APPLICATION		REVISION				
NEXT ASSY	USED ON	ECN NO	LTR	DESCRIPTION	DATE	APPROVED
	2007-02		X 1	Preliminary Specification		

TFT LCD Controller Board Specification of FSB-104U

RoHS Compliant.

APPROVAL		DATE
DRAWN		
CHECKED		
APPROVED		
QA		

FJN Display Inc.

TFT LCD Controller Board Ass'y
15" XGA
17"/ 19" SXGA
20"/ 21" UXGA

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Revision History

Date	Paragraph	Change Description
2006. 7. 10	Relase	1st Release
2006. 8. 9		Revision Board size
2006.12.26		Revision Board

1. Description

FSB-104U Controller board is analog RGB,DVI interface board for TFT LCD Panel that is providing cost-effective - and high quality screen image. This controller board supports from VGA to UXGA panels; resolution at 60Hz-refresh rate with expanding to full screen image on the different type of TFT LCD; TTL 1ch or LVDS 2ch.
It gives a lot of convenience to the user who wants to use different type of LCD panel with this controller and - access the GUI.

2. General Specification

ITEM	DESCRIPTION	REMARKS
Model Name	FSB-104U	
LCD Module	VGA/SVGA/XGA TFT LCD with TTL Interface XGA&WXGA&WXGAplus&SXGA&UXGA TFT LCD with LVDS Interface	Refer to the clause 4.1 Panel Compatibility
Input Signal	Analog RGB(seperated H/V sync) DVI-D	
Input resolution	Hor : 35 to 80 KHz Ver : 50 to 77 Hz Analog RGB : VGA~UXGA DVI-D : VGA~UXGA	
Receptacle	DC Power Jack, D-SUB,DVI-D	RS232
User Controls	5 Buttons Controls UART RS232	
Image Scaler	gm5766_LF	GenesisMicrochip,Inc.
Audio	Not available	
Power Consumption	TBD	
Board Dimension	Controller Board : 100 X 100(mm) Key Board : 115 X 20(mm)	
Plug & Play	DDC 2B	VESA

3. Environmental and Reliability Specifications

3.1 Operating Conditions

3.1.1 Temperature : 0℃~ 70℃ (without panel, invert) *operating condistions depend on LCD panels.,
3.1.2 Humidity : 10% ~ 80%, non-condensing
3.1.3 Altitude : maximum 3,000m

3.2 Transportation Conditions

3.2.1 Temperature : -25℃~ 60℃
3.2.2 Humidity : 5% ~ 95%, non-condensing
3.2.3 Altitude : maximum 15,000m

3.3 Storage Conditions

3.3.1 Temperature : -20℃~ 80℃
3.3.2 Humidity : 5% ~ 95%, non-condensing
3.3.3 Altitude : maximum 3,000m

3.4 Reliability Specifications

3.4.1 MTBF : more than 50,000 hours at 90% confidence level, excluding LCD panel.
3.4.2 Reliability specification and items : refer to “Specification of reliability test for LCD monitor”

4. Electrical Specification

4.1 Panel Compatibility

FSB-104U supports various Panel with small change. If you want to know which Panel is available, please refer to the following Table. If you want to panel specification, please contact to panel maker or us.

Vendor	Panel Part no.	Deviation Contents									Remarks
SEC	LTM150XH										
	LTM170E04										
	LTM17E05										
	LTM190E1										
	LTM021U1										
	LTM213U3,4										
LG-PHILIPS	LM150X06										
	LM170E01										
	LM190E06										
	LM201U01										
	LC230W01										

4.2 Input Signal Characteristics

Input Signal	Description	Unit	Min	Typical	Max	Remarks
DC input	DC Voltage	Vdc	10	12	35	*Option
	Power Consumption	Watts		TBD		for full Option
15Pin D-Sub	R/G/B level	Vp-p		0.714(1.0)		75Ω Terminated
	Sync Voltage	Vp-p		5.0		
	Horizontal Frequency	kHz	35	64	80	Depends on Mode
	Vertical Frequency	Hz	50	75	77	Depends on Mode
DVI-D	Digital RGB	mVp-p	150		1560	
		mVdc	150		1260	
	Dot Clock	MHz	25		135	Depends on Mode

4.3 Output Signal Characteristics

Output Signal	Description	Unit	Min	Typical	Max	Remarks
Invertor Interface	DC Output Voltage	Vdc	10	12	35	
	Brightness Control	Vdc	0		5.0	
	ON/OFF Control	Vdc	0		5.0	
	Differential Output	mVp-p	250	350	450	
LVDS Interface	LCD Power	Vdc		3.3		
				5		
				12		

4.4 Power Management : VESA DPMS standard is applied for power management control.

Mode	HSync.	VSync.	Video signal	LED Indication	Power Consumption (nominal)
On	Active	Active	Active	Green LED	
Stand-by	Inactive	Active	Active	Red LED	
Suspend	Active	Inactive	Active	Red LED	
Off	Inactive	Inactive	Active	Ambor LED	

4.5 Connector Pin Assignment

4.5.1 CN9,JS1 : DC Input Option

Part No.	Pin No	CN9 Description	JS1 Description	Remarks
DJ023 / DIN-422A	1 2 3 4	VCC(12V5A) GND GND	VCC(24V/10A) VCC(24V/10A) GND GND	

4.5.2 CN1 : Analog RGB Input

Part No.	Pin No.	Description	Remarks
DB15HD	1	RED	
	2	GREEN	
	3	BLUE	
	4	NC	
	5	GND (DDC RETURN)	
	6	GND-RED	
	7	GND-GREEN	
	8	GND-BLUE	
	9	NC	
	10	GND-SYNC/SELF TEST	
	11	NC	
	12	DDC DATA	
	13	HORIZONTAL SYNC	
	14	VERTICAL SYNC	
	15	DDC CLOCK	

4.5.3 CN4 : Interface Key Control

Part No.	Pin No.	Description	Remarks
12505WR9P (Yeonho)	1	LED_G	
	2	LED_R	
	3	KEY INPUT1	
	4	KEY INPUT2	
	5	IR INPUT	
	6	GND	
	7	GND	
	8	+5V	
	9	+5V	

4.5.4 CN10 : DVI-D Input

Part No.	Pin No.	Description	Remarks
SD74320-003 (MOLEX)	1	TMDS DATA 2-	
	2	TMDS DATA 2+	
	3	TMDS DATA 2/4 Shield	
	4	TMDS DATA 4- (NC)	
	5	TMDS DATA 4+ (NC)	
	6	DDC Clock	
	7	DDC Data	
	8	NC	
	9	TMDS DATA 1-	
	10	TMDS DATA 1+	
	11	TMDS DATA 1/3 Shield	
	12	TMDS DATA 3- (NC)	
	13	TMDS DATA 3+ (NC)	
	14	5V(NC)	
	15	GND	
	16	Hot Plug Detect	
	17	TMDS DATA 0-	
	18	TMDS DATA 0+	
	19	TMDS DATA 0/5 Shield	
	20	TMDS DATA 5- (NC)	
	21	TMDS DATA 5+ (NC)	
	22	TMDS DATA Clock Shield	
	23	TMDS Clock+	
	24	TMDS Clock-	

4.5.5 : J2,J4 Connect to Pannel Inverter (option)

Part No.	Pin No.	Description	Remarks
SMW200-12 (Yeonho)	1	DIMMING	
	2	Backlight ON/OFF	
	3	GND	
	4	GND	
	5	GND	
	6	GND	
	7	GND	
	8	NC	
	9	12V or equ	
	10	12V or equ	
	11	12V or equ	
	12	12V or equ	

4.5.6 : J6 Connect to External SMPS(option)

Part No.	Pin No.	Description	Remarks
SMW200-06 (Yeonho)	1 2 3 4 5 6	DIMMING Backlight ON/OFF GND GND 12V or equ 12V or equ	

4.5.7 : CN14 : Output to Inverter

Part No.	Pin No.	Description	Remarks
12505WR12P (Yeonho)	1 2 3 4 5 6 7 8 9 10 11 12	GND DIMMING GND BRT ON/OFF GND GND NC GND GND VDD VDD VDD	

4.5.6 CN5 & CN7 : Output to Panel

Part No.	CN7 Pin No.	CN5 Pin No.	CN7 Description	CN5 Description	Remarks
12507WR30P (Yeon ho)	1	1	Pannel power	Pannel power	
	2	2	Pannel power	Pannel power	
	3	3	Pannel power	Pannel power	
	4	4	Pannel power	Pannel power	
	5	5	GND	DCLK	
	6	6	GND	DEN	
	7	7	GND	GND	
	8	8	RxE3+	DEN	
	9	9	RxE3-	DVS	
	10	10	RxEC+	DHS	
	11	11	RxEC-	GND	
	12	12	RxE2+	GND	
	13	13	RxE2-	BLUE7	
	14	14	GND	BLUE6	
	15	15	RxE1+	BLUE5	
	16	16	RxE1-	BLUE4	
	17	17	GND	BLUE3	
	18	18	RxE0+	BLUE2	
	19	19	RxE0-	BLUE1	
	20	20	RxO3+	BLUE0	
	21	21	RxO3-	GND	
	22	22	RxOC+	GND	
	23	23	RxOC-	GREEN7	
	24	24	GND	GREEN6	
	25	25	RxO2+	GREEN5	
	26	26	RxO2-	GREEN4	
	27	27	RxO1+	GREEN3	
	28	28	RxO1-	GREEN2	
	29	29	RxO0+	GREEN1	
	30	30	RxO0-	GREEN0	
		31		GND	
		32		GND	
		33		RED7	
		34		RED6	
		35		RED5	
		36		RED4	
		37		RED3	
		38		RED2	
		38		RED1	
		40		RED0	

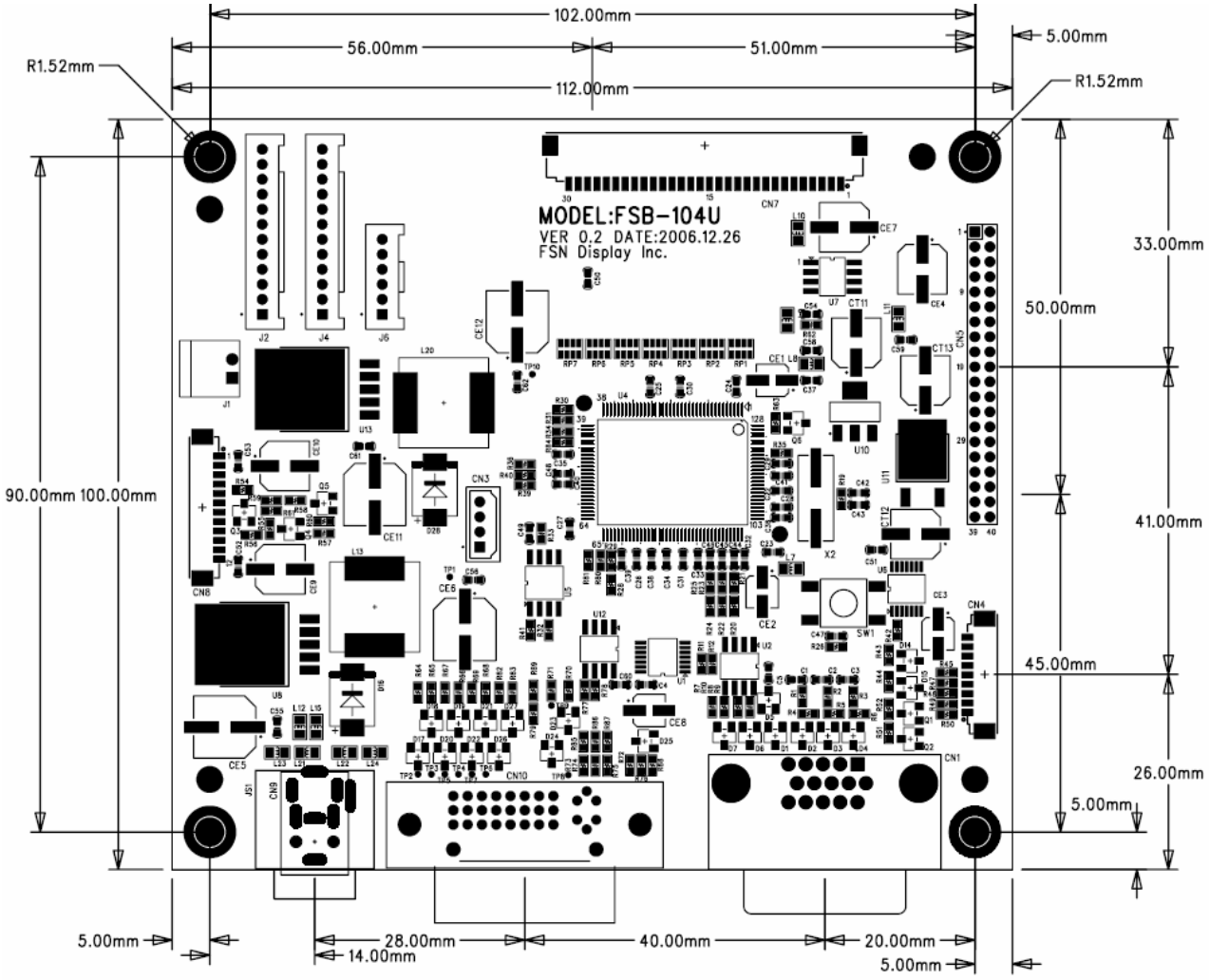
* Panel powers are 3.3V,5V,12V

* CN7 : LVDS 1ch/2ch

* CN5 : TTL 24bits/18bits

5. Mechanical Specification

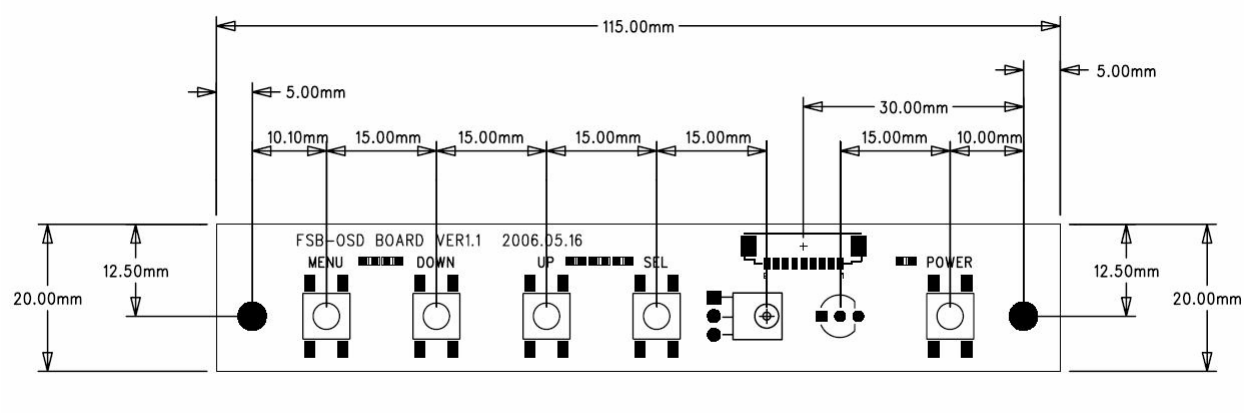
5.1 Main Board Dimension



unit : mm

* Components Height : 15mm(max)

5.2 Key Control Board Dimension



Button place from left to right:
MENU / DOWN / UP / SELECT / POWER

5.3 Remotecontrol

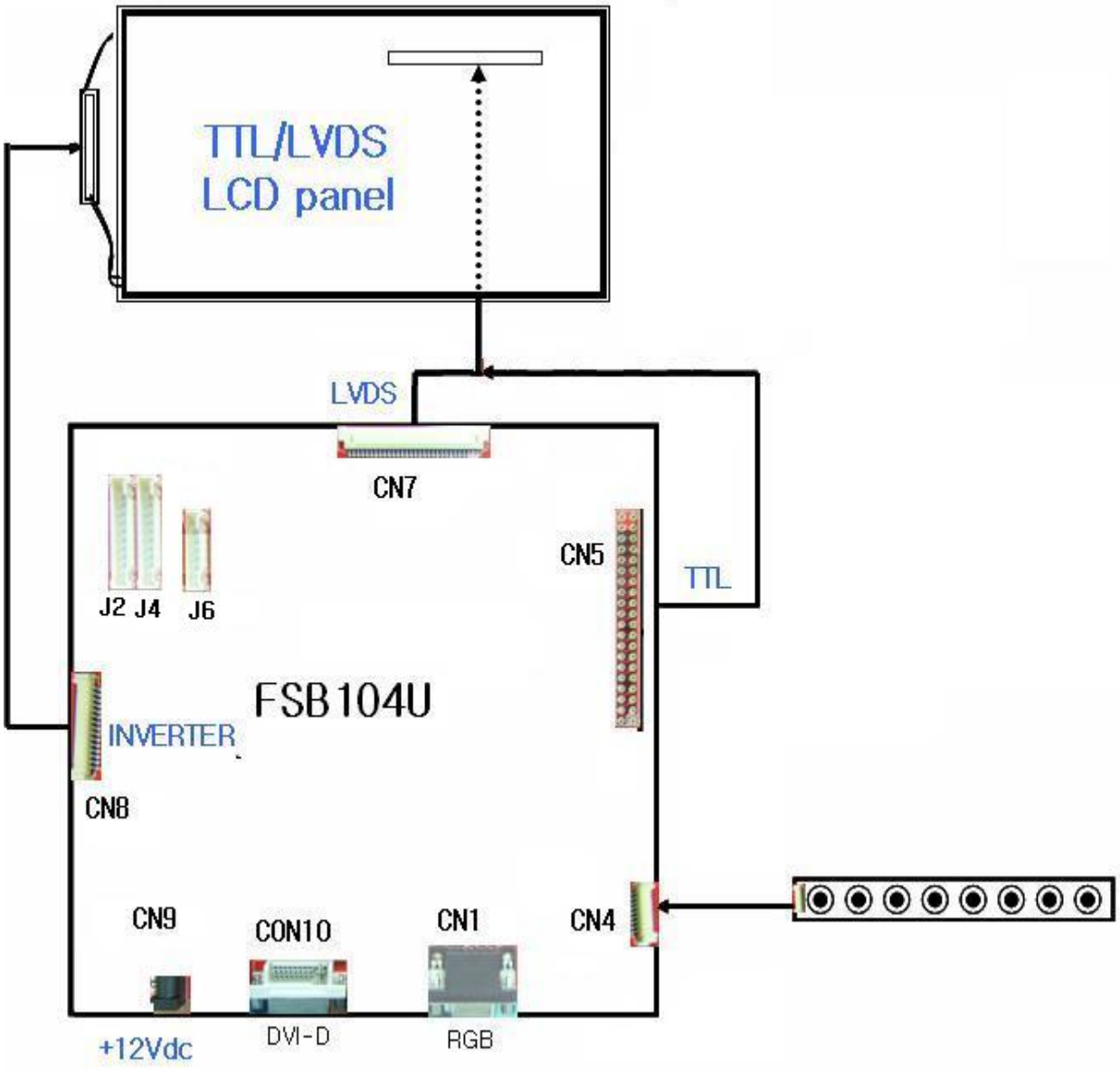
POWER - System On/off
SOURCE - Change functions
MENU - Menu On/Off
AUTO - Auto configuration of RGB display.
LEFT / RIGHT – Menu Move
UP / DOWN – Menu Move

* Below keys used for special function.

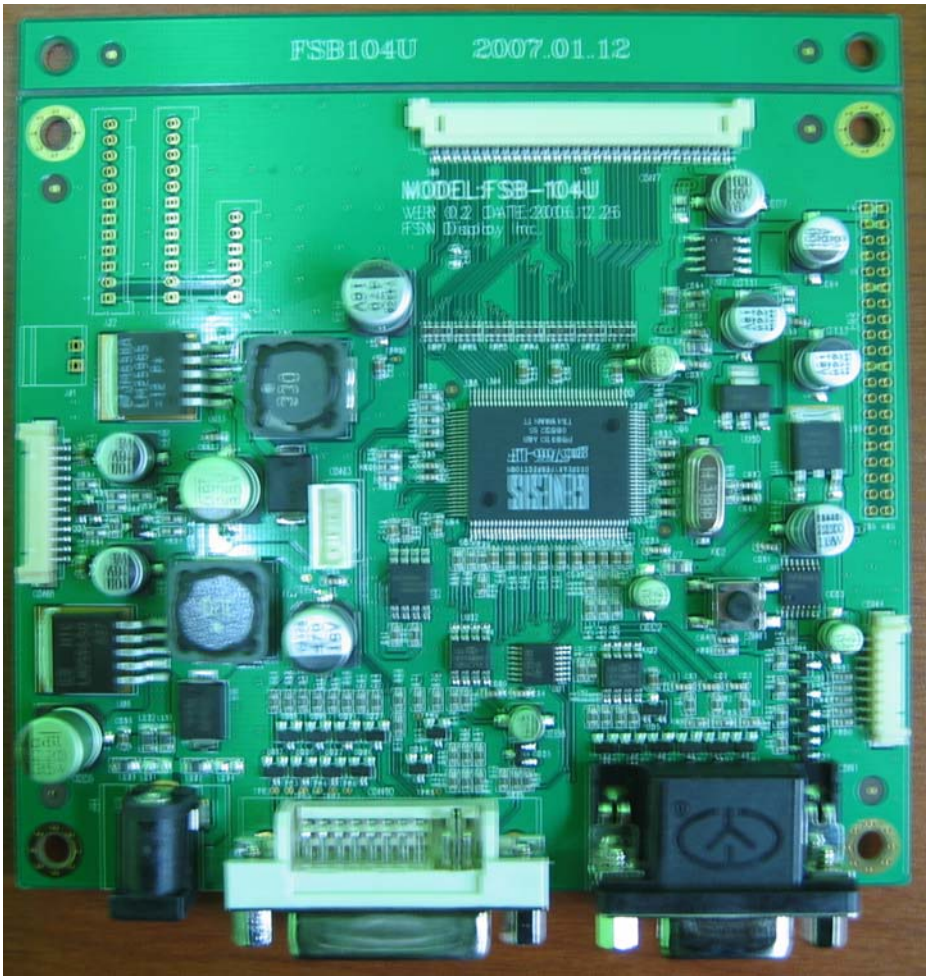
* Before using the Remocon for the first time, install the two AAA batteries.(Not supplied)

*Remocon is optional-product

5.4 Blockdiagrma of inverter interconnection



5.3 Board Picture.



6. Operation Guide

6.1 Installation

This controller is designed for RGB/DVI multi-function monitor using different size of LCD panels.
This section provides some guidelines for assembly and preparation of a finished display solution.
Before proceeding, it is important to familiarize yourself with the parts making up a system and the various connectors, mounting holes and general layout of the controller.
Please follow the below procedure.

1) LCD Panel Connection
Please check the Panel Power, Interface type and Inverter. Refer to the clause 4.1 Panel Compatibility and check if the controller board is matching with panel or not. Connect the inverter and controller board to the panel.

2) Inverter Connection
Each LCD panel has their own inverter to obtain optimum performance and long lifetime. The controller board just supplies the power for inverter logic and controls On/Off signal and brightness control signal. So, it is important to use the proper inverter that has proper driving capacity and control input signal. Refer to the clause 4.5 Connector Pin Assignment and connect the inverter cable to inverter and controller board.

3) Key Control Board Connection
Refer to the 4.5 Connector Pin Assignment and connect the key control cable to key control cable and controller board.

4) Signal Inputs Connection
Analog input, DVI input. Please refer to the clause 4.5 Connector
Pin Assignment and connect the signal what you want to apply to the controller board.
Especially, the Analog RGB and DVI cable may affect the visual characteristics and regulatory emission test. So, a suitably shielded cable should be used.

5) Power Input Connection
Refer to the 4.5 Connector Pin Assignment and connect the power input cable to the controller board.
Every connection is done but you should consider electrical insulation, grounding, EMI shielding and heat & ventilation.

6) Apply Power
Apply power and turn on the monitor and refer to the following clause.

6.2 OSD Adjustment

FSB104U gives various and very easy graphic user interface. User can easily access to the function that user wants. Be sure that your system power and LED is turned on before operating key board.

6.2.1 Key Name and Function

Key Name	Description
MENU	Menu on/off and go out from sub menus
DOWN	Moves icon or Adjust values
UP	Moves icon or Adjust values
SEL	Activate(Enable the icon). menu.
POWER	System power on/off

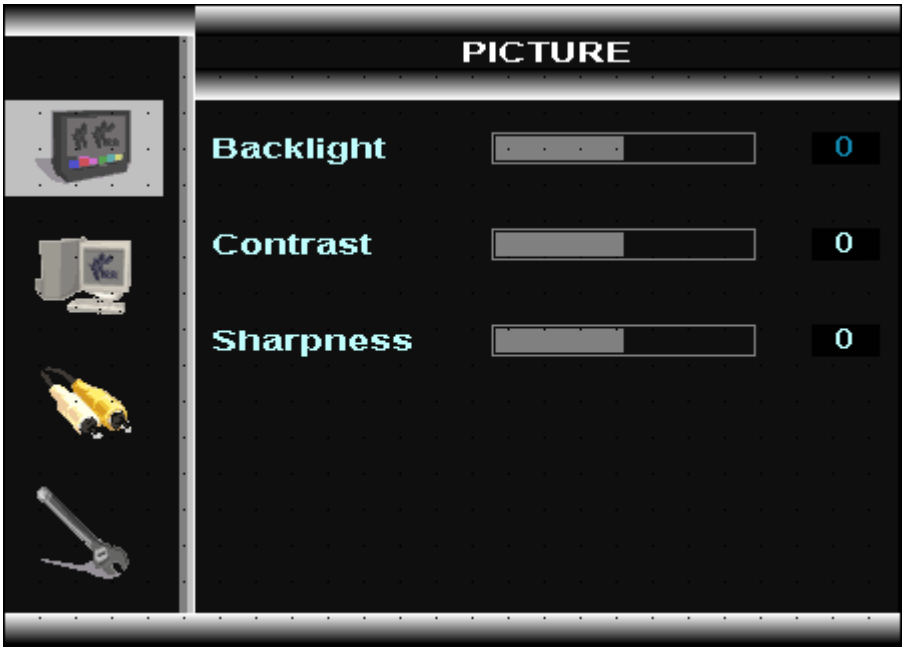
Accessing the menu system

1. With the OSD off, push the **MENU** button to activate the main OSD menu.

2. Press the **UP** or **DOWN** buttons to move from one function to another. As you move from one icon to another, the function name changes to reflect the function or group of functions represented by that icon. Please refer to the following clause on the next page to view a complete list of all of the functions available for the driver board.

3. Press the **SEL button** to enable item.

4. Press the **MENU** button once to return to the main menu to select another function or press twice to exit from the OSD.
   To save the setting values, exit the OSD menu.



Selecting the Images.

Press the MENU button. The OSD menu will be displayed.

1. SEL keys change top icons (Enabled) and then just click at desired menu
2. Press the UP button to select brightness

   Press UP button to increase the backlight dimming value;

   Press DOWN button to decrease the backlight dimming value;

   After adjusting brightness, Press menu to go out.
3. Press the SEL button to select contrast.

   Press UP button to increase the contrast value.

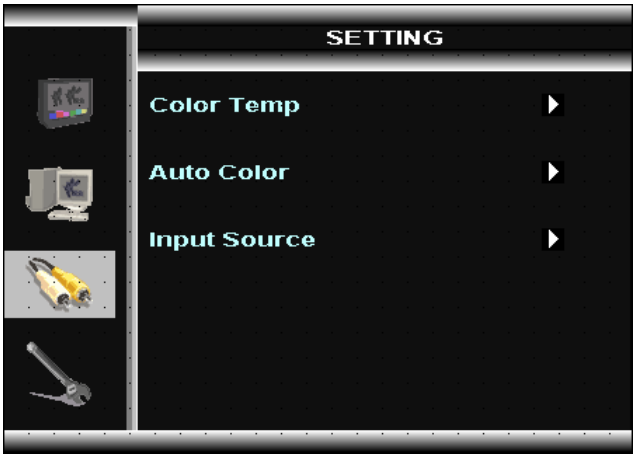
   Press DOWN button to decrease the contrast value.

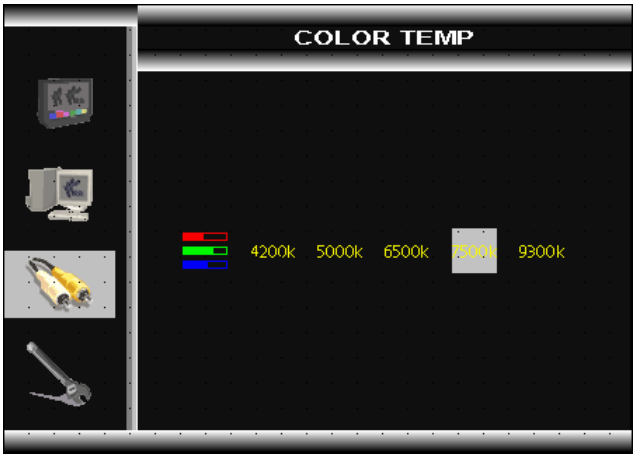
   After adjusting brightness, Press menu to go out.
4. Press the SEL button to select sharpness

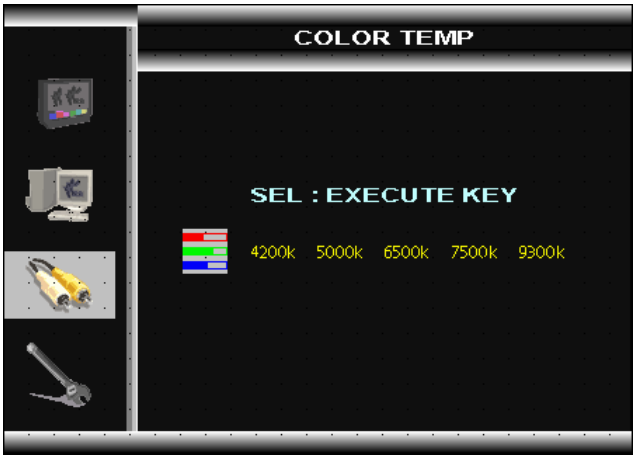
   Press UP button to increase the sharpness value.

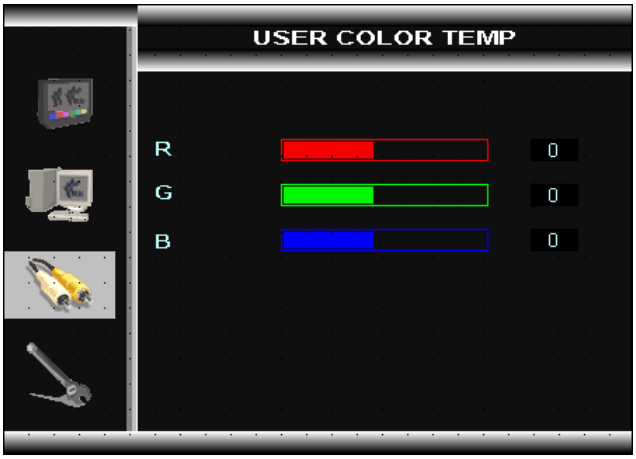
   Press DOWN button to decrease the sharpness value.

   After adjusting sharpness, Press menu to go out.









Selecting the setting of Colors.

Press the MENU button. The OSD menu will be displayed.

1. SEL keys change top icons (Enabled) and then just click at desired menu
2. Press the UP button to select Color Temp.

   The sub color-temp menu will be displayed.

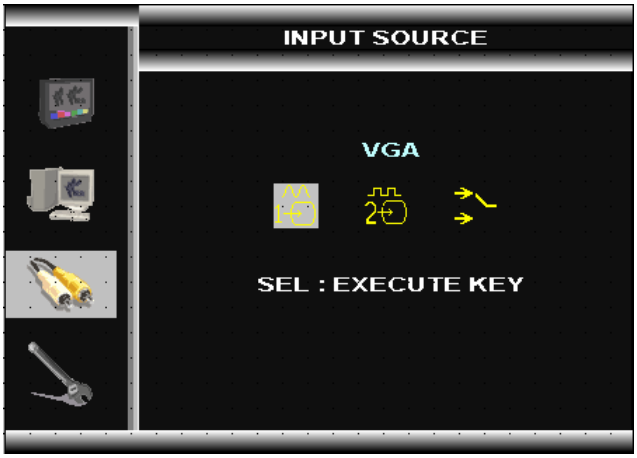
   Press the SEL button to select user color mode

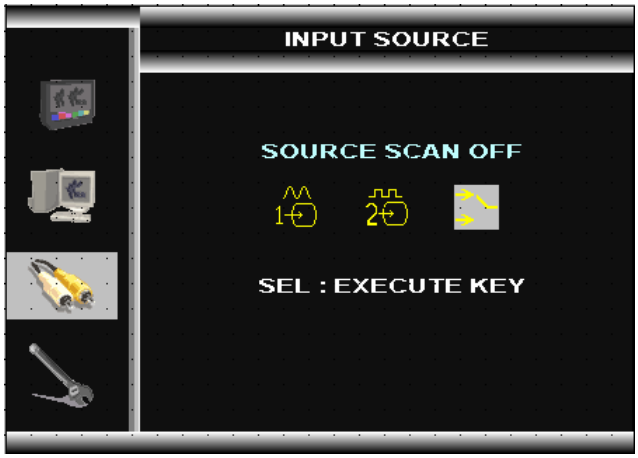
   If you want to R/G/B independently, press UP / OWN key to change the color gain.
3. Press the SEL button to select Auto Color configuration.

   Press the UP button to color calibration automatically;

   After finishing, Press the calibration, press menu to go out
4. Press the UP button to select Input Source menu.
5. If you want to change the color-temp, Press UP / DOWN key .

   After menu changing, Press menu to go out.





Selecting the PC/DVI/Auto detection function

Press the MENU button. The OSD menu will be displayed.

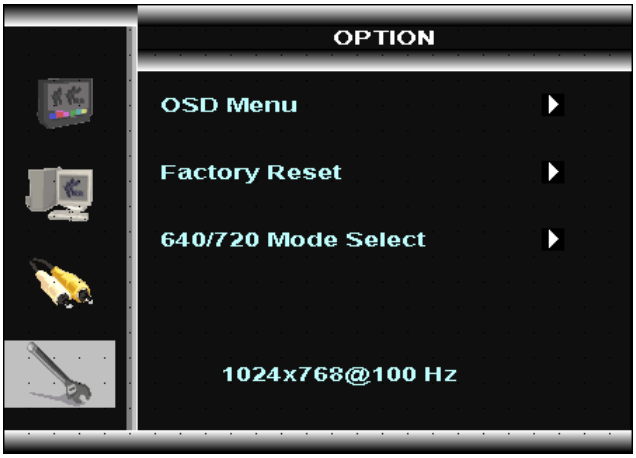
1. SEL keys change top icons (Enabled) and then just click at desired function.
2. Press the UP button. It selects the PC input icon
3. If you want to select PC function, press the SEL button at PC icon.
4. If you want to select DVI function, press the SEL button at DVI icon.
5. If you want to detect PC and DVI automatically, press the SEL button at Auto source scan icon to "ON"
6. After adjusting the menu, Press the MENU button to exit the OSD menu.

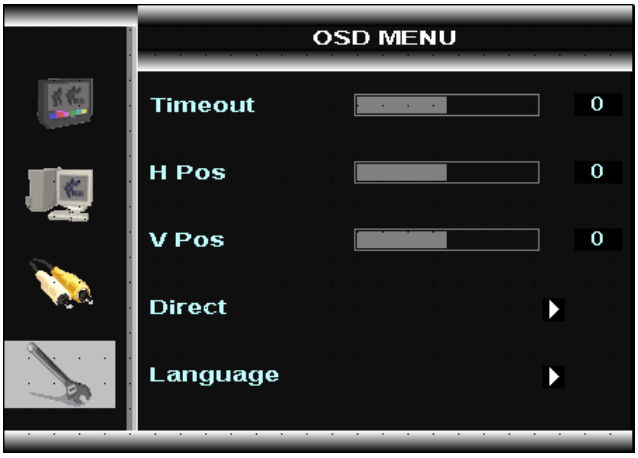
Selecting the Frequency/Phase/Positions/Auto.

Press the MENU button. The OSD menu will be displayed.

1. SEL keys change top icons (Enabled) and then just click at desired menu
2. Press the UP button to select Frequency.
   It's about of changing the clock of input display.
   Press UP / DOWN key to change the frequency.
3. Press the SEL button to select phase.
   Press the UP / DOWN key to fine tune the data sampling phase
   Adjust image quality.
4. Press the SEL button to select H/V Pos.
   Press the UP / DOWN button to change H/V Position.
   After finishing, Press the menu to go out
5. Press the SEL button to select Auto.
   Press the UP button to auto - configuration automatically;
   After finishing, Press the menu to go out

6. Press the select button to select H/V positions.





Selecting the option.

Press the MENU button. The OSD menu will be displayed.

1. SEL keys change top icons (Enabled) and then just click at desired menu
2. Press the UP button to select OSD Menu

   It displays sub-menu; OSD time out, OSD H/V positions, OSD Direction, & OSD Language.
3. Press the UP button to select Factory Reset.

   It initializes the stored value in NVRAM.
4. Press the UP button to select 640/720 DOS mode.

   If computer output dos-mode, Some monitors output noisy.

   You have to decide 640/720 manually.

7.Appendix

7.1 Standard Timing Chart

Resolution / Timing Item	640x350 @70Hz	720x400 @70Hz	640x480 @60Hz	640x480 @75Hz	800x600 @60Hz	800x600 @75Hz	1024x768 @60Hz
Pixel Clock (MHz)	25.175	28.324	25.175	31.500	40.000	49.500	65.000
Sync Polarity(H/V)	P/N	N/P	N/N	N/N	P/P	P/P	N/N
Scaning Type	Progressive	Progressive	Progressive	Progressive	Progressive	Progressive	Progressive
-Hor Frequency(kHz)	31.468	31.469	31.469	37.500	37.879	46.875	48.363
-Period(us)	31.778	31.780	31.778	26.667	26.400	21.333	20.677
-Active time(us)	25.418	25.420	25.422	20.317	20.000	16.162	15.754
-Front porch(us)	0.638	0.640	0.636	0.508	1.000	0.323	0.369
-Sync width(us)	3.823	3.810	3.813	2.032	3.200	1.616	2.092
-Back porch(us)	1.909	1.906	1.907	3.810	2.200	3.232	2.462
-Ver Frequency(Hz)	70.090	70.082	59.940	75.000	60.317	75.000	60.004
-Period(ms)	14.268	14.270	16.683	13.333	16.579	13.333	16.666
-Active time(ms)	11.122	12.710	15.253	12.800	15.840	12.800	15.880
-Front porch(ms)	0.381	0.413	0.064	0.027	0.026	0.021	0.062
-Sync width(ms)	0.064	0.064	0.064	0.080	0.106	0.064	0.124
-Back porch(ms)	1.111	1.080	0.794	0.427	0.626	0.448	0.600

Resolution / Timing Item	1024x768 @75Hz	1280x1024 @60Hz	1280x1024 @75Hz	1152x864 @60Hz	1152x864 @75Hz	1600x1200 @60Hz	1600x1200 @75Hz
Pixel Clock (MHz)	78.750	108.50	135.00	80.000	108.00	162	202.5
Sync Polarity(H/V)	P/P	P/P	P/P	P/P	P/P	P/P	P/P
Scaning Type	Progressive	Progressive	Progressive	Progressive	Progressive	Progressive	Progressive
-Hor Frequency(kHz)	60.023	63.974	79.976	54.348	67.500	75.000	93.750
-Period(us)	16.660	15.631	12.504	18.400	14.815	13.331	10.666
-Active time(us)	13.003	11.797	9.481	14.400	10.667	9.876	7.901
-Front porch(us)	0.203	0.590	0.119	0.400	0.593	0.395	0.316
-Sync width(us)	1.219	1.180	1.067	1.200	1.185	1.185	0.948
-Back porch(us)	2.235	2.065	1.837	2.400	2.370	1.876	1.501
-Ver Frequency(Hz)	75.029	60.013	75.025	60.053	75.029	60.000	75.029
-Period(ms)	13.328	16.663	13.329	16.652	13.333	16.666	13.334
-Active time(ms)	12.795	16.006	12.804	15.898	12.800	16	12.800
-Front porch(ms)	0.017	0.016	0.013	0.017	0.015	0.013	0.011
-Sync width(ms)	0.050	0.047	0.038	0.055	0.044	0.04	0.032
-Back porch(ms)	0.466	0.594	0.475	0.681	0.474	0.613	0.491