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LCD TV SERVICE MANUAL

CHASSIS : LP81A

MODEL : 32LF15R 32LF15R-MA

CAUTION

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



P/NO : MFL41394480 (0904-REV00)

Printed in Korea

CONTENTS

CONTENTS	2
SAFETY PRECAUTIONS	3
SPECIFICATION	6
ADJUSTMENT INSTRUCTION	9
TROUBLE SHOOTING	13
BLOCK DIAGRAM.....	18
EXPLODED VIEW	19
SVC. SHEET	

SAFETY PRECAUTIONS

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 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 1W), keep the resistor 10mm 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 $1M\Omega$ and $5.2M\Omega$.

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.

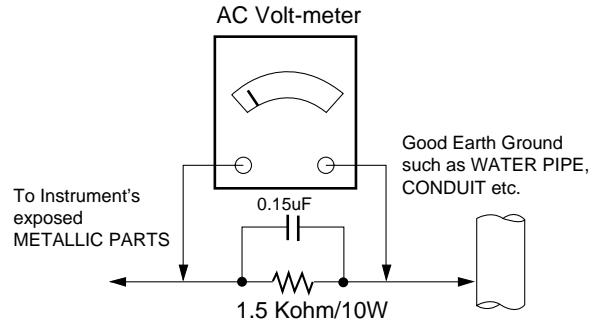
Connect 1.5K/10watt resistor in parallel with a 0.15uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

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 0.5mA.

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



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 is 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 of 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 small wire-bristle (0.5 inch, or 1.25cm) brush with a metal handle.
Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
 - a. Allow the soldering iron tip to reach normal temperature. (500°F to 600°F)
 - b. Heat the component lead until the solder melts.
 - c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
CAUTION: Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique.
 - a. Allow the soldering iron tip to reach a normal temperature (500°F to 600°F)
 - b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
 - c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
CAUTION: Work quickly to avoid overheating the circuit board printed foil.
 - d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement

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

Removal

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

Replacement

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

"Small-Signal" Discrete Transistor

Removal/Replacement

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

Power Output, Transistor Device

Removal/Replacement

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

Diode Removal/Replacement

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

Fuse and Conventional Resistor

Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.

CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

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

At IC Connections

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

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

At Other Connections

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

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

CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

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

1. Application range

This specification is applied to LP81A chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

- (1) Temperature : $25 \pm 5^{\circ}\text{C}$ ($77 \pm 9^{\circ}\text{F}$), CST : $40 \pm 5^{\circ}\text{C}$
- (2) Humidity : $65\% \pm 10\%$
- (3) Power : Standard input voltage (100-240V~, 50/60Hz)
* Standard Voltage of each products is marked by models.
- (4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- (5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. Test method

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

4. General Specification(LCD Module)

Item	Specification	Measurement	Result	Remark
Display Screen Device	26" wide Color Display Module			Resolution:1366X768
	32" wide Color Display Module			Resolution:1366X768
Aspect Ratio	16:9			
LCD Module	26" TFT WXGA LCD			26" HD MAKER : LGD
	32" TFT WXGA LCD			32" HD MAKER : LGD
Operating Environment	1) Temp. : $0 \sim 40$ deg 2) Humidity : $0 \sim 85\%$			LGE SPEC
Storage Environment	1) Temp. : $-20 \sim 60$ deg 2) Humidity : $0 \sim 85\%$			
Input Voltage	AC100-240V~, 50/60Hz			
Power Consumption	Power on (Blue) : LF15R			Volume: 1/8 volume of sound distortion point
	$\leq 110\text{W}$	26" HD		
	$\leq 160\text{W}$	32" HD		
	St-By (Red)	$\leq 1.0 \text{ W}$		

5. Model Specification(NON EU)

Item	Specification			Remark		
Market	NON EU, CHINA					
Broadcasting system	PAL SECAM B/G/D/K, PAL I/I, NTSC-M					
Available Channel	BAND	PAL	NTSC	VHF/UHF CATV	China(DK)	Australia(BG)
	VHF/UHF	E2~C69	2~78		C1~C62	C1~C75
	CATV	S1~S47	1~71		S1~S41	S2~S44
Receiving system	Upper Heterodyne					
Video Input (1EA)	PAL, SECAM, NTSC			Rear		
AV Output (1EA)	PAL, SECAM, NTSC			Rear, Audio Out (8Ω) for commercial china		
Component Input (1EA)	Y/Cb/Cr, Y/Pb/Pr			Rear		
HDMI Input (1EA)	HDMI-DTV, Only PCM MODE					
Audio Input (2EA)	Component (1EA), AV (1EA)			L/R Input		

6. Component Video Input (Y, PB, PR)

Resolution	H-freq(kHz)	V-freq.(kHz)	Pixel clock(MHz)	Proposed
720*480	15.73	59.94	13.500	SDTV, DVD 480I(525I)
720*480	15.75	60.00	13.514	SDTV, DVD 480I(525I)
720*576	15.625	50.00	13.500	SDTV, DVD 576I(625I) 50Hz
720*480	31.47	59.94	27.000	SDTV 480P
720*480	31.50	60.00	27.027	SDTV 480P
720*576	31.25	50.00	27.000	SDTV 576P 50Hz
1280*720	44.96	59.94	74.176	HDTV 720P
1280*720	45.00	60.00	74.250	HDTV 720P
1280*720	37.50	50.00	74.25	HDTV 720P 50Hz
1920*1080	28.125	50.00	74.250	HDTV 1080I 50Hz,
1920*1080	33.72	59.94	74.176	HDTV 1080I
1920*1080	33.75	60.00	74.25	HDTV 1080I
1920*1080	56.25	50	148.5	HDTV 1080P
1920*1080	67.432	59.94	148.350	HDTV 1080P
1920*1080	67.5	60.00	148.5	HDTV 1080P

7. HDMI input (DTV)

Resolution	H-freq.(kHz)	V-freq.(kHz)	Pixel clock(MHz)	Proposed	Remark
720*480	15.73	59.94	13.500	SDTV, DVD 480I(525I)	Spec. out but display
720*480	15.75	60.00	13.514	SDTV, DVD 480I(525I)	
720*576	15.625	50.00	13.500	SDTV, DVD 576I(625I) 50Hz	
720*480	31.47	59.94	27	SDTV 480P	
720*480	31.5	60	27.027	SDTV 480P	
720*576	31.25	50	27	SDTV 576P	
1280*720	44.96	59.94	74.176	HDTV 720P	
1280*720	45	60	74.25	HDTV 720P	
1280*720	37.5	50	74.25	HDTV 720P	
1920*1080	28.125	50	74.25	HDTV 1080I	
1920*1080	33.72	59.94	74.176	HDTV 1080I	
1920*1080	33.75	60	74.25	HDTV 1080I	
1920*1080	56.25	50	148.5	HDTV 1080P	
1920*1080	67.432	59.94	148.350	HDTV 1080P	
1920*1080	67.5	60.00	148.5	HDTV 1080P	
1920*1080	27	24	74.25	HDTV 1080P	
1920*1080	33.75	30	74.25	HDTV 1080P	

ADJUSTMENT INSTRUCTION

1. Application Range

This spec. sheet is applied all of the 26/32" LCD TV, LP81A chassis (HURRICANE 5) by manufacturing LG TV Plant all over the world.

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 $25\pm5^{\circ}\text{C}$ of temperature and $65\pm10\%$ of relative humidity if there is no specific designation.
- 4) The input voltage of the receiver must keep 100-220V, 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°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.

3. PCB assembly adjustment method

3.1. Mstar Main S/W program download

(1) Preliminary steps

- 1) Download method 1 (PCB Assy)
- HD



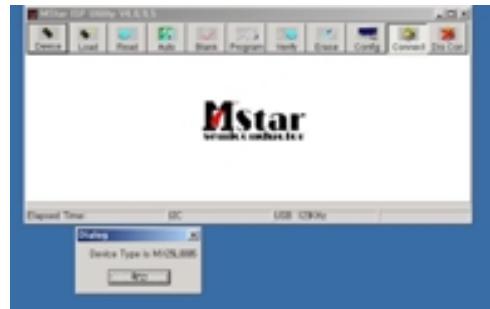
- 2) Connect the download jig to D-sub jack

(2) Download steps

- 1) Execute 'ISP Tool' program in PC, then a main window will be opened



- 2) Click the connect button and confirm "Dialog Box".

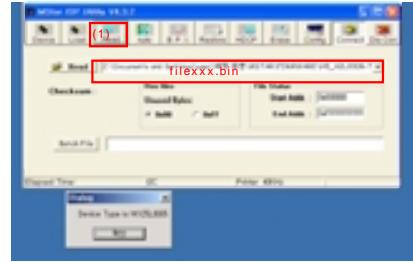


- 3) Click the Config button and Change speed
E2PROM Device setting : over the 350Khz



- 4) Read and write bin file

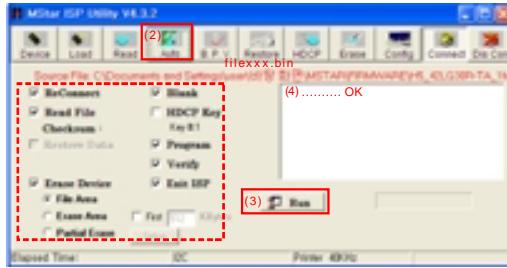
Click "(1)Read" tab, and then load download file(XXXX.bin) by clicking "Read".



- 5) Click "Auto(2)" tab and set as below

- 6) click "Run(3)".

- 7) After downloading, check "OK(4)" message.



3.2. Auto color balance(ADC)-Component

(1) Method of Auto Component Color Balance

- 1) Convert to Component in Input-source
- 2) Input the Component (Which has 720p@60Hz 100% Color Bar YPbPr signal into Component.

(MSPG-925F Model: 217/ Pattern: 65)



- 3) Adjust by commanding AUTO_COLOR_ADJUST (0xF1) 0x00 0x02 instruction

(2) Confirmation

- 1) We confirm whether "0xF3 (offset), 0xF4 (gain)" address of EEPROM "0xBC" is "0xAA" or not.
 - 2) If "0xF3", "0xF4" address of EEPROM "0xBC" isn't "0xAA", we adjust once more.
 - 3) We can confirm the ADC values from "0x06~0x0B" addresses in a page "0xBC".
- * Manual ADC process using Service Remocon. After enter Service Mode by pushing "ADJ" key, execute "Auto-RGB" by pushing "_" key at "Auto-RGB".

3.3. TOOL Option, Area Option

(1) Profile : Must be changed the option value because being different with some setting value depend on module maker, inch and market.

(2) Equipment : adjustment remote control.

(3) Adjustment method

The input methods are same as other chassis.(Use IN-START Key on the Adjust Remocon.)

(If not changed the option, the input menu can differ the model spec.)

* Refer to Job Expression of each main chassis ass'y (EBTxxxxxxxx) for Option value

* Before PCBA check, you have to change the Tool option, Area option and have to AC off/on. (Plug out and in)

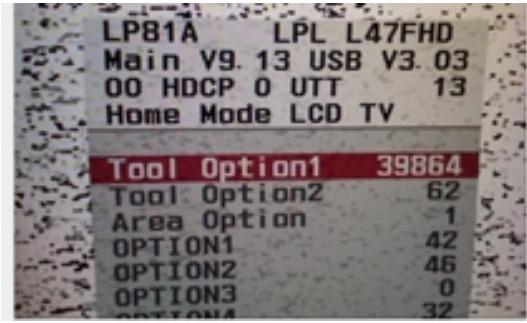
* After Tool Option/ Area Option change, you have to AC power off.

* Never push the IN-STOP KEY after completing the function inspection.

3.4. Check SW Version

(1) Method

- 1) Push In-start key on Adjust remote-control.
- 2) Check "Main V3.xx"



4. EDID (The Extended Display Identification Data) / DDC (Display Data Channel) download

* Caution

Use the proper signal cable for EDID Download

4.1. EDID DOWNLOAD

* Caution:

- Never connect HDMI & D-SUB Cable at the same time.
- Use the proper cables below for EDID Writing



* EDID Data

Item	Condition	Data
Manufacturer ID	GSM	1E6D
Version	Digital : 1	01
Revision	Digital :3	03

<HDMI 1 : 256bytes>

The data is same without Physical address

Addr	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00:00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	F	A	C			
00:10	C	01	03	00	46	27	78	EA	D9	B0	A3	57	49	9C	25	
00:20	II	49	4B	A1	08	00	01	01	45	40	61	40	01	01	01	
00:30	01	01	01	01	01	64	19	00	30	41	00	1E	30	30	68	
00:40	34	00	0C	B6	21	00	00	1B	1B	21	50	A0	51	00	1E	
00:50	48	88	35	00	BC	77	21	00	00	1C	00	00	00	00	40	
00:60	47	30	4	55	04	00	00	00	00	00	00	00	00	00	FD	
00:70	00	32	4B	1C	43	0F	00	0A	20	20	20	20	20	20	01	
00:80	02	03	26	F1	50	07	01	16	02	03	11	12	13	04	14	
00:90	20	21	22	1F	10	23	09	07	07	83	01	00	00	68	03	
00:A0	00	00	00	B8	2D	00	01	1D	00	80	51	D0	1C	20	40	
00:B0	35	00	0C	B8	21	00	00	1E	8C	0A	D0	8A	20	E0	2D	
00:C0	10	3E	96	00	13	8E	21	00	00	18	8C	0A	A0	14	51	
00:D0	00	26	2C	43	00	04	8E	21	00	00	98	01	1D	80	18	
00:E0	71	1C	16	20	58	2C	25	00	C4	8E	21	00	00	9E	00	
00:F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	

-> Physical address(F) : HDMI 1 -> 10

- Detail EDID Options are below (A, B, C, D, E, F)

A. Product ID

Model	Product ID		
	Name	Dec	Hex
HD	4018(A)	9CF5	F59C
	4018(D)	9CF6	F69C

B. Serial No: Controlled on production line

C. Month, Year: Controlled on production line:

ex) Monthly: '09 '09

Year: '2007 -> '11'

D. Model Name(Hex):

Model name	Model Name(HEX)
LG TV	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 20

E. Checksum: Changeable by total EDID data

4.2. HDCP SETTING

(High-Bandwidth Digital Contents Protection)

- * Before HDCP Download, you have to Set the Configuration that CMD delay.
-> Configuration -> Option-> I2C delay(Write Byte : 0.5 ms, Read Byte : 0.5ms, Read CMD Byte : 0.5ms)
 - * Change the DDC -> After Write Data delay Time 20ms ,also Change the After Send Read Command delay Time 20ms.
 - * Check the Communication Clock -> 45KHz.
- (1) Connect D-sub Signal Cable to D-Sub Jack
(2) Input HDCP key with HDCP-key- in-program
(3) HDCP Key value is stored on EEPROM(AT24C64) which is From "0x80" addresses of 0xA0 page
(4) AC off/ on and on HDCP button of MSPG925 and confirm whether picture is displayed or not of using MSPG925
(5) HDCP Key value is different among the sets.

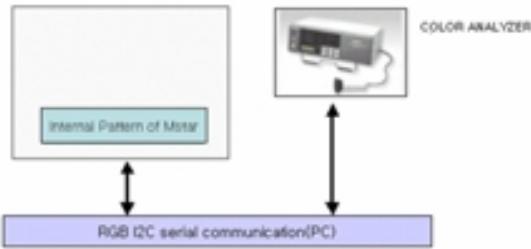
4.3. Adjustment of White Balance

- Purpose : Adjust the color temperature to reduce the deviation of the module color temperature.
- Principle : To adjust the white balance without the saturation, Fix the one of R/G/B gain to C0 and decrease the others.
- Adjustment mode : Two modes - Cool and Warm
(Medium data is automatically calibrated by the Cool data)

* Required Equipment

- 1) Remote controller for adjustment
- 2) Color Analyzer : CA100+ or CA-210 or same product (ch:9)
- 3) Auto W/B adjustment instrument(only for Auto adjustment)

- (1) Connecting diagram of equipment for measuring (For Automatic Adjustment



- 1) Enter the adjustment mode of DDC
 - Set command delay time : 50ms
 - Enter the DDC adjustment mode at the same time heat-run mode when pushing the power on by power only key
 - Maintain the DDC adjustment mode with same condition of Heat-run (Maintain after AC off/on in status of Heat-run pattern display)
- 2) Release the DDC adjustment mode
 - Release the adjust mode after AC off/on or std-by off/on in status of finishing the Hear-run mode
 - Release the Adjust mode when receiving the aging off command(F3 00 00) from adjustment equipment
 - Need to transmit the aging off command to TV set after finishing the adjustment.
 - Check DDC adjust mode release by exit key and release DDC adjust mode

- 3) Enter the adjust mode of white balance

- Enter the white balance adjustment mode with aging command(F3, 00, FF)

* Luminance min value is 200cd/m² in the cool mode (For LCD)

4.4. Adjustment of White Balance

(for Manual adjustment)

- (1) Adjustment mode : Two modes (Cool and Warm)
(Medium data is automatically calibrated by the Cool data)
- (2) Color analyzer(CA100+, CA210) should be used in the calibrated ch by CS-1000(LCD : CH9, PDP : CH10)
- (3) Operate the zero-calibration of the CA100+ or CA-210, then stick sensor to the module when adjusting.
- (4) For manual adjustment, it is also possible by the following sequence.
 - 1) Select white pattern of heat-run by pressing "POWER ON" key on remote control for adjustment then operate heat run longer than 15 minutes. (If not executed this step, the condition for W/B may be different.)
 - 2) Push "Exit" key.
 - 3) Change to the AV mode by remote control.(Push front-AV or Input key)
 - 4) Input external pattern(85% white pattern)
 - 5) Push the ADJ key two times (entering White Balance mode)
 - 6) Stick the sensor to the center of the screen and select each items (Red/Green/Blue Gain and Offset) using D/E (CH +/-) key on R/C.
 - 7) Adjust R/ G/ B Gain using F/G(VOL +/-) key on R/C.
 - 8) Adjust two modes (Cool and Warm)
(Fix the one of R/G/B and change the others)
- 9) When adjustment is completed, Exit adjustment mode using EXIT key on R/C.

* CASE

First adjust the coordinate far away from the target value(x, y).

- (1) x, y > target
 - 1) Decrease the R, G.
- (2) x, y < target
 - 1) First decrease the B gain,
 - 2) Decrease the one of the others.
- (3) x > target, y < target
 - 1) First decrease B, so make y a little more than the target.
 - 2) Adjust x value by decreasing the R
- (4) x < target, y > target
 - 1) First decrease B, so make x a little more than the target.
 - 2) Adjust x value by decreasing the G

- Standard color coordinate and temperature when using the CA100+ or CA210 equipment

Mode	Color coordinate		Temp	Δuv
	X	Y		
Cool	0.276±0.002	0.283±0.002	11,000K	0.000
Warm	0.313±0.002	0.329±0.002	6,500K	0.003

To check the Coordinates of White Balance, you have to measure at the below conditions.

Picture Mode : User 1

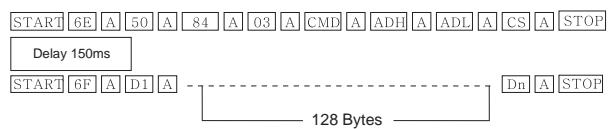
XD : Manual – XD Contrast : Off, XD Colour : Off
(If you miss the upper condition, the coordinates of W/B can be lower than the spec.)

**** DDC Command set ****

Adjustment	CMD(HEX)	ADR	VALUE	detail
Aging On/Off	F3	00	FF/00	FF : ON / OO : OFF
Input select	F4	00		0x10 : TV 0x20 : AV1 0x21 : AV2 0x40 : Component1
R GAIN	16	00	00 - C0	GAIN adjustment
G GAIN	18		00 - C0	CSM COOL
B GAIN	1A		00 - C0	
R GAIN	16	01	00 - C0	GAIN adjustment
G GAIN	18		00 - C0	CSM NORMAL
B GAIN	1A		00 - C0	
R GAIN	16	02	00 - C0	GAIN adjustment
G GAIN	18		00 - C0	CSM WARM
B GAIN	1A		00 - C0	
CSM mode	F2	00	00 01 02	COOL NORMAL WARM
AUTO ADC	F1	00	0, 1, 2	0: Offset adjustment 1: Gain adjustment 2: Offset and Gain adjustment
EEPROM Read	E7	00	00	EEPROM read
EEPROMWrite	E8	00	data	EEPROM write

(3) E2PROM Data Read

1) Signal TABLE



2) COMMAND SET

Adjustment contents	CMD(hex)	ADH(hex)	ADL(hex)	Details
EEPROM READ	E7	A0	0	0-Page 0~7F Read
		80		0-Page 80~FF Read
		A2	0	1-Page 0~7F Read
		80		1-Page 80~FF Read
		A4	0	2-Page 0~7F Read
		80		2-Page 80~FF Read
		A6	0	3-Page 0~7F Read
		80		3-Page 80~FF Read

* Purpose : To read(84h) the appointment Address of E2PROM by 128(80h)-byte

5. DDC command protocol

5.1. Signal TABLE

START [6E] A [50] A [84] A [03] A CMD A ADH A ADL A CS A STOP

5.2. E²PROM Data Write

(1) Signal TABLE

START [6E] A [50] A [84+n] A [03] A CMD A ADH A ADL A
Data_1 A [] ... Data_n A CS A STOP Delay 20m

LEN : 84h+Bytes
CMD : E8h
ADH : E2PROM Slave Address (A0,A2,A4,A6), Not 00h
(Reserved by BufferToEEPROM)
ADL : E2PROM Sub Address(00~FF)
Data : Write data
Delay : 20ms

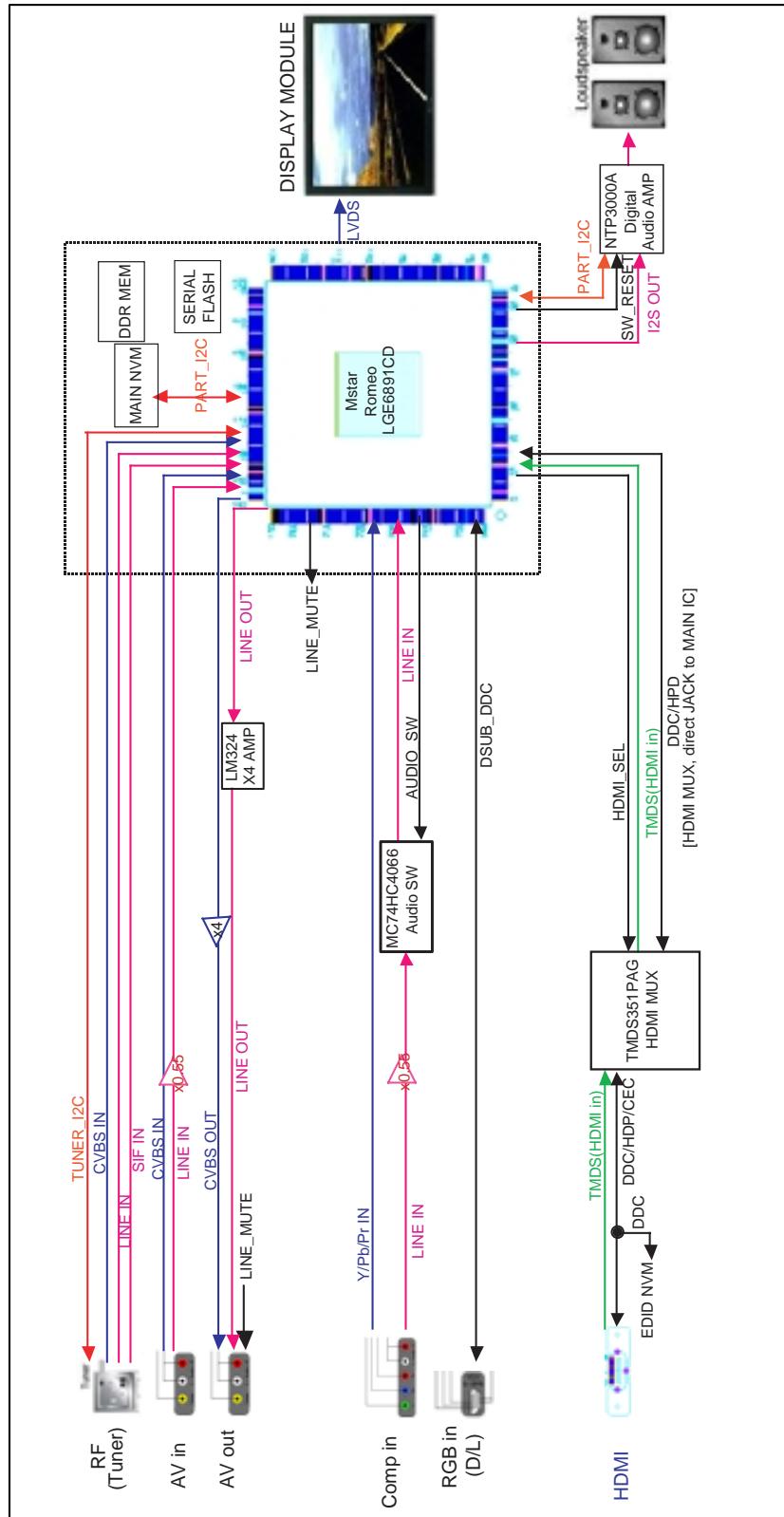
(2) Command Set

Adjustment contents	CMD(hex)	LEN	Details
EEPROM WRITE	E8h	94	16-Byte Write
		(84+n)h	n-byte Write

* Purpose

- 1) EDID write : 16-byte by 16-byte, 8 order (128-byte) write(TO "00 – 7F" of "EEPROM").
- 2) FOS Default write : 14-mode data write
(SyncFlags, HPeriodH, HPeriodL, VtotalH, VtotalL, SrcHTotalH, SrcHTotalL, SrcHStartH, SrcHStartL, SrcVStartH, SrcVStartL, HsyncPhase).
- 3) Random Data write : write the appointment Address of E²PROM.

TROUBLESHOOTING

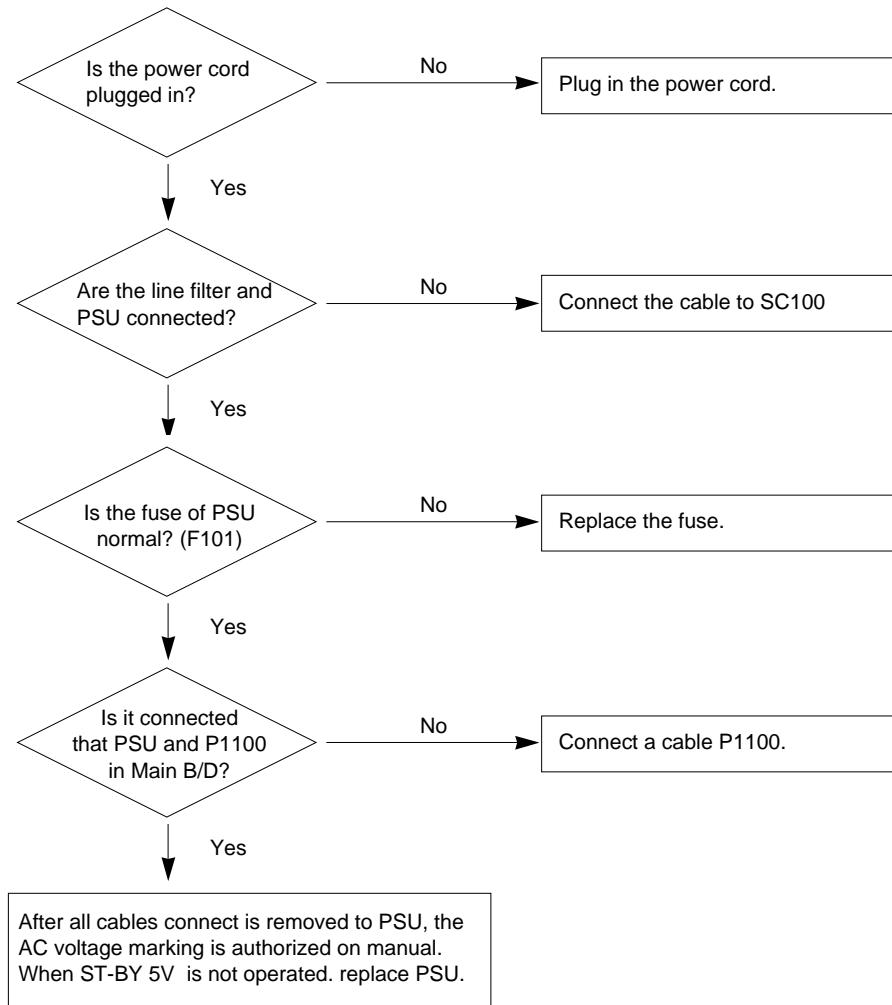


1. No power

(1) Symptom

- 1) It is not discharged minutely from module.
- 2) Light does not come into the front LED.

(2) Check process

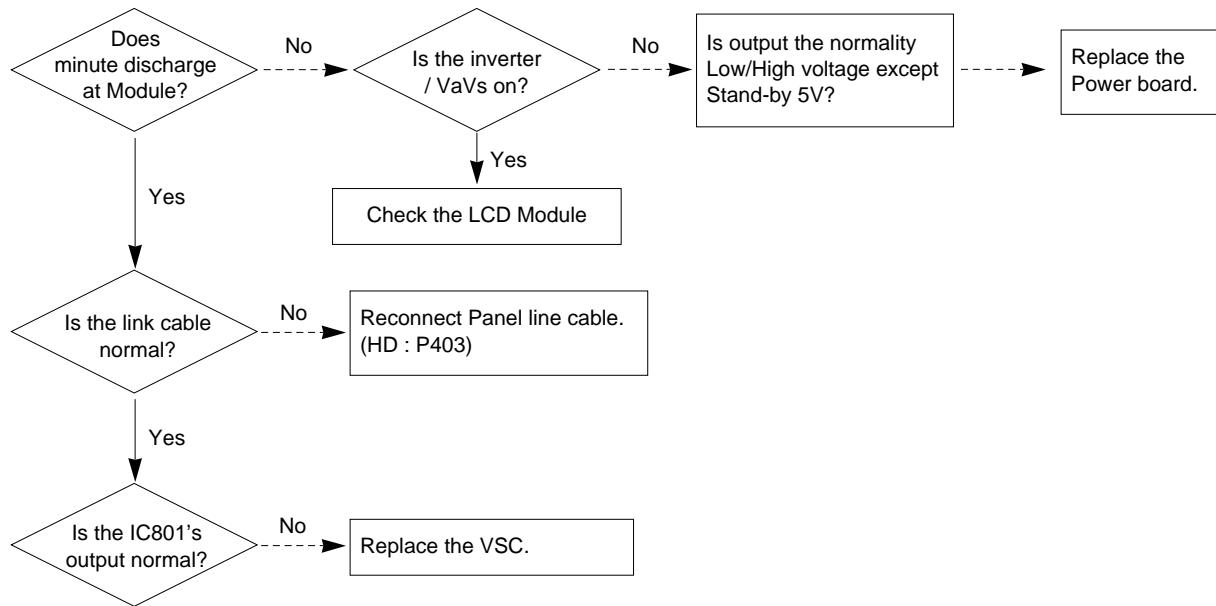


2. No Raster

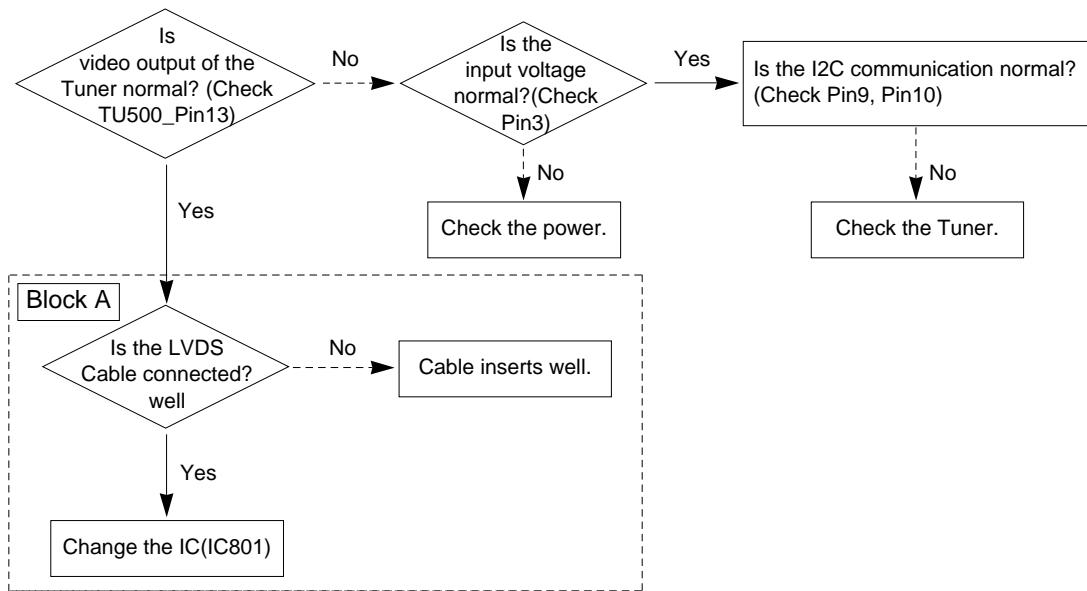
(1) Symptom

- 1) No OSD and image occur at screen.
- 2) It maintains the condition where the front LED is green.

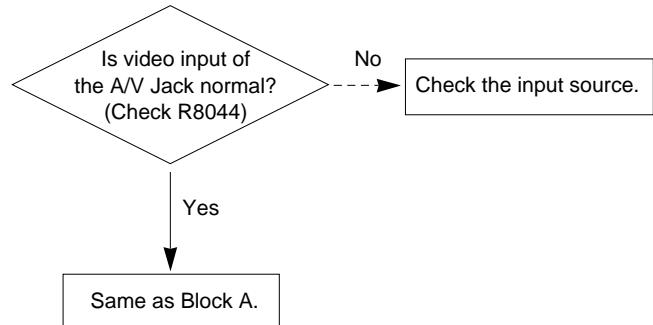
(2) Check process



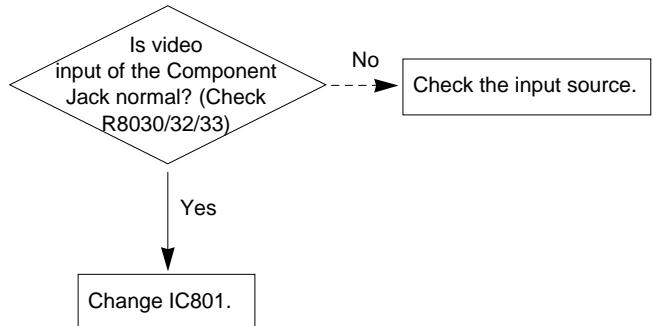
3. Unusual display from RF mode



4. Unusual display from rear AV mode.



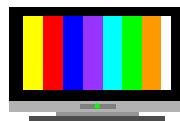
5. Unusual display from component 2 model



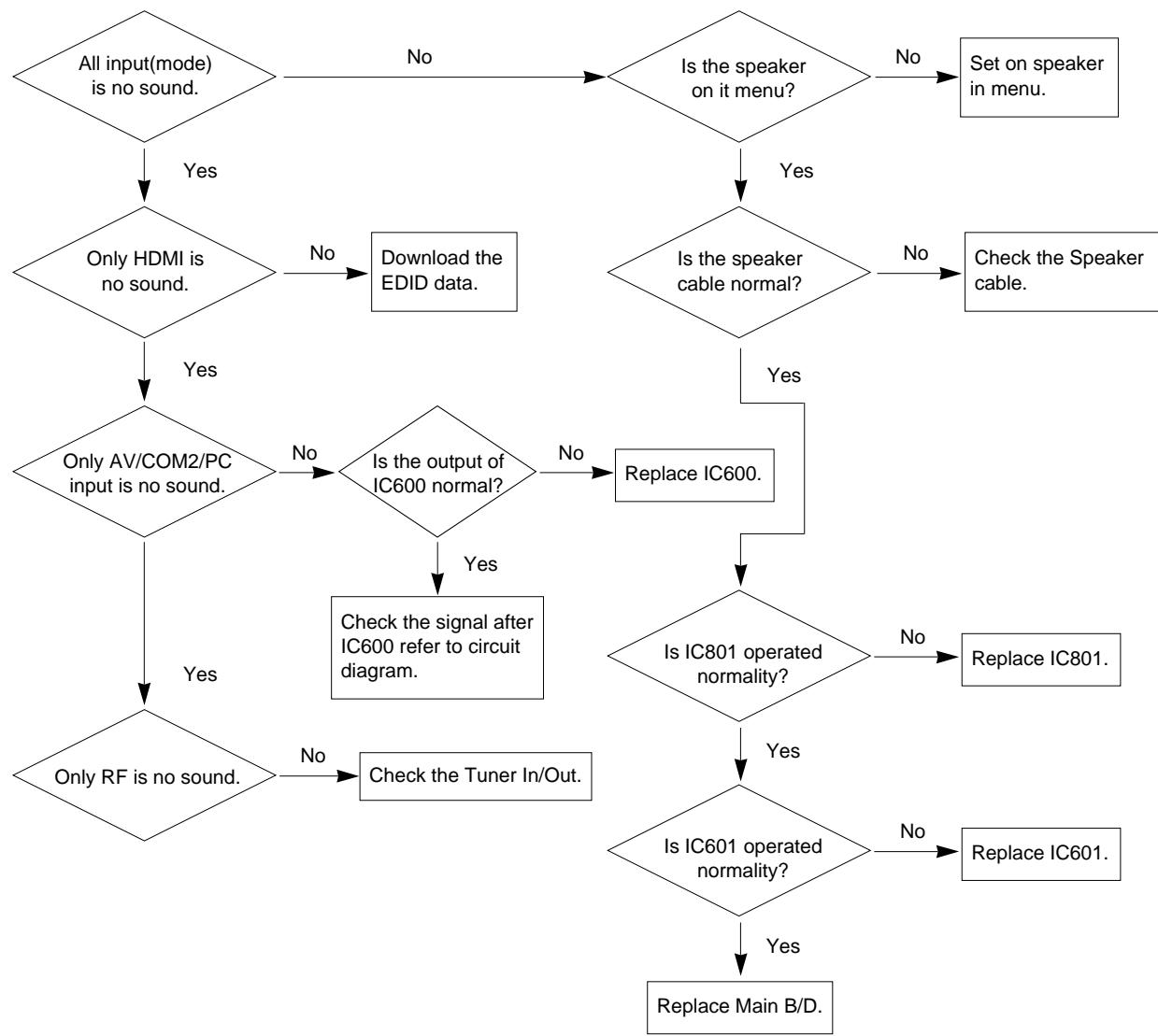
6. No Sound

(1) Symptom

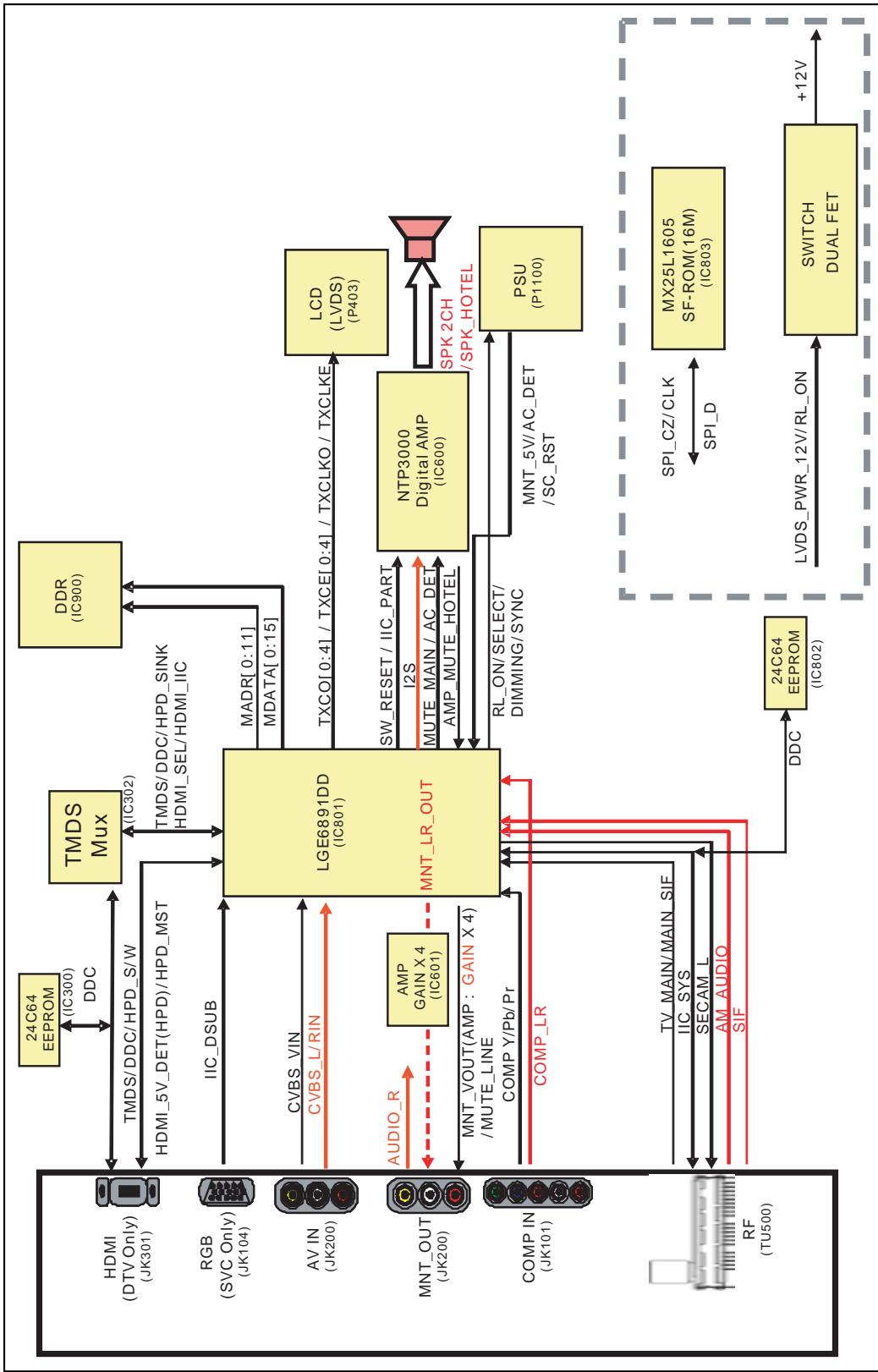
- 1) LED is green
- 2) Screen display but sound is not output.



(2) Check process



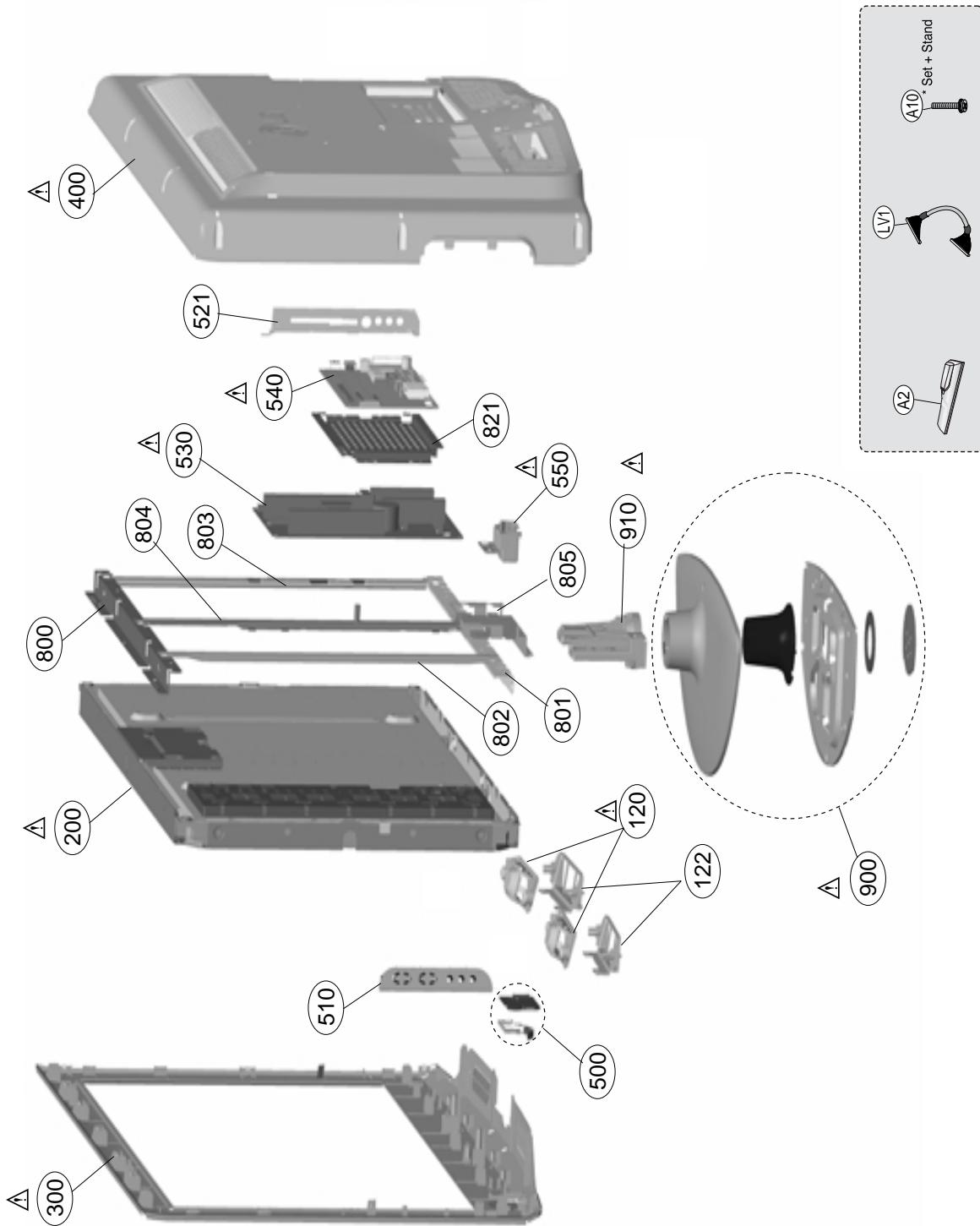
BLOCK DIAGRAM



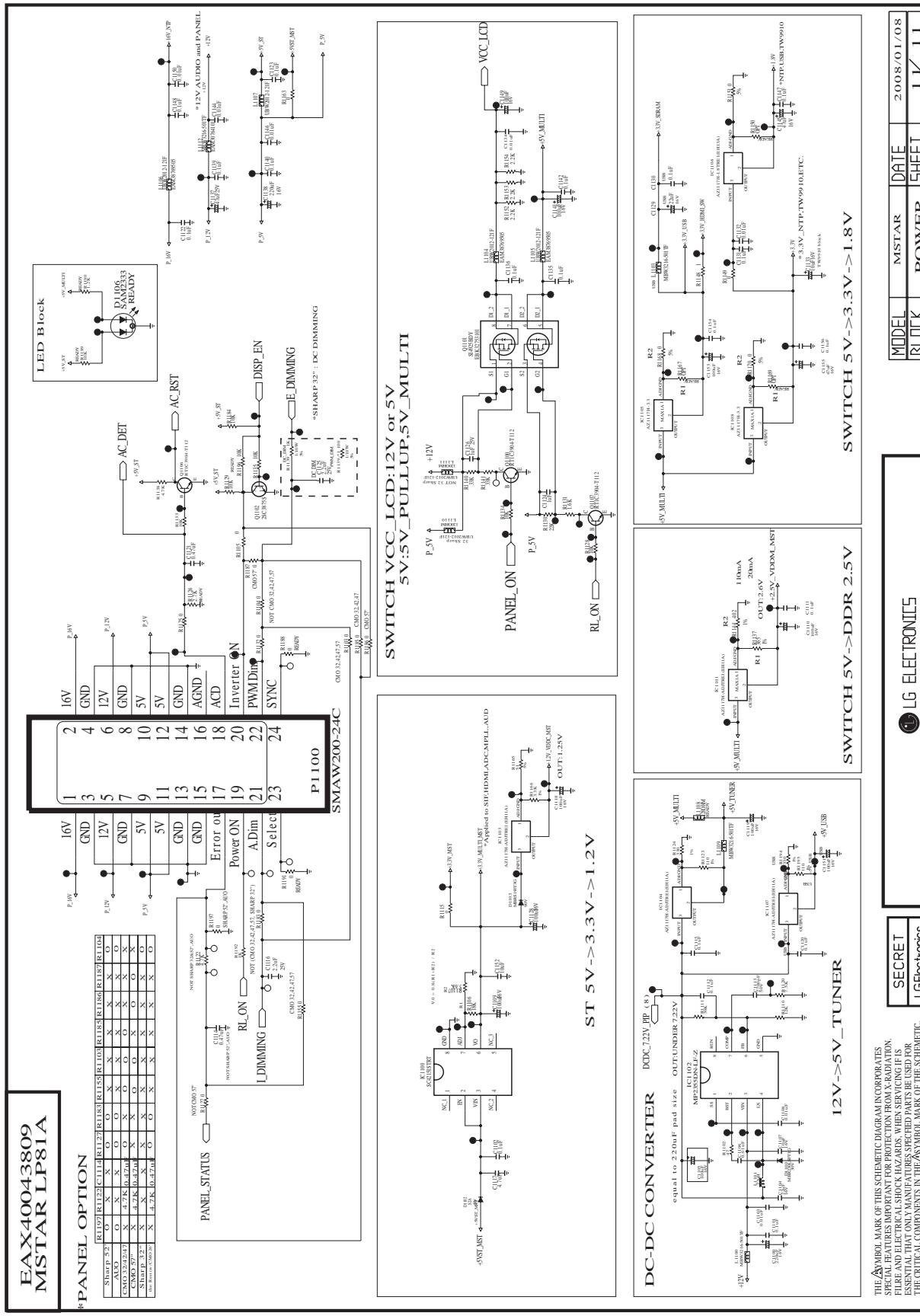
EXPLODED VIEW

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.



SCHEMATIC DIAGRAM

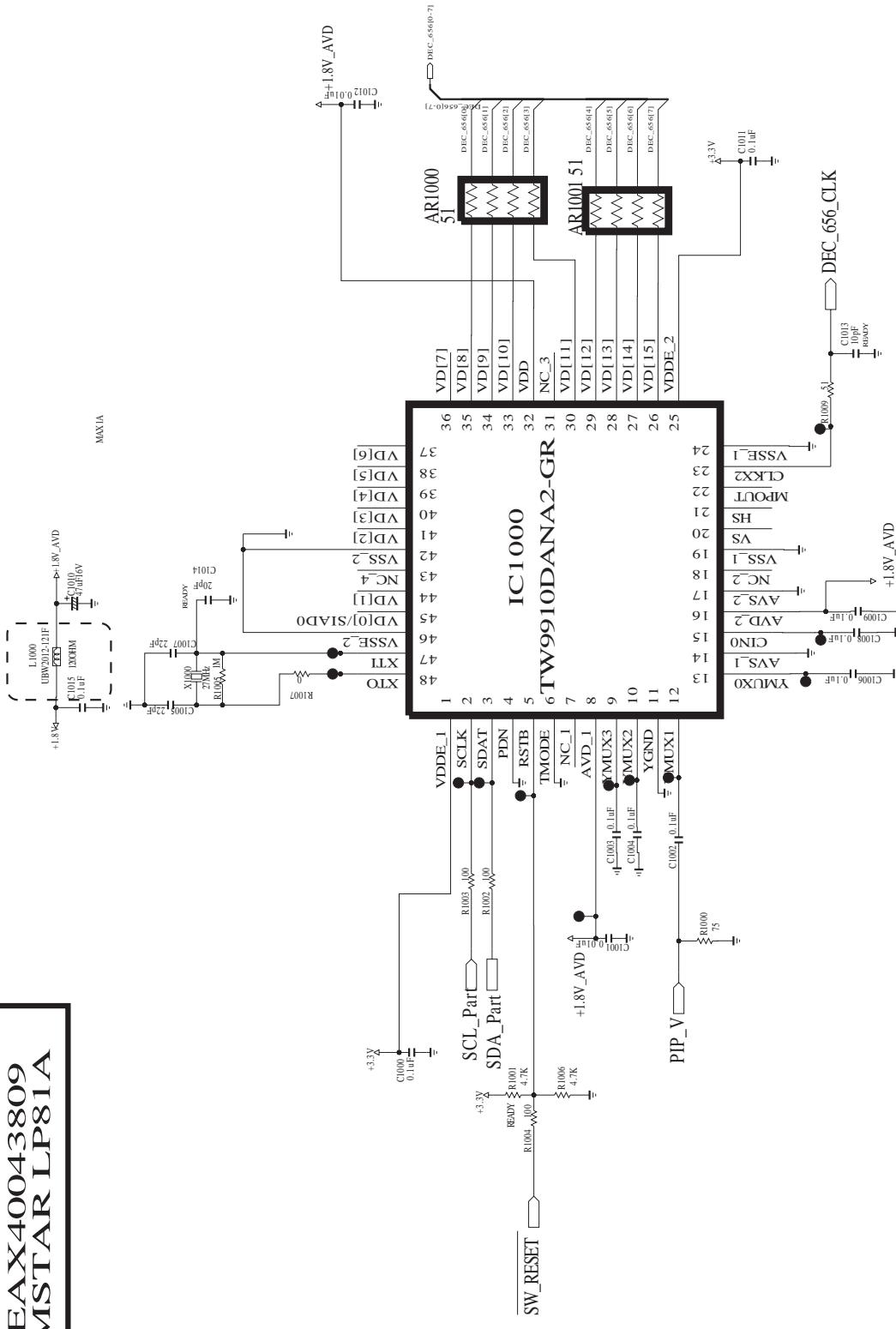


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TW9910

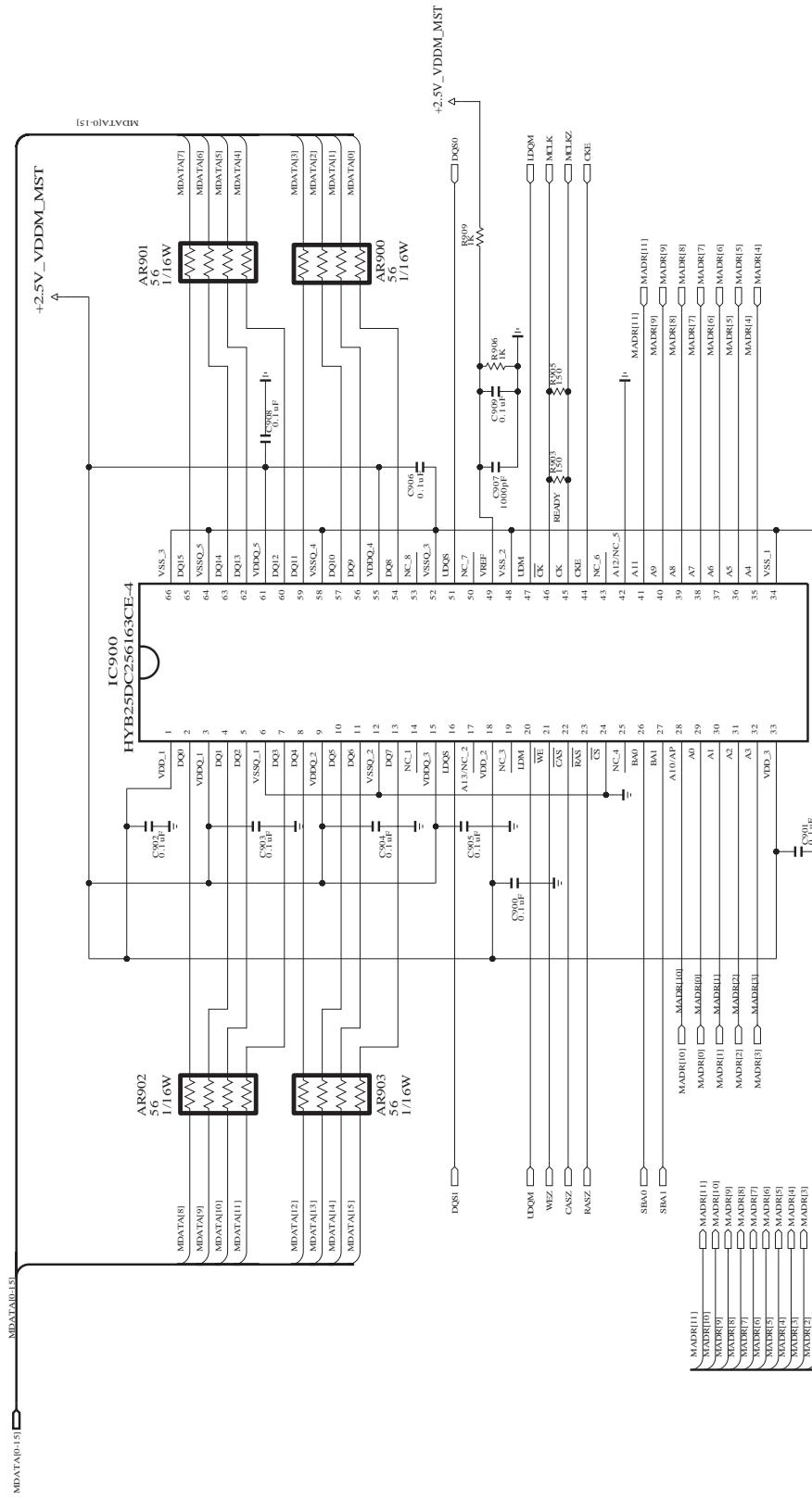
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FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF IS
ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR
THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.



MODEL	MSTAR	DATE	2008/01/08
BLOCK	TW9909	SHEET	10/11

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#9.DDR



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MAIN - QIMONDA : EAN41788501
SUB - HYNIX : EAN31729202

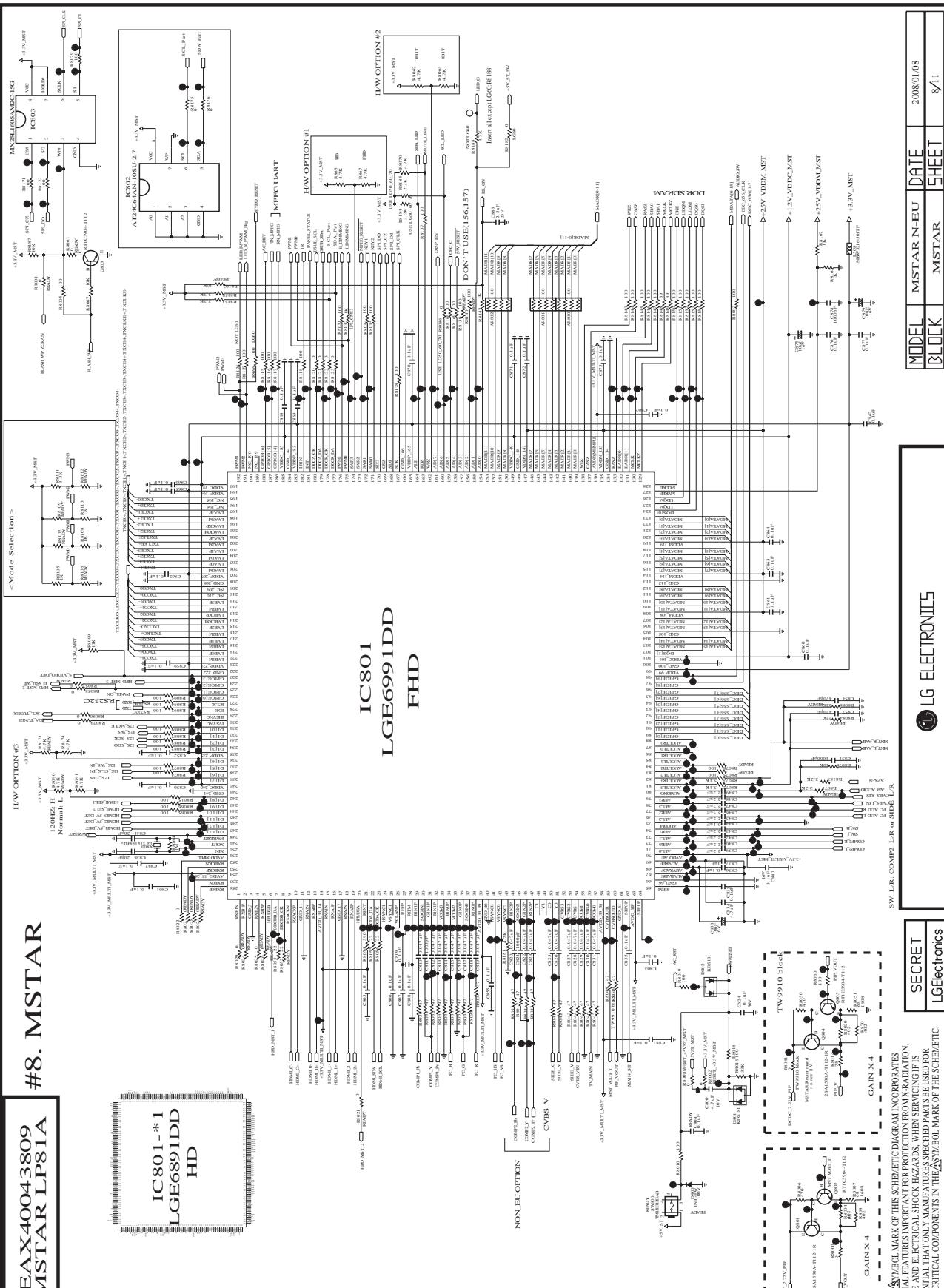
SECRET LG ELECTRONICS
 LG Electronics

MODEL	MSTAR	DATE	2008/01/08
BLUOK	DDR	SHEET	9/11

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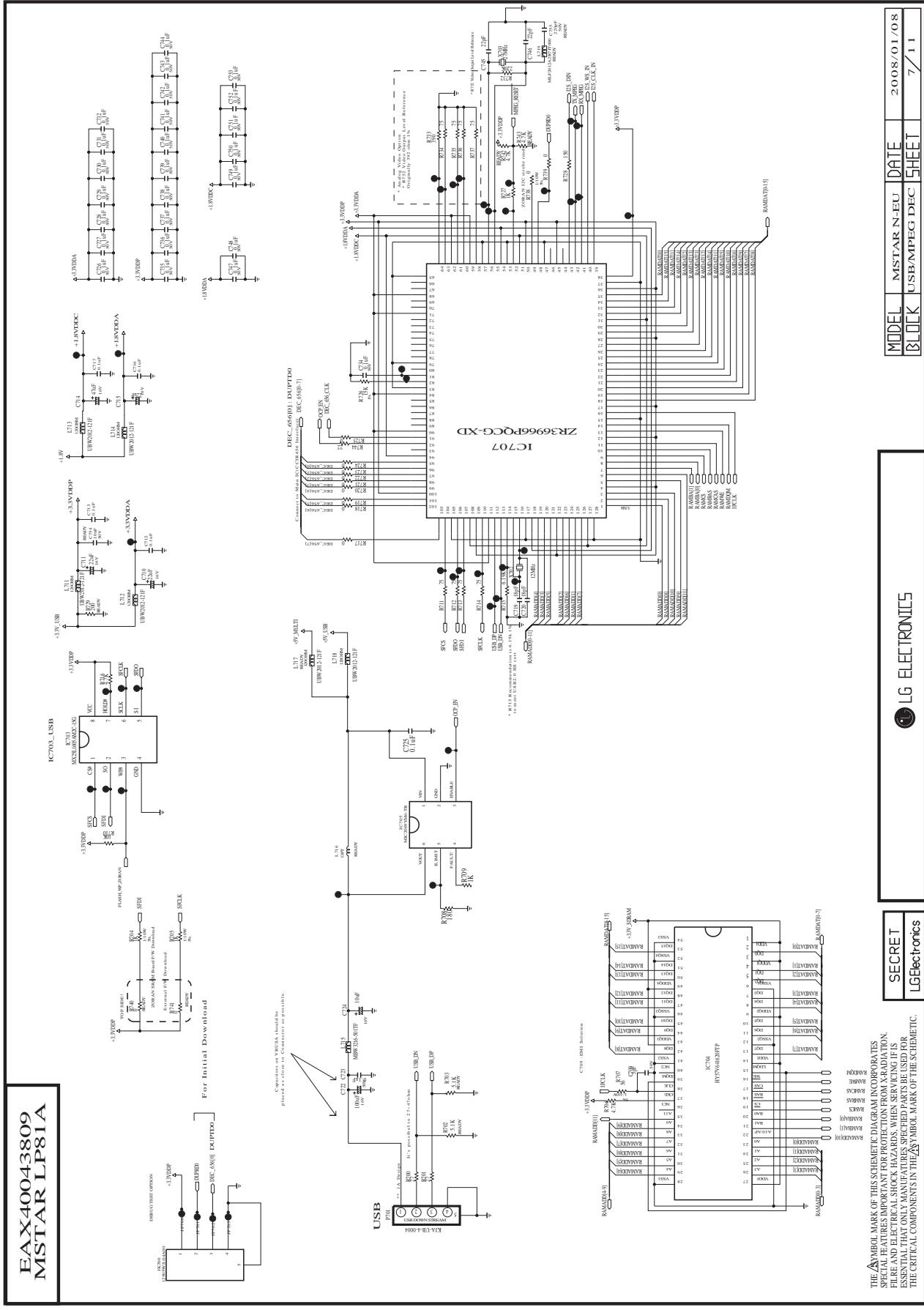
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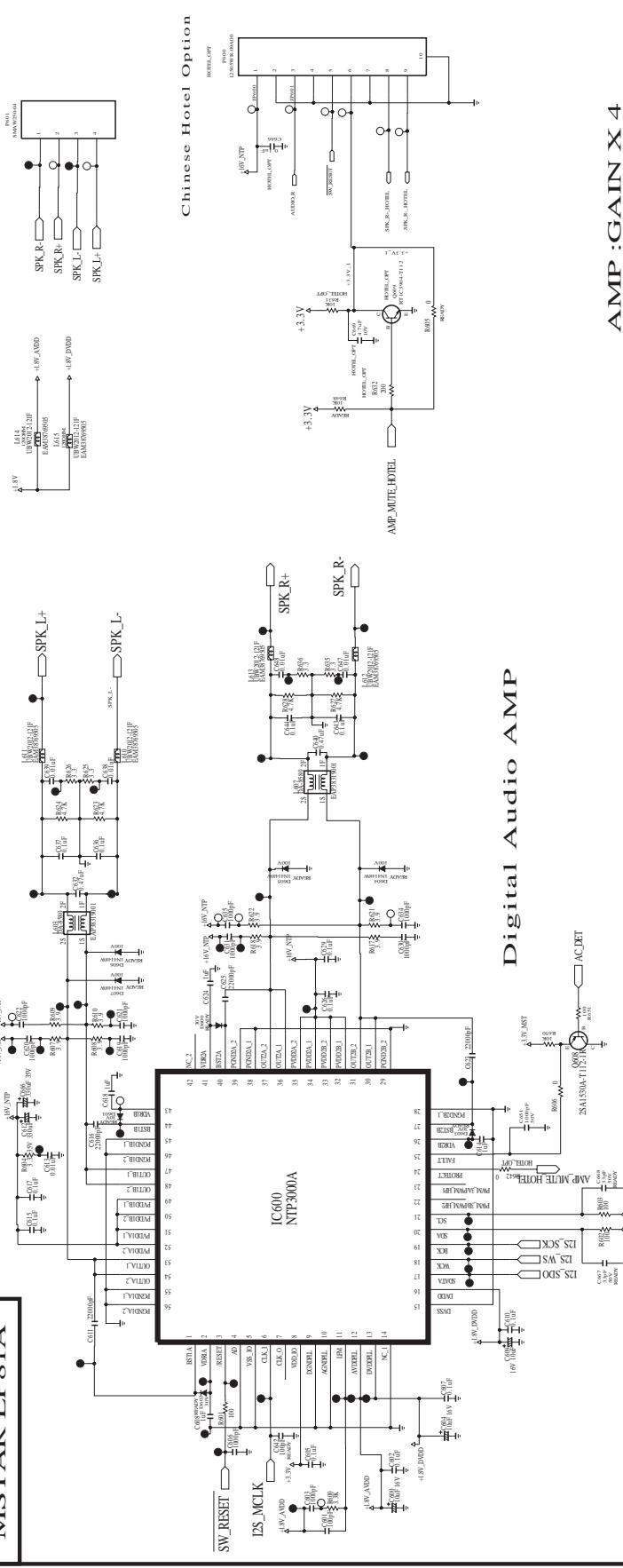
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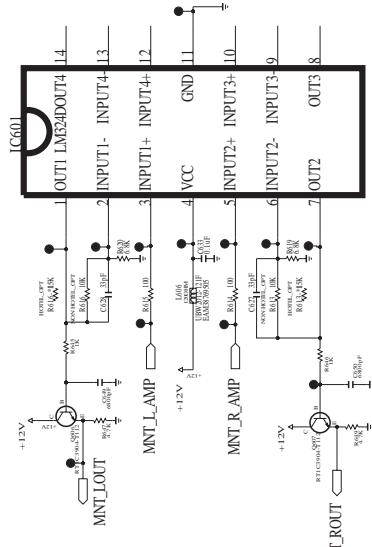


MODEL	MSTAR-N-ELU	DATE	2008.01.08
BLOCK	USB/MPEG	DEC	SHEET
			7 / 11

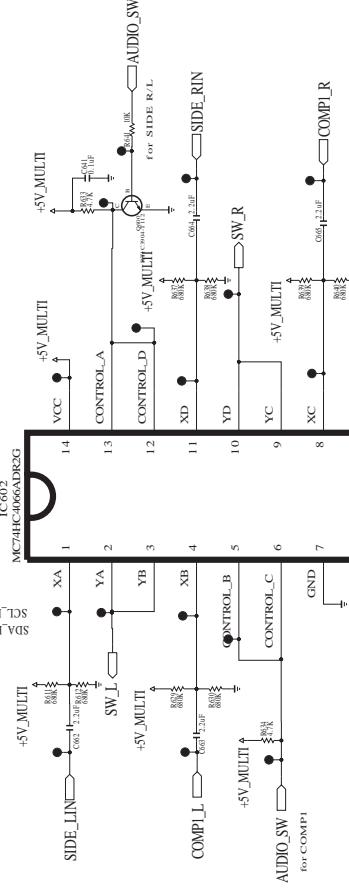
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AMP : GAIN X 4

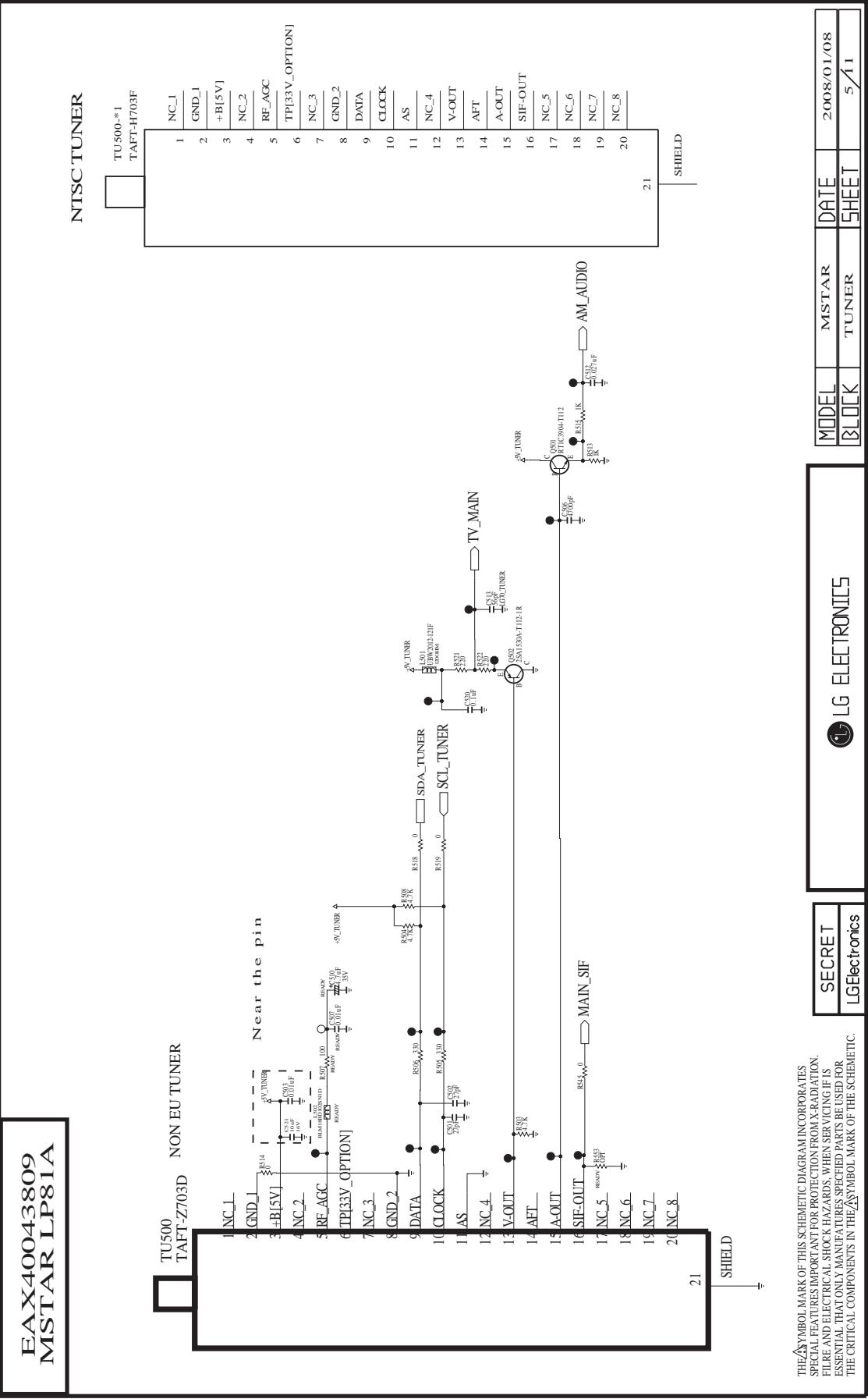


Audio S/W : COMP1 or SIDE L/R



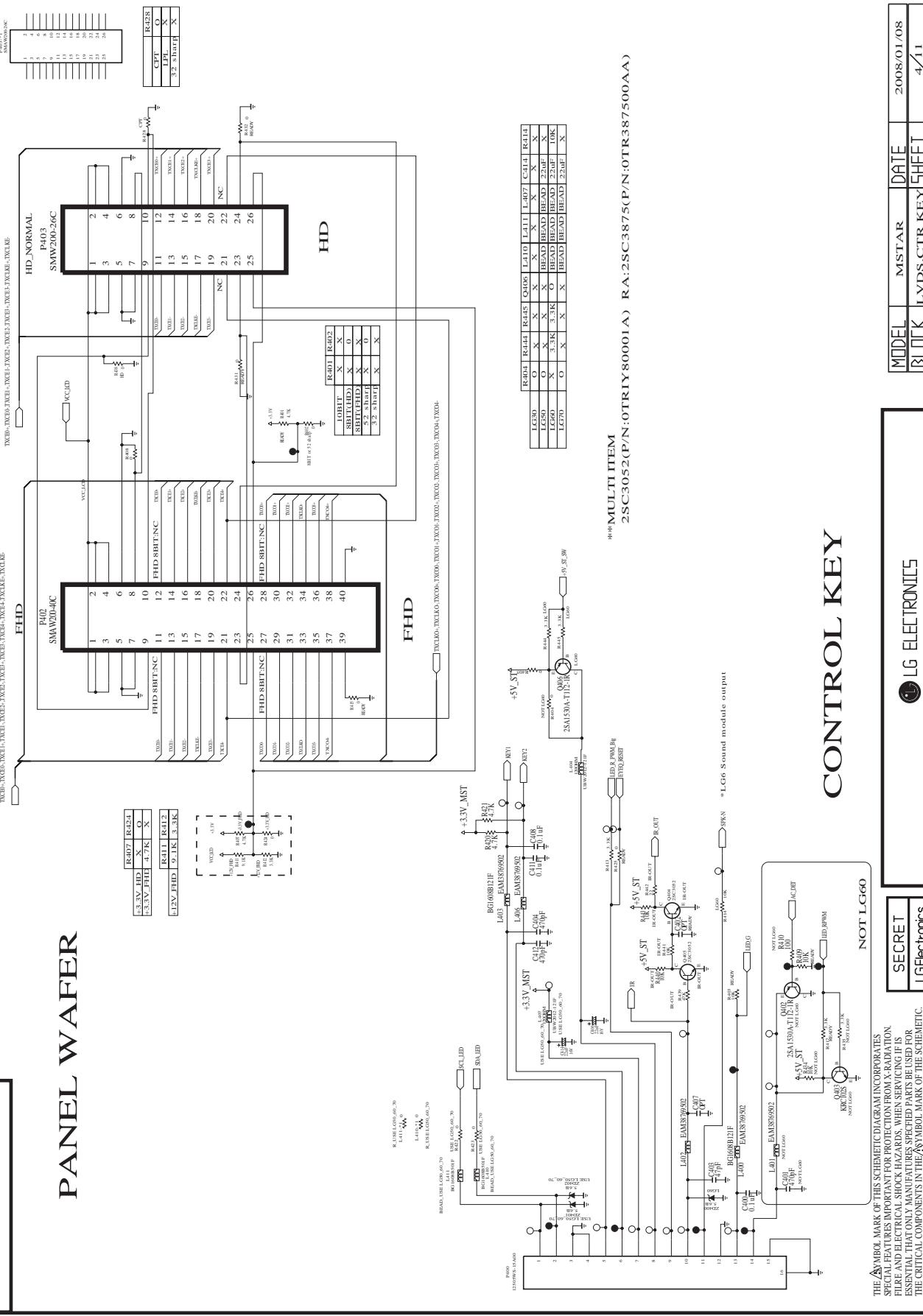
MODEL	MSTAR_N-EU	DATE	2008/01/08
BLOCK	AUDIO	SHEET	6/1

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PANEL WAFER



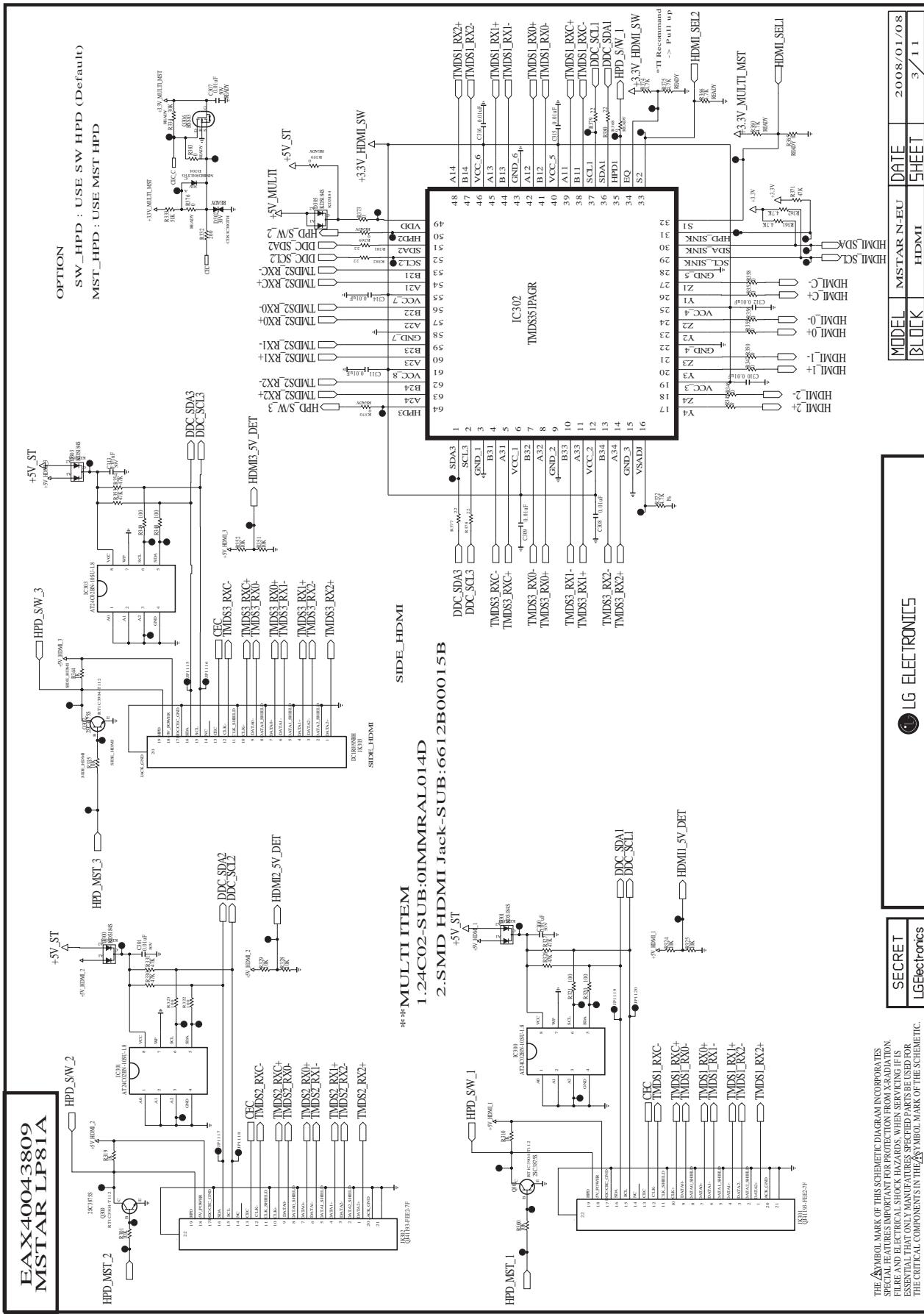
MODEL	MSTAR	DATE	2008/01/08
BLOCK	IVIDS.CTR KEY	SHIFT	4/11

NO. E000

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ESSENTIAL, THAT ONLY MANUFACTURES SPECIFIED
THE CRITICAL COMPONENTS IN THE SYMBOL. M

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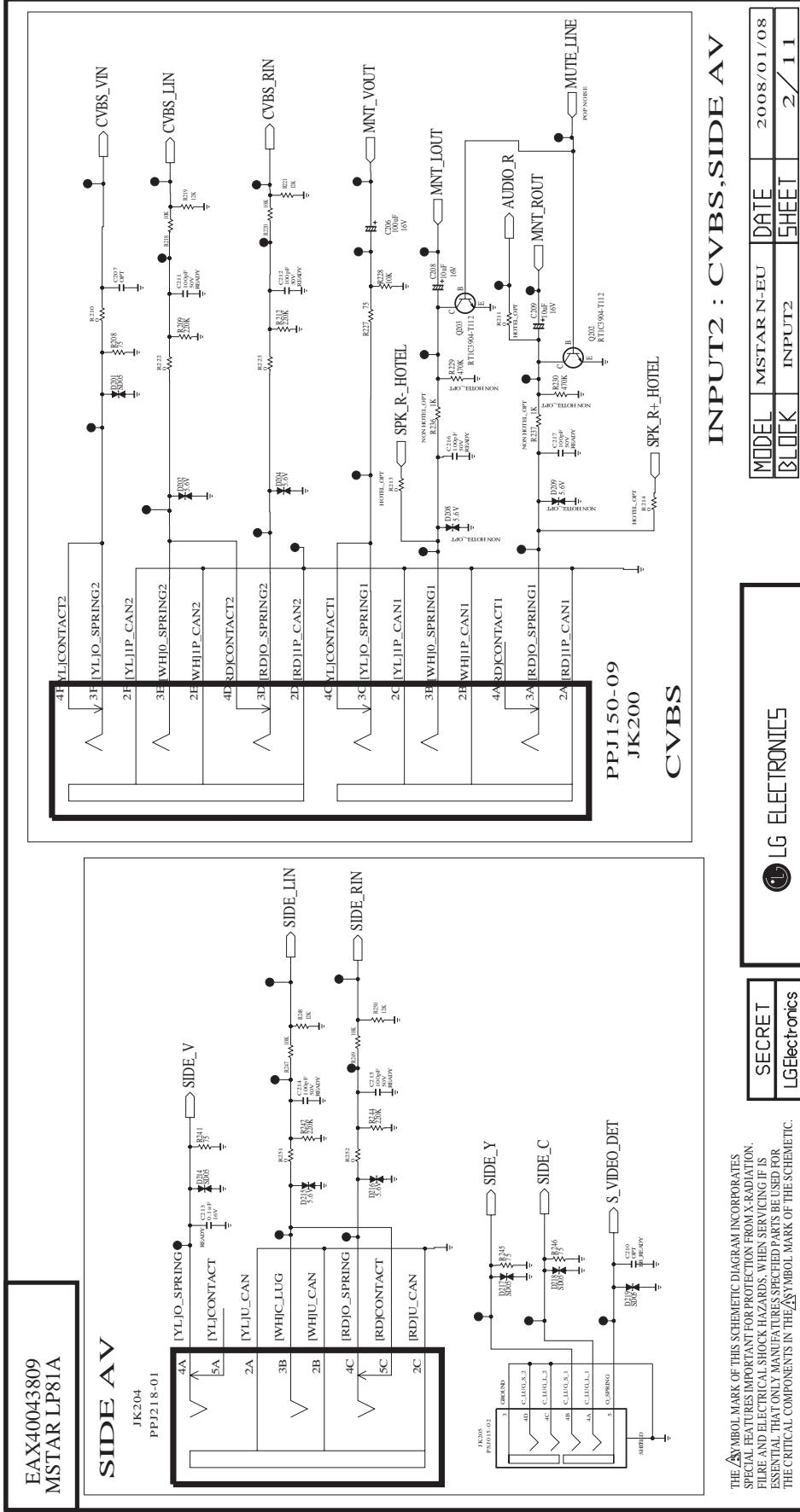
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ESSENTIAL PARTS OF THE SPECIFIED PARTS BEING USED.
THE CRITICAL COMPONENTS IN THIS MARK OF THE SCHEMATIC.

SECRET
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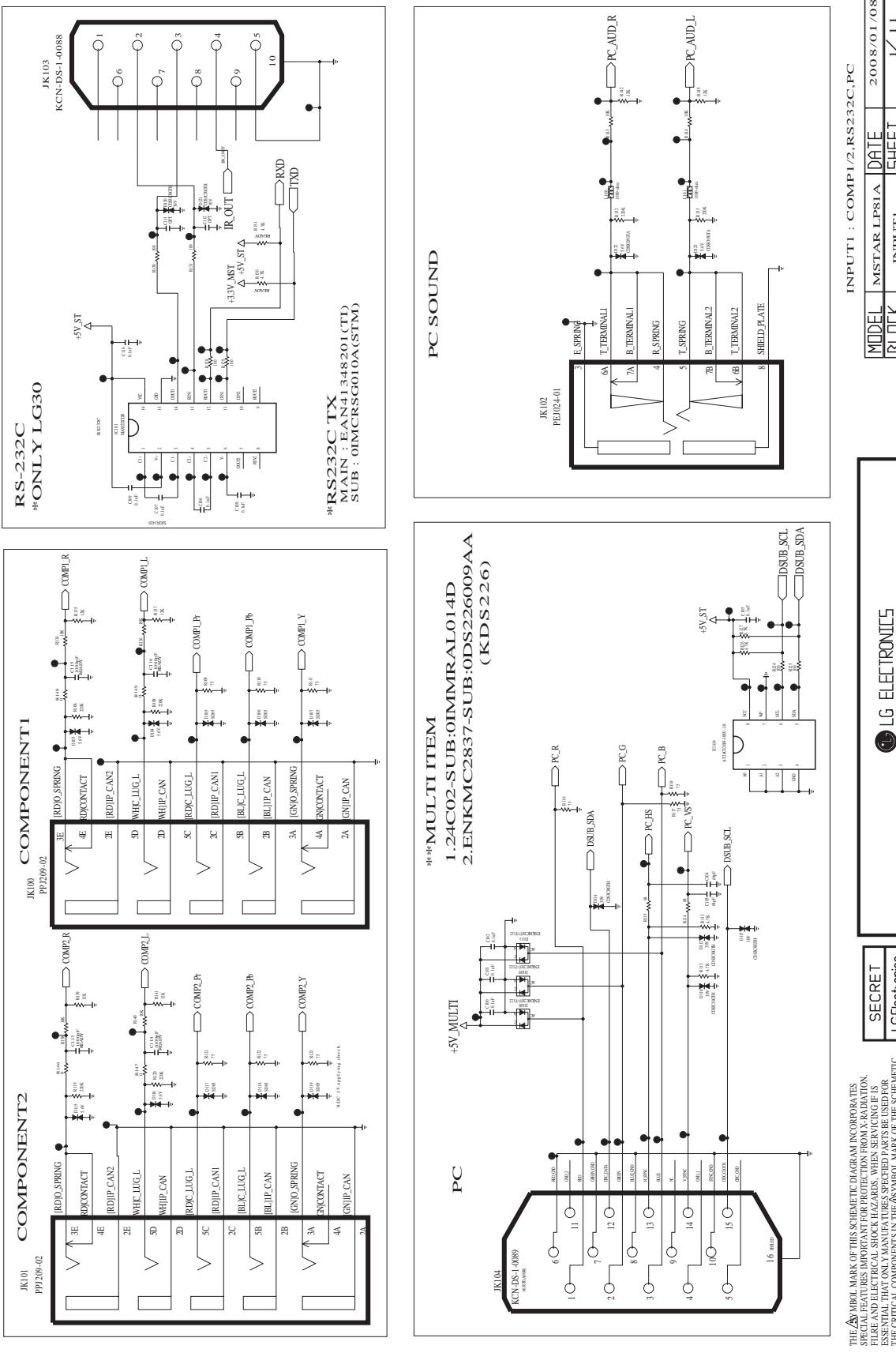
MODEL	MSTAR_N-EU	DATE	2008/01/08
BLOCK	HDMI	SHEET	3 / 11



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