LED TV
SERVICE MANUAL

CHASSIS : LB3AC

MODEL : 32LN549C  32LN549C-TA
          32LP360H  32LP360H-TA

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 △ in the Schematic Diagram and Exploded View. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.

General Guidance

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

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

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

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

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

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

Leakage Current Cold Check(Antenna Cold Check)

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

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

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

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

Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.

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

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity. Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

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

Leakage Current Hot Check circuit

![Leakage Current Hot Check circuit](image)

When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω

*Base on Adjustment standard
SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the SAFETY PRECAUTIONS on page 3 of this publication.
NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions
1. Always unplug the receiver AC power cord from the AC power source before;
   a. Removing or reinstalling any component, circuit board module or any other receiver assembly.
   b. Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
   c. Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.
   **CAUTION:** A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
2. Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
3. Do not spray chemicals on or near this receiver or any of its assemblies.
4. Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
   **CAUTION:** This is a flammable mixture. Unless specified otherwise in this service manual, lubrication of contacts 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 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
5. Use the following unsoldering technique
   a. Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
   b. Heat the component lead until the solder melts.
   c. Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
   **CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
6. Use the following soldering technique
   a. Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
   b. First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
   c. Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
   **CAUTION:** Work quickly to avoid overheating the circuit board printed foil.
   d. Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.
IC Remove/Replacement
Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

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

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

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

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

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

Fuse and Conventional Resistor
Removal/Replacement
1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.
   CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

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

At IC Connections
To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).
1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

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

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

1. Application range
   This specification is applied to the LED TV used LB3AC chassis.

2. Requirement for Test
   Each part is tested as below without special appointment.
   1) Temperature: 25 °C ± 5 °C (77 °F ± 9 °F), CST: 40 °C ± 5 °C
   2) Relative Humidity: 65 % ± 10 %
   3) Power Voltage
      - Standard input voltage (AC 100-240 V~, 50/60 Hz)
      * Standard Voltage of each products is marked by models.
   4) Specification and performance of each parts are followed
      each drawing and specification by part number in accordance with BOM.
   5) The receiver must be operated for about 5 minutes prior to
      the adjustment.

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

4. Model General Specification

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Specification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Market</td>
<td>Asia, Oceania, Africa, Middle East (PAL/DVB Market)</td>
<td>Only Analog for A-ASIA</td>
</tr>
</tbody>
</table>
| 2   | Broadcasting system         | 1) PAL/SECAM-B/G/D/K  
                                         2) PAL-I  
                                         3) NTSC-M  
                                         4) DVB-T | PAL                                        |
| 3   | Channel Storage             | ATV - 135 EA, DTV - 1000 EA                                                |                              |
| 4   | Receiving system            | Analog : Upper Heterodyne  
                                         Digital : COFDM(DVB-T) | DVB-T                        |
|     |                             |                                                                           | Guard Interval(Bitrate_Mbit/s) |
|     |                             |                                                                           | 1/4, 1/8, 1/16, 1/32         |
|     |                             |                                                                           | Modulation : Code Rate       |
|     |                             |                                                                           | QPSK : 1/2, 2/3, 3/4, 5/6, 7/8|
|     |                             |                                                                           | 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8|
|     |                             |                                                                           | 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8|
| 5   | Video (Composite) Input     | PAL, SECAM, NTSC                                                           | 4 System : PAL, SECAM, NTSC, PAL60|
| 6   | RGB Input (1EA)             | RGB-PC                                                                     | Analog(D-SUB 15PIN)          |
| 7   | Component Input             | Y/Cb/Cr, Y/Pb/Pr                                                           | Spec out                     |
| 8   | HDMI Input                  | HDMI1-DTV/DVI  
                                         HDMI2-DTV/DVI  
                                         HDMI3-DTV/DVI | Common Port in AV & PC input.       |
| 9   | Audio Input (1EA)           | RGB/DVI Audio AV                                                          |                              |
| 10  | SDPIF out                   | SPDIF out                                                                 |                              |
| 11  | USB                         | For My Media(Movie/Photo/Music List) and SVC                              |                              |
| 12  | External Speaker            | Max 1W @ 8 ohm                                                             | Stereo SE output             |
## 5. External Input Support Format

### 5.1. Component (Y, Pb, Pr) Speck out

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<tr>
<th>No.</th>
<th>Resolution</th>
<th>H-freq(kHz)</th>
<th>V-freq(Hz)</th>
<th>Proposed</th>
</tr>
</thead>
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<tr>
<td>1.</td>
<td>720×480</td>
<td>15.73</td>
<td>60.00</td>
<td>SDTV, DVD 480i</td>
</tr>
<tr>
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<td>59.94</td>
<td>480p</td>
</tr>
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<td>60.00</td>
<td>480p</td>
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<tr>
<td>5.</td>
<td>720×576</td>
<td>15.625</td>
<td>50.00</td>
<td>SDTV, DVD 625 Line</td>
</tr>
<tr>
<td>6.</td>
<td>720×576</td>
<td>31.25</td>
<td>50.00</td>
<td>HDTV 576p</td>
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<tr>
<td>7.</td>
<td>1280×720</td>
<td>45.00</td>
<td>50.00</td>
<td>HDTV 720p</td>
</tr>
<tr>
<td>8.</td>
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<td>59.94</td>
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<tr>
<td>9.</td>
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### 5.2. HDMI Input (PC/DTV)

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<tr>
<th>No.</th>
<th>Resolution</th>
<th>H-freq(kHz)</th>
<th>V-freq.(Hz)</th>
<th>Pixel clock(MHz)</th>
<th>Proposed</th>
<th>Remark</th>
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<td>720*480</td>
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<td>59.94 / 60</td>
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<td>33.72 / 33.75</td>
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<td>WUXGA (Reduced blanking)</td>
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<td>FHD only(Support to HDMI-PC)</td>
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</tbody>
</table>
ADJUSTMENT INSTRUCTION

1. Application Range
This specification sheet is applied to all of the LED TV with LB3AC chassis.

2. Designation
(1) The adjustment is according to the order which is designated and which must be followed, according to the plan which can be changed only on agreeing.
(2) Power adjustment : Free Voltage.
(3) Magnetic Field Condition: Nil.
(4) Input signal Unit: Product Specification Standard.
(5) Reserve after operation : Above 5 Minutes (Heat Run)
   Temperature : at 25 °C ± 5 °C
   Relative humidity : 65 ± 10 %
   Input voltage : 220 V, 60 Hz
(6) Adjustment equipments: Color Analyzer (CA-210 or CA-110), DDC Adjustment Jig, Service remote control.
(7) Push the "IN STOP" key - For memory initialization.

3. Main PCB check process
* APC - After Manual-Insert, executing APC
   ▪ Boot file Download
   (1) Execute ISP program "Mstar ISP Utility" and then click "Config" tab.
   (2) Set as below, and then click "Auto Detect" and check "OK" message.
      → If "Error" is displayed, check connection between computer, jig, and set.
   (3) Click "Read" tab, and then load download file(XXXX.bin) by clicking "Read".
   (4) Click "Connect" tab. If "Can't" is displayed, check connection between computer, jig, and set.
   (5) Click "Auto" tab and set as below.
   (6) Click "Run".
   (7) After downloading, check "OK" message.

   * USB DOWNLOAD
   (1) Put the USB Stick to the USB socket.
   (2) Automatically detecting update file in USB Stick.
      → If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.
   (3) Show the message "Copying files from memory".
   (4) Updating is starting.
   (5) Updating Completed, The TV will restart automatically.
   (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn’t have a DTV/ATV test on production line.

* After downloading, have to adjust Tool Option again.
  1. Push "IN-START" key in service remote control.
  2. Select "Tool Option 1" and push "OK" key.
  3. Punch in the number. (Each model has their number)

3.1. ADC Process
(1) ADC
  - Enter Service Mode by pushing "ADJ" key,
  - Enter Internal ADC mode by pushing ► key at "8. ADC Calibration".

   ![ADC Calibration Panel]

   <Caution> Using "P-ONLY" key of the Adjustment remote control, power on TV.
   If there is no Component Input, disappear "ADC Comp" message.

* ADC Calibration Protocol (RS232)

<table>
<thead>
<tr>
<th>NO</th>
<th>Item</th>
<th>CMD 1</th>
<th>CMD 2</th>
<th>Data 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Enter Adjust MODE</td>
<td>A</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>ADC adjust</td>
<td>A</td>
<td>D</td>
<td>1</td>
</tr>
</tbody>
</table>

Adjust Sequence
- aa 00 00 [Enter Adjust Mode]
- xb 00 40 [Component 1 Input (480i)]
- ad 00 10 [Adjust 480i Comp1]
- xb 00 60 [RGB Input (1024*768)]
- ad 00 10 [Adjust 1024*768 RGB]
- aa 00 90 End Adjust mode
* Required equipment : Adjustment remote control.

3.2. Function Check
3.2.1. Check display and sound
  • Check Input and Signal items. (cf. work instructions)
    1. TV
    2. AV
    3. COMPONENT (480i)
    4. RGB (PC : 1024 x 768 @ 60hz)
    5. HDMI
    6. PC Audio In
  * Display and Sound check is executed by Remote controller
  Caution : Not to push the INSTOP key after completion if the function inspection.

4. Total Assembly line process
4.1. Adjustment Preparation
  • W/B Equipment condition
    CA210 : CCFL/EEFL -> CH9, Test signal: Inner pattern(80IRE)
    LED -> CH14, Test signal: Inner pattern(80IRE)
  * Required equipment : Adjustment remote control.

4.2. Function Check
3.2.1. Check display and sound
  • Check Input and Signal items. (cf. work instructions)
    1. TV
    2. AV
    3. COMPONENT (480i)
    4. RGB (PC : 1024 x 768 @ 60hz)
    5. HDMI
    6. PC Audio In
  * Display and Sound check is executed by Remote controller
  Caution : Not to push the INSTOP key after completion if the function inspection.
* Connecting picture of the measuring instrument (On Automatic control)
Inside PATTERN is used when W/B is controlled. Connect to auto controller or push Adjustment R/C POWER ON → Enter the mode of White-Balance, the pattern will come out.

* Auto-control interface and directions
(1) Adjust in the place where the influx of light like floodlight around is blocked. (illumination is less than 10 lux).
(2) Adhere closely the Color analyzer(CA210) to the module less than 10 cm distance, keep it with the surface of the Module and Color analyzer's prove vertically.(80° ~ 100°).
(3) Aging time
- After aging start, keep the power on (no suspension of power supply) and heat-run over 5 minutes.
- Using 'no signal' or 'POWER ONLY' or the others, check the back light on.

- After enter Service Mode by pushing “ADJ” key,
- Enter White Balance by pushing "►" key at "9. White Balance".

- For manual adjustment, it is also possible by the following sequence.
(1) Set TV in Adj. mode using “P-ONLY” key on remote controller and 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) Enter White Balance mode by pushing the ADJ key and select “9. White Balance” When KEY (►) is pressed, 206 Gray internal pattern will be displayed.
(4) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10cm of the surface
(5) Select each items (Red/Green/Blue Gain) using ▲/▼(CH +/−) key on R/C.
(6) Adjust R/ G/ B Gain using ◄/►(VOL +/-) key on R/C.
(7) Adjust three modes all (Cool / Medium / Warm)
- For All model w/o LS345
  Fix the one of R/G/B gain and change the others
- For G-FIX model (TBD)
  Cool Mode
  1) Fix the one of R/G/B gain to 192 (default data) and decrease the others.(If G gain is adjusted over 172 and R and B gain less than 192 , Adjust is O.K.)
  2) If G gain is less than 172, Increase G gain by up to 172, and then increase R gain and G gain same amount of increasing G gain.
  3) If R gain or B gain is over 255, readjust G gain less than 172, Conform to R gain is 255 or B gain is 255 Medium / Warm Mode - Fix the one of R/G/B gain to 192 (default data) and decrease the others.
(8) When adjustment is completed, exit adjustment mode using EXIT key on R/C.

---

* EZ ADJUST

<table>
<thead>
<tr>
<th>Cool</th>
<th>Mid</th>
<th>Warm</th>
<th>MIN</th>
<th>CENTER (DEFAULT)</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>R Gain</td>
<td>R Gain</td>
<td>R Gain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>G Gain</td>
<td>G Gain</td>
<td>G Gain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B Gain</td>
<td>B Gain</td>
<td>B Gain</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R Cut</td>
<td>R Cut</td>
<td>R Cut</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>G Cut</td>
<td>G Cut</td>
<td>G Cut</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B Cut</td>
<td>B Cut</td>
<td>B Cut</td>
</tr>
</tbody>
</table>

<Caution>
Color Temperature : COOL, Medium, Warm.
One of R Gain/G Gain/ B Gain should be kept on 0xC0, and adjust other two lower than C0.(When R/G/B Gain are all C0, it is the FULL Dynamic Range of Module)

---

Full White Pattern

CA-210 COLOR ANALYZER

RS-232C Communication

CA-210

COLOR ANALYZER

TYPE : CA-210
* CASE Cool
First adjust the coordinate far away from the target value \((x, y)\).

1. \(x, y > \) target
   i. Decrease the \(R, G\).

2. \(x, y < \) target
   i. First decrease the \(B\) gain,
   ii. Decrease the one of the others.

3. \(x > \) target, \(y < \) target
   i. First decrease \(B\), so make \(y\) a little more than the target.
   ii. Adjust \(x\) value by decreasing the \(R\)

4. \(x < \) target, \(y > \) target
   i. First decrease \(B\), so make \(x\) a little more than the target.
   ii. Adjust \(x\) value by decreasing the \(G\)

* After You finish all adjustments, Press “In-start” button and compare Tool option and Area option value with its BOM, if it is correctly same then unplug the AC cable.
   If it is not same, then correct it same with BOM and unplug AC cable.
   For correct it to the model’s module from factory JIG model.
   * Push The “IN STOP KEY” after completing the function inspection.

4.2. DDC EDID Write (RGB 128Byte)
- Connect D-sub Signal Cable to D-Sub Jack.
- Write EDID DATA to EEPROM(24C02) by using DDC2B protocol.
- Check whether written EDID data is correct or not.
  * For Service main Assembly, EDID have to be downloaded to Insert Process in advance.

4.3. DDC EDID Write (HDMI 256Byte)
- Connect HDMI Signal Cable to HDMI Jack.
- Write EDID DATA to EEPROM(24C02) by using DDC2B protocol.
- Check whether written EDID data is correct or not.
  * For Service main Assembly, EDID have to be downloaded to Insert Process in advance.

4.4. EDID data
(1) All Data : HEXA Value
(2) Changeable Data :
   * : Serial No : Controlled / Data:01
   ** : Month : Controlled / Data:00
   *** : Year : Controlled
   **** : Check sum

4.4.1. Auto Download
- After enter Service Mode by pushing “ADJ” key,
- Enter EDID D/L mode.
- Enter “START” by pushing “OK” key.
  * Caution : Never connect HDMI & D-sub Cable when EDID downloaded.

4.4.2. Manual Download
<Caution>
(1) Use the proper signal cable for EDID Download
  * For HDMI EDID(DVI-D to HDMI or HDMI to HDMI Cable)
    - Analog EDID : Pin3 exists
    - Digital EDID : Pin3 exists
(2) Never connect HDMI & D-sub Cable at the same time.
(3) Use the proper cables below for EDID Writing.
(4) Download HDMI1, HDMI2 separately because HDMI1 is different from HDMI2.

* EDID data and Model option download (RS232)

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>CMD 1</th>
<th>CMD 2</th>
<th>Data 0</th>
<th>Condition</th>
<th>Hex Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Enter download MODE</td>
<td>A</td>
<td>A</td>
<td>00</td>
<td>When transfer the 'Mode In', Carry the command.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>EDID data and Model option download</td>
<td>Download</td>
<td>A</td>
<td>E 00 10</td>
<td>Automatically download (The use of a internal data)</td>
<td></td>
</tr>
</tbody>
</table>
(1) HD RGB EDID data

<table>
<thead>
<tr>
<th>0</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<td>ff</td>
<td>ff</td>
<td>0</td>
<td>1e</td>
<td>6d</td>
<td>a</td>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>01</td>
<td>03</td>
<td>68</td>
<td>a0</td>
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<td>99</td>
<td>26</td>
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(2) HD HDMI EDID data

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<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<td>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>c</td>
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<td>03</td>
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<td>ee</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3) Detail EDID Options are below

- a. Product ID

<table>
<thead>
<tr>
<th>MODEL NAME</th>
<th>HEX</th>
<th>EDID Table</th>
<th>DDC Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD/FHD Model</td>
<td>0001</td>
<td>01 00</td>
<td>Analog/Digital</td>
</tr>
</tbody>
</table>

- b. Serial No: Controlled on production line.
- c. Month, Year: Controlled on production line:
  - ex) Week : ‘01’ -> ‘01’
  - Year : ‘2012’ -> ‘16’ fix
- d. Model Name(HEX):
- cf) TV set’s model name in EDID data is below.

4.5. Model name & Serial number D/L

- Press “Power on” key of service remote control.
  - (Baud rate : 115200 bps)
- Connect RS232 Signal Cable to RS-232 Jack.
- Write Serial number by use RS-232.
- Must check the serial number at the Diagnostics of SET UP menu. (Refer to below)

(1) Signal Table

<table>
<thead>
<tr>
<th>CMD</th>
<th>LENGTH</th>
<th>ADH</th>
<th>ADL</th>
<th>DATA_1</th>
<th>...</th>
<th>Data_n</th>
<th>CS</th>
<th>DELAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMD</td>
<td>LENGTH</td>
<td>ADH</td>
<td>ADL</td>
<td>Data_1</td>
<td>...</td>
<td>Data_n</td>
<td>CS</td>
<td>DELAY</td>
</tr>
</tbody>
</table>

- ADH : EEPROM Sub Address high (00~1F)
- ADL : EEPROM Sub Address low (00~FF)
- Data : Write data
- CS : CMD + LENGTH + ADH + ADL + Data_1 + ... + Data_n
- Delay : 20ms

(2) Command Set

- Adjust mode CMD(hex) LENGTH(hex) Description
- EEPROM WRITE A0h 84h+n n-bytes Write (n = 1~16)

* Description
  - FOS Default write : <7mode data> write
  - Vtotal, V_Frequency, Sync_Polarity, Htotal, Hstart, Vstart, 0, Phase
  - Data write : Model Name and Serial Number write in EEPROM.

(3) Method & notice

1) Serial number D/L is using of scan equipment.
2) Setting of scan equipment operated by Manufacturing Technology Group.
3) Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.
* Manual Download(Model Name and Serial Number)
If the TV set is downloaded by OTA or Service man, sometimes model name or serial number is initialized. (Not always)
There is impossible to download by bar code scan, so it need Manual download.
1) Press the “Instart” key of Adjustment remote control.
2) Go to the menu "6.Model Number D/L" like below photo.
3) Input the Factory model name(ex 32LV2510-TB) or Serial number like photo.
4) Check the model name Instart menu. → Factory name displayed. (ex 32LV2510-TB)
5) Check the Product/Service Info.(Menu Key → Red Key →
Select Product/Service Info.) → Buyer model displayed
(ex 32LV2510-TB)

4.5. Outgoing condition Configuration
■ When pressing IN-STOP key by Service remote control,
Red LED are blinked alternatively. And then automatically
turn off. (Must not AC power OFF during blinking)

5. Check Commercial features
5.1. External SPK Out and Volume control
(1) Connect external speaker to speaker out port with phone
jack on TV side as below.
(2) Check the Max. speaker output is 1W or not. Sine wave
with 1KHz will be displayed.

5.2. IR Out
5.2.1. In using Commercial Check Jig
(1) Check the LED for IR-Out inspection.
* Please refer to the criteria of Judgement.

5.2.2. In using Mini check Jig
(1) Connect JIG for inspection to RS-232C port on TV as
below.
(2) Check the LED for IR-Out inspection.
* Please refer to the criteria of Judgement.
TROUBLE SHOOTING GUIDE

1. Check the booting Voltage

<table>
<thead>
<tr>
<th>Check</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure the Stand-by Voltage P401 3, 5pin : +3.5V_ST</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the Power Connector</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the Micro voltage L403 : +3.5V_ST</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the L403</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the CLK of X201 is 24MHZ</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the X201</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the PWR_ON of P401 1pin : 3.5V</td>
<td>No</td>
</tr>
<tr>
<td>Re-download of Firmware</td>
<td>No</td>
</tr>
<tr>
<td>Make sure the Multi Voltage P401 9, 10pin : 24V, 13-15pin : 12V</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the circuit board</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the Output Voltage of IC 402/3/7 IC402: 2.5V, IC403: 1.1V, IC407: 1.9V, Q403: 3.3V</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the IC402/3/7, Q403</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the voltage of LVDS Power Q406: 12V</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the Q406</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the output of MSTAR LVDS</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the MSTAR (IC101) Or Main board</td>
<td>Yes</td>
</tr>
<tr>
<td>Make sure the Inverter control and error P401 2pin: High</td>
<td>No</td>
</tr>
<tr>
<td>Exchange the circuit or check the LCD Module</td>
<td>Yes</td>
</tr>
<tr>
<td>Exchange the LCD Module</td>
<td>No</td>
</tr>
</tbody>
</table>

2. Digital TV Video

<table>
<thead>
<tr>
<th>Check</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check the Stand-by Voltage P401 3, 5pin : +3.5V_ST</td>
<td>Yes</td>
</tr>
<tr>
<td>Check the Tuner 3.3V : L1003</td>
<td>Yes</td>
</tr>
<tr>
<td>Exchange the L1003</td>
<td>No</td>
</tr>
<tr>
<td>Check the Tuner 1.8V IC1001 2pin : 1.8V</td>
<td>Yes</td>
</tr>
<tr>
<td>Exchange the IC1001</td>
<td>No</td>
</tr>
<tr>
<td>Check the IF_P/N signal TU1002 10/11pin</td>
<td>Yes</td>
</tr>
<tr>
<td>Exchange the Tuner</td>
<td>No</td>
</tr>
<tr>
<td>Check the LVDS output signal of Mstar IC</td>
<td>Yes</td>
</tr>
<tr>
<td>Exchange the Mstar (IC101) Or Main board</td>
<td>No</td>
</tr>
</tbody>
</table>

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3. Analog TV Video

Check the RF cable and RF signal

- Yes

Check the Tuner 3.3V : L1003

- Yes
- No

Check the Tuner 1.8V IC1001 2pin : 1.8V

- Yes
- No

Check the CVBS signal TU1002 8pin

- Yes

Check the LVDS output signal of Mstar IC

- Yes
- No

4. AV Video

Make sure the input signal type and Our TV can support the signal

- Yes

Check the AV cable defect or status of conductor

- Yes

Make sure the JK701, CVBS signal

- Yes

Make sure the CVBS_DET signal

- Yes

Make sure the LVDS output signal of Mstar IC

- Yes
- No

Exchange the AV Jack

Exchange the R705

Exchange the Mstar(IC101) Or Main board

Exchange the Mstar(IC101) Or Main board
5. RGB Video

Make sure the input signal type and Our TV can support the signal

Yes

Check the RGB cable defect or status of conductor

Yes

Check the EDID, I2C signal R723, R724(SDA, SCL)

Yes

Check the J505 H / V_Sync / R / G / B signal

Yes

Check the DSUB_DET signal

Yes

Check the LVDS output signal of Mstar IC

No

Download the EDID data, Exchange the Mstar(IC101) Or Main board

No

Exchange the D-Sub Jack

No

Exchange the resistor R729 / R732

No

Exchange the Mstar(IC101) Or Main board

6. HDMI Video

Make sure the input signal type and Our TV can support the signal

Yes

Check the HDMI cable defect or status of conductor

Yes

Check the EDID, I2C signal R818, 822, 824, 825, 826, 829

Yes

Check the HDMI Jack JK801, JK802, JK803

Yes

Check the HDMI_DET(HPD) signal

Yes

Check the HDMI signal

Yes

Check the LVDS signal output

No

Exchange the Mstar(IC101) Or Main board

No

Exchange the IC or download The EDID data

No

Exchange the HDMI Jack

No

Exchange the Resistor R811, 808, 809, 810, 821, 823

No

Exchange the Mstar(IC101) Or Main board

No

Exchange the Mstar(IC101) Or Main board
7. Audio of All input

Check the speaker menu (menu -> sound -> TV speaker)  
Yes → Menu toggle
No → Check the voltage of AMP IC (IC501) 24V, 3.3V

Check the Mstar Audio_MASTER_CLK signal R148  
Yes → Check the I2C Line R503, R504
No → Exchange the AMP IC or Main board

Check the Mstar I2S output IC501 9, 10, 11pin  
Yes → Check the Audio output signal IC501 1, 2, 3, 4pin
No → Check the connector P501

Check the Speaker resistor or connector  
Yes → Exchange the speaker
No → Menu toggle

8. TV Audio

Check the RF cable of RF signal  
Yes → Menu toggle
No → Check the voltage of Tuner 3.3V : L1003

Check the voltage of Tuner 1.8V IC1001 2pin : 1.8V  
Yes → Check the IF_P/N signal TU1002 10/11pin
No → Exchange the Tuner

Implement the "8. Audio of all input" Of Malfunction guide
9. AV Audio

Check the AV cable is defective

Yes

Check the signal of JK701, L701, L702

No

Exchange the AV Jack

Yes

Implement the "8. Audio of all input"
Of Malfunction guide

10. RGB Audio

Check the Component cable is defective

Yes

Check the signal of JK705

No

Exchange the AV Jack

Yes

Implement the "8. Audio of all input"
Of Malfunction guide
EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by △ in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.
IR/LED and control for normal models.
THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR
FIREE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING.

[51Pin LVDS Connector]
(For FHD 60Hz)

[30Pin LVDS Connector]
(For HD 60Hz_Normal)

FOR FHD REVERSE(8bit)
Change in S7LR

FOR FHD REVERSE(10bit)
Change in S7LR

LVDS for large inch

[30Pin LVDS Connector]
(For HD 60Hz_Normal)
Serial Flash for SPI boot_NON_OS and OS

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.
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.
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