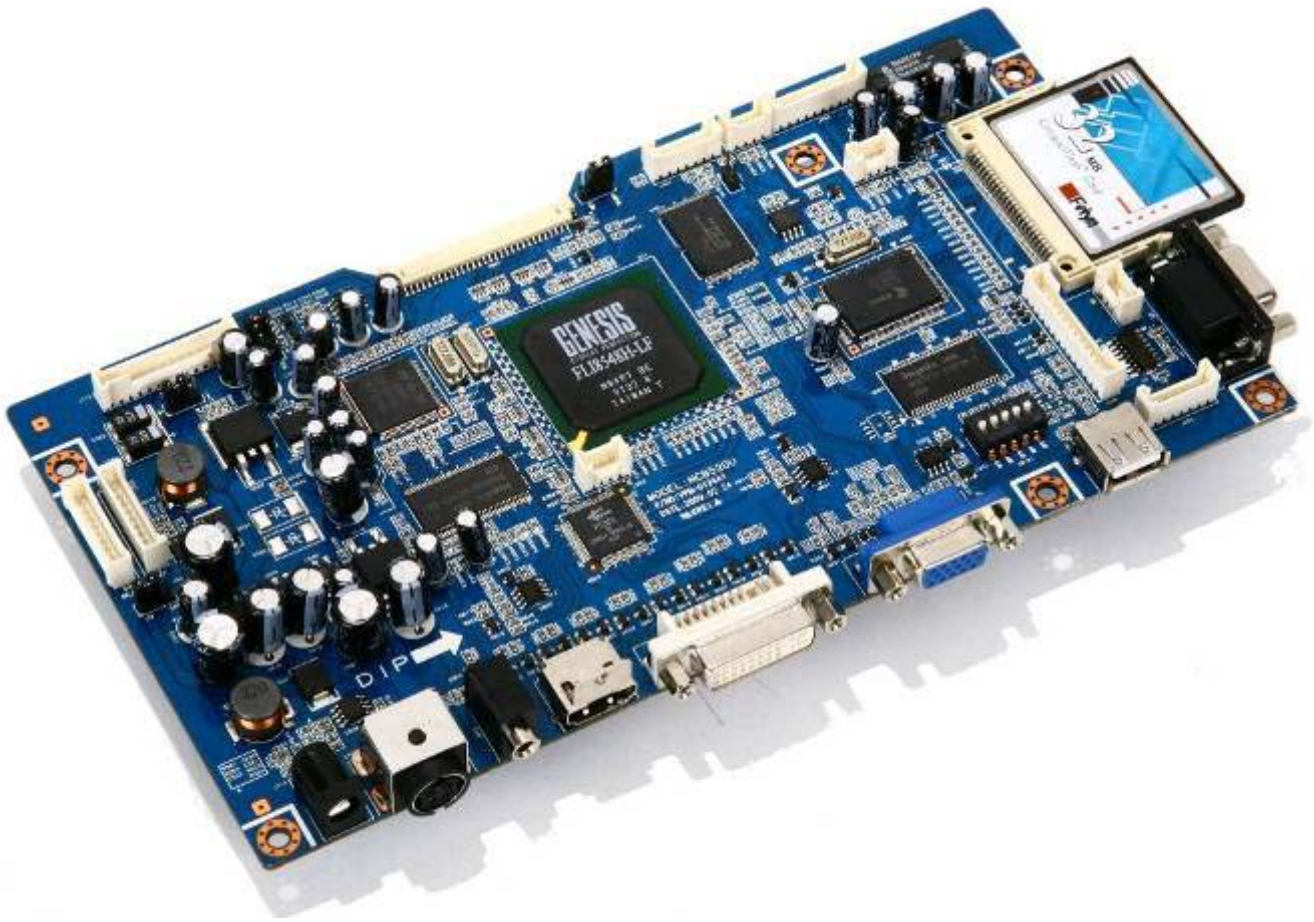
For LCD Monitor (PC, DVI, HDMI, Video and Component) Interface Controller
For 1024x768, 1280x768, 1366x768, 1440x900, 1280x1024, 1600x1200, 1680x1050, 1920x1080, 1920x1200 Resolutions TFT LCD

DATA SHEET (Rev. 01 - Preliminary)



TFT LCD Monitor Control Board

NCB520U6-AA
(ROHS Compliant)

May, 2009

CONTENT

Revision History

No	Description	Date	Rev.	Page
1	Preliminary Release	May 13, 09	00	
2	2nd Preliminary Release	June 4, 09	01	

INTRODUCTION

Designed for LCD monitor and other flat panel display application the NCB520U6 controller provides an auto-input synchronization and easy to sue interface controller for:

▶ TFT (active matrix) LCD panels of 1024x768, 1280x768, 1366x768, 1280x1024, 1440x900, 1680x1050, 1600x1200, 1920x1080 and 1920x1200 resolutions.

▶ Computer video signals of VGA, SVGA, XGA, WXGA, SXGA and WXGA+, WSXGA+, UXGA, WUXGA standard.

▶ CVBS and SVHS Video signals of NTSC, PAL standard

▶ Components video signals

- 480P : 59.94/60Hz, 756i : 50Hz, 756P : 50Hz, 720P : 59.94/60Hz , 1080i : 50/59.94/60Hz

▶ 3-D Comb filter and Noise Reduction adoption, 1 De-Interlacing Block

▶ All input supporting PIP/POP/PBP, Up-to 1080i HD component input supporting

▶ All VESA Standard Signal Input Support

▶ Multi Media Player support

- MP3, WMA, PCM, ADPCM, OGG, AAC-LC, AMR-NB, AMR-WB and WAVE audio formats
- JPEG, progressive JPEG, HD P, BMP, GIF, TIFF image format
- Microsoft HD Photo image format - supports
- M-JPEG, MPEG-1, MPEG-2, MPEG-4, AVI, QuickTime MOV,MP4, 3GP and other video formats
- USB memory stick, 4Bits SD Card or 8 bits CF Card

HOW TO PROCEED

▶ Ensure that you have all parts & they are correct, refer to:

- Connection diagram
- Connector reference
- Assembly notes

▶ Check controller switch & jumper settings (errors may damage the panel)

▶ Prepare the PC, Video and Memory card (USB/CF/SD)

▶ Connect the parts

▶ Understand the operation & functions

IMPORTANT USAGE NOTE

This equipment is for use by developers and integrators. The manufacturer accepts no liability for damage or injury caused by the use of this product. It is the responsibility of the developer, integrators or other users of this product to:

- Ensure that all necessary and appropriate safety measures are taken.
- Obtain suitable regulatory approvals as may be required.
- Check power settings to all component parts before connection.

DISCLAIMER

There is no implied or expressed warranty regarding this material.

GENERAL SPECIFICATION

No.	Item	Description			
1	Model name				Note 1)
		XGA Panel	1024X768	NCB520X4	
		WXGA Panel	1280X768	NCB520W4	
		WXGA Panel	1366X768	NCB520WZ4	
		SXGA Panel	1280X1024	NCB520E4	
		WSXGA+ Panel	1680X1050	NCB520WE4	
		UXGA Panel	1600X1200	NCB520U6	
		HD Panel	1920X1080	NCB520WH4	
		WUXGA Panel	1920X1200	NCB520WU4	
2	LCD Module	SVGA, XGA, WXGA, SXGA, WSXGA+, UXGA, HD, WUXGA			
3	Signal Input	Analog RGB, TMDS(DVI). NTSC/PAL			
4	Resolution Support	H: 31 ~ 80kHz			
		V: 55 ~ 76Hz			
5	OSD Control	Menu, Sel, Left, Right, Up, Down, Source, Power			8 keys
	Plug & Play	VESA DDC 2B Ver1.3			
6	Power Connector	Input	Type: IEC320 MALE 3Line Connector		
7.	Power Consumption	Supply Voltage	12Vdc/15Vdc/18Vdc or 24vdc		
		Max Power	18W (Without Back Light Inverter)		
8	Signal Connector	Analog	DSUB 15P(R, G, B Separate H, V Sync)		
		Digital	DVI-D(TMDS)		TMDS
		HDMI	HDMI 1.2		
		Video	MINIDIN-4P(SVHS), RCA(CVBS) DSUB 15P(YPbPr)		
9	MMP Connector	USB	USB 2.0		
		CF Slot	8 Bits, Max 8GByte		
		SD Slot	4 Bits, Max 8GByte		
10	Sound	Stereo	2x3W @ R_L= 4 Ω		

Notes 1) Depends On Panel Resolution					
X	XGA (1024X768)	E	SXGA (1280X1024)	WU	WUXGA (1920x1200)
W	WXGA (1280X768)	WE	WSXGA+ (1680x1050)	WH	HD 1080i (1920x1080)
WZ	WXGA (1366X768)	U	UXGA (1600x1200)		

ELECTRICAL SPECIFICATION

Input characteristic

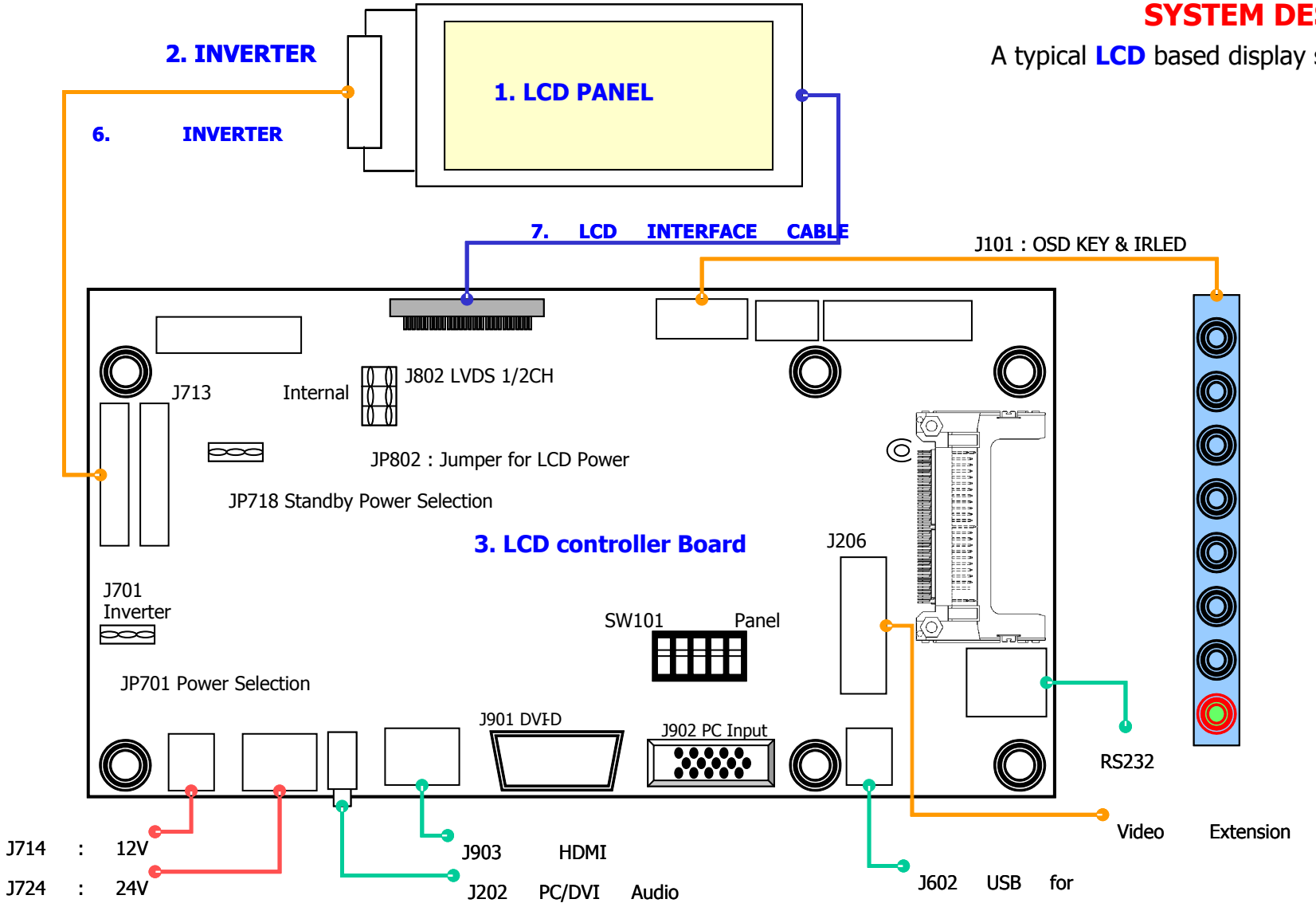
Description	Signal	Unit	Min	Typical	Max	Remarks
Power In (24V)						
	Input	Vdc	22.8	24.0	25.2	
	Consumption	Watt		TBD		Without INV
Power In (12V)						
	Input	Vdc	11.4	12.0	12.6	
	Consumption	Watt		TBD		Without INV
RGB Input						
	Analog RGB	Vp-p	0	0.7	-	
	Sync	Vdc	0	5.0	5.5	
	H Frequency	KHz	31	64	80	Depends on Mode
	V Frequency	Hz	55	60	75	
DVI Input						
	TMDS	mVp-p	450	500	900	
NTSC/PAL						
	Y/CVBS	Vp-p	0.7	1.0	1.4	
	C	Vp-p	0.6	0.8	1.0	

Output Characteristics

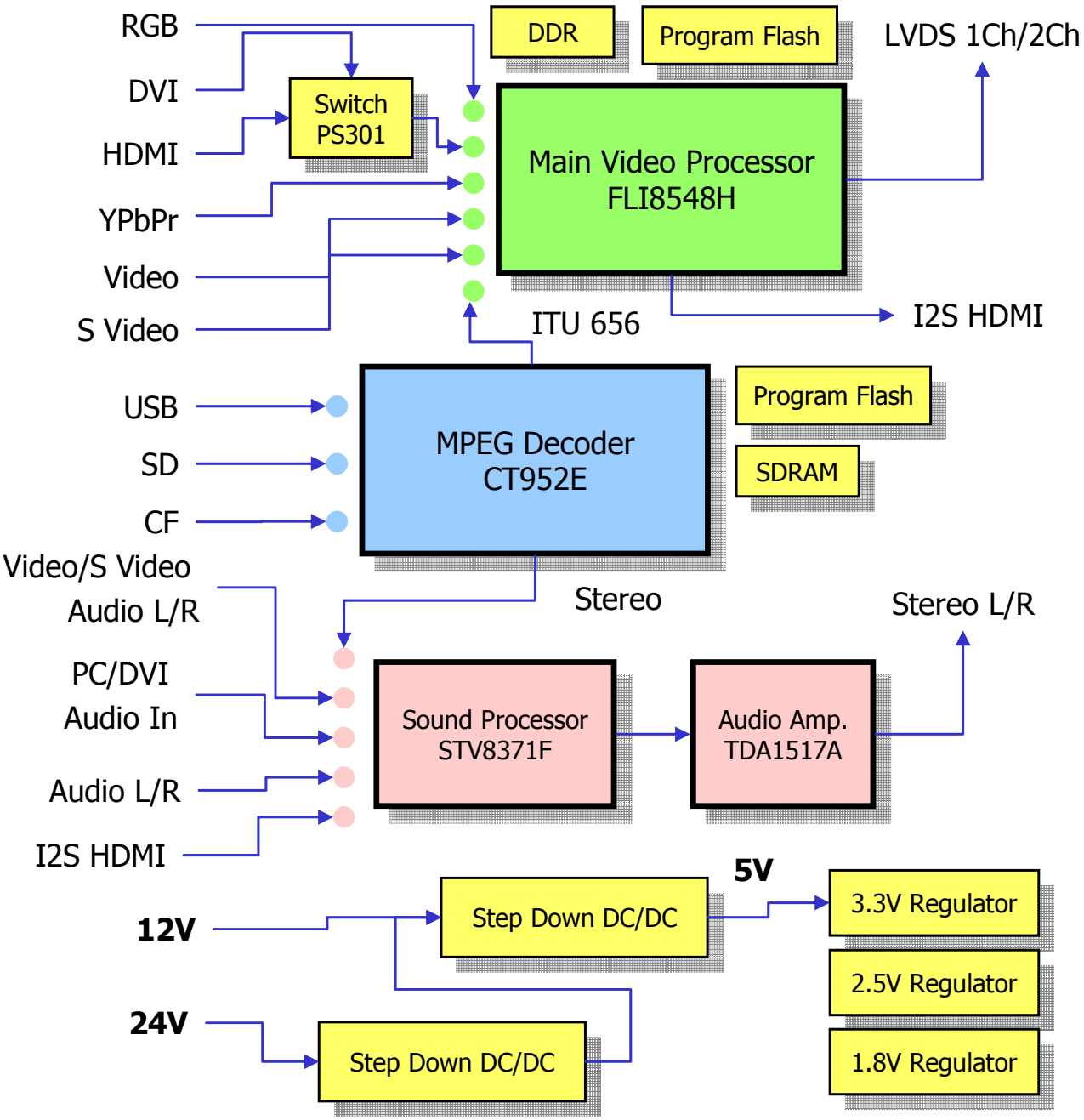
Description	Signal	Unit	Min	Typical	Max	Remarks
Panel Power						
	LCD Power (12V)	Vdc	11.4	12	12.6	Jumper option
	LCD Power(5V)	Vdc	4.75	5	5.25	Jumper option
	LCD Power(3.3V)	Vdc	3.13	3.3	3.46	Jumper option
LVDS Interface						
	Differential output	Vp-p (mV)	250	350	450	Different +/-
Inverter Interface						
	Power out	Vdc	22.8	24	25.2	Depends on Power Input and Spec.
			11.4	12	12.6	
	On/Off control	V	0		3.3	L=off, H=on
	Brightness control	V	3.3		0	Option
			0		3.3	Option
		Step	0		100	OSD Value

SYSTEM DESIGN

A typical **LCD** based display system



BLOCK DIAGRAM



ASSEMBLY NOTES

This controller is designed for monitors and custom display projects using TFT (active matrix) LCD panels of 1024x768, 1280x768, 1366x768, 1280x1024, 1680x1050, 1600x1200, 1920x1080 and 1920x1200 resolutions,
PDP panels of 1024x768 and 1366x768 resolutions WVGA, SVGA, XGA, WXGA, SXGA, WSXGA+ and UXGA, WUXGA signal input. The following provides some guidelines for installation and preparation of a finished display solution.

Preparation: Before proceeding it is important to familiarize yourself with the parts making up the system and the various connectors, mounting holes and general layout of the controller. As much as possible connectors have been labeled. Guides to connectors and mounting holes are shown in the following relevant sections.

1. LCD Panel: This controller has LVDS interface logic on the Board for different kind of TFT LCD panel. Due to the different signal timing and electrical characteristics from each LCD panel manufacturer, for selecting LCD interface type and resolution, put jumper marked SW101 on the right position following LCD panel specification. For selecting DC power level, put jumper marked JP802 on the right position. Supplied power level depends on LCD panel specification.

2. Controller: Handle the controller with care as static charge may damage electronic components, Make sure correct jumper and switches settings to match the target LCD and PDP panel

3. LCD connector board: Different makers and models of LCD panel require different panel signal connectors and different pin assignments.

PDP connector board: Different makers and models of PDP panel require different panel signal connectors and different pin assignments.

4. LVDS signal cables: In order to provide a clean signal it is recommended that LVDS signal cables should not longer than 30cm. If loose wire cabling is utilized these can be a made into a harness with cable ties. Care should be taken when you place the cables to avoid signal interface. Additionally it may necessary in some systems to add ferrite cores to the cables to minimize signal noise.

5. Inverter: This will be required for the backlight of an LCD, some LCD panel have an inverter built in. As LCD panels may have 1 or more backlight tubes and the power requirements for different panel backlights may vary it is important to match the inverter in order to obtain optimum performance. See application notes for more information on connection.

6. Inverter cable: Different inverter models require different cables and different pin assignment. Make sure the correct cable pin out to match the inverter. Unsuitable cable pins out may damage the inverter.

7. AV cable: Standard composite or S-video cables can be used. Reasonable quality cables should be used to avoid image quality degradation.

8. OSD Button: See Operational Function section.

9. 3 Color LED: This LED shows the state of controller.

- Green – Normal state
- Red – Off mode
- Amber – DPMS mode

10. Power switch: This switch is located on OSD button board.

11. Power input: Proper power is required to supply power for the controller, the Inverter and the LCD panel

12. VGA Input Cable: As this may affect regulatory emission test result, a suitably shielded cable should be utilized.

13. MMP Memory Card

a. USING MEMORY CARDS
- Insert the memory card into the card slot on the DPF to play the content of it. You may directly use the memory card of your digital camera to play the photos you shot.
- This device is compatible with the following memory cards:
Secure Digital Card (SD™) Compact Flash (CF™)

b. NSERTING MEMORY CARD
- Insert the memory card with its label facing towards you. Slightly push it into the card slot.
* Caution: Do not force the memory card in the slot.

c. REMOVING A MEMORY CARD
- Simply insert the card into the card slot and unplug directly from the DPF after use.
* Please note: This DPF will only recognize digital pictures with JPEG format. Other format of picture can be converted to this JPEG format in your PC first before transfer to this unit.

EMI: Shielding will be required for passing certain regulatory emissions tests. Also the choice of video board and power supply can affect the test result.

Consideration should be given to:

- Electrical insulation.
- Grounding.
- EMI shielding.
- Heat & ventilation
-

Caution: Ensure that the adequate insulation is provided for all areas of the PCB with special attention to high voltage parts such as the inverter.

***** Remarks*****

For a specific panel use, One panel sample and full technical specifications for the LCD panel from the manufacturer are required to test for tuning up screen image. Innodisplay can provide engineering service for customers specific controller development.

Please contact Innodisplay. (sohn@innodisplay.co.kr)

***** Setup for operation*****

Once the circuit has been connected, a setup procedure for optimal is requires a few minutes The following instructions are likely to form the basis of the finished product operation manual.

PC Settings

The PC needs to be set to an appropriate graphics mode that has the same resolution with the LCD panel to have clear screen image. And the vertical refresh rate should be set to one of 56~75Hz, non – interlaced signal.

Display System Settings

The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 8 buttons OSD operation as a standard. The control functions defined on OSD operation are as below.

Pc Graphics Output: A few guidelines:

- Signal quality is very important, if there is noise or instability in the PC graphics output this may result in visible noise on the display
- Refer to the graphic modes table in specification section for supported modes.
- Non-interlaced & interlaced video input is acceptable.

Important: please read the application notes section for more information.

CONNECTION & OPERATION

CAUTION: Never connect or disconnect parts of the display system when the system is powered up as this may cause serious damage.

CONNECTION

1. **LCD panel & Inverter**: Connect the inverter (if it is not built- in the panel) to the CCFT lead connector of the LCD panel.
2. **LVDS type panels**: Plug the signal cables direct to J802 of the NCB520 for 1 or 2 channel interface panel
3. **Inverter & Controller:** Plug the inverter cable to J701, J702 of the NCB520 and another end to the connector on the inverter.
4. **Function switch & Controller:** Plug the OSD switch mount cable to J101 of the NCB520 and another end to the OSD board.
5. **Jumpers:** Check all jumpers JP701 (Inverter power Setting) and JP802(Target Panel Power setting) are set correctly. Details referring the jumpers setting table (in the following section)
6. **VGA cable & Controller:** Plug the VGA cable to the connector J902 of the NCB520.
7. **DIV-D Cable & Controller**: Plug the DVI-D Cable to the connector J901 of the NCB520.
8. **S/C Video Cable & Controller**: Plug S-Video/ C-Video Cable to the connector on extra board as extension board
9. **Component Video Cable & Controller :** Plug Component Cable to the connector to the connector on extra board as extension board
10. **Power supply to Controller:** Plug the DC 12V/ power in to the connector J714 or DC 24V power in to the connector J724 of NCB520.
11. **SMPS & Controller :** Plug the SMPS power in to the connector J713 of NCB520
12. **Power on:** Switch on the NCB520 and panel by using the OSD switch mount.

General:

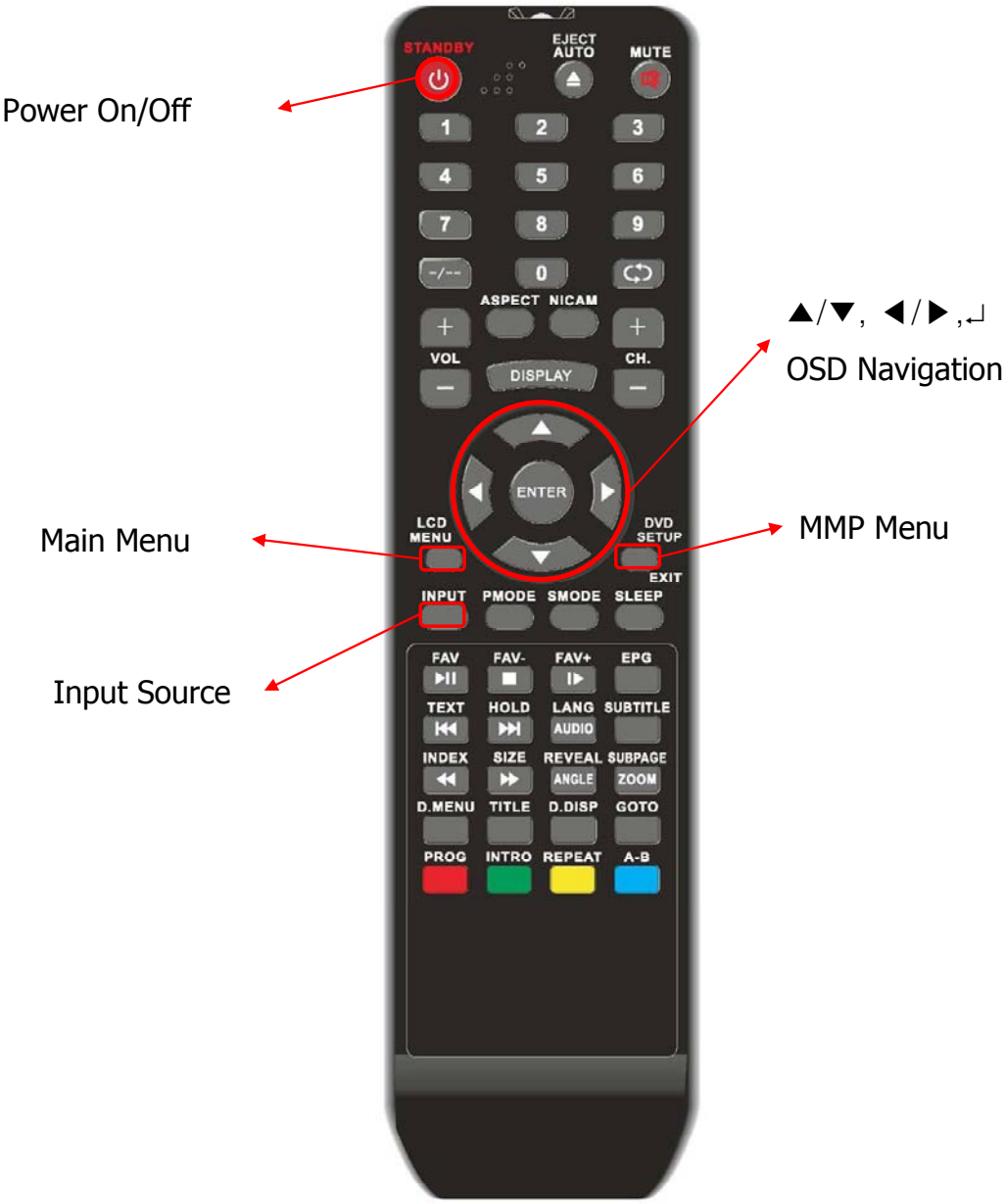
- If you use supplied cables & accessories, ensure that they are correct for the model of the panel and the controller.
- If you make your own cables & connectors, refer carefully to both the panel & inverter specifications and the section in this manual, "Connectors, Pin outs & Jumpers" to ensure the correct pin to pin wiring.

PC Setting:

The controller has been designed to take a very wide range of input signals however to optimize the PC's graphic performance we recommend choosing 60Hz vertical refresh rate – this will not cause screen flicker.

Remote Controller

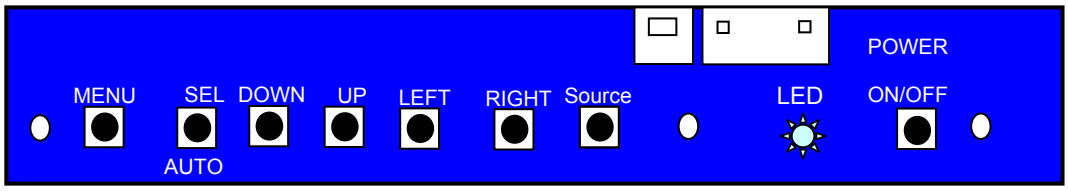
Only 9 buttons are available

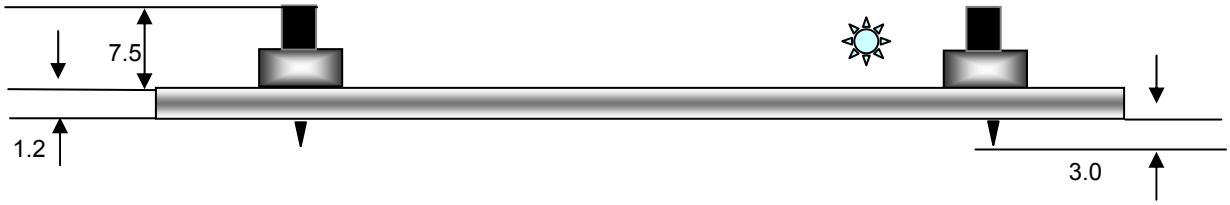


OSD CONTROL BOARD

The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 7 buttons OSD operation as a standard. The control functions defined on OSD operation are as below. (unit: mm)

Appearance





Button	Function	Status	HOT Key
LED	Indicates operation status	Green/ Red/ Amber	
POWER	Power on/off	On/Off	
MENU	Activate menu		
SELECT	Menu Select		No OSD, Auto Adjust
LEFT	Cursor control Left	First Activate Menu Key	
RIGHT	Cursor control Right	First Activate Menu Key	
DOWN	Cursor control Down	First Activate Menu Key	
UP	Cursor control Up	First Activate Menu Key	
SOURCE	Source change		

OSD FUNCTION

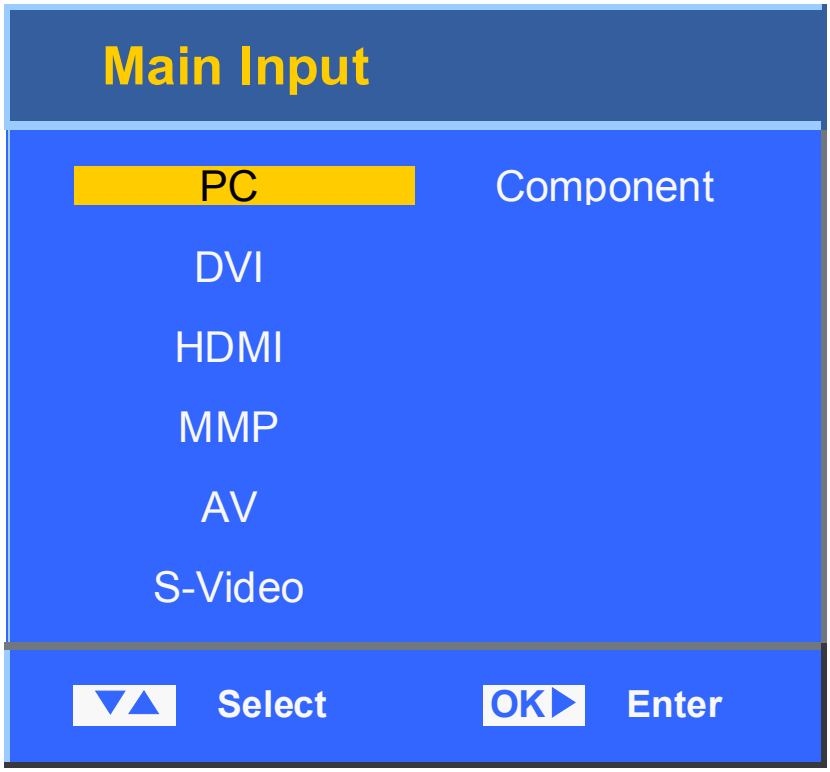
The chosen OSD settings will be stored in memory. The OSD menu can be cleared from the screen from the screen by moving the selection bar to the **EXIT MENU** icon pressing the **SEL** button otherwise it will be automatically cleared after a few second of non-use

OSD GUI Control Table

MAIN MENU	SUB MENU	CONTROL			
Picture	Colour Tone	Normal, Cool, Warm			
	Picture Preset	Brightness/Contrast/Red/Green/Blue			
	Backlight	100 (0 ~ 100)			
Sound	Sound Preset	Standard, Music, Movie, Speech, User			
	Volume	50 (0 ~ 100)			
	Balance	0 (- 50 ~ 50)			
	Equalizer	Treble	50 (0 ~ 100)		
		Bass	50 (0 ~ 100)		
		Loudness	50 (0 ~ 100)		
	AVL	ON/OFF			
Screen	Auto Configuration	Execute			PC Only
	Image Postiion	H – 50 to 50, V – 36 to 36			
	Phase	1 digit			
	Clock	4digit			
Pip/pop/pbp	ON/OFF	ON	PIP	Source, Swap, PIP Size, PIP Position	
			POP, PBP	Source, Swap	
Features	Language	English, Deutsh, Francais, Italiano, Espanol, Dutch, Greek, Danish, Slovenska, Suomi, Trukish			
	OSD Tone	0 (0 ~7)			
	ARC	Auto , 1:1, 16:9, 14:9, 4:3, Zoom1, Zoom2	PC, DVI, HDMI, Video, S-Video, Component		
		Auto , 1:1, 16:9, 14:9, 4:3, Zoom1	MMP		
	SET ID On/Off	On/Off			
	SET ID	0 (0~255)			
	Reset	On/Off			
	Time	Clock	HH : MM		
		Off Timer	HH : MM Off/On		
		On Timer	HH : MM Off/On		
		On Timer Source	MMP		
		On Timer Volume	20 (0 ~ 100)		
		Sleep Timer	0ff (10 ~ 240 / 10 Min)		
PIP/PAP	PIP Mode	Off , Large PIP, Small PIP, PAP 1, PAP			
	PIP Position	Right down, Right Up, Left Up, Left Down			
	Source	DVI, HDMI, MMP	Main PC, AV, S-Video, Component		
		PC, MMP, AV, S-Video, Component	Main DVI or HDMI		
		PC, DVI, HDMI, AV, S-Video, Component	MMP		
	PIP Picture	Clour Tone			
		Picture Preset			
	Sound Source	Main/Sub			

OSD MAIN MENU

Main Input Select:

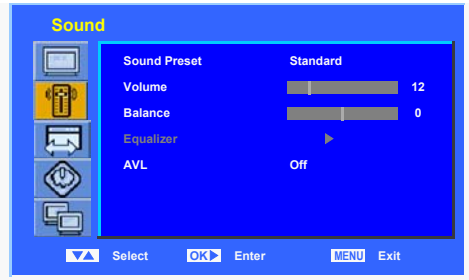


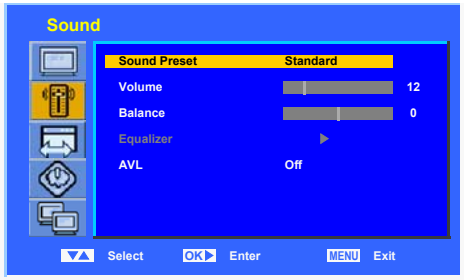
All Input : Picture

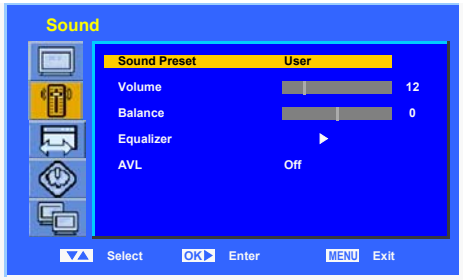
1) Colour Tone Normal → Cool → Warm
2) Picture Preset : Brightness, Contrast, Red, Green and Blue control 0 to 100
3) Backlight : Backlight Brightness Control 0 to 100

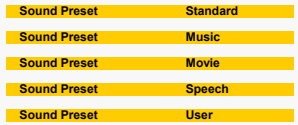
All Input : Sound

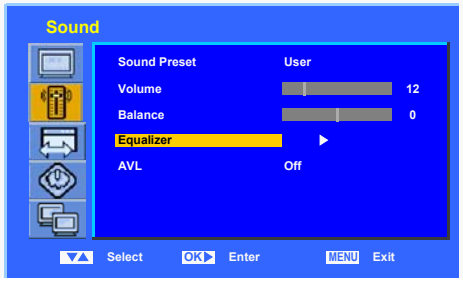
1) Sound Preset : Standard → Music → Movie → Speech → User
2) Volume : Volume Control 0 to 100
3) Balance : Left and Right Volume Balance control – 50 to 50, 0 is center value
4) Equalizer : When Sound Preset is selected to "User", it is enable. Treble, Bass, Loudness could be controlled
5) AVL : Auto Volume Limit, Input sound is too big, Volume limit is enable with "ON"





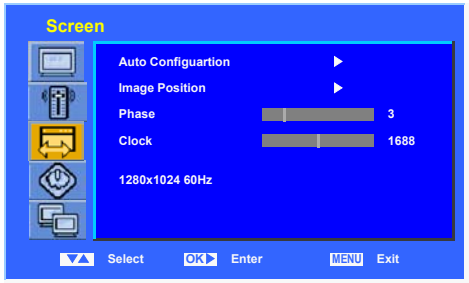


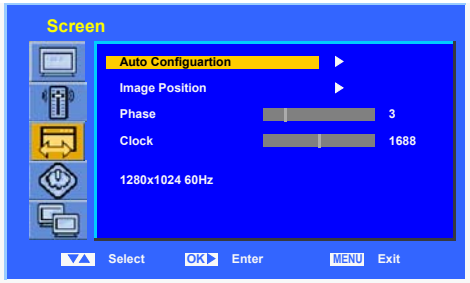


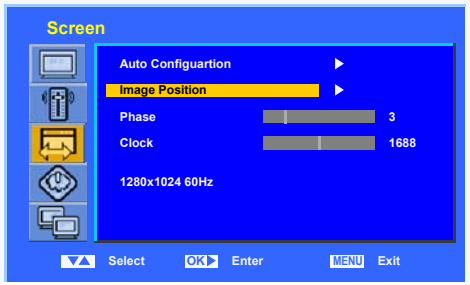


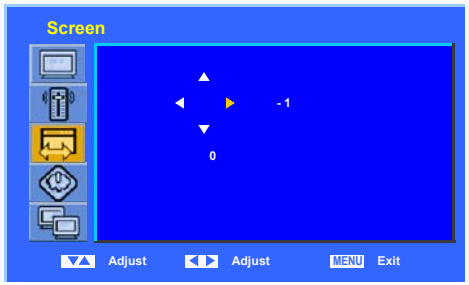
PC Input : Screen (This menu is disable on other inputs like as DVI, HDMI, Video and etc)

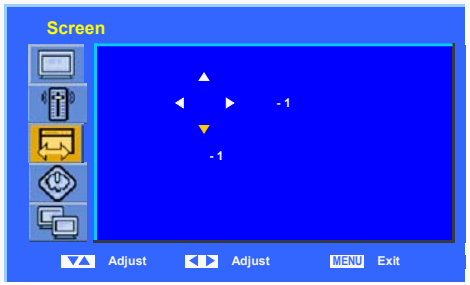
1) Auto Configuration : Automatic adjust Image Position, Phase and Clock
2) Image Position : Horizontal and Vertical Position manually control, H – 50 to 50, V – 36 to 36
3) Phase : Sampling clock phase control for Focus
4) Clock : Sampling clock number control for Size





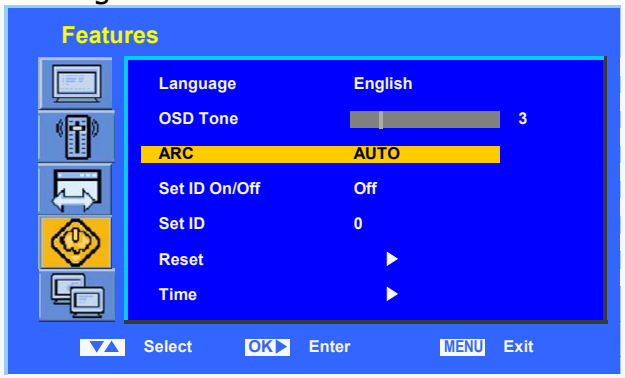


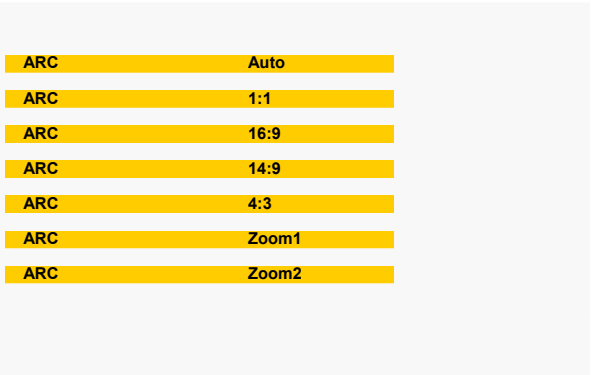


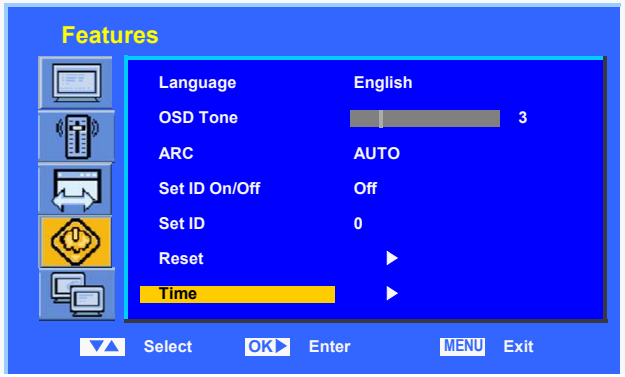


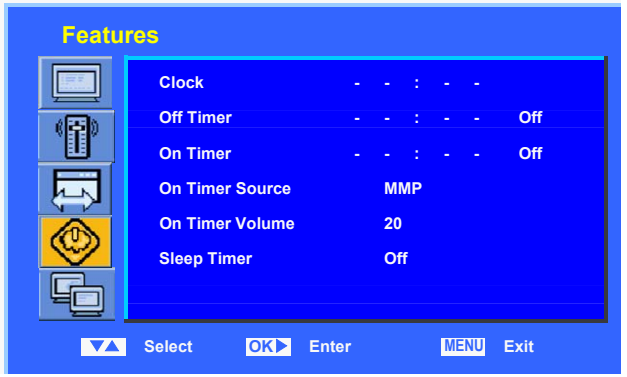
All Input : Features

1) Language : English, Deutsh, Francais, Italiano, Espanol, Dutch, Greek, Danish, Slovenska, Suomi, Trukish and Etc.
2) OSD Tone : OSD Transparence control 0 to 7
3) ARC : Aspect Ratio Control, Auto → 1:1 → 16:9 → 14:9 → 4:3 → Zoom1 → Zoom2 → Auto
   *) 1:1 is supported when input resolution is smaller than panel resolution,
4) Set ID On/Off : RS232 Remote control set enable ON/OFF
5) Set ID : Set ID setting, 0 all, ID available 1 to 255
6) Reset : Recall default value from NVRAM
7) Time : Clock Setting, ON/OFF, Sleep setting



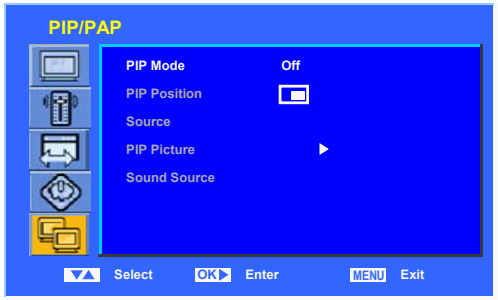


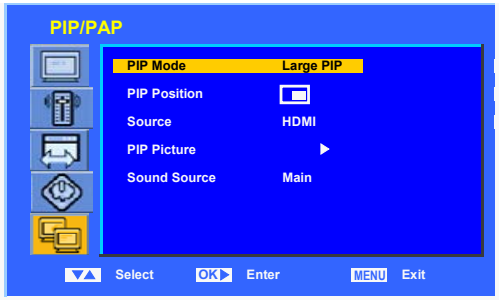


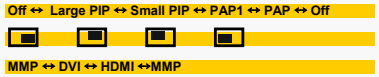


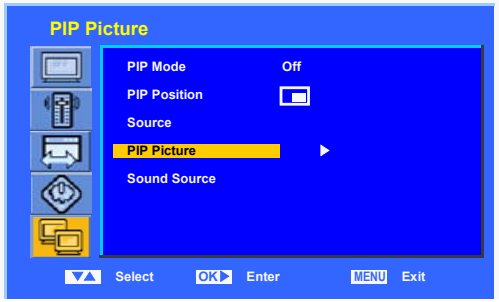
All Input : PIP/PAP

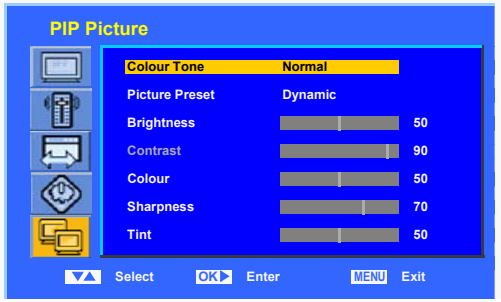
1) PIP Mode : Off Language : Off ←→ Large PIP ←→ Small PIP ←→ PAP 1 ←→ PAP ←→ Off
2) PIP Position : Right down ←→ Right Up ←→ Left Up ←→ Left Down ←→ Right Down
3) Source : Note [1)]
4) PIP Picture : Colour Tone, Picture Preset
5) Sound Source : Main ←→ Sub

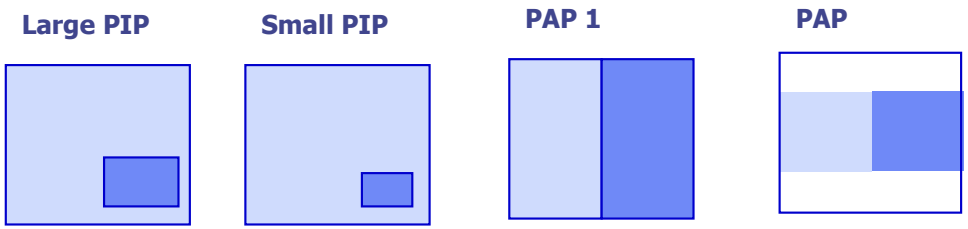










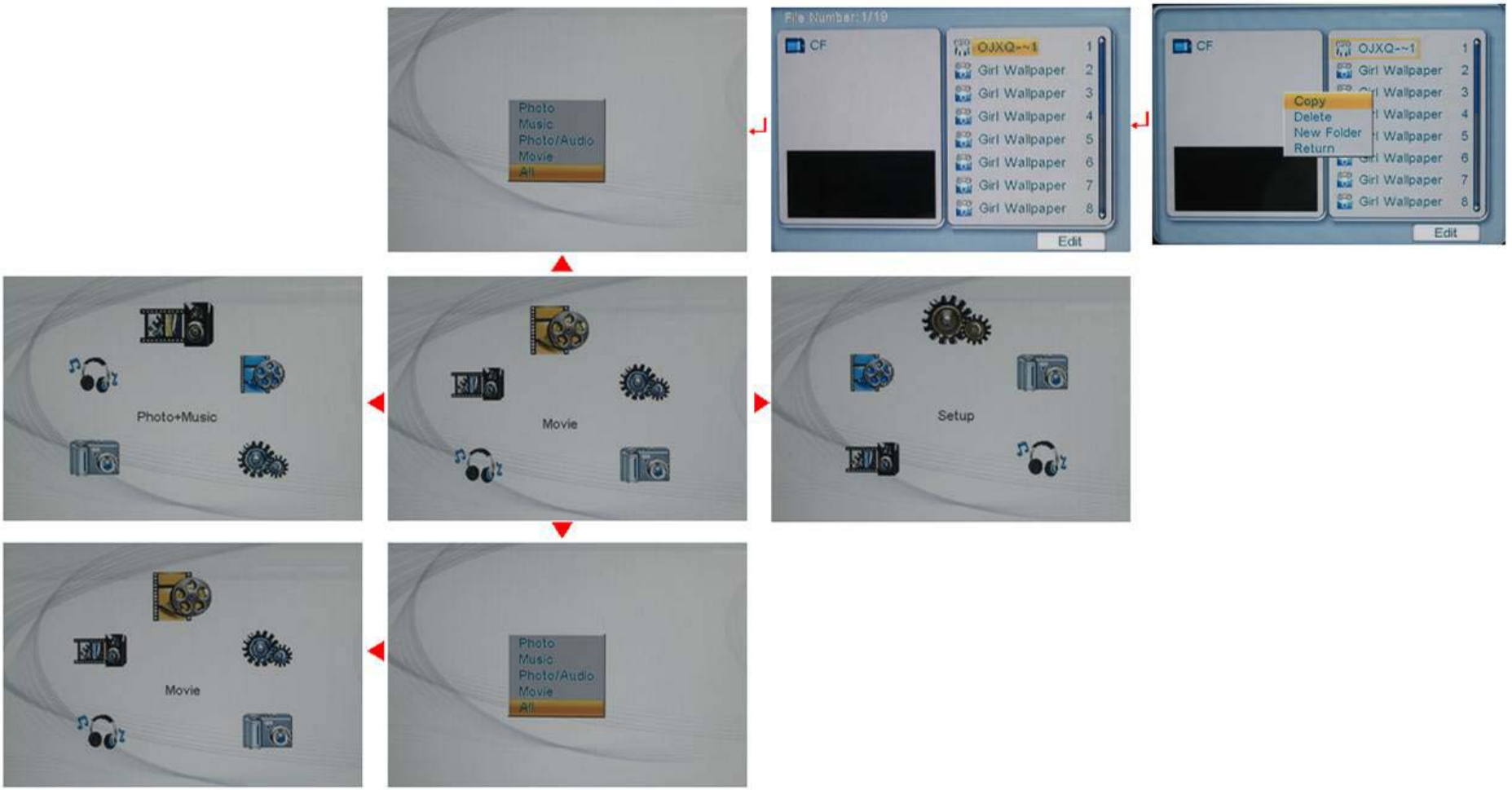


Note [1] **PIP Main/Sub Matrix**

Main / Sub	PC	DVI	HDMI	MMP	AV	S-Video	Component
PC	X	O	O	O	X	X	X
DVI	O	X	X	O	O	O	O
HDMI	O	X	X	O	O	O	O
MMP	O	O	O	x	O	O	O
AV	X	O	O	O	X	X	X
S-Video	X	O	O	O	X	X	X
Component	X	O	O	O	X	X	X

MMP Main Menu

1) Left/Right Key : Menu Selection, Setup ←→ Photo ←→ Music ←→ Photo+Music ←→ Movie
2) Up/Down Key : File edit, Photo, Music, Photo/Audio, Movie, All



Setup :MMP

Menu	Interval Time	Description	Photo file display interval time control
		Value	5/10/15/30 Sec., 1/3 Min., Off

Menu	Transition Effect	Description	Photo file to file transition effect control
		Value	No Effect, Blind Vertical/ Horizontal
			Color Ration Vertical/Horizontal
			Block 1/2/3/4/5/6/7/8/9, Fade In/put, Off

Menu	Show Type	Description	Photo file display format control
		Value	Fit Screen, Full Screen

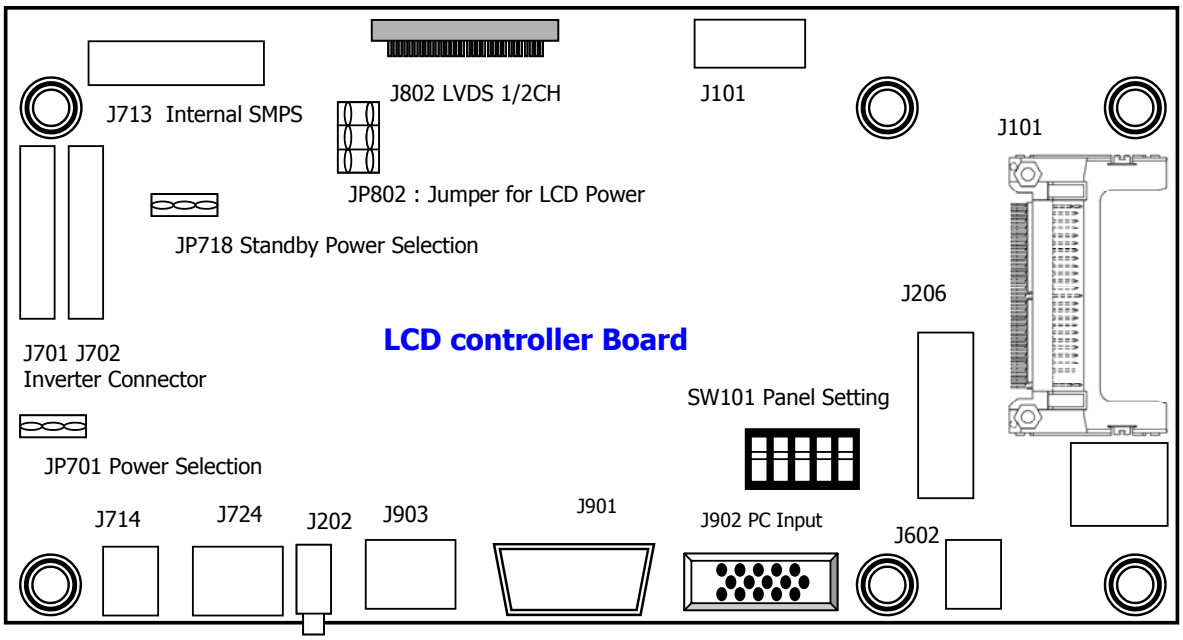
Menu	Slide Mode	Description	
		Value	Normal, Motion, Date & Time


Setup Menu
Custom Setup
OSD Language
Encoding
Repeat Mode
Media
Music Preference
English
French
German
Italian
Spanish
USB
CF
Western European
Central European
Spectrum
Tag & Cover
Off
One
All
Read
Default
Select
Confirm

Menu	Description	Value
OSD Language	MMP OSD Language selection	English, French, German, Italian, Spanish, Portuguese, Dutch, Polish,
Encoding	Subtitle selection	Western European, Central European
Repeat Mode	Play list repeat mode selection	Off, One, All
Media	Memory Card priority and slot selection	USB, SD/MMC, MS, XD, CF
Music Preference		Spectrum, Tag & Cover
Default	Recall default value	Read

* In order to OSD menu, press menu more than 2 seconds on MMP

CONNECTOR, PINOUT & JUMPERS



Summary

Reference	Item	Description	Type	Manufacture
J714	Jack	12V Input DC power Jack	2.5Ø	-
J724	Jack	24V Input Dc power Jack	KPJ-4S-S	KYCON
J202	Jack	Audio Input Jack for PC and DVI	3.5Ø	
J903	Connector	HDMI Connector		
J901	Connector	DVI-D Input(TMDS)	DVI-D24P	-
J902	Connector	Analog RGB Input	15P D-SUB	-
J602	Connector	USB Connector for MMP	USB down	-
J601	Slot	Compact Flash (CF) Slot		
J101	Connector	To OSD Board	20017WR-0710	YEONHO
J802	Connector	LVDS 1/2 Channel for LCD	12507WR-30	YEONHO
J701, J702	Connector	Inverter Connector	SMW200-1010	YEONHO
JP701	Jumper	Inverter Power Jumper	HDR3X1	-
SW101	Switch	Panel Type Select Switch	HDR5X2	-
J713	Connector	Internal SMPS Power Input	SMW200-1410	YEONHO
J718	Jumper	Standby Power Selection	HDR3X1	-
J206	Connector	Extension Port	SMW200-1410	YEONHO
JP802	Jumper	Panel Power Jumper	HDR2X3	-
J303	Connector	To RS232 Interface Board	SMW200-0410	YEONHO

J901: DVI-D Input Connector

Pin No.	Symbol	Description
1	TMDS DATA2-	TMDS DATA2 Differential Negative Signal
2	TMDS DATA2+	TMDS DATA2 Differential Positive Signal
3	TMDS DATA2 Shield	Shield for TMDS Channel #2
4	NC	No Connection
5	NC	No Connection
6	DDC Clock	The Data Line for the DDC Interface
7	DDC Data	The Clock Line for the DDC Interface
8	NC	No Connection
9	TMDS DATA1-	TMDS DATA1 Differential Negative Signal
10	TMDS DATA1+	TMDS DATA1 Differential Positive Signal
11	TMDS DATA1 Shield	Shield for TMDS Channel #1
12	NC	No Connection
13	NC	No Connection
14	+5V Power	+5 Volt signal for EDID (Un-powered Monitor)
15	GND(for +5V)	Ground for +5 Volt Power pin, Sync return
16	HPD	Identify the presence of a monitor
17	TMDS DATA0-	TMDS DATA0 Differential Negative Signal
18	TMDS DATA0+	TMDS DATA0 Differential Positive Signal
19	TMDS DATA0 Shield	Shield for TMDS Channel #0
20	NC	No Connection
21	NC	No Connection
22	TMDS CLOCK Shield	Shield for TMDS Clock differential Pair
23	TMDS CLOCK+	TMDS DATA0 Differential Positive Signal
24	TMDS CLOCK-	TMDS DATA0 Differential Negative Signal

J902: ANALOG VGA INPUT

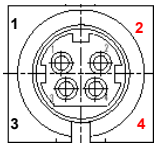
Pin No.	Symbol	Description
1	Red1	Red analog input
2	Green1	Green analog input
3	Blue1	Blue analog input
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	Not connected
10	GND	Ground
11	GND	Ground
12	DSDA	DDC-SDA
13	HSYNC	Horizontal Sync
14	VSYNC	Vertical Sync
15	DSCL	Serial Clock Input

J714: +12V DC power supply

Pin No.	Symbol	Description
-	GND	Ground
+	Vcc	12V

J724: +24V DC power supply

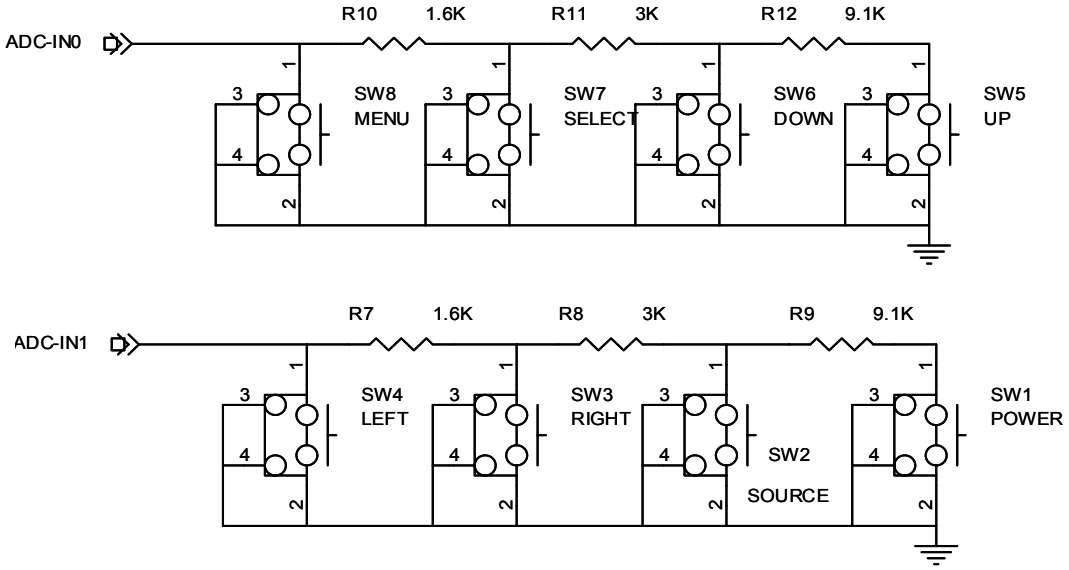
Pin No.	Symbol	Description
1,3	GND	Ground
2,4	Vcc	24V



EX) LSE0227B24130(4PIN) Li-shin Adapter / SLS0227B24118

J101 : OSD control connector

Pin No.	Symbol	Description
1	Vcc	+5V power for IR sensor
2	IRQ	Infrared rays signal line.
3	LED2	RED LED
4	LED1	GREEN LED
5	GND	Ground
6	ADC-IN1	Left, Light, Source, Power
7	ADC-IN0	Menu, Select, Down, UP



J802: LCD Interface connector for 2 Ch LVDS type

Pin No.	Symbol	Description
1	MOD_PWR	Panel Power (12V, 5V or 3.3V)
2	MOD_PWR	Panel Power (12V, 5V or 3.3V)
3	MOD_PWR	Panel Power (12V, 5V or 3.3V)
4	MOD_PWR	Panel Power (12V, 5V or 3.3V)
5	GND	Ground
6	SELLDS	LVDS DATA ORDER SELECT(Depends on Panel)/ No Connection
7	GND	Ground
8	Y3P-EVEN	Positive(+) LVDS differential first 3 data(A port)
9	Y3M-EVEN	Negative(-) LVDS differential first 3 data(A port)
10	YCP-EVEN	Positive(+) LVDS differential first Clock(A port)
11	YCM-EVEN	Negative(-) LVDS differential first Clock(A port)
12	Y2P-EVEN	Positive(+) LVDS differential first 2 data(A port)
13	Y2M-EVEN	Negative(-) LVDS differential first 2 data(A port)
14	GND	Ground
15	Y1P-EVEN	Positive(+) LVDS differential first 1 data(A port)
16	Y1M-EVEN	Negative(-) LVDS differential first 1 data(A port)
17	YOP-EVEN	Positive(+) LVDS differential first 0 data(A port)
18	Y0M-EVEN	Negative(-) LVDS differential first 0 data(A port)
19	GND	Ground
20	Y3P-ODD	Positive(+) LVDS differential second 3 data(B port)
21	Y3M-ODD	Negative(-) LVDS differential second 3 data(B port)
22	YCP-ODD	Positive(+) LVDS differential second Clock(B port)
23	YCM-ODD	Negative(-) LVDS differential second Clock(B port)
24	Y2P-ODD	Positive(+) LVDS differential second 2 data(B port)
25	Y2M-ODD	Negative(-) LVDS differential second 2 data(B port)
26	GND	Ground
27	Y1P-ODD	Positive(+) LVDS differential second 1 data(B port)
28	Y1M-ODD	Negative(-) LVDS differential second 1 data(B port)
29	YOP-ODD	Positive(+) LVDS differential second 0 data(B port)
30	Y0M-ODD	Negative(-) LVDS differential second 0 data(B port)

A/B port of LVDS cable must be changed below SXGA mode.

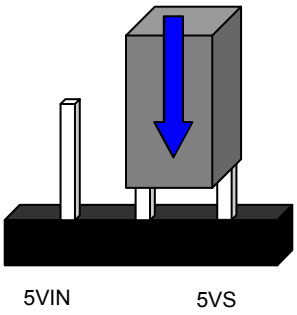
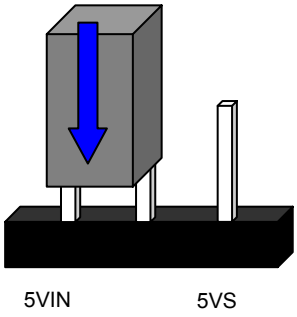
J802: LCD Interface connector for 1 Ch LVDS type

Pin No.	Symbol	Description
1	MOD_PWR	Panel Power (12V, 5V or 3.3V)
2	MOD_PWR	Panel Power (12V, 5V or 3.3V)
3	MOD_PWR	Panel Power (12V, 5V or 3.3V)
4	MOD_PWR	Panel Power (12V, 5V or 3.3V)
5	GND	Ground
6	SELLDS	LVDS DATA ORDER SELECT(Depends on Panel)/ No Connection
7	GND	Ground
8	Y3P-EVEN	Positive(+) LVDS differential first 3 data(A port)
9	Y3M-EVEN	Negative(-) LVDS differential first 3 data(A port)
10	YCP-EVEN	Positive(+) LVDS differential first Clock(A port)
11	YCM-EVEN	Negative(-) LVDS differential first Clock(A port)
12	Y2P-EVEN	Positive(+) LVDS differential first 2 data(A port)
13	Y2M-EVEN	Negative(-) LVDS differential first 2 data(A port)
14	GND	Ground
15	Y1P-EVEN	Positive(+) LVDS differential first 1 data(A port)
16	Y1M-EVEN	Negative(-) LVDS differential first 1 data(A port)
17	YOP-EVEN	Positive(+) LVDS differential first 0 data(A port)
18	Y0M-EVEN	Negative(-) LVDS differential first 0 data(A port)
19	GND	Ground
20		
21		
22		
23		
24		
25		
26	GND	Ground
27		
28		
29		
30		

J713: Internal SMPS Power Input

Pin No.	Symbol	Description	I/O	Remarks
1	NC	No Connection		
2	GND	Ground		
3,4	12V	12V Logic Power Supply	I	
5,6	GND	Ground		
7,8	5VIN	5V Logic Power Supply	I	
9	5VS	5V Standby Power Supply	I	
10,11	GND	Ground		
12	PWR_ON	SMPS Power On Control Signal	O	3.3V(High) :On
13	INV_DIM	Inverter Dimming Control Signal	O	
14	INV_CTRL	Inverter ON/OFF Control Signal	O	3.3V(High) :On

J718 : Standby Power selection

Reference	Description	Description
JP718		
	Internal SMPS	External DC Adapter

J701, J702: Backlight Inverter connector

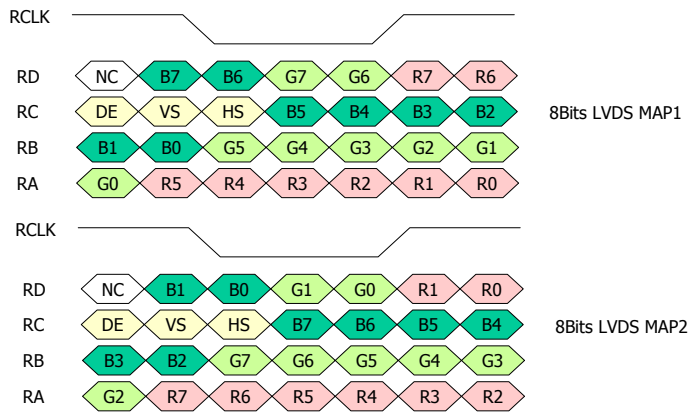
Pin No.	Symbol	Description
1	DIM-ADJ	DIM-adjustment analog dimming control signal * make sure inverter specification
2	ON/OFF	Inverter digital ON(3.3V)/OFF(0V) signal
3,4,5,6	GND	Ground
7,8,9,10	B+	B+(24V or 12V)

SW101 : Target panel jumper setting

1~4 : Output Resolution Selection

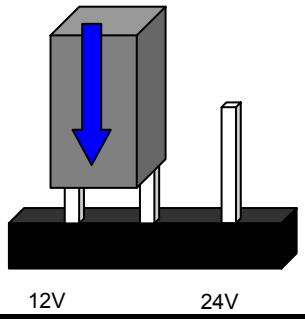
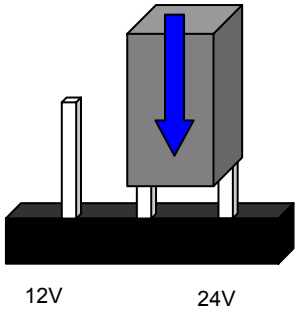
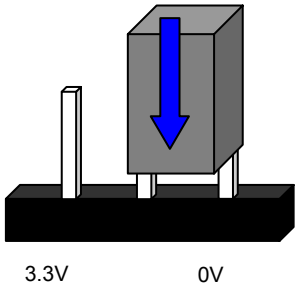
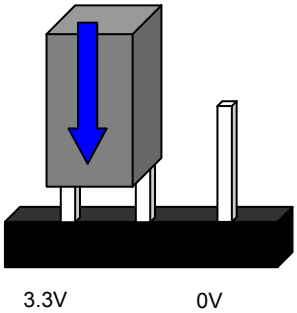
1	2	3	4	Output	Remarks
OFF	OFF	OFF	OFF	1024 X 768	
ON	OFF	OFF	OFF	1280 X 768	
OFF	ON	OFF	OFF	1366 X 768	
ON	ON	OFF	OFF	1280 X 1024	
OFF	OFF	ON	OFF	1440 X 900	
ON	OFF	ON	OFF	1680 X 1050	
OFF	ON	ON	OFF	1600 X 1200	
ON	ON	ON	OFF	1920 X 1080	
OFF	OFF	OFF	ON	1920 X 1200	
ON	OFF	OFF	ON	TBD	
OFF	ON	OFF	ON	TBD	
ON	ON	OFF	ON	TBD	
OFF	OFF	ON	ON	TBD	
ON	OFF	ON	ON	TBD	
OFF	ON	ON	ON	TBD	
ON	ON	ON	ON	TBD	

5: LVDS MAP Selection => ON : Map1 (Normal Type), OFF : Map2 (Shift Type)

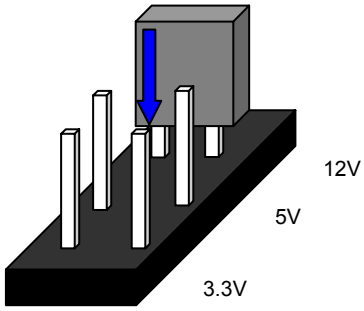
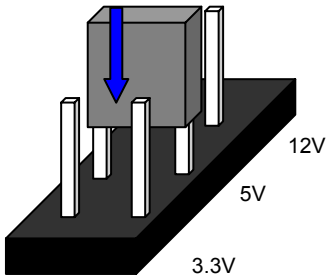
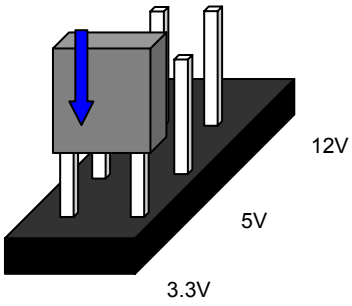


JP701 : Inverter Power Setting Jumper (12V or 24V)

JP804 : Inverter Dimming Setting Jumper (OFF : 0V High ON : 3.3V High)

Reference	Description	Connector Type
JP701	+12V inverter power enable	
	+24V inverter power enable	
JP804	Inverter Dimming Setting 0V (Reserve On)	
	Inverter Dimming Setting 3.3V (Reserve Off)	

JP802 : LCD Panel Power Selection Jumper

Reference	Description	Connector Type
JP802	12V panel power **CAUTION**: Incorrect setting can damage panel	
	5V panel power **CAUTION**: Incorrect setting can damage panel	
	3.3V panel power **CAUTION**: Incorrect setting can damage panel	

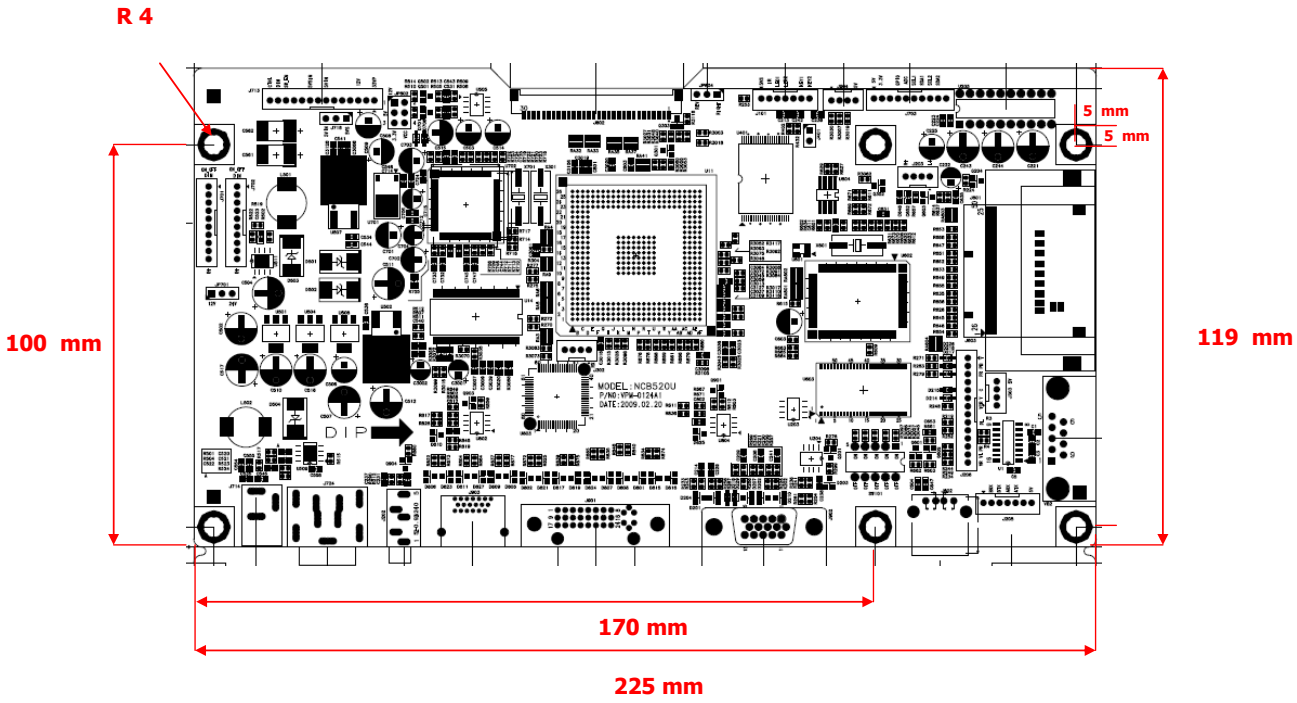
J206: Video Extension Port

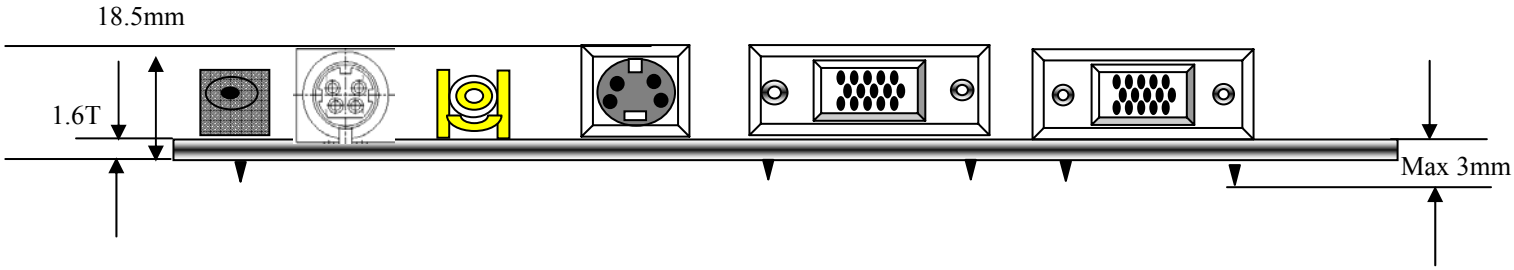
Pin No.	Symbol	Description
1	Y	Component Y
2	Pb	Component Pb
3	Pr	Component Pr
4	GND	Ground
5	Y	S-Video Luma signal input
6	C	S-Video Croma signal input
7	CVBS	Video CVBS signal input
8	GND	Ground
9	L1	Component Sound Left
10	R1	Component Sound Right
11	GND	Ground
12	L2	Video/S-Video Sound Left
13	R2	Video/S-Video Sound Right
14	Ext-Det	Video Connector Detection

J303: To RS232 Interface Board

Pin No.	Symbol	Description
1	TX1	Tx
2	GND	Ground
3	RX1	RX
4	GND	Ground

CONTROLLER DIMENSIONS





APPLICATION NOTES

USING THE CONTROLLER WITHOUT BOTTONS ATTACHED

This is very straightforward:

- Firstly setup the controller/display system with the buttons. With the attached controllers and display system active make any settings for color, contrast and image position as required then switch everything off.
- Remove the control switches, the 7-way cable.
- Refer to inverter specifications for details as to fixing brightness to a desired level, this may require a resistor, an open circuit or closed circuit depending on inverter

INVERTER CONNECTION

There are 3 potential issues to consider with inverter connection:

- Power
- ON/OFF
- Brightness (DIM-ADJ)

Inverter power: This should be matched with the inverter specification.

Inverter ON/OFF: This is a pin provided on some inverter for ON/OFF function and is used by this panel controller for VESA DPMS compliance. If the inverter does not have on/off pin or the on/off pin is not used DPMS will not operate. Pin 5 should be matched to the inverter specification for the ON/OFF pin.

Brightness Dimming control: NCB520 controller boards are analog dimming control method. And it is important to consider the specifications for the inverter to be used.

TROUBLESHOOTING

General

A general guide to troubleshooting of a flat panel display system it worth considering the system as separate elements, such as:

- Controller (jumpers, PC settings)
- Panel (controller, cabling, connection, panel, PC settings)
- Backlight (inverter, cabling, connection, panel, Pc settings)
- Cabling
- Computer system (display settings, operating system)

Through checking the system step by step cross with instruction manuals and a process of elimination to isolate the problem it is usually possible to clearly identify the problem area.

No image:

- If the panel backlight is not working it may still be possible to see just some image.
- A lack of image is most likely to be caused by incorrect connection, lack of power, failure to provide a signal or incorrect graphic card settings.

Image position:

If it is impossible to position the image correctly, the image adjustment controls will not move the image far enough, then test using another graphics card. This situation can occur when a graphic card is not close to standard timing or when something is in the graphics line that may affect the signal such as a signal splitter (please note that normally a signal splitter will not have any adverse effect).

Image appearance:

- A faulty panel can have blank lines, failed sections, flickering or flashing display.
- Incorrect graphic card refresh rate, resolution or interlaced mode will probably cause the image to be the wrong size, to scroll to, flicker badly or possibly even no image.
- Incorrect jumper settings on the controller may cause everything from incorrect image viewing to total failure.

CAUTION: Do not set the panel power input incorrectly.

- Sparkling on the display: faulty panel signal cable.

Backlight:

Items to check include: Power input, controls, inverter and Tubes generally in this order.

If half the screen is dimmer than the other half:

- Check cabling for the inverter.

Also:

- If system does not power down when there is a loss of signal.

APPLICABLE GRAPHIC MODE

The microprocessor measures the, H – sync V – sync and polarity for RGB Inputs, and uses this timing information to control all of the display operation to get the proper image on a screen. This board can detect all VESA standard Graphic modes shown on the table below and Provide mare clear and stable image on a screen

Table 6.1) RGB input format

Spec / Mode	Pixel Freq.	Horizontal Timing				Vertical Timing			
		Sync Polar	Freq.	Total	Active	SP	Freq.	Total	Active
	MHz		KHz	Pixel	Pixel		Hz	Line	Lind
640*350@70Hz	25.144	P	31.430	800	640	N	70.000	449	350
640*400@70Hz	28.287	N	31.430	800	640	P	70.000	449	400
720*400@ 70Hz	28.287	N	31.430	900	720	P	70.000	449	400
640*480@60Hz	28.175	N	31.469	800	640	N	59.940	525	480
640*480@72Hz	31.500	N	37.861	832	640	N	72.809	520	480
640*480@75Hz	31.500	N	37.500	840	640	N	75.000	500	480
800*600@56 Hz	36.000	P	35.156	1024	800	P	56.250	625	600
800*600@60Hz	40.000	P	37.879	1056	800	P	60.317	628	600
800*600@72Hz	50.000	P	48.077	1040	800	P	72.188	666	600
800*600@75Hz	49.500	P	46.875	1056	800	P	75.000	625	600
1024*768@60Hz	65.000	N	48.363	1344	1024	N	60.005	806	768
1024*768@ 70Hz	75.000	N	56.476	1328	1024	P	70.070	806	768
1024*768@75Hz	78.750	P	60.023	1312	1024	P	75.030	800	768
1280*720@60Hz	74.500	P	44.772	1664	1280	P	59.855	748	720
1280*768@60Hz	68.250	P	47.396	1440	1280	N	59.995	790	768
1360*768@60Hz	84.75	P	47.72	1776	1360	P	59.799	798	768
1280*1024@60Hz	108.000	P	63.981	1688	1280	P	60.020	1066	1024
1280*1024@75Hz	135.000	P	79.976	1688	1280	P	75.035	1066	1024
1440*1050@60Hz	101.000	P	64.744	1560	1400	N	59.948	1080	1050
1680*1050@60Hz	119.125	P	64.742	1840	1680	N	59.946	1080	1050
1600*1200@60Hz	162,000	P	75,000	2160	1600	P	60.00	1250	1200
1920*1080@60Hz	138.625	P	66.647	2080	1920	N	59.988	1111	1080
1920*1200@60Hz	154.125	P	74.099	2080	1920	N	59.999	1235	1200

ACCESSORY

This board requires several accessories to build a complete display unit. InnoDisplay can provide standard accessory for this board as below.

No.	Items	Part No.	Ex) LG Philips LC320W01
1	LCD signal cable	SC-Panel Part No.-mm	SC-LC320W01-400mm
2	Inverter	Part no. of Manufacturer	
3	Inverter cable	IC-Inverter Part No.-mm	IC-LC320W01-300mm
4	OSD Board	NOB008P	NOB008P
5	OSD Cable	OC- OSD Part No -mm	OC-NOB008P-300mm

* **SC** : LCD **S**ignal **C**able
IC : **I**nverter Interface **C**able
OC : **O**SD Board **C**able
mm : Cable length(unit: mm)

APPENDIX

A. Tested panel

This board can support various LCD panels, which have XGA, WXGA, SXGA WSXGA+, UXGA and WUXGA resolution.

The table below shows the model names of LCD panel, Jumper setting for LCD power, LCD panel selection and the dedicated inverter for each LCD panel. All of the LCD Panels listed can work without changing the control program of the NCB520U board. And INNODISPLAY will try continuously to the model names of the LCD panels that have been tested.

No.	LCD Model Name	LCD vendor	LCD VCC	Option	SW1	SW2	SW3	SW4	SW5
1	NL10276BC20-08	NEC	3.3V		OFF	OFF	OFF	OFF	ON
2									
3									
4									
5									
6									
7									
8									
10									
11									
13									
14									
15									
16									
17									
18									
19									
20									