CAUTION
BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.
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</table>
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 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 1MΩ and 5.2MΩ.

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 a 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 is 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

![Leakage Current Hot Check circuit](image)
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 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.
### 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 ± 5°C(77 ± 9°F), CST : 40 ± 5°C
2. Humidity : 65% ± 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)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Measurement</th>
<th>Result</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Screen Device</td>
<td>26&quot; wide Color Display Module</td>
<td>Resolution:1366X768(HD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32&quot; wide Color Display Module</td>
<td>Resolution:1366X768(HD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspect Ratio</td>
<td></td>
<td></td>
<td>16:9</td>
<td></td>
</tr>
<tr>
<td>LCD Module</td>
<td>26&quot; TFT WXGA LCD</td>
<td>26&quot; HD MAKER: CMO</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>32&quot; TFT WXGA LCD</td>
<td>32&quot; HD MAKER:LPL, CPT, CMO, AUO, SHARP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Environment</td>
<td>1) Temp. : 0 ~ 40 deg</td>
<td>LGE SPEC</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>2) Humidity : 0 ~ 85%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Storage Environment</td>
<td>1) Temp. : -20 ~ 60 deg</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>2) Humidity : 0 ~ 85%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>100-240V~, 50/60Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Power on (Blue) : LG30/LG50</td>
<td>Volume: 1/8 volume of sound distortion point</td>
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<tr>
<td></td>
<td>Power on (White) : LG60</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>≤ TBD 26&quot; HD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≤ TBD 32&quot; HD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>St-By (Red) ≤ 1.0 W (All)</td>
<td>LG60: St-By Light condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCD Module (Maker : AUO, CMO, CPT, LPL, SHARP)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Maker</td>
<td>Inch (H) x (V) x (D)</td>
<td>unit</td>
<td>Remark</td>
<td></td>
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<tr>
<td>CMO(HD)</td>
<td>Outline Dimension 26&quot;</td>
<td>626 x 373 x 43.7</td>
<td>mm [with inverter]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pixel Pitch 26&quot;</td>
<td>0.1405 x 0.4215</td>
<td>mm</td>
<td></td>
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<tr>
<td></td>
<td>Back Light 26&quot;</td>
<td>12 CCFL</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outline Dimension 32&quot;</td>
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</tr>
<tr>
<td></td>
<td>Pixel Pitch 32&quot;</td>
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<td>mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Back Light 32&quot;</td>
<td>16 CCFL</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>LPL(HD)</td>
<td>Outline Dimension 32&quot;</td>
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<td>mm [with inverter]</td>
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</tr>
<tr>
<td></td>
<td>Pixel Pitch 32&quot;</td>
<td>0.17025 x 0.51075</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Back Light 32&quot;</td>
<td>12 EEFL</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Display Colors</td>
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<td></td>
<td></td>
<td>LPL, CMO, AUO / Sharp</td>
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<tr>
<td>Coating</td>
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<td></td>
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<td>3H, AG / 2H, AG</td>
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## 5. Model Specification

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<tr>
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<th>Specification</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcasting system</td>
<td>PAL SECAM B/G/D/K, PAL I/II, NTSC-M</td>
<td></td>
</tr>
<tr>
<td>Available Channel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear</td>
<td>1EA</td>
<td>Rear</td>
</tr>
<tr>
<td>Side</td>
<td>1EA</td>
<td>Rear</td>
</tr>
<tr>
<td>Rear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side (S-Video Priority)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LG50, LG70 Tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LG30 Tool, 32LG60</td>
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<td></td>
</tr>
<tr>
<td>L/R Input</td>
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</tr>
<tr>
<td>Side(1EA) - LG30 Tool only</td>
<td></td>
<td>LG50, LG70 Tool</td>
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<tr>
<td>LG60, LG70 Tool Only</td>
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<td></td>
</tr>
<tr>
<td>LG30, LG50 Not Support</td>
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<td></td>
</tr>
<tr>
<td>Central and South America</td>
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<tr>
<td>Broadcasting system</td>
<td>PAL SECAM B/G/D/K, PAL I/II, NTSC-M</td>
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</tr>
<tr>
<td>Available Channel</td>
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<td></td>
</tr>
<tr>
<td>VHF</td>
<td>2~13</td>
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<tr>
<td>UHF</td>
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<td></td>
</tr>
<tr>
<td>CATV</td>
<td>1~125</td>
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</tr>
<tr>
<td>Receiving system</td>
<td>Upper Heterodyne</td>
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</tr>
<tr>
<td>Video Input (2EA)</td>
<td>NTSC, PAL-M/N</td>
<td>Rear 1EA, Side 1EA</td>
</tr>
<tr>
<td>AV Output (1EA)</td>
<td>NTSC, PAL-M/N</td>
<td>Rear</td>
</tr>
<tr>
<td>S-Video Input (1EA)</td>
<td>NTSC, PAL-M/N</td>
<td>Side (S-Video Priority)</td>
</tr>
<tr>
<td>Component Input (2EA)</td>
<td>Y/Cb/Cr, Y/ Pb/Pr</td>
<td>Rear</td>
</tr>
<tr>
<td>RGB Input (1EA)</td>
<td>RGB-PC, S/W Upgrade</td>
<td>Rear</td>
</tr>
<tr>
<td>HDMI Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2EA</td>
<td>HDMI-DTV, Only PCM MODE</td>
<td>LG30 Tool, 32LG60</td>
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<tr>
<td>3EA</td>
<td></td>
<td>LG50, LG70 Tool</td>
</tr>
<tr>
<td>Audio Input (5EA)</td>
<td>PC Audio, Component (2EA), AV (2EA)</td>
<td>L/R Input</td>
</tr>
<tr>
<td>RS-232C</td>
<td>Remote control, Commercial</td>
<td>Side(1EA)-LG30 Tool only (LG50, LG60, LG70 not Support)</td>
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<tr>
<td>USB Input</td>
<td>Divx, MP3, JPEG</td>
<td>Side(1EA) - LG60, LG70 Tool Only (LG30, LG50 Not Support)</td>
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</table>

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

<table>
<thead>
<tr>
<th>Resolution</th>
<th>H-freq(kHz)</th>
<th>V-freq.(kHz)</th>
<th>Pixel clock(MHz)</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1280*720</td>
<td>44.96</td>
<td>59.94</td>
<td>74.176</td>
<td>HDTV 720P</td>
</tr>
<tr>
<td>1280*720</td>
<td>45.00</td>
<td>60.00</td>
<td>74.250</td>
<td>HDTV 720P</td>
</tr>
<tr>
<td>1920*1080</td>
<td>28.125</td>
<td>50.00</td>
<td>74.250</td>
<td>HDTV 1080I 50Hz</td>
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<td>50.00</td>
<td>74.250</td>
<td>HDTV 1080I</td>
</tr>
<tr>
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<td>60.00</td>
<td>74.25</td>
<td>HDTV 1080I</td>
</tr>
<tr>
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<td>56.25</td>
<td>50</td>
<td>148.5</td>
<td>HDTV 1080P</td>
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<td>59.94</td>
<td>148.350</td>
<td>HDTV 1080P</td>
</tr>
<tr>
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<td>148.5</td>
<td>HDTV 1080P</td>
</tr>
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</table>
### 7. RGB Input (Analog PC)

<table>
<thead>
<tr>
<th>Resolution</th>
<th>H-freq (kHz)</th>
<th>V-freq (kHz)</th>
<th>Pixel clock (MHz)</th>
<th>Proposed</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>640*350</td>
<td>31.468</td>
<td>70.80</td>
<td>25.17</td>
<td>EGA</td>
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</tr>
<tr>
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<td>70.08</td>
<td>28.32</td>
<td>DOS</td>
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<tr>
<td>640*480</td>
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<tr>
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<td>40</td>
<td>VESA(SVGA)</td>
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<td>1024*768</td>
<td>48.363</td>
<td>60</td>
<td>65</td>
<td>VESA(XGA)</td>
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<tr>
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<td>59.87</td>
<td>79.5</td>
<td>VESA(WXGA)</td>
<td></td>
</tr>
<tr>
<td>1360*768</td>
<td>47.72</td>
<td>59.799</td>
<td>84.75</td>
<td>VESA(WXGA)</td>
<td></td>
</tr>
<tr>
<td>1366*768</td>
<td>47.7</td>
<td>60</td>
<td>84.62</td>
<td>VESA(WXGA)</td>
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</tr>
<tr>
<td>1280*1024</td>
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<td>59.895</td>
<td>109.00</td>
<td>SXGA</td>
<td>Only FHD</td>
</tr>
<tr>
<td>1400*1050</td>
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<td>59.978</td>
<td>121.75</td>
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<td>Only FHD</td>
</tr>
<tr>
<td>1600*1200</td>
<td>74.537</td>
<td>59.869</td>
<td>161.00</td>
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<tr>
<td>1920*1080</td>
<td>66.587</td>
<td>59.934</td>
<td>138.50</td>
<td>WUXGA(Reduced Blanking)</td>
<td>Only FHD</td>
</tr>
</tbody>
</table>

### 8. HDMI input (PC)

- Spec. out but display correctly at only HDMI/DVI IN 1 via DVI to HDMI Cable

<table>
<thead>
<tr>
<th>Resolution</th>
<th>H-freq (kHz)</th>
<th>V-freq (kHz)</th>
<th>Pixel clock (MHz)</th>
<th>Proposed</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>720*400</td>
<td>31.468</td>
<td>70.08</td>
<td>28.32</td>
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<tr>
<td>640*480</td>
<td>31.469</td>
<td>59.94</td>
<td>25.17</td>
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<td></td>
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<tr>
<td>800*600</td>
<td>37.879</td>
<td>60.31</td>
<td>40</td>
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</tr>
<tr>
<td>1024*768</td>
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<td>60</td>
<td>65</td>
<td>VESA(XGA)</td>
<td></td>
</tr>
<tr>
<td>1280*768</td>
<td>47.776</td>
<td>59.87</td>
<td>79.5</td>
<td>VESA(WXGA)</td>
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</tr>
<tr>
<td>1360*768</td>
<td>47.72</td>
<td>59.799</td>
<td>84.75</td>
<td>VESA(WXGA)</td>
<td></td>
</tr>
<tr>
<td>1366*768</td>
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<td>84.62</td>
<td>VESA(WXGA)</td>
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</tr>
<tr>
<td>1280*1024</td>
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<td>Only FHD</td>
</tr>
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<td>1400*1050</td>
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<td>59.988</td>
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<td>Only FHD</td>
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### 9. HDMI input (DTV)

<table>
<thead>
<tr>
<th>Resolution</th>
<th>H-freq (kHz)</th>
<th>V-freq (kHz)</th>
<th>Pixel clock (MHz)</th>
<th>Proposed</th>
<th>Remark</th>
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</thead>
<tbody>
<tr>
<td>720*480</td>
<td>31.47</td>
<td>59.94</td>
<td>27</td>
<td>SDTV 480P</td>
<td>Support(not spec)</td>
</tr>
<tr>
<td>720*480</td>
<td>31.5</td>
<td>60</td>
<td>27.027</td>
<td>SDTV 480P</td>
<td>support(not spec)</td>
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<tr>
<td>720*576</td>
<td>31.25</td>
<td>50</td>
<td>27</td>
<td>SDTV 576P</td>
<td>support(not spec)</td>
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<tr>
<td>1280*720</td>
<td>44.96</td>
<td>59.94</td>
<td>74.176</td>
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<td></td>
</tr>
<tr>
<td>1280*720</td>
<td>45</td>
<td>60</td>
<td>74.25</td>
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<td></td>
</tr>
<tr>
<td>1280*720</td>
<td>37.5</td>
<td>50</td>
<td>74.25</td>
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<td></td>
</tr>
<tr>
<td>1920*1080</td>
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<td>50</td>
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<td>HDTV 1080I</td>
<td></td>
</tr>
<tr>
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<td>33.72</td>
<td>59.94</td>
<td>74.176</td>
<td>HDTV 1080I</td>
<td></td>
</tr>
<tr>
<td>1920*1080</td>
<td>33.75</td>
<td>60</td>
<td>74.25</td>
<td>HDTV 1080I</td>
<td></td>
</tr>
<tr>
<td>1920*1080</td>
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<td>1920*1080</td>
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<td></td>
</tr>
<tr>
<td>1920*1080</td>
<td>67.5</td>
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<td>148.5</td>
<td>HDTV 1080P</td>
<td></td>
</tr>
<tr>
<td>1920*1080</td>
<td>27</td>
<td>24</td>
<td>74.25</td>
<td>HDTV 1080P</td>
<td></td>
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<td>1920*1080</td>
<td>33.75</td>
<td>30</td>
<td>74.25</td>
<td>HDTV 1080P</td>
<td></td>
</tr>
</tbody>
</table>
ADJUSTMENT INSTRUCTION

1. Application Range
This spec. sheet is applied all of the 32/37/42/47/52” 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±5°C of temperature and 65±10% of relative humidity if there is no specific designation.
4) The input voltage of the receiver must keep 100-220V, 50/60Hz.
5) Before adjustment, execute Heat-Run for 15 minutes at RF no signal.

3. S/W program download
3-1. Preliminary steps
(1) Download method 1 (PCB Assy)
  - HD
  - FHD

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

3-2. 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(XXX.bin) by clicking “Read”.

(5).Click “Auto(2)” tab and set as below
(6).click “Run(3)”.
(7).After downloading, check “OK(4)” message.
## USB DOWNLOAD

1) Put the USB Stick to the USB socket
2) Automatically detecting update file in USB Stick
3) Select “Start” Button and press “ok” button
   Updating is staring.
4) Finishing the version updating, you have to put out USB stick and “AC Power” off.
5) After putting “AC Power” on and check updated version on your TV.

4. ADC Process
   * Required Equipments
     - Remote controller for adjustment
     - MSPG-925F Pattern Generator

4-1. Method of Auto RGB Color Balance
   - Convert to RGB PC in Input-source
   - Input the PC 1024x768 @ 60Hz 1/2 Black & White Pattern(MSPG-925F model:60, pattern:54) into RGB.
   - Adjust by commanding AUTO_COLOR_ADJUST (0xF1) 0x00 0x02 instruction.

(1) Confirmation
- We confirm whether “0xF1 (offset), 0xF2 (gain)” address of EEPROM “0xBC” is “0xAA” or not.
- If “0xF1”, “0xF2” address of EEPROM “0xBC” isn’t “0xAA”, we adjust once more.
- We can confirm the ADC values from “0x00~0x05” addresses in a page “0xBC”.

4-2. Component input ADC
   (1) Component Gain/Offset Adjustment
   - Convert to Component in Input-source
   - Input the Component (Which has 720p@60Hz YPbPr signal : 100% Color Bar (MSPG-925F Model: 217/Pattern: 65) into Component.
   - Adjust by commanding AUTO_COLOR_ADJUST (0xF1) 0x00 0x02 instruction

(2) Confirmation
- We confirm whether “0xF3 (offset), 0xF4 (gain)” address of EEPROM “0xBC” is “0xAA” or not.
- If “0xF3”, “0xF4” address of EEPROM “0xBC” isn’t “0xAA”, we adjust once more.
- We can confirm the ADC values from “0x06~0x0B” addresses in a page “0xBC”.

5. TOOL Option, Area Option change
   (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 (EBTxxxxxxx) for Option value

* Never push the IN-STOP KEY after completing the function inspection.
6. EDID (The Extended Display Identification Data) /DDC (Display Data Channel) download

* Caution:
  - Use the proper signal cable for EDID Download

6-1. EDID DOWNLOAD

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

* EDID Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Condition</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer ID</td>
<td>GSM</td>
<td>1E6D</td>
</tr>
<tr>
<td>Version</td>
<td>Digital : 1</td>
<td>01</td>
</tr>
<tr>
<td>Revision</td>
<td>Digital : 3</td>
<td>03</td>
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* LP81A HD Model EDID
  <Analog : 128bytes>  

<table>
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<tr>
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<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>0A</th>
<th>0B</th>
<th>0C</th>
<th>0D</th>
<th>0E</th>
<th>0F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Addx</th>
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<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>0A</th>
<th>0B</th>
<th>0C</th>
<th>0D</th>
<th>0E</th>
<th>0F</th>
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</thead>
<tbody>
<tr>
<td>Data</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For RGB EDID
* For HDMI EDID

6-2. HDCP SETTING

(High-Bandwidth Digital Contents Protection)

- Connect D-sub Signal Cable to D-Sub Jack
- Input HDCP key with HDCP-key-in-program
- HDCP Key value is stored on EEPROM(AT24C64) which is From '0x80' addresses of 0xA0 page
- AC off/ on and on HDCP button of MSPG925 and confirm whether picture is displayed or not of using MSPG925
- HDCP Key value is different among the sets.

7. Adjustment of White Balance

7-1. Purpose and Principle for adjustment of the color temperature

- 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.

7-2. Adjustment mode : Two modes of Cool and Warm

(Medium data is automatically calibrated by the Cool data)

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

7-3. 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 Heat-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)

7-4. 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 CA210, 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 ▲▼(CH +/-) key on R/C.
7) Adjust R/ G/ B Gain using ◄►(VOL +/-) key on R/C.
8) Adjust two modes (Cool and Warm)
(For 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.
         - In case of decreasing the x, decreasing the R : fix G
         - In case of decreasing the y, decreasing the G : fix R
   (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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Color coordinate</th>
<th>Temp</th>
<th>Δuv</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Cool</td>
<td>0.276±0.002</td>
<td>0.283±0.002</td>
<td>11,000K</td>
</tr>
<tr>
<td>Warm</td>
<td>0.313±0.002</td>
<td>0.329±0.002</td>
<td>6,500K</td>
</tr>
</tbody>
</table>

** DDC Command set **

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>CMD(HEX)</th>
<th>ADR</th>
<th>VALUE</th>
<th>detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging On/Off</td>
<td>F3</td>
<td>00</td>
<td>FF/00</td>
<td>FF : ON / OO : OFF</td>
</tr>
<tr>
<td>Input select</td>
<td>F4</td>
<td>00</td>
<td>0x10 : TV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x20 : AV1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x21 : AV2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x40 : Component1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x41 : Component2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x60 : RGB</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>0x90 : HDMI1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0x91 : HDMI2</td>
<td></td>
</tr>
<tr>
<td>R GAIN</td>
<td>16</td>
<td>00</td>
<td>00 - C0</td>
<td>GAIN adjustment</td>
</tr>
<tr>
<td>G GAIN</td>
<td>18</td>
<td>00</td>
<td>00 - C0</td>
<td>CSM COOL</td>
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<td>B GAIN</td>
<td>1A</td>
<td>00</td>
<td>00 - C0</td>
<td></td>
</tr>
<tr>
<td>R GAIN</td>
<td>16</td>
<td>01</td>
<td>00 - C0</td>
<td>GAIN adjustment</td>
</tr>
<tr>
<td>G GAIN</td>
<td>18</td>
<td>00</td>
<td>00 - C0</td>
<td>CSM NORMAL</td>
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<td>1A</td>
<td>00</td>
<td>00 - C0</td>
<td></td>
</tr>
<tr>
<td>R GAIN</td>
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<td>02</td>
<td>00 - C0</td>
<td>GAIN adjustment</td>
</tr>
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<td>00</td>
<td>00 - C0</td>
<td>CSM WARM</td>
</tr>
<tr>
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<td>00</td>
<td>00 - C0</td>
<td></td>
</tr>
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<td>CSM mode</td>
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<td>COOL</td>
</tr>
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<td></td>
<td></td>
<td>01</td>
<td>NORMAL</td>
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<td>02</td>
<td>WARM</td>
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<td>AUTO ADC</td>
<td>F1</td>
<td>00</td>
<td>0, 1, 2</td>
<td>0: Offset adjustment</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1: Gain adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2: Offset and Gain adjustment</td>
</tr>
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<td>EEPROM Read</td>
<td>E7</td>
<td>00</td>
<td>00</td>
<td>EEPROM read</td>
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<tr>
<td>EEPROMWrite</td>
<td>E8</td>
<td>00</td>
<td>data</td>
<td>EEPROM write</td>
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</tbody>
</table>
8. DDC command protocol

8-1. Signal TABLE

8-2. E2PROM Data Write

(1) Signal TABLE

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

<table>
<thead>
<tr>
<th>Adjustment contents</th>
<th>CMD(hex)</th>
<th>LEN</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPROM WRITE</td>
<td>E8h</td>
<td>94</td>
<td>16-Byte Write</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(84+n)h</td>
<td>n-byte Write</td>
</tr>
</tbody>
</table>

* Purpose
1) EDID write : 16-byte by 16-byte, 8 order (128-byte) write (TO “00 – 7F” of “EEPROM Page A4”).
2) FOS Default write : 14-mode data write
(SyncFlags, HPertiodH, HPertiodL, VtotalH, VtotalL,
SrcHTotalH, SrcHTotalL, SrcHStartH, SrcHStartL,
SrcVStartH, SrcVStartL, HsyncPhase).
3) Random Data write : write the appointment Address of E2PROM.

(3) E2PROM Data Read

1) Signal TABLE

<table>
<thead>
<tr>
<th>Adjustment contents</th>
<th>CMD(hex)</th>
<th>ADH(hex)</th>
<th>ADL(hex)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEPROM READ</td>
<td>E7</td>
<td>A0</td>
<td>0</td>
<td>0-Page 0~7F Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>0</td>
<td>0-Page 80~FF Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A2</td>
<td>0</td>
<td>1-Page 0~7F Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>1</td>
<td>1-Page 80~FF Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A4</td>
<td>0</td>
<td>2-Page 0~7F Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>2</td>
<td>2-Page 80~FF Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A6</td>
<td>0</td>
<td>3-Page 0~7F Read</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>3</td>
<td>3-Page 80~FF Read</td>
</tr>
</tbody>
</table>

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

- Is the power cord plugged in?
  - No: Plug in the power cord.
  - Yes: Go to the next step.

- Are the line filter and PSU connected?
  - No: Connect the cable (SC100).
  - Yes: Go to the next step.

- Is the fuse of PSU normal? (F101)
  - No: Replace the fuse.
  - Yes: Go to the next step.

- Is it connected that PSU and P1100 in Main B/D?
  - No: Connect a cable P1100.
  - Yes: Proceed to the next step.

After all cables connect is removed to PSU, the AC voltage marking is authorized on manual. When ST-BY 5V is not operated, replace PSU.
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

- Does minute discharge at Module?
  - Yes: Check the LCD Module
  - No: Is the inverter / VaVs on?
    - Yes: Is output the normality Low/High voltage except Stand-by 5V?
      - Replace the Power board.
    - No: Replace the VSC.

- Is the link cable normal?
  - Yes: Reconnect Panel line cable. (HD : P403, FHD : P402)
  - No: Is the IC801’s output normal?
    - Yes: Reconnect Panel line cable. (HD : P403, FHD : P402)
    - No: Replace the VSC.

3. Unusual display from RF mode

- Is video output of the Tuner normal? (Check TU500_Pin13)
  - Yes: Check the power.
  - No: Is the input voltage normal? (Check Pin3)
    - Yes: Is the I2C communication normal? (Check Pin9, Pin10)
      - No: Check the Tuner.
    - No: Is the LVDS Cable connected? well
      - No: Check the power.
      - Yes: Change the IC(IC801)

4. Unusual display from rear AV mode.

- Is video input of the A/V Jack normal? (Check R8044)
  - No: Check the input source.
  - Yes: Same as Block A.

5. Unusual display from Side AV mode.

- Is video input of the Side A/V Jack normal? (Check R8043)
  - No: Check the input source.
  - Yes: Same as Block A.

6. Unusual display from Side S-Video mode.

- Is video input of the S-Video Jack normal? (Check R8041/42)
  - No: Check the input source.
  - Yes: Same as Block A.
7. Unusual display from component 1 mode

- Is video input of the Com1 Jack normal? (Check R8011/12/13)
  - No: Check the input source.
  - Yes: Change IC801.

8. Unusual display from component 2 model

- Is video input of the Com2 Jack normal? (Check R8030/32/33)
  - No: Check the input source.
  - Yes: Change IC801.

9. Unusual display from RGB model

- Is video input of the Com2 Jack normal? (Check R8035/37/39)
  - No: Check the input source.
  - Yes: Change IC801.
10. No Sound

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

(2) Check process

- All input(mode) is no sound.
  - Yes
    - Is the speaker on in menu?
      - Yes
        - Check the signal after IC600 refer to circuit diagram.
    - No
      - Check the Speaker cable.
      - Yes
        - Replace IC801
      - No
        - Replace IC600
  - No
    - Download the EDID data.
    - Yes
      - Is the speaker cable normal?
        - Yes
          - Replace IC600
        - No
          - Check the Speaker cable.
  - No
    - Is the output of IC600 normal?
      - Yes
        - Check the signal after IC600 refer to circuit diagram.
      - No
        - Replace IC600
  - No
    - Replace IC601

- Only AV/COM2/PC input is no sound.
  - Yes
    - Check the Tuner In/Out.
  - No
    - Is the output of IC600 normal?
      - Yes
        - Replace IC600
      - No
        - Replace IC601

- Only RF is no sound.
  - Yes
    - Replace Main B/D.
EAX40043808
MSTAR LP81A

**MULTI ITEM**
1. 24C02-SUB:01MMRAL014D
2. ENKMC2837-SUB:0DS22609AA (KDS226)

**RS-232C**
*ONLY LG30*

*RS232C TX
MAIN: EAX41348201(TI)
SUB: 01MCRSG010A(STM)

PC SOUND

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

**MULTI ITEM**
1.24C02-SUB:01MRAL014D
2. SMD HDMI Jack-SUB:6612B00015B

OPTION
SW_HPDP : USE SW HPD (Default)
MST_HPDP : USE MST HPD

MSTAR N-EU 2007/12/20

LG ELECTRONICS
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#9.DDR

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

**MULTI ITEM**
MAIN - QIMONDA : EAN41788501
SUB - HYUNX : EAN31729202

**MSTAR**

EAX40043807
MSTAR LP81A

2007/12/20
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE, AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IF ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.
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