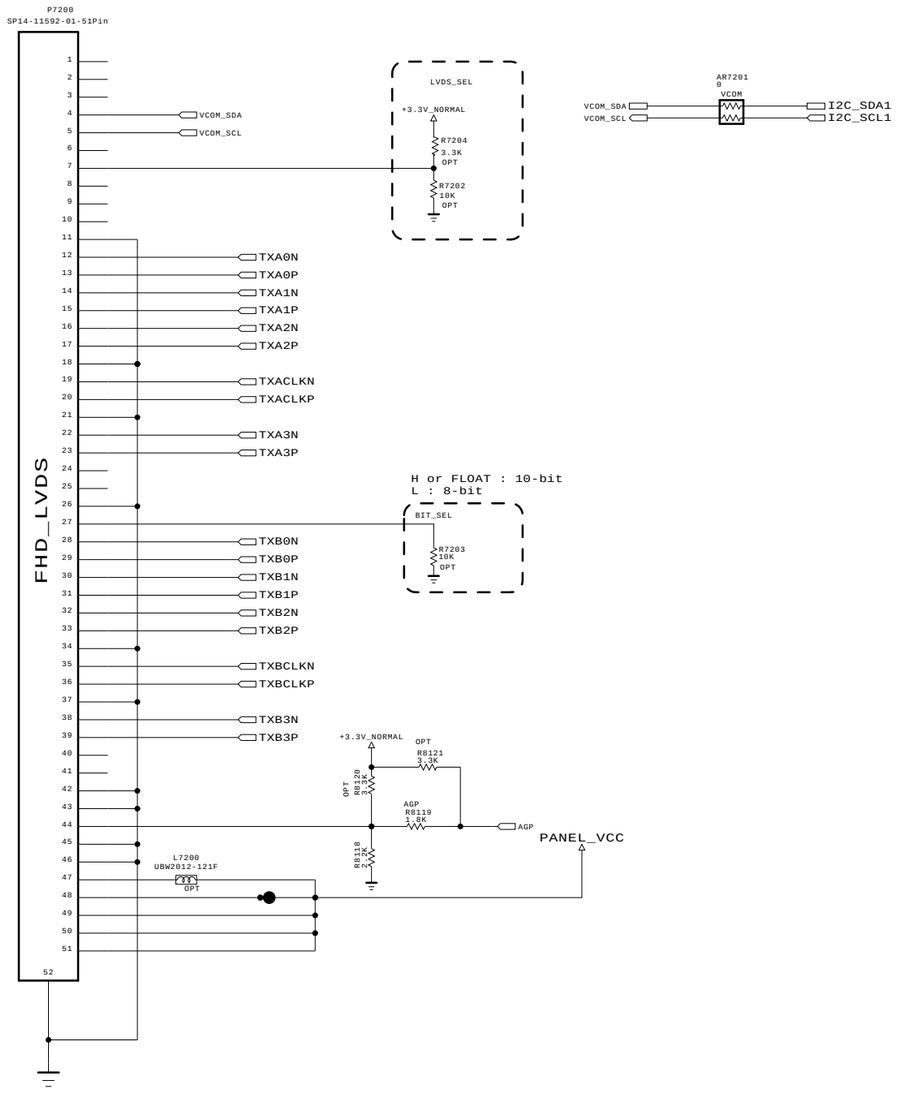
SECRET
LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	TUNER_2	SHEET	67

LVDS

[51Pin LVDS OUTPUT Connector]



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

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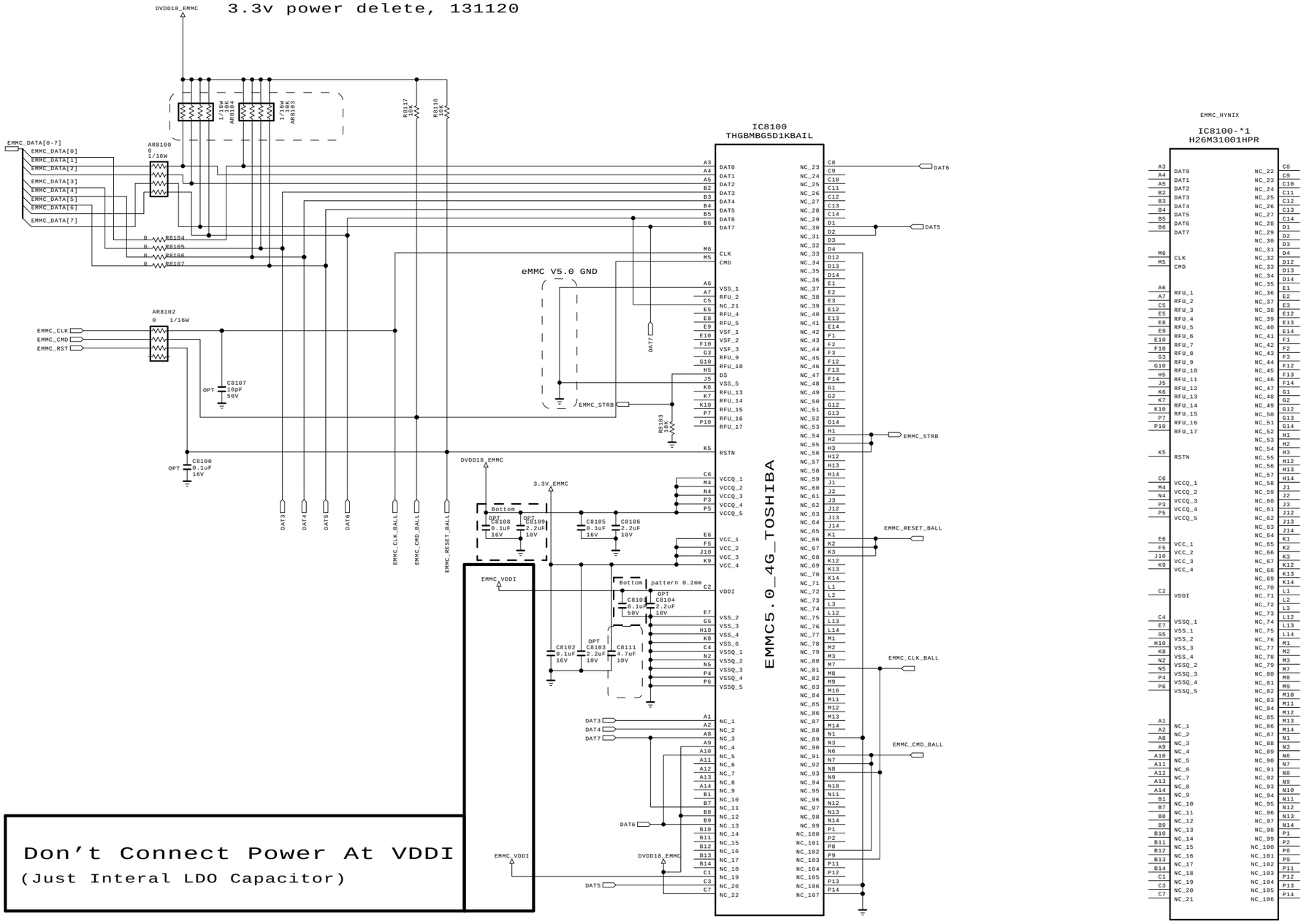
MODEL	M2_Simple Smart	DATE	2015.07.07
BLOCK	LVDS	SHEET	72

eMMC I/F

3.3v power delete, 131120



Don’t Connect Power At VDDI
(Just Interal LDO Capacitor)

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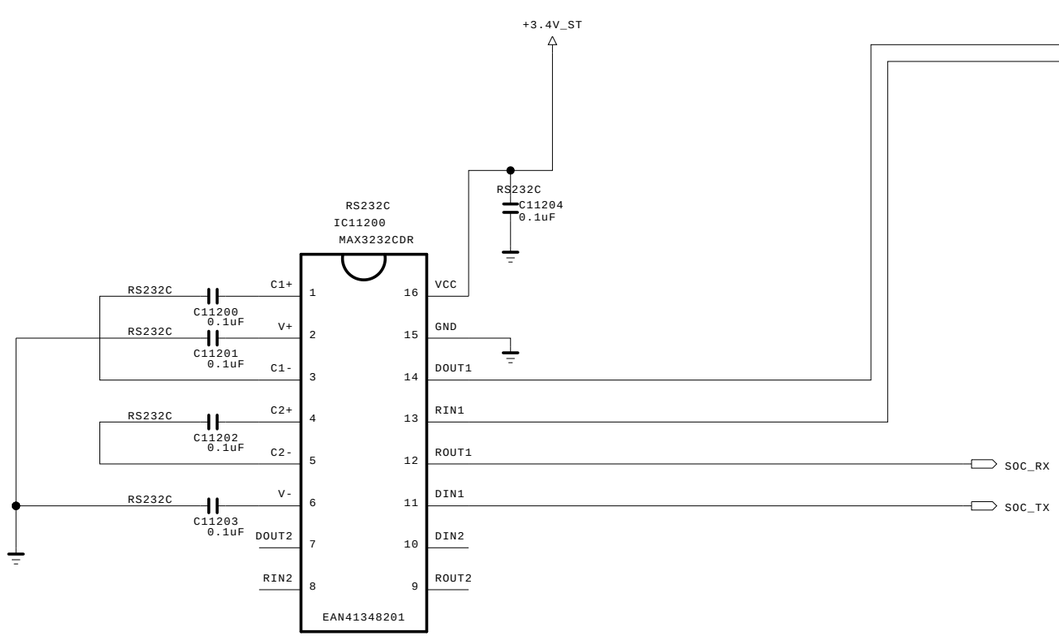
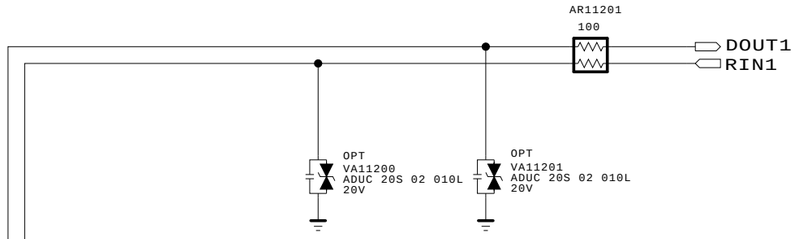
LG ELECTRONICS

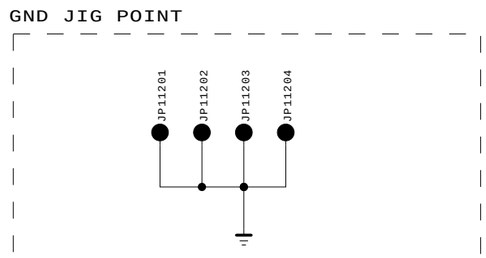
MODEL	16Y_M2	DATE	2015.09.02
BLOCK	eMMC	SHEET	81

RS-232C Control INTERFACE





GND JIG POINT



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SECRET
LGElectronics

LG ELECTRONICS

MODEL	16Y_M2	DATE	2015.09.02
BLOCK	RS232C	SHEET	112

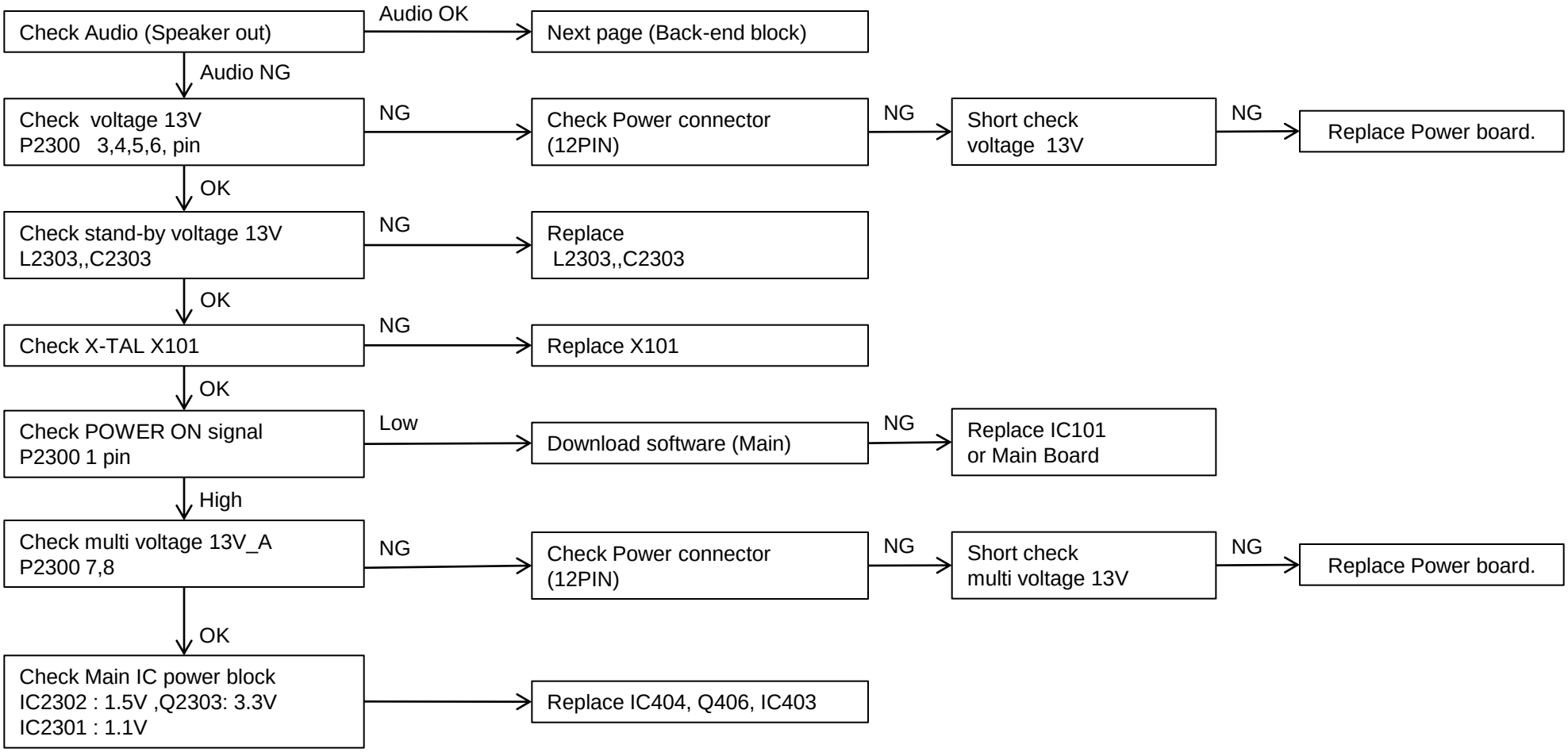
LGE Internal Use Only


LG
Life's Good

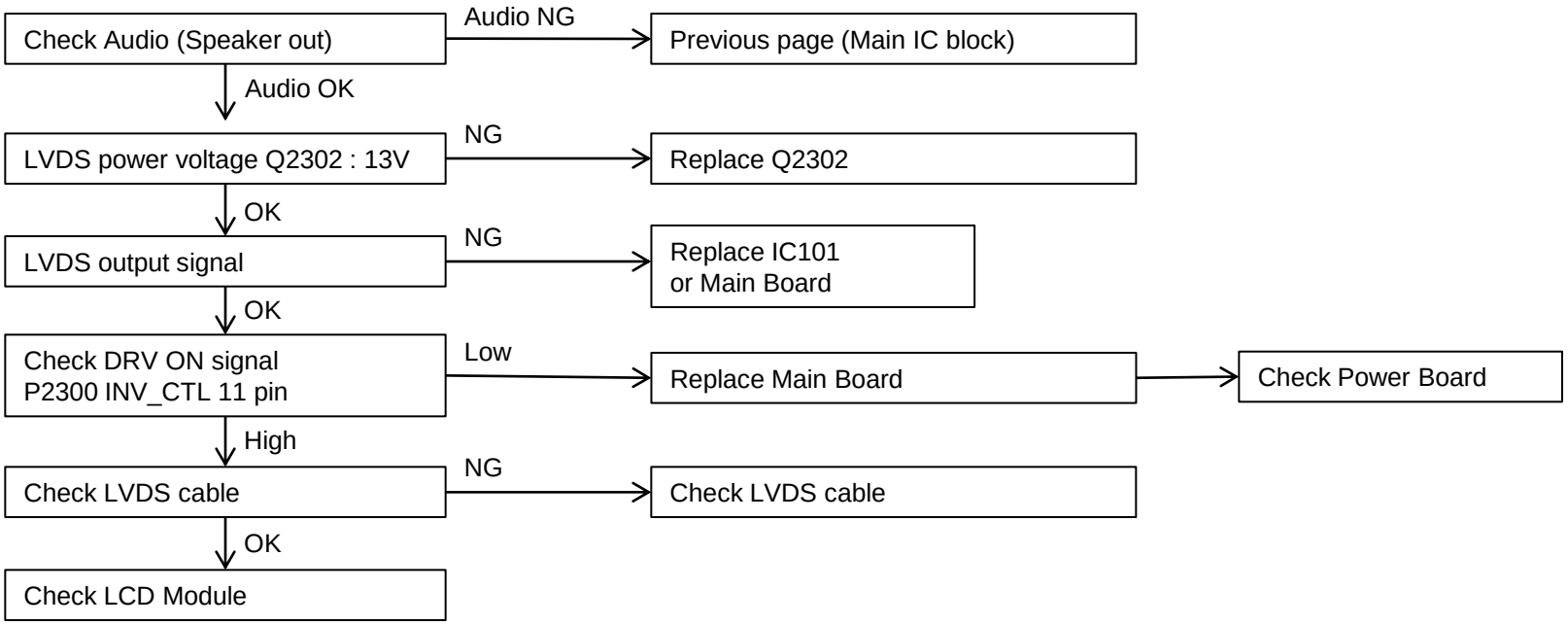
TROUBLE SHOOTING GUIDE

Trouble shooting guide

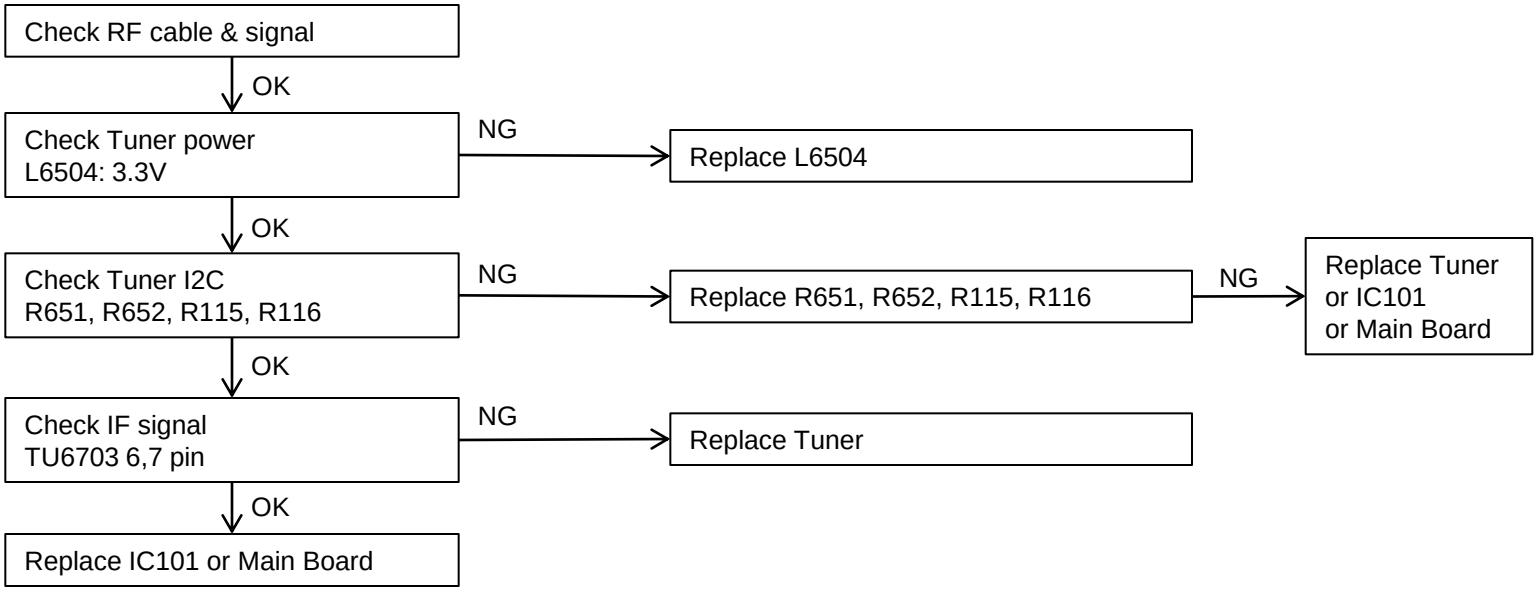
1. No video (Main IC Block)



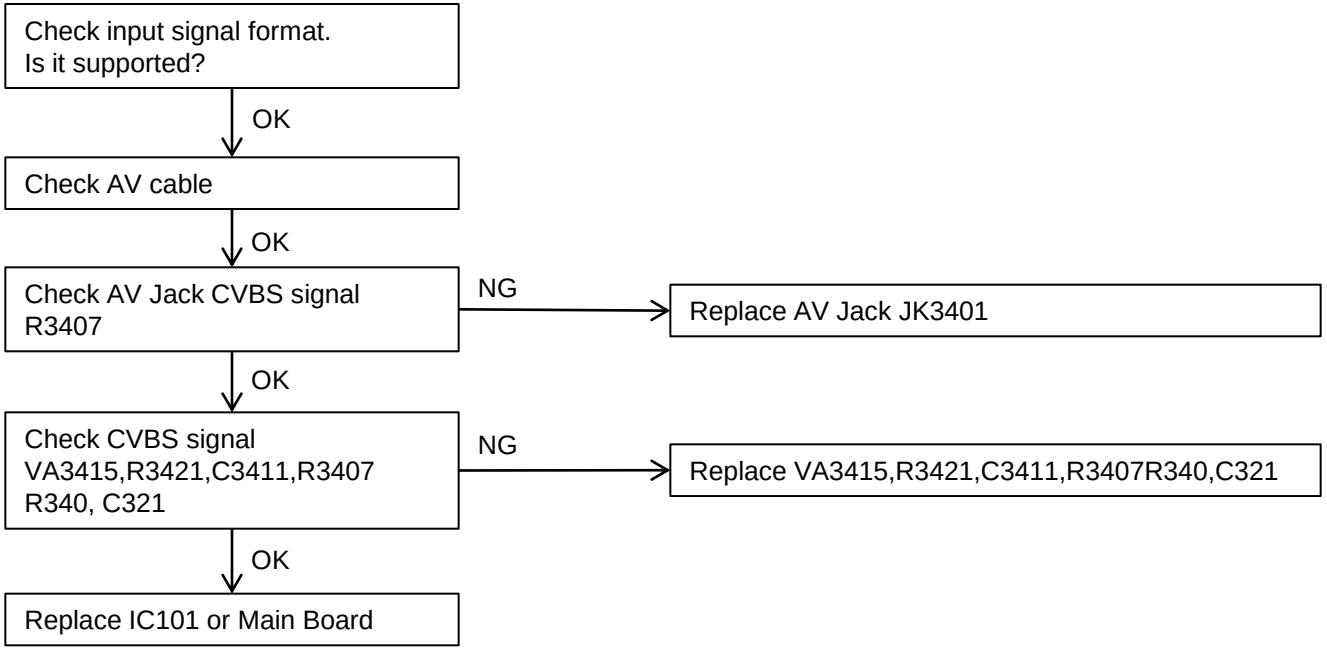
2. No video (Back-end Block)



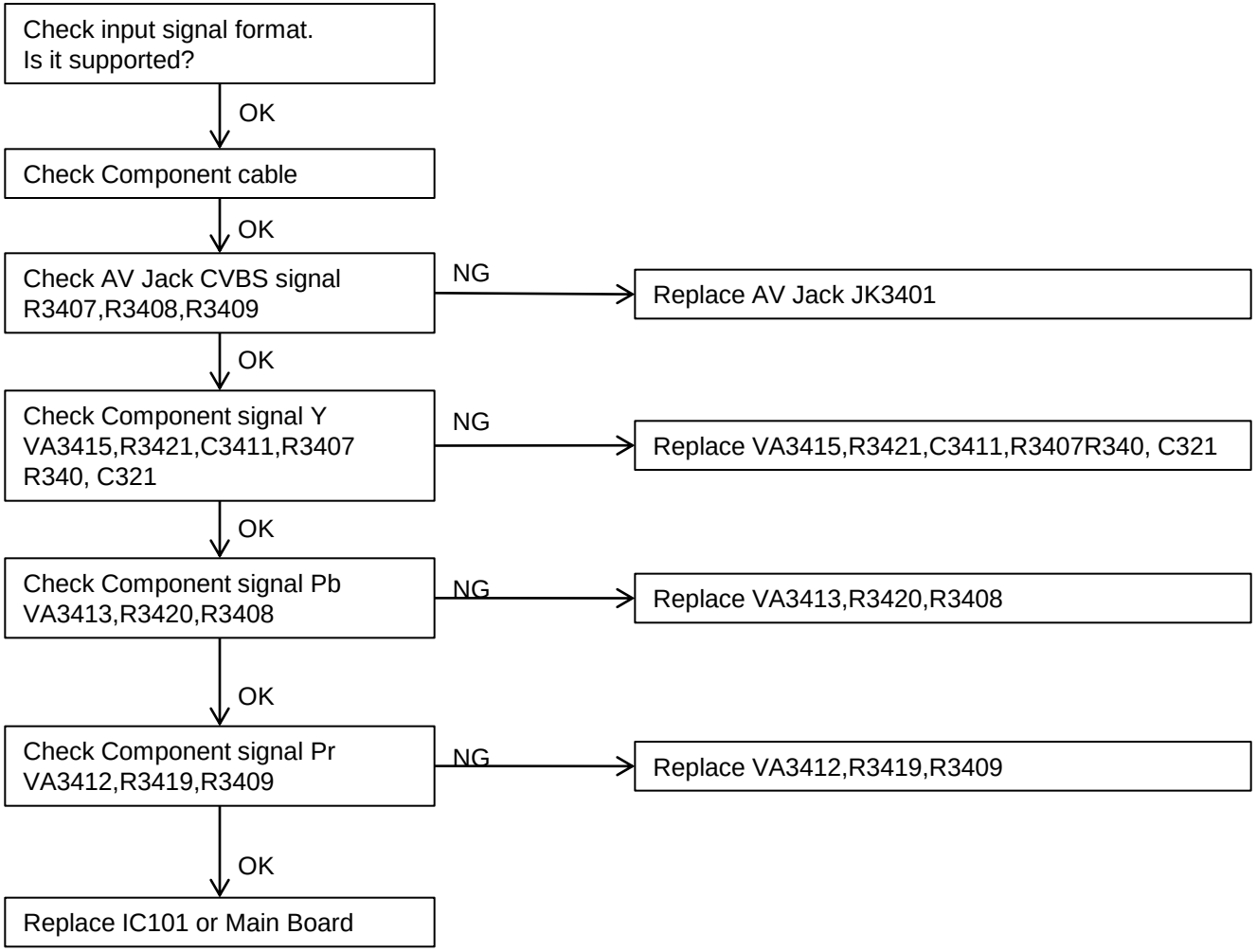
3. Digital / Analog TV Video No signal



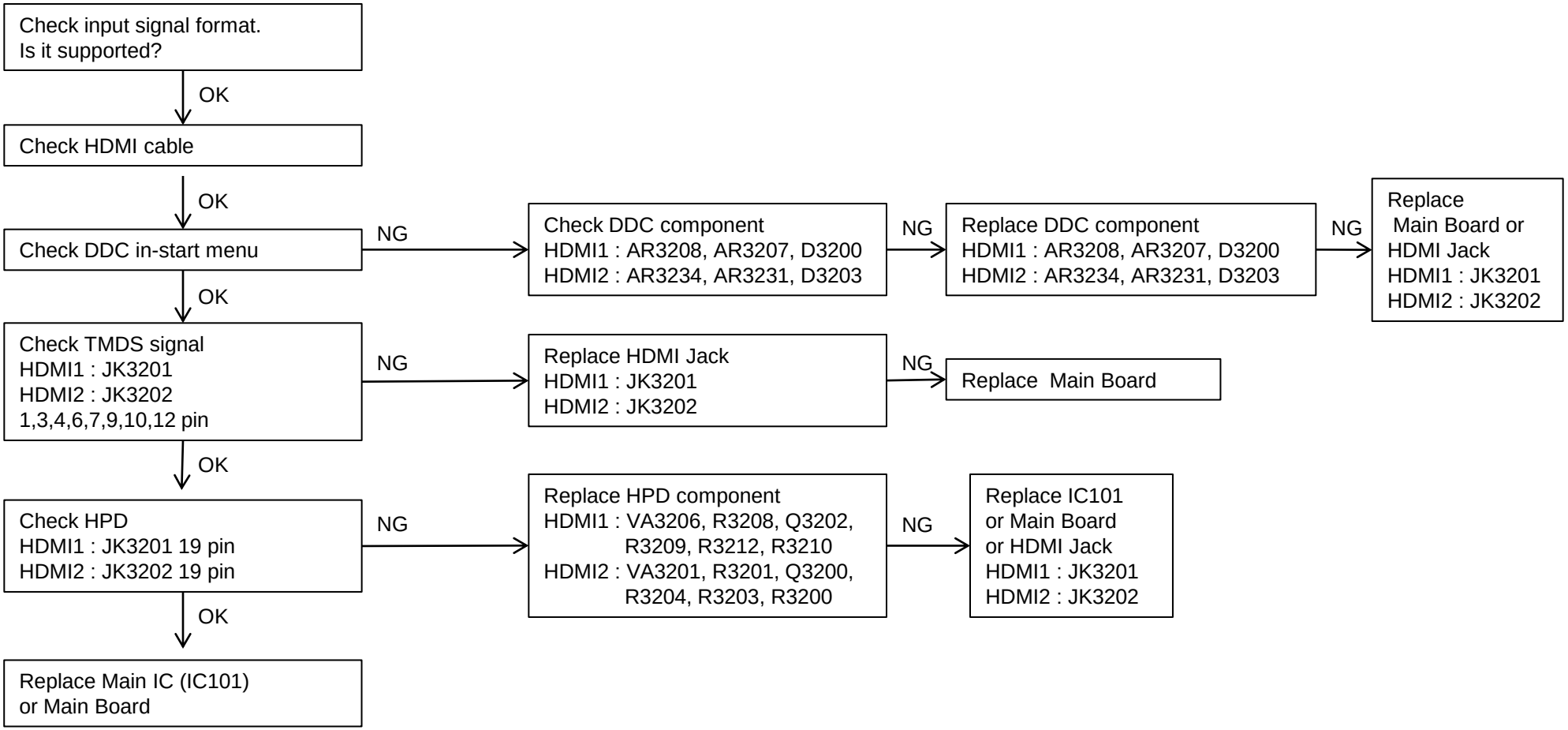
4. AV Video No signal



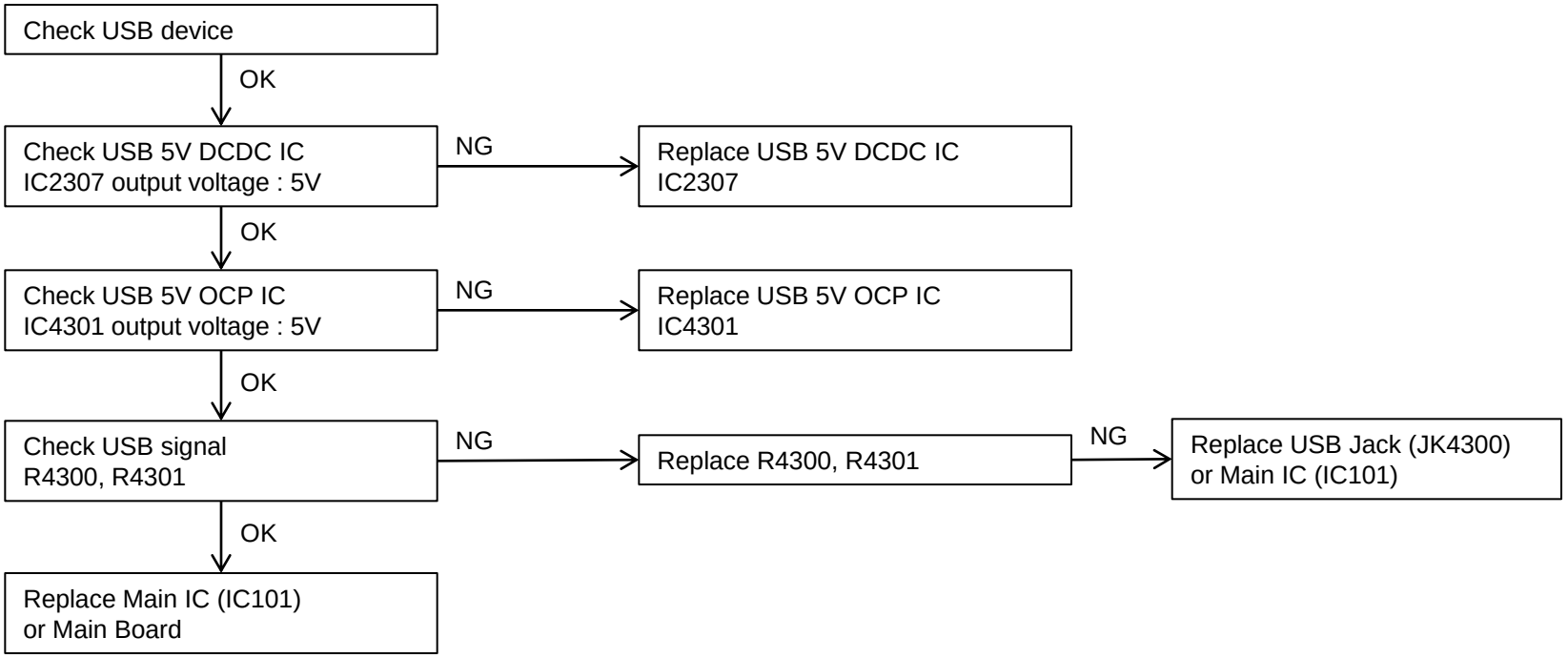
5. Component Video No signal



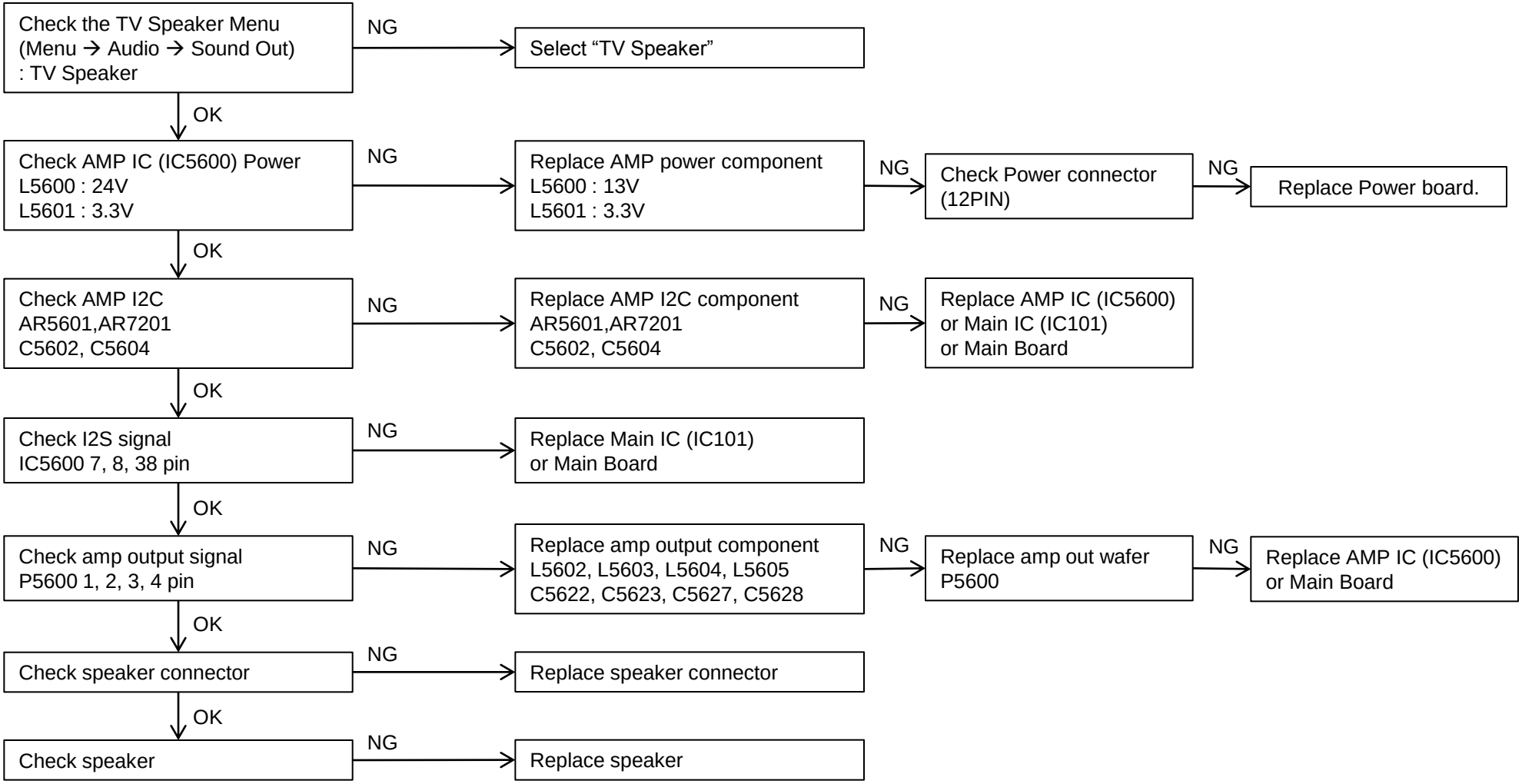
6. HDMI Video No signal



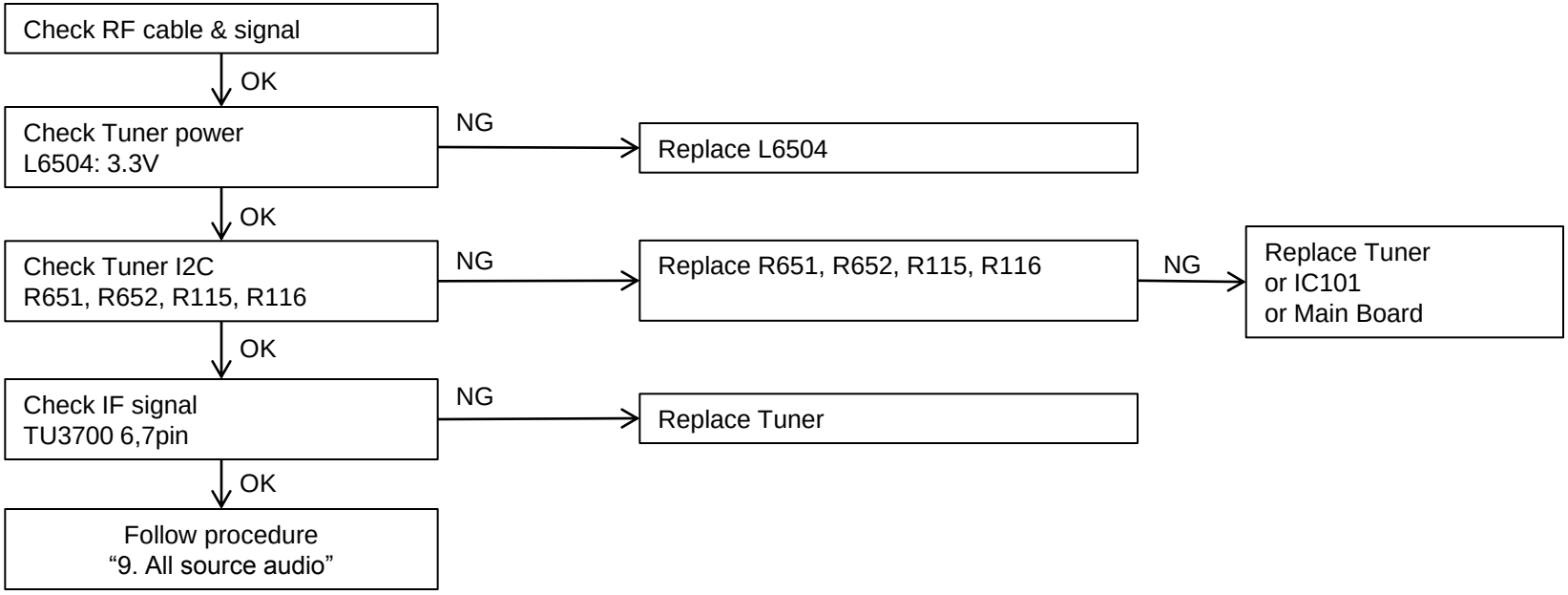
7. USB No storage



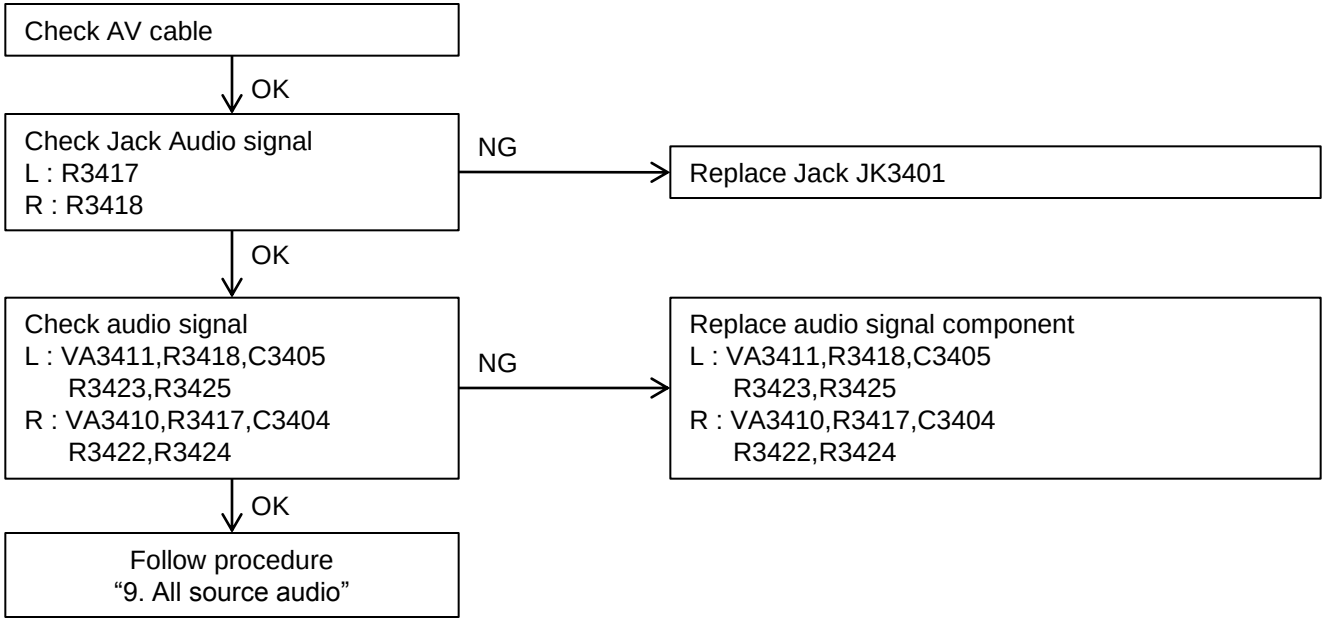
8. All source Audio



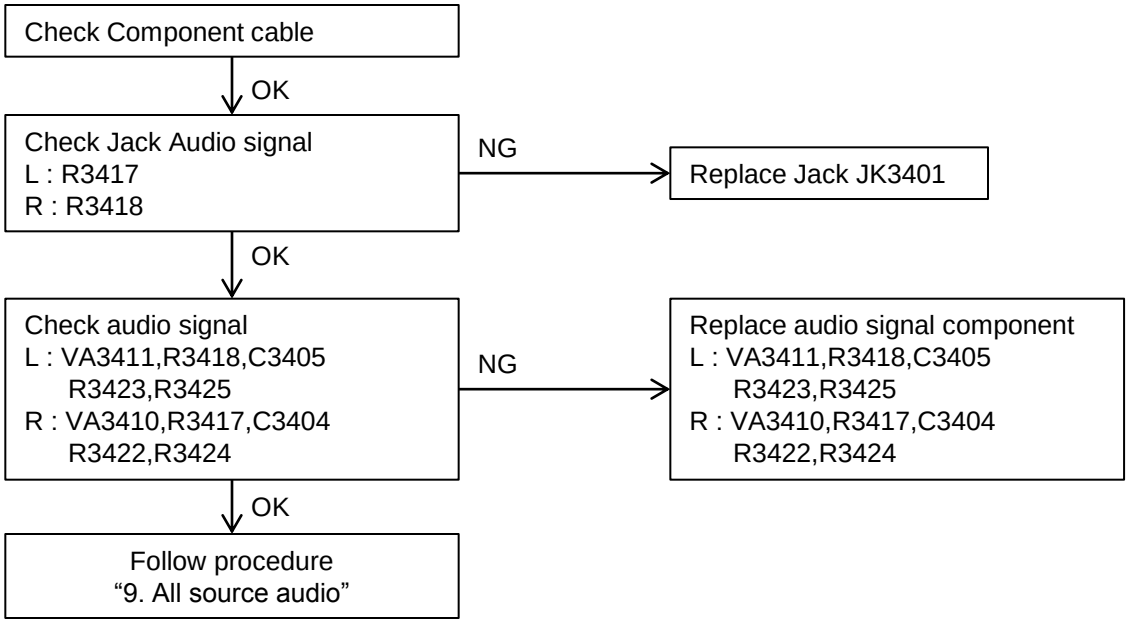
9. Digital / Analog TV No sound



10. AV No sound



11. Component No sound



12. HDMI No sound