



Internal Use Only

website:<http://biz.LGservice.com>

# LCD TV

# SERVICE MANUAL

CHASSIS : LA86B

MODEL : 32LG70      32LG70-UA

## CAUTION

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



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# SAFETY PRECAUTIONS

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\triangle$  in the Schematic Diagram and Replacement Parts List.

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.

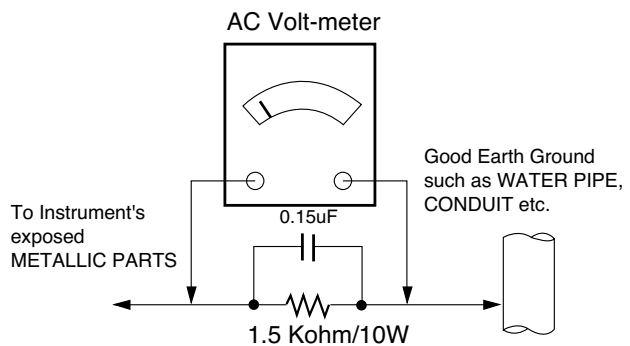
Connect 1.5K/10watt resistor in parallel with a 0.15uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

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

### IC Remove/Replacement

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

#### Removal

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

#### Replacement

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

### "Small-Signal" Discrete Transistor Removal/Replacement

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

### Power Output, Transistor Device Removal/Replacement

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

### Diode Removal/Replacement

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

### Fuse and Conventional Resistor Removal/Replacement

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

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

### Circuit Board Foil Repair

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

#### At IC Connections

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

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

#### At Other Connections

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

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

# SPECIFICATION

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

## 1. Application Range

This spec sheet is applied to the 26"/32" LCD TV used LA86B chassis.

## 3. Test method

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

## 2. Specification

Each part is tested as below without special appointment

- 1) Temperature : 20 ±5°C
- 2) Relative Humidity : 65 ±10%
- 3) Power Voltage : 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.

## 4. General Specification(TV)

No.	Item	Specification	Remark
1.	Receiving System	ATSC/ NTSC-M	
2.	Available Channel	1) VHF : 02~13	
		2) UHF : 14~69	
		3) DTV : 02-69	
		4) CATV : 01~135	
		5) CADTV : 01~135	
3.	Input Voltage	1) 100- 240V~, 50/60Hz	Mark : 110V, 60Hz
4.	Market	NORTH AMERICA	
5.	Screen Size	32 inch Wide (1920 x 1080)	FHD
6.	Aspect Ratio	16:9	
7.	Tuning System	FS	
8.	LCD Module	T315HW01-V0	AUO
9.	Operating Environment	1) Temp : 0 ~ 40 deg	
		2) Humidity : ~ 80 %	
10.	Storage Environment	1) Temp : -20 ~ 60 deg	
		2) Humidity : 0 ~ 85 %	

## 5. Chroma & Luminance

No	Item	Min.	Typ.	Max.	Unit	Remark		
1	White peak brightness (Center 1-point / Full White Pattern)	400	500		cd/m <sup>2</sup>			
2	White average brightness				cd/m <sup>2</sup>	N/A		
3	Brightness uniformity	80			%	Full white		
4	Color coordinate	RED	X	0.640			± 0.03	
			Y	0.330			± 0.03	
		GREEN	X	0.290				± 0.03
			Y	0.600				± 0.03
		BLUE	X	0.150				± 0.03
			Y	0.060				± 0.03
		WHITE	X	0.280				± 0.03
			Y	0.290				± 0.03
5	Color coordinate uniformity					N/A		
6	Contrast ratio	2000:1	2500:1			DCS		
		8000:1	10000:1					
7	Color Temperature	Cool	10,000	11,000	12,000	<Test Signal> HDMI input, 85% Full white pattern		
		Standard	8,300	9,300	10,300			
		Warm	5,500	6,500	7,500			
8	Color Distortion, DG			10.0	%			
9	Color Distortion, DP			10.0	deg			
10	Color S/N, AM/FM	43.0			dB			
11	Color Killer Sensitivity	-80			dBm			

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

No.	Specification				Remark
	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock	
1.	720*480	15.73	60	13.5135	SDTV ,DVD 480I
2.	720*480	15.73	59.94	13.5	SDTV ,DVD 480I
3.	720*480	31.47	60	27.027	SDTV 480P
4.	720*480	31.47	59.94	27.0	SDTV 480P
5.	1280*720	45.00	60.00	74.25	HDTV 720P
6.	1280*720	44.96	59.94	74.176	HDTV 720P
7.	1920*1080	33.75	60.00	74.25	HDTV 1080I
8.	1920*1080	33.72	59.94	74.176	HDTV 1080I
9.	1920*1080	67.500	60	148.50	HDTV 1080P
10.	1920*1080	67.432	59.939	148.352	HDTV 1080P
11.	1920*1080	27.000	24.000	74.25	HDTV 1080P
12.	1920*1080	26.97	23.94	74.176	HDTV 1080P
13.	1920*1080	33.75	30.000	74.25	HDTV 1080P
14.	1920*1080	33.71	29.97	74.176	HDTV 1080P

## 7. RGB input (PC)

No.	Specification				Remark	
	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)		
	PC	DDC				
1.	640*350	31.468	70.09	25.17	EGA	X
2.	720*400	31.469	70.08	28.32	DOS	O
3.	640*480	31.469	59.94	25.17	VESA(VGA)	O
4.	640*480	37.861	72.80	31.50	VESA(VGA)	O
5.	640*480	37.500	75.00	31.50	VESA(VGA)	O
6.	800*600	35.156	56.25	36.00	VESA(SVGA)	O
7.	800*600	37.879	60.31	40.00	VESA(SVGA)	O
8.	800*600	48.077	72.18	50.00	VESA(SVGA)	O
9.	800*600	46.875	75.00	49.50	VESA(SVGA)	O
10.	1024*768	48.363	60.00	65.00	VESA(XGA)	O
11.	1024*768	56.476	70.06	75.00	VESA(XGA)	O
12.	1024*768	60.023	75.02	78.75	VESA(XGA)	O
13.	1280*768	47.776	59.870	79.5	CVT(WXGA)	O
14.	1280*768	60.289	74.893	102.25	CVT(WXGA)	O
15.	1360*768	47.712	60.015	85.50	VESA (WXGA)	O
16.	1280*1024	63.981	60.020	108.00	VESA (SXGA)	O
17.	1280*1024	79.976	75.025	135	VESA (SXGA)	O
18.	1600*1200	75.00	60.00	162	VESA (UXGA)	O
19.	1920*1080	66.587	59.934	148.5	HDTV 1080P	O



## 8. HDMI input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	Pixel clock(MHz)	Remark	
PC						
1	640*350	31.468	70.09	25.17	EGA	X
2	720*400	31.469	70.08	28.32	DOS	O
3	640*480	31.469	59.94	25.17	VESA(VGA)	O
4	640*480	37.861	72.80	31.50	VESA(VGA)	O
5	640*480	37.500	75.00	31.50	VESA(VGA)	O
6	800*600	35.156	56.25	36.00	VESA(SVGA)	O
7	800*600	37.879	60.31	40.00	VESA(SVGA)	O
8	800*600	48.077	72.18	50.00	VESA(SVGA)	O
9	800*600	46.875	75.00	49.50	VESA(SVGA)	O
10	1024*768	48.363	60.00	65.00	VESA(XGA)	O
11	1024*768	56.476	70.06	75.00	VESA(XGA)	O
12	1024*768	60.023	75.02	78.75	VESA(XGA)	O
13	1280*768	47.776	59.870	79.5	CVT(WXGA)	O
14	1360*768	47.712	60.015	85.50	VESA (WXGA)	O
15	1280*1024	63.981	60.020	108.00	VESA (SXGA)	O
16	1280*1024	79.976	75.025	135	VESA (SXGA)	O
17	1600*1200	75.00	60.00	162	VESA (UXGA)	O
18	1920*1080	67.5	60	148.5	HDTV 1080P	O
DTV						
1	720*480	31.47	60	27.027	SDTV 480P	
2	720*480	31.47	59.94	27.00	SDTV 480P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	44.96	59.94	74.176	HDTV 720P	
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	
6	1920*1080	33.72	59.94	74.176	HDTV 1080I	
7	1920*1080	67.500	60	148.50	HDTV 1080P	
8	1920*1080	67.432	59.939	148.352	HDTV 1080P	
9	1920*1080	27.000	24.000	74.25	HDTV 1080P	
10	1920*1080	26.97	23.94	74.176	HDTV 1080P	
11	1920*1080	33.75	30.000	74.25	HDTV 1080P	
12	1920*1080	33.71	29.97	74.176	HDTV 1080P	

# ADJUSTMENT INSTRUCTION

## 1. Application Object

These instructions are applied to all of the LCD TV, LA86B.

## 2. Notes

- (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 equipment.
- (2) Adjustments must be done in the correct order.
- (3) The adjustments must be performed in the circumstance of  $20\pm 5^{\circ}\text{C}$  of temperature and  $65\pm 10\%$  of relative humidity if there is no specific designation.
- (4) The input voltage of the receiver must be kept 220V, 60Hz when adjusting.
- (5) The receiver must be operational for about 15 minutes prior to the adjustments.
  
- (6) Perform preliminary operation after receiving 100% White Pattern (06CH). (Or 3. White Pattern status of Ez-Adjust)
- (7) White Pattern entry method
  - 1) Enter into Ez-Adjust by pressing the ADJ key on the adjustment R/C.
  - 2) 100% FULL WHITE PATTERN appears if pressing the OK (■) key after selecting the '10.WHITE PATTERN' with the CH +/- KEY.

\* It is possible to heat run the set without a separate signal generator in this mode.

**Caution** : Care must be taken as afterimage phenomena may occur about the black level part of screen If leaving pause image turned on for more than 20 minutes (especially inner digital pattern (13 CH), Cross Hatch Pattern (09CH) with significant black/white contrast).

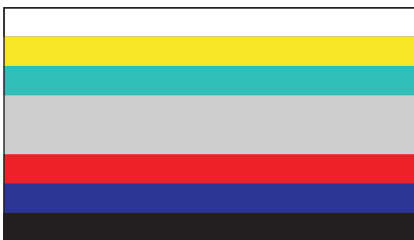
## 3. ADC-Set Adjustment

### 3-1. Synopsis

ADC-set is Gain and Black level setting at Analog to Digital converter, and compensate the RGB deviation.

### 3-2. Test Equipment

- (1) Remote control for service
- (2) 801GF (802B, 802F, 802R) or MSPG-925FA pattern generator
  - Revolution : 480i, 1080p
  - Pattern name : Horizontal 100% Color Bar Pattern
  - Pattern level :  $0.7\pm 0.1\text{Vp-p}$
  - Image
- (3) Using regulation signal cable



### 3-3. Adjustment

- (1) ADC 480i Component1 adjustment
  - 1) Check the Component1 connection condition from the used device.
  - 2) Apply 480i Mode, Horizontal 100% Color Bar Pattern to Comp1 port.(MSPG-925FA => Model: 209, Pattern: 65)
  - 3) Set the input to Component1 and select 'Normal' as video.
  - 4) Wait for one second or longer after receiving the signal, press the ADJ key of the R/C to enter into 'Ez-Adjust', select '3. ADC 480i Comp1', and press the Enter key to automatically adjust.
  - 5) If it is normally adjusted, the message "ADC Component1 Success" is displayed.
  - 6) If it is not normally adjusted, the message 'ADC Component1 480i Fail' is displayed. If the component is not connected, the message Component1 Not Connected, or if the input format is not 480i, the message 'Not Valid Format', or if there is no input signal, the message 'Check Signal Status' is displayed for one second.
  - 7) If the adjustment is failed, check the pattern or the adjustment condition and then readjust
  
- (2) ADC 1080p Component1 / RGB adjustment
  - 1) Check the connection condition of Component1 and RGB from the device to use.
  - 2) Apply 1080p Mode, 100% Horizontal Color Bar Pattern to Comp1 and RGB port.  
(MSPG-925 Series => model:225 , pattern:65 )
  - 3) Set the input to Component1 and select 'Normal' as video.
  - 4) Wait for one second or longer after receiving the signal, press the ADJ key of the R/C to enter into 'Ez-Adjust', select '4. ADC 1080p Comp1/RGB', and press the Enter key to automatically adjust the component1.
  - 5) If it is normally adjusted, the message "ADC Component1 Success" is displayed, or if not, the message 'ADC Component1 1080p Fail' is displayed.
  - 6) When adjusting the Component1 is ended, it is automatically switched to the RGB-DTV Mode and the RGB adjustment is started. If it is normally adjusted, the message "ADC RGB 1080P Success" is displayed.
  - 7) If it is not normally adjusted, check the pattern or the adjustment condition, and then readjust. The error message is same to 6).
  - 8) If the adjustment is ended, press the ADJ key to exit from the adjustment mode. If the 7) adjustment is ended, press the ADJ or the Exit of the adjustment R/C to exit from the adjustment mode.

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

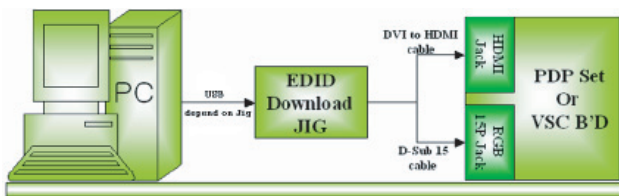
### 4-1. Summary

It is established in VESA, for communication between PC and Monitor without order from user for building user condition. It helps to make easily use realize "Plug and Play" function.

### 4-2. Required Test Equipment

- 1) PC (with S/W : EDID Data write & Read)
- 2) EDID DOWNLOAD JIG
- 3) HDMI Cable, D-Sub cable

### 4-3. Connection diagram(Setting of DL device)



- 1) Set devices as above and turn on the PC and JIG.
- 2) Operate the DDC program.(EDID data write & read).
- 3) In menu, enter to 'model -> open' and select EDID Data

### 4-4. How to download

- 1) Configure the download environment as shown at the adjustment wiring diagram and turn on the PC.
- 2) Execute the DDC program. (EDID Data Write & Read)
- 3) Go to Model -> Open, and select the EDID data of the desired model.
- 4) Check the item to download from the <Test> item
  - 4-1) HDMI & RGB: Check Digital & Analog
  - 4-2) (Only)HDMI: Check Digital only
- 5) Press ESC(Cancel Mode) -> F8(Auto Mode). (Set Auto Detecting)
- 6) Connect the desired signal cable to the set.
- 7) Make sure that the popup "Proceed to write?" is displayed.
- 8) Press the Enter key or the space key to download.
- 9) After downloading, check the OK message and disconnect the connected cable.

### 4-4. EDID DATA for LA73E

\* It is possible to download on only POWER ON MODE.

#### ● HDMI-1 [C/S : 8A27]

EDID Block 0 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	00	11	01	03	80	73	41	96	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	AF	CF	00	31	40	45	40	61	40	81	80	A9	40
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	36	00	C4	8E	21	00	1E	66	21	50	B0	51	00	1B	30	
50	40	70	36	00	C4	8E	21	00	00	1E	00	00	00	FD	00	30
60	58	1F	64	11	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	8A	

EDID Block 1 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	02	03	18	F1	47	84	05	03	02	20	22	10	23	15	07	50
10	67	03	0C	00	10	00	B8	2D	01	1D	00	72	51	D0	1E	20
20	6E	28	55	00	C4	8E	21	00	00	1E	01	1D	80	18	71	1C
30	16	20	58	2C	25	00	C4	8E	21	00	00	9E	8C	0A	D0	8A
40	20	E0	2D	10	10	3E	96	00	C4	8E	21	00	00	18	8C	0A
50	D0	8A	20	E0	2D	10	10	3E	96	00	13	8E	21	00	00	18
60	26	36	80	A0	70	38	1F	40	30	20	25	00	C4	8E	21	00
70	00	1A	00	00	00	00	00	00	00	00	00	00	00	00	00	27

#### ● HDMI-2 [C/S : 8A17]

EDID Block 0 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	00	11	01	03	80	73	41	96	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	AF	CF	00	31	40	45	40	61	40	81	80	A9	40
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	C4	8E	21	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	C4	8E	21	00	00	1E	00	00	00	FD	00	30
60	58	1F	64	11	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	8A	

EDID Block 1 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	02	03	18	F1	47	84	05	03	02	20	22	10	23	15	07	50
10	67	03	0C	00	20	00	B8	2D	01	1D	00	72	51	D0	1E	20
20	6E	28	55	00	C4	8E	21	00	00	1E	01	1D	80	18	71	1C
30	16	20	58	2C	25	00	C4	8E	21	00	00	9E	8C	0A	D0	8A
40	20	E0	2D	10	10	3E	96	00	C4	8E	21	00	00	18	8C	0A
50	D0	8A	20	E0	2D	10	10	3E	96	00	13	8E	21	00	00	18
60	26	36	80	A0	70	38	1F	40	30	20	25	00	C4	8E	21	00
70	00	1A	00	00	00	00	00	00	00	00	00	00	00	00	00	17

#### ● HDMI-3 [C/S : 8A07]

EDID Block 0 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	00	11	01	03	80	73	41	96	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	AF	CF	00	31	40	45	40	61	40	81	80	A9	40
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	C4	8E	21	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	C4	8E	21	00	00	1E	00	00	00	FD	00	30
60	58	1F	64	11	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	8A	

EDID Block 1 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	02	03	18	F1	47	84	05	03	02	20	22	10	23	15	07	50
10	67	03	0C	00	30	00	B8	2D	01	1D	00	72	51	D0	1E	20
20	6E	28	55	00	C4	8E	21	00	00	1E	01	1D	80	18	71	1C
30	16	20	58	2C	25	00	C4	8E	21	00	00	9E	8C	0A	D0	8A
40	20	E0	2D	10	10	3E	96	00	C4	8E	21	00	00	18	8C	0A
50	D0	8A	20	E0	2D	10	10	3E	96	00	13	8E	21	00	00	18
60	26	36	80	A0	70	38	1F	40	30	20	25	00	C4	8E	21	00
70	00	1A	00	00	00	00	00	00	00	00	00	00	00	00	00	07

- RGB [C/S : F6BC]  
EDID Block 0 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	00	11	01	03	18	73	41	96	0A	CF	74	A3	57	4C	B0	23
20	09	48	4C	AF	CF	00	31	40	45	40	61	40	81	80	A9	40
30	01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40	70
40	36	00	C4	8E	21	00	00	1A	02	3A	80	18	71	38	2D	40
50	58	2C	45	00	C4	8E	21	00	00	1E	00	00	00	FD	00	30
60	58	1F	64	11	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	F6

EDID Block 1 table =

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	02	03	04	00	0E	1F	00	80	51	00	1E	30	40	80	37	00
10	C4	8E	21	00	00	1C	F1	27	00	A0	51	00	25	30	50	80
20	37	00	C4	8E	21	00	00	1C	26	36	80	A0	70	38	1F	40
30	30	20	25	00	C4	8E	21	00	00	0A	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	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

## 5. White Balance

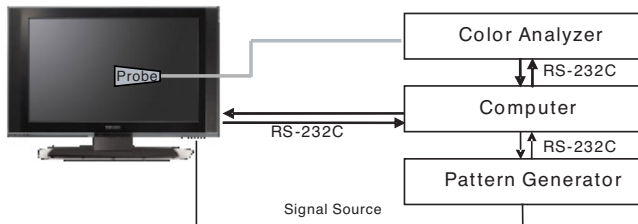
### 5-1. The Purpose and Principal of Color Temperature Adjustment

- (1) Purpose: to reduce the difference in color temperature among modules
- (2) Principal: A module is in full dynamic range when RGB Gain on OSD is 192. To adjust the white balance without causing full dynamic range and full data, fix one of RGB Gains at 192 and control the other two by reducing them from 192.

### 5-2. Required Equipment

- (1) Color Analyzer : CA-210 (NCG:CH 9 / WCG:CH12 / LED Module:CH14))
- (2) Automatic computer (with automatic adjustment necessity and the RS-232C communication being possible)
- (3) Remote control for adjustment
- (4) Video Signal Generator MSPG-925F 720p, 216Gray (Model : 217, Pattern 78)=> Applied only when the inner pattern cannot be used

\*Use the Color Analyzer with the matrix calibrated by the CS-1000



\* Not used when the inner pattern of the TV set is used

Connection Diagram of Automatic Adjustment

## 5-3. Adjustment command (Protocol)

### (1) Protocol

<Command Format>

START 6E A 50 A LEN A 03 A CMD A 00 A VAL A CS A STOP

- LEN : Number of Data Byte
  - CMD : Command
  - VAL : Value of FOS Data
  - CS : Checksum
  - A : Acknowledge
- Ex) [Send: JA\_00\_DD] / [Ack: A\_00\_okDDX]

### (2) RS-232C Command(Automatic adjustment)

RS-232C Command			Meaning
[CMD	ID	DATA]	
wb	00	00	White Balance adjustment start.
wb	00	ff	End of White Balance adjust(Inner pattern disappeared)

- Ex) wb 00 00 : Start Auto-adjustment of white balance.  
 wb 00 10 : Start Gain Adjustment (Inner pattern)  
 ja 00 ff : Adjustment data  
 jb 00 c0 :  
 ...  
 ...  
 wb 00 1f : End of Gain adjustment  
 \* (wb 00 20(start), wb 00 2f(end)) -> In the case of Off-set adjustment  
 wb 00 ff : End of white balance adjustment

### (3) Adjustment Map

	ITEM	Command		Data Range (Hex.)		Default (Decimal)
		Cmd 1	Cmd 2	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					
	G-Cut					

## 5-4. Adjustment of White Balance

(Automatic Adjustment)

- 1) The adjustment condition should be set by the Power On key.
- 2) Perform the zero calibration of the Color Analyzer and place the probe close to the display center.
- 3) Connect the communication cable (RS-232C).
- 4) Select the desired model of the adjustment program and perform the adjustment.
- 5) After the adjustment is ended (check the OK sign), check the adjustment condition for each mode of the set. (Warm, Medium, Cool)
- 6) Disconnect the probe and the communication cable to end the adjustment.

\* The adjustment should be started with "wb 00 00" and ended with "wb 00 ff", and the offset should be adjusted when necessary.

## 5-5. Manual white Balance

- 1) The adjustment condition should be set by the Power On key.
- 2) Press the ADJ of the R/C to enter into 'EZ-ADJUST'.
- 3) Select '10.TEST PATTERN' with the CH +/- key and press the Enter key for 30 minutes or longer to perform the heat run.
- 4) Perform the zero calibration of the Color Analyzer and fix the sensor with the 10cm or less distance at the center of the LCD module surface when adjusting.
- 5) Press the ADJ of the R/C to select '7.White-Balance' of the Ez-Adjust and press the right arrow key(▶) to enter into the adjustment mode. (As soon as you press '▶', the screen is entered into the full white inner pattern.)
- 6) Fix one of the R/G/B gains to 192 and decrease the remaining two gains to adjust not to exceed 192.
- 7) The adjustment is done at three white balances of Cool, Medium and Warm.

\* The inner pattern is basically used, and if it is not possible, the adjustment can be done by selecting the HDMI input. NONE, INNER or HDMI can be selected by the bottom option at the Ez Adjust Menu 7.White Balance menu and it is set to INNER as default. If the adjustment cannot be done by the inner pattern, select the HDMI to adjust.

\* Adjustment environment and reference

- 1) Environment illuminance

Adjust it to 10 LUX or less at the place where the light source such as lamp should be blocked at maximum.

- 2) Probe location

: Maintain the Color Analyzer (CA-210) close to the module surface by 10cm or less and keep the probe of the Color Analyzer perpendicular to the module surface (80°~ 100°).

- 3) Aging time

- Keep the power on after the aging start (with no power off) to perform the heat run for 15 minutes or longer.

- Make sure that the back light is turned on by using no signal and the full white pattern or others.

## 5-6. Reference

- (1) Brightness: Full white 216 Gray

- (2) Standard color coordinate and white balance when using the CS-1000

Mode	Color Coordination		Temp	ΔUV
	x	y		
COOL	0.276	0.283	11000K	0.0000
MEDIUM	0.285	0.293	9300K	0.0000
WARM	0.313	0.329	6500K	0.0000

- (3) Standard color coordinate and white balance when using the CA-210 (CH 10)

Mode	Color Coordination		Temp	ΔUV
	x	y		
COOL	0.276±0.002	0.283±0.002	11000K	0.0000
MEDIUM	0.285±0.002	0.293±0.002	9300K	0.0000
WARM	0.313±0.002	0.329±0.002	6500K	0.0000

## 6. Select the option by country

### 6-1. Overview

- 1) The option selection is applied to the North American model only, which selects the rating related country.
- 2) Applied models: LA84A Chassis applied None USA Model(Canada, Mexico)

### 6-2. How to select

- 1) Press the In-Start key of the R/C and press the red oval OP1(PIP CH-) key to enter into the Factory Option menu.
- 2) Select 1.USA, 2.CANADA or 3.MEXICO from the country select according to the destination. At this time, use the volume +/- key to adjust

## 7. Set the shipping mode (In-stop)

- After completing the final test, in order to set the set to the shipping condition, press the In-Stop key of the R/C to make sure that the set is turned off.

## 8. GND and resisting pressure test

### 8-1. How to test

- (1) Preparing for the automatic test on the GND & resisting pressure
  - Make sure that the power cord is completely inserted into the set. (When it is disconnected or loosened, test after inserting it)
- (2) Perform the automatic test on the GND & resisting pressure
  - 1) The set with power cord, the cord and the A/V completely inserted into the tuner is loaded on the pallet and entered into the automatic test process.
  - 2) Connect the D-terminal AV JACK tester
  - 3) Turn on the automatic (GWS103-4)
  - 4) Perform the GND TEST
  - 5) If it is not good, the buzzer is operated to notify the test result to the operator.
  - 6) If it is OK, it is automatically switched to the resisting pressure test. (Disconnect the cord and the A/V from the AV JACK BOX)
  - 6) Perform the resisting pressure test
  - 7) If it is not good, the buzzer is operated to notify the test result to the operator.
  - 8) If it is OK, the GOOD LAMP is turned and the stopper is moves down, and it moves to the next process.

### 8-2. Items to manage

- (1) TEST voltage
  - GND:1.5KV/min at 100mA
  - SIGNAL:3KV/min at 100mA
- (2) TEST time:1 second
- (3) TEST POINT
  - GND test = between Power cord GND and Signal cable metal GND
  - Resisting pressure test = between Power cord GND and Live & Neutral
- (4) LEAKAGE CURRENT: Set to 0.5mArms

## 9. ISP Download (option)

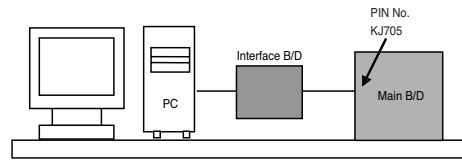
### 9-1. Overview

The Micom upgrade via the external port for the service for the customer.

### 9-2. Device to use

- 1) PC
- 2) B/D for the interface (IIC & ISP)
- 3) Jig for downloading (for the power supply)

### 9-3. Adjustment wiring diagram (Download device configuration diagram)



### 9-4. Adjustment condition(Download condition)

- 1) IC name & circuit number: MYSON MTV416GMF & IC4015
- 2) Power supply: 5V (P4004 Pin 3)
- 3) SCL: D-sub Pin 10
- 4) SDA: D-sub Pin 7

### 9-5. How to adjust (for downloading)

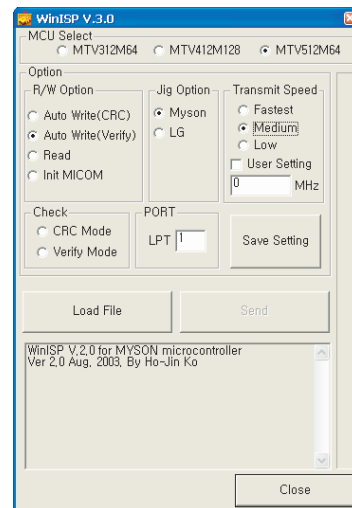
- 1) After executing LGE Monitor Tools v1.1, click the first icon. (See the figure)



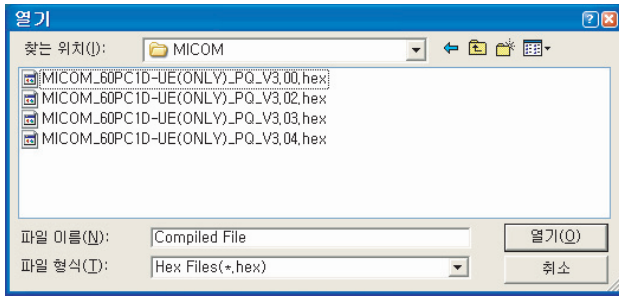
- 2) When the screen is displayed as shown at the below figure, set the items as follows:

- MCU Select: MTV512M64
- R/W Option: Auto Write(Verify)
- Jig Option: Myson
- Transmit Speed: Medium
- Check: blank
- PORT: Select the Parallel Port to use (LPT1 in general)

\* caution: Select the EPP as LPT from the ROM BIAS setting.



- 3) Click the Load File Button, and select the desired Hex File to download. (If no file is displayed, make sure that the file format is selected as Hex file (\*.hex))



4) Click 'Send Button

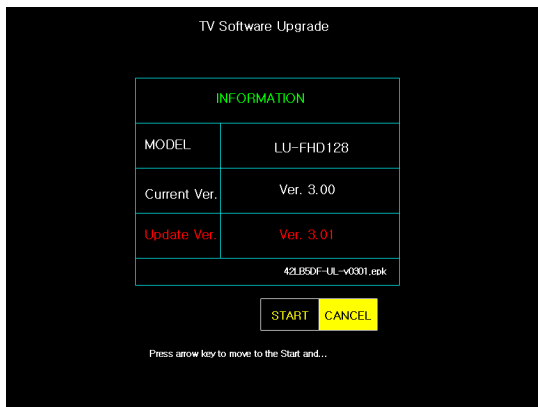
## 10. USB S/W Download (option)

### 10-1. Overview

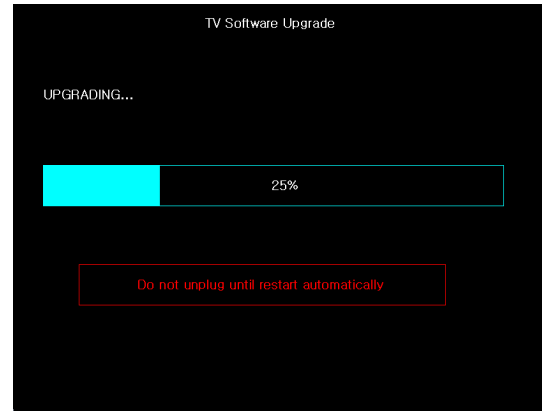
The USB download is for the quick service response via the S/W upgrade and for applying the S/W upgrade necessary for the board adjustment

### 10-2. How to download

- 1) After turning on the set, make sure that the display screen is turned on.
- 2) When the USB Memory Stick with the upgrade file applied is inserted into the USB jack on the main board, the following screen (example) is displayed after several seconds



- 3) Check the current version at [Current TV Software Version Information], check the S/W version to upgrade at [New Found TV Software Version Information], and press the Enter button of the TV remote controller.
- 4) Downloading is proceeded as shown at the below screen, and when it is ended, turning on/off is automatically done. (When the automatic proceeding is not smoothly done, manually perform the power On/Off).

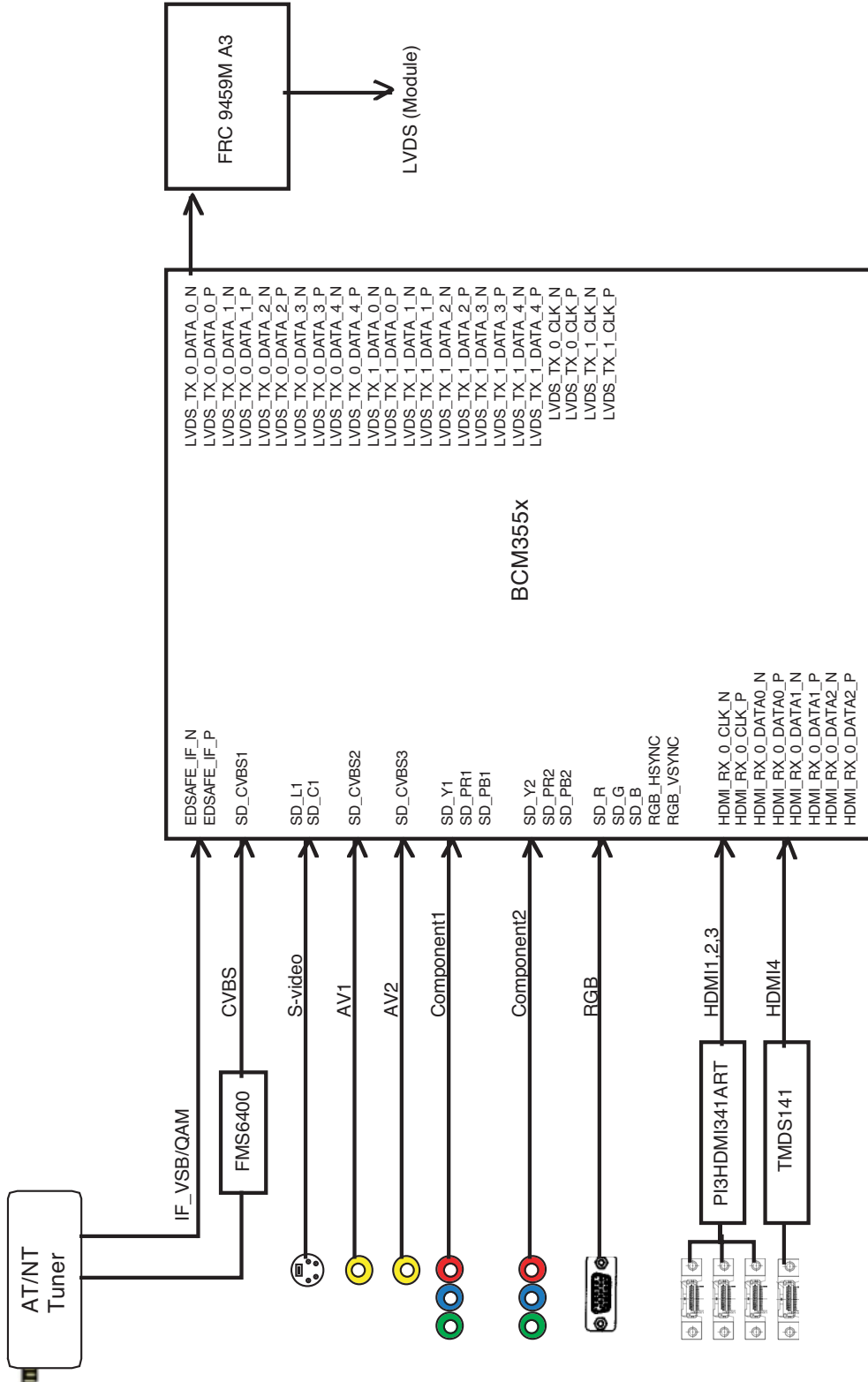


- 5) When downloading is ended, remove the USB Memory Stick from the USB jack.
- 6) Press the IN-START button of the remote controller to check the upgraded S/W version.

# TROUBLESHOOTING

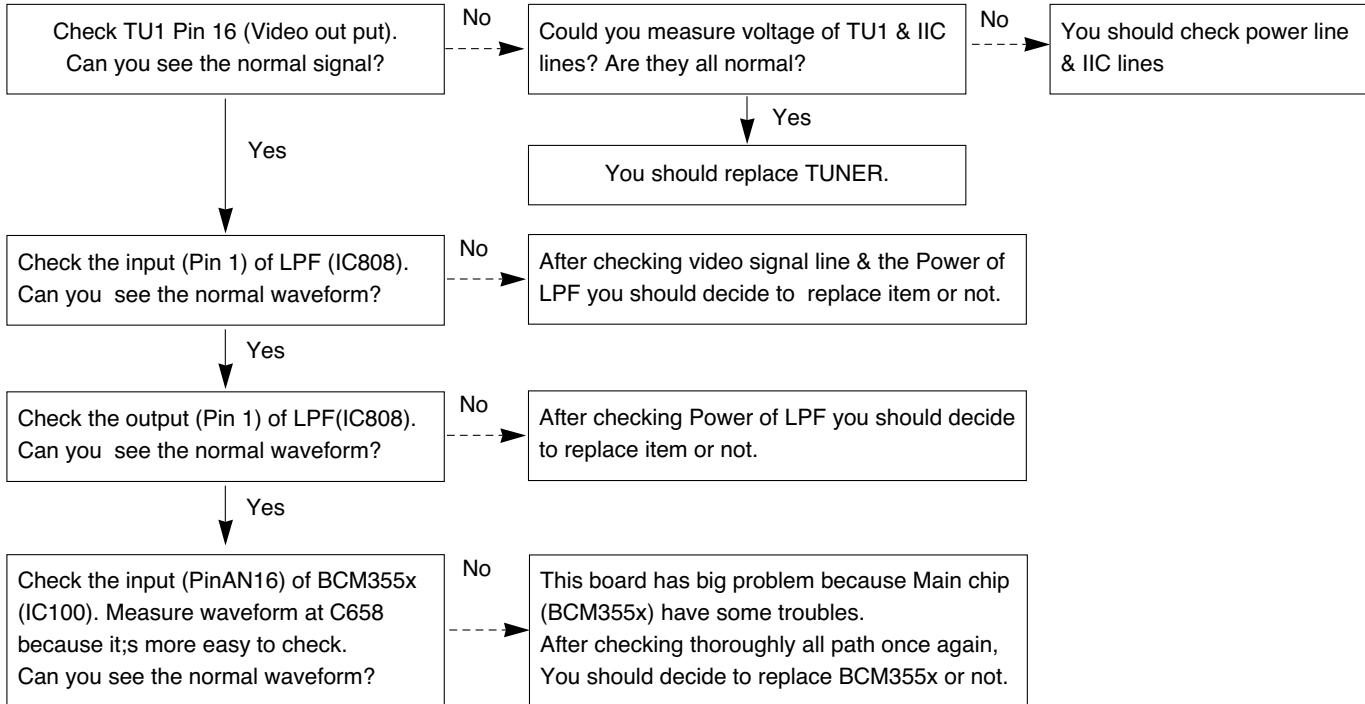
## 1. VIDEO

### (1) Video path

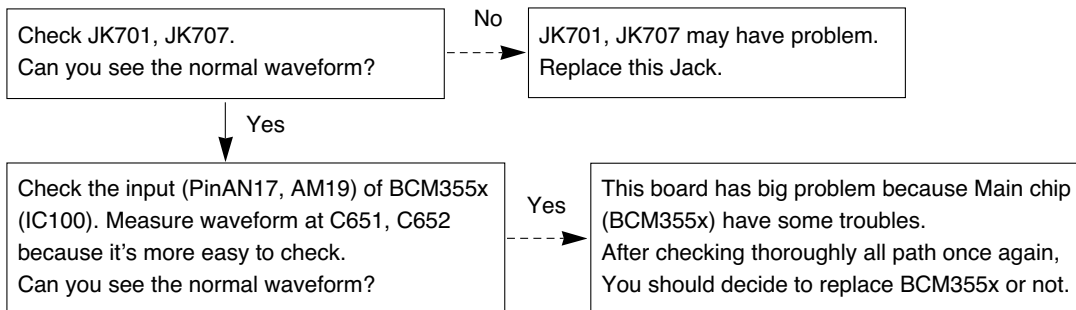




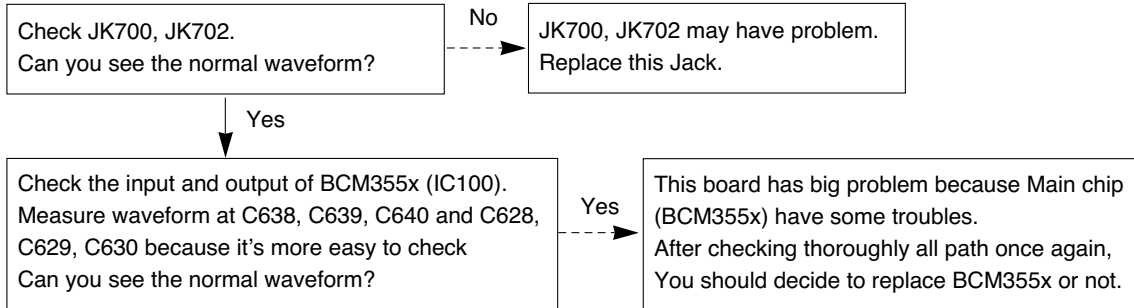
## (2) TV/CATV



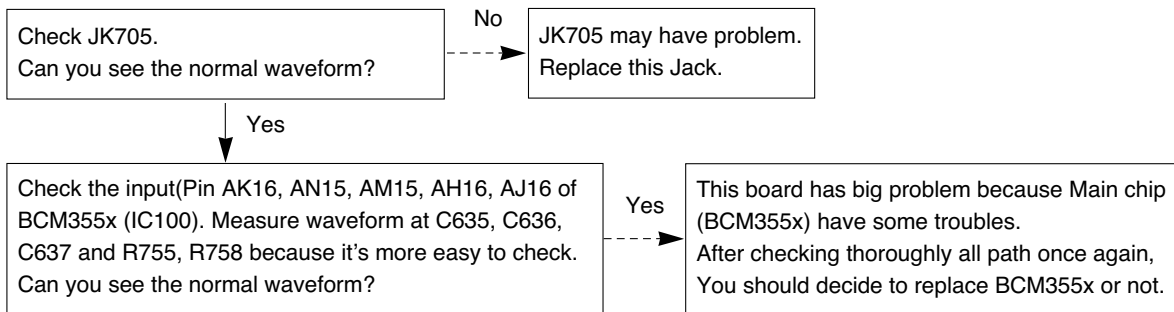
## (3) AV



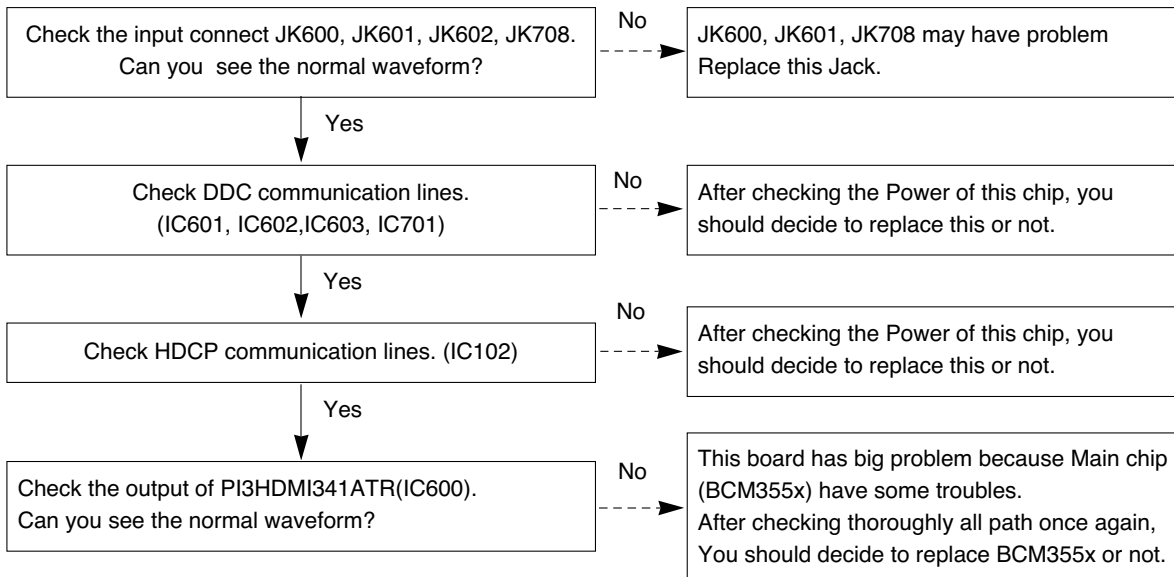
#### (4) Component



#### (5) RGB\_PC

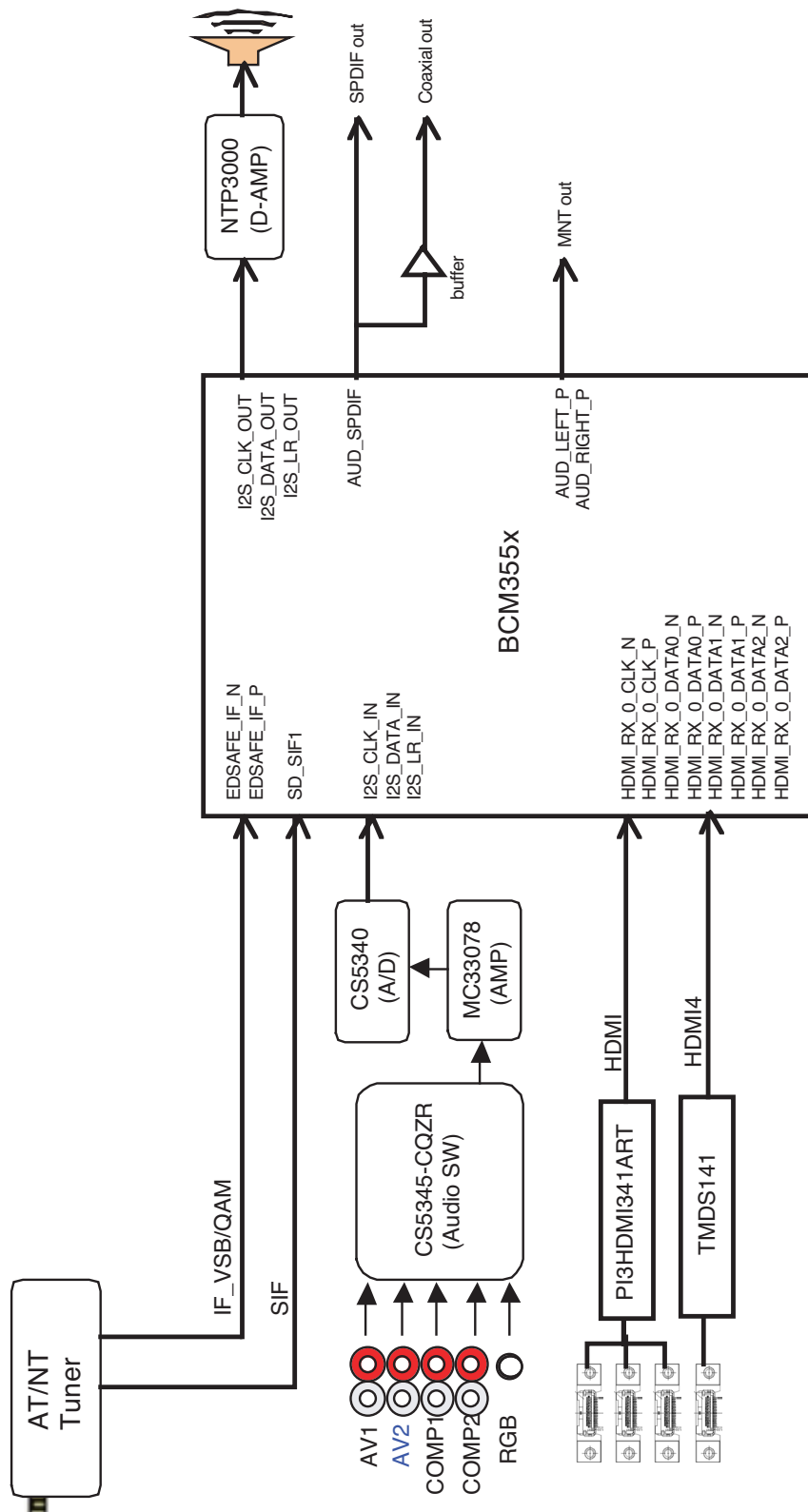


#### (6) HDMI

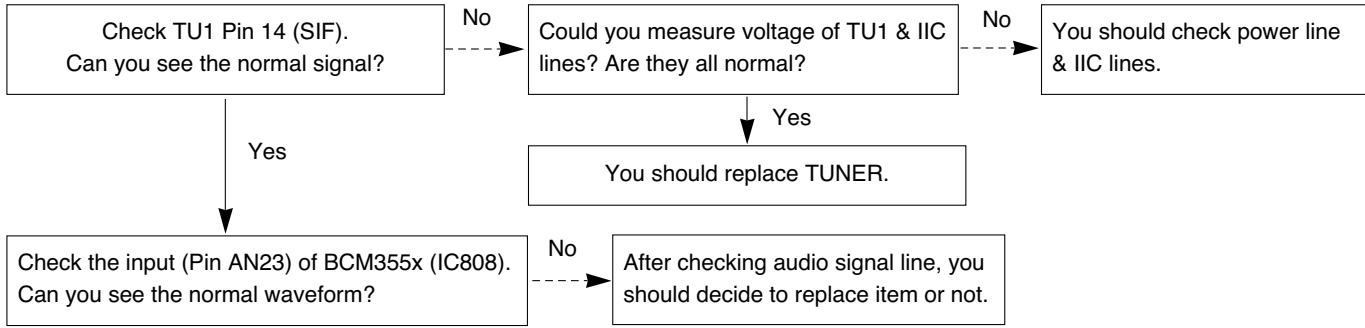


## 2. AUDIO

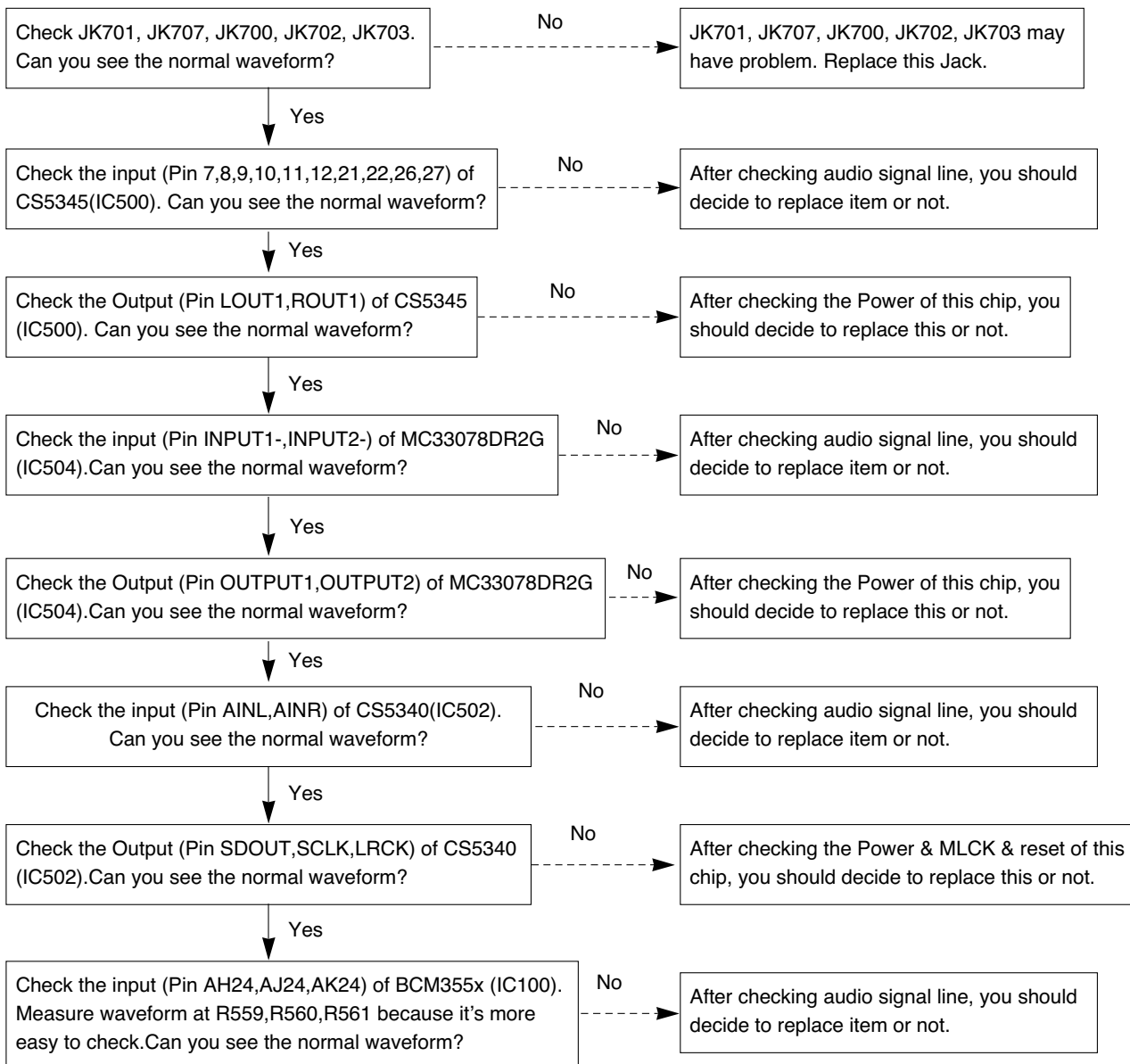
### (1) Audio path



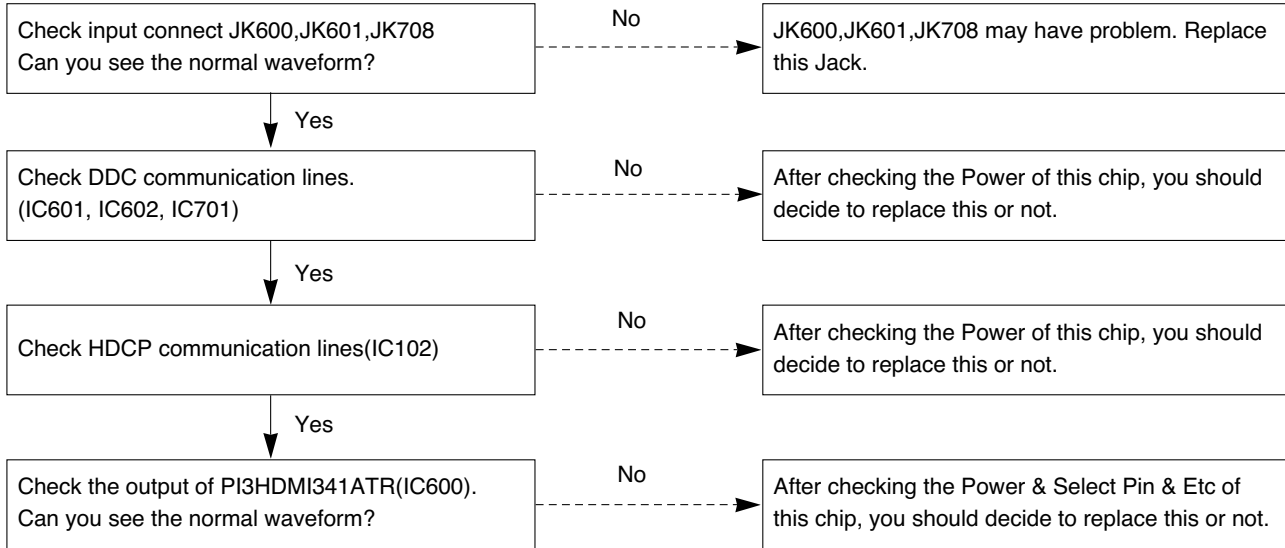
## (2) TV/CATC - Audio (In)



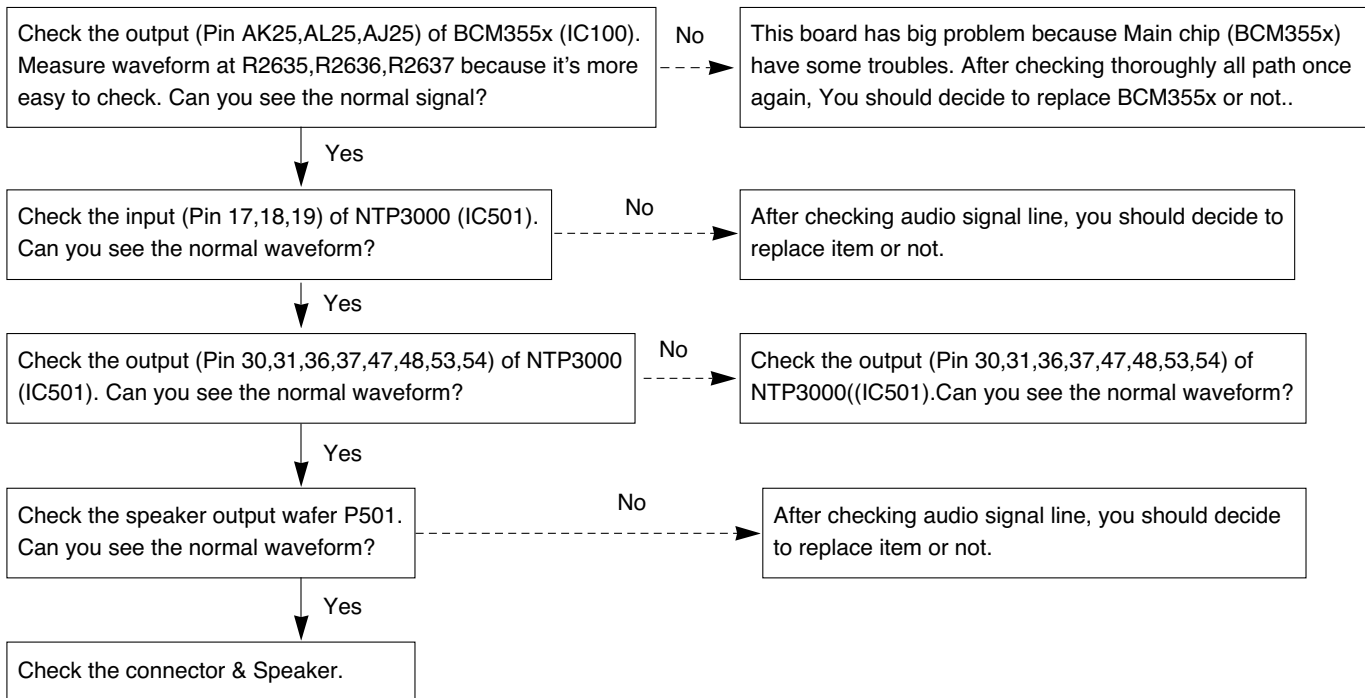
## (3) AV/ Component/ RGB-PC - Audio (In)



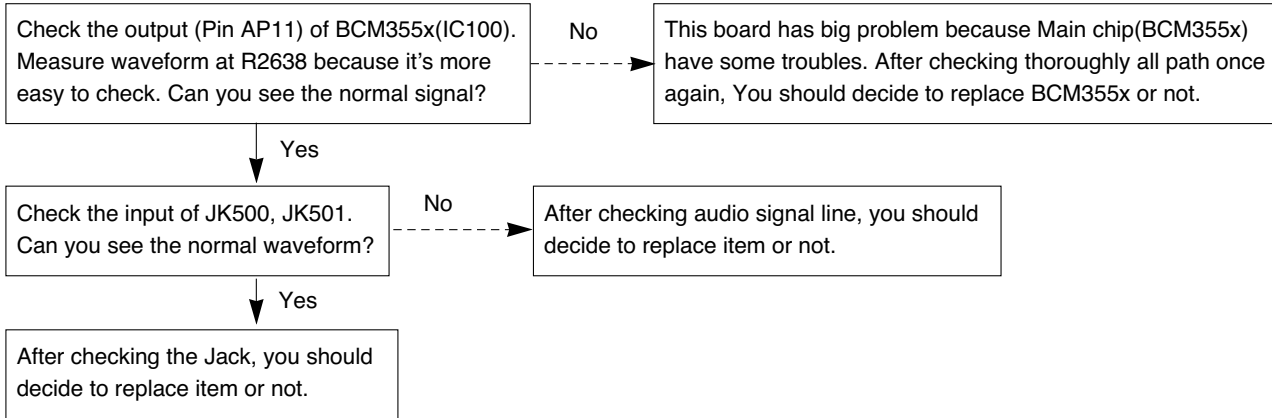
#### (4) HDMI - Audio(In)



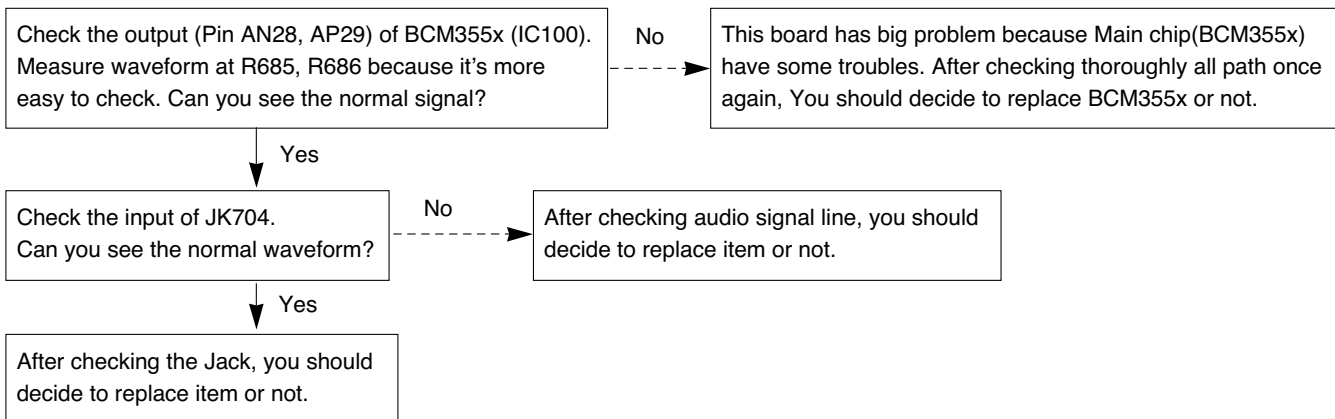
#### (5) Speaker - Audio(Out)



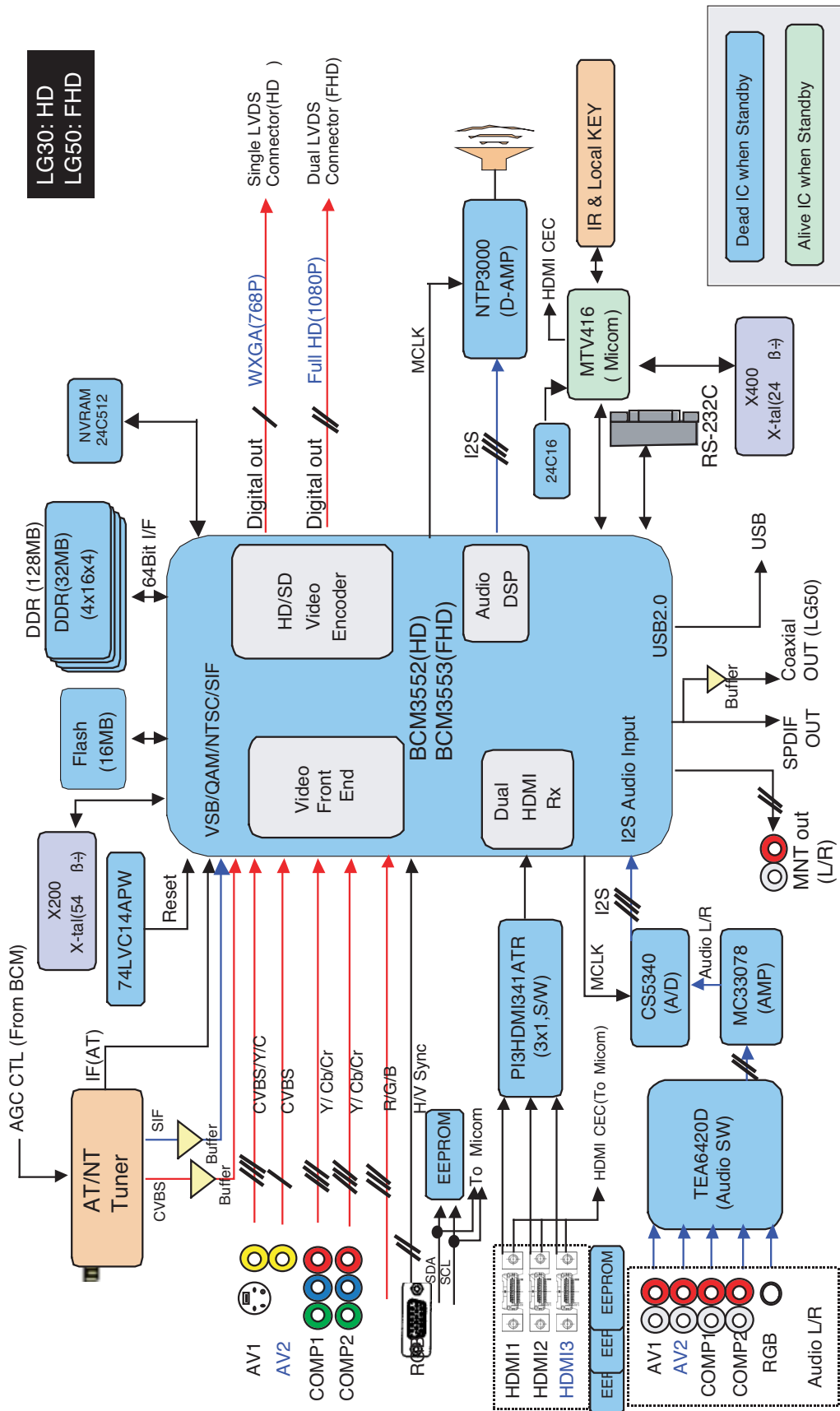
## (6) Spdif & Coaxial - Audio(Out)



## (7) MNT out - Audio(Out)

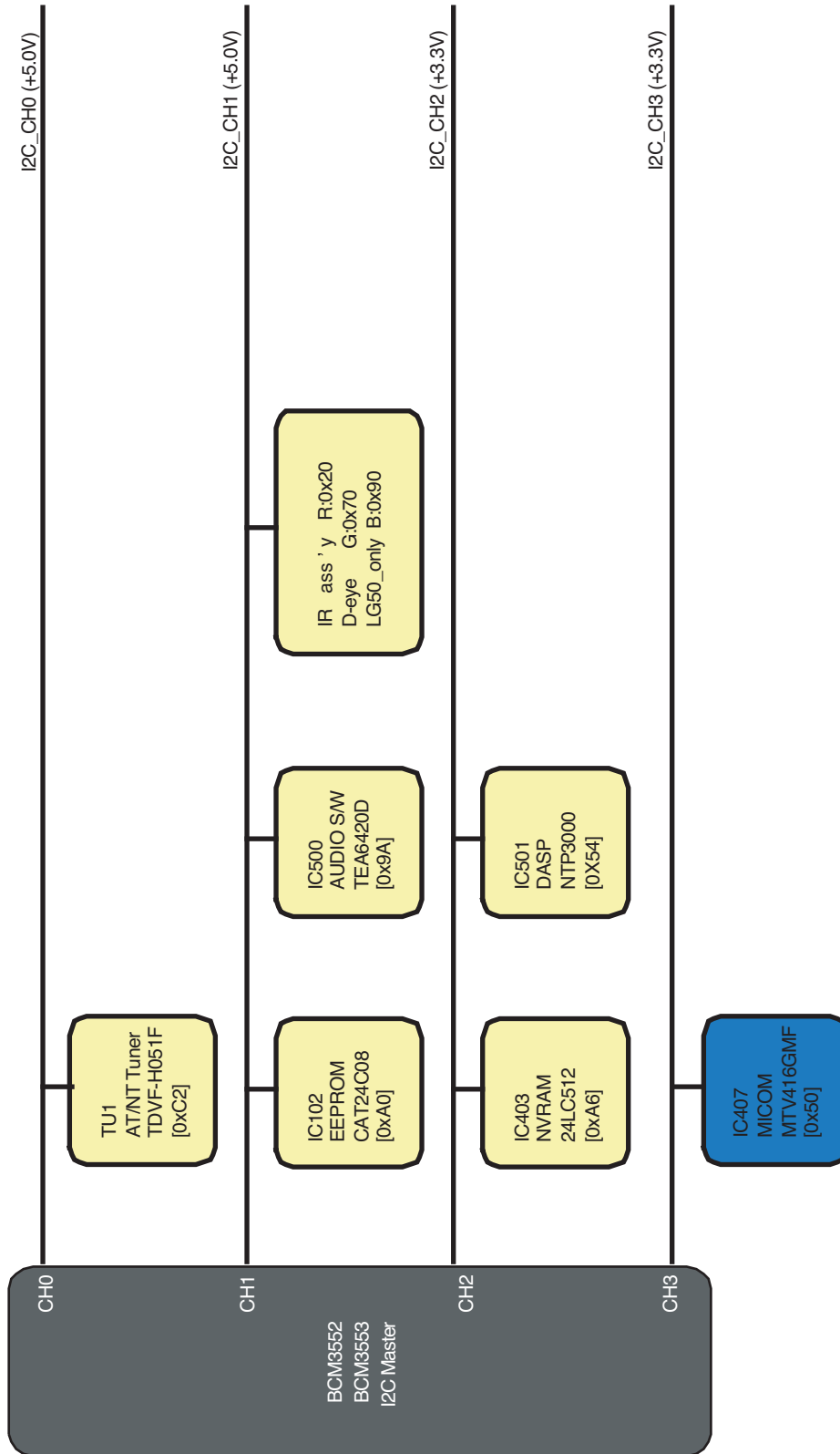


# BLOCK DIAGRAM

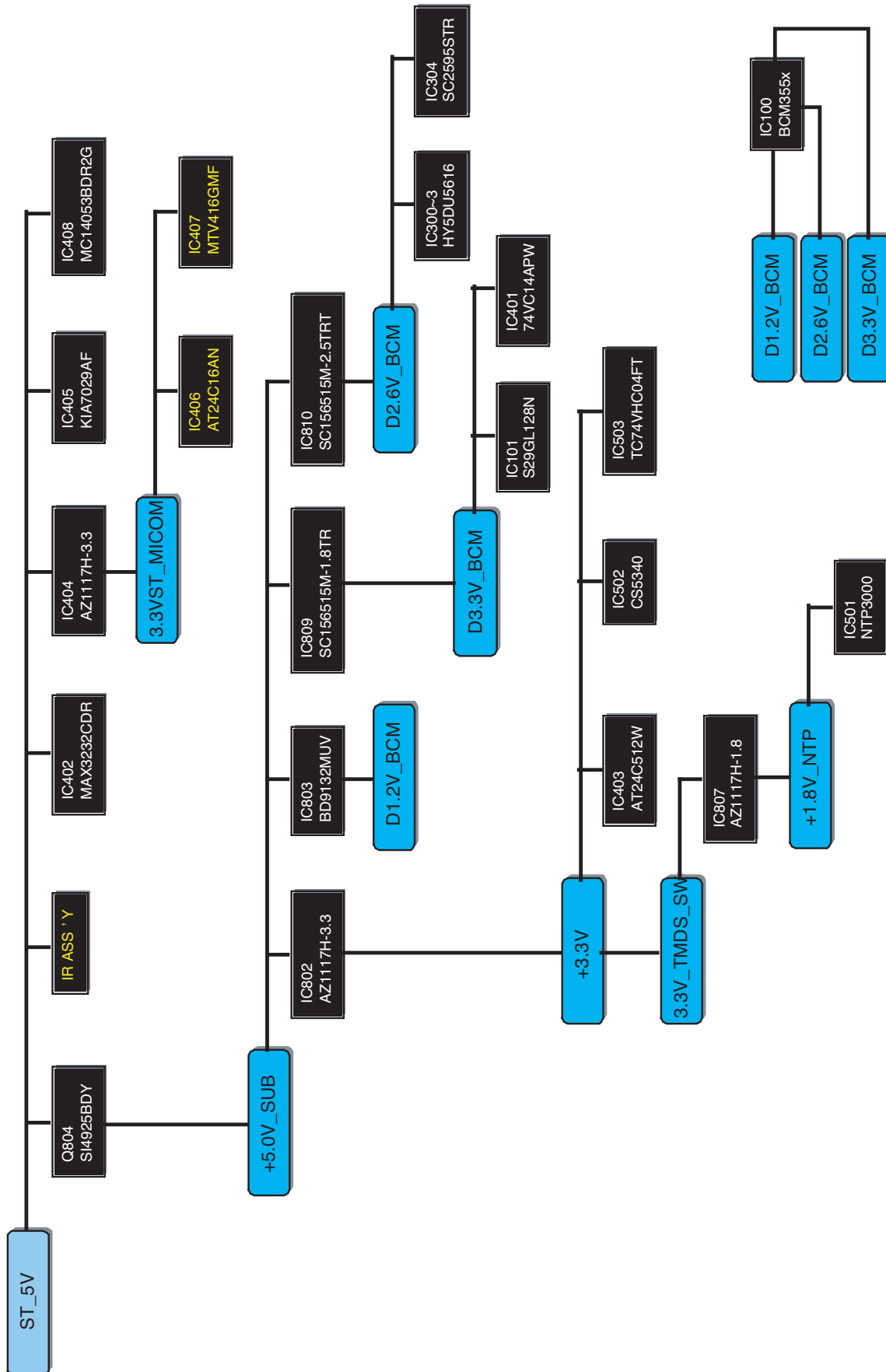


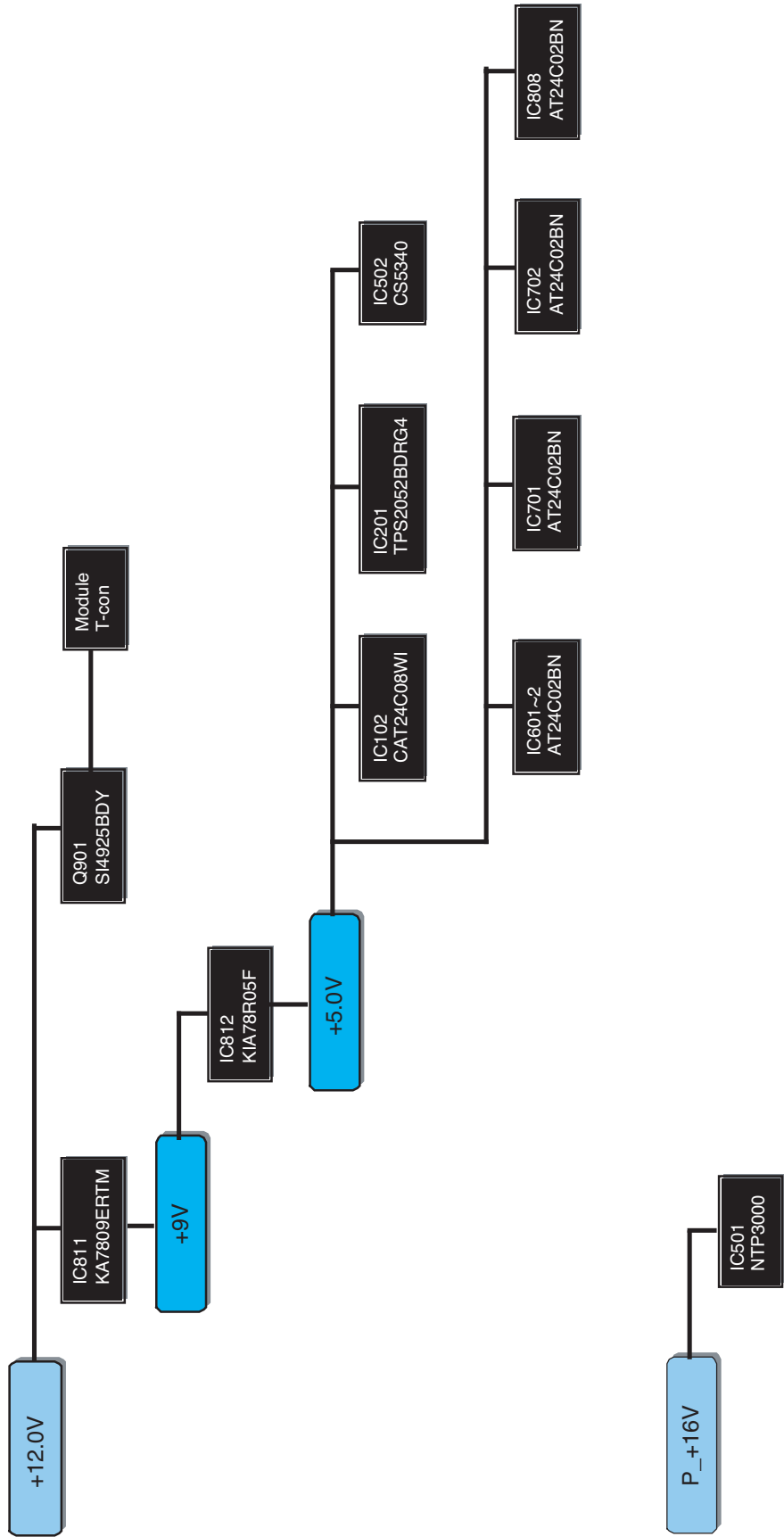
Dead

Live





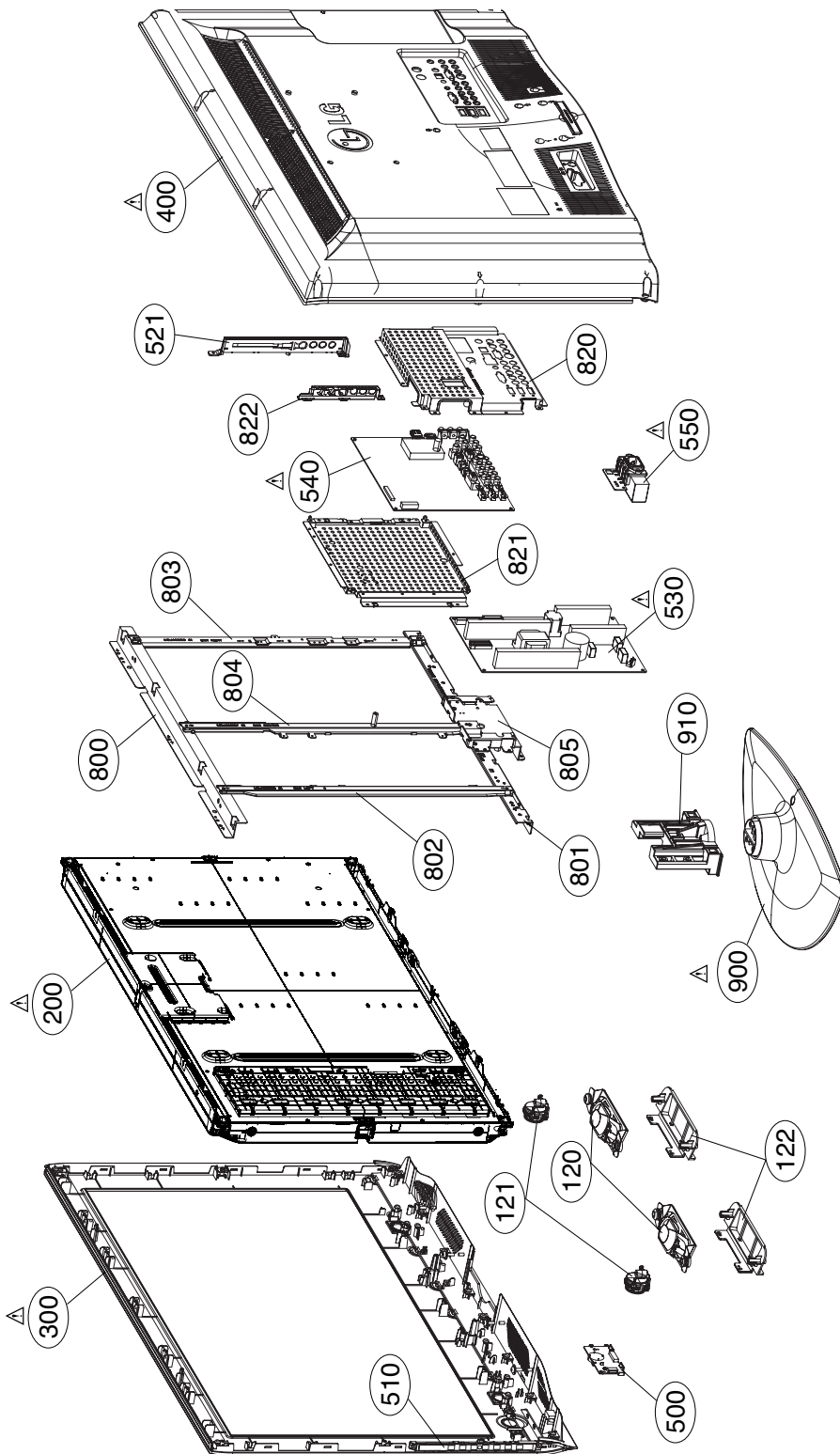


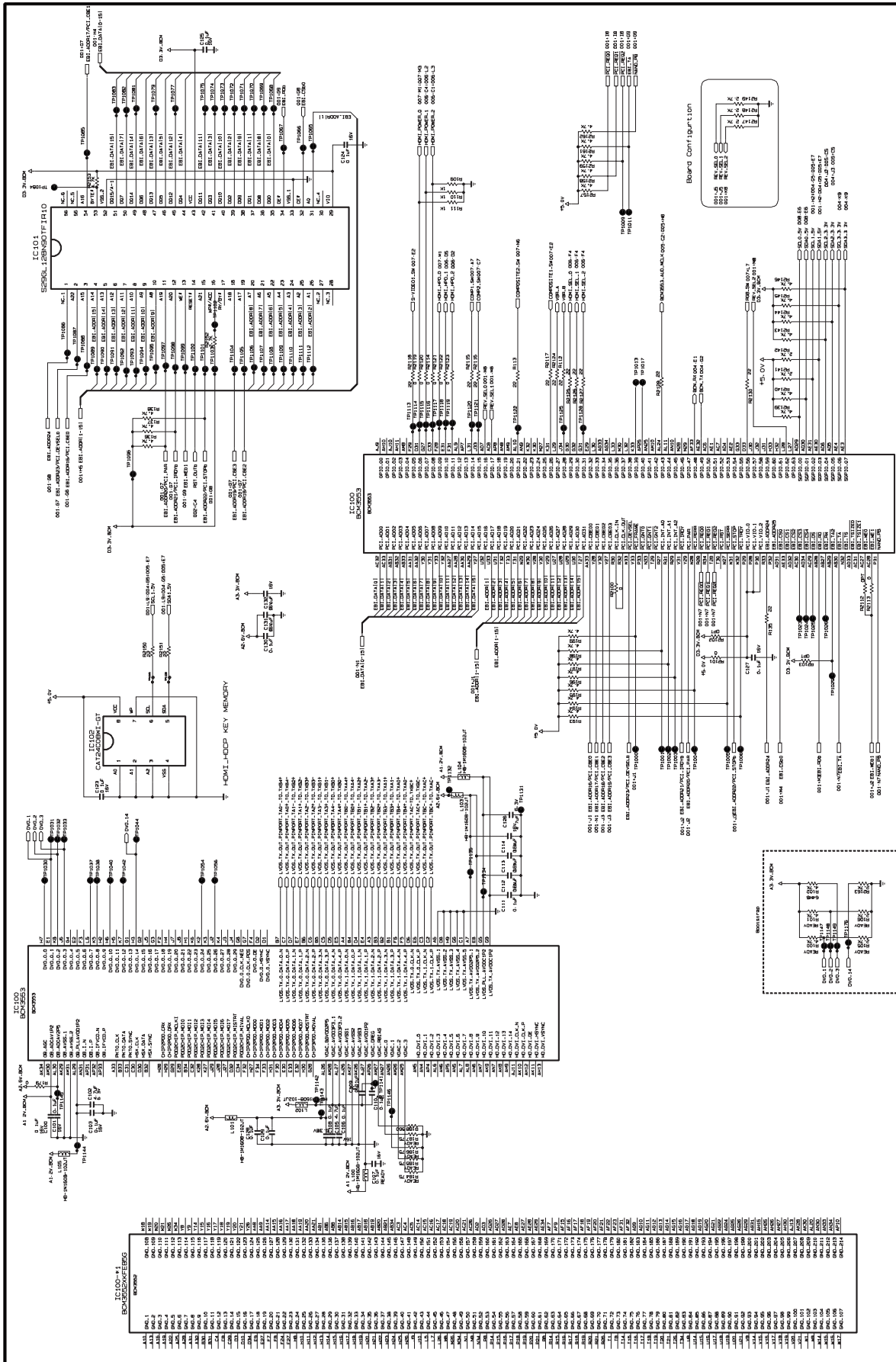


# EXPLODED VIEW

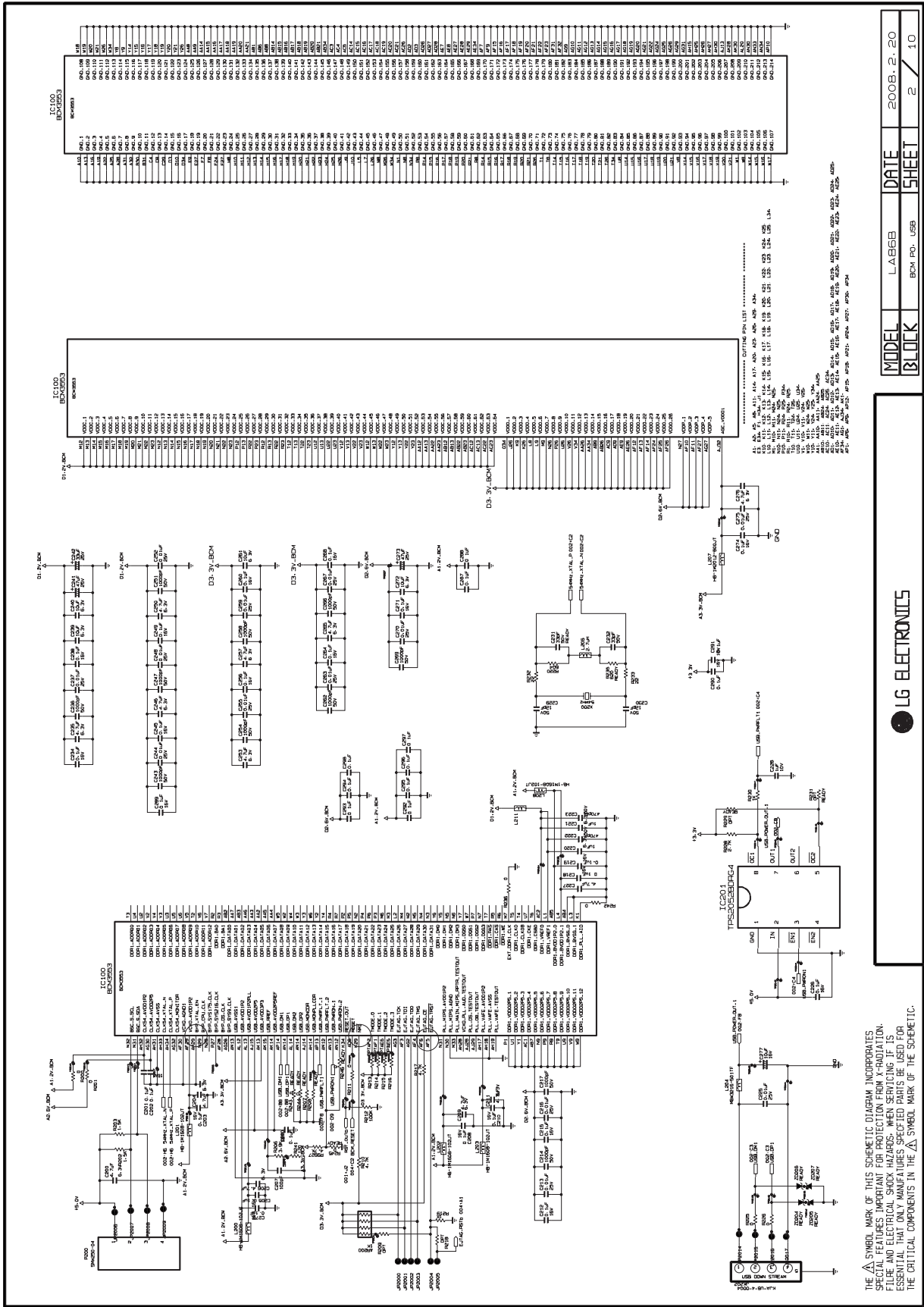
## IMPORTANT SAFETY NOTICE

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





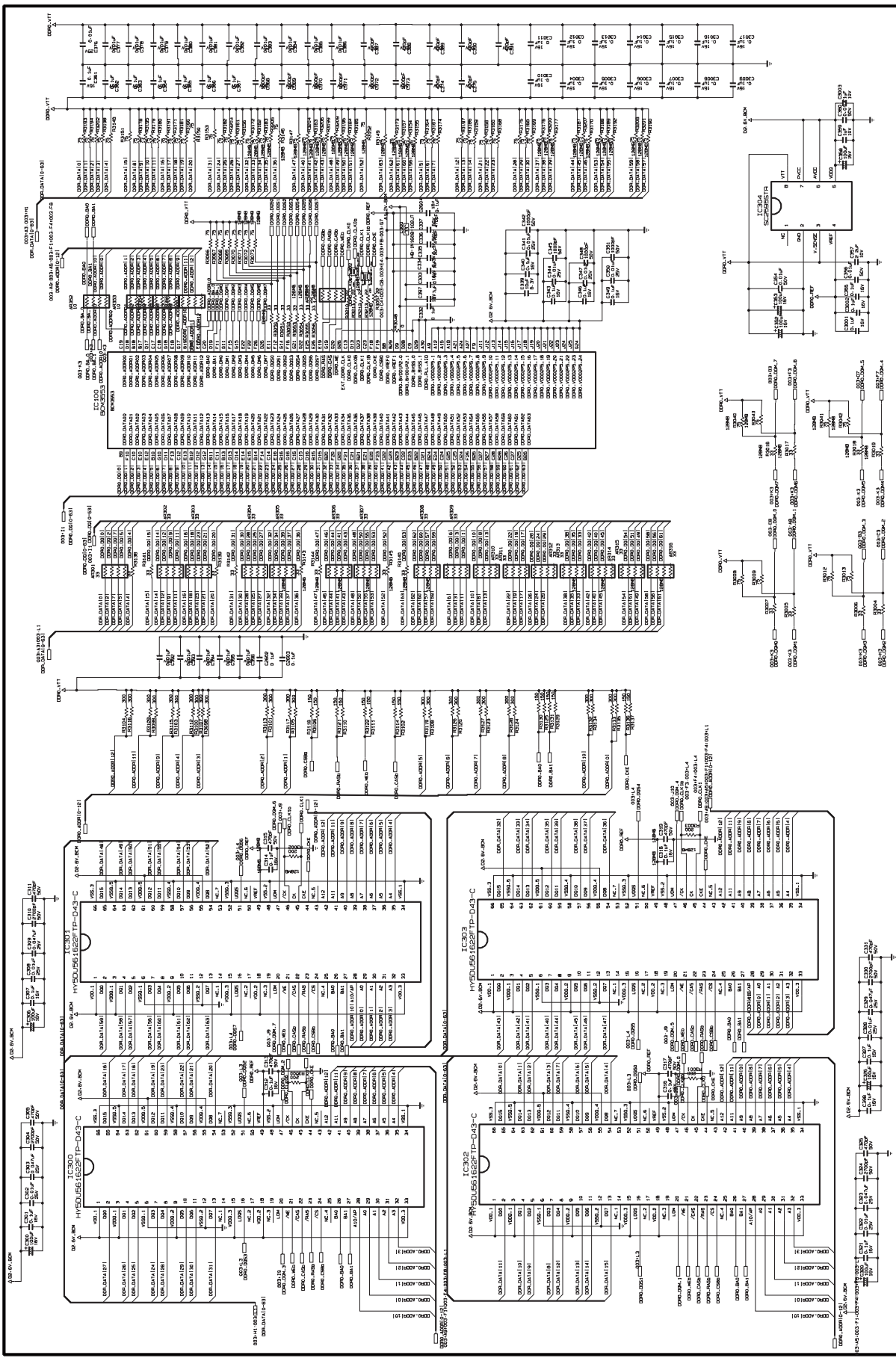
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FILTRATION AND ELECTRICAL SHOCK HAZARDS WHEN SERVICING. IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.



MODEL	LABELL	DATE	2008.2.20
BLOCK	BCM-IND-USA	SHEET	2 / 10



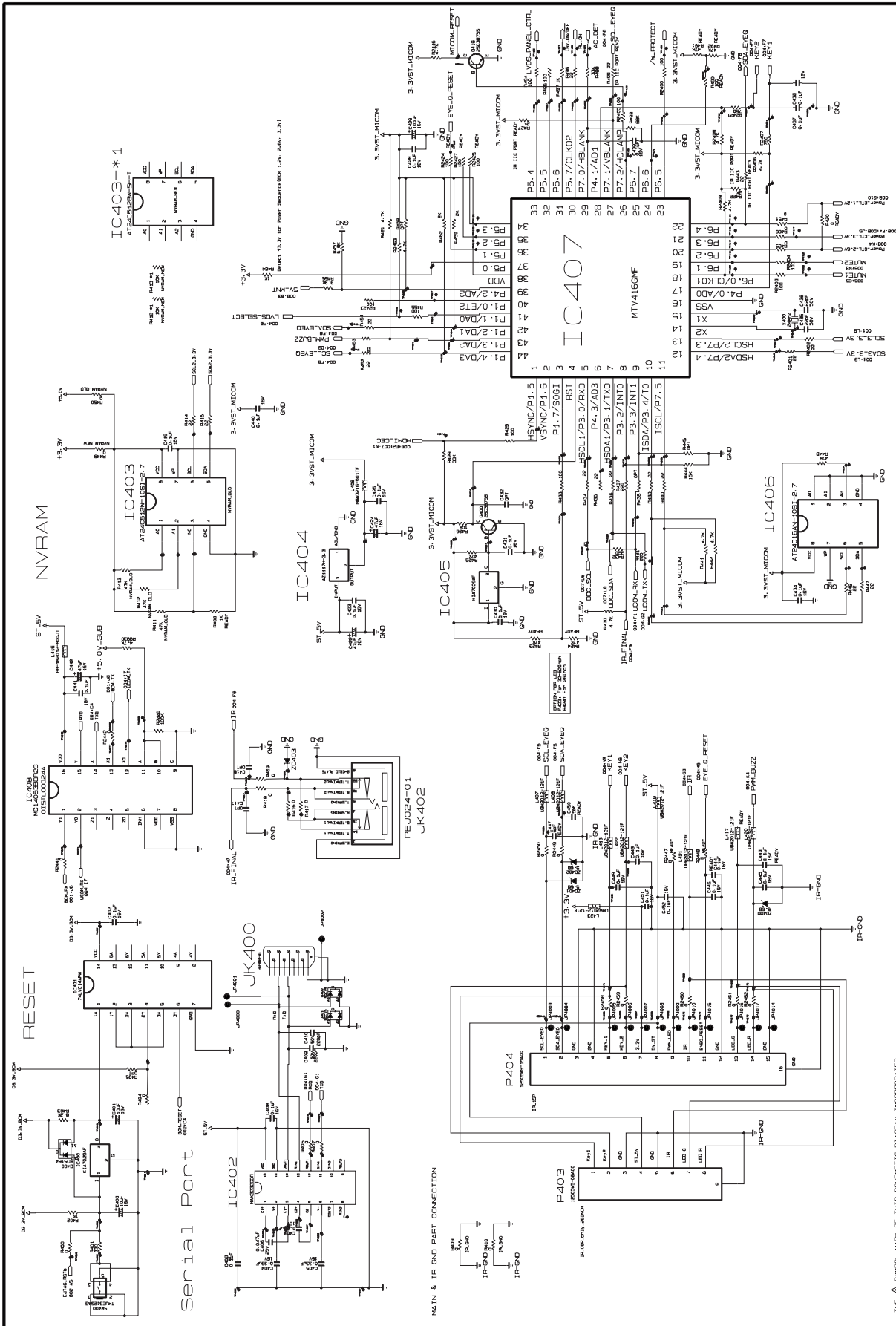
THE  $\Delta$  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FLUORESCENCE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  $\Delta$  SYMBOL MARK OF THE SCHEMATIC.



THE  $\Delta$  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILE AND ELECTRICAL SHOCK HAZARDS: WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  $\Delta$  SYMBOL MARK OF THE SCHEMATIC.

MODEL	L96BB	DATE	2008.2.20
BLOCK	003	SHEET	3 / 10

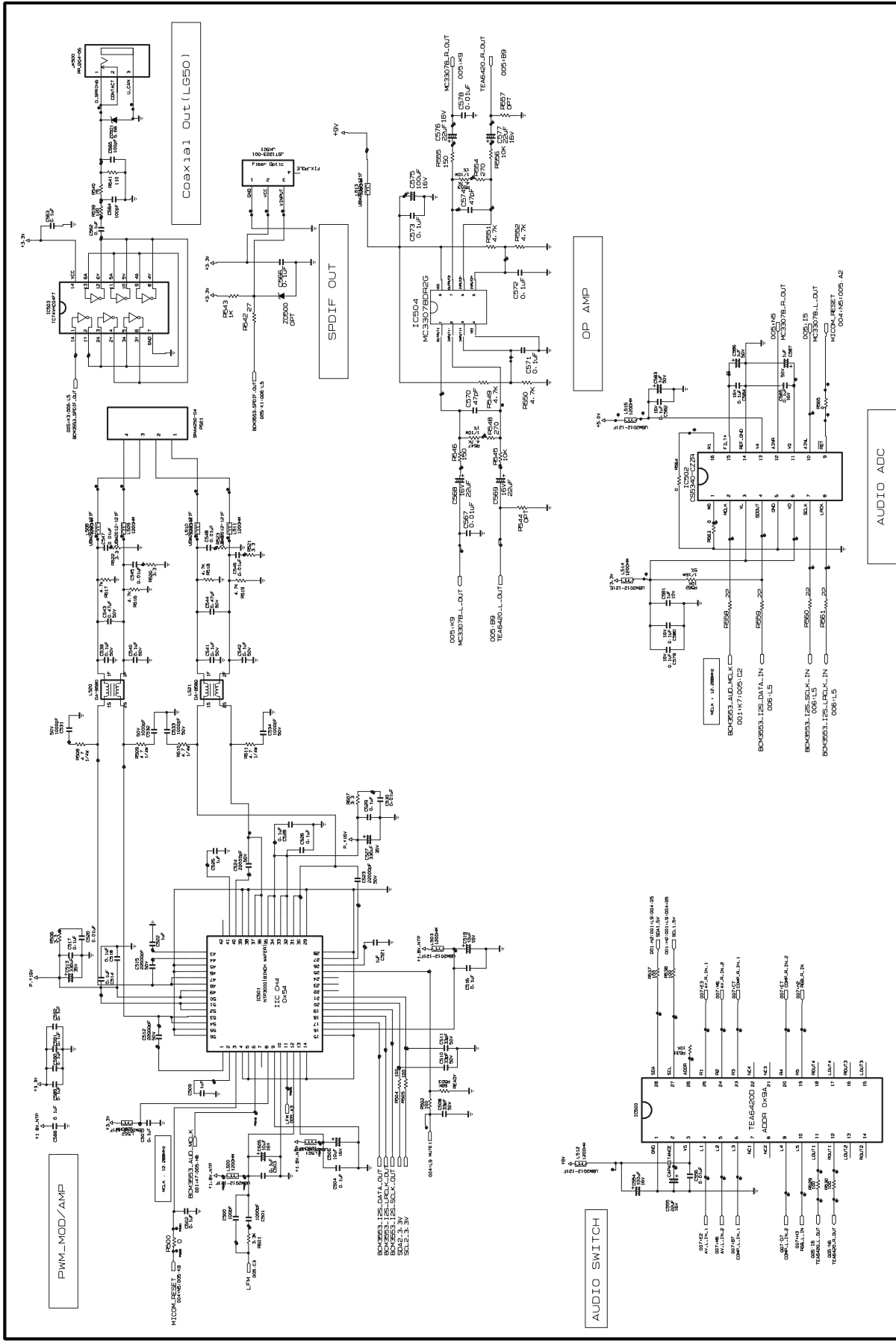




MODEL	LABEL	DATE	2008.2.20
BLOCK	MICOM-TTL	SHEET	4 / 10



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

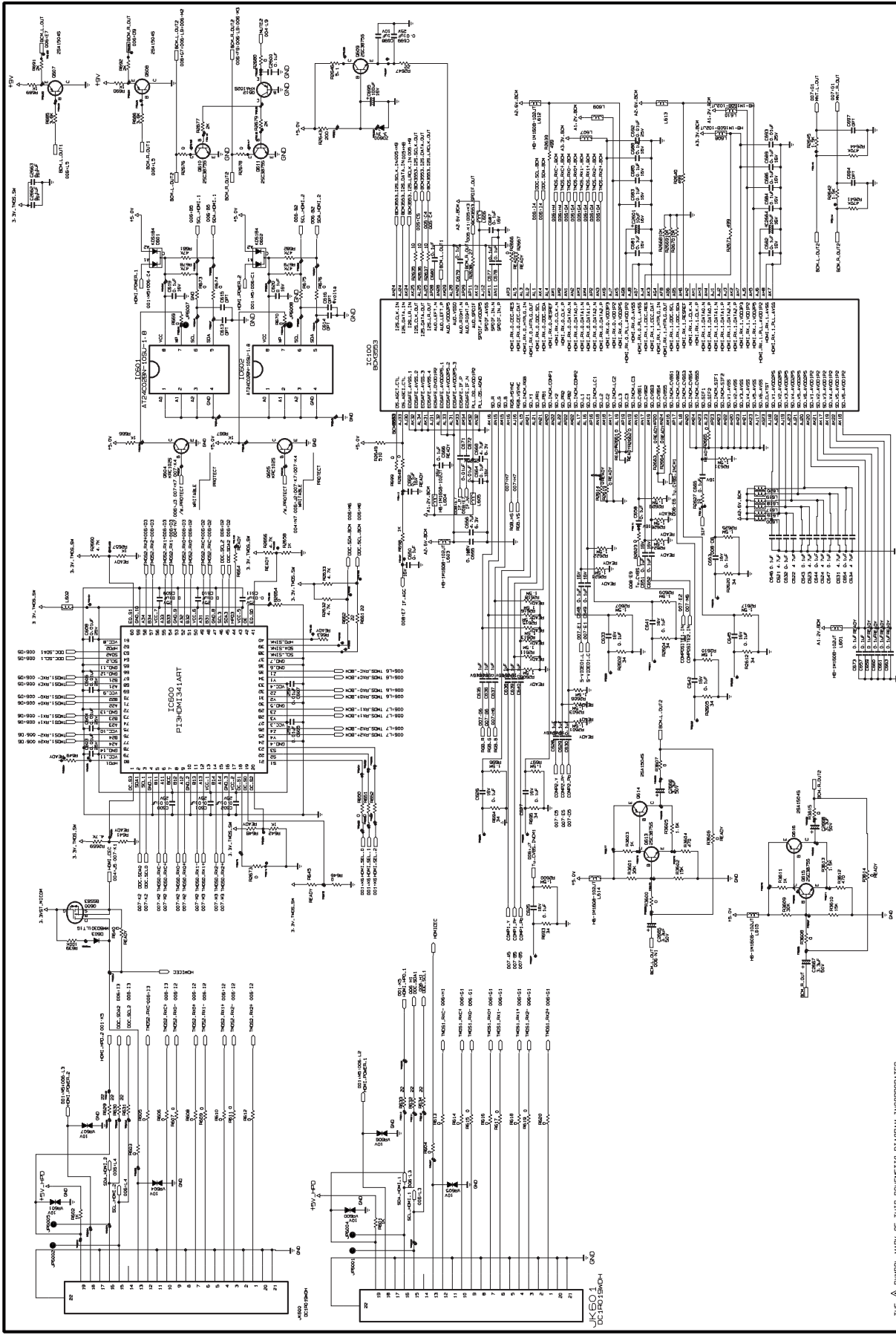


MODEL	LABEL	DATE	2008.2.20
BLOCK	AUDIO	SHEET	5 / 10



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

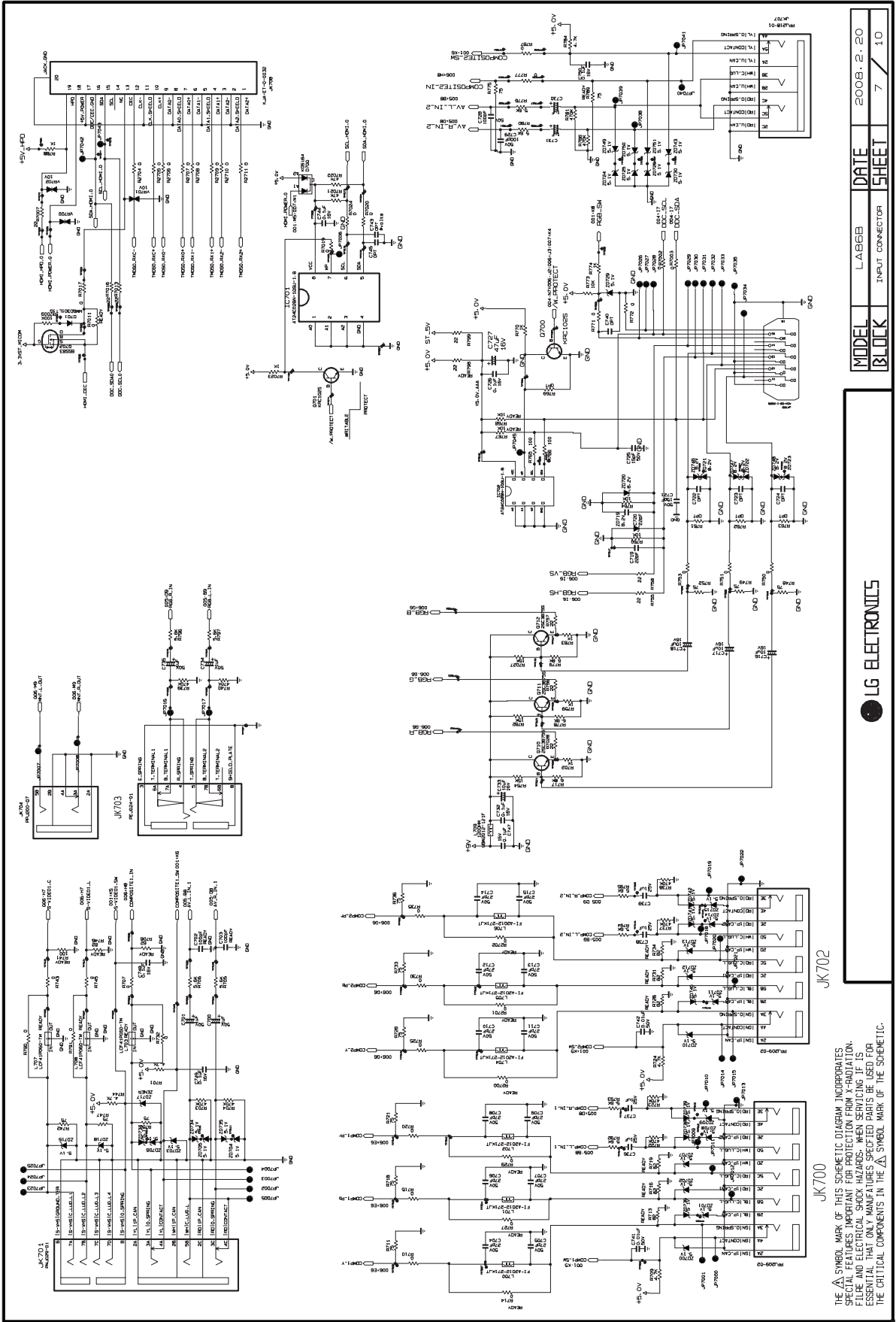




MODEL	LAB6B	DATE	2008.2.20
BLOCK	VIDEO EXT. IN/OUT	SHEET	6 / 10



THE  $\Delta$  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER'S SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  $\Delta$  SYMBOL MARK OF THE SCHEMATIC.

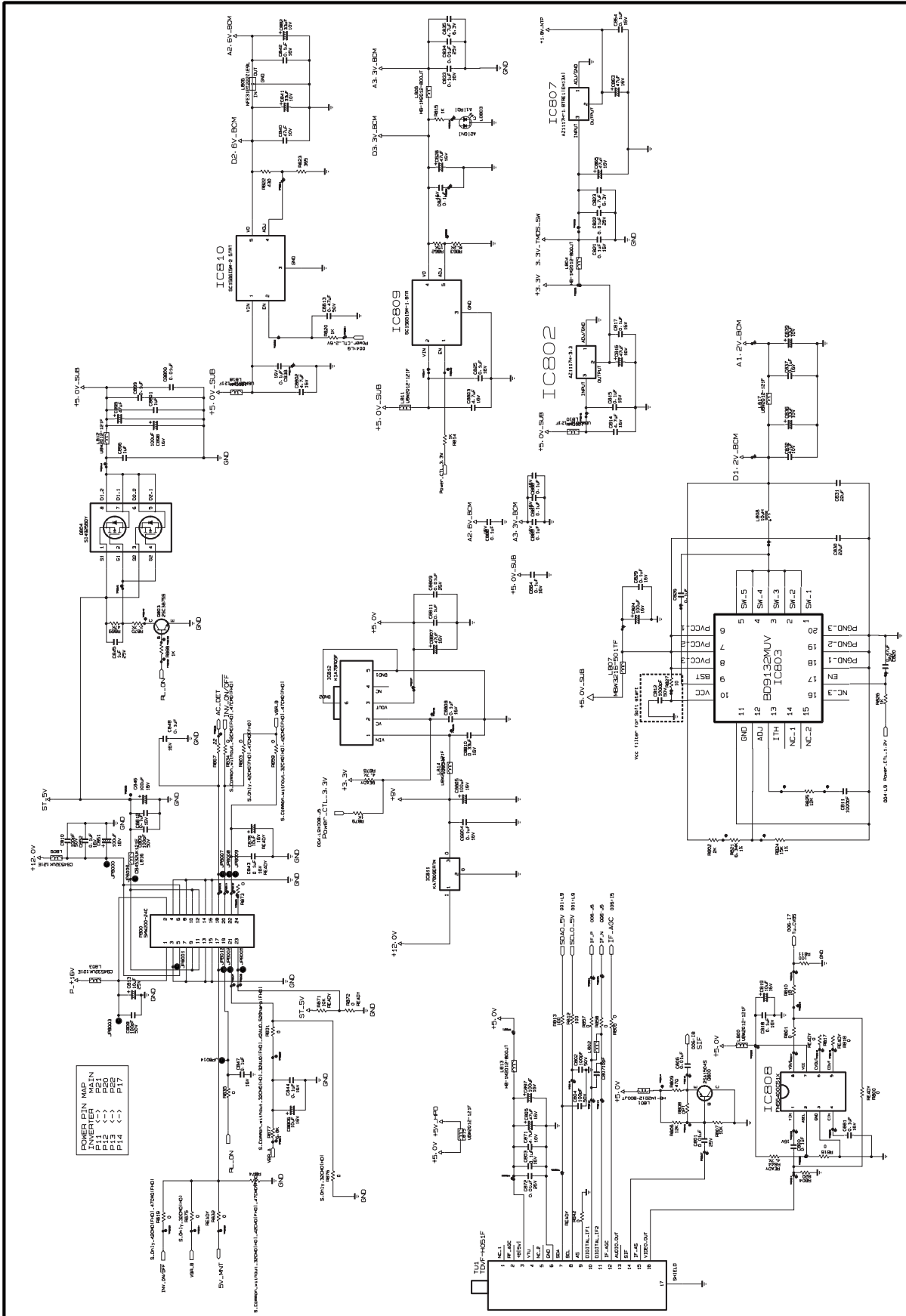


MODEL LABBB DATE 2008.2.20  
 BLOCK INPUT CONNECTOR SHEET 7 / 10



JK702  
 JK700

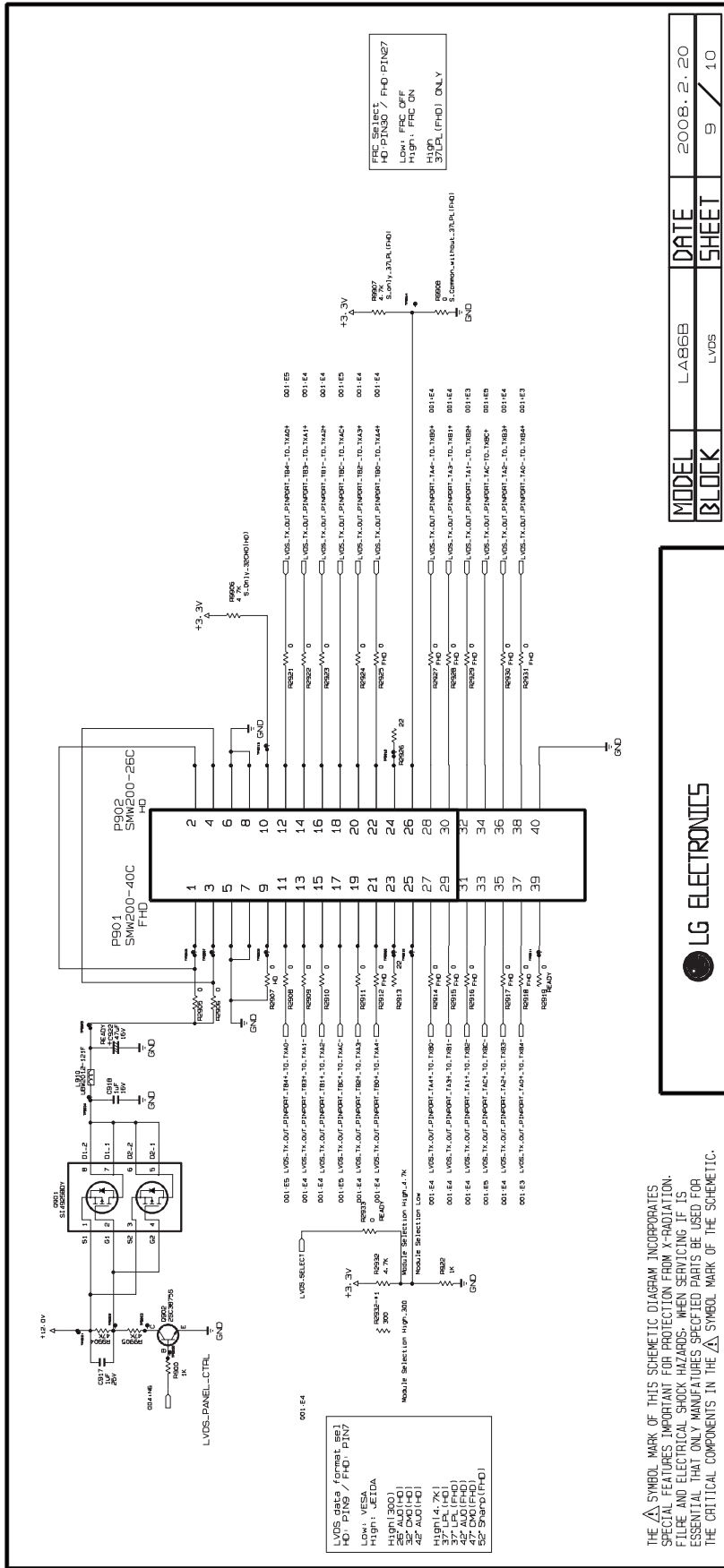
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FILLS AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING, IT IS ESSENTIAL THAT ONLY MANUFACTURER SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.



The symbol mark of this schematic diagram incorporates spectral features important for protection from X-radiation. Filter and electrical shock hazards when servicing it is essential that only manufactures specified parts be used for the critical components in the symbol mark of the schematic.



MODEL	L.AB6B	DATE	2008.2.20
BLOCK	TUNER - POWER	SHEET	B / 10



MODEL	LAB6B	DATE	2008.2.20
BLOCK	LVDS	SHEET	9 / 10



THE  $\Delta$  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. THESE AND ELECTRICAL SHOCK HAZARDS WHEN SERVICING PARTS ESSENTIAL THAT ONLY MANUFACTURER SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  $\Delta$  SYMBOL MARK OF THE SCHEMATIC.



P/NO : MFL42149302

May, 2008  
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