PDP TV Lily

TRAINING MANUAL

Agenda

1. Specification
2. Alignment & Adjustment
3. Block Diagram
4. Wiring Diagram
5. Operation Instruction & Installation
6. Trouble Shooting

Concept

■ Value Proposition

Relaxation

Pleasure

Affordable

Satisfaction

“ beyond the space… ”

1. Specification

Product Features

Features			
Block	Specfication	Major IC	Remark
RF	Tuner	TCPS3001PD32S(H)	SEMCO
PDP Module	Samsung SDI W2A	42"HD/50"HD	SAMSUNG SDI
Power	Input Voltage: AC 100~240V, 50/60Hz		
Video	Scaler	MT8202FG	MTK
	Video Decoder		
Sound	Sound AMP	NTP3000	Neo Fidelity
	Audio CODEC	MT8291(IC8002)	MTK
Cabinet	C9 Design		

Specification		
Model	PS-42C91H	PS-50C91H
Screen Size	42 Inches (16:9)	50 Inches (16:9)
Dimensions (WxHxD)	1055 x 775 x 341 mm (With stand)	1227.1 x 861.3 x 341 mm (With stand)
Weight	40.4 kg (With stand)	49.7 kg (With stand)
Voltage	AC 100~240V, 50/60Hz	
Colour System	PAL, SECAM, NTSC4.43, NTSC 3.58	
Sound System	BG, DK, I, M	
PC Resolution	1024 x 768 @ 60/75Hz	1360 x 768 @ 120 Hz
ANTENNA input	AIR IN (75Ω unbalanced)	
VIDEO input	SCART1, SCART2 AV1, AV2 S-VIDEO COMPONENT1 - 480i/480p/720p/1080i PC HDMI1/2 (DVI Compatible HDMI) (Option)	
AUDIO input	SCART1, SCART2 AV1, AV2 S-VIDEO COMPONENT1 - 480i/480p/720p/1080i PC DVI	
Audio Output	AUDIO (L/R)	
Speaker Output	10W + 10W	

Key Features

Model	PS-42C91H	PS-50C91H
Screen Size	42 Inches (16:9)	50 Inches (16:9)
Dimensions (WxHxD)	1055 x 775 x 341 mm (With stand)	1227.1 x 861.3 x 341 mm (With stand)
Weight	40.4 kg (With stand)	49.7 kg (With stand)
Voltage	AC 100~240V, 50/60Hz	
Colour System	PAL, SECAM, NTSC4.43, NTSC 3.58	
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2. Alignment & Adjustment

Factory Mode adjustments

1. How to enter factory mode

1. General Remote

To Enter: POWER OFF → INFO → MENU → MUTE → POWER ON
(Interval between key strokes: less than 3 sec)

To Exit: POWER OFF → POWER ON

2. Factory Remote

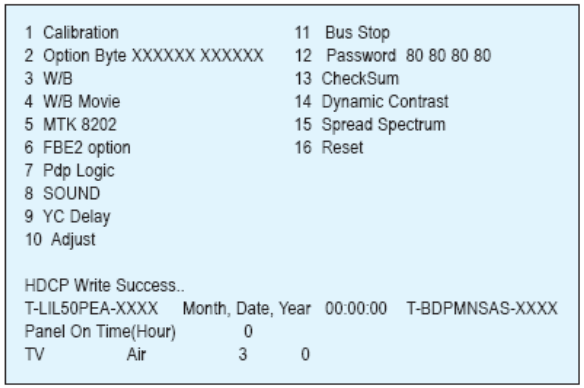
To Enter: POWER ON → INFO → FACTORY Key (Interval between key strokes: less than 3 sec)

To Exit: POWER OFF → POWER ON
Press the Factory key twice with a key stroke interval of more than 1 second (Pressing once enters Aging Mode)

3. Settings when entering Factory mode
- Sharp Screen (Dynamic), Color Tone (Cool1), Factory (Dynamic CE Off)

4. Adjustment Procedures
- Channel ▲ ▼ Key : Select an item.
- Volume ◀ ▶ Key : Adjust the value up or down.
- MENU Key : Save the changes to the EEPROM and return to the higher-level mode.
- Using the Numeric (0~9) keys, you can select a channel.
- Using the SOURCE key, you can switch AV modes.

5. Initial SERVICE MODE DISPLAY State



1. Calibration

ITEM	Data
AV Calibration	Sucesses
Comp Calibration	Sucesses
DTV Calibration	Sucesses
HDMI Calibration	Sucesses

Service adjustments

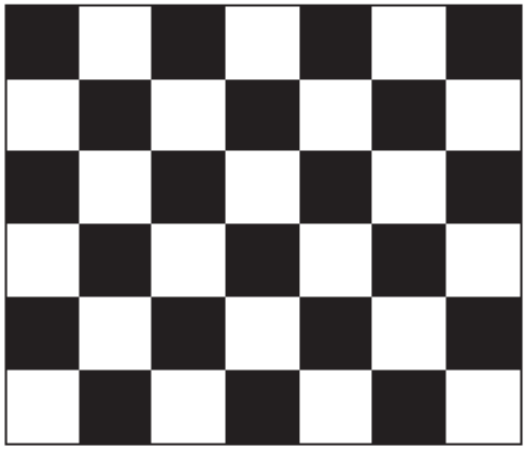
■ White Balance - Calibration

If picture color is wrong, do calibration first.

Execute calibration in Factory Mode

1. Source : VIDEO
2. Setting Mode : PAL Video (MODE : #2)
3. Pattern : Pattern #24 (Chess Pattern)
4. Use Equipment : MSPG945 Series or MSPG925 Series
5. Work order
   1) Enter by Factory Mode select "1.CALIBRATION".
   2) Select "AV CALIBRATION" again in CALIBRAION MENU.
   3) After Completing Calibration, come out "Av success". OSD on the screen (bottom-side) for about 3 seconds.

Source AV : PAL composite, Component : 1280*720/60Hz(720P)
PC : 42" - 1024*768/60Hz
50" - 1360*768/60Hz



(Chess Pattern)

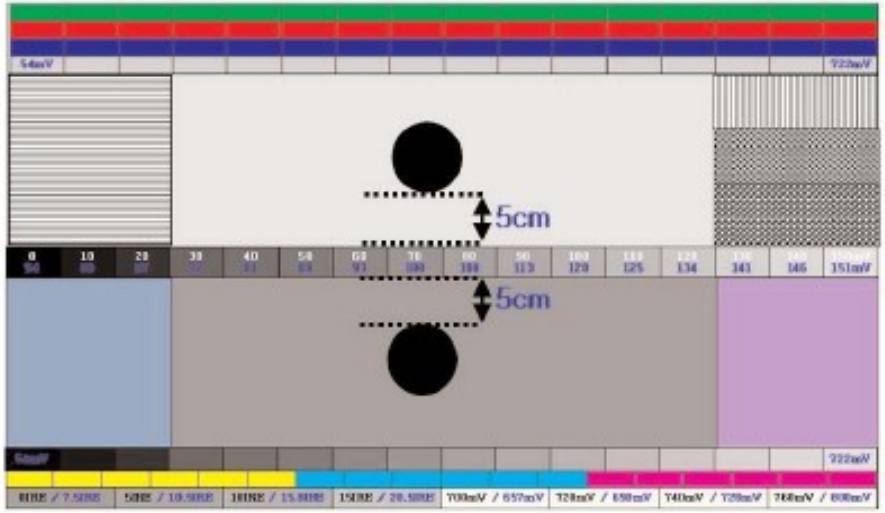
Service adjustments

■ White Balance - Adjustment

If picture color is wrong, check White Balance condition.

Equipment : CA210, Patten : Toshiba
Adjust W/B in Factory Mode

Sub brightness and R/G/B Offset controls low light region
Sub contrast and R/G/B Gain controls high light region
Source AV : PAL composite, Component : 1280*720/60Hz,
HDMI[DVI] : 1280*720/60Hz



(SAMSUNG WHITE BALANCE Adjustment PATTERN with FPD)

[Test Pattern : MSPG-945 Series Pattern #16]

* Color temperature
1500K ± 500, -6 ~-20 MPCD

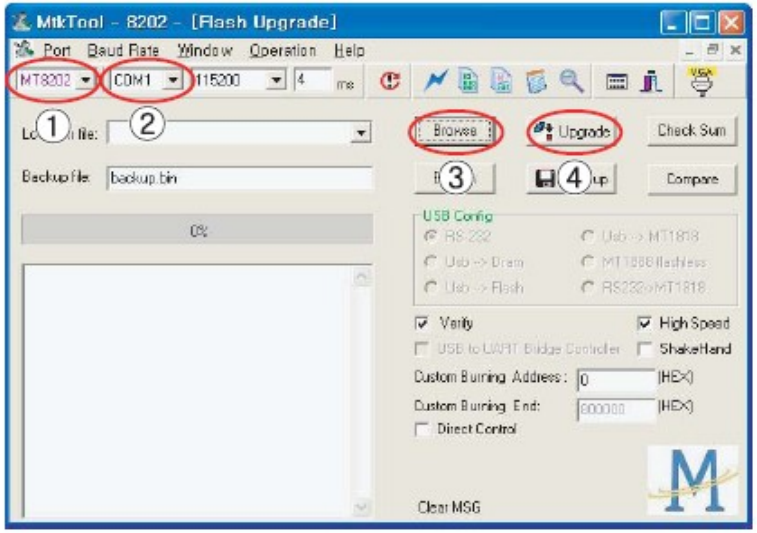
* Color coordinate
H/L : 278/285 ± 2
L/L : 278/285 ± 3, 1.9ft ± 0.05ft
(This Data will be able to be changed according to Picture quality Setting, Please refer to latest data from Factory.)

Software Upgrade (with RS-232C)

MTKtool

1. Install the MTKtoll
   Connect Set (Service Jack) and Jig Cable to execute Program Update.

2. Turn on the Set (or on Stand by mode)
   - Run "MTKtool"

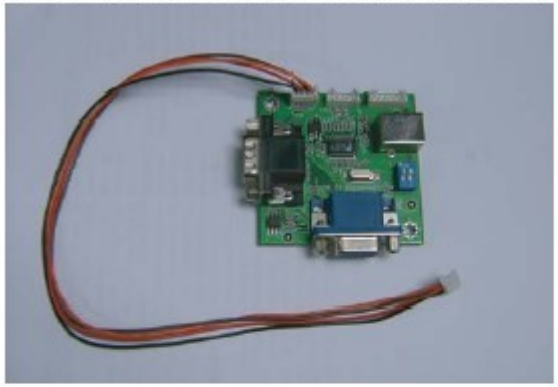


- Click Reset
- Choose MT8202 ①
- Select Com Port ② (Auto Detect)
- Select Bin file, by browse ③
- Click Upgrade button ④

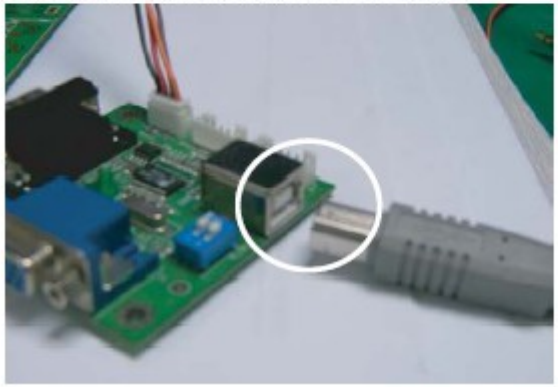
3. Turn off (= AC Power off) the Set (waiting a few seconds) and turn on again.

Software Upgrade (with UART JIG)

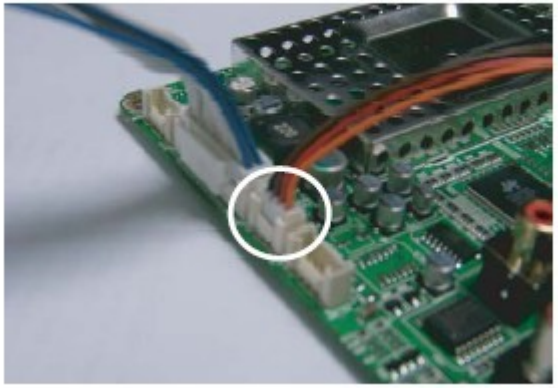
1. If some problems occur under this condition, update S/W by using UART JIG.



2. You can use UART JIG with USB Connection.



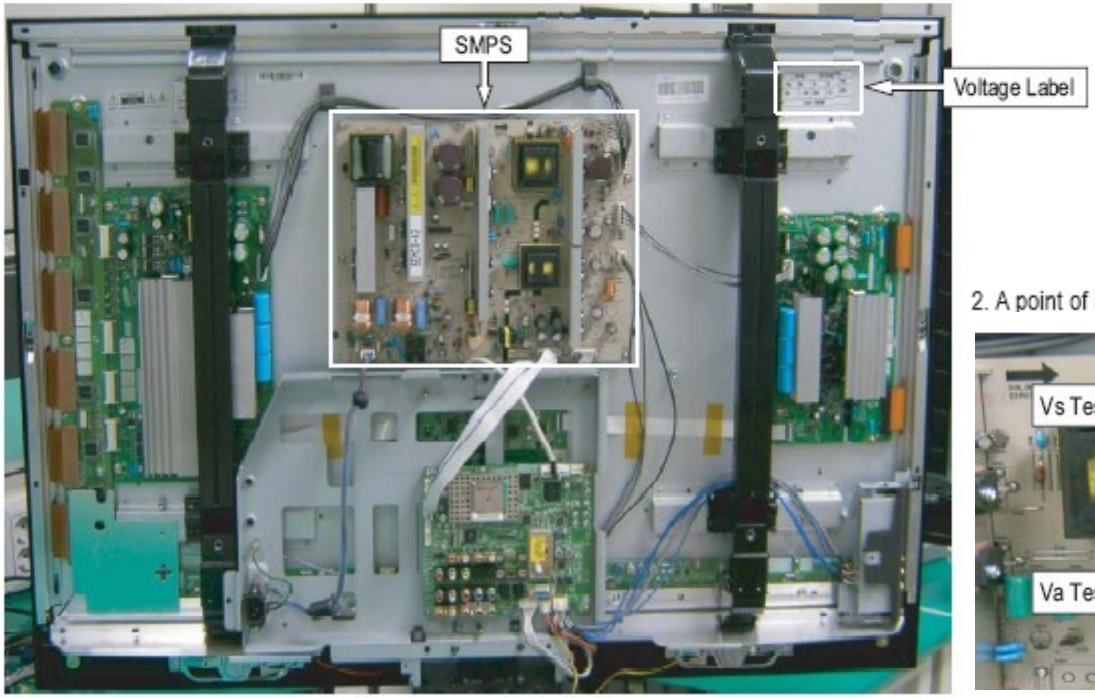
3. Install PL-2303 Driver Installer in your PC before using the JIG.
Connect 4P Lead connector to Main Board (CN501)



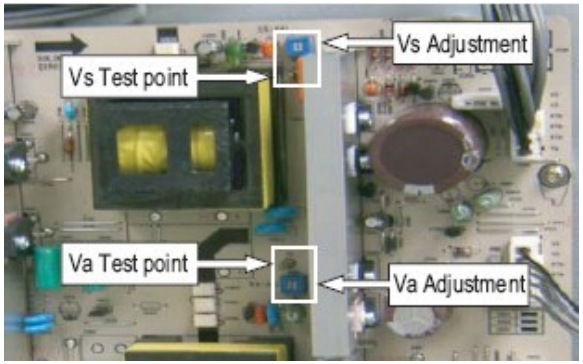
Voltage Adjustment

1. After replacing the SMPS or PDP panel, you must adjust the voltage referring to the voltage label printed on the panel.
(If you do not adjust the voltage, an abnormal discharge symptom may appear.)

	Value	Board Adjustment
Vs	210	SMPS
Va	63	
Vset	-	-
Ve	94	
Vscan	-190	



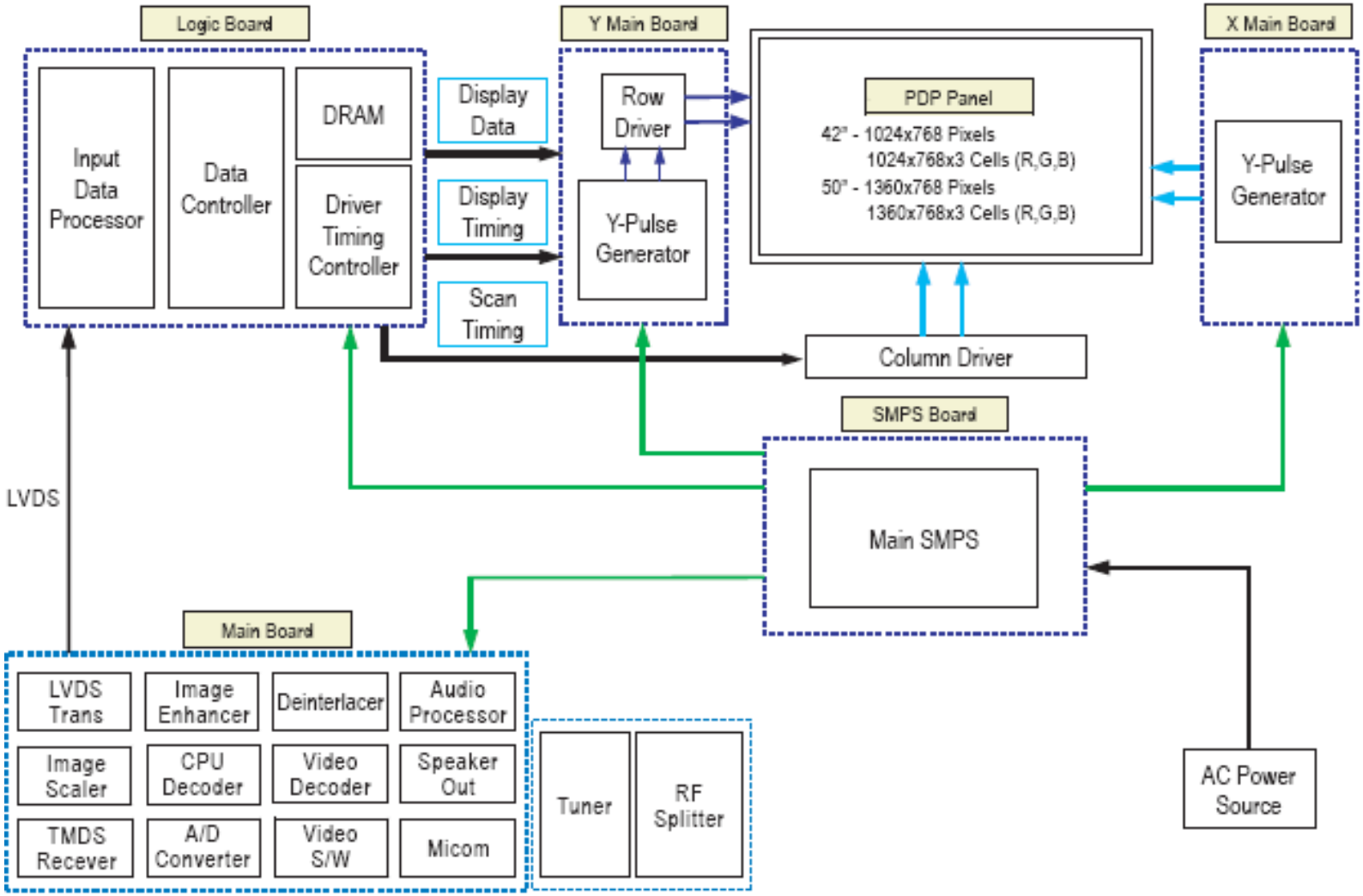
2. A point of adjusting SMPS-MAIN voltage.



3. Block Diagram

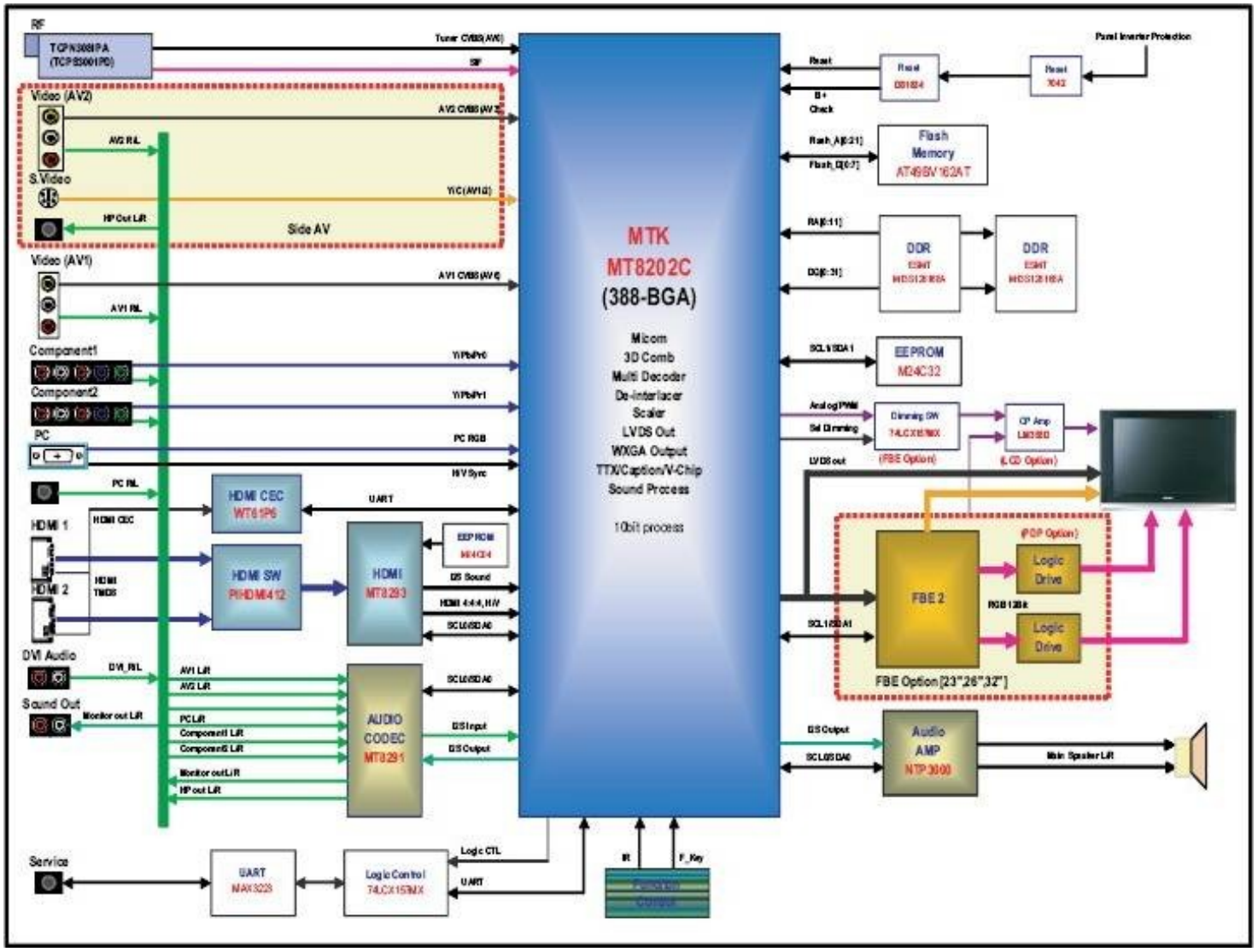
3. Block Diagram

Overall Block Diagram



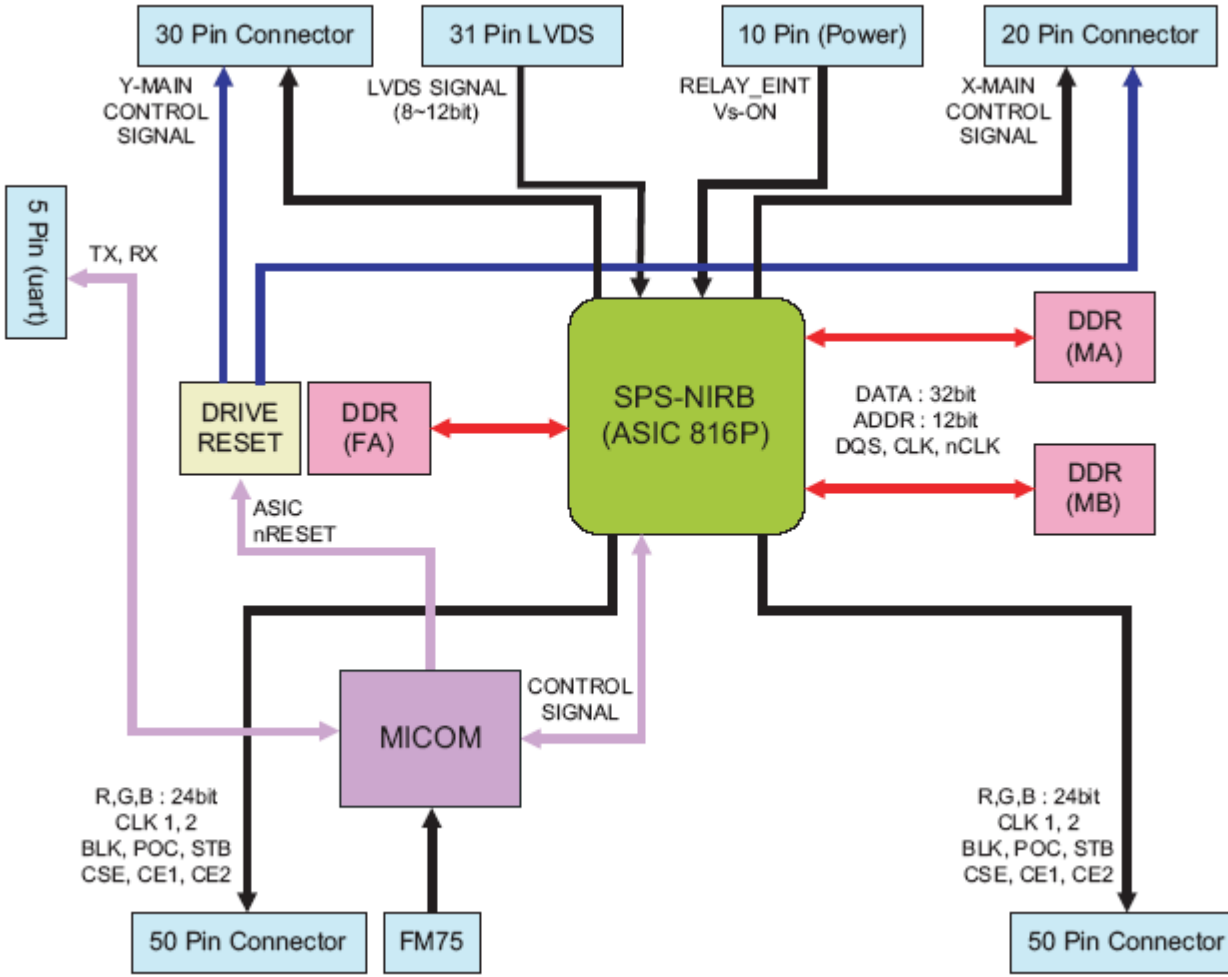
3. Block Diagram

Audio/Video Signal Block Diagram

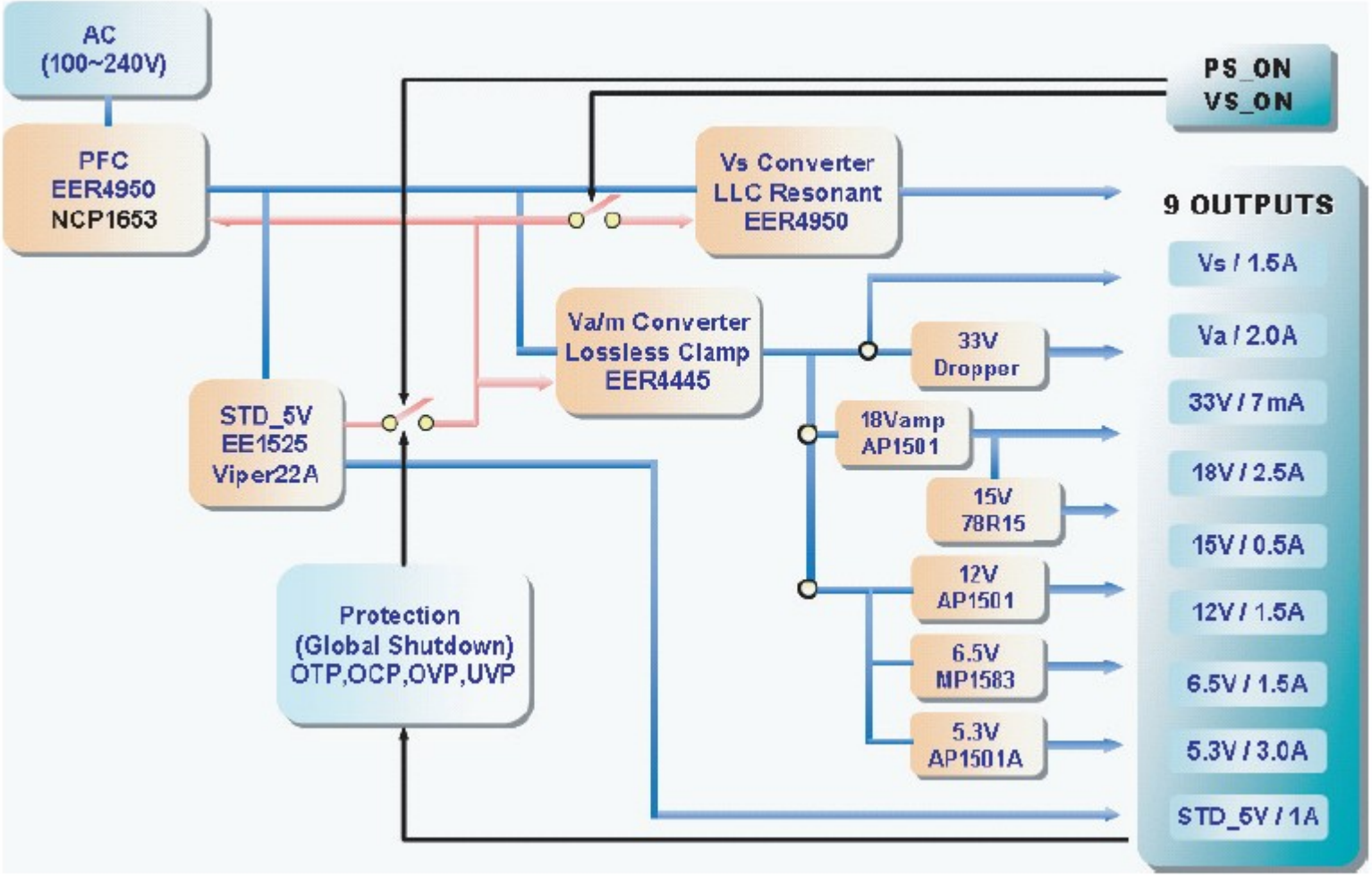


3. Block Diagram

Logic Board Block Diagram



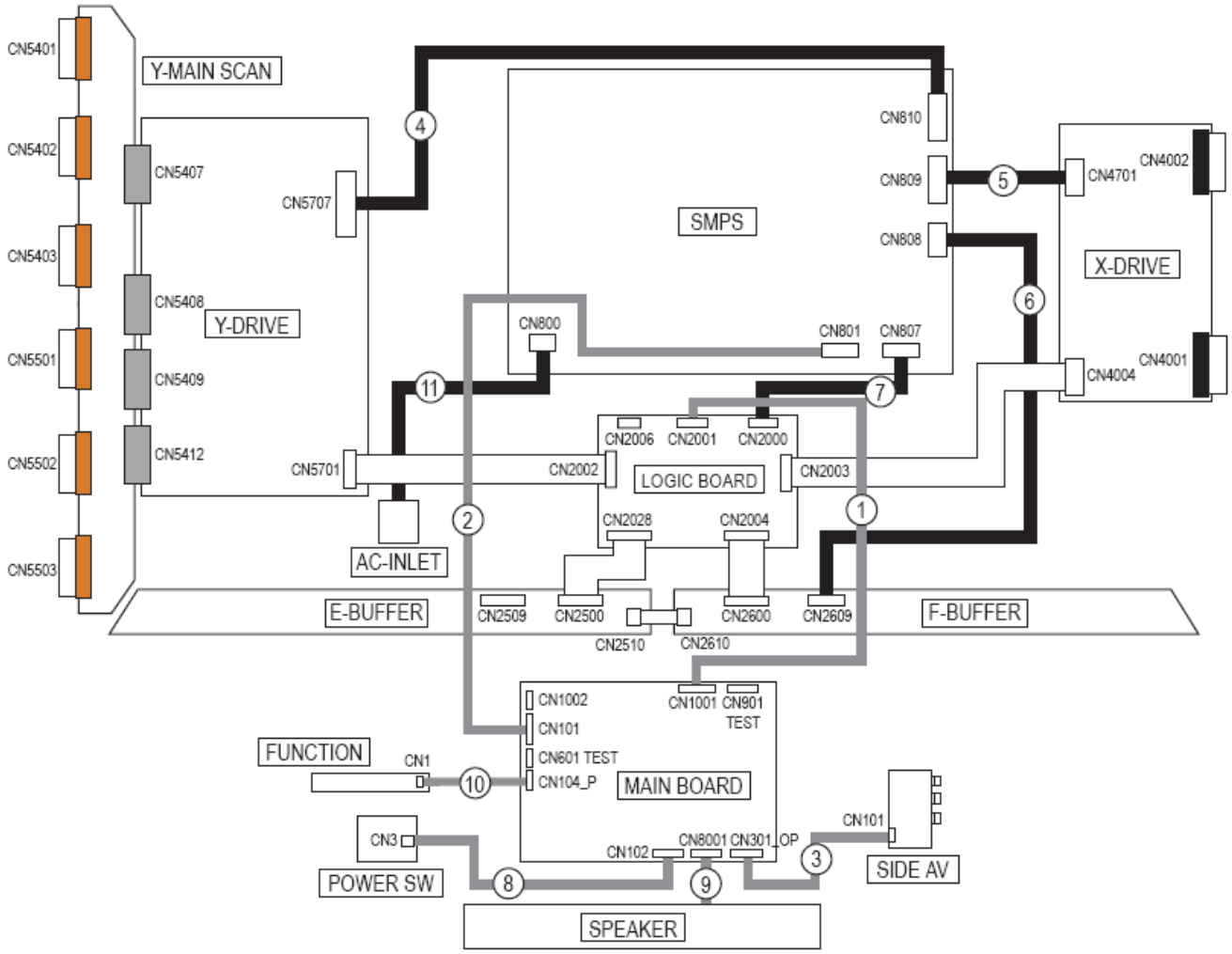
Power Block Diagram



4. Wiring Diagram

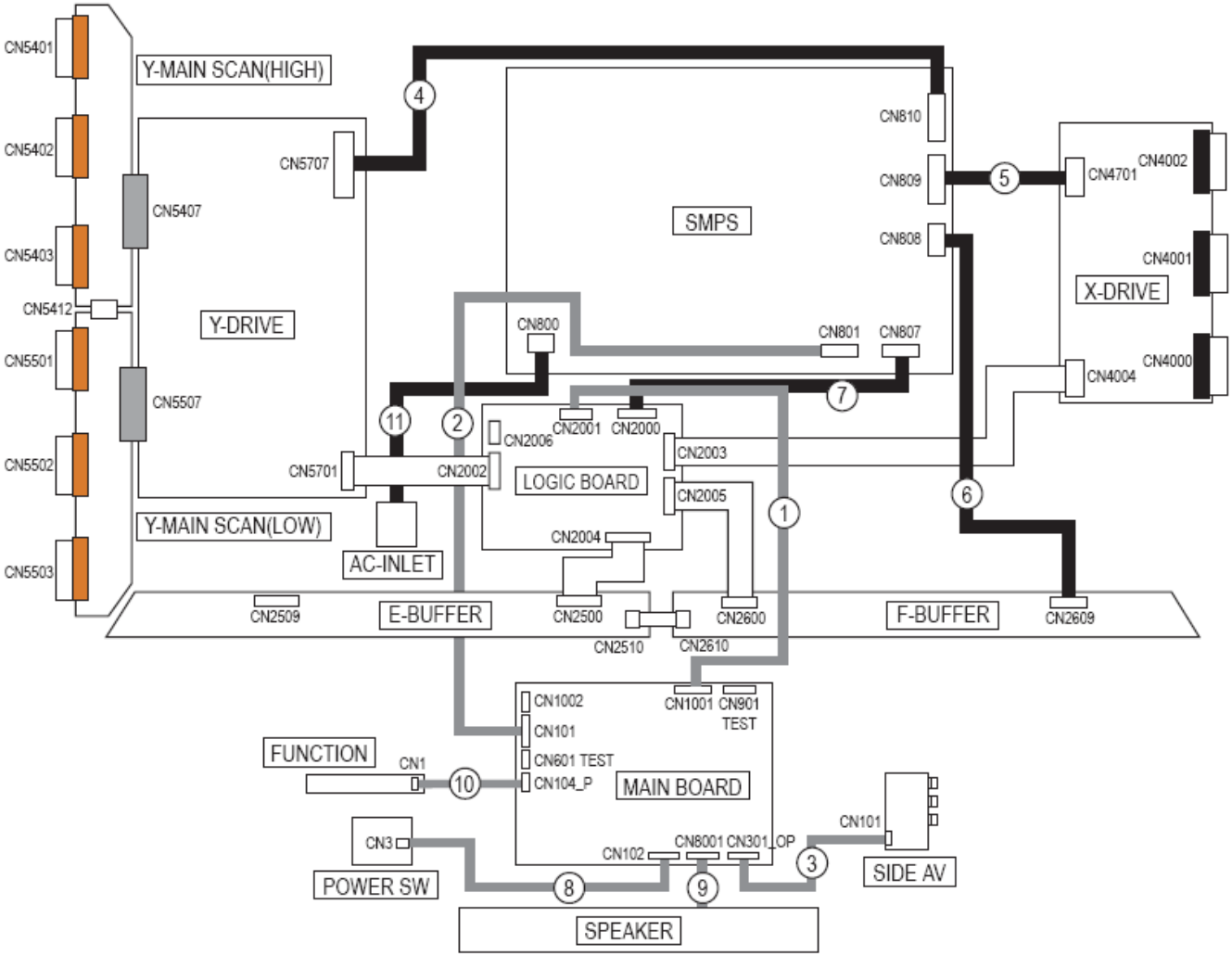
4. Wiring Diagram

Overall Wiring(42”)



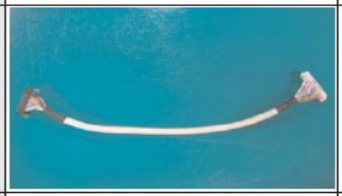
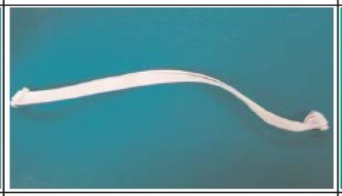
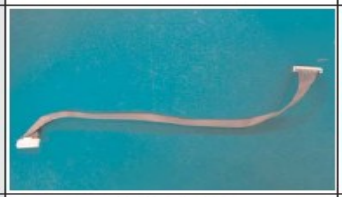
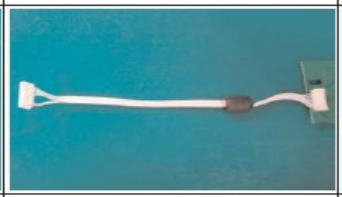
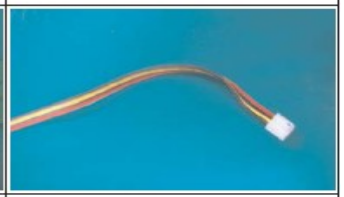
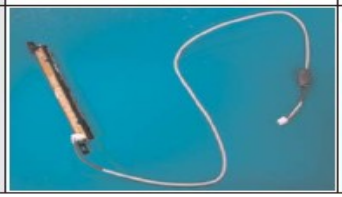
4. Wiring Diagram

Overall Wiring(50”)



4. Wiring Diagram

Overall Wiring

Use	① LVDS 31P-30P	② POWER 24P	③ SIDE
Code	42" - BN39-00859A 50" - BN39-00817A	BN39-00827A	-
Photo			
Use	④ Y Drive	⑤ X Drive	⑥ Address
Code	-	-	-
Photo			
Use	⑦ Logic	⑧ Front	⑨ SPEAKER
Code	-	-	-
Photo			
Use	⑩ FUNCTION	⑪ AC_INPUT	
Code	-	42" - 2901-001378 50" - 2901-001340	
Photo			

PDP - SMPS Wiring

④ CN805(SMPS) ↔ CN5015(Y B'D)	
Pin No.	Signal
1	Vg
2	GND
3	GND
4	GND
5	Vs
6	Vs

⑤ CN804(SMPS) ↔ CN4000(X B'D)	
Pin No.	Signal
1	Vg
2	GND
3	GND
4	Vs
5	Vs

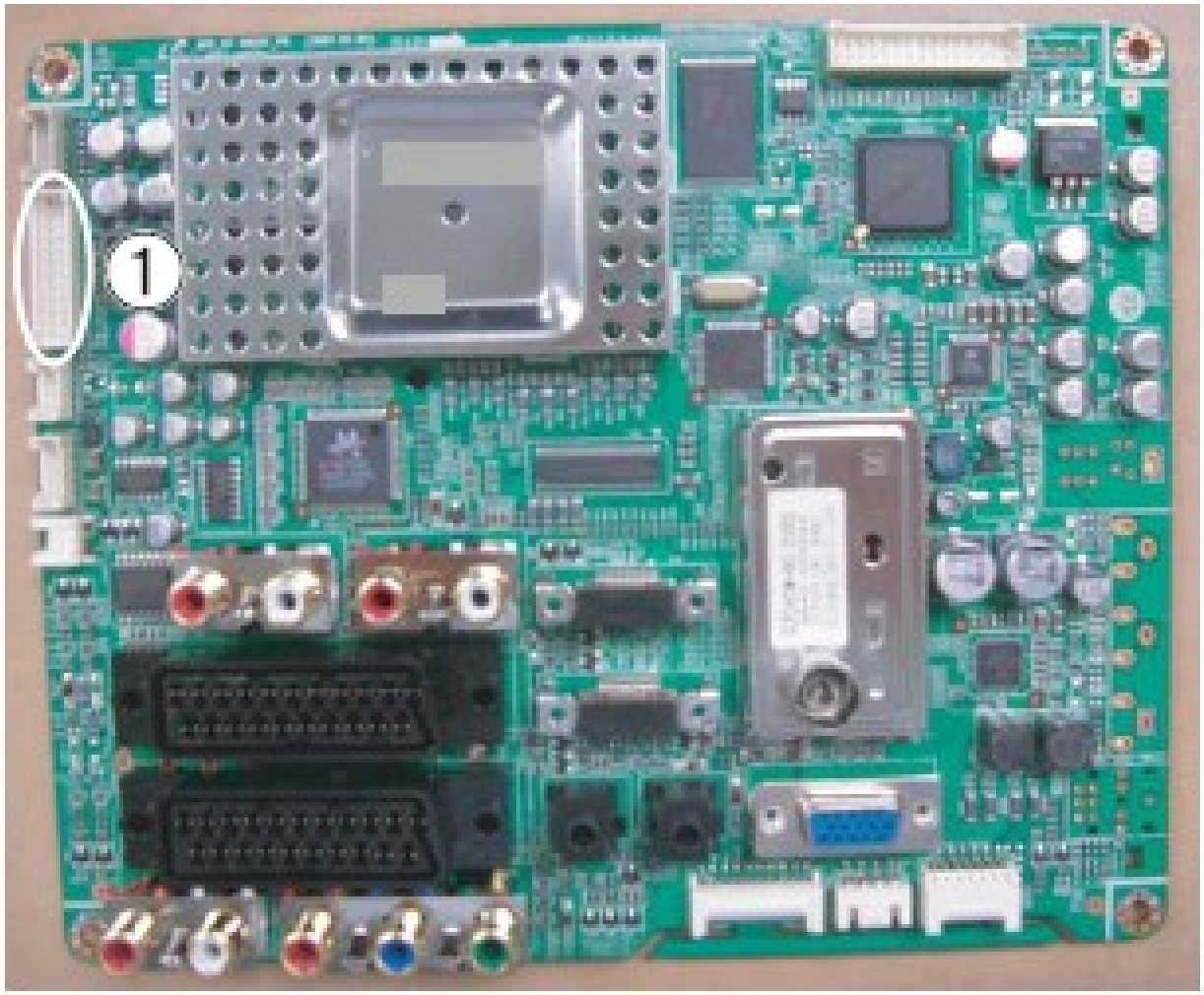
⑥ CN806/CN807(SMPS) ↔ CN2501(E-BUFFER)	
Pin No.	Signal
1	Va
2	GND
3	5.3V

⑦ CN803(SMPS) ↔ CN2036(LOGIC B'D)	
Pin No.	Signal
1	STBY
2	VS_ON
3	N/C
4	PS_ON
5	RTN
6	5.3V
7	RTN
8	RTN
9	5.3V
10	5.3V

⑪ CN800(SMPS) ↔ AC INLET	
Pin No.	Signal
1	AC Neutral
2	N/C
3	AC Live

4. Wiring Diagram

Main Board Wiring



Main Board Wiring

① CN1401(MAIN B'D) ↔ CN2010(LOGIC B'D)

Pin No.	Signal	Pin No.	Signal
1	RxIN0-	16	NC
2	RxIN0+	17	GND
3	RxIN1-	18	WP
4	RxIN1+	19	SCL
5	RxIN2-	20	SDA
6	RxIN2+	21	LVDS Opt
7	RxINCLK-	22	DCC Opt
8	RxINCLK+	23	GND
9	RxIN3-	24	GND
10	RxIN3+	25	GND
11	NC	26	Vdd
12	NC	27	Vdd
13	NC	28	Vdd
14	NC	29	Vdd
15	NC	30	Vdd

② CN101(MAIN B'D) ↔ CN801(SMPS)

Pin No.	Signal	Pin No.	Signal
1	PS_ON	13	5V
2	N/C (Auto_V)	14	5V
3	STBY	15	5V
4	GND_STBY	16	5V
5	GND_18V AMP	17	GND_12V
6	GND_18V AMP	18	GND_12V
7	18V AMP	19	12V
8	18V AMP	20	GND_12V
9	GND_5V	21	12V
10	GND_5V	22	12V
11	GND_5V	23	N.C(FAN_ON)
12	GND_5V	24	N.C(FAN_DET)

③ CN1804(MAIN B'D) ↔ CN105(SIDE AV)

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	GND	12	TXC-	23	NC	34	VIDEO_SR_IN
2	TX2+	13	GND	24	NC	35	VIDEO_SL_IN
3	TX2-	14	MICOM_CEC	25	GND	36	HP_IDENT
4	GND	15	GND	26	SVHS_IDENT	37	HP_OUT_R
5	TX1+	16	TSCL	27	SVHS_Y	38	HP_OUT_L
6	TX1-	17	TSDA	28	GND	39	USB_VCC
7	GND	18	LSCL	29	SVHS_C	40	B1.8V
8	TX0+	19	HDMI3_5V	30	GND	41	B3.3V
9	TX0-	20	HPD_SIL9185	31	VIDEO_IDENT		
10	GND	21	DDC_WP	32	VIDEO_CVBS		
11	TXC+	22	GND	33	GND		

⑧ CN1701(MAIN B'D) ↔ POWER&IR

Pin No.	Signal
1	IR
2	GND
3	A5V_1
4	LED_STB
5	BUZZER
6	KEY_INPUT1
7	KEY_INPUT2
8	GND
9	B5V
10	LED_CTRL

⑨ CN1201(MAIN B'D) ↔ SPEAKER

Pin No.	Signal
1	R+_OUT
2	R-_OUT
3	L+_OUT
4	L-_OUT

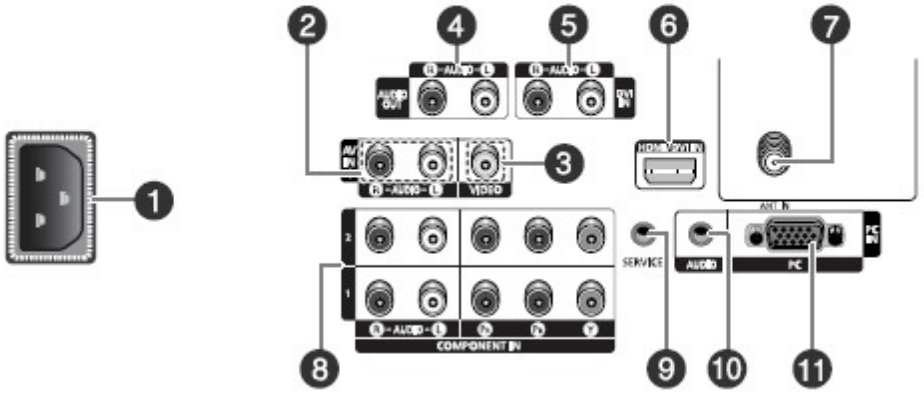
⑩ CN1702(MAIN B'D) ↔ FUNCTION

Pin No.	Signal
1	KEY_INPUT1
2	KEY_INPUT2
3	GND

5. Operation Instruction & Installation

Rear Panel

PL-42C91H/50C91H



❶ **POWER IN**
Connect the supplied power cord.

❷ **AUDIO-R/L (AV IN 1)**
Audio inputs for external devices, such as a camcorder or VCR.

❸ **VIDEO (AV IN 1)**
Video input for external devices, such as a camcorder or VCR.

❹ **AUDIO OUT (AUDIO-R/L)**
Audio outputs for external devices.

❺ **DVI IN (AUDIO-R/L)**
Connect to the DVI audio output jack of an external device.
➢ In case of PL-42Q91H/50Q91H models, only the HDMI IN 2 jack is compatible with DVI.

❻ **HDMI/DVI IN**
Connect to the HDMI jack of a device with HDMI output.
This input can also be used as a DVI connection with separate analog audio inputs. (In case of PL-42Q91H/50Q91H models, only the HDMI IN 2 jack is compatible with DVI.)
An optional HDMI/DVI cable will be necessary to make this connection.
When using an optional HDMI/DVI adapter, the DVI analog audio inputs on your TV allow you to receive left and right audio from your DVI device. (Not compatible with PC)

❼ **ANT IN**
75Ω Coaxial connector for Air/Cable Network.

❽ **COMPONENT IN 1, 2**
Video (Y/PB/PR) and audio (R-AUDIO-L) component inputs.

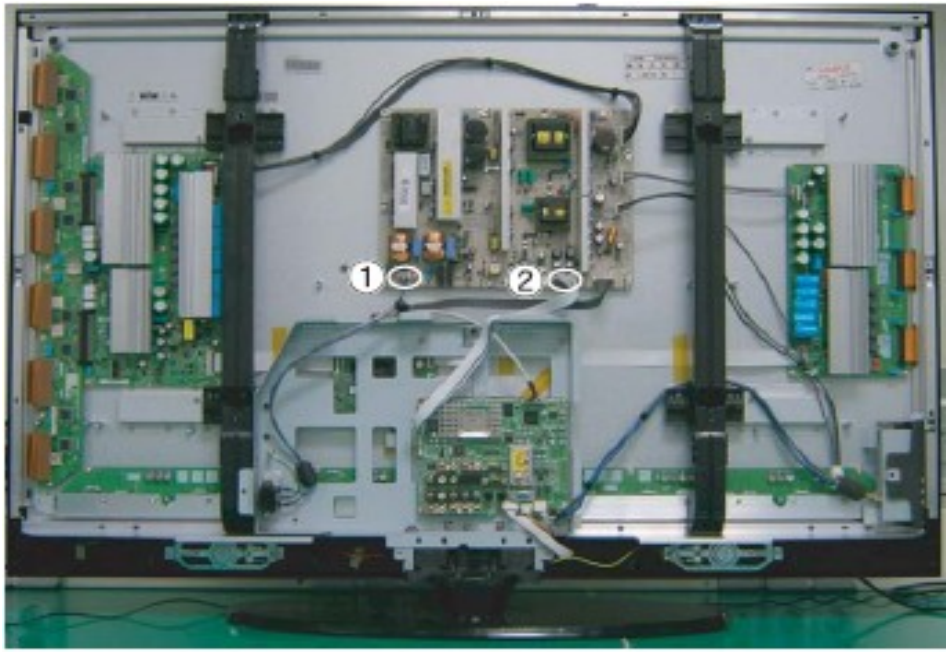
❾ **SERVICE**
These jacks are for service purposes only.

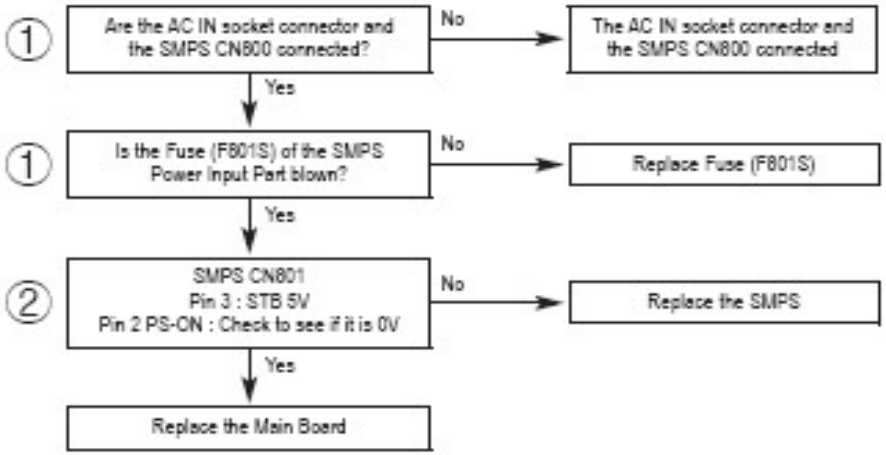
❿ **PC AUDIO IN**
Connect to the audio output jack on your PC.

⓫ **PC IN**
Connect to the video output jack on your PC.

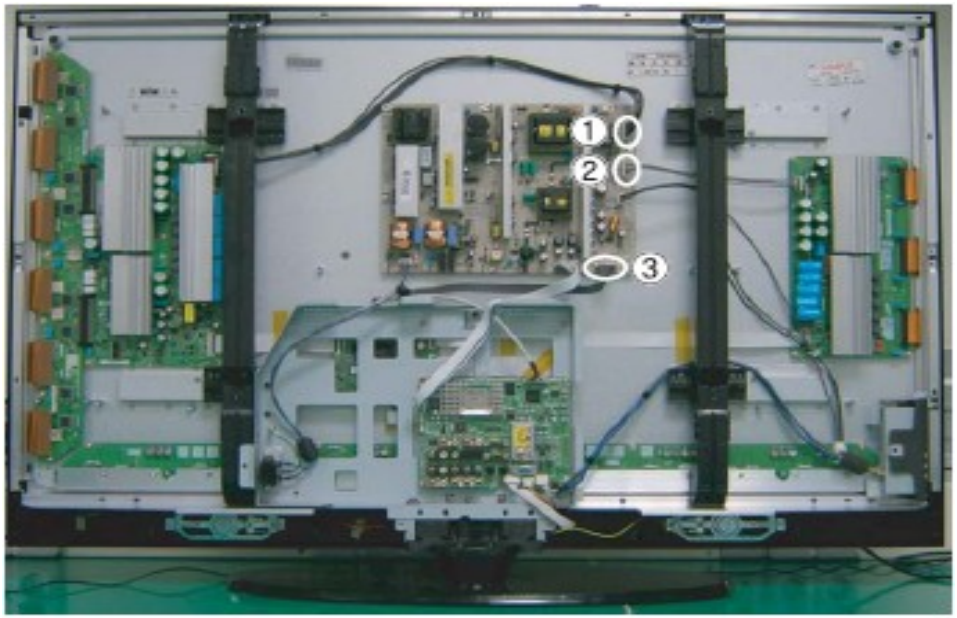
6. Trouble shooting

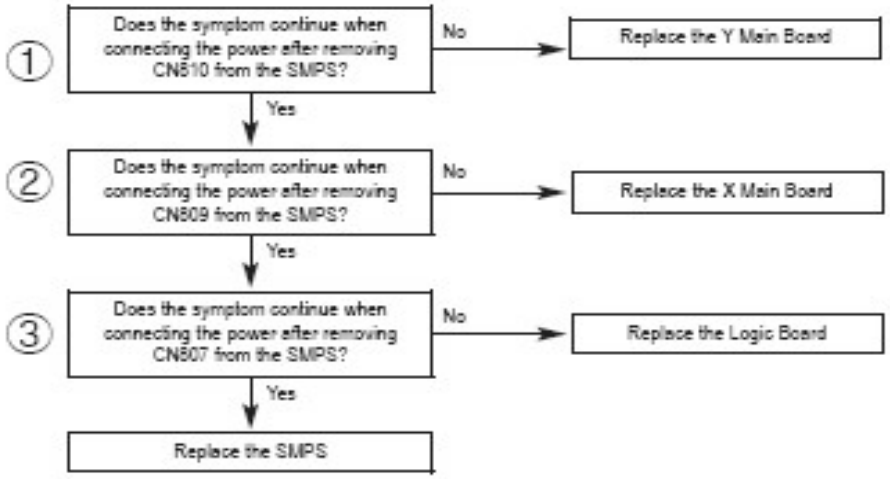
No Power


1
2

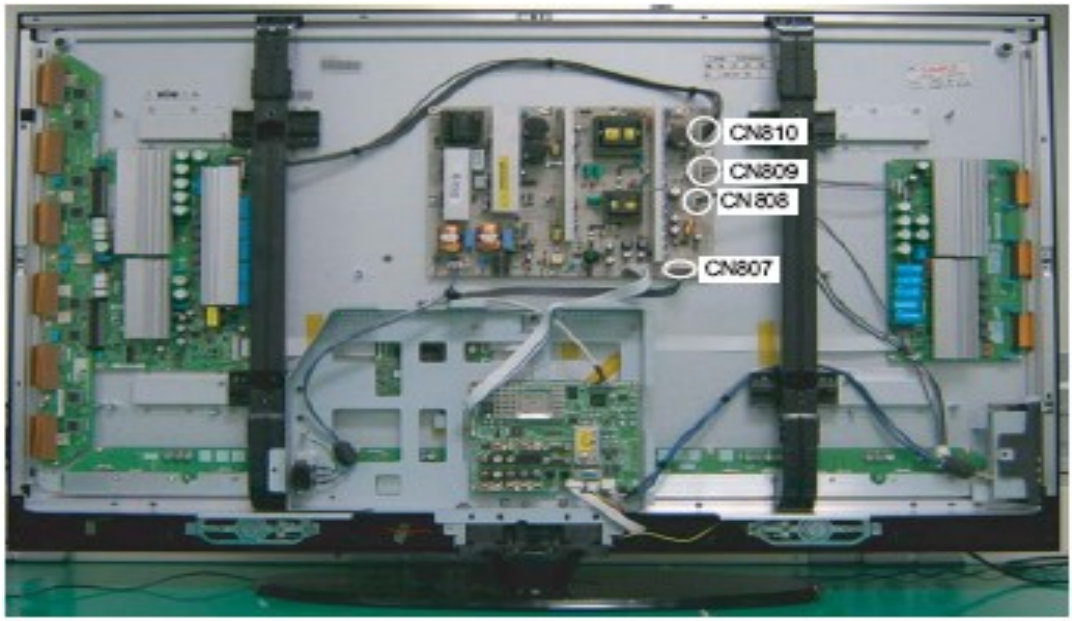

①
Are the AC IN socket connector and the SMPS CN800 connected?
No
The AC IN socket connector and the SMPS CN800 connected
Yes
①
Is the Fuse (F801S) of the SMPS Power Input Part blown?
No
Replace Fuse (F801S)
Yes
②
SMPS CN801
Pin 3 : STB 5V
Pin 2 PS-ON : Check to see if it is 0V
No
Replace the SMPS
Yes
Replace the Main Board

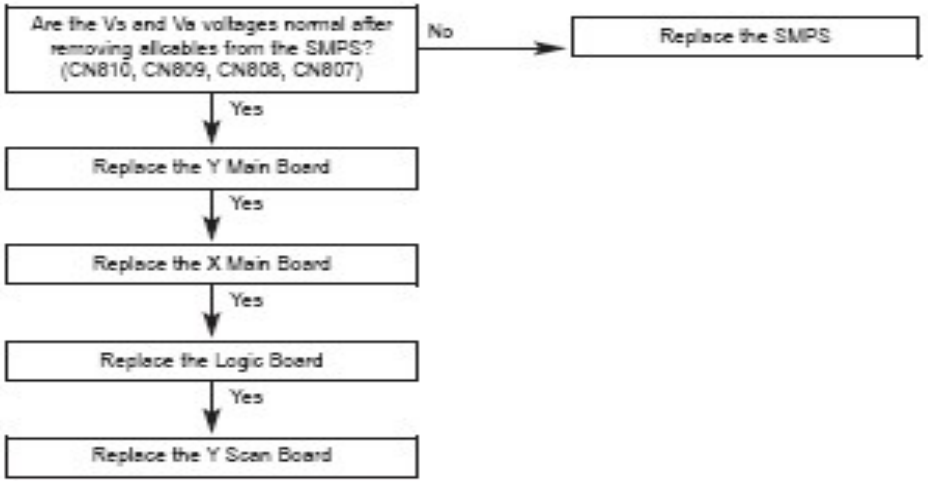
Turned on and off repeatedly



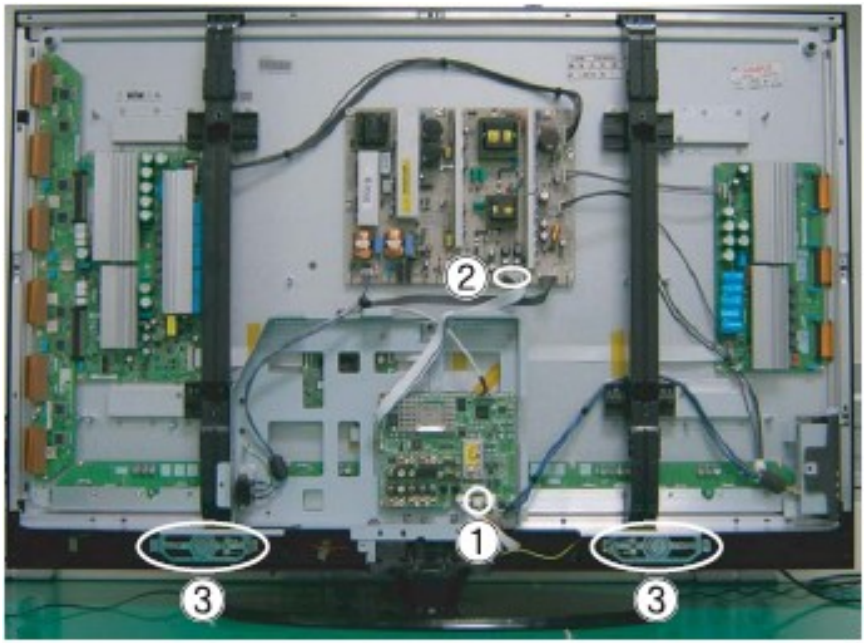


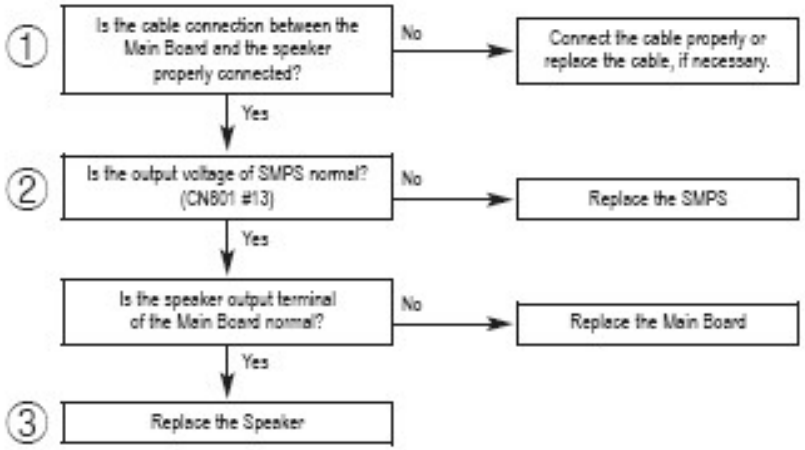
No Picture (When audio is normal)





No Sound


2
1
3
3


①
Is the cable connection between the Main Board and the speaker properly connected?
No
Connect the cable properly or replace the cable, if necessary.
Yes
②
Is the output voltage of SMPS normal? (CN601 #13)
No
Replace the SMPS
Yes
Is the speaker output terminal of the Main Board normal?
No
Replace the Main Board
Yes
③
Replace the Speaker


ATTACHMENT
SAMSUNG

CONTENTS

What is

PDP ?

Agenda

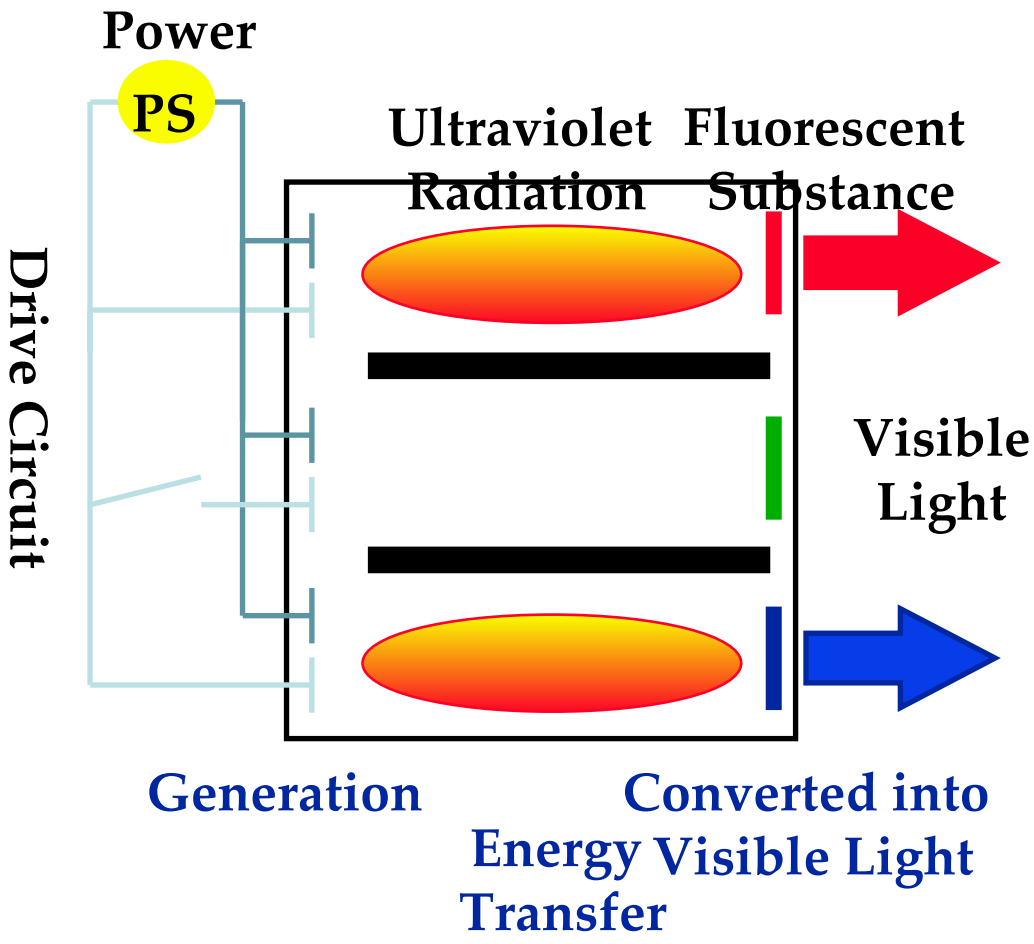
1. Introduction to PDP

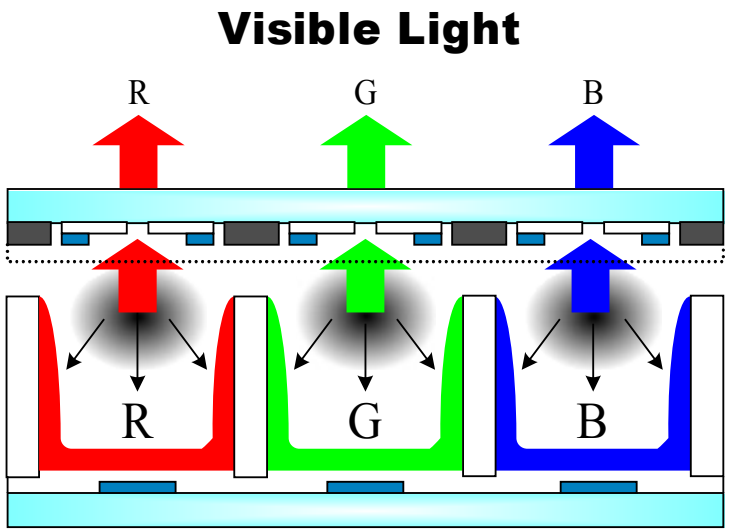
2. Panel Structure & Manufacturing

3. PDP Driving Characteristics

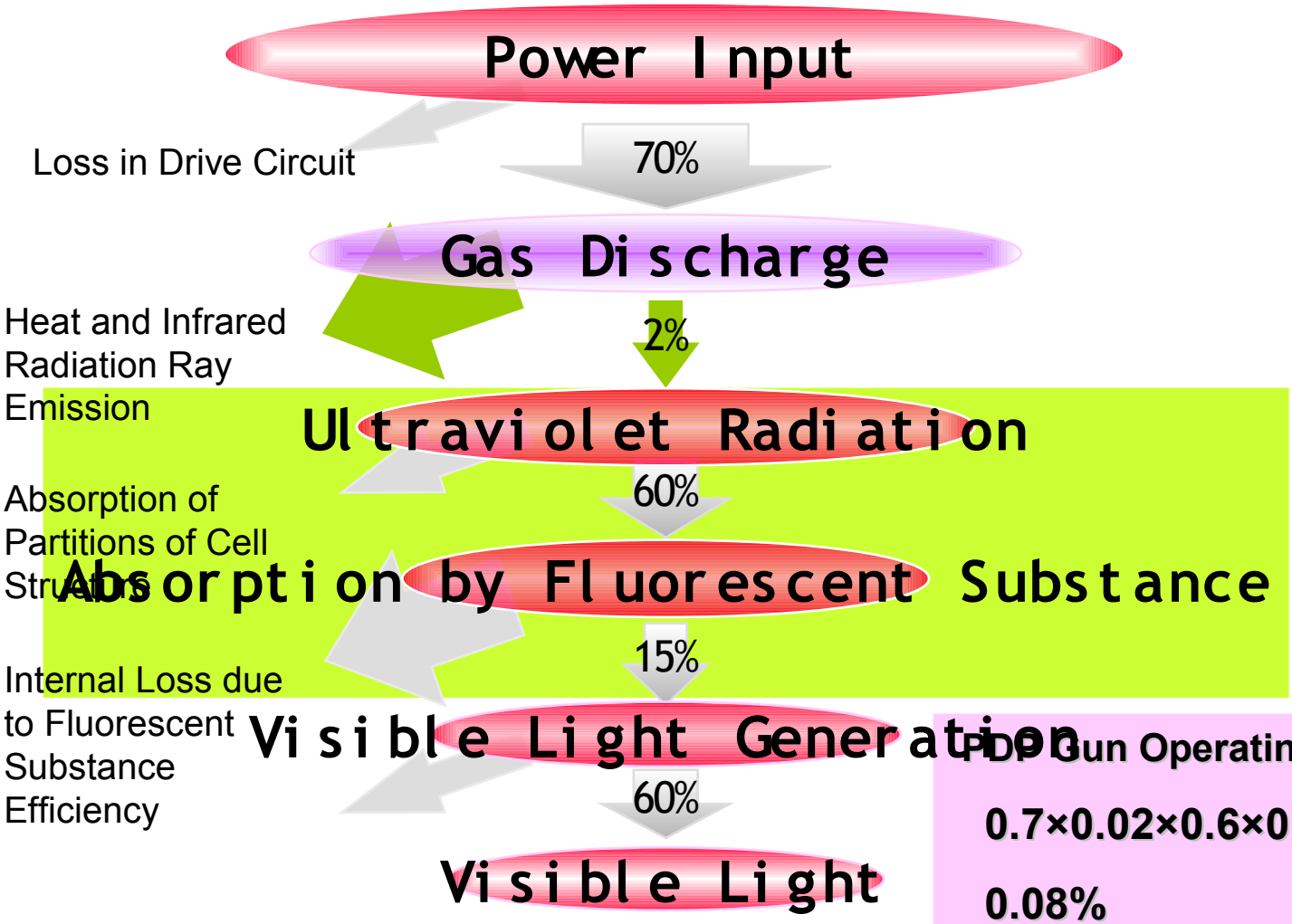
4. Characteristic of Board

- **PDP Concept**


Power
PS
Drive Circuit
Ultraviolet Radiation
Fluorescent Substance
Visible Light
Generation
Converted into Energy Transfer
Visible Light


R
G
B
R
G
B

- **PDP Operating Efficiency**



• PDP Advantages and Disadvantages

< Advantages >

- Ultra-Slim : Wall-mounted TV
- Easy Wide Screen
  Implementation : 80” or Higher
- Lightweight (on the basis of a 42”)
  : 42” PDP: 30kg
  / 42” CRT : more than 100kg
  : 40” LCD: 32Kg
- Wide View Angles (170°)
- High Resolution
  : 0.1mm Cell Pitch
- Not affected by magnetic fields
- Full-color
- Excellent Non-linearity
  : Does not require TFT (Thin Film Transistor) unlike LCD

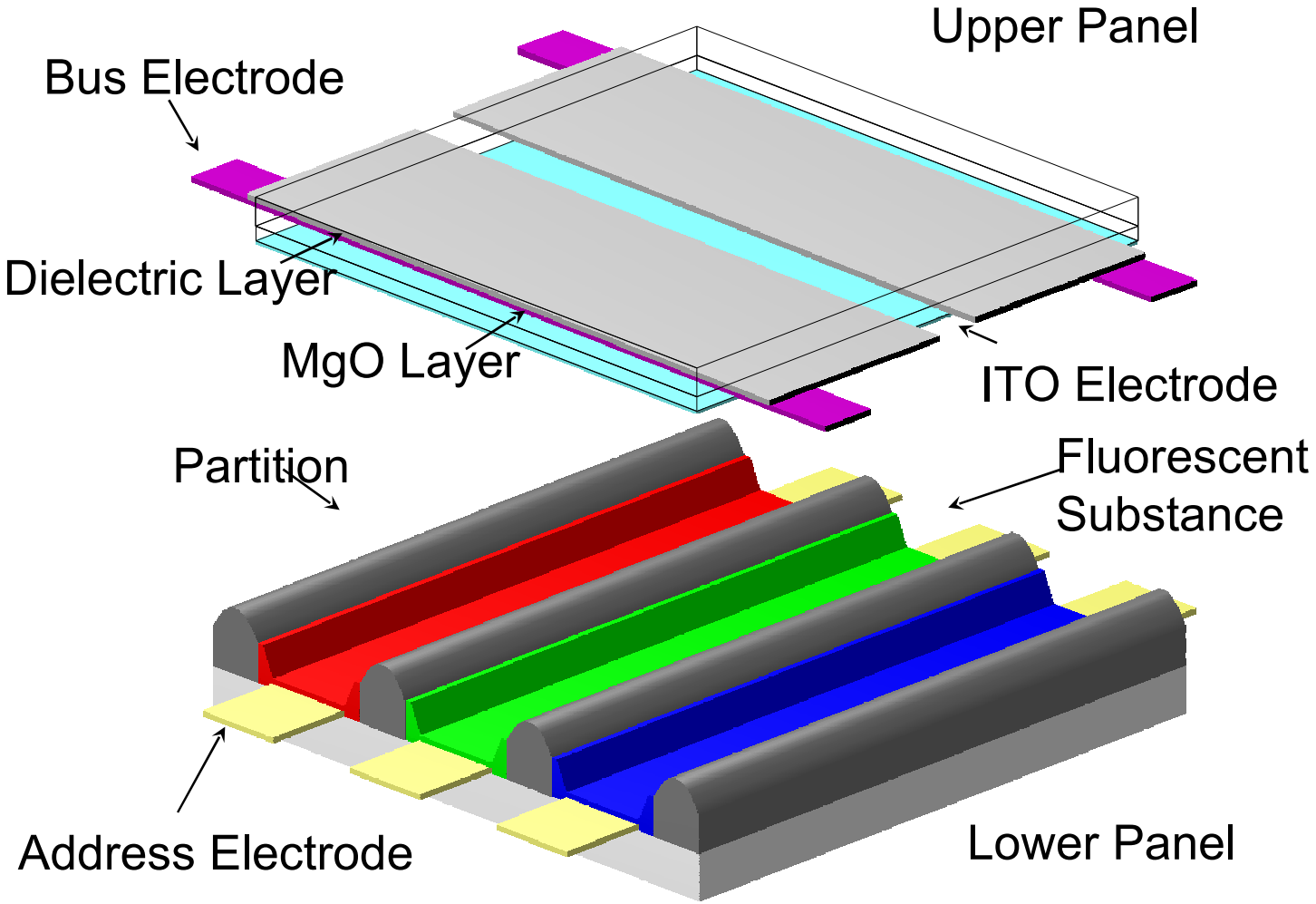
: Does not require TFT (Thin Film Transistor) unlike LCD

< Disadvantages >

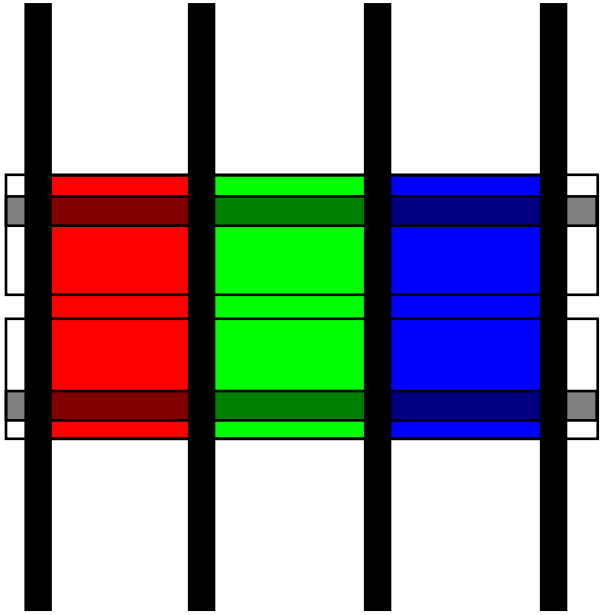
- High Power Consumption
- Low Brightness
- High Price
- Low Emissions Efficiency
  (Approximately 1.5lm/W)
- After Image
- High Operating Temperature
- Drive and Panel Noise

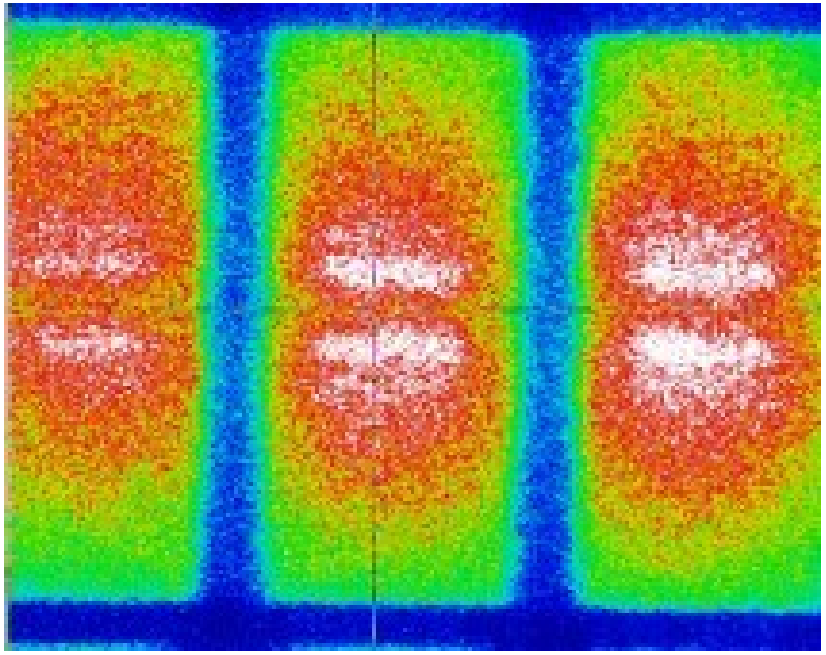
Panel Structure and Manufacturing

- **Panel Cell Structure**

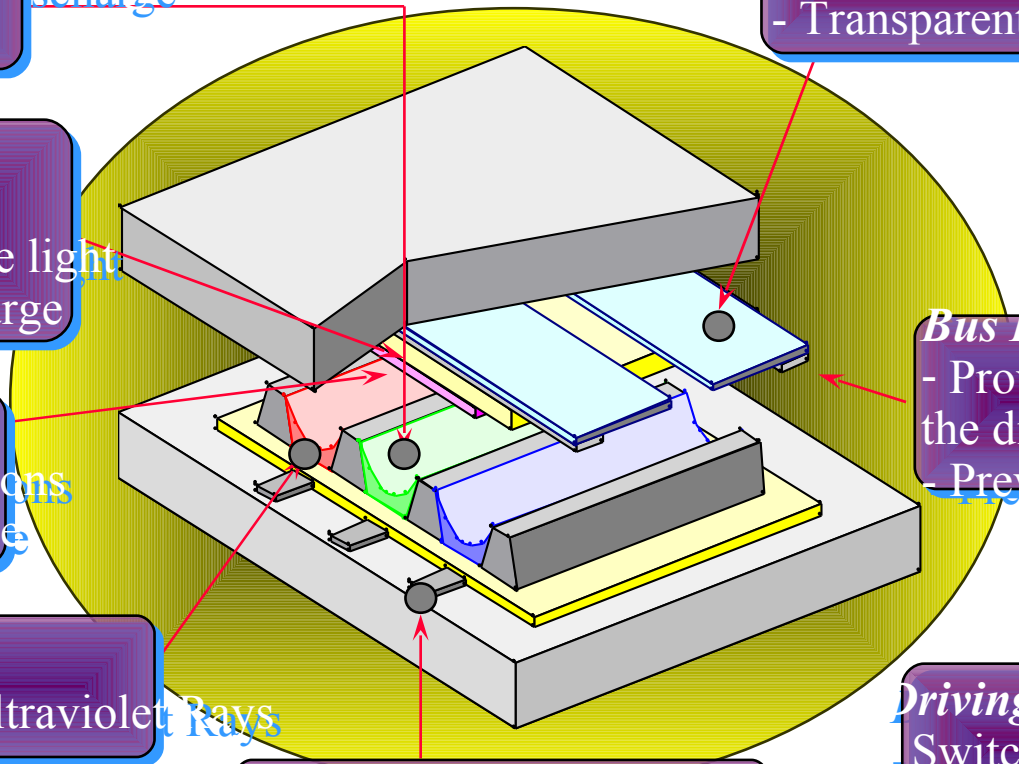


- **Panel Cell Structure**





• PDP Cell Component Function



Transparent Electrode
- Sets a gap between electrodes
- Transparent for visible light

Bus Electrode
- Provides a path for the discharge current
- Prevents a voltage drop

Driving Circuit
- Switches discharged cells
- Processes the video signal

Address Electrode
- Inputs the Data Signal

hor Layer
verts Visible Light-Ultraviolet Rays

O Thin Film
- mits secondary electrons
- enerates a wall charge

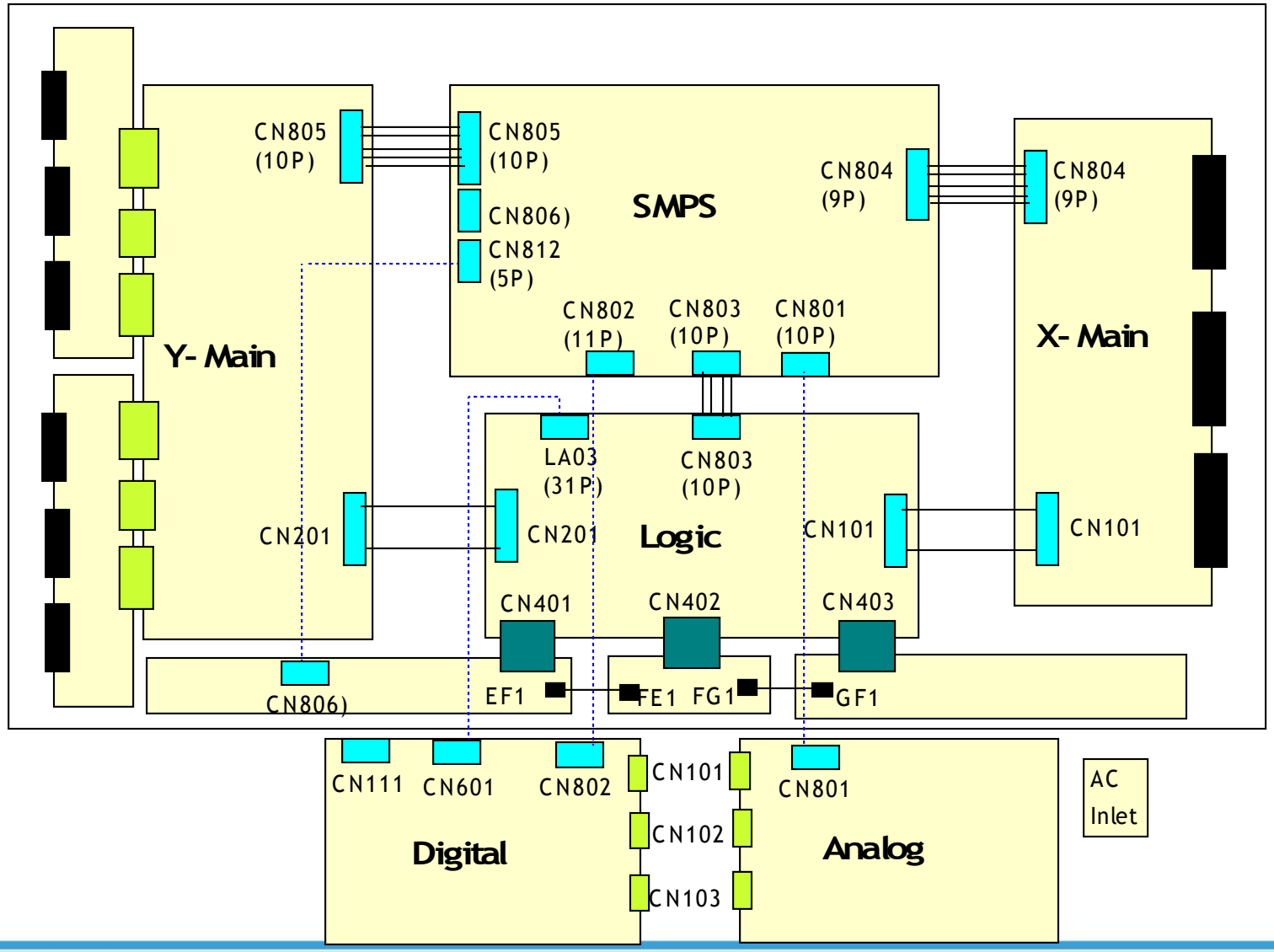
ielectric Layer
- Limits current flow
- Transparent for visible light
- Accumulates wall charge

s and maintains the discharge
ates ultraviolet rays

PDP Driving Characteristics

- Block Diagram

[Wiring Diagram Schematic]



• Board Functions

■.SMPS(Switching Mode Power Supply)

: SMPS supplies the voltage for the parts installed on the boards and supplies the voltage and current for the panel.

■.X-MAIN Board

: Switches FETs according to the timing provided by the Logic Board, generates the Drive Waveform and supplies the Drive Waveform for the X electrode of the panel through the connector.

■.Y-MAIN Board

: Switches FETs according to the timing provided by the Logic Board, generates the Drive Waveform and supplies the Drive Waveform for the Y electrode of the panel through the Scan Driver IC of the Y-Buffer Board.

■.Logic Main Board

: Processes the video signal and generates and outputs the Address Drive Output and the XY Drive signals. It also buffers the Logic Main Board and the Address Drive Output signal and supplies the Output signal for the Address Driver IC (COF Module).

• Board Functions

■.Logic Buffer (E, F, G) : Outputs data and the control signal to the COF.

■.Y-Buffer (Upper, Lower)

: A board supplies a Scan Waveform to the Y terminal. This board consists of Upper and Lower boards.

8 Scan Driver ICs (ST's STV7617 : 64 or 65 Output) are installed.

■.AC Noise Filter

: Removes low frequency noise and surge from the AC line.

It affects (EMC,EMI) the safety regulations depending on the AC filter.

■.COF (Chip on Flexible)

: Applies a Va pulse to the Address electrode in the Address duration and causes an Address Discharge through the potential difference from the scan pulse applied to the Y electrode.

It is manufactured as a COF. A COF consists of 4 Data Drive ICs (STV7610A :96 Output). A Single Scan consists of 7 COFs.

- 1 Sub-Field Structure (ADS – Address Data Separate)

Reset Duration

Function
- Removes the Sustain Components
- Initialize the Wall-Voltage

Issue
- Operating Margin
- Contrast
- Short Reset Time

Address Duration

Function
- Sets the Discharge Cell

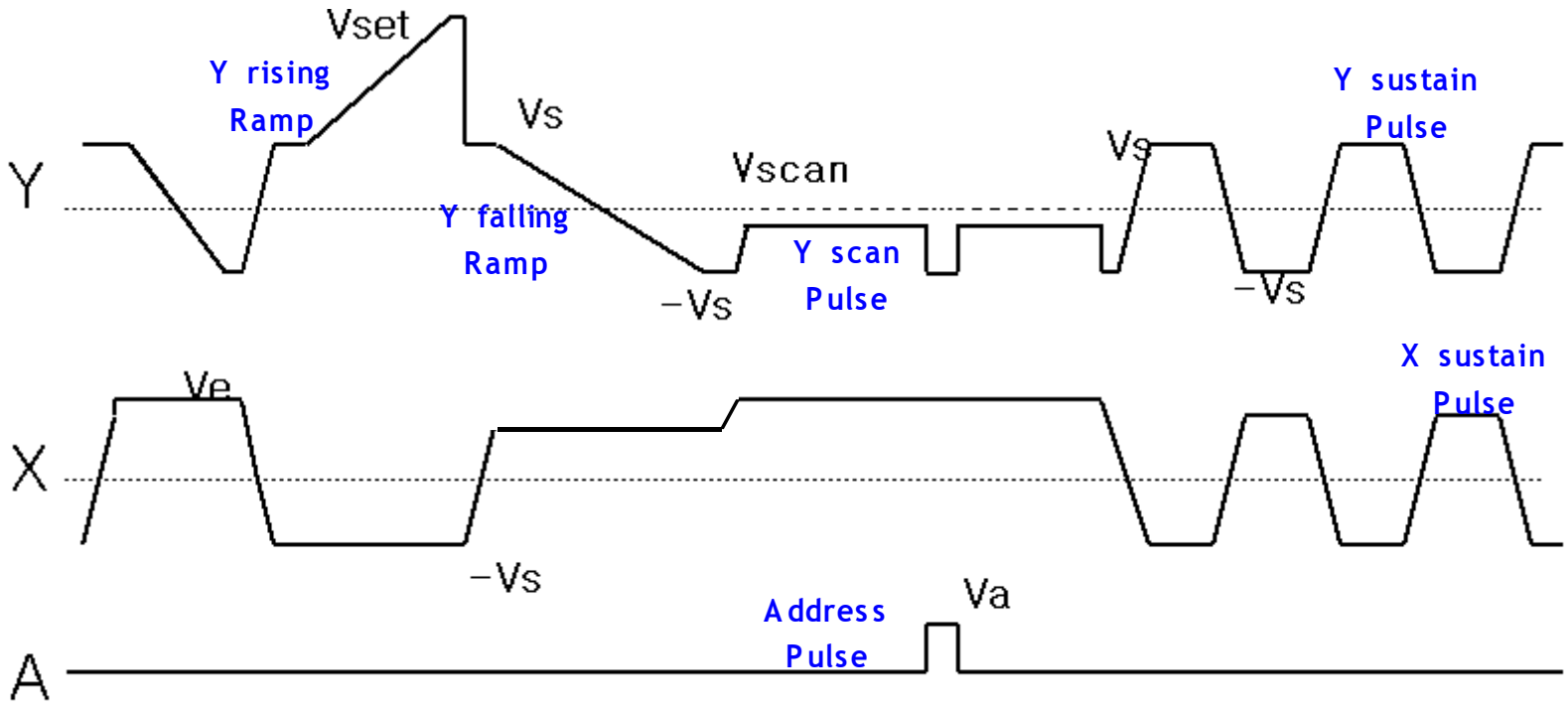
Issue
- High-Speed Switching
- Low-Voltage

Sustain Duration

Function
- Emission of visible rays through a Cell Discharge

Issue
- High Efficiency
- Low Voltage
- ERC Operating Efficiency

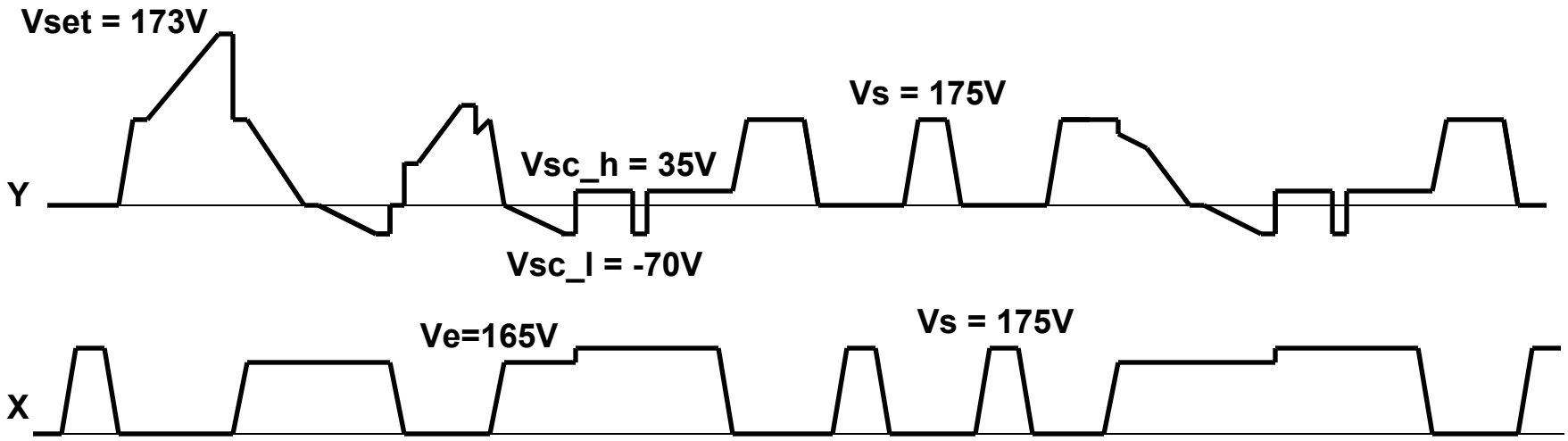
• Drive Waveform (P3 Alexander)



A1, 2	Address (=Data) Electrode
X	Common & Sustain Electrode
Y1, 2 . . .	Scan & Sustain Electrode

Vs	85V	Ve	110V
Vset	95V	Va	79V
Vscan	85V		

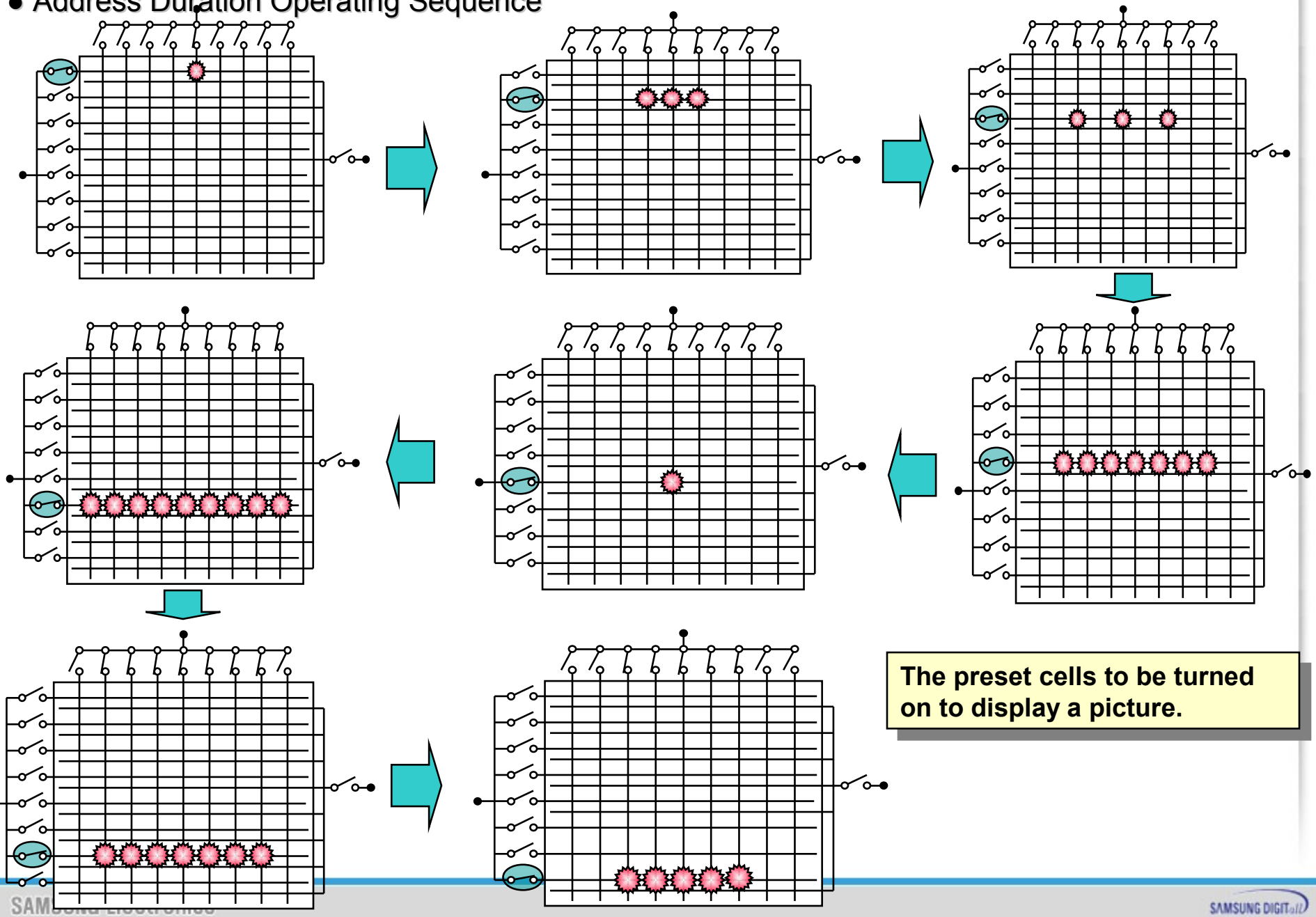
- **Drive Waveform (P4 Mozart)**



A1, 2	Address(=Data) Electrode
X	Common & Sustain Electrode
Y1, 2 . . .	Scan & Sustain Electrode

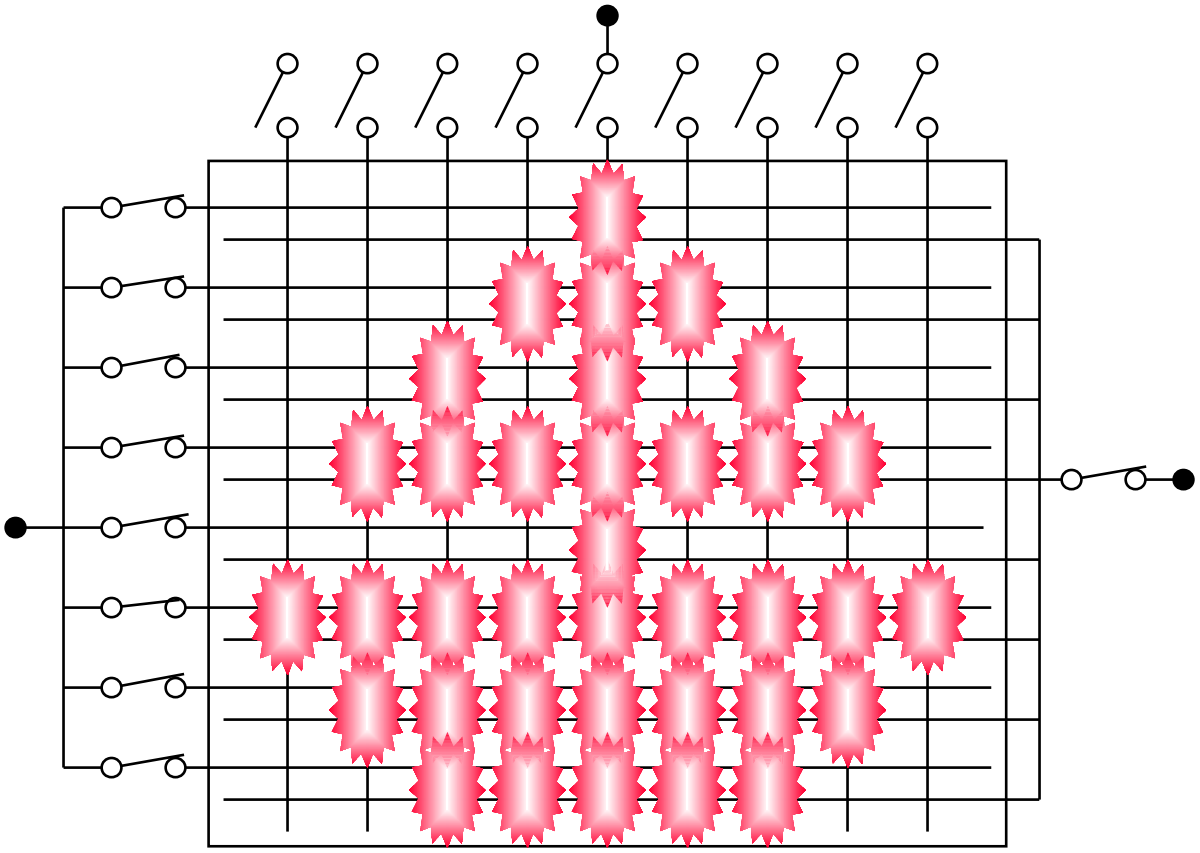
3. PDP Driving Characteristics

- Address Duration Operating Sequence



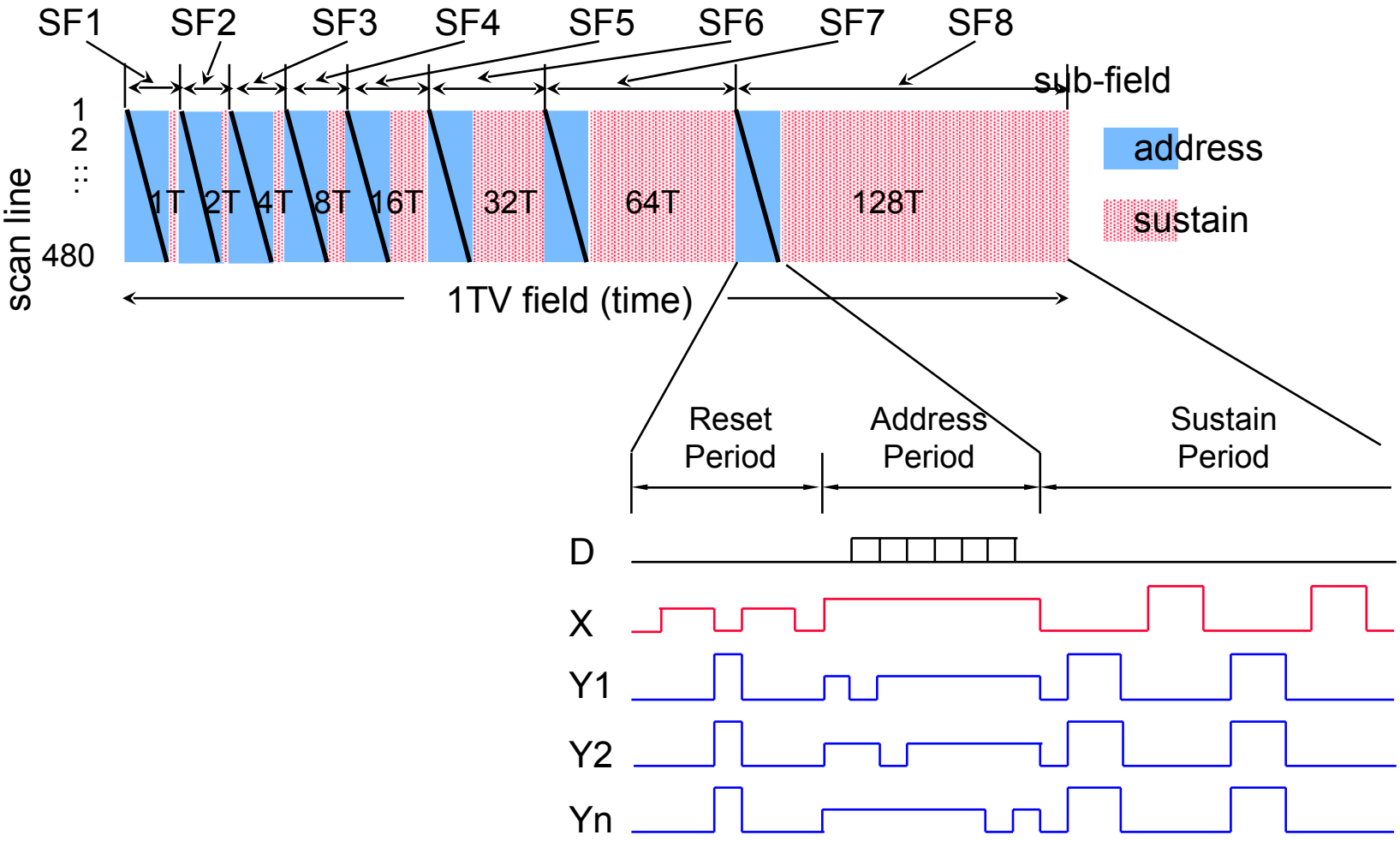
The preset cells to be turned on to display a picture.

- Sustain Duration

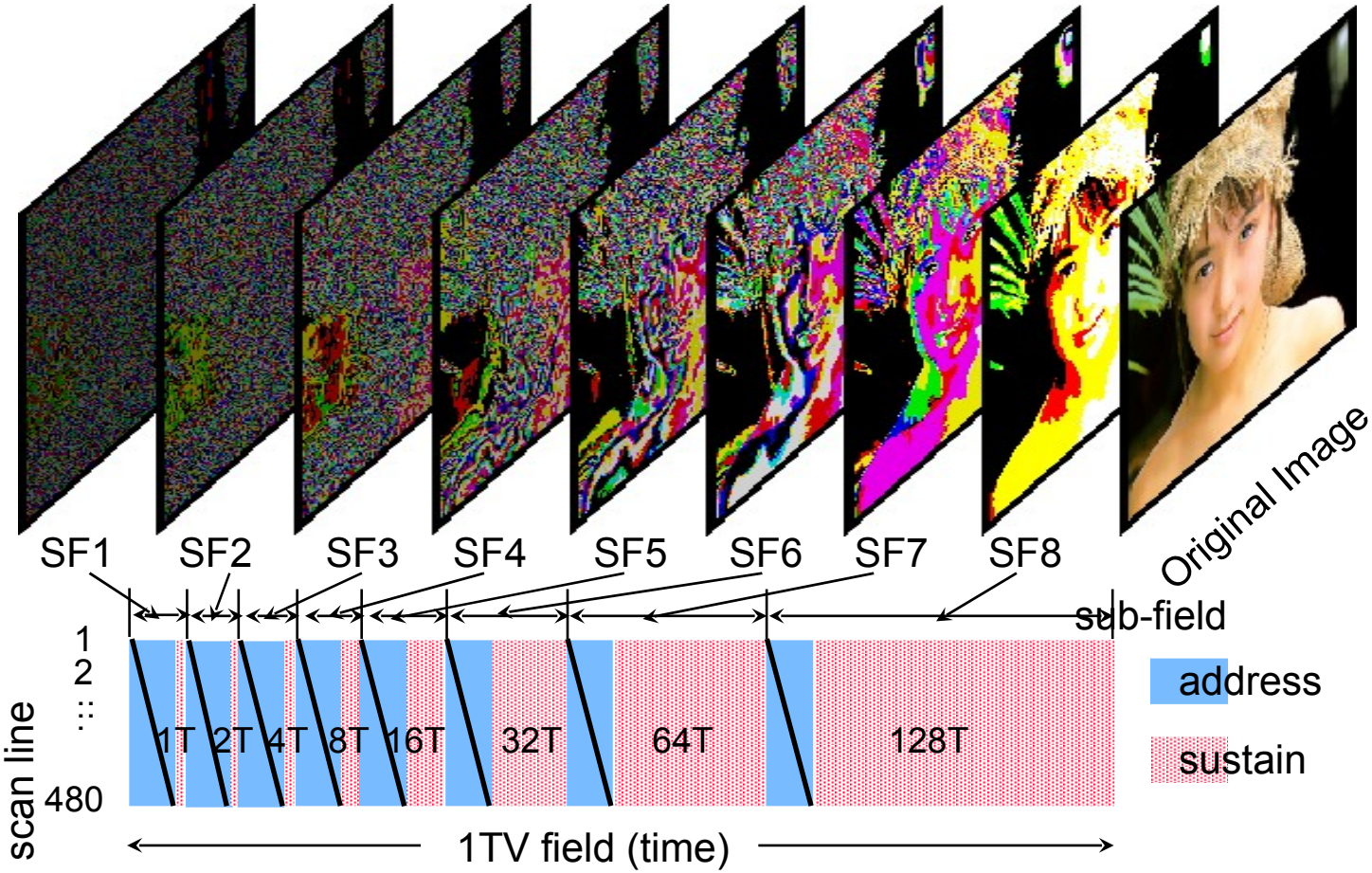


Turn the cells on by a strong Sustain Discharge

- **Frame Structure (ADS)**

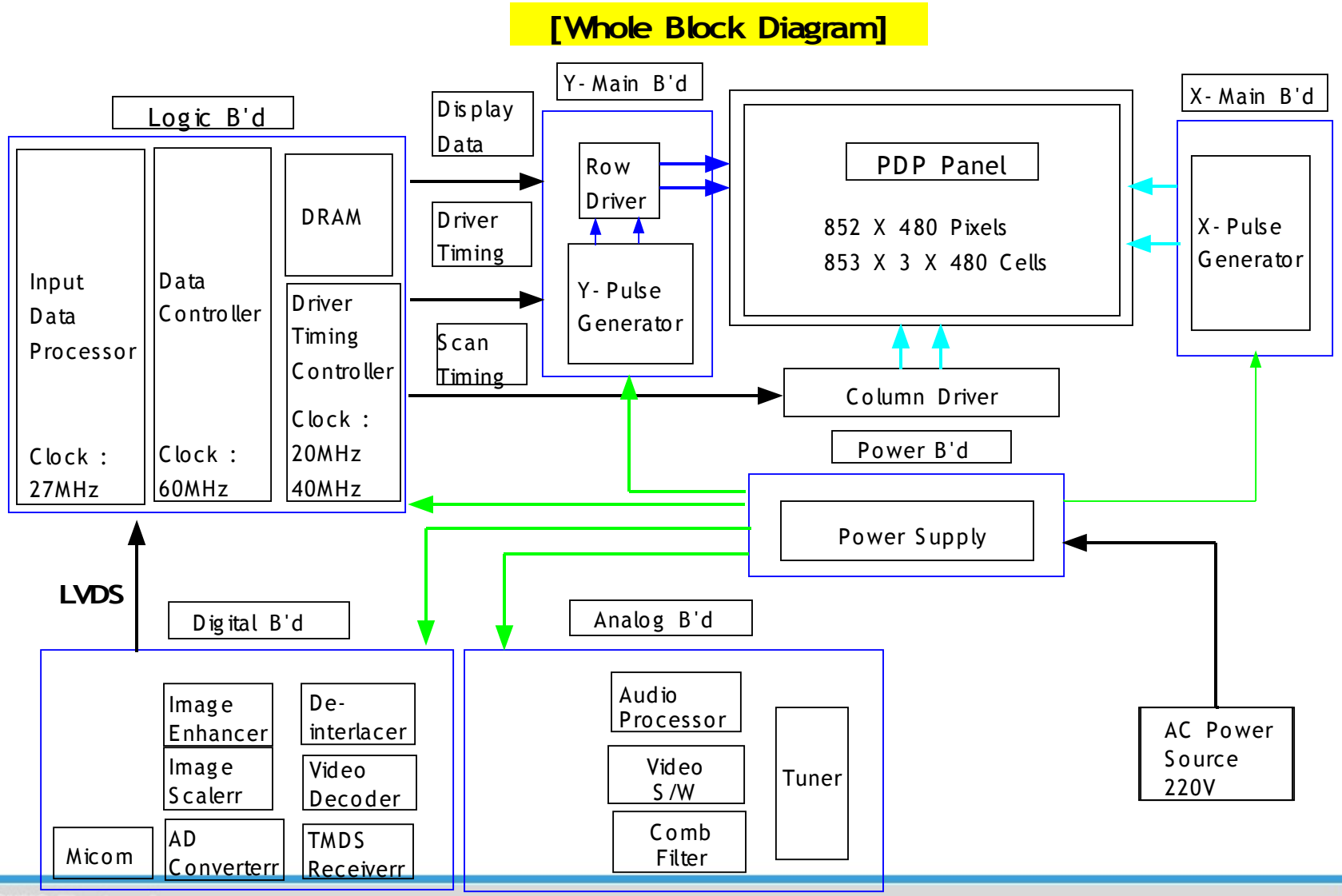


- Image Display by **8 Sub-Fields**

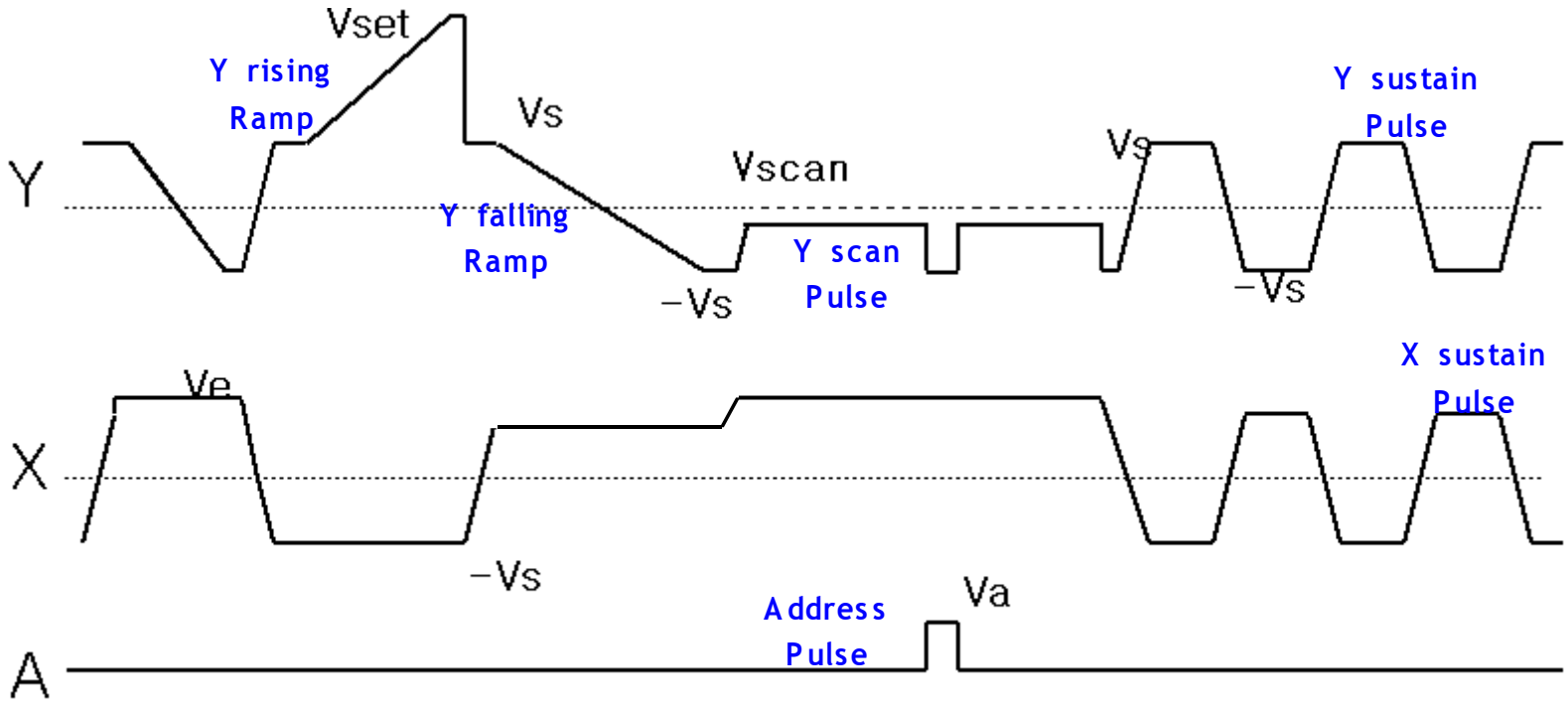


Operating Explanation per Board

- Entire PDP Module Block Diagram



• Drive Waveform Specifications



A1, 2. . . .	Address(=Data) Electrode
X	Common & Sustain Electrode
Y1, 2. . .	Scan & Sustain Electrode

Vs	85V	Ve	110V
Vset	95V	Va	79V
Vscan	85V		

What is

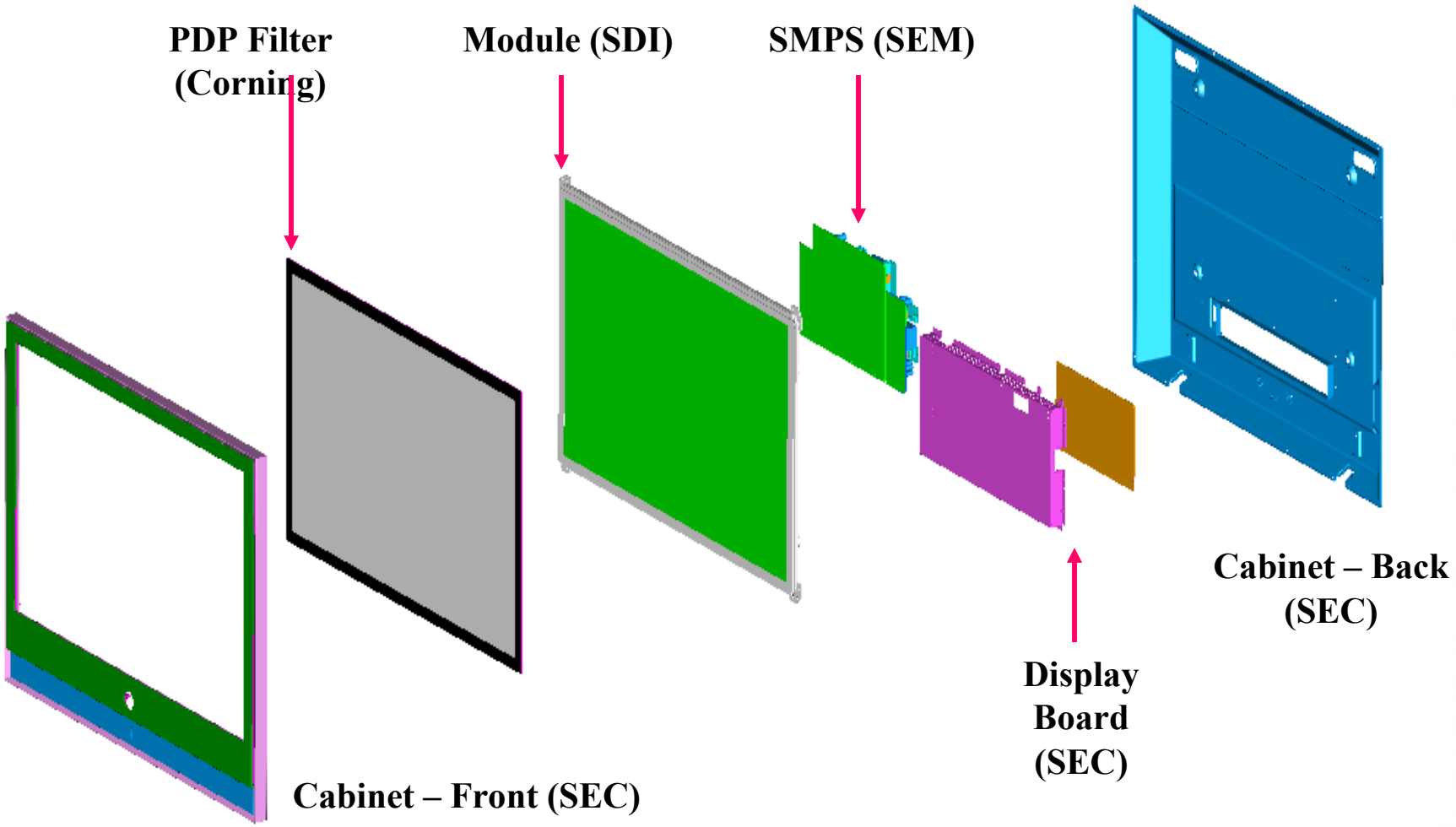
PDP Filter ?

Content

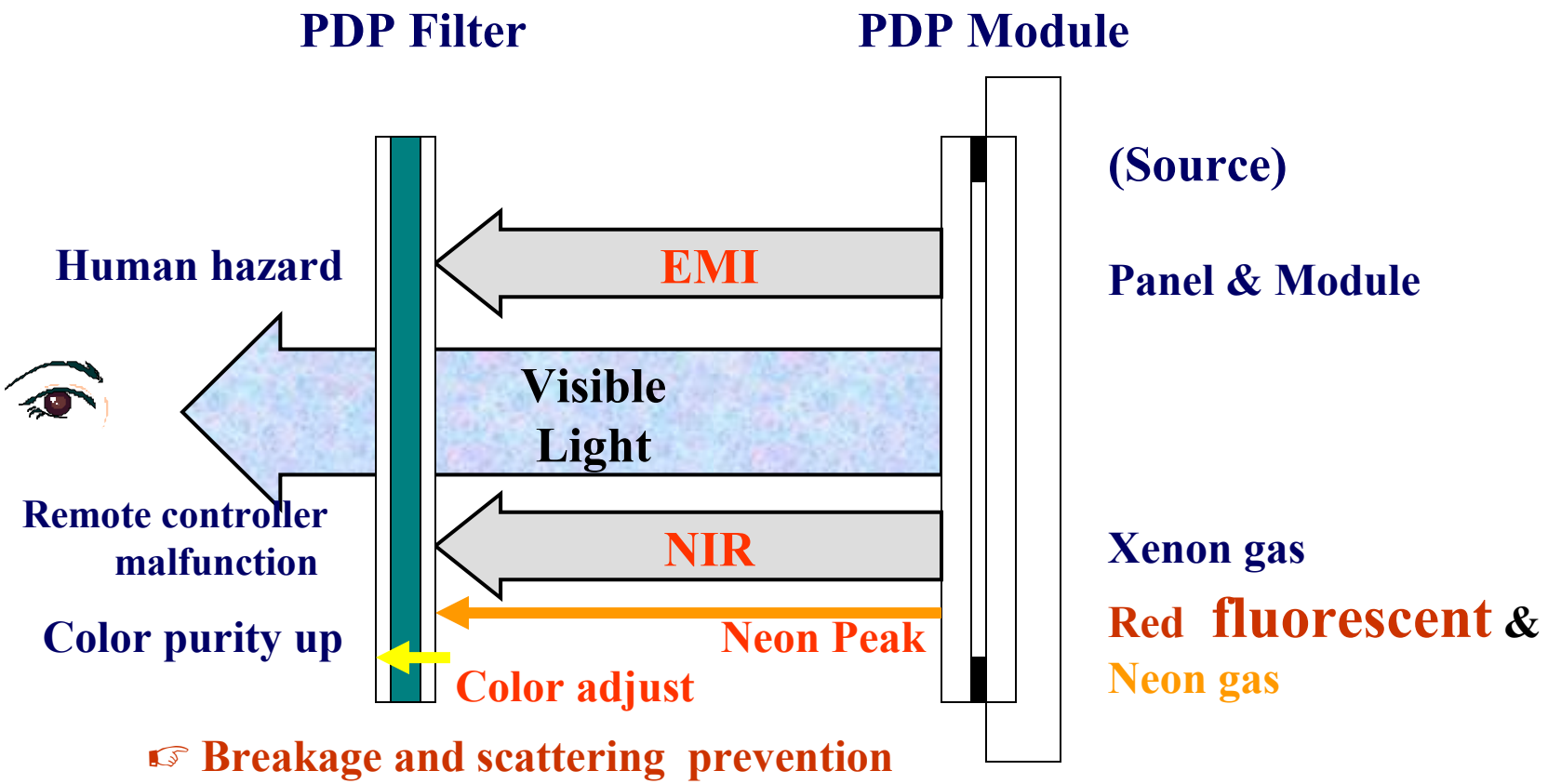
- PDP Filter Function
- PDP Filter Structure
- PDP Filter Performance
- PDP Filter Manufacturing Process

PDP Filter Function

Plasma Panel Display Structure



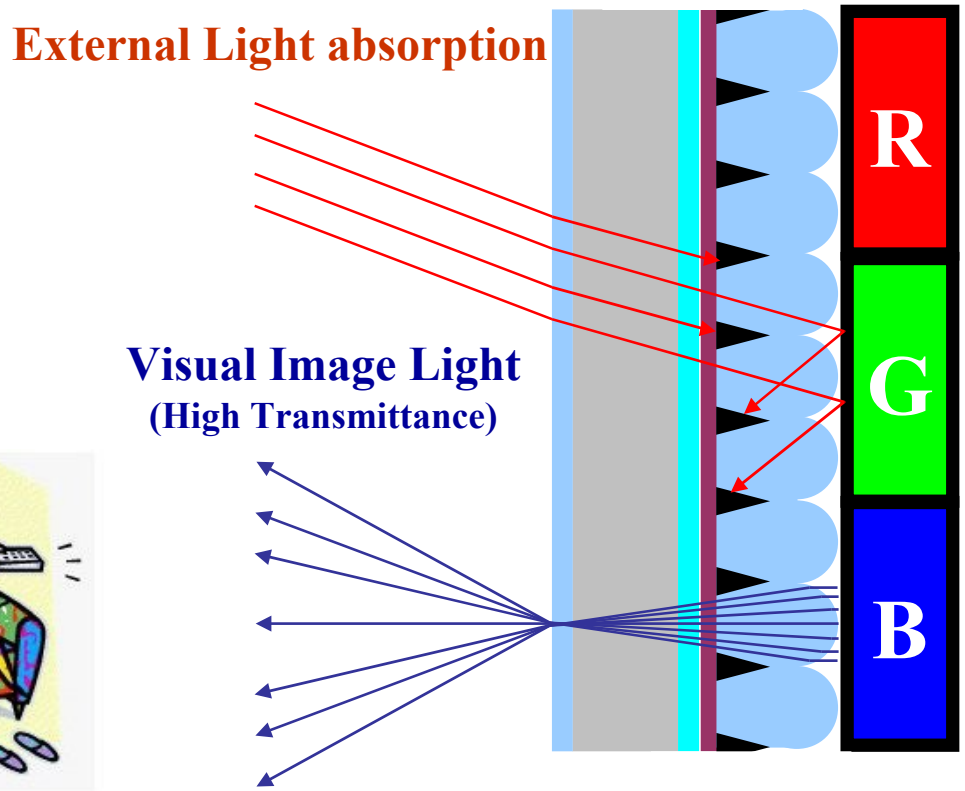
The Function of the PDP Filter



NIR : Near Infrared

EMI : Elctro Magnetic Interference

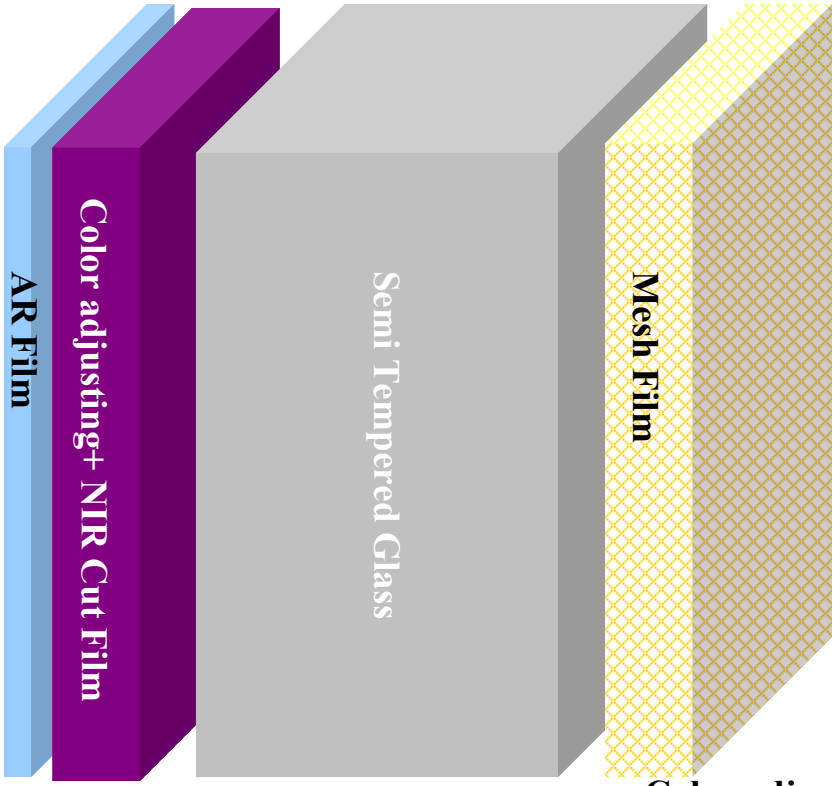
The Function of the MRT PDP Filter

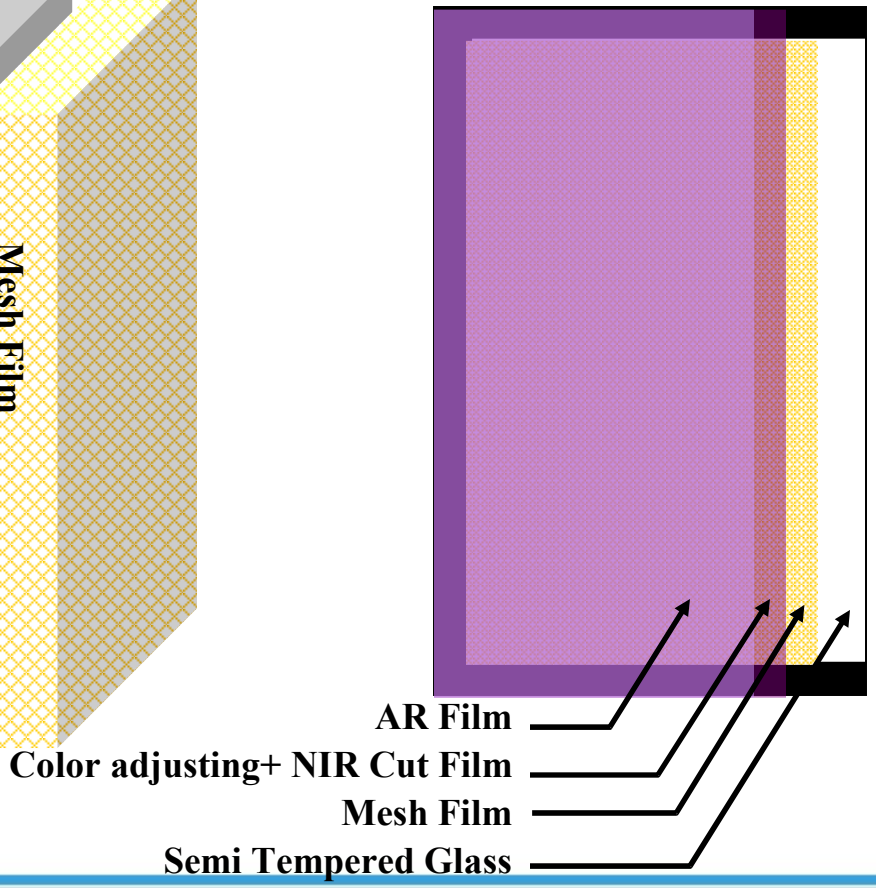


High Contrast !

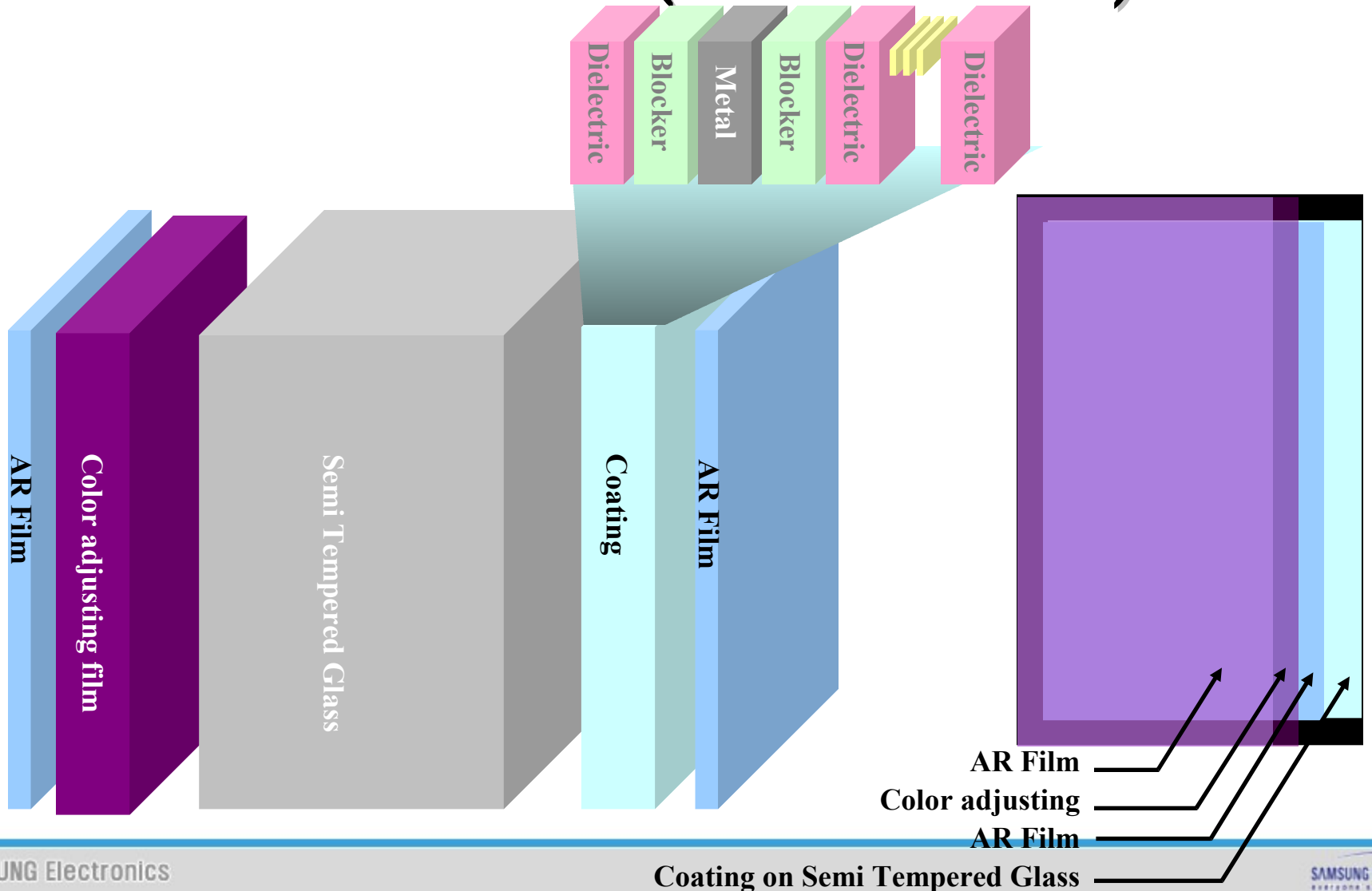
PDP Filter Structure

PDP Filter Mesh Type Structure

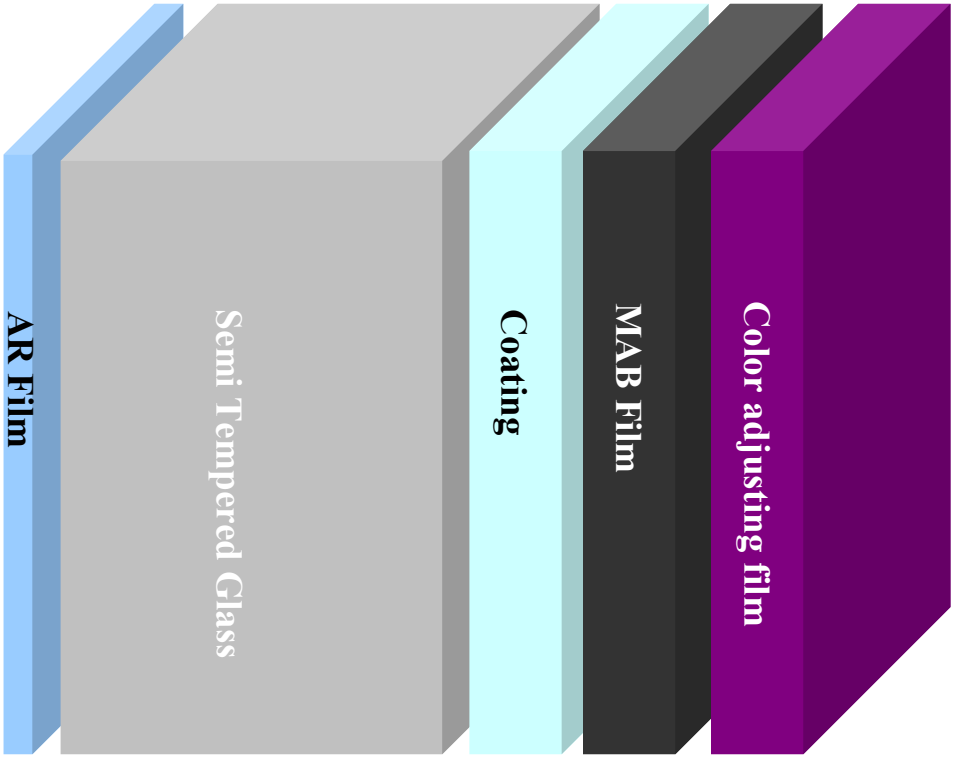


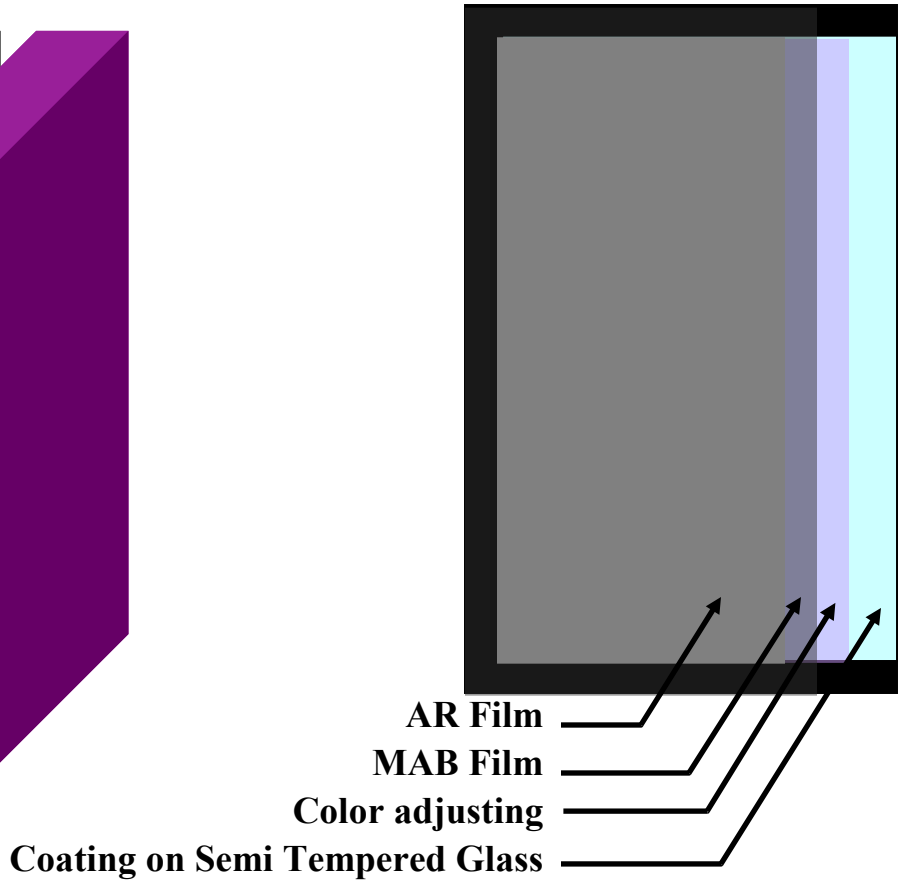


PDP Filter Sputter type Structure (Double AR)



PDP Filter MRT (Sputter) type Structure





PDP Filter Performance

PDP Filter Performance

ITEM		Mesh Type	Sputter Coating Type	MRT Type (Coating)
Transmittance (%)		48 %	44 %	52 %
EMI Margin* @ Class B		17	4	4
NIR** Shielding (%)	850 nm	9 %	5 %	5 %
	950 nm	4 %	2 %	2 %

* SDI V3 Module & SEC 42” P4 set Test Result
** Measure Data

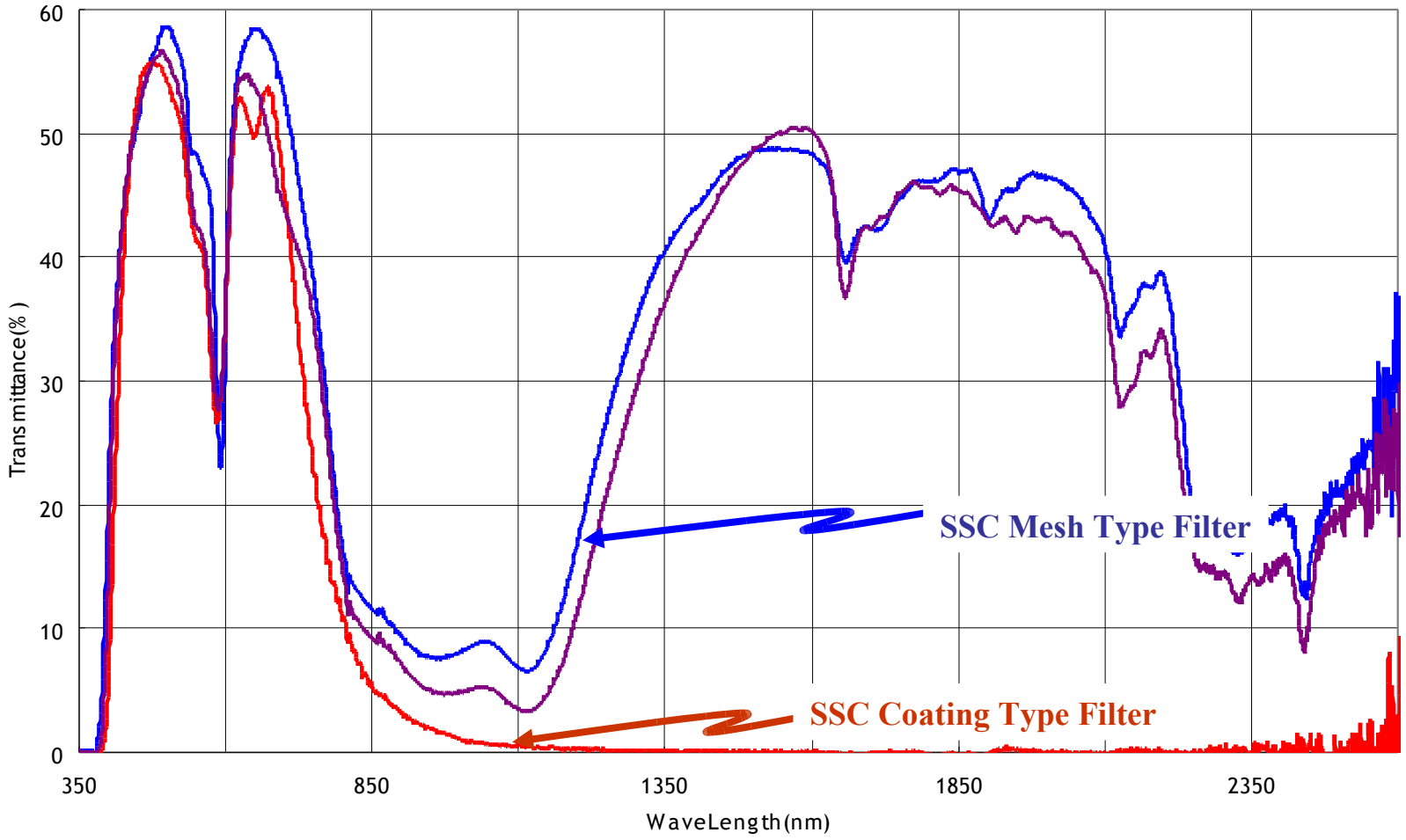
MRT PDP Filter Performance

(Unit : cd/m²)

Item		SDI V4 Module	M Filter Applied	Conducting Film Applied	Pioneer Direct-Attached
Bright Room (150Lux)	Peak Brightness	1,077	561	476	212
	Black Brightness	12.17	1.33	2.40	2.47
	Contrast Ratio	88 : 1	423 : 1	181 : 1	86 : 1
Dark Room	Peak Brightness	1,047	561	468	210
	Black Brightness	0.15	0.08	0.07	0.65
	Contrast Ratio	6,978 : 1	7,480 : 1	6,938 : 1	467 : 1
PDP Filter Transmissivity		-	52 %	44 %	30 %

- SDI V4 Module : V4 2.0x Version (Manufactured in November)
- Original Data : Refer to the SEC Measurement Data

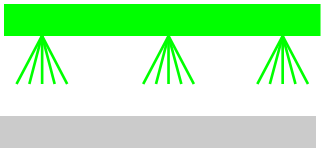
NIR / IR Shielding



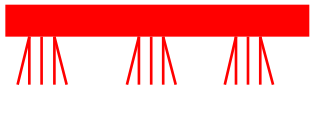
PDP Filter Manufacturing Process

PDP Filter Manufacturing Process
(Coating Type)

Glass Cleaning



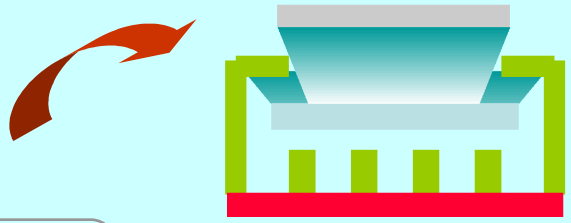
Dry



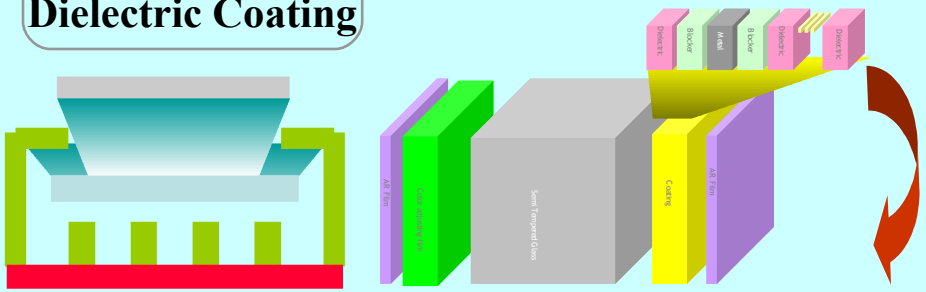
Inspection

Sputter Coating Process

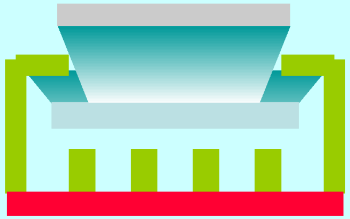
Blocker Coating



Dielectric Coating



Metal Coating

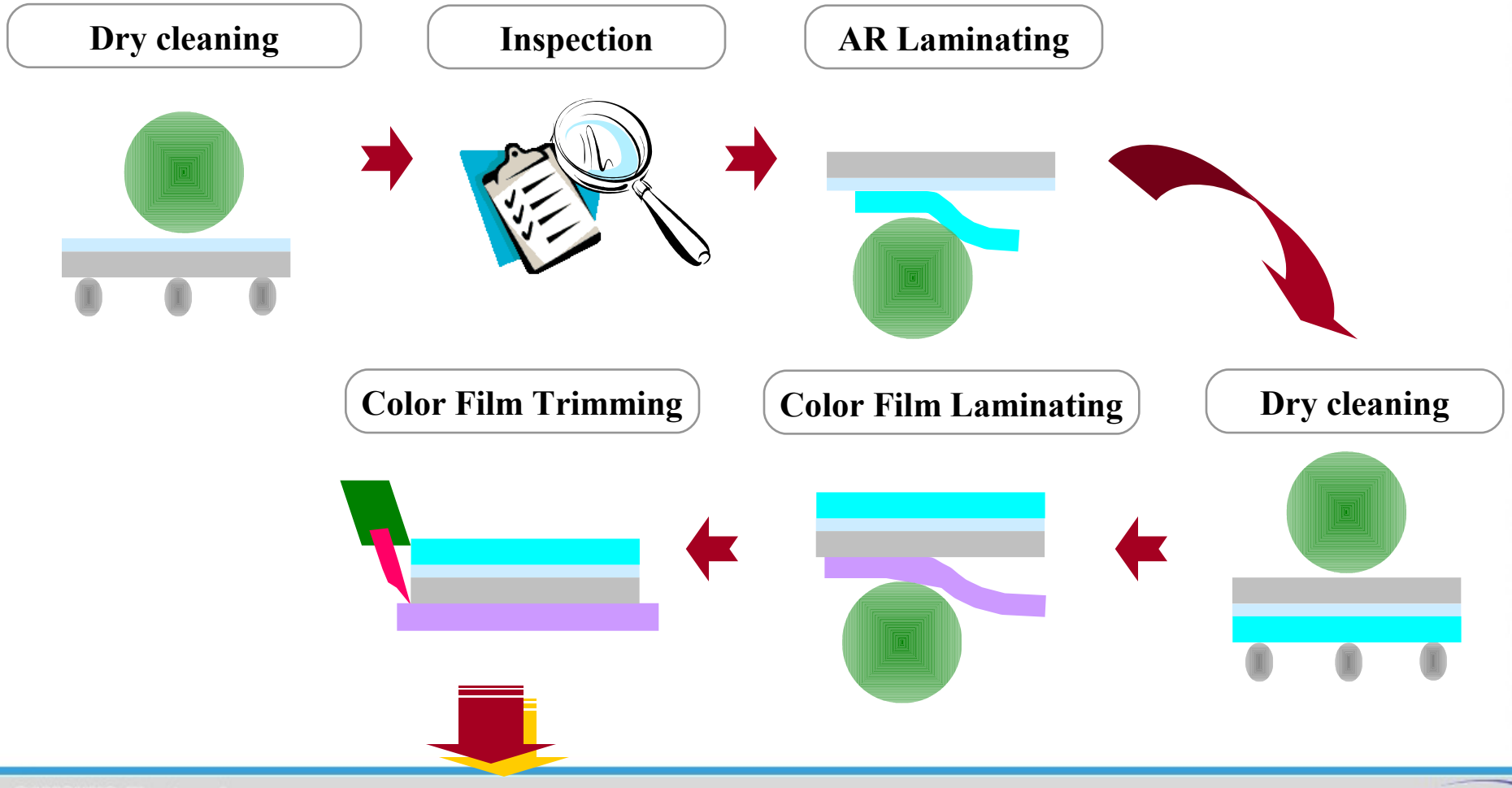


Inspection

FQA Inspection

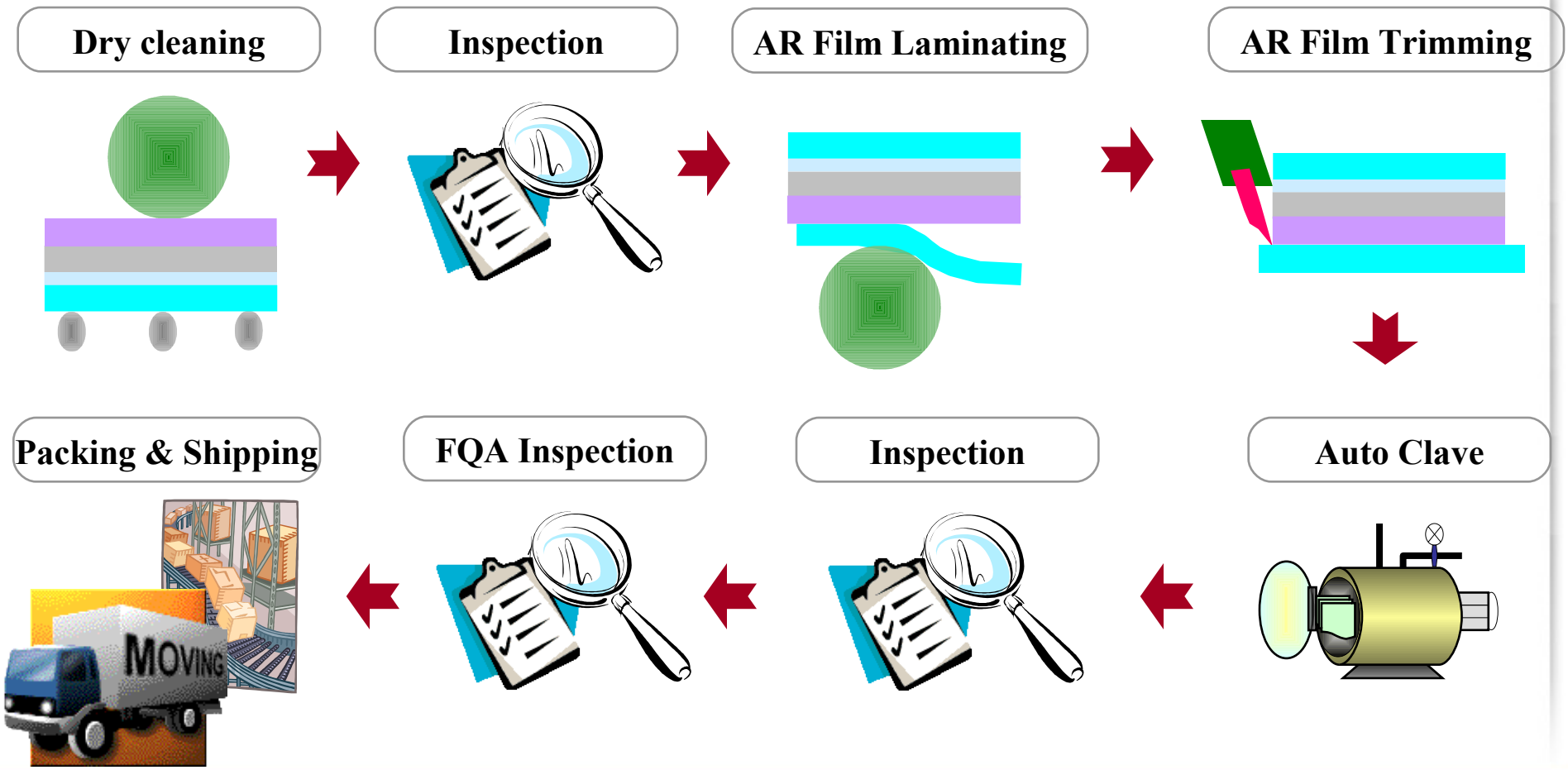
PDP Filter Manufacturing Process

(Coating Type)

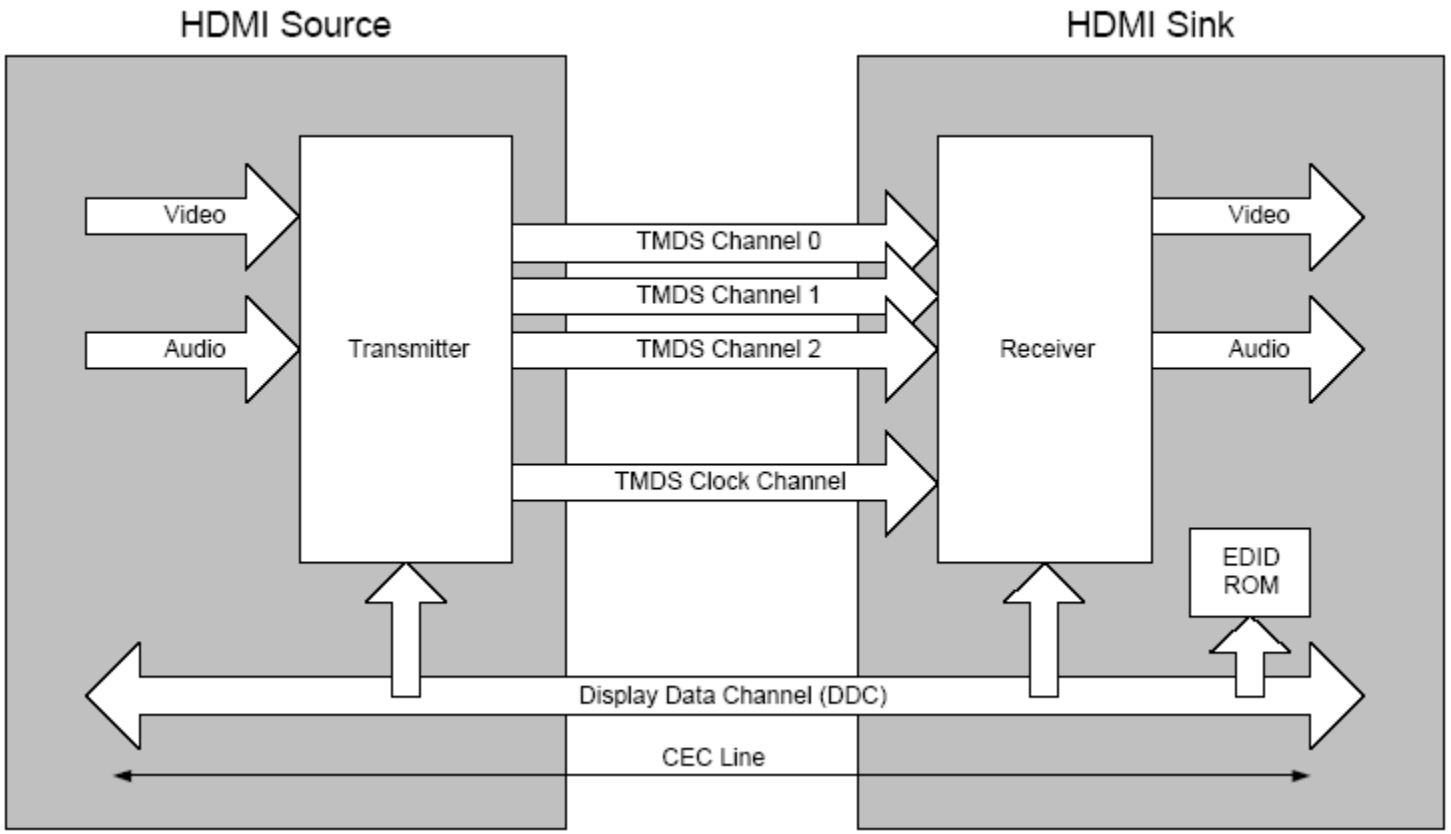


PDP Filter Manufacturing Process

(Coating Type)



ITEM	DVI	HDMI
DATA SPEED	1.78G BPS	2.2G BPS
AUDIO	NONE	CD OR HIGHER QUALITY DATA
REMOTE CONTROL	NONE	AV-LINK CAPABILITIES REPLACES INFRARED REPEATERS INTEGRATED REMOTE CONTROL SYSTEM
CONNECTOR		
FUTURE COMPATIBILITY	NONE	ACCOMMODATES ATSC DTV FORMATS SUPPORTS 8 CHANNEL AUDIO SPARE BANDWIDTH FOR FUTURE APP. (55% EXTRA AFTER HD TRANSMISSION)



HDMI block diagram

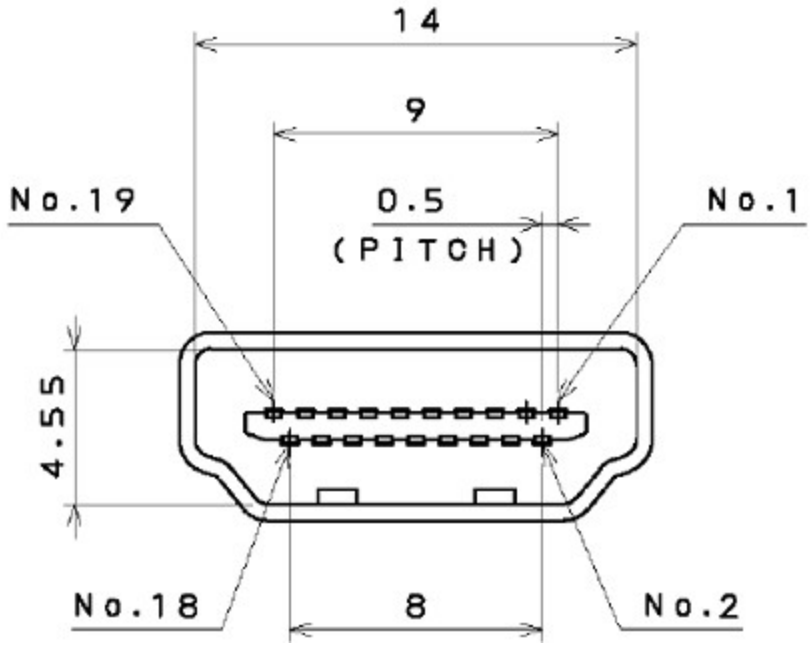
HDMI system architecture is defined to consist of Sources and Sinks. A given device may have one or more HDMI inputs and one or more HDMI outputs. Each HDMI input on these devices shall follow all of the rules for an HDMI Sink and each HDMI output shall follow all of the rules for an HDMI Source.

As shown HDMI block diagram the HDMI cable and connectors carry four differential pairs that make up the TMDS data and clock channels. These channels are used to carry video, audio and auxiliary data. In addition, HDMI carries a VESA DDC channel. The DDC is used for configuration and status exchange between a single Source and a single Sink. The optional CEC protocol provides high-level control functions between all of the various audiovisual products in a user's environment.

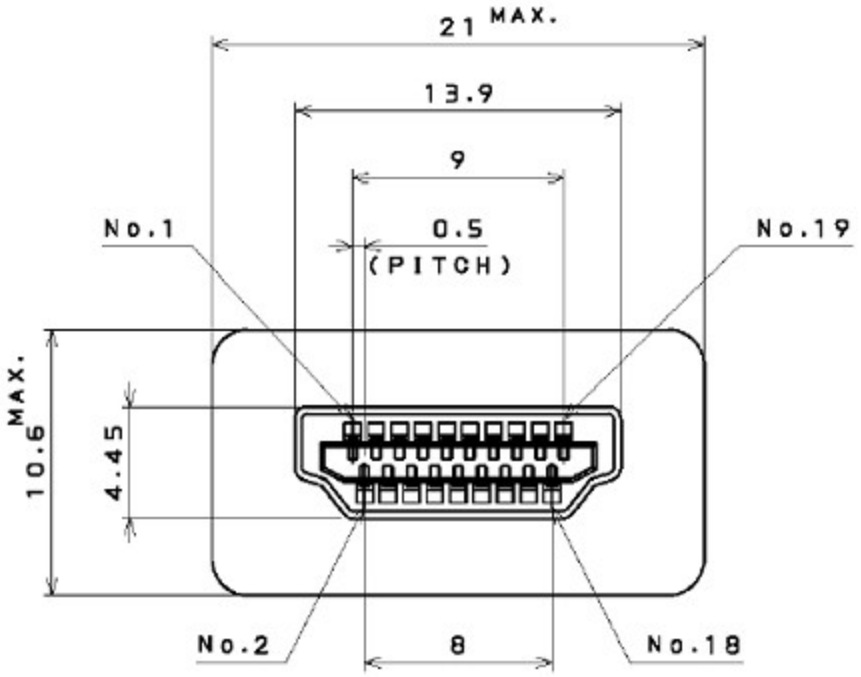
Audio, video and auxiliary data is transmitted across the three TMDS data channels. The video pixel clock is transmitted on the TMDS clock channel and is used by the receiver as a frequency reference for data recovery on the three TMDS data channels. Video data is carried as a series of 24-bit pixels on the three TMDS data channels. TMDS encoding converts the 8 bits per channel into the 10 bit DC-balanced, transition minimized sequence which is then transmitted serially across the pair at a rate of 10 bits per pixel clock period.

Connector Drawings
All dimensions in millimeters

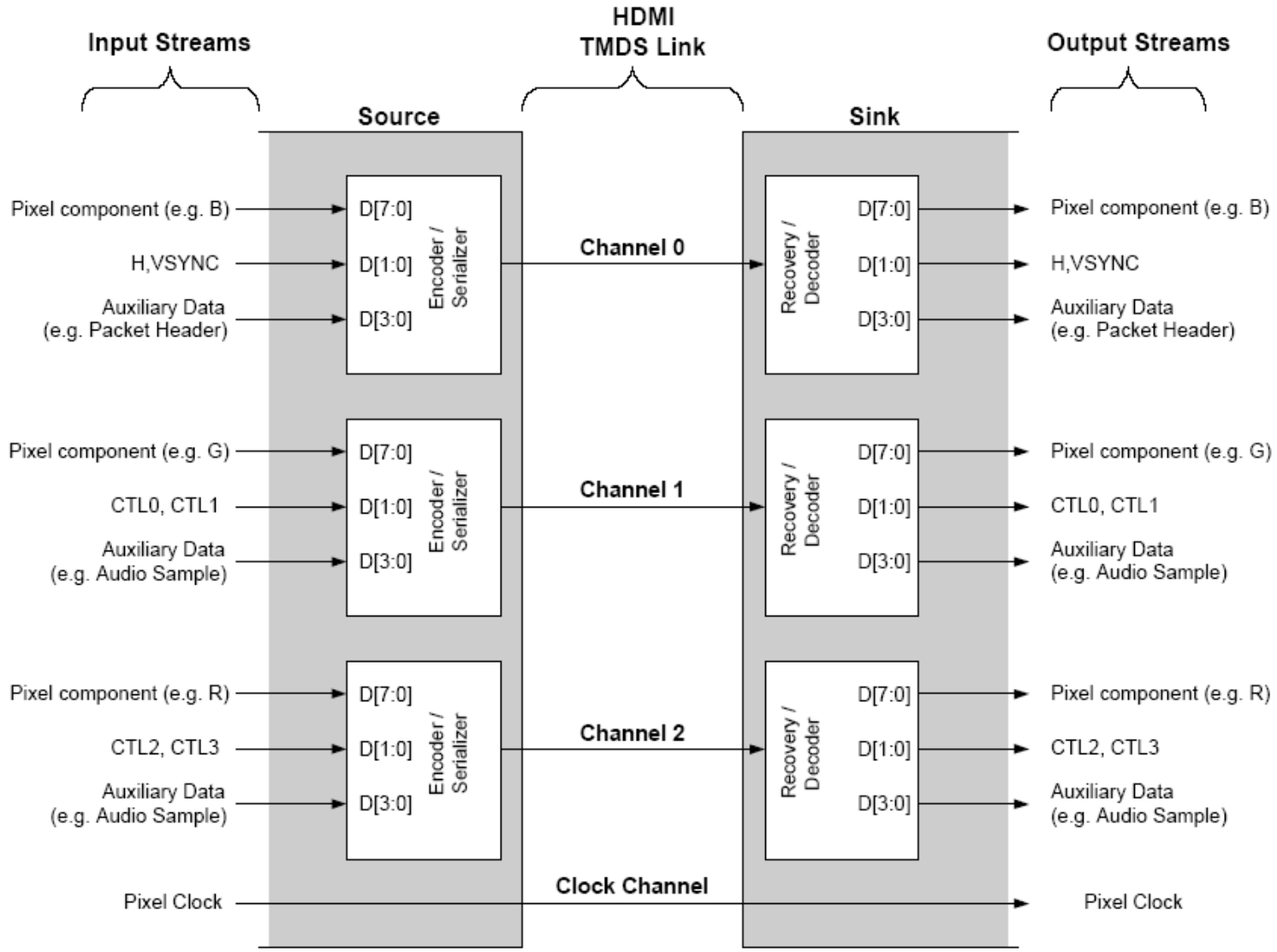
Type A Receptacle



Type A Plug



HDMI Connector pin configuration			
NO	Function	NO	Function
1	D2_RX2+	11	D2_RXCLK GND
2	D2_RX2 GND	12	D2_RXCLK
3	D2_RX2-	13	No connection
4	D2_RX1+	14	No connection
5	D2_RX1 GND	15	HDMI_DDC_SCL
6	D2_RX1-	16	HDMI_DDC_SDA
7	D2_RX0+	17	HDMI_DDC_GND
8	D2_RX0 GND	18	HDMI VCC (5V)
9	D2_RX0-	19	Ident_HDMI
10	D2_RXCLK+	20	Common GND



HDMI Encoder/Decoder Overview

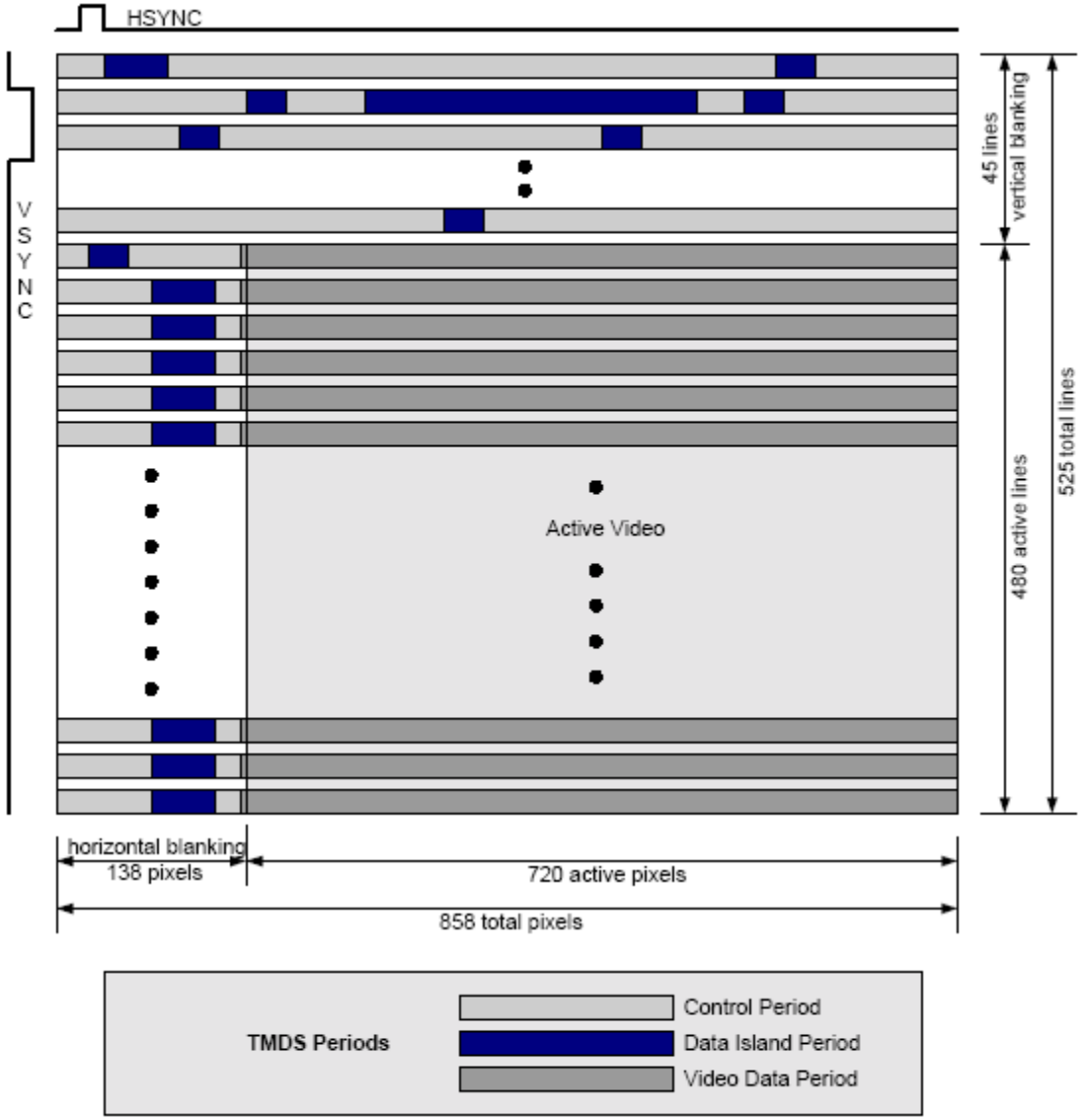
Link Architecture

As shown in an HDMI link includes three TMDS Data channels and a single TMDS Clock channel. The TMDS Clock channel constantly runs at the pixel rate of the transmitted video. During every cycle of the TMDS Clock channel, each of the three TMDS data channels transmits a 10-bit character. This 10-bit word is encoded using one of several different coding techniques.

The input stream to the Source's encoding logic will contain video pixel,
packet and control data. The packet data consists of audio and auxiliary data and associated error correction codes.

These data items are processed in a variety of ways and are presented to the TMDS encoder as either 2 bits of control data, 4 bits of packet data or 8 bits of video data per TMDS channel. The Source encodes one of these data types or encodes a Guard Band character on any given clock cycle.

Example: TMDS periods in 720x480p video frame



Operating Modes Overview

The HDMI link operates in one of three modes: Video Data Period, Data Island period, and Control period. During the Video Data Period, the active pixels of an active video line are transmitted. During the Data Island period, audio and auxiliary data are transmitted using a series of packets. The Control period is used when no video, audio, or auxiliary data needs to be transmitted.
A Control Period is required between any other two periods.

Video Data Periods use transition minimized coding to encode 8 bits per channel, or 24 bits total per pixel.
Data Island Periods are encoded using a similar transition minimized coding, TMDS Error Reduction Coding (TERC4), which transmits 4 bits per channel, or 12 bits total per pixel clock period.
During Control Periods, 2 bits per channel, or 6 bits total are encoded per pixel clock using a transition maximized encoding. These 6 bits are HSYNC, VSYNC, CTL0, CTL1, CTL2 and CTL3. Near the end of every Control Period, a Preamble, using the CTLx bits, indicates whether the next Data Period is a Video Data Period or a Data Island Period.

Video Format Support

In order to provide maximum compatibility between video Sources and Sinks,

specific minimum requirements have been specified for Sources and Sinks

Primary Video Format Timings

- 640x480p @ 59.94/60Hz
- 1280x720p @ 59.94/60Hz
- 1920x1080i @ 59.94/60Hz
- 720x480p @ 59.94/60Hz
- 720(1440)x480i @ 59.94/60Hz
- 1280x720p @ 50Hz
- 1920x1080i @ 50Hz
- 720x576p @ 50Hz
- 720(1440)x576i @ 50Hz

Audio Sample Rates and Support Requirements

If an HDMI Source supports audio transmission across any output, then it shall support HDMI audio transmission. If an HDMI Source supports any HDMI audio transmission, then it shall support 2 channel L-PCM using an IEC 60958 Subpacket structure, with either 32kHz, 44.1kHz or 48kHz sampling rate and a sample size of 16 bits or more.

An HDMI Source is permitted to transmit L-PCM or encoded audio data at sample rates of 32kHz, 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz and 192kHz using either IEC 60958 format or IEC 61937 format. If an HDMI Sink supports audio reception across any input, then it shall support audio reception from all HDMI inputs.

Basic Audio. is defined as two channel L-PCM audio at sample rates of 32kHz, 44.1kHz, *or* 48kHz, with a sample size of at least 16 bits. For EIA/CEA-861B references to DTV devices, .Basic Audio. is defined as two channel L-PCM audio at sample rates of 32kHz, 44.1kHz, *and* 48kHz.

There is no sample size usage restriction for DTV devices. An HDMI Sink may optionally accept audio at sample rates of 88.2kHz, 96kHz, 176.4kHz and/or 192kHz using either IEC 60958 format or IEC 61937 format, and should indicate these capabilities in the E-EDID data structure.

Compatibility With DVI

All HDMI Sources shall be compatible with DVI 1.0 compliant sink devices (i.e. “monitors” or “displays”) through the use of a passive cable converter. Likewise, all HDMI Sinks shall be compatible with DVI 1.0 compliant sources (i.e. “systems” or “hosts”) through the use of a similar cable converter.

When communicating with a DVI device, an HDMI device shall operate according to the DVI 1.0 specification, with the following exception - these devices are not required to comply with DVI 1.0 rules regarding:

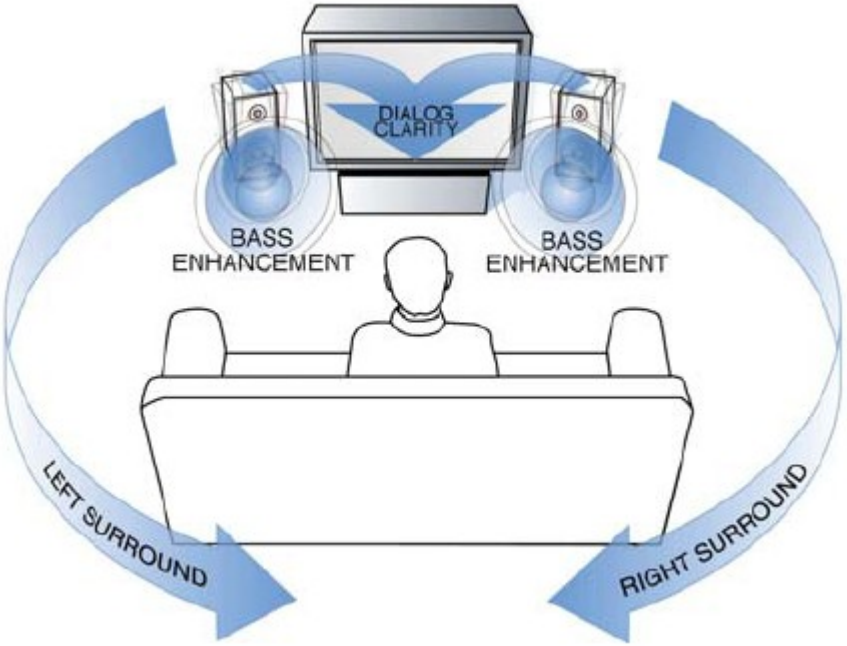
- Monitor scaling requirements
- Physical Interconnect specifications
- System Low Pixel Format Support Requirements

Furthermore, for HDMI devices which do not have a “BIOS” or “operating system”,
there are the following additional exceptions:

- “BIOS” requirements
- “Operating system” requirements
- “System level event” requirements
- Power management requirements

TruSurround XT for Virtual Surround Sound

DVD players have transformed the household into an entertainment center. While DVD owners can now enjoy 5.1 multichannel soundtracks for movies and music in the comfort of their living room or at their computer, most televisions and computer playback systems have only two speakers.



TruSurround XT☐ bridges this gap. It processes any multichannel audio source, as is usually found on DVDs, and transforms the material into breathtaking virtual surround sound from just two speakers or headphones.

Based upon the patented TruSurround® technology from SRS Labs, which is the established standard for virtual surround sound, TruSurround XT also includes the unique features of SRS Dialog Clarity and TruBass and creates a stunning 3D sound image from standard stereo material.

TruSurround XT features

- **TruSurround:** TruSurround is a patented SRS technology that solves the problem of playing 5.1 multichannel content over two speakers. TruSurround delivers a compelling, virtual surround sound experience through any two-speaker playback system, including internal television speakers and headphones. It is fully compatible with all multichannel formats up to 6.1 channels.

- **SRS Dialog Clarity Enhancement:** Playback of dialog often suffers due to competing signals from other speakers. In addition, feature film soundtracks are mixed specifically for cinema playback and are loaded with the latest advancements in special audio effects. When translated over home theatre or computers systems, dialog may become unintelligible. This patented SRS algorithm enhances signal clarity to address these problems, thus improving dialog intelligibility from all such source material.

TruSurround XT features

- **TruBass:** TruBass is a patented SRS technology that enhances bass performance utilizing proprietary psychoacoustic techniques. These techniques restore the perception of fundamental low frequency tones by dynamically augmenting harmonics, which are more easily reproduced by contemporary loudspeakers.

Using TruBass, TruSurround XT takes the bass information contained within the original audio track and helps the speakers or headphones re-create it – even if it is below the speaker's low frequency limitations.

- **WOW**: WOW™ is an award winning stereo enhancement technology that significantly improves the performance of stereo (non-surround sound encoded material) signals through any two-speaker system, including headphones. It extends the sound image in both the horizontal and vertical planes well beyond the speakers themselves. In addition, WOW incorporates TruBass and SRS Dialog Clarity Enhancement.

When TruSurround XT accepts a stereo signal, WOW is enabled for a better listening experience. Wow is also used by Microsoft in their new Media Player for Windows XP and Windows Media Player 7.