Overview of Topics to be Discussed

Section 1
Contact Information, Preliminary Matters, Specifications, Plasma Overview, General Troubleshooting Steps, Disassembly Instructions, Voltage and Signal Distribution

Section 2
Circuit Board Operation, Troubleshooting and Alignment of:
  • Switch mode Power Supply
  • Y-SUS Board
  • Y Drive Boards
  • Z-SUS Board
  • Control Board
  • X Drive Boards
  • Main Board
Section 1

This Section will cover Contact Information and remind the Technician of Important Safety Precautions for the Customers Safety as well as the Technician and the Equipment.

Basic Troubleshooting Techniques which can save time and money sometimes can be overlooked. These techniques will also be presented.

This Section will get the Technician familiar with the Disassembly, Identification and Layout of the Plasma Display Panel.

At the end of this Section the Technician should be able to Identify the Circuit Boards and have the ability and knowledge necessary to safely remove and replace any Circuit Board or Assembly.
IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by persons possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a major Product, personal injury and property damage can result. The manufacturer or seller maintains no liability for the interpretation of this information, nor can it assume any liability in conjunction with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. If wires, screws, clips, straps, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original positions and properly fastened.

CAUTION

To avoid personal injury, disconnect the power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be aware that many household products present a weight hazard. At least two people should be involved in the installation or servicing of such devices. Failure to consider the weight of an product could result in physical injury.
Today’s sophisticated electronics are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in a manner that renders them inoperative or reduces the time until their next failure. Connect an ESD wrist strap to a ground connection point or unpainted metal in the product. Alternatively, you can touch your finger repeatedly to a ground connection point or unpainted metal in the product. Before removing a replacement part from its package, touch the anti-static bag to a ground connection point or unpainted metal in the product. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe these same precautions.

Regulatory Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and the receiver; Connect the equipment to an outlet on a different circuit than that to which the receiver is connected; or consult the dealer or an experienced radio/TV technician for help.
Contact Information

Customer Service (and Part Sales) (800) 243-0000
Technical Support (and Part Sales) (800) 847-7597
USA Website (GSFS) http://gsfs-america.lge.com
Customer Service Website us.lgservice.com
LG Web Training lge.webex.com
LG CS Academy lgcsacademy.com http://136.166.4.200

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AL, 35813.

Presentations with Audio/Video and Screen Marks

Also available on the Plasma page

Plasma Panel Alignment Handbook

New Training Materials on the Learning Academy site
**Safety & Handling Regulations**

1. Approximately 10 minute pre-run time is required before any adjustments are performed.
2. Refer to the Voltage Sticker inside the Panel when making adjustments on the Power Supply, Y-SUS and Z-SUS Boards. Always adjust to the specified voltage level.
3. Be cautious of electric shock from the PDP module since the PDP module uses high voltage, check that the Power Supply and Drive Circuits are completely discharged because of residual current stored before Circuit Board removal.
4. C-MOS circuits are used extensively for processing the Drive Signals and should be protected from static electricity.
5. The PDP Module must be carried by two people. **Always carry vertical NOT horizontal.**
6. **Also the Plasma television MUST be transported vertical NOT horizontal.**
7. Exercise care when making voltage and waveform checks to prevent costly short circuits from damaging the unit.
8. Be cautious of lost screws and other metal objects to prevent a possible short in the circuitry.

**Checking Points to be Considered**

1. Check the appearance of the Replacement Panel and Circuit Boards for both physical damage and part number accuracy.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history. Example: Y Board Failure, Mal-discharge on screen, etc.
Basic Troubleshooting Steps

Define, Localize, Isolate and Correct

• Define
  Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc. Observation of the front Power LED may give some clues.

• Localize
  After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply Voltages to those circuits under test. Always confirm the supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.

• Isolate
  To further isolate the failure, check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude Phasing and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes “glitches” or “road bumps” will be an indication of an imminent failure.

• Correct
  The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.
This section of the manual will discuss the specifications of the 50PG20 Advanced Single Scan Plasma Display Panel.
50PG20 Specifications

PLASMA HDTV
50” Class (49.9” diagonal)

• 720p HD Resolution
• Dual XD Engine™
• 20,000:1 Contrast Ratio
• Fluid Motion
• 3x HDMI™ V.1.3 with Deep Color
• AV Mode (Cinema, Sports, Game)
• Clear Voice
• LG SimpLink™ Connectivity
• Invisible Speaker System
• 100,000 Hours to Half Brightness (Typical)
• PC Input
Grid to Pixel to Resolution Relationship

Layout below as viewed from the rear.

Horizontal Grids are on “Front” of the Cells as viewed from the front.

Y-Drive “Buffers”

Y-SUS
Cell Clean up (Y-Drive Edge)
Deliver Luminance Fire
Firing the Cell via Wall Charge
Line by Line

Vertical Grids
Determine Horizontal Resolution

Red, Green and Blue Cells make a “Pixel”

X-Boards
Same as (A-BUS)
Initialize the Cell
Deliver Color information

Horizontal Grids
Determine Vertical Resolution

Z-SUS
Firing the Cell via Wall Charge
All Lines fire at once

Where the 3 Grids Intersect is a single Colored Cell

Vertical Grids are in “Back” of the Cells as viewed from the front.
High definition television is the highest performance segment of the DTV system used in the US. It’s a wide screen, high-resolution video image, coupled with multi-channel, compact-disc quality sound.

### Pixel Count to Resolution Comparisons

<table>
<thead>
<tr>
<th>Formats</th>
<th>NTSC 480I</th>
<th>SD 480P</th>
<th>HD 1080I</th>
<th>HD 720P</th>
<th>HD 1080P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlaced</td>
<td>240 Lines</td>
<td>Progressive</td>
<td>480 Lines</td>
<td>Interlaced</td>
<td>540 Lines</td>
</tr>
<tr>
<td>Progressive</td>
<td>720 Lines</td>
<td>Progressive</td>
<td>1080 Lines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Possible Frame Rates:
- 24FPS: 2 Fields to make a Frame
- 30FPS: Progressive
- 60FPS: Each Field is a Frame

Think of sync as the Panels “Refresh Rate”
HD RESOLUTION 720p HD Resolution Pixels: 1365 (H) × 768 (V)

High definition television is the highest performance segment of the DTV system used in the US. It’s a wide screen, high-resolution video image, coupled with multi-channel, compact-disc quality sound.

HDMI (1.3 Deep Color) Digital multi-connectivity

HDMI (1.3 Deep color) provides a wider bandwidth (340MHz, 10.2Gbps) than that of HDMI 1.2, delivering a broader range of colors, and also drastically improves the data-transmission speed.

Invisible Speaker

Personally tuned by Mr. Mark Levinson for LG

TAKE IT TO THE EDGE newly introduces ‘Invisible Speaker’ system, guaranteeing first class audio quality personally tuned by Mr. Mark Levinson, world renowned as an audio authority. It provides Full Sweet Spot and realistic sound equal to that of theaters with its Invisible Speaker.

Dual XD Engine

Realizing optimal quality for all images

One XD Engine optimizes the images from RF signals as another XD Engine optimizes them from External inputs. Dual XD Engine presents images with optimal quality two times higher than those of previous models.
AV Mode "One click" - Cinema, Sports, Game mode.
TAKE IT TO THE EDGE is a true multimedia TV with an AV Mode which allows you to choose from 3 different modes of Movies, Video Games and Sports by a single click of a remote control.

Clear Voice Clearer dialogue sound
Automatically enhances and amplifies the sound of the human voice frequency range to provide high-quality dialogue when background noise swells.

Save Energy, Save Money
Home electronic products use energy when they're off to power features like clock displays and remote controls. Those that have earned the ENERGY STAR use as much as 60% less energy to perform these functions, while providing the same performance at the same price as less-efficient models. Less energy means you pay less on your energy bill.
**Tru-Surround** is a sound-scheme that has the ability to take multi-channel encoded sources, such as Dolby Digital, and reproduce the multi-channel surround effect by just using two-speakers. The result is not as impressive as true Dolby Digital 5.1 (the front and side surround effects are impressive, but the rear surround effects fall a little short, with the sense they are coming from just to rear of your head rather than from the back of the room).

**Dolby® Digital**
In thousands of cinemas and millions of homes worldwide, Dolby Digital is the reigning standard for surround sound technology in general and 5.1-channel surround sound in particular.

**LG SIMPLINK™ MULTI-DEVICE CONTROL**
Allows for convenient control of other LG SimpLink products using the existing HDMI connection.

**FLUIDMOTION (180 Hz Effect)**
Enjoy smoother, clearer motion with all types of programming such as sports and action movies. The moving picture resolution give the impression of performance of up to 3x the panels actual refresh rate.
**Specifications FluidMotion Familiarization**

**FluidMotion (180 Hz Effect)**
Enjoy smoother, clearer motion with all types of programming such as sports and action movies. The moving picture resolution give the impression of performance of up to 3x the panels actual refresh rate.

**Moving Picture Response Time**
- **LCD 60Hz**: 16.5 milliseconds
  - (120Hz takes MPRT to 8.25ms)
- **PDP 180Hz**: 5.44 milliseconds
  - Panel Response Time is less than 1 millisecond

**Panel Response Time**
- **LCD 60Hz**: 4 to 8 milliseconds
- **PDP 180Hz**: less than 1 millisecond
Remote Control

TOP PORTION

BOTTOM PORTION
**Rear and Side Input Jacks**

- **AC In**
- **Side Inputs**
- **Rear Inputs**
- **USB**
  - Only for Software Upgrades

![Diagram of Rear and Side Input Jacks](image)
Software Upgrade (Automatic Download)

1. Copy new software (xxx.bin) to root folder in USB storage.
2. Turn on the TV
3. Connect USB storage to USB port on TV.
4. After about 5 seconds and it shows on screen.
5. Select ‘START’ button.

INFORMATION

<table>
<thead>
<tr>
<th>Current Ver.</th>
<th>03.11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update Ver.</td>
<td>03.14</td>
</tr>
</tbody>
</table>

merged_50PG20_UA_0314_PDP_56.bin

To start upgrading your TV set. Please follow the procedures.

1. Press an arrow key on your remote to reach START on the screen.
2. Press ENTER key on your remote to start downloading.

If you do not want to download the upgrade file, please press the arrow key to reach CANCEL on the screen. Then, press the ENTER key on your remote

<USB download main screen>
Your File name and version number will differ. Use this just for reference.
50PG20 Product Dimensions

There must be at least 4 inches of Clearance on all sides.

Weight without Stand: 83.3 lb
Weight with Stand: 92.1 lb
This section of the manual will discuss Disassembly, Layout and Circuit Board Identification, of the 50PG20 Advanced Single Scan Plasma Display Panel.

Upon completion of this section the Technician will have a better understanding of the disassembly procedures, the layout of the printed circuit boards and be able to identify each board.
Removing the Back Cover

To remove the back cover, remove the 26 screws (The Stand does not need to be removed). Indicated by the arrows.

PAY CLOSE ATTENTION TO THE TYPE, SIZE AND LENGTH Of the screws when replacing the back cover. Improper type can damage the front.
**Disassembly Procedure for Circuit Board Removal**

Notes: 1) All Plugs listed are from left to right Pin 1, 2, 3, ETC.
2) Remember to be cautious of ESD as some semiconductors are CMOS and prone to static failure

**Switch Mode Power Supply Board Removal**

Remove 8 screws securing the Power Supply and disconnect Connectors from Plugs **CN101** (AC Input)
**P801** (Vs, Vs, NC, GND, GND, Va, Va, GND, M5V, M5V),
**P802** (Vs, Vs, NC, GND, GND, Va, Va, GND, M5V, M5V),
**P803** (22 pins).
After the board is replaced readjust RV901 (VS), RV902 (VA) according to the DC voltage levels indicated by the Voltage Label in the upper Left corner of the Panel.

**Y-SUS Board Removal**

Remove Connectors P209, P102 and P210
Remove the 9 screws holding the Y-SUS secured.
Lift gently and slide Board to the right to release from the Upper and Lower Y-Drive Boards.

**Top Y Drive Board Removal**

Remove the 4 connectors going to the Flexible Ribbon Connectors for the Panel.
Remove the 3 screws holding the Board in place.
Lift the Board up to unseat the Board from the screw Stand Off collars and pull the Board away from the Y-SUS Board connectors.

**Bottom Y Drive Board**

Remove the 4 connectors going to the Flexible Ribbon Connectors for the Panel.
Remove the 3 screws holding the Board in place.
Lift the Board up to unseat the Board from the screw Stand Off collars and pull the Board away from the Y-SUS Board connectors.
**Disassembly Procedure for Circuit Board Removal (2)**

**Z-SUS Board Removal**

Remove the following connectors P3, P2  
Remove the 6 Screws  
Lift the Board up slightly and pull Board to the left to disengage the connectors going to the FPC cables interface Boards.  
When reinstalling Board, be sure to check Va/Vs and then readjust ZBias according to the voltage panel label.

**Main Board Removal**

Remove the following connectors P302, P303, P701 and the Speaker plug CN701  
Remove the 2 Screws holding the decorative black plastic piece over the input jacks and remove.  
Remove the 4 screws holding the Board in place and remove.  
NOTE: If the Board just needs to be out of the way;  
Remove the 2 Screws holding the decorative black plastic piece over the input jacks and remove.  
Remove the two screws at the top of the Main Board mounting brackets, loosen the tape at the bottom of the bracket, unplug P701 and CN701 and swing the Board up and to the right.

**Control Board Removal**

Remove the following connectors; P111, P163, P162, P161, P151  
Carefully remove the LVDS Cable P121 from the Control Board by pressing the Locking Tabs together and pulling straight out.  
Remove the 4 screws in each corner.  
Pay attention to the back side. Note: The rubber looking pad is actually a “Temperature Transfer Medium”. Be sure to remove this pad from the old Board and place the pad back on the New Board before installation.
**X Circuit Board Removal**

**X Board Removal**

X Board Removal will require the most disassembly of all the boards. All the Brackets and Assemblies marked with A–F will need to be removed. This includes the Stand “A”. Before an X Board can be removed the Heat Sink Assembly “F” will also need Removal.
**X Circuit Board Removal Continued**

**X Board Removal (continued)**

Lay the unit face down on non-scratch material. To prevent damage to the LVDS Cable, carefully remove the LVDS Cable P121 from the Control Board by pressing the Locking Tabs together and pulling straight back to remove the cable see illustration below.

![LVDS Cable Connector Control Board side](image)

(A) Remove the Stand mounting support plastic piece.
(B) Remove the Stand Metal Support Bracket, unplug AC ground lug.
(C) Remove the Decorative Black plastic piece over side inputs.
(D) Remove the two screws at the top of the Main Board support bracket. Unplug Speaker and Front Input plugs and swing the Board out of the way.
(E) Remove both bottom black support braces 3 screws each.
(F) Remove the TCP Heat sink 9 screws and remove.

**X DRIVE Board Removal:**

Disconnect all connectors going to each Board that needs to be removed.

- **Left X Drive:** P121, P101 through P104.
- **Center X Drive:** P242, P241, P232 P211, P201 through P206.
- **Right X Drive:** P331, P311, P503, P301 through P306.

Remove the 4 screws for each Board and remove the Board. One of the screws supports two Boards.

Reassemble in reverse order. Recheck Va/Vs/VScan/-VY/Z-Drive.
This Section will cover Circuit Operation, Troubleshooting and Alignment of the Power Supply, Y-SUS Board, Y Drive Boards, Z-SUS Board, Control Board, Main Board and the X Drive Boards.

At the end of this Section the technician should understand the operation of each circuit board and how to adjust the controls. The technician should be able with confidence to troubleshoot a circuit board failure, replace the defective circuit and perform all necessary adjustments.
Panel Label Explanation

1. Model Name
2. Bar Code
3. Manufacture No.
4. Adjusting Voltage DC, Va, Vs
5. Adjusting Voltage (Set Up / -Vy / Vsc / Ve / Vzb)
6. Trade name of LG Electronics
7. Manufactured date (Year & Month)
8. Warning
9. TUV Approval Mark
10. UL Approval Mark
11. UL Approval No.
12. Model Name
13. Max. Watt (Full White)
14. Max. Volts
15. Max. Amps
Adjustment Notice

All Adjustments Must Be Done in White Wash.
(Customer’s Menu – Options – ISM – White Wash)

It is critical that the DC Voltage adjustments be checked whenever:
1) SMPS, Y-SUS or Z-SUS Board is replaced.
2) Panel is replaced, since the SMPS does not come with new panel.
3) A Picture issue is encountered.
4) As a general rule of thumb when ever the back is removed.

ADJUSTMENT ORDER “IMPORTANT”

DC VOLTAGE ADJUSTMENTS
1) SMPS Board: Vs Va (Always do SMPS first)
2) Y-SUS Board: Adjust -Vy, Vscan
3) Z-SUS Board: Adjust Zbias

WAVEFORM ADJUSTMENTS
1) Y-SUS Board: Ramp Up, Ramp Down

The Waveform adjustment is only necessary
1) When the Y-SUS Board is replaced
2) When a “Mal-Discharge” problem is encountered
3) When an abnormal picture issues is encountered.

Remember, the Voltage Label MUST be followed, it is specific to the panel’s needs.

All label references are from a specific panel. They are not the same for every panel encountered.
This Section of the Presentation will cover troubleshooting the Switch Mode Power Supply for the Single Scan Plasma. Upon completion of the section the technician will have a better understanding of the operation of the Power Supply Circuit and will be able to locate voltage and test points needed for troubleshooting and alignments.

- DC Voltages developed on the SMPS
- Adjustments VA and VS. Note: The M5V is pre-adjusted and sealed.

- Always refer to the Voltage Sticker located on the back of the panel, in the upper Left Hand side for the correct voltage levels for the VA, VS, -VY, Vscan, and Z Bias as they will vary from Panel to Panel.
SMPS P/N (EAY41360901).
Check the sticker on the upper left side to confirm origin of the Panel or the White Label on the Power Supply itself to identify the Board P/N.

We will examine the Operation of the EAY41360901.
Power Supply Board Layout

Hot Ground Symbol represents a SHOCK Hazard
### Switch Mode Power Supply Overview

#### The Switch Mode Power Supply Board Outputs to the:

<table>
<thead>
<tr>
<th>Board</th>
<th>Voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y-SUS Board And Z-SUS Board</td>
<td>VS</td>
<td>Drives the Display Panel Horizontal Grid</td>
</tr>
<tr>
<td></td>
<td>VA</td>
<td>Primarily responsible for Display Panel Vertical Grid</td>
</tr>
<tr>
<td></td>
<td>M5V VCC</td>
<td>Used to develop Bias Voltages on the Y-SUS, Z-SUS, X Drive, and Control Boards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Board</td>
<td>16V</td>
<td>Audio B+ Supply</td>
</tr>
<tr>
<td></td>
<td>12V</td>
<td>Signal Processing Circuits and Fan Drive</td>
</tr>
<tr>
<td></td>
<td>5V</td>
<td>Signal Processing Circuits</td>
</tr>
</tbody>
</table>

### Adjustments

There are 2 adjustments located on the Power Supply Board VA and VS. The 5V VCC is pre-adjusted and fixed. All adjustments are made with relation to Chassis Ground. Use “Full White Raster” 100 IRE.

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA</td>
<td>RV901</td>
</tr>
<tr>
<td>VS</td>
<td>RV902</td>
</tr>
</tbody>
</table>
Switch Mode Power Supply Circuit Layout

- **AC Input CN 101**
- **380V Source**
  - 380V Fuse F801 (10Amp/230V)
- **VS Source**
- **VA Source**
- **16V, 12V, 5V Source**
- **PFC Circuit**
- **Standby Source**
- **U801 Regulation**
- **U701 Sub Micon**
- **No Connection**
- **To MAIN**
- **To Y-SUS**
- **To Z-SUS**

Related Components:
- **Main Fuse F101** (10Amp/230V)
- **Fuse F801** (10Amp/230V)
- **AC Input CN 101**
- **VS VR901**
- **P801**
- **P802**
- **P803**
- **VA VR902**
Power Supply Basic Operation

Power Supply Operation and Troubleshooting

AC Voltage is supplied to the SMPS Board at Connector SC101 from the AC Input Filter. Standby 5V is developed from 330V source supply (which during standby measures 155V with relation to AC Ground). This supply is also used to generate all other voltages on the SMPS. The 5V (standby) voltage is routed to the Sub Micon (U701) on the SMPS and through P803 to the Main Board for Micon operation (IC100).

AC detect Pin 18 of P803 is generated on the SMPS by monitoring the AC input and rectifying a small sample voltage. This AC Detect Voltage is routed to the Sub Micon (U701) on the SMPS and the Micon (IC100) located on the Main Board and is used as a basic “SMPS OK” signal. AC Det actually releases “Reset” on the Main Board.

When the Micon (IC100) on the Main Board receives an “ON” Command from either the Keyboard or the Remote IR Signal it outputs a high to RL-ON which enters the SMPS Board at Pin 19 of P803. The RL-ON command is sensed by the Sub Micon (U701) circuit which causes the Relay Drive Circuit to close Relay RL101 bringing the primary source voltage up to full power by increasing the 155V standby to 330V. At this time the 16V and 12V source becomes active and sent to the Main Board via P803. The relay on command on the main board turns on a 5V general regulator that creates a 5V Det signal that is also set to the Power Supply.

The next step is for the Micon (IC100) on the Main Board to output a high on M5V_ON Line to the SMPS at P803 Pin 21 which is sensed by the Sub Micon IC (U701) on the SMPS turning on the M5V line which is routed out P801 and P802 to the SUS boards. This same M5V kicks off the Control Board.

The last step to bring the supply to “Full Power” occurs when the Micon (IC100) on the Main Board brings the VS-ON line high at Pin 20 of P803 on the SMPS Board which when sensed by the Sub Micon IC (U701) turns on the VA and VS Supplies (VA is brought high before VS).
M5V (DC Voltage) To Y-SUS, then to Control PWB.

Vs/Va (DC Voltage) To Y-SUS, Z-SUS Va routed to X-PWBs

AC In

Stand By 5V Reg

5V Det. Relay On

12V/16V Regulators

12V 16V

Vs Reg

Vs/Va

M5V On

Vs On

5V Reg

12V Video 16V Audio

MAIN PWB

At point TV is in Stand-By state. Energy Star compliant. Less than 1 Watt

M5V arrives at Y-SUS. DC to DC generators develop the following:
Floating Ground 5V, sent to Y-Drive for buffers. -Vy for Y-Drive negative portion. VSC for Y-Drive positive portion. 15V sent to Control board, then to Z-SUS. 15V also sent to X-Boards for VPP circuit.

M5V on Control Board fires up Controller Chip. 3.3V generated and sent to X boards for TCPs. 15V received from Y-SUS routes to Z-SUS along with the M5V.
Optional circuits components. However, the output logic on P701 remains the same.
**50PG20 Power Supply Controls from Micro side (During Stand By)**

1. **A** 5V-SBY Arrives from SMPS
2. **B** LED703 receives 5VST and glows Red
3. **C** AC-DET creates Micro Reset
4. **D** AC-DET is Monitored by uP

**Flow of Events:**
- **A** 5V-SBY Arrives from SMPS
- **B** LED703 receives 5VST and glows Red
- **C** AC-DET creates Micro Reset
- **D** AC-DET is Monitored by uP

**Note:** The circuit diagram illustrates the control flow from SMPS to the microcontroller (Micro) and the resulting actions.
50PG20 Power Supply Controls from Micro side (At Turn On)

- **A** Receives Power On Command from Side Keys or Remote
- **B** Outputs Relay On (RL-ON) command. Turns on Power Supply Relay and lets 16V and 12V Power Supplies.
- **C** Turns on Q706. Creates 5V General. Outputs VS-On which turns on Va and Vs in the Power Supply.
- **D** 5V General allows 5V Detect to be generated.
- **E** Outputs M5V On command which turns on the 5Vcc regulator.
- **F** LD703 Lights Red and Green.
Power Supply Generic Troubleshooting Tips

Remember if a voltage is missing check for proper resistance before proceeding

Understanding the Power On Sequence when Troubleshooting a possible Power Supply Failure will simplify the process of isolating which circuit board failed to operate properly. In this Section we will investigate the Power on Sequence and examine ways to locate quickly where the failure occurred.

Check the Power On LED for Operation. A Red LED indicates a presence of 5V STB and AC-ON/DETECT. Failure of the Power ON LED to light is an indication of loss of 5V STB or AC ON/ Detect remember the 5V STB and AC-ON/DETECT are developed on the SMPS and sent to the Main Board.

Listen for Relay Click, the click of the Relay is an indication of RL-ON going high. RL-ON is sent from the Main Board to the SMPS and when present the U701 controls the Relay Operation. RL-ON going High and no Relay is a failure of the SMPS, RL-ON staying low is a failure of the Main Board.

Relay Operation means that the SMPS if working properly will output the 16V Supply to the Main Board. This voltage will allow the Tuner, Audio and Video Circuits on the Main Board to function, and if connected to an Antenna Input, Audio would be present. If the Relays closed and these supplies failed suspect a problem with the SMPS.

The next step of operation calls for the M5V_ON line from the Main Board to the SMPS to go high on P803 pin 21. A high on the M5V_ON Line activates the 5V VCC line. Loss of 5V VCC results in no “Raster”, no Display Panel Reset, no Y, Z, Control or X Board operation. Loss of 5V VCC and M5V_ON going high could be caused by any of these boards or failure of the SMPS. M5V_ON staying low indicates a problem on the Main Board.

VS-ON is the last step of the Power Sequence and is responsible for bringing the VS and VA Voltages up. The VS-ON signal pin 20 P803 is sent from the Main Board to the SMPS as a high, VS and VA and full operation of the Display Panel are now enabled. Loss of VS-ON results in loss of VA and VS and no Raster, no Panel Display Reset but Audio would be present. If VS-ON went high and VS and VA where missing the problem could be caused by a failure on the SMPS or a circuit using these voltages. A Resistance check should narrow the possible failures quickly.
**Switch Mode Power Supply Static Test**

This test can confirm the proper operation of the SMPS without the need to exchange the board. This Power Supply can operate in a No Load State. This means that by applying AC power to CN101 and all other plugs disconnected, this power supply will function. Simply removing P803 (Lower Right Hand Side of the Board), will cause the “AUTO” Pin 22 to go high from its normal low state allowing the Power Supply to go to full power on mode when AC Power is Supplied. *Be careful after this test and make sure the VA and VS lines have discharged before reconnecting the supply cables.*

If either Y-SUS or Z-SUS is causing the power supply to shutdown, unplug the Z-SUS. This will allow the Y-SUS to function. If you unplug the Y-SUS from the SMPS, and jump the 5V VCC line to the Y-SUS for Control Board Power the Z-SUS will function.

If the Y-SUS and Z-SUS Boards are working normal, when the SMPS comes up to full power on, “Display Panel Reset” will be visible. Shorting the Auto Pattern Gen. test points at this time should result with test patterns on the screen (if not check for 16V and VA to the X Boards).

For a “Stand-Alone” static test for the Power Supply, apply the usual 2 100Watt light Bulbs test on the Vs output line for a simulated load. If the Power Supply operates in this condition, it is assured it can maintain its output power under load.
Switch Mode Power Supply Static Test (Forcing on the SMPS in stages)

- Ground the Auto Ground (Pin 22) on P803
- AC Power Applied AC Det (Pin 18) and 5V STB (Pins 9 ~ 12) are 5V.
- 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to RL ON (Pin 19) closes relay RL101 turning on the 16V Supply
- 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to M5V_ON (Pin 21) brings the 5V VCC line high
- 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to VS_ON (Pin 20) brings the VA and VS Lines high

Remove AC between each test step
Static Test Using Light Bulbs as a Load

Unplug all connectors. Using two 100 Watt light bulbs, attach on end to Vs P801 pin 1 or 2 and the other end to chassis ground. Apply AC to CN101. If the light bulbs turn on, allow the SMPS to run for several minutes to be sure it will operate under load. If this test is successful and all other voltages are generated, you can be assured the power supply is OK.

Note: The light bulb test is not necessary for the SMPS to turn on and stay on. This SMPS will run without a load. But it is necessary to test the SMPS under a load.
**Va and Vs Adjustments**

**Panel Voltage Label**

Model: PDP50G1####

700K00G0000000.AKLGGEC

Voltage Setting: DC 5.2V

Va: 65V       Vs: 193V

NA / 195 / 135 / NA / 100

---

This Power Supply will come up and run with “NO” load.

Pull P803

Apply AC Power

Power Supply Starts.

---

Y and Z-SUS Runs “Yes”

Pull “802”

Y-SUS Runs “Yes”

Z-SUS “No”

Pull “801”

Y and Z-SUS will not Run

---

Use Chassis Ground

Use Full White Raster

---

Va TP TP Pins 6 or 7

Vs TP Pins 1 or 2

---

P801

P802

---

Vs

Va

---

LG TRAINING CENTER
CN101 and P801 Pin ID and Voltages

Voltage and Diode Test Measurements for the SMPS.
All voltages from a working unit.

<table>
<thead>
<tr>
<th>Connector</th>
<th>Pin Number</th>
<th>Standby</th>
<th>Run</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN101</td>
<td>1 and 3</td>
<td>120VAC</td>
<td>120VAC</td>
<td>480K</td>
</tr>
</tbody>
</table>

P801 CONNECTOR "SMPS Board" to "Y-SUS" P209

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>2</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
</tr>
<tr>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>.897V</td>
</tr>
<tr>
<td>10</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>.897V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
**P802 Pin ID and Voltages**

Voltage and Diode Test Measurements for the SMPS.  
All voltages from a working unit.

P802 CONNECTOR "SMPS Board" to "Z-SUS" P3

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>2</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
</tr>
<tr>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>.897V</td>
</tr>
<tr>
<td>10</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>.897V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
# P803 Connector ID, Voltages and Diode Checks

Voltage and Diode Test Measurements for the SMPS from working unit

**P803 Connector "SMPS" to "Main Board" P701**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>No Load</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>15V</td>
<td>0V</td>
<td>16V</td>
<td>16V</td>
<td>2.26V</td>
</tr>
<tr>
<td>3-4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5-6</td>
<td>12V</td>
<td>0V</td>
<td>12V</td>
<td>12V</td>
<td>2V</td>
</tr>
<tr>
<td>7-8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9-12</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>1.7V</td>
</tr>
<tr>
<td>13-16</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>17</td>
<td>5_V Det</td>
<td>.15V</td>
<td>5V</td>
<td>5V</td>
<td>1.56V</td>
</tr>
<tr>
<td>18</td>
<td>AC Det</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>2.56V</td>
</tr>
<tr>
<td>19</td>
<td>RL_On</td>
<td>0V</td>
<td>4.5V</td>
<td>0V</td>
<td>2.6V</td>
</tr>
<tr>
<td>20</td>
<td>Vs_On</td>
<td>0V</td>
<td>3.2V</td>
<td>0V</td>
<td>2.7V</td>
</tr>
<tr>
<td>21</td>
<td>M5V_ON</td>
<td>0V</td>
<td>3.2V</td>
<td>0V</td>
<td>2.6V</td>
</tr>
<tr>
<td>22</td>
<td>AUTO</td>
<td>0V</td>
<td>0V</td>
<td>5V</td>
<td>2.1V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
Using the Front Power LED for visual clues

Note: This information pertains to “Shorted” voltage lines, not Open voltage lines.

(1) STBY 5V Short or Open: Power LED does not light in stand by. No Power button function.

(2) AC Detect Open (Shorted Reset Line): Power LED is lit all Blue, 5V STBY OK. Power Button has no effect.

(3) M5V Vcc Short: Apply AC Power, goes to flashing Red and Blue. Relay Clicks “On and Off”

(4) 12V Short: Power LED is lit Red in stand by. At Power On, Power LED flashes 2 times Blue then 1 Long Blue goes back to Red. Relay clicks off immediately.

(5) 16V Short: Apply AC Power, Power LED flashes Blue. Relay clicks rapidly on and off.

(6) Va or Vs Short: Power LED is lit Red in stand by. At Power On, goes to Blue. Relay closes. Power LED blinks blue twice and 3rd blink stays blue. Relay opens, LED goes to red. Power Supply outputs 16V, 12V and 5Vcc, drops to 0V after the relay opens. No Va or Vs. With Relay closed, 330V OK, then when relay opens, it drops to 155V.
**Y-SUS BOARD SECTION (Overview)**

This Section of the Presentation will cover troubleshooting the Y-SUS Board for the Single Scan Plasma.

Upon completion of the Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and resistance test points needed for troubleshooting and alignments.

- Adjustments
- DC Voltage and Waveform Checks
- Resistance Measurements

**Operating Voltages**

<table>
<thead>
<tr>
<th>SMPS Supplied</th>
<th>VA</th>
<th>VS</th>
<th>M5V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VA</td>
<td>VS</td>
<td>5V</td>
</tr>
<tr>
<td></td>
<td>supplies the Panel Vertical Grid</td>
<td>Supplies the Panel Horizontal Grid</td>
<td>Supplies Bias to Y-SUS, Z-SUS, Control, and X Boards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Y-SUS Developed</th>
<th>-VY</th>
<th>V SET UP (Ramp)</th>
<th>V Set Dn</th>
<th>VSC</th>
<th>15V</th>
<th>5V FG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-VY</td>
<td>Ramp UP sets Pitch of the Top Ramp of the Drive Waveform</td>
<td>V Set Down sets the Pitch of the Bottom Ramp of the Drive Waveform</td>
<td>VSC (VScan) Set the amplitude of the complex waveform.</td>
<td>15V Used internally and routed out to Control board then to Z-SUS</td>
<td>5V FG Routed out to the Y-Drive Board. (Floating Ground 5V)</td>
</tr>
</tbody>
</table>
**Y-SUS Board Layout**

P206, P207 and P208 provide Logic (Drive) Signals to the Y Drive Boards.

- **P206**: To Y-Drive
  - V SET DN VR 601
  - This Voltage will read Positive
  - -VY TP R201
  - Use right side Of C213 to test Y-SUS signal
  - Y Drive TP Bottom Y-Drive Board

- **P207**: To Y-Drive
  - VSC TP R202
  - VSC ADJ R502
  - -Vy ADJ R501

- **P208**: To Y-Drive
  - Protecting Floating Gnd Power Supply Pulse
  - Floating Gnd Gnd: FS502 125V 1.5A
  - Floating Gnd 15V: FS501 125V 1.5A
  - Floating Gnd 5V: FS504 125V 1.5A

(All fuses read -90V) from chassis ground

**Model**: PDP 50G1####
**Voltage Setting**: 5.2V
**Va**: 65 **Vs**: 193
**N.A. / -195 / 135 / N.A. / 100**

- **FS201 (Vs)**: Glass 250V 4A

**P102**: Logic Signals from the Control Board

- **FS202 (5V)**: 125V 10A
- **FS701 (Va)**: 125V 10A

**P210**: 15V and Va to Center X Board

- **VS and VA Input from the SMPS**

**Voltage Label Related to Y-SUS**

- **FS503 (5V)**: 125V 5A

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Plasma Spring 2009 50PG20
Y-SUSTAIN ADJUSTMENT DETAILS (Va / Vs adjustments should already be completed)

Model: PDP 50G1####
Voltage Setting: 5.2V
Va: 65  Vs: 193
N.A / -195 / 135 / N.A. / 100

These are DC level Voltage Adjustments. Waveform just for reference

VSC ADJ VR502
-VY ADJ VR501

Sync to this tip
Y Drive Waveform

Note: These adjustments are DC voltage adjustments

This voltage actually reads Positive during DC adjustment
Vsc = 135V R502

-Vy = -195V R501
Affects Amplitude and Phase

-Vy and Vsc DC Adjustments and how they affect the Y Drive Waveform

All Adjustments in White Wash

This Voltage will read Positive
VR 8 adjust Z-Bias. It is measured from VZB Test Point to Chassis Ground, Adjust to the level indicated on the Voltage Sticker on the upper Left Hand side of the Panel.

Z Bias Test Point
Bottom of either R49 or R50

Z Bias Control
VR8

Z Bias Test Point
Bottom of either R49 or R50

VR 8 adjust Z-Bias. It is measured from VZB Test Point to Chassis Ground, Adjust to the level indicated on the Voltage Sticker on the upper Left Hand side of the Panel.
**External Trigger for Observing the Y-SUS and Z-SUS Output Waveforms**

External Triggering of the Oscilloscope allows for a Stable Display of both the Y-SUS and Z-SUS Output Waveforms regardless of how distorted the waveforms may be, allowing the wave shape and phasing to be easily examined.

To set the Oscilloscope up for External Trigger first connect a Scope Probe set on direct to the External Input Jack. Next set the External Jack for AC Coupling either positive or negative slope, use the Trigger Menu on the Scope. Finally you will need to set the Trigger Level press the Trigger View and set the level as indicated in the picture below.

**VS_DA Located on the Control Board just above the AUTO Gen Test Points may be used as an external trigger source for locking the waveform on the Oscilloscope**
**Observing the Y-Drive Signal for V-Setup**

**Fig 1 Top:** As an example of how to lock in to the Y-Drive Waveform. Figure 1 top shows the signal locked in at 4ms per/div. The signal for Vsetup is outlined within the Waveform.

**Fig 1 Lower:** At 400uSec per/division, the waveform to use for Vsetup is now isolated.

**Fig 2 Top:** At 2ms per/div. the signal for Vsetup is now easier to recognize. It is outlined within the Waveform.

**Fig 2 Lower:** At 100uSec per/division, the waveform to use for Vsetup is now isolated.

**Fig 3 Top:** At 200uSec per/div. the signal for Vsetup is now clearly visible. It is outlined within the Waveform.

**Fig 3 Lower:** At 20uSec per/division, the adjustment for Vsetup can be made.
**Observing the Y-Drive Signal for V-Setdown**

**Fig 1 Top:** As an example of how to lock in to the Y-Drive Waveform. Figure 1 top shows the signal locked in at 4ms per/div. The signal for Vsetdn is outlined within the Waveform.

**Fig 1 Lower:** At 400uSec per/division, the waveform to use for Vsetdn is now isolated.

**Fig 2 Top:** At 2ms per/div. the signal for Vsetdn is now easier to recognize. It is outlined within the Waveform.

**Fig 2 Lower:** At 100uSec per/division, the waveform to use for Vsetdn is now isolated.

**Fig 3 Top:** At 200uSec per/div. the signal for Vsetdn is now clearly visible. It is outlined within the Waveform.

**Fig 3 Lower:** At 20uSec per/division, the adjustment for Vsetdn can be made.

---

V SET DOWN set too high can cause shut down. Remove LVDS cable to allow set to remain on and realign Set-Dn

---

Area to be adjusted

Zoomed out
Y-Drive Waveform Test Point (Lower Y Drive Board) Blow Up

BOTTOM Y-DRIVE PWB WAVEFORM TEST POINT

Bottom of lower Y-Drive Board
V-Set Up and V-Set Down Adjustments

Observe the Picture while making these adjustments. Normally, they do not have to be done. Always adjust if Y-SUS Board Replaced.

Observe the "Peak" Portion of the waveform

Observe the "Time" Portion of the waveform

Note: Vs, Va, Vsc, -Vy adjustments should already be complete.

V SET UP
VR 602

V SET DOWN
VR 601

V SET DOWN set too high can cause shut down.

V SET UP (RAMP) / V SET-Down Waveform

Bottom Y-Drive PWB WAVEFORM TEST POINT

Bottom of lower Y-Drive Board

RAMP
Panel Waveform Adjustment

The center begins to wash out and arc due to **Vset UP**. Peeking too late and alters the start of the **Vset DN** phase.

Very little alteration to the picture, the wave form indicates a distorted **Vset UP**. The peek widens due to the **Vset UP** peeking too quickly.
V Set Dn Too High or Low

Panel Waveform Adjustment

NOTE: If Vset DN too high, this set will go to excessive bright, then shutdown. To correct, remove the LVDS from control Board and make necessary adjustments.

All of the center washes out due to increased Vset_DN time.

The center begins to wash out and arc due to decreased Vset DN time.
V Set Dn Too High Causing Shutdown

The above image is the Set Down signal set for Normal operation at 100uSec

NOTE: If Vset DN too high, this set will go to excessive bright, then shutdown. To correct, remove the LVDS from Control Board and make necessary adjustments.

The above image is the Set Down signal set to High (Approx. 120uSec) This is the Shutdown Threshold level. Any higher, the set will shut down.

Notice that the amplitude of the Set Down (Bottom portion) peak begins to decrease.
Panel Waveform Adjustment

When VSC is too high

Both of these are DC adjustments

When VSC is too low

The image will display some distortion in a quickly changing image.
Plasma Spring 2009 50PG20

Y-SUS Block Diagram

Power Supply Board SMPS

- Generates Vsc and -Vy from Vs by transformer.
- Also controls Ramp up/down.

Control Board

- Distributes 5V and 15V

Receive M5V, Va, Vs from SMPS

- Creates 15V from M5V
- Creates Floating Ground 5V from M5V for Y Drive Board

Components generate Sustain Waveform

- Distributes 15V and VA

FETs amplify the Sustain Waveform

Transfer Waveform to Y Drive Boards

Display Panel

Center X Board

- Distributes 15V and VA to Left and Right X Boards

Z-SUS Board

- Distributed 15V

Logic signals needed to generate drive waveform

SMPS

FETs amplify the Sustain Waveform

NO IPMs

Distributes Floating Ground 5V

Distributes 5V and 15V

Distributes 15V

Distributes 15V and VA to Left and Right X Boards
# Y-SUS P102 Plug Information Test Points 1 through 10

Voltage and Diode Test Measurements for the Y-SUS Board

This Chart relates to the Labeling shown on the silk screening shown on the Control Board

## P102 CONNECTOR "Y-SUS Board" to P111 "Control" (1 OF 2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLK</td>
<td>0V</td>
<td>3.2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>2</td>
<td>STB</td>
<td>0V</td>
<td>0.76V</td>
<td>2.87V</td>
</tr>
<tr>
<td>3</td>
<td>OSC1</td>
<td>0V</td>
<td>0V</td>
<td>2.87V</td>
</tr>
<tr>
<td>4</td>
<td>OSC2</td>
<td>0V</td>
<td>3V</td>
<td>2.87V</td>
</tr>
<tr>
<td>5</td>
<td>DATA</td>
<td>0V</td>
<td>0.6V</td>
<td>2.87V</td>
</tr>
<tr>
<td>6</td>
<td>SUS_DN</td>
<td>0V</td>
<td>0V</td>
<td>2.87V</td>
</tr>
<tr>
<td>7</td>
<td>SUS_UP</td>
<td>0V</td>
<td>2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>8</td>
<td>ER_DN</td>
<td>0V</td>
<td>1.2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>9</td>
<td>ER_UP</td>
<td>0V</td>
<td>2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>10</td>
<td>SET_UP</td>
<td>0V</td>
<td>0.26V</td>
<td>2.87V</td>
</tr>
</tbody>
</table>

P102 This connector is a little confusing in its labeling. This is a 50 Pin Connector. Pin 1 here is Pin 50 on Control Board.

Example: Labels are on Control Board silk screening. However, this connector has many more pins than shown.

In other words, there is a ground between each pin.

Roughly the first 39 pins dedicated to Y-SUS.

Pins 40~44 are 5V B+ to the Control Board.

Pins 45~46 are not used.

Pins 47~50 is 16V output. To Control board then to Z-SUS.

Diode Mode readings taken with all connectors removed.
# Y-SUS P102 Plug Information Test Points 11 through 19

Voltage and Diode Test Measurements for the Y-SUS Board

*This Chart relates to the Labeling shown on the silk screening shown on the Control Board*

## P102 CONNECTOR "Y-SUS Board" to P111 "Control" (2 OF 2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>SET_DN</td>
<td>0V</td>
<td>0.2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>12</td>
<td>PASS_TOP</td>
<td>0V</td>
<td>0.2V</td>
<td>2.87V</td>
</tr>
<tr>
<td>13</td>
<td>DELTA_VY</td>
<td>0V</td>
<td>0.16V</td>
<td>2.87V</td>
</tr>
<tr>
<td>14</td>
<td>DET_LEVEL</td>
<td>0V</td>
<td>0V</td>
<td>2.87V</td>
</tr>
<tr>
<td>15</td>
<td>SLOPE_KEY</td>
<td>0V</td>
<td>0V</td>
<td>2.87V</td>
</tr>
<tr>
<td>16</td>
<td>SET_UP</td>
<td>0V</td>
<td>1.9V</td>
<td>2.87V</td>
</tr>
<tr>
<td>17</td>
<td>SET_DN</td>
<td>0V</td>
<td>1.4V</td>
<td>2.87V</td>
</tr>
<tr>
<td>18</td>
<td>X_ER</td>
<td>0V</td>
<td>2.9V</td>
<td>2.87V</td>
</tr>
<tr>
<td>19</td>
<td>Y_ENABLE</td>
<td>0V</td>
<td>0.6V</td>
<td>2.87V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.

This Chart relates to the Labeling shown on the silk screening shown on the Control Board.

P102 This connector is a little confusing in its labeling.

This is a 50 Pin Connector.
Pin 1 here is Pin 50 on Control Board.

Example: Labels are on Control Board silk screening.

However, this connector has many more pins than labels.

In other words, there is a ground between each pin.

Roughly the first 39 pins dedicated to Y-SUS.

Pins 40~44 are 5V B+ to the Control Board.

Pins 45~46 are not used.

Pins 47~50 is 16V output. To Control board then to Z-SUS.

---

LG TRAINING CENTER

Plasma Spring 2009 50PG20
### Y-SUS P209 Plug Information

Voltage and Diode Test Measurements for the Y-SUS Board

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>2</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
</tr>
<tr>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>0.897V</td>
</tr>
<tr>
<td>10</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>0.897V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
**Y-SUS P210 Plug Information**

Voltage and Diode Test Measurements for the Y-SUS Board

P210 CONNECTOR "Y-SUS Board" to P242 "X-Drive Center"

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Va_C</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>2</td>
<td>Va_C</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>VPP_Out_XR</td>
<td>0V</td>
<td>62.4V</td>
<td>OL</td>
</tr>
<tr>
<td>4</td>
<td>VPP_Out_XR</td>
<td>0V</td>
<td>62.4V</td>
<td>OL</td>
</tr>
<tr>
<td>5</td>
<td>VPP_Out_XL</td>
<td>0V</td>
<td>62.3V</td>
<td>OL</td>
</tr>
<tr>
<td>6</td>
<td>VPP_Out_XL</td>
<td>0V</td>
<td>62.3V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>VPP_Out</td>
<td>0V</td>
<td>63.3V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>VPP_Out</td>
<td>0V</td>
<td>63.3V</td>
<td>OL</td>
</tr>
<tr>
<td>9</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>10</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>11</td>
<td>+15V</td>
<td>0V</td>
<td>15.9V</td>
<td>0.95V</td>
</tr>
<tr>
<td>12</td>
<td>+15V</td>
<td>0V</td>
<td>15.9V</td>
<td>0.95V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
Y DRIVE BOARD SECTION

Y-Drive Board works as a path supplying the Sustain and Reset waveforms which are made in the Y-SUSTAIN B/D and sent to the Panel through SCAN DRIVER IC’s.

The Y Drive Boards supply a waveform which selects the horizontal electrodes sequentially.

* 50PG20 uses 8 DRIVER ICs on 2 Boards (TOP, BOTTOM: 4 each)
50G1 Panel has 768 Vertical lines of resolution (Horizontal Grids determine V Resolution)
4 Ribbons (Tabs) separated into 2 = 192 grids per tab.
8 Ribbon inputs to 4 Tabs = 96 lines per ribbon input
2 Buffers per Ribbon input = 96 lines per ribbon input
Y Drive Board Layout

5 Volts (Floating Ground) 5VFG and Logic Signals from Y-SUS Board are supplied to the Top Drive Board on Connector P100. 5 Volts (Floating Ground) 5VFG input also enters the Bottom Y Drive Board at P200.
**Y Drive to Flexible Ribbon (Panel)**

To remove the Ribbon Cable from the connector first carefully lift the Locking Tab from the back and tilt it forward (lift from the outside edge as shown in Fig 1). Lift up the entire Ribbon Cable gently to release the Tabs on each end. Gently slide the Ribbon Cable free from the connector.

To reinstall the Ribbon Cable carefully slide it back into the slot see (Fig 2), be sure the Tab is seated securely and press the Locking Tab back to the locked position see (Fig 3).
The Ribbon Cable is clearly improperly seated into the connector. You can tell by observing the linearity.

Note the cable is crooked. In this case the Tab on the Ribbon cable was improperly seated at the bottom. This can cause bars, lines, intermittent lines abnormalities in the picture.

Remove the ribbon cable and re-seat it correctly.
**Y Drive Upper Troubleshooting**

Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>Open</td>
</tr>
<tr>
<td>DC1</td>
<td>Open</td>
</tr>
<tr>
<td>DC2</td>
<td>Open</td>
</tr>
<tr>
<td>LE</td>
<td>Open</td>
</tr>
<tr>
<td>CLK</td>
<td>Open</td>
</tr>
<tr>
<td>Data-Out</td>
<td>Open</td>
</tr>
<tr>
<td>+5V</td>
<td>Open</td>
</tr>
<tr>
<td>+5V</td>
<td>Open</td>
</tr>
</tbody>
</table>

- TEST POINT:
  - Data
  - DC1
  - DC2
  - LE
  - CLK
  - Data-Out

- READING:
  - Open
  - Open
  - Open
  - Open
  - Open

---

**Data-OUT**

- Open

**+5V**

- Open
- Open

---

**POSITIVE**

**NEGATIVE**
Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>.78 V</td>
</tr>
<tr>
<td>DC1</td>
<td>.63 V</td>
</tr>
<tr>
<td>DC2</td>
<td>.63 V</td>
</tr>
<tr>
<td>LE</td>
<td>.63 V</td>
</tr>
<tr>
<td>CLK</td>
<td>.63 V</td>
</tr>
<tr>
<td>Data-Out</td>
<td>.73 V</td>
</tr>
<tr>
<td>+5V</td>
<td>.53 V</td>
</tr>
<tr>
<td>+5V</td>
<td>.53 V</td>
</tr>
</tbody>
</table>
**Y Drive Upper Troubleshooting**

Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

**Scan Drive**

Floating Ground

**READING**

0.659V

**Scan Drive**

Floating Ground

**READING**

OPEN
**Y Drive Lower Troubleshooting**

Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>Open</td>
</tr>
<tr>
<td>+5V</td>
<td>Open</td>
</tr>
<tr>
<td>DATA</td>
<td>Open</td>
</tr>
<tr>
<td>DC2</td>
<td>Open</td>
</tr>
<tr>
<td>DC1</td>
<td>Open</td>
</tr>
<tr>
<td>LE</td>
<td>Open</td>
</tr>
<tr>
<td>CLK</td>
<td>Open</td>
</tr>
</tbody>
</table>
Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>.52V</td>
</tr>
<tr>
<td>+5V</td>
<td>.52V</td>
</tr>
<tr>
<td>DATA</td>
<td>.78V</td>
</tr>
<tr>
<td>DC2</td>
<td>.61V</td>
</tr>
<tr>
<td>DC1</td>
<td>.62V</td>
</tr>
<tr>
<td>LE</td>
<td>.62V</td>
</tr>
<tr>
<td>CLK</td>
<td>.62V</td>
</tr>
</tbody>
</table>
**Y Drive Lower Troubleshooting**

Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

**Reading OPEN “OPEN”**
- Scan Drive: Floating Ground

**Reading 0.66V**
- Scan Drive: Floating Ground
Y Drive Buffer Troubleshooting

YOU CAN CHECK ALL 8 BUFFER ICs USING THIS PROCEDURE (4 per/Board)

BACK SIDE OF Y-DRIVE Board

Buffer IC (Floating Gnd) OUTPUT LUGS

- Any of these output lugs can be tested.
- Look for shorts indicating a defective Buffer IC

Using the “Diode Test” on the DVM, check the pins for shorts or abnormal loads.

RED LEAD ON BUFFER IC
BLACK LEAD ON “ANY” OUTPUT LUG.
READING 0.73 V

Indicated by Red outline

BLACK LEAD ON BUFFER IC
RED LEAD ON “ANY” OUTPUT LUG.
READING “OPEN”

Indicated by Red outline

48 + 48
96 per FPC
4 FPC 2 sections per FPC
96 X 8 = 768
Troubleshooting the Z-SUS Board

This Section of the Presentation will cover troubleshooting the Z-SUS Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and resistance test points needed for troubleshooting and alignment.

**Locations**
- DC Voltage and Waveform Test Points
- Z BIAS Alignment
- Resistance Test Points

**Operating Voltages**
- SMPS Supplied
  - VA (Not used)
  - VS
  - M5V

Y-SUS Supplies 16V To Control
Control Supplies 16V To Z-SUS

Developed on Z-SUS Z Bias
Z-SUS SECTION

Supply Voltages from the Power Supply, VA, VS, and M5V

Z Bias Control VR8

FS1 (Vs) 250V 4A

FS2 (5V) 125V 10A

FS3 (16V) 125V 1.5A

16V and Logic Signals from the Control Board

Discrete Components (No IPMs)

Discrete Components (No IPMs)

Z Bias Test Point Bottom of either R49 or R50

To Z-SUB Board

Model: PDP 50G1####
Voltage Setting: 5.2V
Va: 65 Vs: 193
N.A. / -195 / 135 / N.A. / 100

Z Bias

Voltage Label related to Z-SUS

Service Bulletin Related to this Board. Please read first before ordering. Related to Gender of plugs P4 and P5.

Discrete Components (No IPMs)

Service Bulletin Related to this Board. Please read first before ordering. Related to Gender of plugs P4 and P5.
The Z-SUS Board provides the amplified SUSTAIN and ERASE PULSE for generating SUSTAIN discharge in the panel. It receives LOGIC signals from the CONTROL Board.

This waveform is supplied to the panel through the Z-SUB board then to the FPC (Flexible Printed Circuit).

Z-Bias is a “DC” adjustment using a DVM.

The effects of this adjustment can be observed on the scope looking at the Z-SUS output.

Note: Any cap can be used on the Z-SUB board. Bottom and top caps use bottom leg. Center cap, use upper leg.

Use Caution, legs are close together.

52V AC (RMS) use just as a check to see if Z-SUS is producing a output.

Scope probe connected to C404 top leg.

Note: This adjustment is a DC voltage adjustment

Vzb voltage 100V ± 1V

(Vzb) Z Bias VR8
VR 8 adjust Z-Bias. It is measured from VZB Test Point to Chassis Ground, Adjust to the level indicated on the Voltage Sticker on the upper Left Hand side of the Panel.
**Z-SUS Board Understanding**

**Input Voltages from the SMPS Board**

- **VS** VS is input at P3 pins 1 and 2 and supplied to the driver IC circuit.
- **VA** VA is not used on the Z-SUS Board.
- **M5V** 5V in input P3 pins 9 and 10. It is used to Bias the circuits on the Z-SUS Board.

**Input Voltages from the Control Board**

- **15.9V** 15.9V enters Pins 1 and 2 of P2 connector. Used in the amplification of Z drive waveform.

**Voltages Developed on the Z-SUS Board**

- **Z Bias** Z Bias Voltage is used to Bias the output circuits driving the Sustain and Erase Pulses, removing previous images from the PDP. Z-bias is measured from the Vzb TP on the Z-SUS Board and adjusted by VZB Adj.
Z-SUS Basic Block Diagram

Y-SUS Board
- Distributes M5V and 15V

Control Board
- Distributes Logic Signals and 15V

Power Supply Board - SMPS
- Distributes M5V, VA, and VS
  Note: VA not used by Z-SUS board.

Z-SUS BOARD

Z-SUS
- Receive M5V, VA, VS

Drive Circuit amplifies Z-Sustain waveform

NO IPMs

FETs amplify Drive waveform

- Via FPC (flexible printed circuit)

Display Panel
Z-SUS Noise Dampening Pads (Back Side)

Make sure the replacement Board comes with the noise reducing pads.
If they do not, contact parts and advise.
You should order a new Board.

EBR3837450
Original comes with insulation strips,
(Noise Prevention)
## Z-SUS Connector P2 Voltages and Diode Check

### Voltage and Diode Test Measurements

**P2 CONNECTOR "Z-SUS Board" to P163 "Control Board"**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SUS-DN</td>
<td>0V</td>
<td>16V</td>
<td>2.69V</td>
</tr>
<tr>
<td>2</td>
<td>SUS-UP</td>
<td>0V</td>
<td>16V</td>
<td>2.69V</td>
</tr>
<tr>
<td>3</td>
<td>ER-DN</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>4</td>
<td>ZBIAS</td>
<td>0V</td>
<td>0.48V</td>
<td>2.85V</td>
</tr>
<tr>
<td>5</td>
<td>ZB-CON</td>
<td>0V</td>
<td>0.27V</td>
<td>2.85V</td>
</tr>
<tr>
<td>6</td>
<td>ER-UP</td>
<td>0V</td>
<td>0.1V</td>
<td>2.85V</td>
</tr>
<tr>
<td>7</td>
<td>ENABLE</td>
<td>0V</td>
<td>0.06V</td>
<td>2.85V</td>
</tr>
<tr>
<td>8</td>
<td>none</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>none</td>
<td>0V</td>
<td>0V</td>
<td>2.85V</td>
</tr>
<tr>
<td>10</td>
<td>none</td>
<td>0V</td>
<td>1.93V</td>
<td>2.85V</td>
</tr>
<tr>
<td>11</td>
<td>none</td>
<td>0V</td>
<td>2.66V</td>
<td>0.66V</td>
</tr>
<tr>
<td>12</td>
<td>none</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.

Note: Pin 1 is actually Pin 12 on the Control Board. This is because the pin numbers are inverted from the Control Board.
**Z-SUS Connector P3 Voltages and Diode Check**

Voltage and Diode Test Measurements for the Z-SUS Board

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>2</td>
<td>Vs</td>
<td>0V</td>
<td>192V</td>
<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
<td>nc</td>
</tr>
<tr>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>Gnd</td>
<td>0V</td>
<td>0V</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>Va</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>1.3V</td>
</tr>
<tr>
<td>10</td>
<td>M5V</td>
<td>0V</td>
<td>5V</td>
<td>1.3V</td>
</tr>
</tbody>
</table>

Note: 
Va is not Used on the Z-SUS board, It is an Open connection

Diode Mode readings taken with all connectors removed.
This Section of the Presentation will cover troubleshooting the Control Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and resistance test points needed for troubleshooting.

- DC Voltage and Waveform Test Points
- Resistance Test Points

**Signals**
- Main Board Supplied
- LVDS Signal

**Operating Voltages**
- Y-SUS Supplied
  - 5V VCC
- Developed on the Control board
  - 1.8V
  - (2) 3.3V

**Y-SUS Supplied**
- 15V supplied to Control board from the Y-SUS board.
- But routed through Control board to Z-SUS.
- 15V not used by the Control board.
With the unit on. If none of D15, 16, 17 are illuminated. Check supplies to the PCB. If they are present replace the Control PCB.

TP VS-DA is a quick check for voltage to the Control PWB. 3V - 3.3V

Short across the two points labeled Auto Gen to generate a test pattern.

* If the complaint is no video and shorting the points (AutoGen) causes video to appear suspect the Digital PCB.
Control Board Quick Check

For quick Board test. (All Board connectors Disconnected).

Jump 5V from Power Supply to IC121 Pin 1.
If the Temp LED lights,
Pretty much guaranteed, Board is OK.
But check FL111 and FL112 to be sure they are OK.

When the Television has a problem related to;
1) Shutdown caused by Main Board
2) No Picture
This can be checked by the following.
(1) Disconnect the Main Board from all connectors. Apply AC power.
Since P803 is not connected, the set will come on. Short the two pins on the Auto Test Pattern lands.
If there is a picture of cycling colors, the Y-SUS, Y-Drive, Z-SUS, Power Supply, Control Boards and Panel are all OK.
Same test for (2) to tell if the No Video is caused by the Main Board.

If testing the Z-SUS for functionality when the Y-SUS isn’t running. Tap the 16V from pin 1 or 2 of P701 or P803 (removed from Main Board) and jump to pin 12 of P163. Jump 5V to 5V in on Control Board. Confirm a good waveform output from Z-SUS.
Check the output of the Oscillator package. The frequency of the sine wave is 50 MHz. Missing this clock signal can halt operation of the unit.
LVDS

Video Signals from the Main Board to the Control Board are referred to as Low Voltage Differential Signals or LVDS. Their presence can be confirmed with the Oscilloscope by monitoring the LVDS signals with no input signal selected while pressing the Menu Button “on” and “off” with the Remote Control or Keypad. Loss of these Signals would confirm the failure is on the Main Board!

Example of Normal Signals measured at 200mv/cm at 5µs/cm.

Use “Only” Component Input. Select by remote by guess since there’s no video. Toggle between Menu and Menu Off to see difference in waveform.
Control Board Signal Block

The Control Board supplies Video Signals to the TCP (Tape Carrier Package) ICs. If there is a bar defect on the screen, it could be a Control Board problem.

Control Board to X Board Address Signal Flow

This Picture shows Signal Flow Distribution to help determine the failure depending on where the it shows on the screen.

Basic Diagram of Control Board

IC201

MCM

CONTROL Board

Resistor Array

16 line

X-DRIVE Board

PANEL

256 X 16 = 4096

4096 / 3 = 1365 (R G B)

Vertical Grids = Horizontal Resolution

128 Lines per Buffer

256 Lines output Total per TCP
## Control Connector P163 Voltages and Resistance

### Voltage and Resistance Measurements

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ZSUS-DN</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>2</td>
<td>ZSUS-UP</td>
<td>0V</td>
<td>2.7V</td>
<td>1.28V</td>
</tr>
<tr>
<td>3</td>
<td>Z-ER-DN</td>
<td>0V</td>
<td>1.9V</td>
<td>1.28V</td>
</tr>
<tr>
<td>4</td>
<td>Z-ER-UP</td>
<td>0V</td>
<td>0V</td>
<td>1.28V</td>
</tr>
<tr>
<td>5</td>
<td>VZD-SEL</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>Z-BIAS</td>
<td>0V</td>
<td>0.06V</td>
<td>1.28V</td>
</tr>
<tr>
<td>7</td>
<td>Z-ENABLE</td>
<td>0V</td>
<td>0.1V</td>
<td>1.28V</td>
</tr>
<tr>
<td>8</td>
<td>none</td>
<td>0V</td>
<td>0.27V</td>
<td>1.28V</td>
</tr>
<tr>
<td>9</td>
<td>none</td>
<td>0V</td>
<td>0.48V</td>
<td>1.28V</td>
</tr>
<tr>
<td>10</td>
<td>none</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>11</td>
<td>15V</td>
<td>0V</td>
<td>15.9V</td>
<td>1.15V</td>
</tr>
<tr>
<td>12</td>
<td>15V</td>
<td>0V</td>
<td>15.9V</td>
<td>1.15V</td>
</tr>
</tbody>
</table>

Diode Mode Readings taken with all connectors removed.

Pin configuration is inverted on the Z-SUS PWB.
Control Connector P111 to P102 on the Y-SUS Slide 1 of 3 Label Explanation

LABELS P160 is a 60 Pin but the 50PG20 uses only 50 Pins P111 but P111 is covered in Silicone so P160 pins are used for description below.

P160 This connector is a little confusing in its labeling.
This is a 60 Pin Connector to the Y-SUS board.
Example: The Labels outlined are on the silk screening.
However, this connector has many more pins than the Labels show.
Actual: Pin 1 through 10 of P160 are not used in this model. Pins 17 through 21 are +5V.
Pins 23 through 60 are the Y-SUS drive signals. There is a ground between each pin.
Roughly 39 pins dedicated to Y-SUS beginning at pin 23.
Pin 1 on the Control Board P111 is pin 50 on the Y-SUS Board P102.

FL111 and FL112 5V Fuse (Actually EMI Filters)

P111 CONNECTOR LABELS
(19 here is 49 on the connector)
P111 CONNECTOR “Control PWB” to P102 “Y-SUS PWB”

Pins 17, 18, 19, 20 and 21 Deliver +5V to the Control PWB from the Y-SUS. Easy to check using 20th hash mark.

P111 pins 1, 2, 3 and 4 are the 15.9V from the Y-SUS but they are covered in silicone. The Control board simply routes this voltage out P163 pins 11 and 12.

No problem making a voltage reading since 17~21 connectors are the same voltage.
### Control Connector P111 Slide 3 of 3 Voltage Readings and Diode Check

**P111 (P160) CONNECTOR “Control Board” to P102 “Y-SUS Board”**

#### Diode Mode Readings with the PCB Disconnected.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>5V</td>
<td>O/V</td>
<td>4.75V</td>
<td>1.17V</td>
</tr>
<tr>
<td>22</td>
<td>n/c</td>
<td>n/c</td>
<td>n/c</td>
<td>OL</td>
</tr>
<tr>
<td>23</td>
<td>Y-Enable</td>
<td>0V</td>
<td>0.6V</td>
<td>1.37V</td>
</tr>
<tr>
<td>24</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>25</td>
<td>X_ER</td>
<td>0V</td>
<td>2.9V</td>
<td>1.36V</td>
</tr>
<tr>
<td>26</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>27</td>
<td>Set_DN_2</td>
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<td>1.4V</td>
<td>1.37V</td>
</tr>
<tr>
<td>28</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>29</td>
<td>SET_UP</td>
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<td>1.9V</td>
<td>1.37V</td>
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<tr>
<td>30</td>
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<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
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<td>SLOPE_RETE</td>
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</tr>
<tr>
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<td>Gnd</td>
<td>Gnd</td>
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<td>DET_LEVEL</td>
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<td>Gnd</td>
<td>Gnd</td>
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<td>DELTA_Vy</td>
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<td>0.16V</td>
<td>1.37V</td>
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<td>36</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>37</td>
<td>PASS_TOP</td>
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</tr>
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<td>38</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
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<td>Set_DN2</td>
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<td>0.2V</td>
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<td>40</td>
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<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>41</td>
<td>SET_UP</td>
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<td>0.26V</td>
<td>1.37V</td>
</tr>
<tr>
<td>42</td>
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<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>43</td>
<td>ER_UP</td>
<td>0V</td>
<td>2V</td>
<td>1.37V</td>
</tr>
<tr>
<td>44</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>45</td>
<td>ER_DN</td>
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<td>1.2V</td>
<td>1.37V</td>
</tr>
<tr>
<td>46</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>47</td>
<td>SUS_UP</td>
<td>0V</td>
<td>2V</td>
<td>1.37V</td>
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<tr>
<td>48</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>49</td>
<td>SUS_DN</td>
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<td>0V</td>
<td>1.37V</td>
</tr>
<tr>
<td>50</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>51</td>
<td>DATA</td>
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<td>0.6V</td>
<td>1.37V</td>
</tr>
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<td>52</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>53</td>
<td>OSC2</td>
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<td>3V</td>
<td>1.37V</td>
</tr>
<tr>
<td>54</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
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<td>55</td>
<td>OSC1</td>
<td>0V</td>
<td>0V</td>
<td>1.37V</td>
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<tr>
<td>56</td>
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<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
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<td>57</td>
<td>STB</td>
<td>0V</td>
<td>0.76V</td>
<td>1.37V</td>
</tr>
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<td>58</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>59</td>
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</tr>
<tr>
<td>60</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

#### Not Used

Pin 10 Below is actually Pin 1 of P111
Pins are very close together read voltages safely.

**Note:** Pin 1, 2, 3, 4 and 5 of P111 are actually 15.9V from the Y-SUS, but they do not connect to P160 Pins 11, 12, 13, 14 and 15.
Control Board Plug P121 “LVDS Plug” Location and Explanation

Pins are very close together making voltage checks risky. Use P302 on the Main Board for checks.

CONTROL Board
Shows connector location on the Control Board
# Control Board Plug P121 “LVDS Plug” Voltage and Diode Check

## P121 Connector Odd Pins "Control" to P302 "Main"

<table>
<thead>
<tr>
<th>Pin</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>3</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
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<tr>
<td>5</td>
<td>0V</td>
<td>1.19V</td>
<td>1.10V</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>1.26V</td>
<td>1.10V</td>
</tr>
<tr>
<td>9</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>11</td>
<td>0V</td>
<td>1.15V</td>
<td>1.10V</td>
</tr>
<tr>
<td>13</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>15</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>17</td>
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<td>1.10V</td>
</tr>
<tr>
<td>19</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>21</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>23</td>
<td>0V</td>
<td>5.29V</td>
<td>1.10V</td>
</tr>
<tr>
<td>25</td>
<td>0V</td>
<td>1.2V</td>
<td>1.10V</td>
</tr>
<tr>
<td>27</td>
<td>0V</td>
<td>3.29V</td>
<td>1.37V</td>
</tr>
<tr>
<td>29</td>
<td>0.89V</td>
<td>3.29V</td>
<td>OL</td>
</tr>
<tr>
<td>31</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

## P121 Connector Even Pins "Control" to P302 "Main"

<table>
<thead>
<tr>
<th>Pin</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>4</td>
<td>0V</td>
<td>1.26V</td>
<td>1.10V</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
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<td>Gnd</td>
</tr>
<tr>
<td>8</td>
<td>0V</td>
<td>1.19V</td>
<td>1.10V</td>
</tr>
<tr>
<td>10</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>12</td>
<td>0V</td>
<td>1.26V</td>
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</tr>
<tr>
<td>14</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>16</td>
<td>0V</td>
<td>0V</td>
<td>1.10V</td>
</tr>
<tr>
<td>18</td>
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<tr>
<td>24</td>
<td>0V</td>
<td>1.26V</td>
<td>1.10V</td>
</tr>
<tr>
<td>26</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>28</td>
<td>0.89V</td>
<td>3.29V</td>
<td>OL</td>
</tr>
<tr>
<td>30</td>
<td>0V</td>
<td>0V</td>
<td>OL</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
Control Board Plug P151-P161-P163 Voltage Reading Notes

As can be seen from the Picture below, these connectors are protected by coating and are too close together for safe readings.

UNABLE TO READ THESE CONNECTORS, THEY ARE COVERED IN SILICON. You can poke through with a needle tip probe.
**X Drive Boards (Also known as: A-BUS Boards)**

Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed. After a very short time, these ICs will begin to self destruct due to overheating.

TCP IC’s shown are part of the Ribbon Cable
TCP = “Taped Carrier Package”
X Drive Left Board

Left X Board

Center X Board

Right X Board

TCP IC
TCP (Tape Carrier Package)

TCP Connector Removal

Lift up the lock as shown by arrows. (The Lock can be easily broken. It needs to be handled carefully.)

Pull TCP apart as shown by arrow. (TCP Film can be easily damaged. Handle with care.)
TCP (Tape Carrier Package)

TCP ICs supply RGB 16 (X2) bit signal to the Panel by connecting the PAD Electrode of the PANEL with the X Board.

256 lines per TCP. 16 TCPs total. (6x6x4)
4096 Total Vertical Lines divided by 3 (RGB per/pixel)
1365 Horizontal Pixel Count
TCP Testing

ANY X BOARD TO TCP
P101~P104 or P201~P206 or P301~P306

Typical Reading 0.65V
Opposite reads open

(+ On any Gnd
10,11,12,13,14,27,28,29,30,37,38,39,40,41
9,30,37,38,39,40,41

(- On any Va or 3.3V
(4,5,6,7) or (44,45,46,47)
Or (32, 33)

Typical Reading 0.65V
Opposite reads open

Flexible Printed Ribbon Cable to TCP IC
**X Board Voltage Distribution**

**RGB Address Signals out to TCP IC’s**

**NOTE:**
VPP will meter slightly lower than VA. VPP is used to control current draw depending on color presence for that TCP to display.
Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed. After a very short time, these ICs will begin to self destruct due to overheating.

This damaged TCP can,
\(a\) Cause the Power Supply to shutdown
\(b\) Generate abnormal vertical bars
\(c\) Cause the entire area driven by the TCP to be “All White”
\(d\) Cause the entire area driven by the TCP to be “All Black”
\(e\) Cause a “Single Line” defect
**X Drive Connector P233, P121, P232, P241, and P331**

These connectors on the X-Drive Boards would be impossible to read safely. Some are even Silicon covered which prevents the ability to read.

With these connectors, Check carefully for their seating accuracy. Improper seating can lead to many different symptoms. Lines, bars, noise, ect…. All Vertical in nature.

**P232 (X-Drive R)** receives 3.3V. Easy to check, use the pad for pins 50, 51, and 52.

**P232 (X-Drive C)** receives 3.3V for the X-Boards. Easy to check, use the pad for pins 10, 11, and 12.
### Voltage and Diode Test Measurements for the X Drive Board

**P211 CONNECTOR "X Center Board" to P311 "X-Left"**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VPP_Out</td>
<td>.15V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
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<td>OL</td>
</tr>
<tr>
<td>3</td>
<td>VPP_Out</td>
<td>.15V</td>
<td>61.1V</td>
<td>OL</td>
</tr>
<tr>
<td>4</td>
<td>VPP_Out</td>
<td>.15V</td>
<td>62.2V</td>
<td>OL</td>
</tr>
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<td>6</td>
<td>+15V_R</td>
<td>0V</td>
<td>16V</td>
<td>2.91V</td>
</tr>
<tr>
<td>7</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
</tbody>
</table>

VPP_Out Voltages vary with video content

Diode Mode readings taken with all connectors removed.
### X Drive Center Connector P311 Voltages and Diode Check

Voltage and Diode Test Measurements for the X Drive Board

P311 CONNECTOR "X Left Board" to P211 "X-Center"

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>2</td>
<td>Gnd</td>
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<td>Gnd</td>
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<tr>
<td>3</td>
<td>+15V_R</td>
<td>0V</td>
<td>16V</td>
<td>OL</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>0V</td>
<td>0V</td>
<td>OL</td>
</tr>
<tr>
<td>5</td>
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<td>65V</td>
<td>OL</td>
</tr>
</tbody>
</table>

VPP_Out Voltages vary with video content

Diode Mode readings taken with all connectors removed.
**X Drive Center Connector P242 Voltages and Diode Check**

Voltage and Diode Test Measurements for the X Drive Board

![X Drive Center Connector P242](image)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
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<td>Va_C</td>
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<td>65V</td>
<td>OL</td>
</tr>
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<td>2</td>
<td>Va_C</td>
<td>0V</td>
<td>65V</td>
<td>OL</td>
</tr>
<tr>
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<td>0V</td>
<td>62.4V</td>
<td>OL</td>
</tr>
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<td>62.4V</td>
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</tr>
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</tr>
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</tr>
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<td>OL</td>
</tr>
<tr>
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<td>VPP_Out</td>
<td>0V</td>
<td>63.3V</td>
<td>OL</td>
</tr>
<tr>
<td>9</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>10</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>11</td>
<td>+15V</td>
<td>0V</td>
<td>15.9V</td>
<td>OL</td>
</tr>
<tr>
<td>12</td>
<td>+15V</td>
<td>0V</td>
<td>15.9V</td>
<td>OL</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
**Left, Right and Center X Drive Removal**

After removing the back cover, Main Board is lifted out of the way, 15 screws removed from heat sink covering TCPs and heat sink removed, the X-Drive Boards can be removed.

Gently pry the locking mechanism upward on all TCP connectors P101 ~ P104 P201~P206 P301~P306
This Section of the Presentation will cover troubleshooting the Main Board. Upon completion of this Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and resistance test points needed for troubleshooting and alignments.

- DC Voltage and Waveform Checks
- Resistance Measurements

### Operating Voltages

<table>
<thead>
<tr>
<th>SMPS Supplied</th>
<th>5V</th>
<th>12V</th>
<th>16V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed on the Main Board</td>
<td>2.5V</td>
<td>3.3V (2)</td>
<td>5V</td>
</tr>
</tbody>
</table>
Main Board Layout and Identification

To Power Supply

IC902 1 (OV) 2 (OV) 3 (OV) 4 (5V) 5 (0.20V)

LVDS
To Control

Q706
5V General

P701

IC100

Reset
SW100

P302

IC902

P302

P303

Reset
SW100

Q706

LD703

Q706

5V General

LD400

X100
12 Mhz

X400
25 Mhz

RGB/
PC

Q706

Cable/Antenna

HDMI inputs

USB

OPTICAL
AUDIO

SPK
Out

Front
Controls

CN701

AV
In 3

OPTICAL
AUDIO

RS232

A/V Composite inputs

A/V Component Inputs

HDMI inputs
### Main Board Back Side (Regulator Checks)

**Bottom Leg Pin 1**

<table>
<thead>
<tr>
<th>IC701</th>
<th>IC709</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 5V</td>
<td>1) 3.29V</td>
</tr>
<tr>
<td>2) 0V</td>
<td>2) 1.26V</td>
</tr>
<tr>
<td>3) 5V</td>
<td>3) 0V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IC702</th>
<th>IC501</th>
</tr>
</thead>
<tbody>
<tr>
<td>3) 5V</td>
<td>1) 3.3V</td>
</tr>
<tr>
<td>2) 3.3V</td>
<td>2) 1.8V</td>
</tr>
<tr>
<td>1) 0V</td>
<td>3) 0V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IC705</th>
<th>IC805</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 5V</td>
<td>1) 5V</td>
</tr>
<tr>
<td>2) 3.29V</td>
<td>2) 3.3V</td>
</tr>
<tr>
<td>3) 0V</td>
<td>3) 0V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IC706</th>
<th>IC902</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 5V</td>
<td>5) .29V</td>
</tr>
<tr>
<td>2) 3.64V</td>
<td>4) 5V</td>
</tr>
<tr>
<td>3) 1.38V</td>
<td>3) 0V</td>
</tr>
<tr>
<td>2) 0V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IC708</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1) 5V</td>
<td></td>
</tr>
<tr>
<td>2) 3.3V</td>
<td></td>
</tr>
<tr>
<td>3) 0V</td>
<td></td>
</tr>
</tbody>
</table>

---

Be sure to prevent the Board from touching the frame while the Board is turned over.

Use a piece of cardboard or towel to insulate.
Tuner with Shield Off

TU400

LD400
Tuner Osc.
Lock
On Unlocked
Off Locked

IC400
Tuner Controller

X400
Tuner Controller Osc.

Pin 16
Video Pin 16

Pin 14
Audio SIF Pin 14

Pin 8
SCL Pin 8

Pin 7
SDA Pin 7

Pin 3
+5V Pin 3

Pin 1

TDVF-H051F
EBL37676801

Not Used 1
NC_1

Not Used 2
RF-AGC

+5V (5V)

Not Used 4
VTU

Not Used 5
NC_2

Not Used 6
GND

Not Used 7
SDA

Not Used 8
SCL

Not Used 9
AS

Not Used 10
DIGITAL_IF1

Not Used 11
DIGITAL_IF2

Not Used 12
IC_AG

Not Used 13
AUDIO_OUT

Not Used 14
SIF

Not Used 15
IF_A

Not Used 16
VIDEO_OUT

Shield

LG TRAINING CENTER

118 Plasma Spring 2009 50PG20
## Main Board Plug P302 “LVDS” Voltage and Diode Check

### Diode Mode Measurements and Voltage Checks

P302 CONNECTOR "Main" Odd to P121 "Control Board"

<table>
<thead>
<tr>
<th>Pin</th>
<th>SBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0V</td>
<td>0V</td>
<td>Open</td>
</tr>
<tr>
<td>3</td>
<td>0V</td>
<td>0V</td>
<td>Open</td>
</tr>
<tr>
<td>5</td>
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<td>0V</td>
<td>Gnd</td>
</tr>
<tr>
<td>7</td>
<td>0V</td>
<td>0V</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>0.89V</td>
<td>3.29V</td>
<td>1.64V</td>
</tr>
<tr>
<td>11</td>
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<td>1.16V</td>
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<tr>
<td>13</td>
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<td>1.16V</td>
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<td>1.16V</td>
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<tr>
<td>21</td>
<td>0V</td>
<td>1.24V</td>
<td>1.16V</td>
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<tr>
<td>23</td>
<td>0V</td>
<td>0.58V</td>
<td>1V</td>
</tr>
<tr>
<td>25</td>
<td>0V</td>
<td>3.29V</td>
<td>OL</td>
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<table>
<thead>
<tr>
<th>Pin</th>
<th>SBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0V</td>
<td>OL</td>
</tr>
<tr>
<td>4</td>
<td>0V</td>
<td>0V</td>
<td>OL</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>10</td>
<td>0.89V</td>
<td>3.29V</td>
<td>1.64V</td>
</tr>
<tr>
<td>12</td>
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<td>0V</td>
<td>1.21V</td>
<td>1.16V</td>
</tr>
<tr>
<td>16</td>
<td>0V</td>
<td>1.21V</td>
<td>1.16V</td>
</tr>
<tr>
<td>18</td>
<td>0V</td>
<td>1.25V</td>
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<tr>
<td>22</td>
<td>0V</td>
<td>1.18V</td>
<td>1.16V</td>
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<tr>
<td>24</td>
<td>0.93V</td>
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<td>1.5V</td>
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<tr>
<td>26</td>
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<td>Gnd</td>
<td>Gnd</td>
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</table>

### Odd Pins

Diode Mode readings taken with all connectors removed.

### Even Pins
## Main Board Plug P303 Voltages and Diode Check

Voltage and Diode Test Measurements for the Main Board

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>IR</td>
<td>5V</td>
<td>5V</td>
<td>2.97V</td>
</tr>
<tr>
<td>2</td>
<td>Gnd</td>
<td>OV</td>
<td>OV</td>
<td>Gnd</td>
</tr>
<tr>
<td>3</td>
<td>KEY2</td>
<td>OV</td>
<td>3.29V</td>
<td>1.17V</td>
</tr>
<tr>
<td>4</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>KEY1</td>
<td>OV</td>
<td>3.29V</td>
<td>1.17V</td>
</tr>
<tr>
<td>6</td>
<td>Gnd</td>
<td>OV</td>
<td>OV</td>
<td>Gnd</td>
</tr>
<tr>
<td>7</td>
<td>STBY_5V</td>
<td>5V</td>
<td>5V</td>
<td>0.79V</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>9</td>
<td>RED_R</td>
<td>OV</td>
<td>OV</td>
<td>1.11V</td>
</tr>
<tr>
<td>10</td>
<td>Gnd</td>
<td>Gnd</td>
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<td>Gnd</td>
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<td>1.11V</td>
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<tr>
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<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
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Diode Mode readings taken with all connectors removed.
Main Board Plug P701 Voltages “Odd Pins”

Voltage and Diode Test Measurements for the Main Board P701

P701 CONNECTOR "Main" Odd Pins to P803 "SMPS Board"

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
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<td>16V</td>
<td>2.87V</td>
</tr>
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<td>Gnd</td>
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<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>5</td>
<td>12V</td>
<td>0V</td>
<td>12V</td>
<td>OL</td>
</tr>
<tr>
<td>7</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>OL</td>
</tr>
<tr>
<td>9</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>0.79V</td>
</tr>
<tr>
<td>11</td>
<td>5V</td>
<td>5V</td>
<td>5V</td>
<td>0.79V</td>
</tr>
<tr>
<td>13</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>15</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
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<td>5_V Det</td>
<td>.15V</td>
<td>5V</td>
<td>3.24V</td>
</tr>
<tr>
<td>19</td>
<td>RL_On</td>
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<td>4.5V</td>
<td>OL</td>
</tr>
<tr>
<td>21</td>
<td>M5V_ON</td>
<td>0V</td>
<td>3.2V</td>
<td>1.21V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
**Main Board Plug P701 Voltages “Even Pins”**

Voltage and Diode Test Measurements for the Main Board P701

P701 CONNECTOR "Main" Even Pins to P803 "SMPS Board"

<table>
<thead>
<tr>
<th>Pin</th>
<th>Label</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>15V</td>
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<td>2.8V</td>
</tr>
<tr>
<td>4</td>
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<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
<td>6</td>
<td>12V</td>
<td>0V</td>
<td>12V</td>
<td>OL</td>
</tr>
<tr>
<td>8</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
<td>Gnd</td>
</tr>
<tr>
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<td>5V</td>
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<td>Gnd</td>
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</table>

Diode Mode readings taken with all connectors removed.
Main Board Speaker Plug JK501 Voltages and Diode Check

Voltage and Diode Test Measurements for the Main Board Speaker Plug

JK501 CONNECTOR "Main" to "Speakers"

<table>
<thead>
<tr>
<th>Pin</th>
<th>STBY</th>
<th>Run</th>
<th>Diode Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>8V</td>
<td>2.58V</td>
</tr>
<tr>
<td>2</td>
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<td>8V</td>
<td>2.58V</td>
</tr>
<tr>
<td>3</td>
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<td>8V</td>
<td>2.58V</td>
</tr>
<tr>
<td>4</td>
<td>0V</td>
<td>8V</td>
<td>2.58V</td>
</tr>
</tbody>
</table>

Diode Mode readings taken with all connectors removed.
INTERCONNECT DIAGRAM (11 X 17 FOLDOUT SECTION)

This section shows the 11X17 foldout that’s available in the Paper and Adobe version of the Training Manual.

The Adobe version of this Training Manual allows the viewer to zoom in and out making reading of the small text easier. This Power Point shows a graphical representation of the 11 X 17 foldout page so clarity is limited.
During SMPS Test (Described below), P803 disconnected;
1) P801 and P802 connected. Y-SUS and Z-SUS will produce sustain waveforms.
2) P801 connected P802 disconnected. Y-SUS will produce sustain waveform, Z-SUS does not.
3) P801 disconnected P802 connected. No SUS waveforms are produced due to a loss of control PWB B+ routed through the Y-SUS PWB.
This concludes the 50PG20 Presentation

Thank You