

DLP Training (Atlantis Chassis) March 2004



Agenda

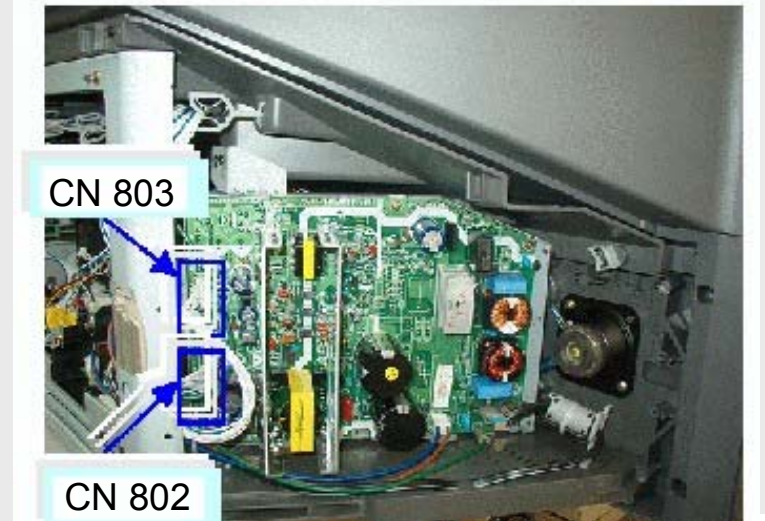
1. Power Supply
2. Digital Board
3. Analog Board
4. DMD Board
5. Troubleshooting
6. Initialization Process
7. LED Indicators
8. Optical Section
9. Service Hints
10. Parts Information
11. Dimensions
12. Review

Power Supply Board

CN803							
Pin #	1	2	3	4	5	6	7
Spec	5V A	GND	33VB	GND	Power -S/W	N.C.	N.C
Used	Supplies DC voltage to the PCB ANALOG						

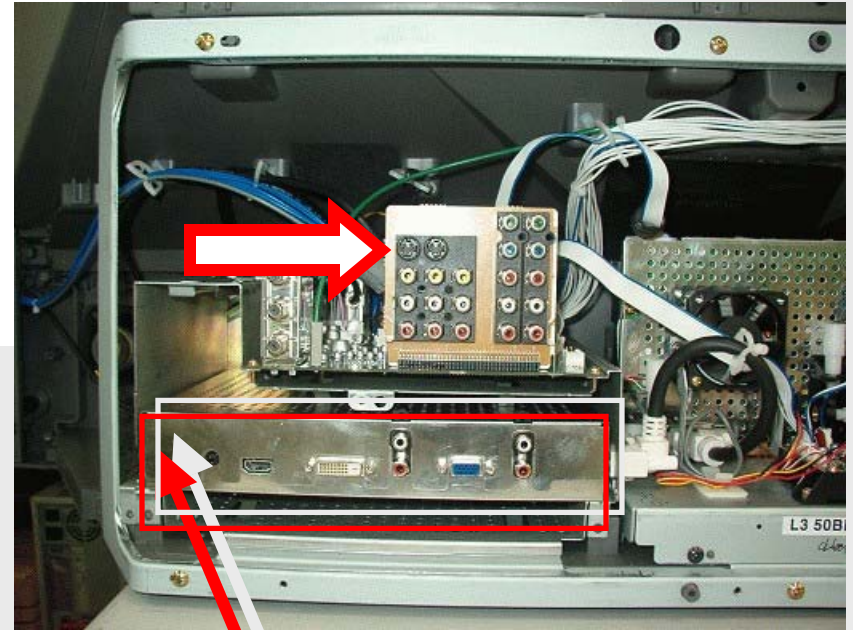


CN802							
Pin #	1	2	3	4	5	6	7
Spec	Power -Mute	S14. 5VB	S- GND	S14. 5VB	S- GND	5.7 VB	GN D
Pin #	8	9	10	11	12	13	
Spec	12VB	GND	12V B	GND	70V B	GND	
Used	Supplies DC voltage to the PCB ANALOG						



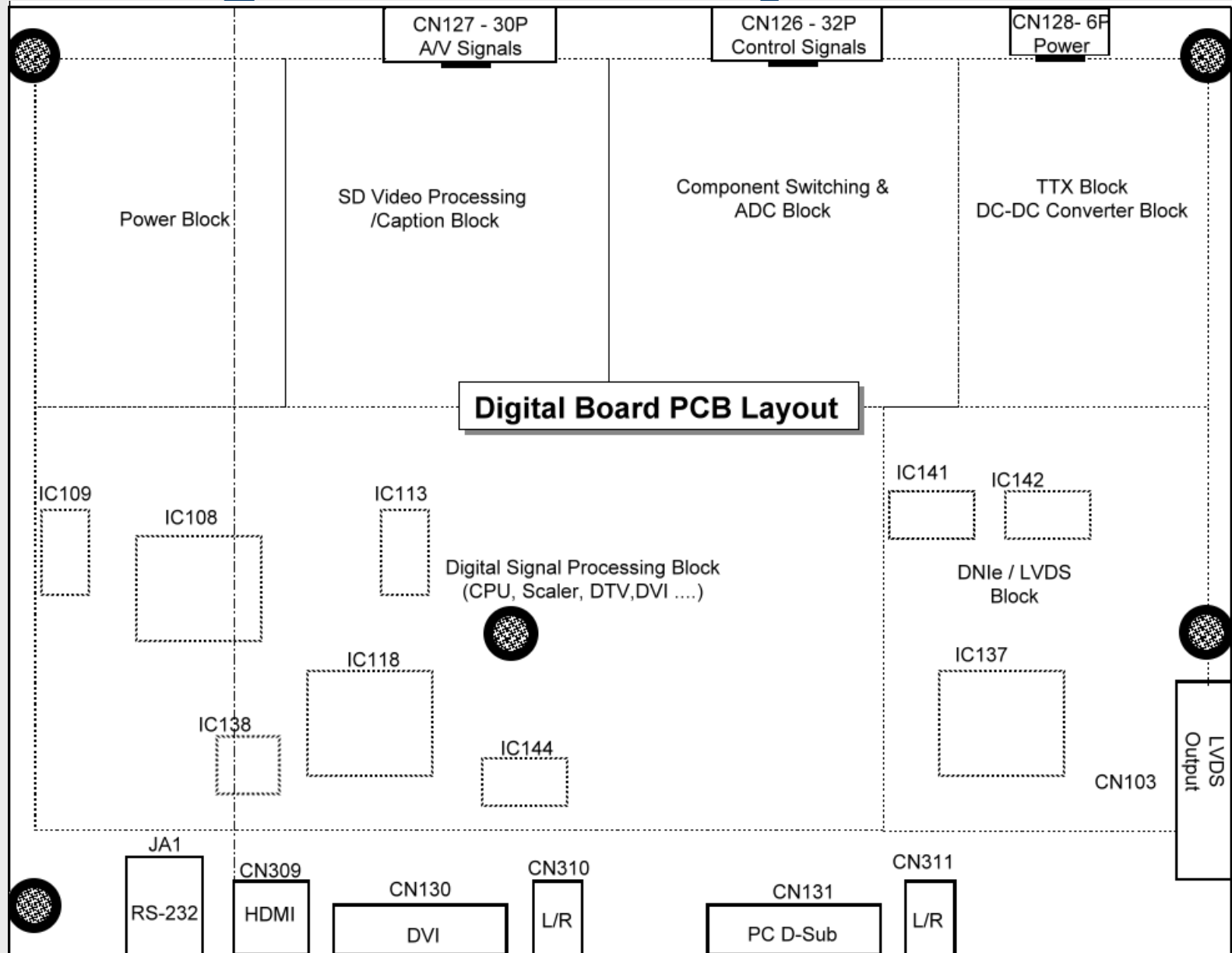
Digital Board

- Microprocessor (Generates turn on signal to power board)
- Monitor LED's
- All Digital Video Processing
- Sensor / Switch Controls
- OSD / Menu

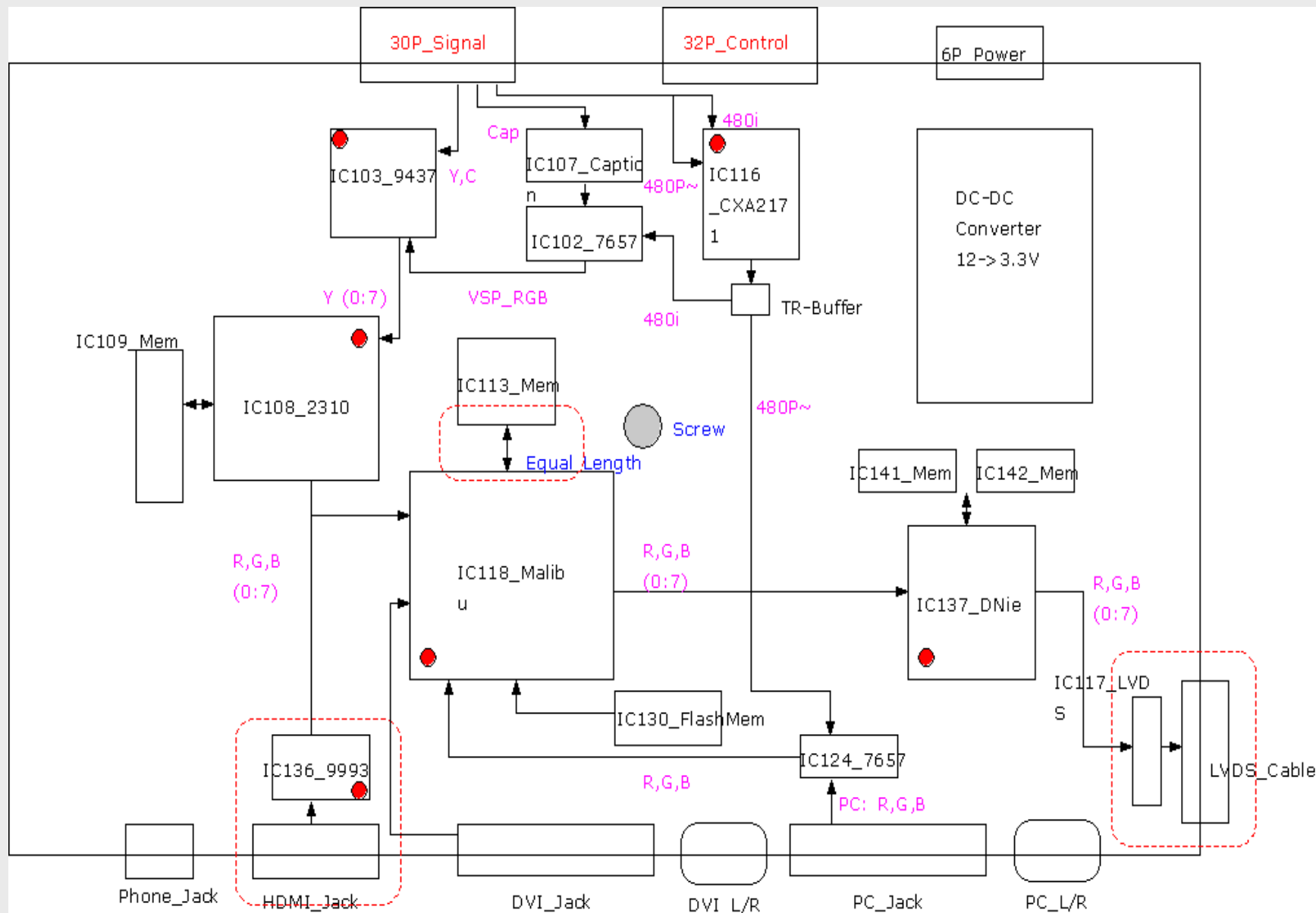


RS232- Factory Use Only
HDMI- A/V Input
RGB-PC Input
DVI – Digital Visual Interface

Digital Board Layout

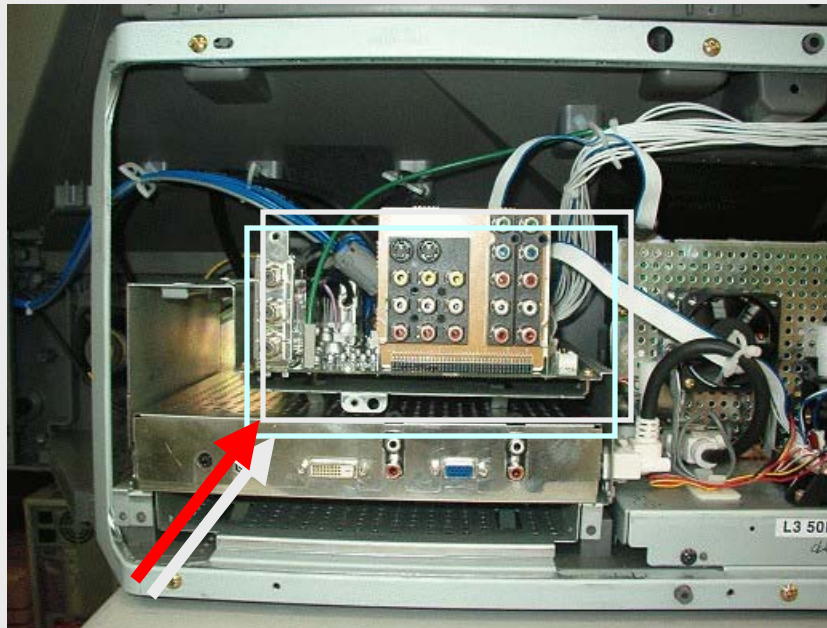


Digital Board Characteristics

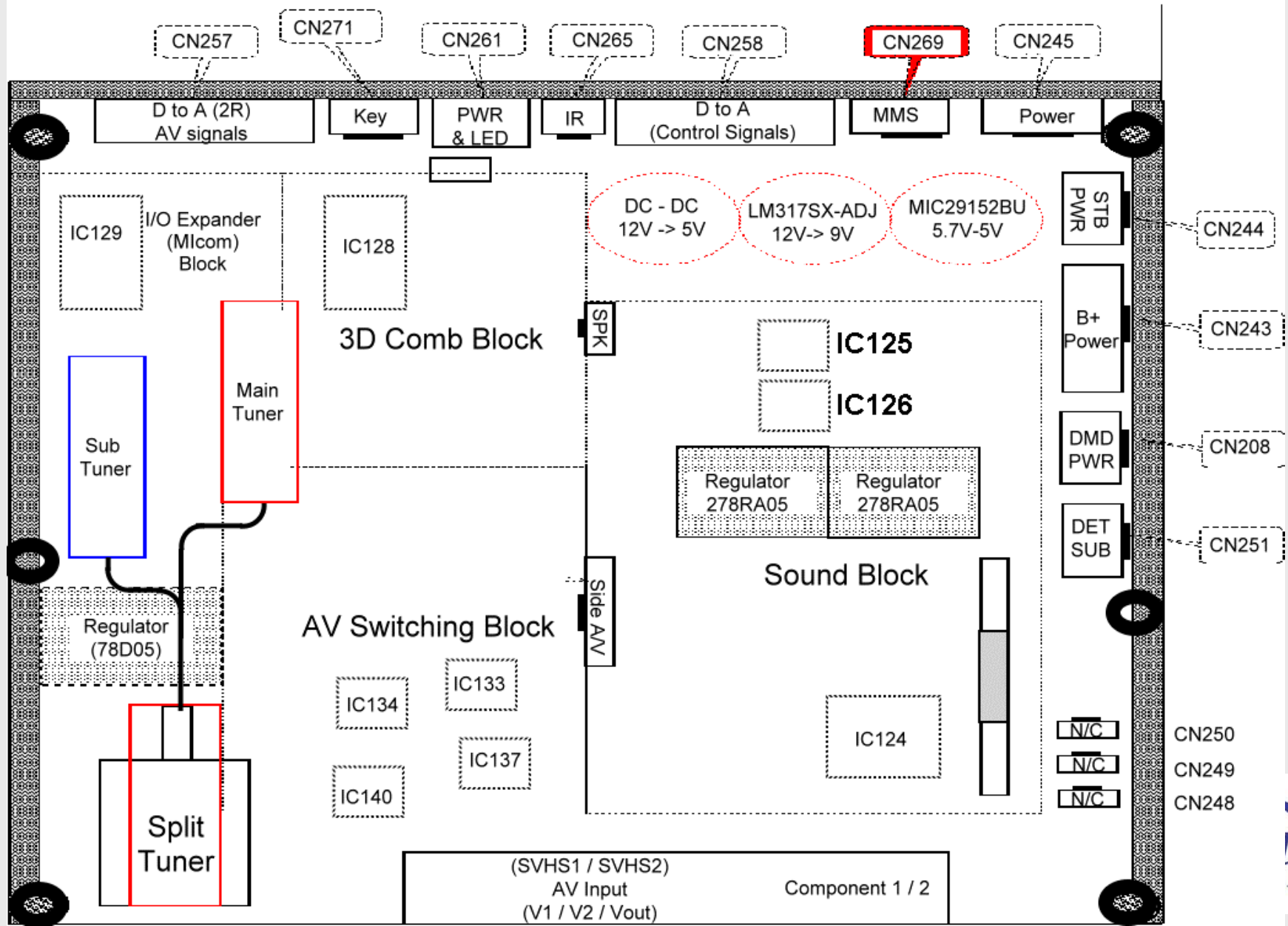


Analog Board

- Distributes supply voltage from the Power Board to Digital Board
- Transfers Turn-On Command from Digital Board to Power Board.
- Encompasses the majority of the Audio Circuit
- Analog Video Switching / Processing

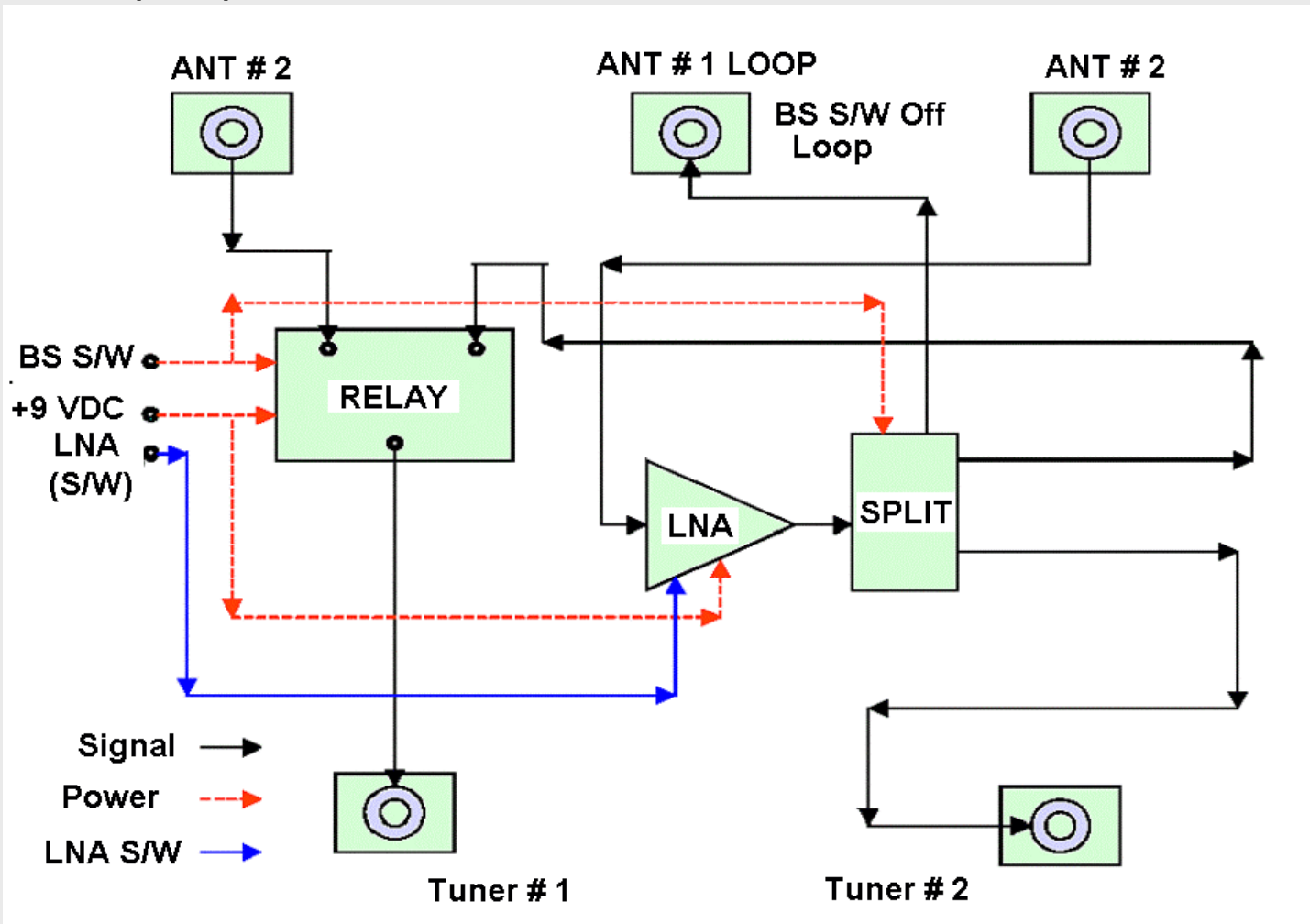


Analog PCB Layout

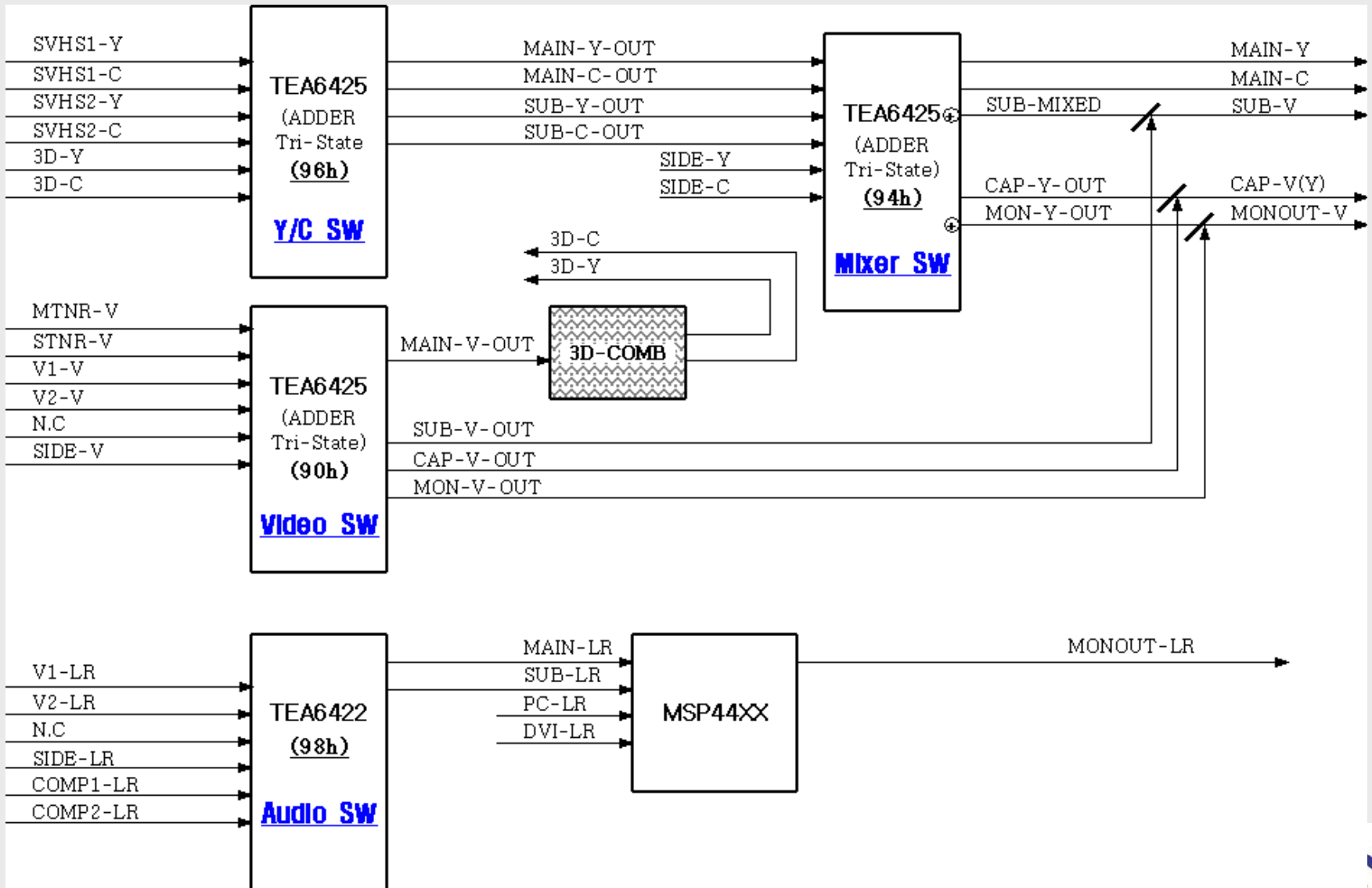


Analog Board Block Diagram

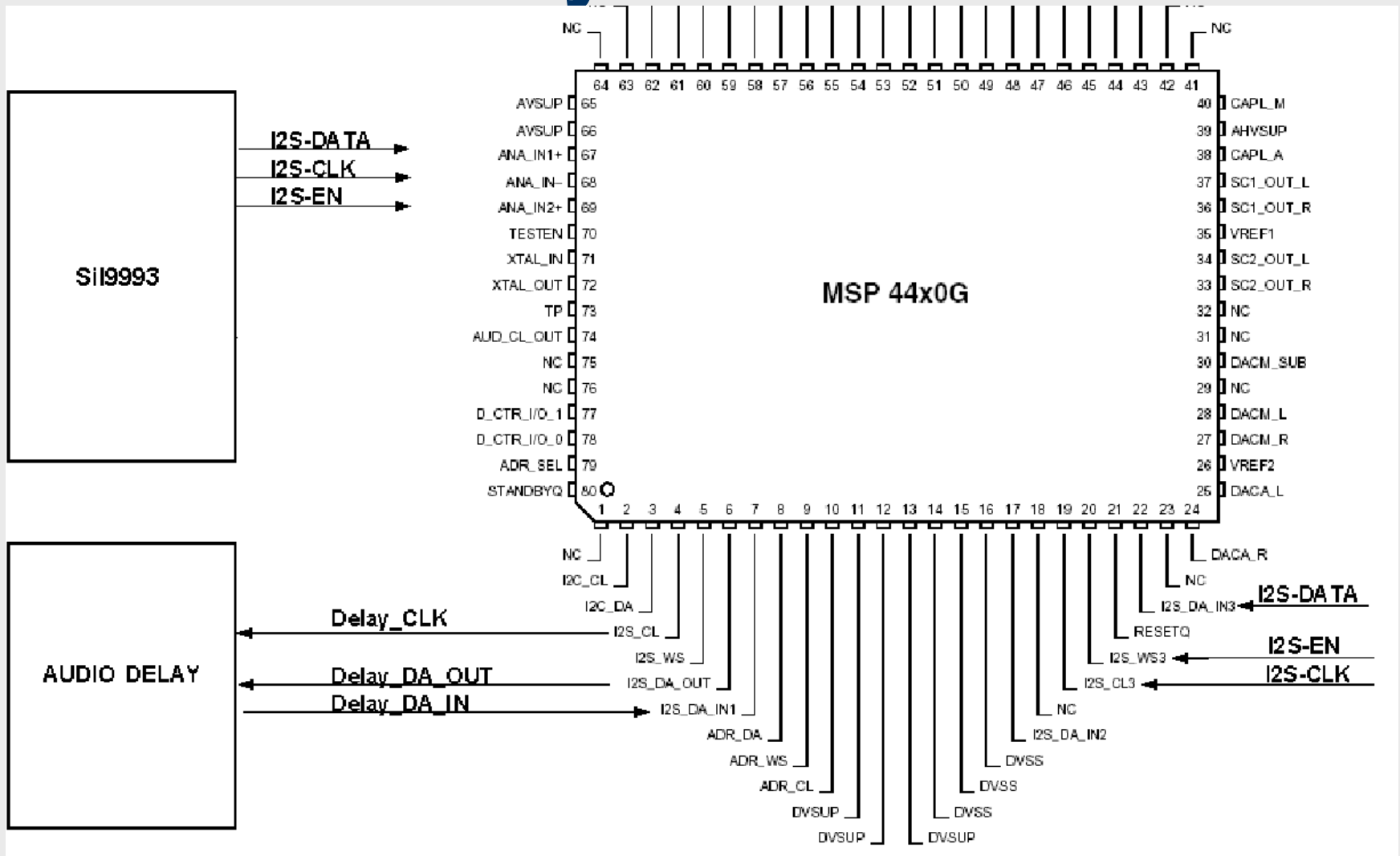
RF SWITCH (LNA) BLOCK



AV Switching (TEA64XX) Block



Audio Delay and HDMI Audio



CN 257 Pin Assignment

CN257- Supplies AV Signals to PCB DIGITAL

Pin Name	I/O	PIN No.		I/O	Pin Name
Comp1-Y	←	1	2		GND
Comp1-Pb	←	3	4		GND
Comp1-Pr	←	5	6		GND
Comp2-Y	←	7	8		GND
Comp2-Pr	←	9	10		GND
Comp2-Pb	←	11	12		GND
N.C.	←	13	14		GND
N.C.	←	15	16		GND
N.C.	←	17	18		GND
Main-Y/V	←	19	20		GND
Main-C	←	21	22		GND
Sub-Y/V	←	23	24		GND
Sub-C	←	25	26		GND
Caption-CVBS	←	27	28		GND
IR	←	29	30		GND

CN258 Pin Assignment

CN258- Connects Control Signals between PCB Analog and PCB Digital

Pin Name	I/O	PIN No.		I/O	Pin Name
LED1	↔	1	2	↔	SDA-Micom
LED2	→	3	4	←	SCL-Micom
LED3		5	6		GND
Key1	←	7	8	↔	SDA-Analog
Key2		9	10	←	SCL-Analog
Reset-D	←	11	12		GND
I2C-STOP	←	13	14	←	SDA-Digital
Power-SW	←	15	16		SCL-Digital
N.C.		17	18	←	GND
N.C.	←	19	20	←	I2S-CLK-HDMI
GND	←	21	22		I2S-EN-HDMI
MCLK_AUDIO	→	23	24		I2S-DATA-HDMI
S-MUTE	→	25	26	←	GND
PC-L	→	27	28	←	DVI-L
PC-R		29	30		DVI-R
GND	←	31	32	←	GND

CN243/CN244 Pin Assignment

CN243 / 244 Receives Power Signals from PCB POWER

Pin Name	PIN No.		Pin Name
Power-Mute	1	2	S14.5VB
S-GND	3	4	S14.5VB
S-GND	5	6	5.7VB
GND	7	8	12VB
GND	9	10	12VB
GND	11	12	70VB
GND	13	-	

Pin Name	PIN No.		Pin Name
5VA	1	2	GND
33VB	3	4	GND
Power-SW	5	6	N.C.
N.C.	7	-	

CN208 / CN251 Pin Assignment

CN208 Supplies Power Signals to PCB DMD

Pin Name	PIN No.		Pin Name
5VB	1	2	5VB
GND	3	4	GND
12VB	5	6	12VB
GND	7	8	GND
GND	9	-	-

CN251 supplies power to Actuator / Protection Board

Pin Name	SUB Detector/Actuator	PIN No.		SUB Detector/Actuator	Pin Name
GND	Ground	1	2	Fan-VCC	12VB
GND	Ground	3	4	SDA-Memory	SDA-M
SCL-M	SCL-Memory	5	6	Ground	GND
5VA	5VA	7	8	Ground	GND
70VB	70VB	9	10	Ground	GND

CN223 Pin Assignment

CN223 Receives AV Signals from PCB SIDE-AV

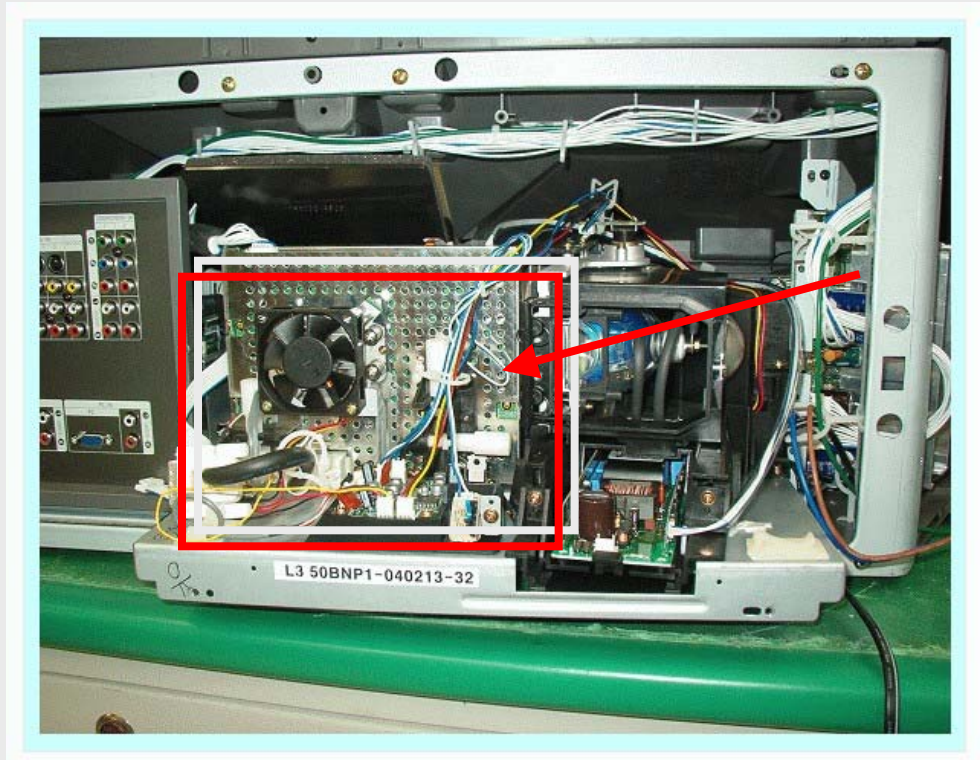
Pin Name	Side AV	PIN No.		Side AV	Pin Name
Side-Y	SVHS Y (Luma)	1	2	SVHS C (Chroma)	Side-C
GND	Ground	3	4	Video (CVBS)	Side-V
GND	Ground	5	6	Side Sound L	Side-L
GND	Ground	7	8	Side Sound R	Side-R
GND	Ground	9	10	SVHS Jack Detect	Side-SDET
Side-VDET	Video Jack Detect	11	-		

I/O Expander Pin Assignment

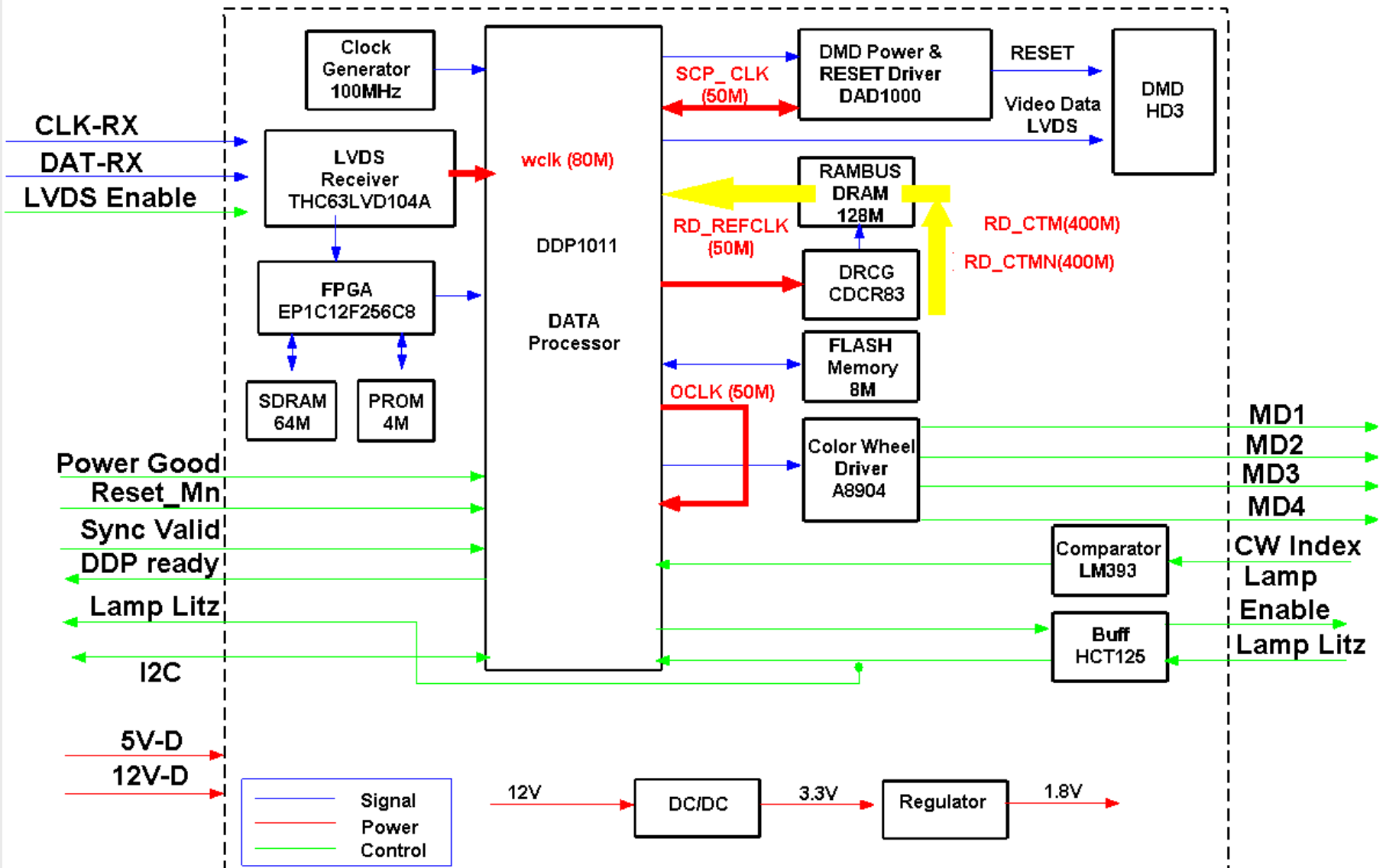
	DES	NAME	PIN		PIN	NAME	DES	
GND		VSS	1	S3P9428 / 32-SOP	32	VDD		
		XIN	2		31	P0.2	I/O	S1-DET
		XOUT	3		30	P0.3	I/O	S2-DET
GND		TEST	4		29	P0.4	I/O,ADC	Side-SDET
Comp2-DET	I/O	P0.1	5		28	P0.5	I/O,ADC	V1-DET
Comp1-DET	I/O	P0.0	6		27	P0.6	I/O,ADC	V2-DET
RESET-D		RESET	7		26	P0.7	I/O,ADC	Side-VDET
RF-SEL	O	P3.0	8		25	P3.1	O	SOUND-RESET
LNA-SW	O	P3.2	9		24	P3.3	O	DEFAULT
MTNR-AFT	I/O,ADC	P2.0	10		23	P1.0	I/O	DELAY1
STNR-AFT	I/O,ADC	P2.1	11		22	P1.1	I/O	DELAY2
N.C	I/O,ADC	P2.2	12		21	P1.2	I/O	GAIN0
N.C	I/O,ADC	P2.3	13		20	P1.3	I/O	GAIN1
RF-AGC	I/O,ADC	P2.4	14		19	P2.7	SCL	SCL-A
GND	ADDRESS	P2.5	15		18	P2.6	SDA	SDA-A
GND		AVSS	16		17	AVREF		

DMD Board

- Controls Lamp Turn-On
- Powers Color Wheel Motor
- Drives DMD Panel
- Sensor Controls
- Attached to Light Engine

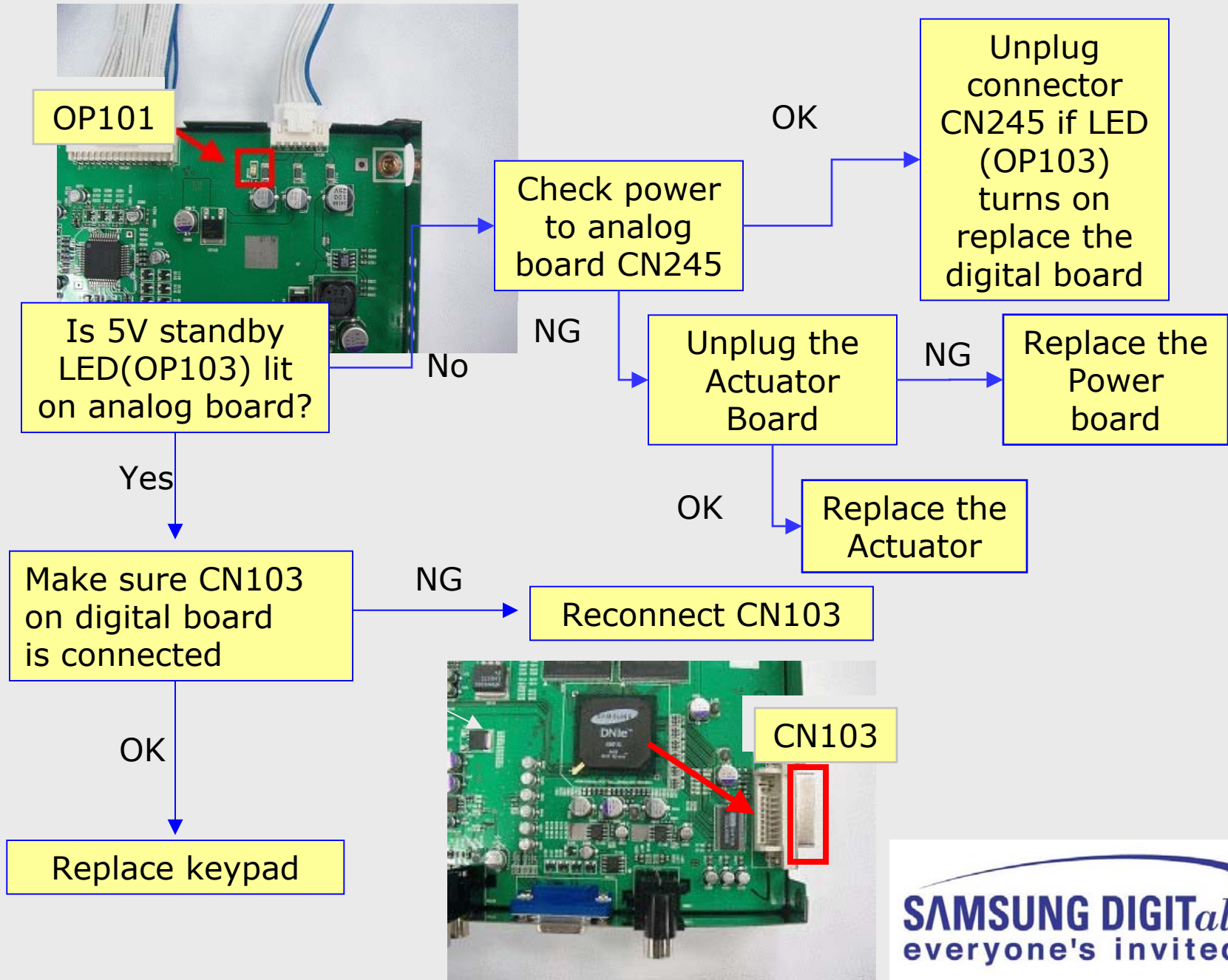


DMD Block Diagram

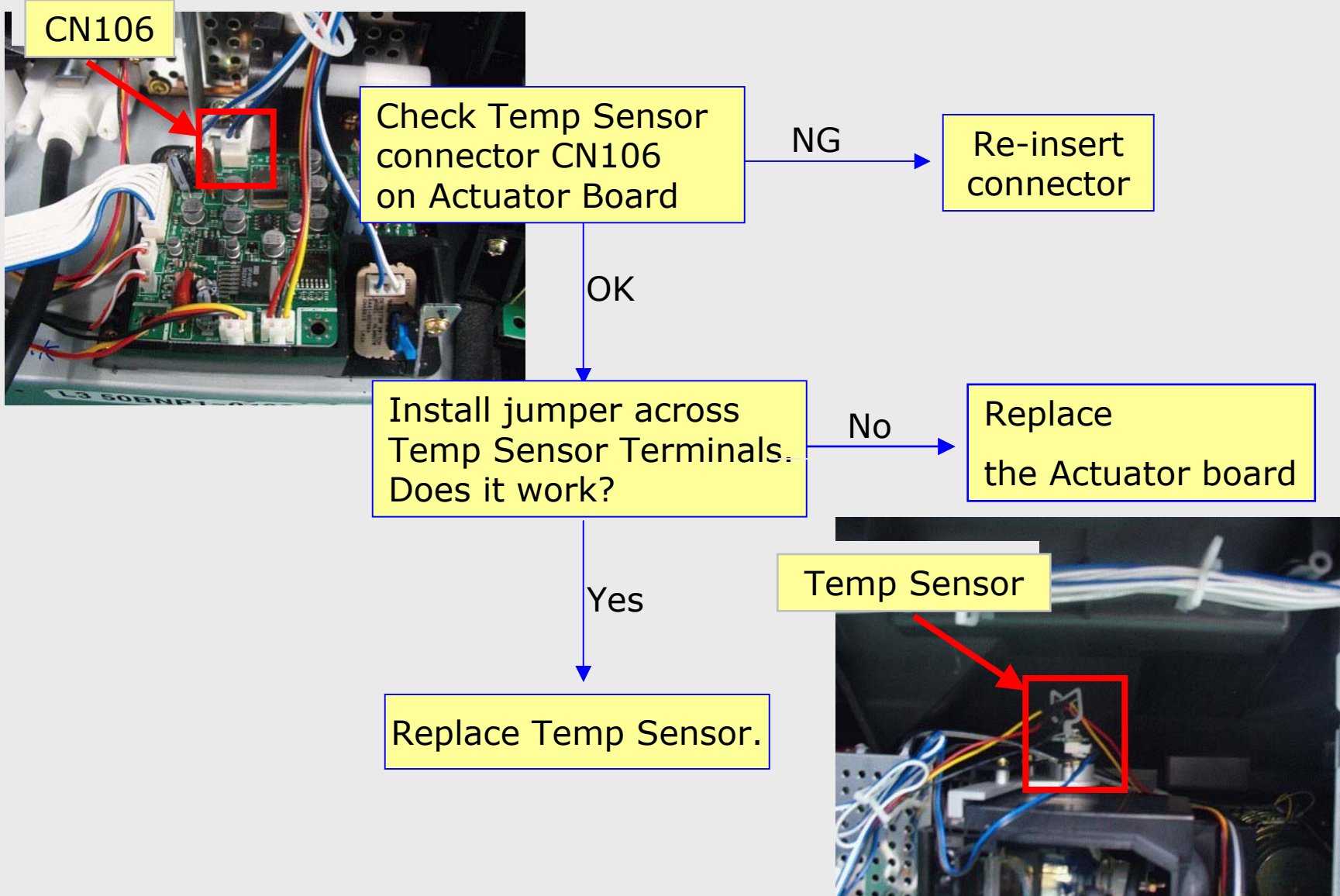


Troubleshooting

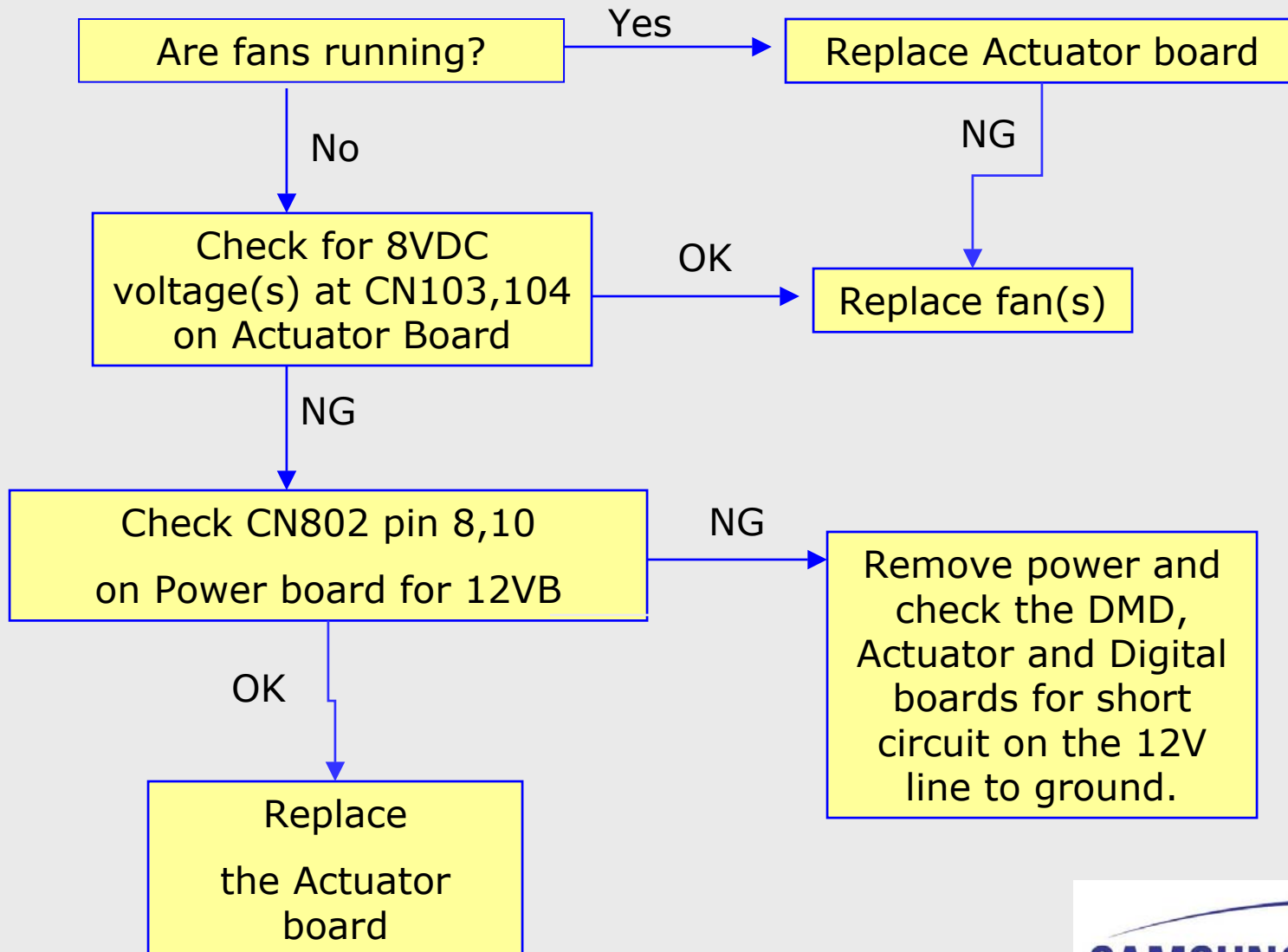
Dead Set



Blinking Temp LED

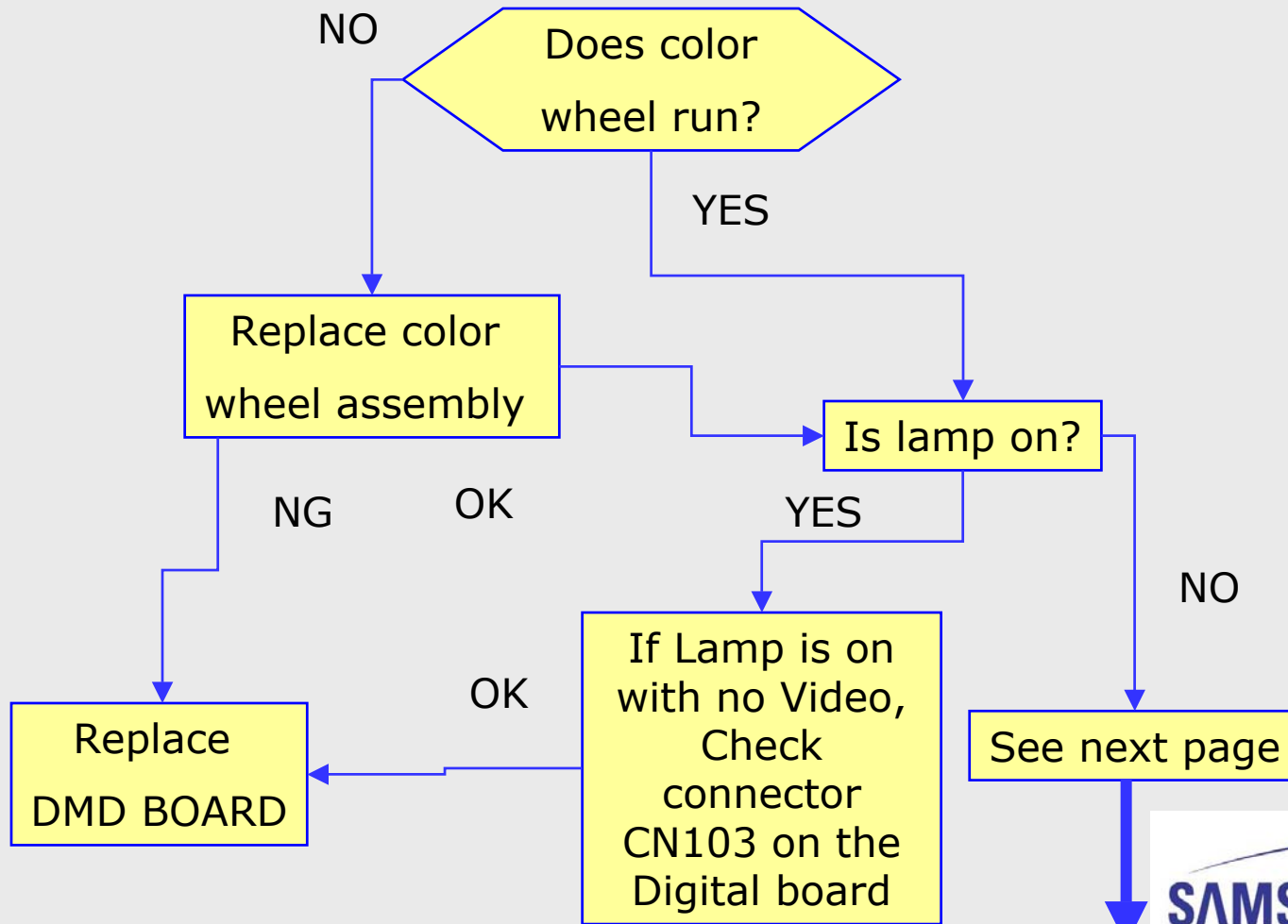


Blinking Temp and Timer LED

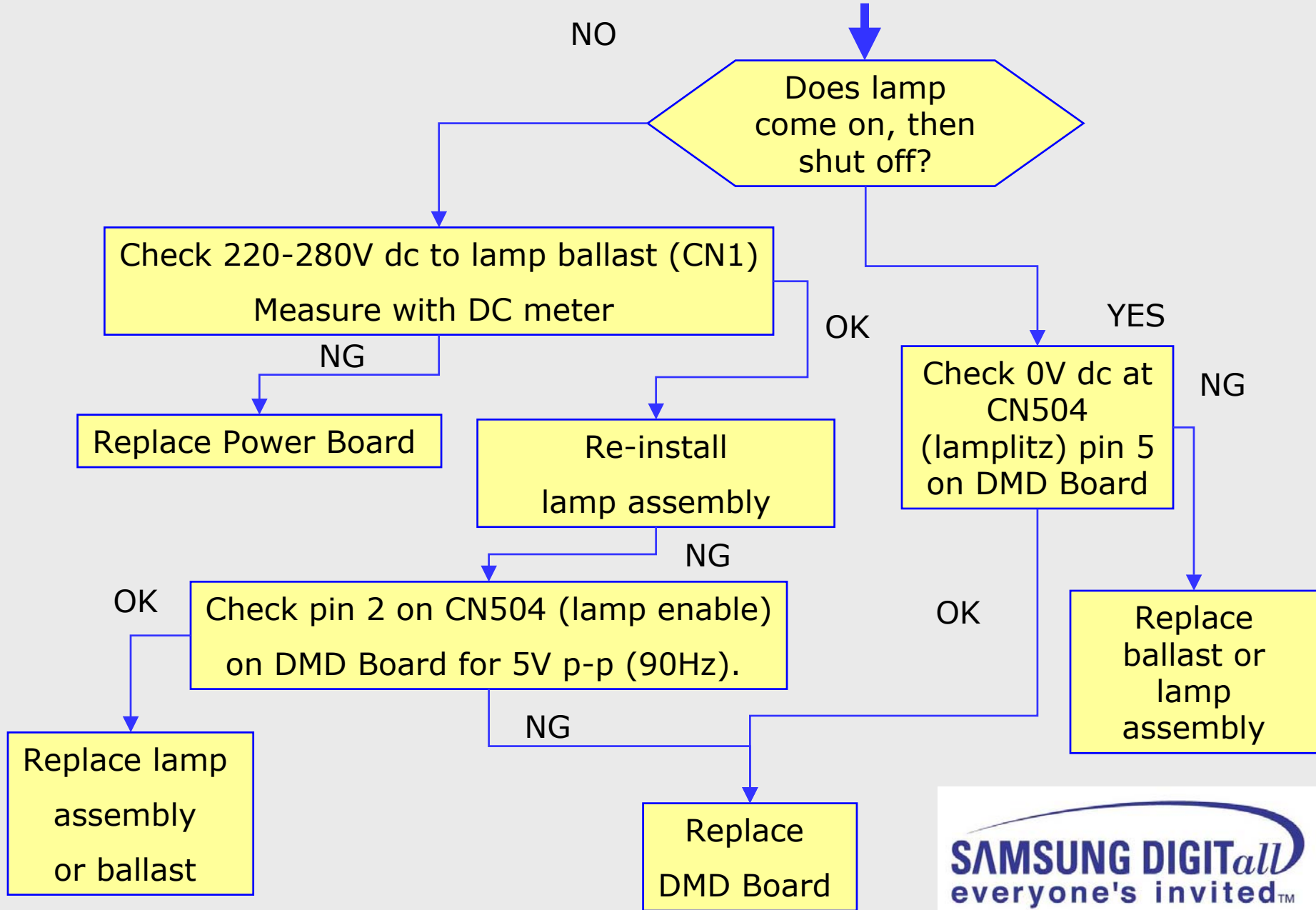


All Front Panel LEDs Blinking

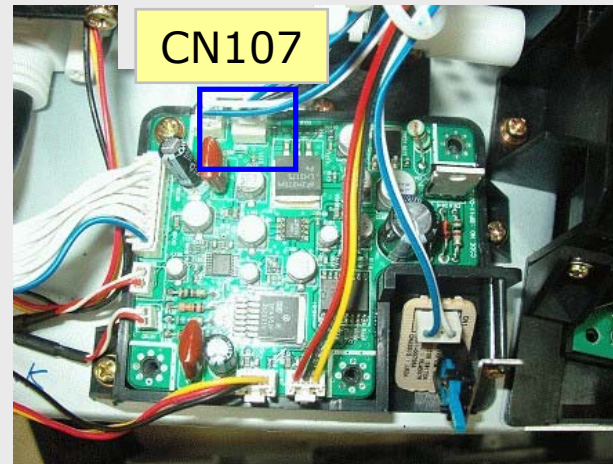
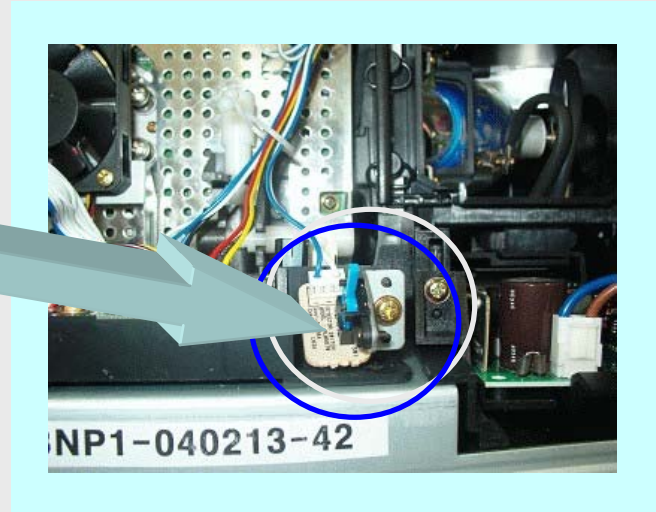
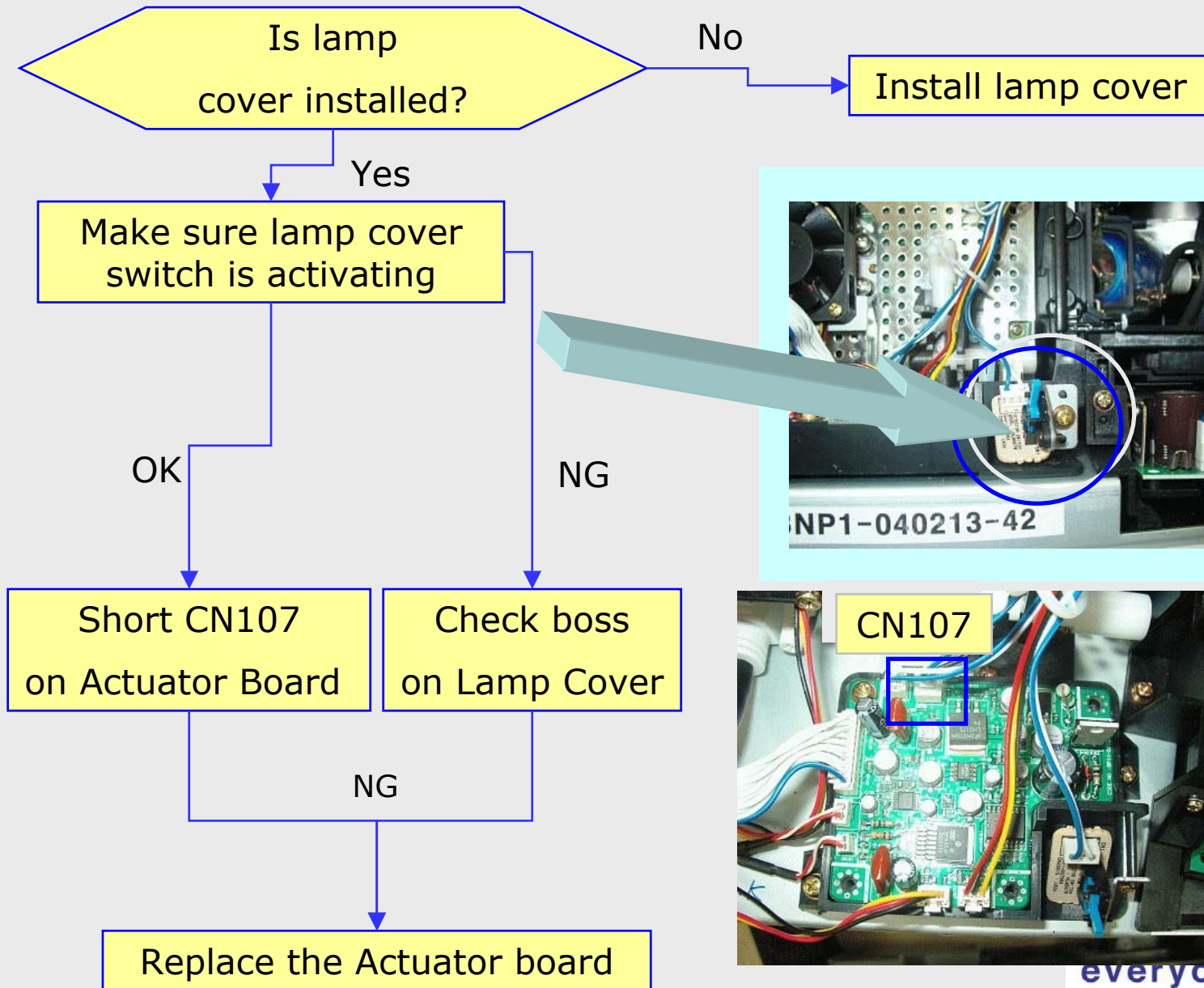
All three LEDs blinking is the most common failure indication. It can be caused by defective lamp, defective color wheel, fan failure or other defective components.



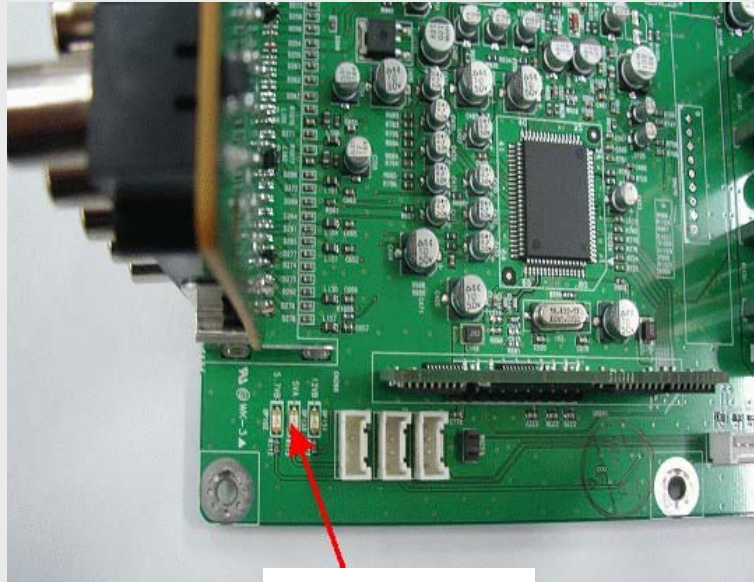
All Front Panel LEDs Blinking Continued



Blinking Lamp and Temp. LED's



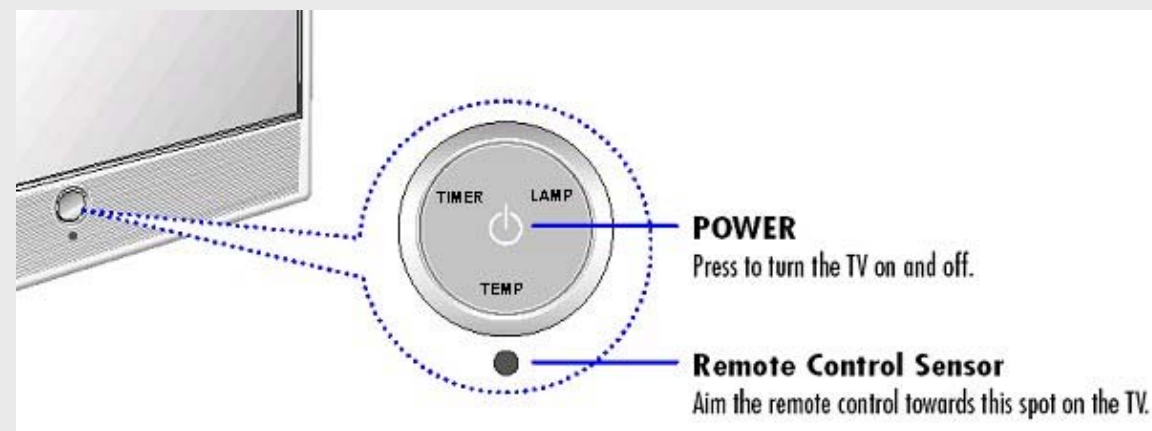
Initialization Process



Standby LED

1. Standby LED on Analog PCB ON (5V)
2. Power ON signal from Sub Front PCB or IR sensor to Digital PCB.
3. Power ON signal generated by Digital PCB-> Analog PCB-> POWER PCB.
4. All other voltages turn on (3 status LED's on analog board lit) .
5. Fans turn on.
6. Fan protection circuit verifies Fan Operation.
7. Digital PCB tells DMD PCB to turn color wheel and lamp on.
8. DMD / digital PCB's check feedback (LampLitz – low, DDP ready – High) signals from lamp and DMD Controller (DDP1011).
9. If OK, Digital PCB tells DMD to remove video mute.

Front Panel LED Indicators



Legend

● = LED On

○ = LED Off

⊙ = LED Blinking

Timer	Lamp	Standby/ Temp	Indication
○	○	●	Standby State
●	○	○	Auto Timer On/Off has been set
○	○	○	Set is operating Normally
○	⊙	○	Turn on state, picture will appear in about 15 seconds
⊙	⊙	○	Auto Timer On/Off has been set, picture will appear in ~ 25 seconds
⊙	○	⊙	A cooling fan inside the set is not operating properly
○	⊙	⊙	The Lamp cover on the rear of the set is not installed properly.
○	○	⊙	Excessive Temperature error, check for proper ventilation
⊙	⊙	⊙	Lamp does not light, replace with a new lamp

Optical Section

Background

Samsung introduced their new DLP technology projection televisions in 2002. DLP stands for

Digital Light Processing

DLP is quite different than conventional projection television, which uses three separate color CRT's. These separate video signals are projected and combined on the screen. DLP, on the other hand, has no CRT's. Instead, one high intensity lamp is used to project one image on the screen.

DLP technology was first developed by Texas Instruments.

The heart of this technology is the DMD, or

Digital Micromirror Device.



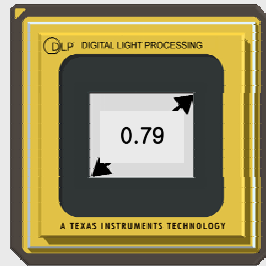
L2 and L3 Design Comparison

DMD PANEL

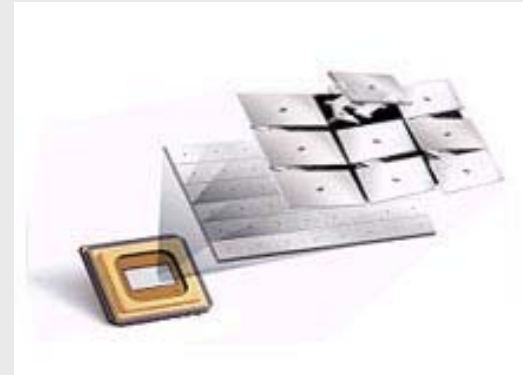
Incident light

L2 Design : HD2 Panel

1280 X 720
(921600 pixels)



* Unit = Inch



L3 Design : HD3 Panel

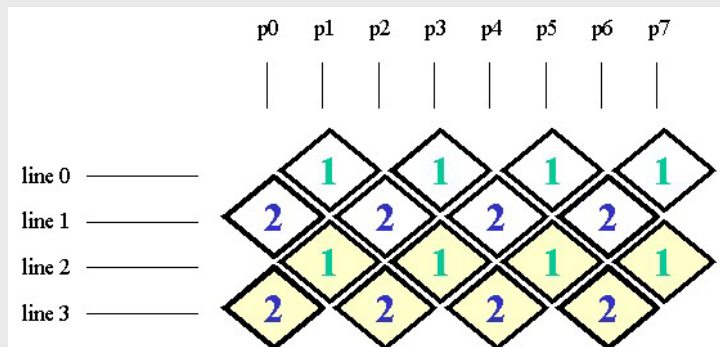
Incident light

640 x 720
(460800 pixels)



* Unit = Inch

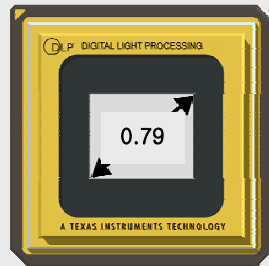
Diamond Pixel Pattern



DMD Differences

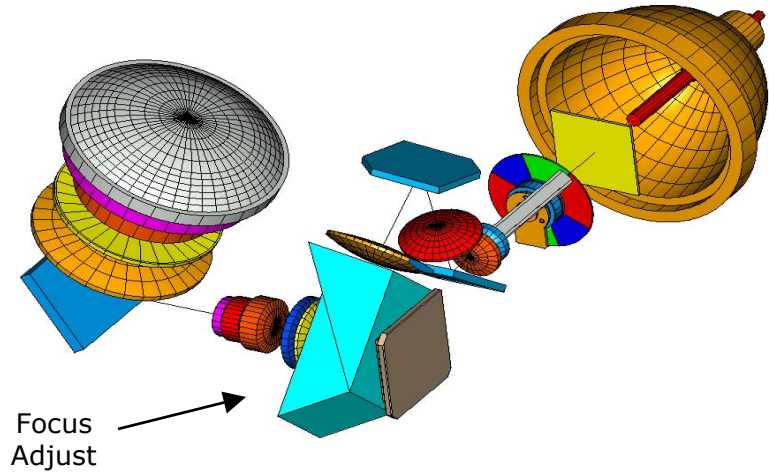
Incident light

1280 X 720
(921600 pixels)



Incident light

640 x 720
(460800 pixels)



Focus Adjust

Focus Lens

Color Wheel

Illum. Lens

Mirror

UV Filter

Illum. Lens

Illum. Lens

Actuator

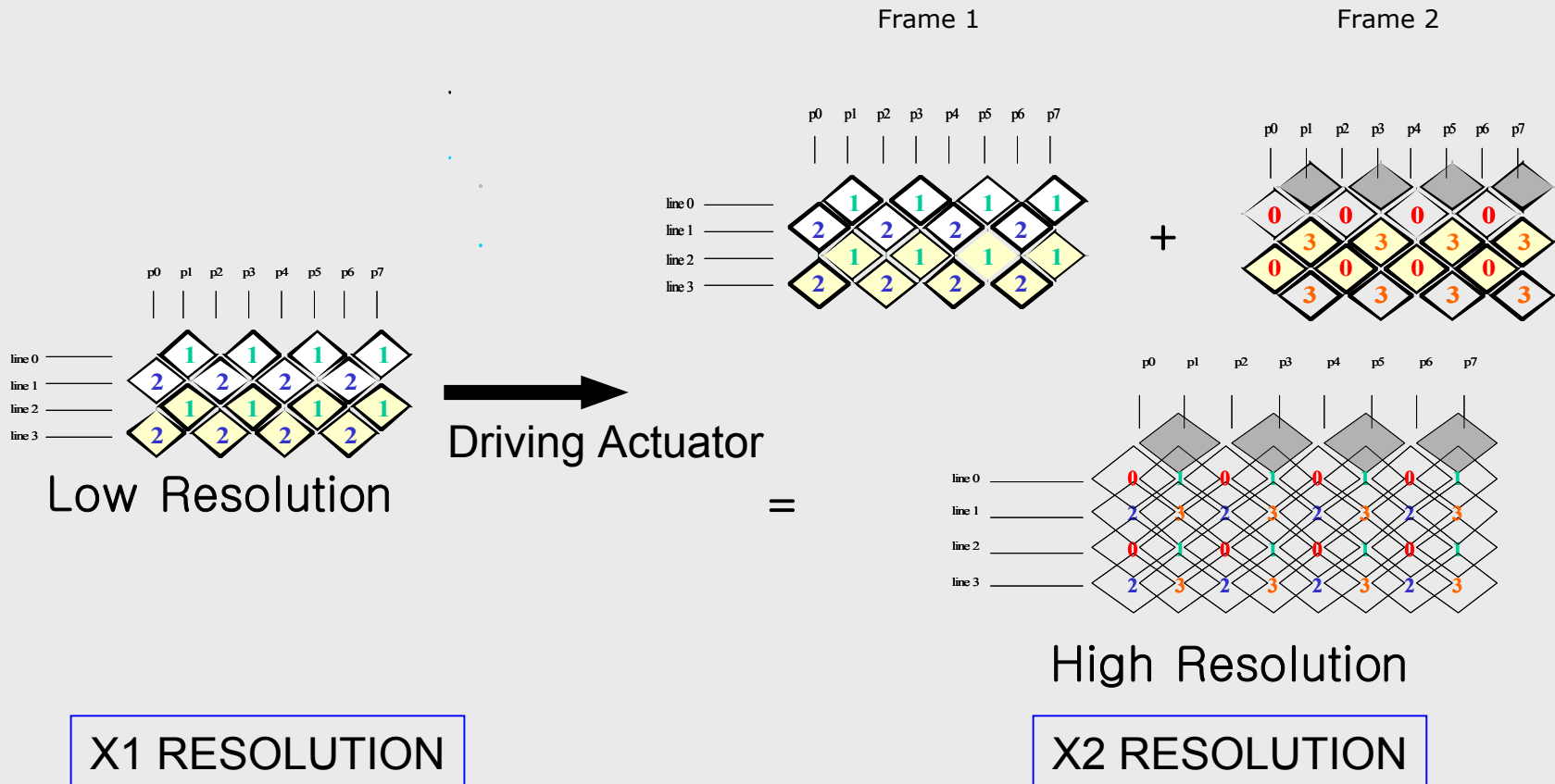
Proj. Lens

Field Lens

DMD

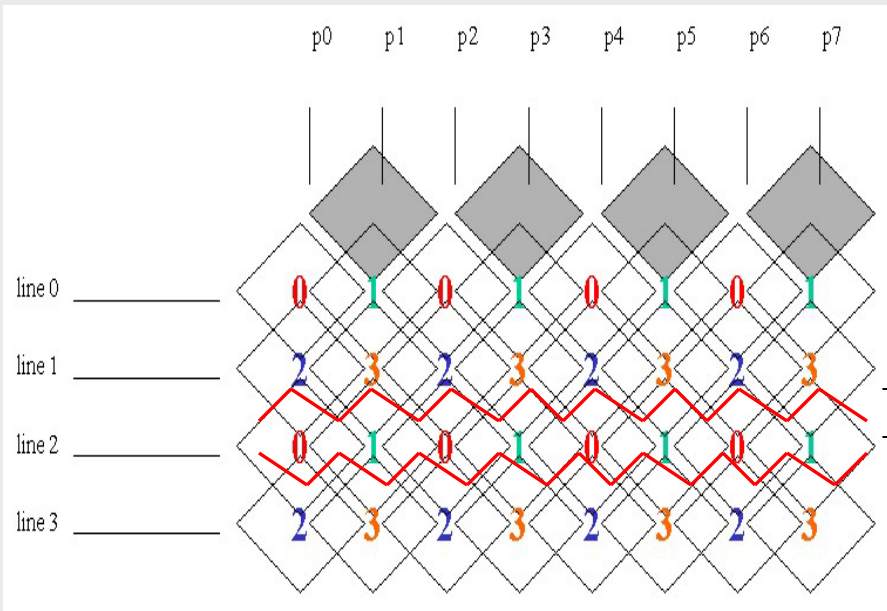
Design Concept

1. Display Resolution



Realizing Method

Mirror movement by vibration of Piezoelectric material.

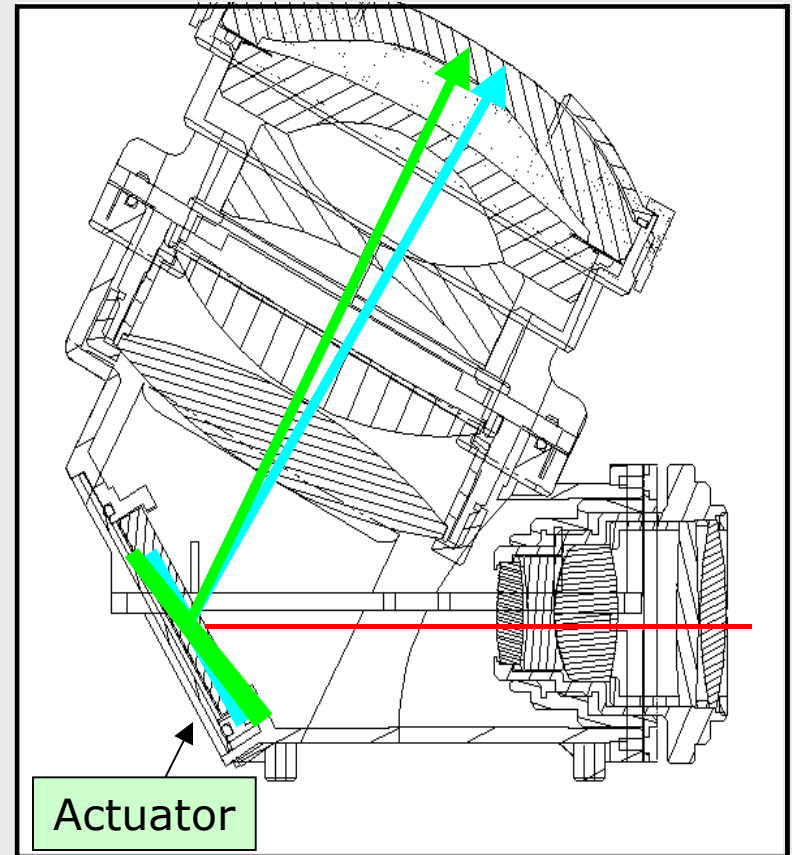


X2 Resolution

460800 pixels -> 921600 pixels

Effect = Jagged line to Smooth line

Vibration Distance = $\frac{1}{2}$ Pixel

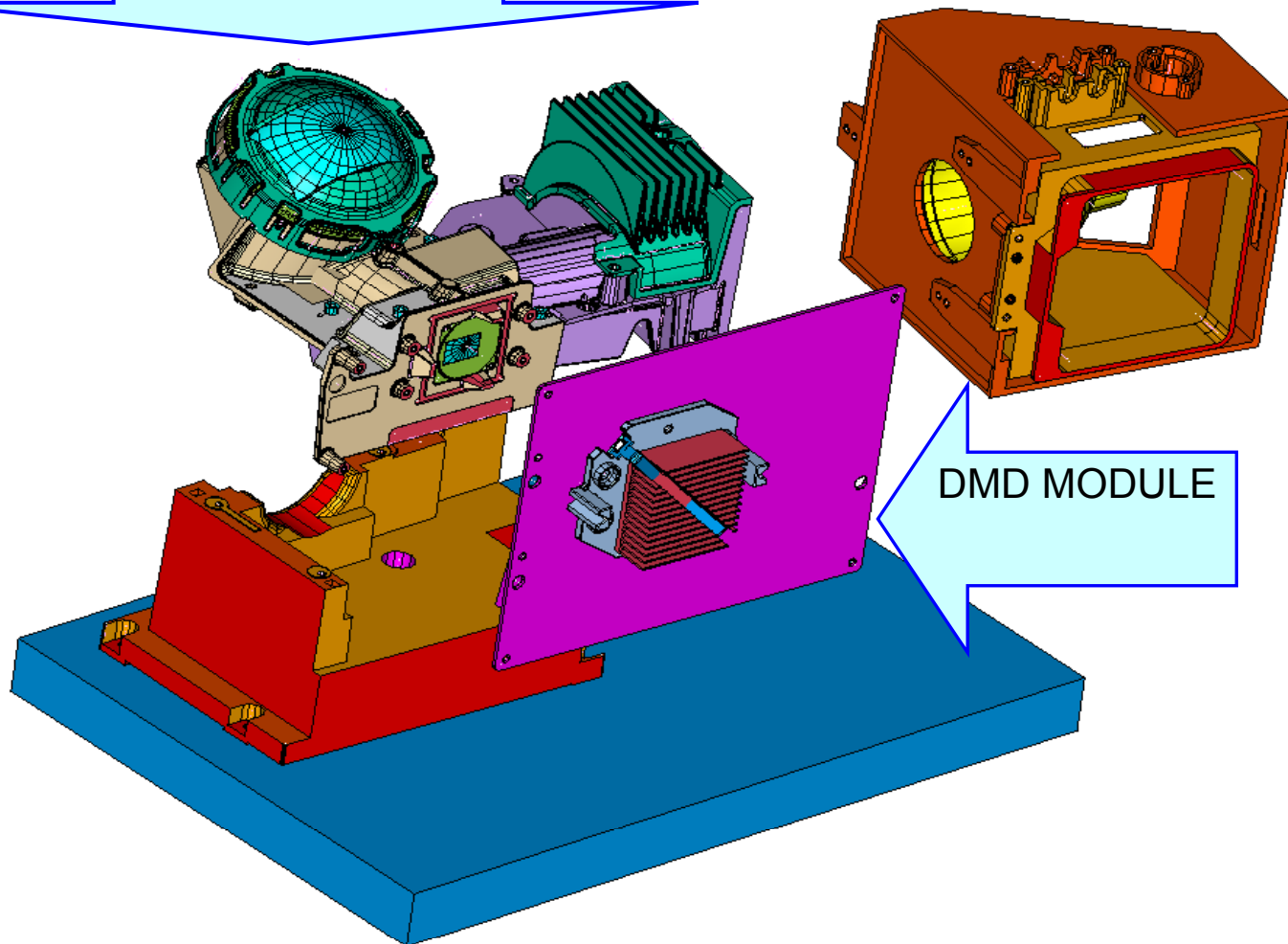


Folding Mirror Vibration

Light Engine Breakdown

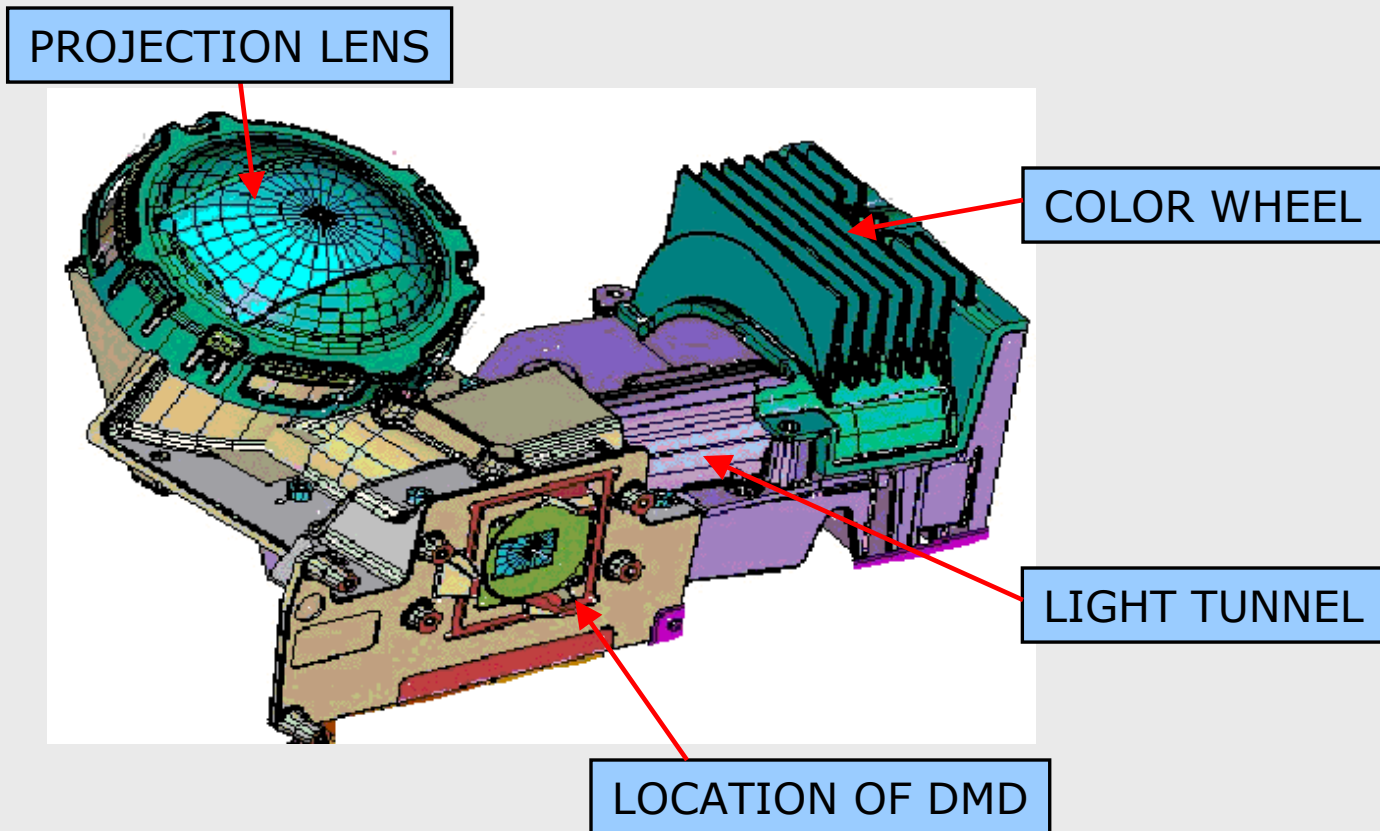
OPTICAL MODULE

LAMP MODULE

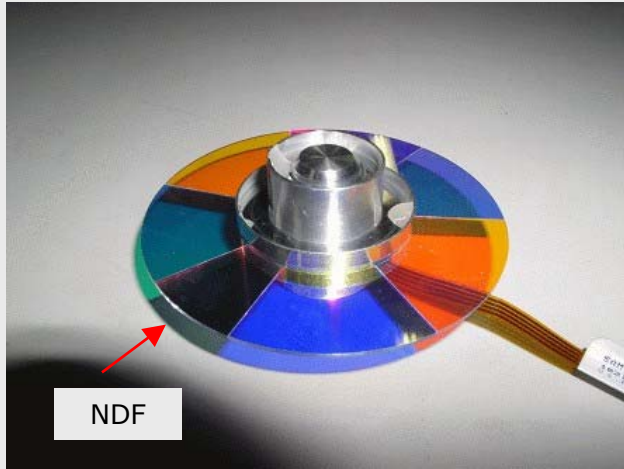


DMD MODULE

Optical Module



Color Wheel



<Air Bearing Type Motor>

Life time : over 30,000 hrs (max 50,000 hrs)

On/off : over 50,000 times (max 300,000 times)

Less Vibration & Noise

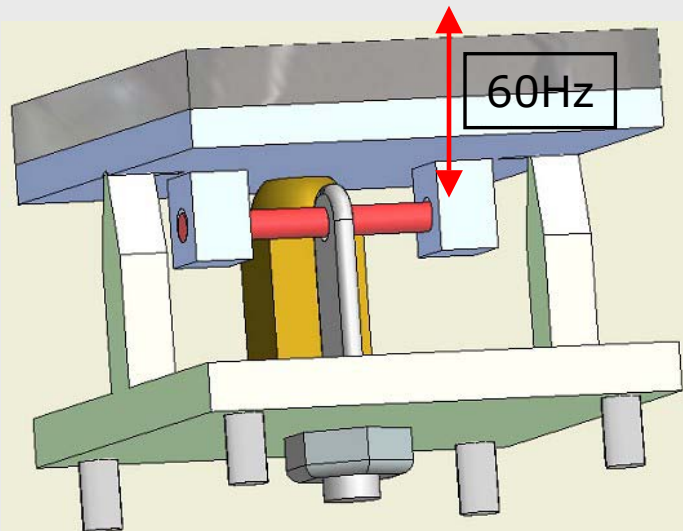
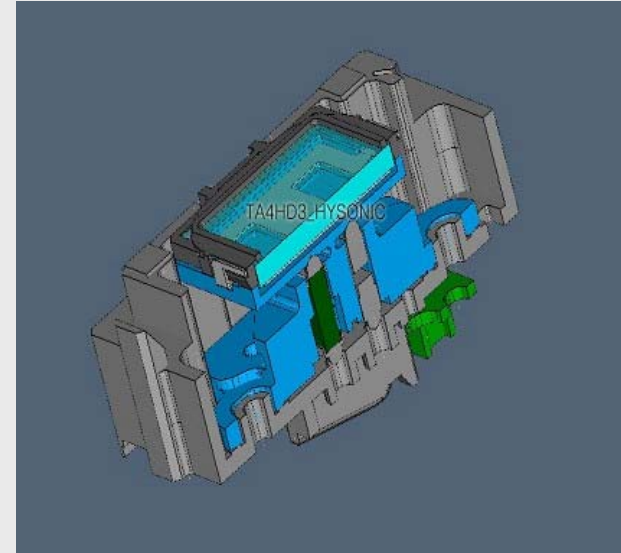
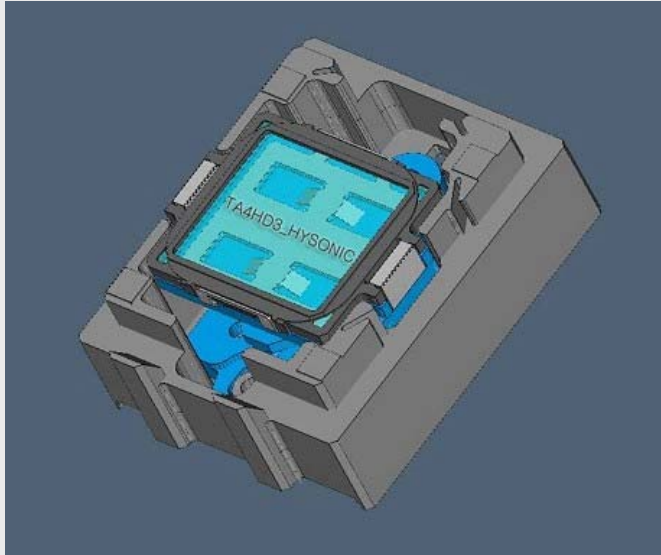
Parameter	Value	Unit	Comment
Number of segments	7		
Filter Thickness	0.7	mm	
Angle of Incidence	15	Deg.	Average
Color sequence (as seen by light beam)	GBRG(NDG)BR		

Parameter		Value	Unit	Comment
Outer diameter		65	mm	
Clear Aperture (Radius)		14.75	mm	Min
Inside Diameter		33.5	mm	Includes adhesive allowance
Motor	Manuf.	Nidec		
	Model	PC-20 VA		Air Bearing
	Unaxis MM#	102152589		
	Speed	10,800	rpm	
Direction of Rotation		CW		
Residual Dynamic Unbalance		G6.3		According to ISO 1940

*Addition = Neutral Density Filter

NDF Purpose: Decrease Dither noise.

Actuator



No.	Items	Specification
1	Mass	79g
2	Mirror tilt angle range	0~0.015deg.
3	State transition time	<1.0 mSec
4	Initial static angle	+/-0.025deg.

Purpose: Smooth Picture
by ½ Pixel movement
using 60Hz mirror
vibration.

Lamp

Full name : High Pressure Mercury Lamp

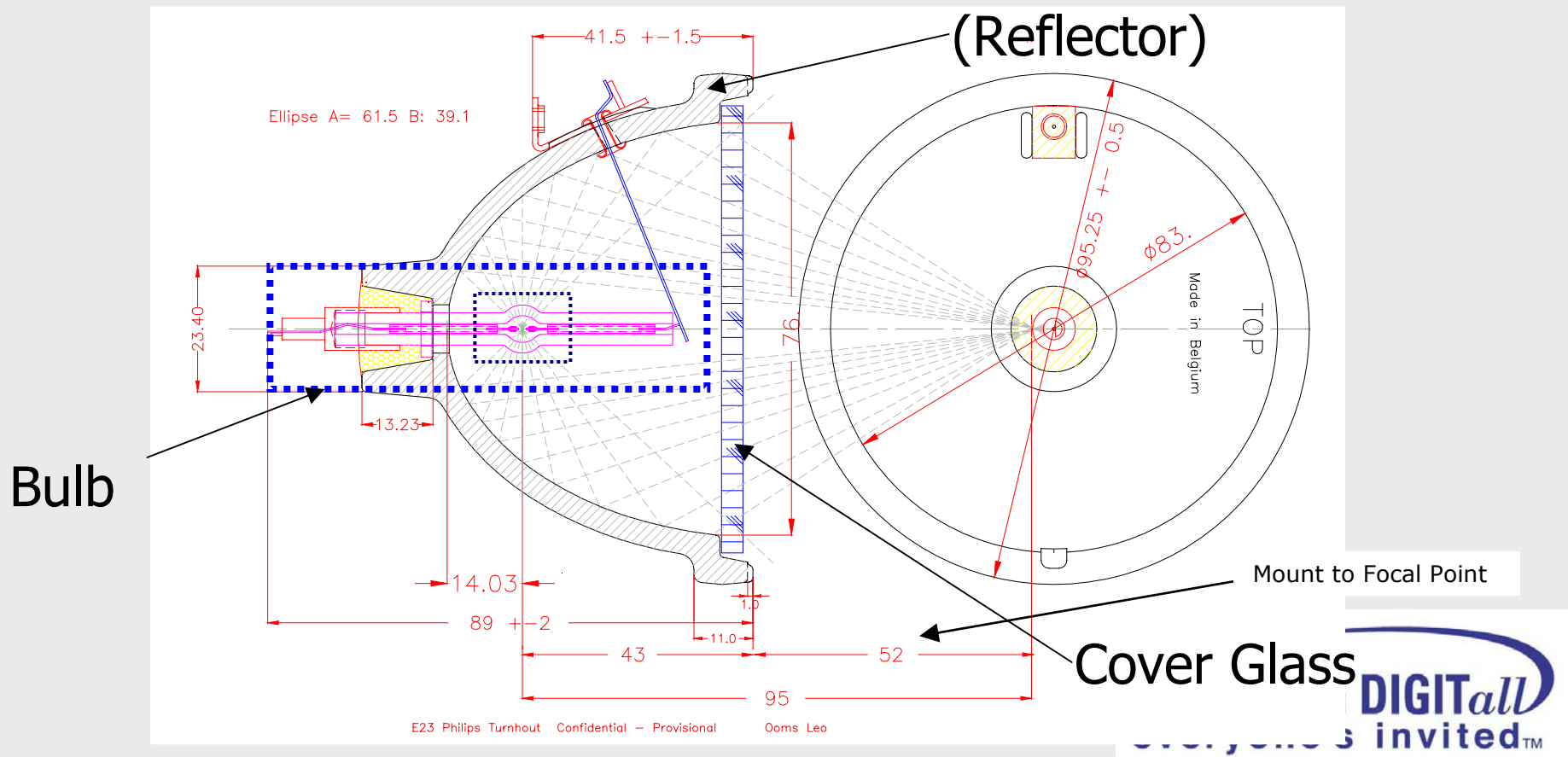
Maker : Philips

Specification

- Arc gap : 1.0 mm
- Wattage : 100W or 120W
- Life time : about 8000 – 6000hrs

Optical Specification

- Reflector type : E23
- Size : $95.25 \pm 0.5\text{mm}$
- Mount to focal point : 52mm



Ballast

Maker : Philips

Type no. : **EUC 120PH/11**

Ignition : 20KV(Max 25KV)

Size : 150 x 60 x 32mm

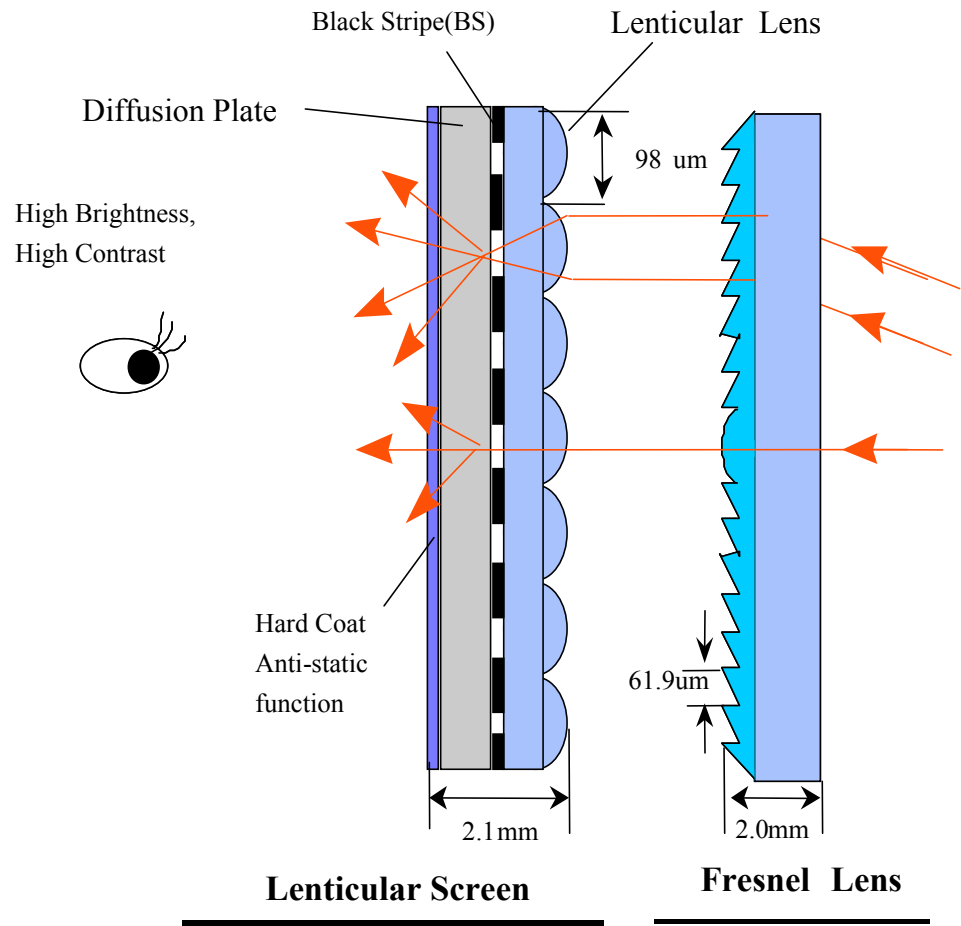
Ambient temp. : under 65deg C.



Screen

Good Point :

1. Good Contrast
2. No reflection of out-light.
3. Good View Angle (140 deg)
4. Reduced Moire
5. Increased Screen Gain



Optical Specification

Parameter	Nominal value	unit	Comment
Brightness	460	nits	7-segment color wheel, TI development board, no spoke light recapture, reference lamp
Uniformity (ANSI) - Typical - Minimal	+/- 15 +/- 25	% %	+: brightest of 13 ANSI points/average of 9 points -: darkest of 13 ANSI points/average of 9 points
Contrast full on/off - Typical	1500:1	n.a.	7 segment color wheel, TI development board, no spoke light recapture

Optical Specification Continued

Parameter	Nominal value	unit	Comment
Color Temperature	7,500 K (Warm 1)	n.a.	measured in image center
F-number	≥ 2.6	n.a.	design value
Projection distance at 50" screen size	585	mm	projection distance: distance from vertex of front lens to projection screen
Exit pupil position	30.98 mm	mm	design value, distance to vertex of front lens
F.O.V (Field of View)	94	deg.	design value
Panel size	12.451 x 7.008	mm	Diamond Pixel Configuration

Optical Specification Continued

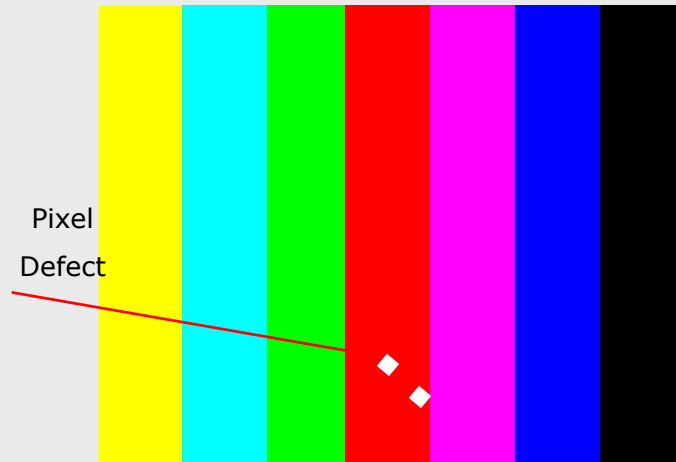
Parameter	Nominal value	unit	Comment
Lateral color aberration @ 50" (R-G; B-G)	≤ 7 ≤ 8.5	μm μm	Design value 440/546/640 nm
TV distortion - in horizontal direction - in vertical direction	$\leq 0.3 $ $\leq 0.3 $	% %	Pin Cushion or Barrel condition
folding angle	66	deg.	mechanical design value

Service Hint #1

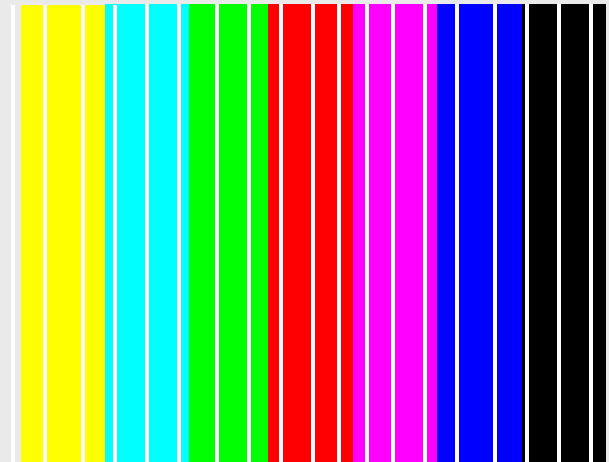
DMD BOARD ASSY

Problem : PIXEL DEFECT, VERTICAL LINE

Solution : Change the DMD Board assembly.



Vertical Line Problem (Jail Bar effect)

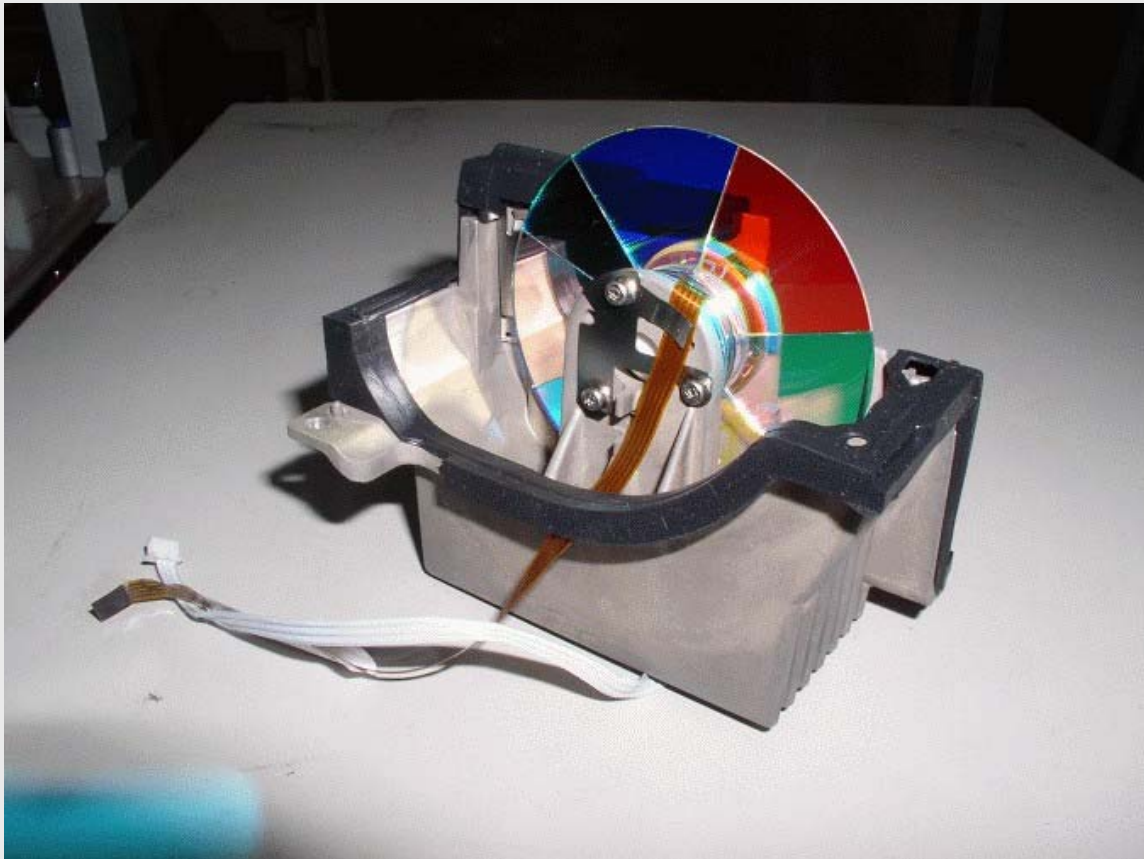


Service Hint #2

Color Wheel Assembly

Problem : INCREASED NOISE

Solution : Change the Color wheel module.



Service Hint #3

LAMP ASSY

Problem : LOW BRIGHTNESS or No Power

Solution : Change the Lamp module

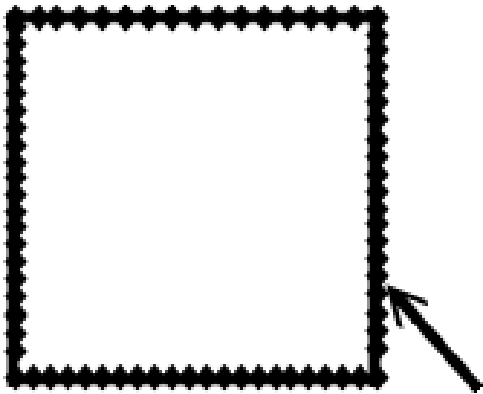


Service Hint #4

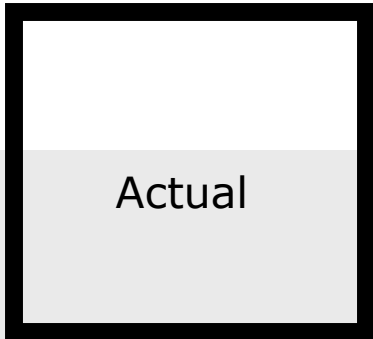
ACTUATOR

Problem : High Frequency Noise(1200Hz), Distorted edges in Picture

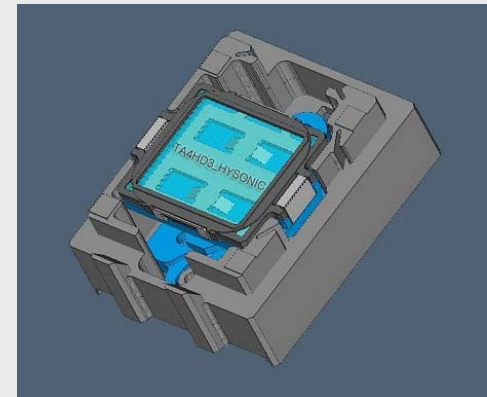
Solution : Change the Actuator



Sawtooth
Edges



Actual



Mechanic

L3 DLP Main Parts

CABINET-FRONT

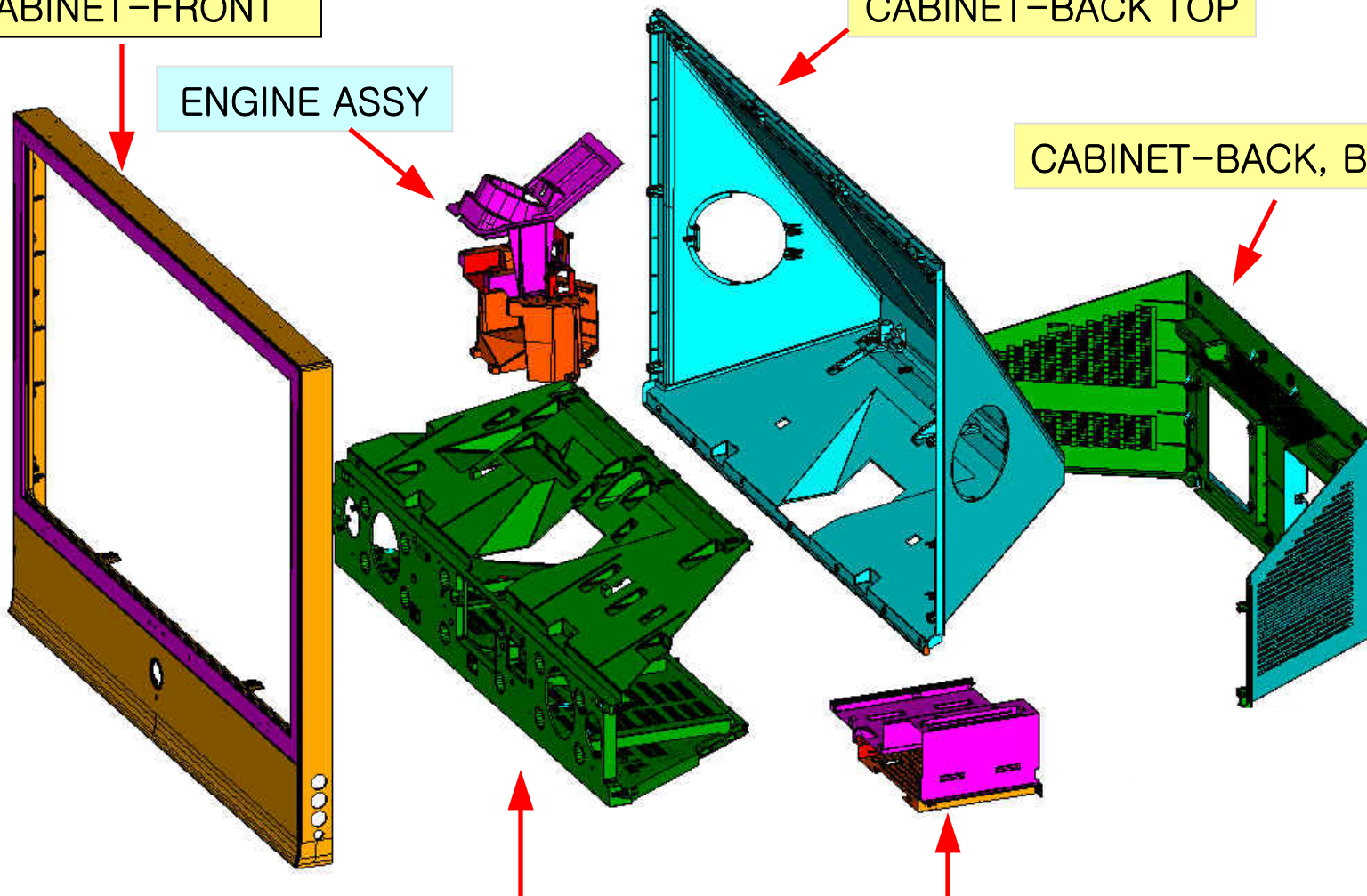
CABINET-BACK TOP

ENGINE ASSY

CABINET-BACK, BOTTOM

CABINET-MAIN

CHASSIS



Set Dimensions

MODEL	W x D x H (mm Unit)	Weight (Kg)	W x D x H (mm Box)	Weight (Kg)
46L3	1094 x 339 x 814	31.5	1205 x 455 x 950	39
50L3	1182 x 359 x 870	35	1300 x 480 x 1010	43
56L3	1330 x 396 x 963	41.5	1450 x 520 x 1105	53
61L3	1446 x 425 x 1035	45	1580 x 565 x 1170	57

Mirror Size

MODEL	SIZE (W1 x W2 x H)
46L3	1035 x 530 x 523
50L3	1030 x 580 x 570
56L3	1279 x 650 x 645
61L3	1395 x 692 x 700

Screen Size

MODEL	SIZE (W x H)
46L3	1021 x 580.5
50L3	1126 x 646
56L3	1257 x 713.5
61L3	1381 x 790

* Dimensions in mm

The End

Thank You!