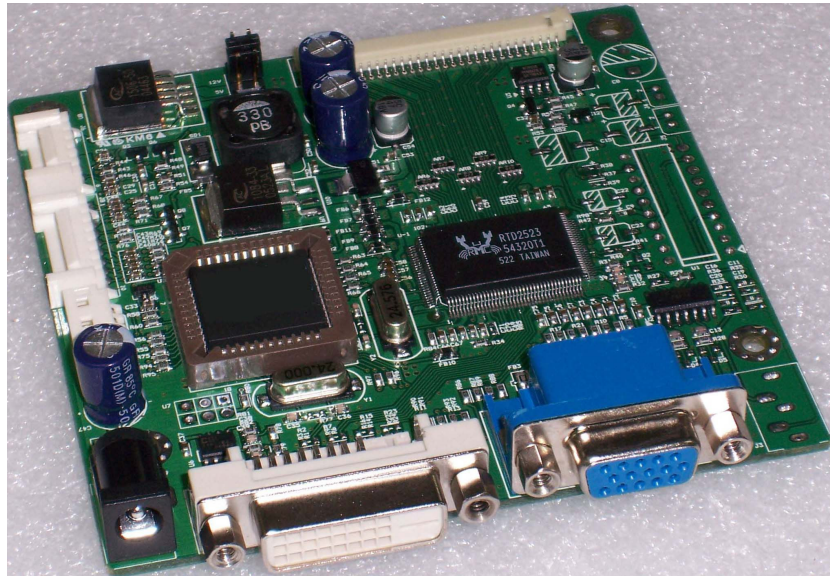


DATA SHEET

Model : Lily-O (Rev.0.2)

Part No. : SMLM05012



Aug, 2005

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The information presented in this document may form a part of quotation or contract under the agreement of both parties. Otherwise, this datasheet is subject to change without prior notice.

1. Revisions of History

Revision No.	Date	Page	Description	Actionee
Ver. 0.1	JUN. 08 '05	ALL	Preliminary Specification	Doojun.Jang
Ver. 0.2	AUG. 30 '05	ALL	Draft Non Audio function	Injoon Lee

2. General Descriptions

SMLM05012 is an advanced TFT LCD Monitor Control Board. This design enables a full conventional CRT monitor and/or video & audio replacement with a large size Active Matrix TFT LCD module.

It is suitable for video resolution up to SXGA @ 75Hz in all video modes, the full display area of the module is used. The design is implemented as a single printed circuit board.

The SMLM05012 is designed to act as a full monitor and/or video & audio interface.

Besides the main functionality of an analog and digital video interface, also stereo audio amplifier with 1 input.

The SMLM05012 is designed to support various TFT- LCDs under SXGA resolution by BIOS option, customers line-up their monitors with their own identity with following options.

No	Item	Description		Remarks
1	Model name	Interface Board for SMLM05012		
2	LCD Module	SVGA,XGA,SXGA		LVDS
3	Signal Input	Analog RGB / DVI Input		
4	Resolution Support	H : 30 ~ 80KHz		
		V : 56 ~ 75 Hz		
5	OSD Control	Menu, Up, Down, Source/Auto/Exit, Power		5Keys
	Plug & Play	VESA DDC 1/2B		
6	Power Connector	Input	Type : 2.5Ø	
7	Power Consumption	Supply Voltage	12Vdc	
		Max Power	40W(With Back Light Inverter)	17" TFT LCD
8	Signal Connector	Analog	D-SUB 15P(R,G,B Separate H/ V Sync)	
		Digital	DVI-D(TMDS)	TMDS

3. Electrical Specification

Description	Signal	Unit	Min	Typ	Max	Remarks
Power In (12Vdc)						
	InPut	Vdc	11.4	12	12.6	
	Consumption	Watt	-	-	40	
RGB Input						
	Analog RGB	Vp-p	0.5	0.7	1.0	
	Sync	V	0.8/3.3	-	-	Low / High
	H-Frequency	KHz	30	-	80	Depends on Mode
	V-Frequency	Hz	56	60	75	Depends on Mode
DVI-D Input						
	Data/Clk	Vp-p	300	350	500	Differential +/-
	V-Frequency	Hz	-	-	60	
Clock						
	Video Sample Rate	MHz	-	-	135	

4. Major Components

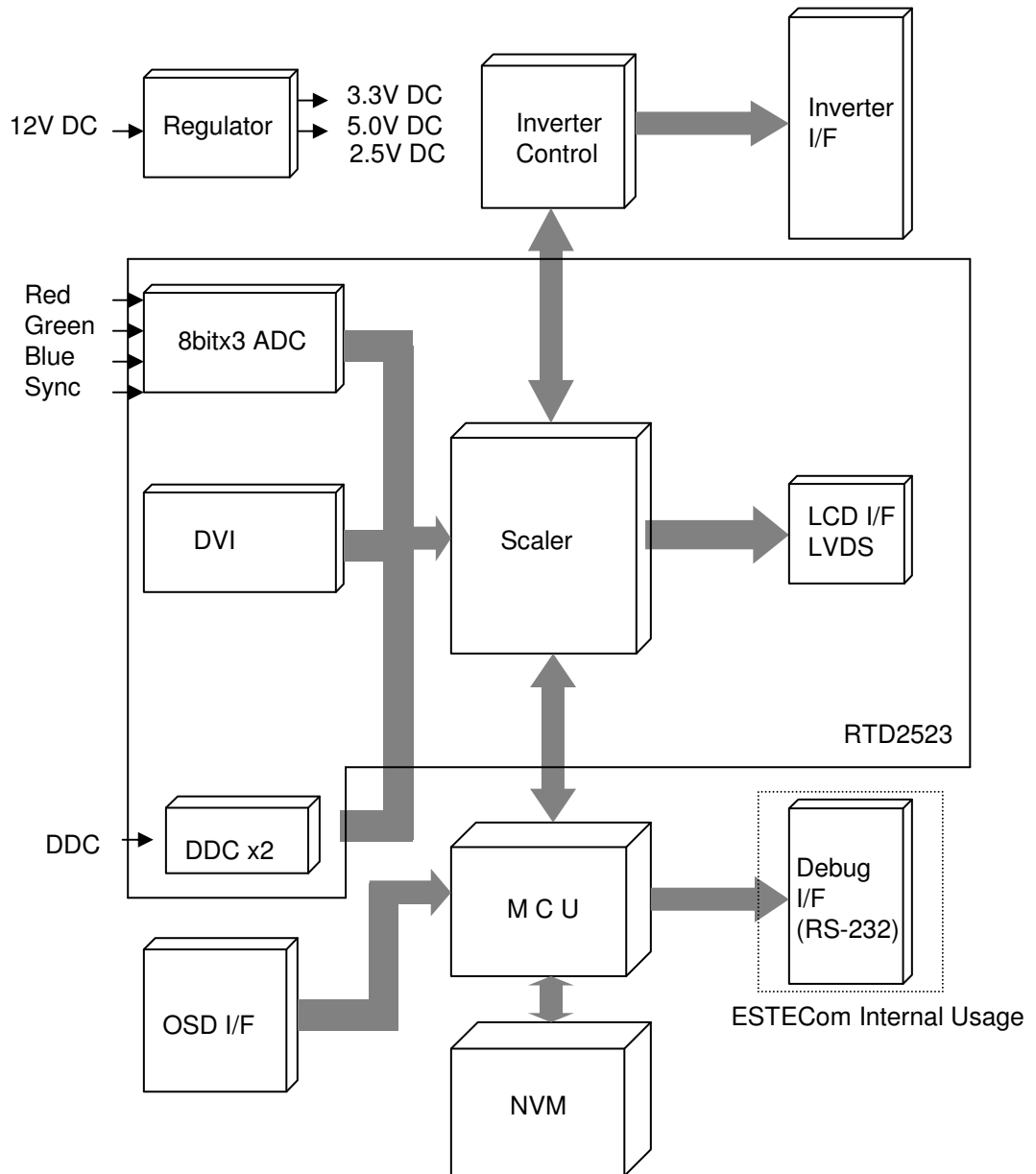
- RTD2523 (Scaler, Realtek)
- W78E65P-40 (MCU with 64K Flash Memory, Winbond)

5. Features

- State of the art high performance picture quality design
- Analog RGB / DVI (Digital Video Interface)
- Full CRT multi-sync monitor compatibility
- Multi-Sync capability up to SXGA resolution @ 75Hz, compatible standard SVGA XGA and SXGA VESA Standard
- Expand DOS, VGA, SVGA and SXGA to full screen display
- True color (16.7M) data processing and display driving
- Single control operated & On-Screen-Display (hereafter 'OSD') user interface
- Full control of all relevant display and interface parameters via OSD
- Multi language support
- VESA DDC1/2B compliant
- Compatible with VESA DPMS power saving modes
- Form factor: 96mm (L) x 96mm (W) x 14.5mm(H)
- +12VDC single power: 40watts AC/DC power adapter recommended.
- Operating temperature: 0 to 45° C
- OSD & Power switch board

Parameter	Value	Unit
Overall Dimensions	96 x 96 x 14.5	Mm
Width	96	Mm
Height	96	Mm
Depth (From PCB Bottom)	14.5	Mm
Video Input Impedance (Analog / DVI)	75 / 50	Ohm
Sync Polarities	+/-	
Output Signal Type	LVDS	Vdc

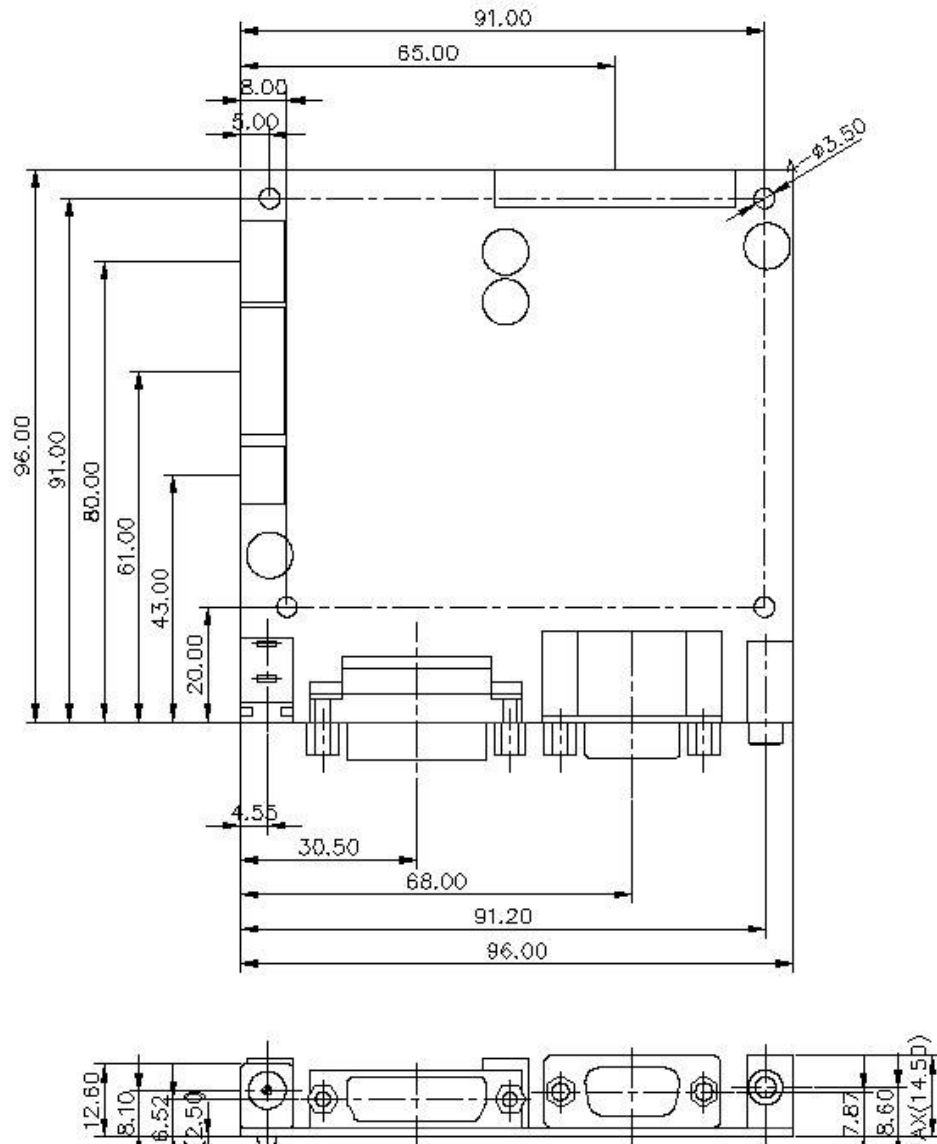
6. Block Diagram



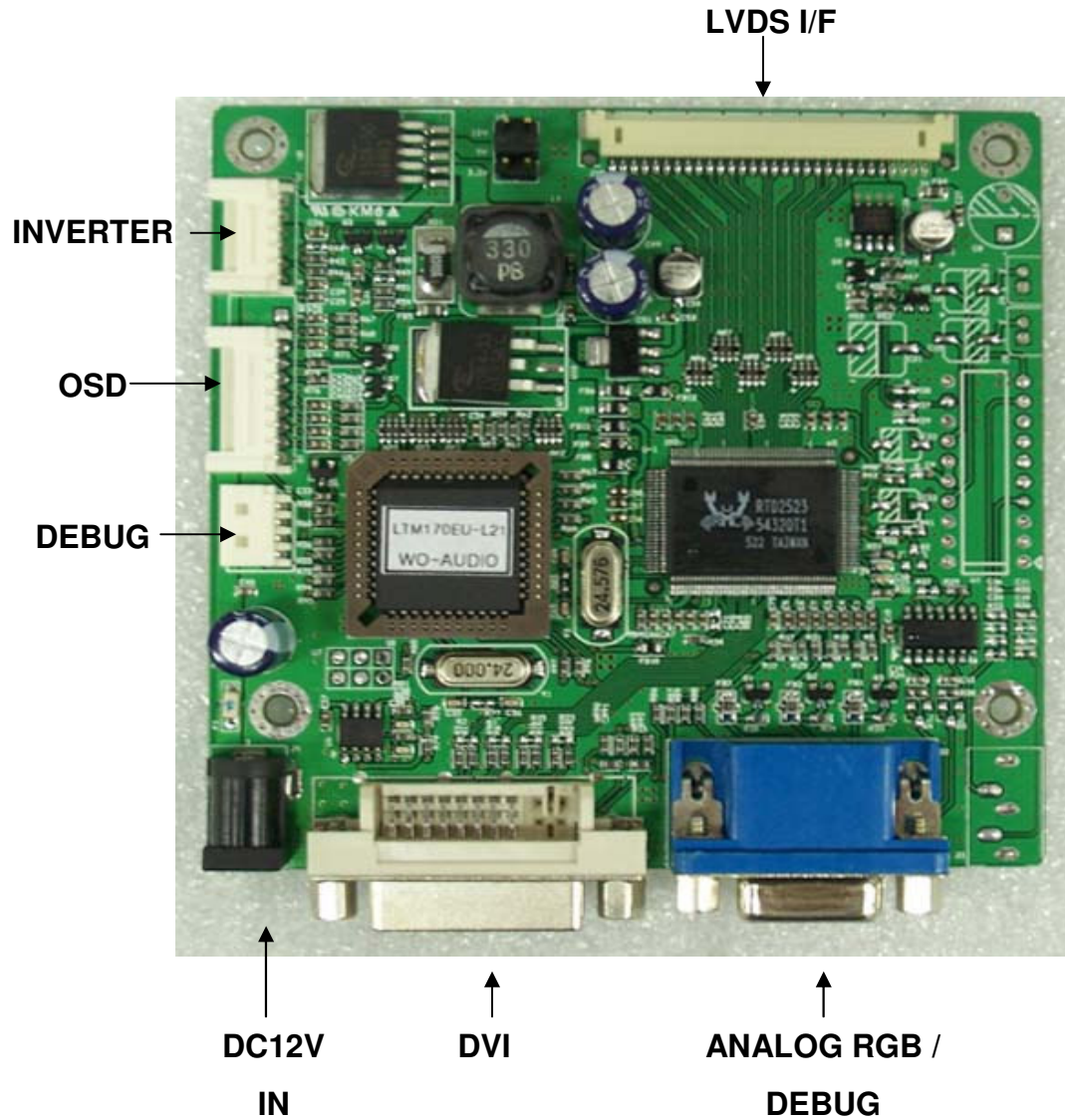
7. Outline Dimensions

7.1 Standard Connectors for Power, DVI, Audio, OSD, Inverter

- Dimension : 96mm (L) x 96mm (W) x 14.5mm(H)



7.2 PICTURE



8. Connectors Information

- Power Input Connector

Connector : DC-005 (J9)

Pin no.	Function	Pin no.	Function	Pin no.	Function
1	VCC (DC12V)	2	GND	3	GND

- Analog RGB Input Connector

Connector : D_SUB(HDB-15FEMALE)(J2)

Pin no.	Function	Pin no.	Function	Pin no.	Function
1	RED	2	GREEN	3	BLUE
4	N/C	5	GND	6	GND (RED)
7	GND (GREEN)	8	GND (BLUE)	9	RxD
10	GND	11	TxD	12	SDA
13	HSYNC	14	VSYNC	15	SCL

- OSD, LED Interface Connector :

Connector : Yeonho SMAW200-10 (J8)

Pin No.	Function	Pin No.	Function
1	Reserved	6	Left / Decrease
2	Auto / Source / Exit	7	Right / Increase
3	Power	8	Menu
4	Red LED	9	Reserved
5	Green LED	10	Ground

- DVI-D Input Connector

Connector : DVI-D,STANDARD(J1)

Pin no.	Function	Pin no.	Function	Pin no.	Function
1	DATA_E2-	2	DATA_E2+	3	GND
4	N/C	5	N/C	6	SCL
7	SDA	8	VSYNC	9	DATA_E1-
10	DATA_E1+	11	GND	12	N/C
13	N/C	14	5V	15	N/C
16	DETECT	17	DATA_E0-	18	DATA_E0+
19	GND	20	N/C	21	N/C
22	GND	23	CLOCK+	24	CLOCK-

- Inverter Connector :

Connector : Yeonho SMAW200-10 (J6)

Pin No.	Function
1	+12 VCC
2	+12 VCC
3	Ground
4	Ground
5	ON / OFF
6	Brightness Control

- Debug Connector :

Connector : Molex 53015-0410 (J7)

Pin No.	Function
1	Ground
2	TxD
3	RxD
4	+5V DC

- LVDS Output Connector :

Connector : Yeonho 12507WR-30 (J10)

Pin No.	Function	Pin No.	Function
1	TxE0-	16	TxO1+
2	TxE0+	17	Ground
3	TxE1-	18	TxO2-
4	TxE1+	19	TxO2+
5	TxE2-	20	TxOclk-
6	TxE2+	21	TxOclk+
7	Ground	22	TxO3-
8	TxEclk-	23	TxO3+
9	TxEclk+	24	Ground
10	TxE3-	25	N / C
11	TxE3+	26	Ground
12	TxO0-	27	VCC
13	TxO0+	28	VCC
14	Ground	29	VCC
15	TxO1-	30	VCC

9. Reference Data

Video Input Timing:

Supported vertical refresh rates for each mode are as follow:

640 x 350	70Hz
640 x 400	70Hz
720 x 350	70Hz
720 x 400	70Hz
720 x 480	60Hz
640 x 480	60~75Hz
800 x 600	56~75Hz
832 x 624	75Hz
960 x 600	60~75Hz
1024 x 768	60~75Hz
1088 x 612	60~75Hz
1152 x 864	60~75Hz
1280 x 720	60~75Hz
1280 x 768	60~75Hz
1280 x 960	60~75Hz
1280 x 1024	60~75Hz

Sync. : H/V Separated TTL

● Electrical Parameters

Reference SMLM05012 at 25°C

Symbol	Description	Min	Typ	Max	Unit
V_{DD}	+12V DC Power Supply	10.8	12.0	13.2	V
$V_{i(RGB)}$	Video Input Signal (w.r.t. GND)	0.5	0.7	1.0	V_{PP}
f_S	Video Sample Rate			135	MHz
f_{HS}	Horizontal Sync Frequency	30		80	KHz
f_{vs}	Vertical Sync Frequency	56		75	Hz
F_{SIH}	Sync Input High Level	2.5			V
V_{SIL}	Sync Input Low Level			0.8	VDC
I_{DD2}	Supply Current +12V (with LCD & Inverter)			3.5	A

Note : Power consumption measuring condition is 2 pixel checkerboard pattern @ SXGA 75Hz and maximum

10. Input Formats

10.1 Video Mode Support

The SMLM05012 series can support any video mode within the following input constraints:

- Signal sample frequency with the input $\leq 80\text{MHz}$
- Horizontal sync frequency between 30KHz and 80KHz

The modes are detected with the presentation of the input and previous alignments for setup are automatically recalled. The emulation of a true multi-sync monitor is implemented.

The factory preset supported modes are as follows:

Mode	Resolution	Refresh Rate	H-Freq.	Pixel Freq.	Remarks
VGA	640 x 350	70Hz	31.47KHz	25.175MHz	VESA Standard
VGA	720 x 400	59.940HZ	31.469KHZ	25.175MHZ	IBM VGA 3H
VGA	640 x 480	60Hz	31.5KHz	25.175MHz	Industry Standard
VGA	640 x 480	72Hz	37.9KHz	31.500MHz	VESA Standard
VGA	640 x 480	75HZ	37.5KHZ	31.500MHZ	VESA Standard
SVGA	800 x 600	60Hz	37.9KHz	40.000MHz	VESA Guidelines
SVGA	800 x 600	72Hz	48.1KHz	50.000MHz	VESA Standard
SVGA	800 x 600	75HZ	46.9KHZ	49.500MHZ	VESA Standard
XGA	1024 x 768	60Hz	48.4KHz	65.000MHz	VESA Guidelines
XGA	1024 x 768	70Hz	56.5KHz	75.000MHz	VESA Standard
XGA	1024 x 768	75HZ	60KHZ	78.750MHZ	VESA Standard
SXGA	1280 x 1024	60Hz	64KHZ	108.000 MHZ	VESA Standard
SXGA	1280 x 1024	75HZ	80KHZ	135.000 MHZ	VESA Standard

Notes:

1. All mentioned modes are non-interlaced. The maximum and minimum frame rates are decided by the TFT-LCD.
2. Factory preset modes are overwritten by additional user alignments for automatic recall. The factory preset modes can be recalled at any time.

10.2 LCD Panel & I/O Support

The SMLM05012 is an advanced and general application for a TFT-LCD Monitor Control Board.

Therefore, the application of this board is not limited to panel manufacturers or models.

Furthermore, this board operates with any LVDS interface panel ranging from VGA to SXGA that can be driven with three or less timing signals. The usual timing signals to a panel are H-sync, V-sync and Data Enable.







For backlight intensity control mechanism, a built-in DC dimming drive signal is installed into the GCEI

11. DVI (Digital Video Interface)







The SMLM05xxx has one DVI input port which complies with VESA DVI standard. Therefore, users can make direct interface to the DVI output of Digital VGA cards. The signal source can be switched through OSD.

12. OSD (On Screen Display)




12.1 OSD menu enables user to manipulate the image and settings.

MODE 40	1280x1024 60Hz
 Color	Contrast 50 - <input type="range"/> +
 Picture	Brightness 100 - <input type="range"/> +
 Function	Gamma 0 1 2 3
 OSD Menu	Color Temp. 9300 6500 5800 User
 Misc.	Color Adjust
 Exit	Exit

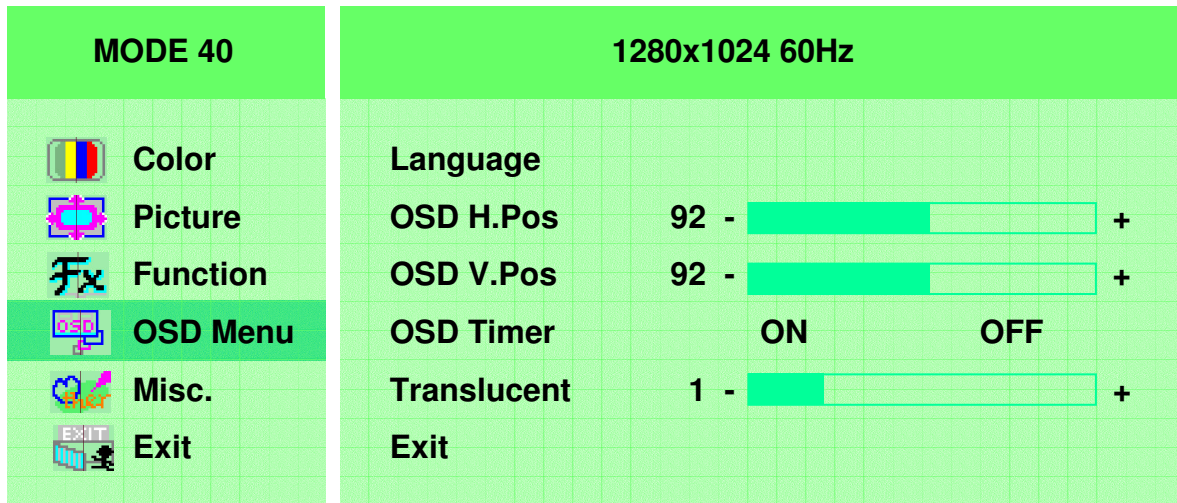
Main Menu	Sub Menu	Operation
Color Available Mode - Analog RGB - DVI	Contrast	- Contrast is ratio of luminance between black and white. - Adjust distinction. (Analog RGB Only)
	Brightness	- Adjust Brightness of the screen. (used to PWM control)
	Gamma	- RGB gain option.
	Color Temp	- Choice of Warm, Normal, Cool and user's option is chosen, RGB can be adjusted. - User : Able to adjust the color by controlling Red, Green, and Blue. - 5800 : Red-tinged screen. - 6500 : Green-tinged screen. - 9300 : Blue-tinged screen.
	Color Adjust	- If the menu of Color Temp is set in user mode, the color can be controlled freely.

MODE 40		1280x1024 60Hz	
	Color	H.Position	50 - <input type="range" value="50"/> +
	Picture	V.Position	100 - <input type="range" value="100"/> +
	Function	Phase	0 - <input type="range" value="0"/> +
	OSD Menu	Clock	50 - <input type="range" value="50"/> +
	Misc.	Sharpness	1 2 3 4 5
	Exit	Exit	

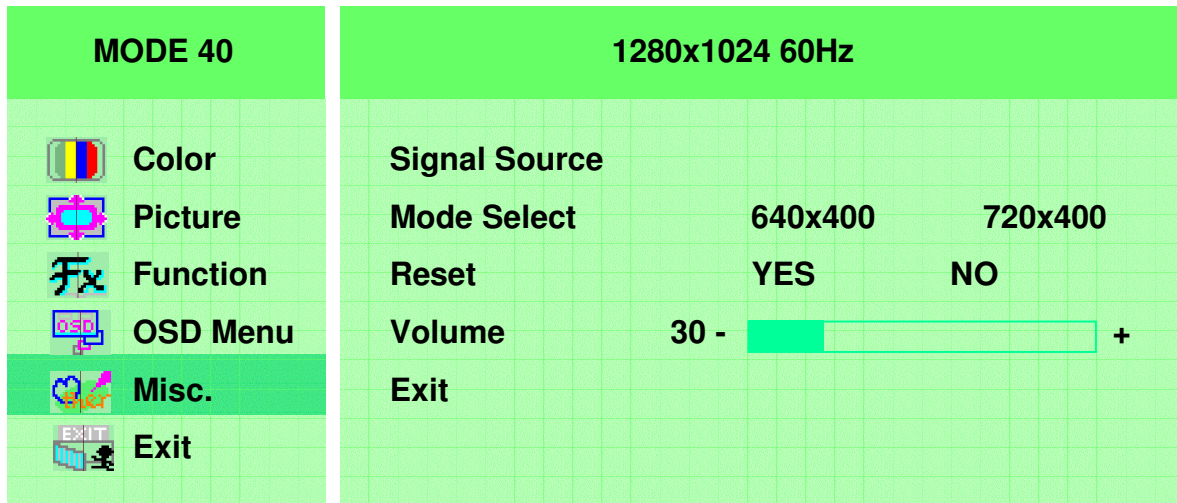
Main Menu	Sub Menu	Operation
Picture <u>Available</u> <u>Mode</u> - Analog RGB	H.Position	- Move screen horizontally.
	V.Position	- Move screen vertically.
	Phase	- Adjust Phase of screen. Used when noise or overlapped lines are shown on the screen. Caution : Do not make manual adjustment when the picture is in its normal Shape or you will create problem on it.
	Clock	- Adjust horizontal size of the screen by increasing or decreasing the number of picture elements. Caution : Perform this adjustment just in the case of having horizontallyUnmatched picture after operation the " Auto Adjustment "
	Sharpness	- Adjust sharpness of pictures in 5 levels.
	Exit	- Go back to main menu.

MODE 40		1280x1024 60Hz			
	Color	Auto Adjust	YES	NO	
	Picture	Auto Color	YES	NO	
	Function	Exit			
	OSD Menu				
	Misc.				
	Exit				

Main Menu	Sub Menu	Operation
Function <u>Available Mode</u> - Analog RGB	Auto Adjust	- Auto configuration of geometry. - Automatically adjusted items are : 1) Clock 2) Phase 3) Position is centered
	Auto Color	Color automatically set from strange input signal.
	Exit	- Go back to main menu.



Main Menu	Sub Menu	Operation
OSD Menu <u>Available Mode</u> - Analog RGB - DVI	Language	- Select the language of OSD menu. English / Français / Deutsch / Español / Italiano / Danish
	OSD H.Pos	- Adjust horizontal position of OSD menu by value.
	OSD V.Pos	- Adjust vertical position of OSD menu by value.
	OSD Timer	- The range of controlling the duration time of the OSD menu (OSD turn-off time).
	Translucent	- Choose between “translucent” and “opaque” for the basic color Of OSD menu.
	Exit	- Go back to main menu



Main Menu	Sub Menu	Operation
Misc. <u>Available Mode</u> - Analog RGB - DVI	Signal Source	- Select input signal source. Analog RGB / DVI
	Mode Select	- Select DOS 640(Graphic) or DOS 720(Text) input mode.
	Reset	- Initial set-up, preset by the factory before forwarding.
	Volume	- N/A
	Exit	- Go back to main menu.

13. Operation Message

AUTO TRACKING (Analog RGB mode)

- Execute Auto Function

AUTO TRACKING

Self Diagnostics (Analog RGB / DVI mode)

- Input Signal is not present after power on with power switch. This message is disappeared after 10 sec or activity of input signal

NO SIGNAL

Self Diagnostics (Analog RGB)

- Cable is not present after power on with power switch. This message is disappeared after 10 sec or activity of input signal

NO CABLE

Out of Range

- Input Signal is over the supporting range

NO SUPPORT

15. Supportable Panel List

Lily--O board can support the BIOS and harness settings for the TFT-LCD models as followings:

Manufacturer	Size	Part Number	Resolution	Brightness (cd/M2)	Viewing Angle (Deg)
OPTREX	8.4	T-51639D084U-FW-A-AA	XGA	300	60/60/40/50
OPTREX	12.1	T-51756D121J-FW-A-AA	XGA	300	60/60/50/40
AUO	19	M190EN02/04	SXGA	350	65/65/65/65
CMO	19	M190E3-L01	SXGA	250	85/85/85/85
FUJITSU	19	FLC48SXC8V-10/11	SXGA	300	85/85/85/85
HYDIS	17	HT17E12-100	SXGA	250	65/65/40/65
LG	15	LM150X05	XGA	250	65/65/45/55
LG	17	LM170E01	SXGA	250	70/70/60/60
LG	18.1	LM181E06	SXGA	250	80/80/80/80
LG	19	LM190E01/E02	SXGA	250	88/88/88/88
SEC	17	LTM170E6-LXX	SXGA	250	89/89/89/89
SEC	17	LTM170E8-LXX	SXGA	250	89/89/89/89
SEC	17	LTM170EU-LXX	SXGA	300	75/75/75/60
SEC	17	LTM170EX-L0X	SXGA	270	75/75/75/60
SEC	19	LTM190E1-L0X	SXGA	250	85/85/85/85
SEC	19	LTM190E4-L0X	SXGA	250	89/89/89/89