

Landmark Technology Inc.

MG22 LCD Controller

For

TFT LCDs with Resolution up to 1,280 x 1,024

(Rev. A)

January 29, 2007

1. Introduction

MG22 is an LCD controller specifically designed for industrial LCD applications. The MG22 card uses the Genesis gm5221 chip. It supports TFT LCD modules up to SXGA (1,280 x 1,024) native resolutions (1.31 MPixels) with 16,777,216 colors.

For video inputs beyond the SXGA resolution, the MG22 displays a window with the native resolution of the LCD in an image space of the video input resolution. The user can pan this window in the image space via the mouse. In addition, the MG22 supports the unique feature of being able to provide a very wide range of screen brightness control. With a proper Landmark inverter, the LCD screen brightness can be adjusted with the OSD over a 100:1 range

Features:

Resolution	Up to SXGA (1,280 x 1,024) in native resolution
Number of Colors	Up to 16,776,216 (8bit/color)
Input Signal	Analog RGB - 15 pin D-sub Analog RGB (0.7VP-P) CVBS Signal- TV, AV, and S-Video inputs, supports NTSC/PAL TV tuner
LCD Interface	Single channel LVDS and dual channel LVDS Single channel TTL
LCD Voltage	3.3V / 5V / 12V
OSD keys	6 keys, Power, Menu, Up, Down, +, and -
Power	12V DC, Operating: TBD, standby, < 3W
Dimensions	Controller: 125 mm (W) x 105 mm (H) OSD Board: 104.5 mm (W) x 22 mm (H)
Temperature Range	Operating: 0 to 50 deg. C, storage: -20 to 70 deg. C
Humidity	90% R.H. max,

To Proceed - Make sure to use the correct parts and refer to:

The connection diagram to connect the parts correctly
This User's Guide for operating procedures and cautions

Important Usage Notes – This product is designed for system 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 system developers, integrators, and other users to ensure:

All required and appropriate safety measures are properly implemented.
Obtain regulatory approvals as needed
Check power specifications and connections to all parts of the system before turning on the power

2. System Connection

The typical connection diagram of the MG22 LCD controller to Landmark VHB LCD modules is illustrated in Fig. 1.

Cautions

- The inverter power should go directly from the power supply as shown below. The 12V from connector CN7 cannot carry the heavy inverter current load to run the VHB backlight.
- Never connect or disconnect parts of the system while the power is turned on as doing so may cause serious damages to various parts.

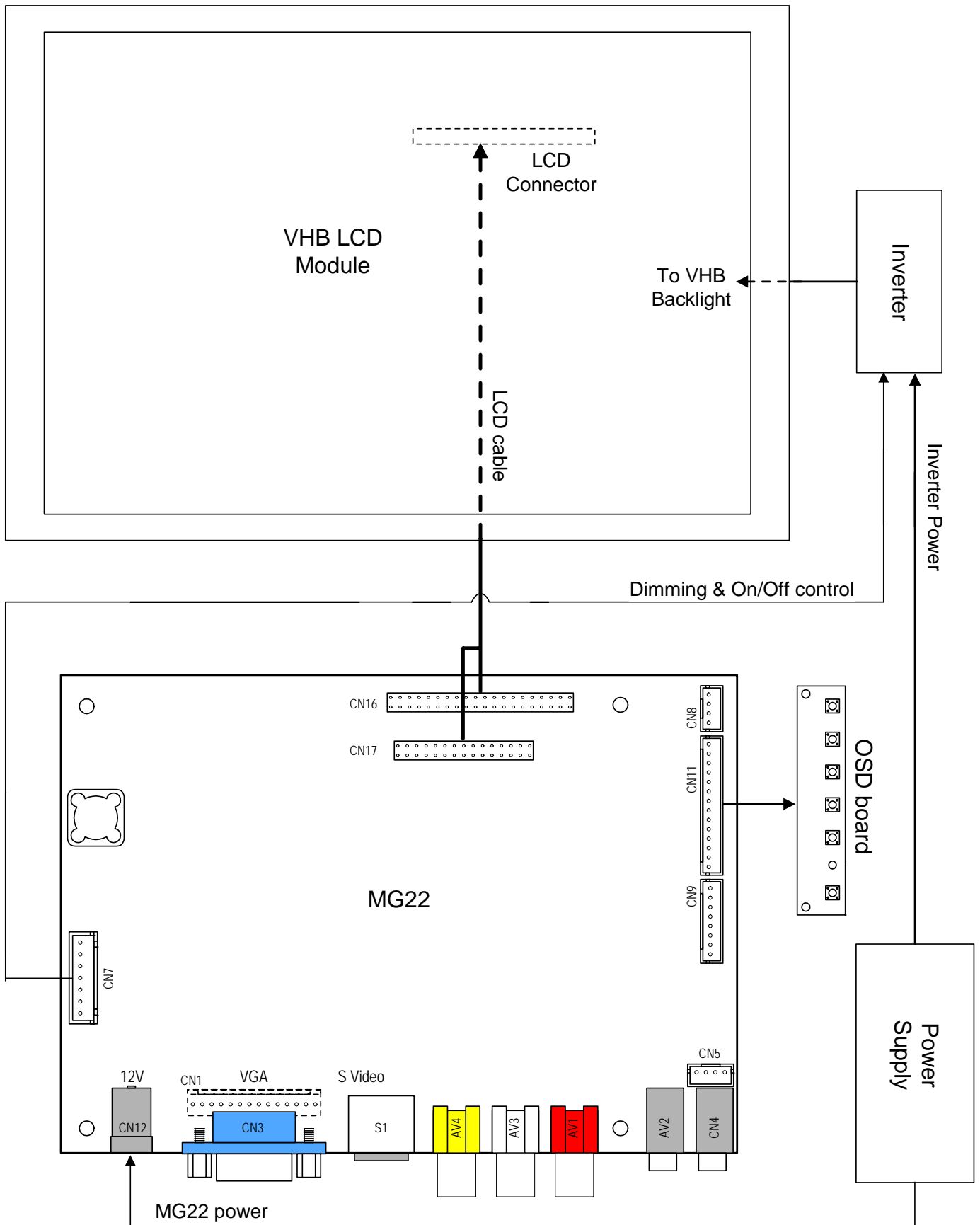


Fig. 1 - Typical Connection Diagram from MG22 to a Landmark VHB LCD and the Inverter

3. Video Modes Supported

640x350	@ 70Hz, 85Hz
720x400	@ 70Hz
640x480	@ 60Hz, 66Hz, 72Hz, 75Hz
800x480	@ 60Hz
800x600	@ 56Hz, 60Hz, 72Hz, 75Hz
1024x768	@ 60Hz, 70Hz, 75Hz
1024x800	@ 73Hz, 85Hz
1152x864	@ 60Hz, 70Hz, 75Hz
1152x870	@ 75Hz
1152x900	@ 66Hz, 76Hz
1280x720	@ 60Hz, 75Hz
1280x768	@ 60Hz, 70Hz, 75Hz
1280x960	@ 60Hz, 75Hz
1280x1024	@ 60Hz, 70Hz, 75Hz
1360x768	@ 60Hz
1366x768	@ 60Hz

4. Mechanical Specifications

The dimensions of the main controller board and its connectors are shown in Fig. 2 below:

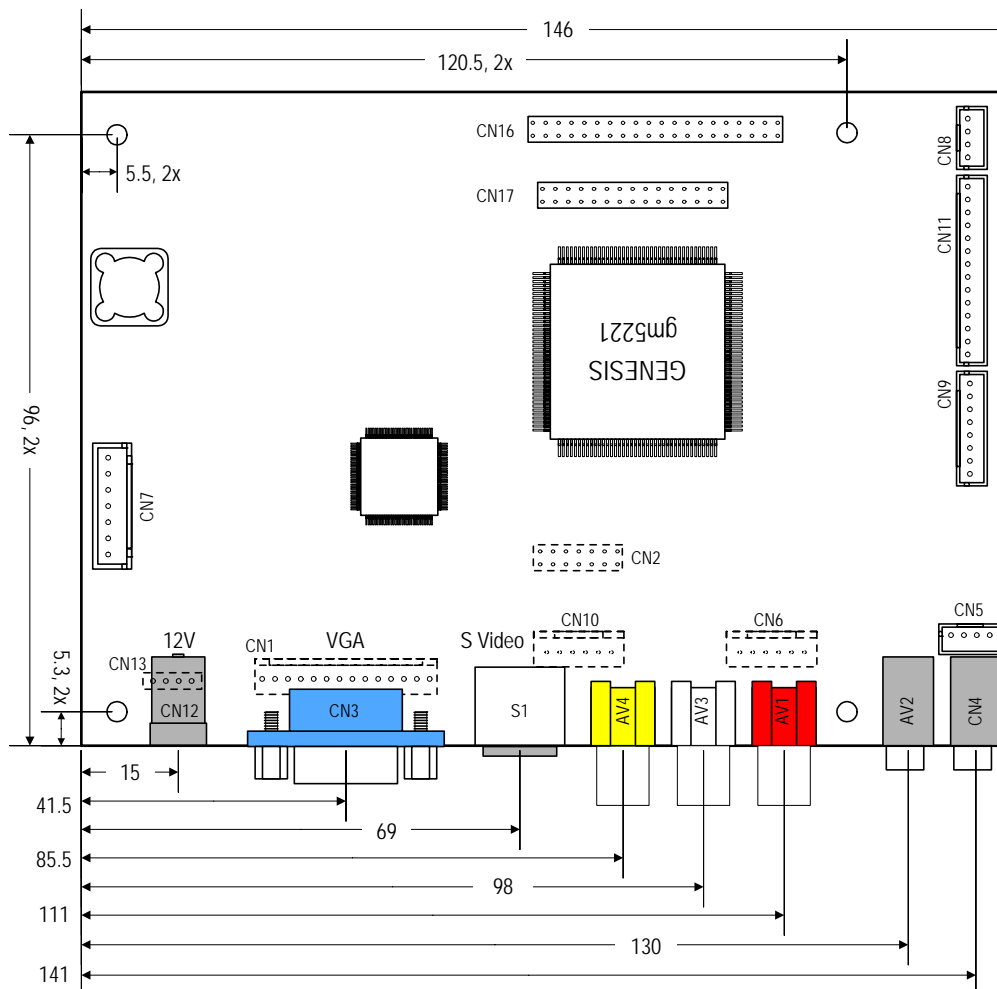
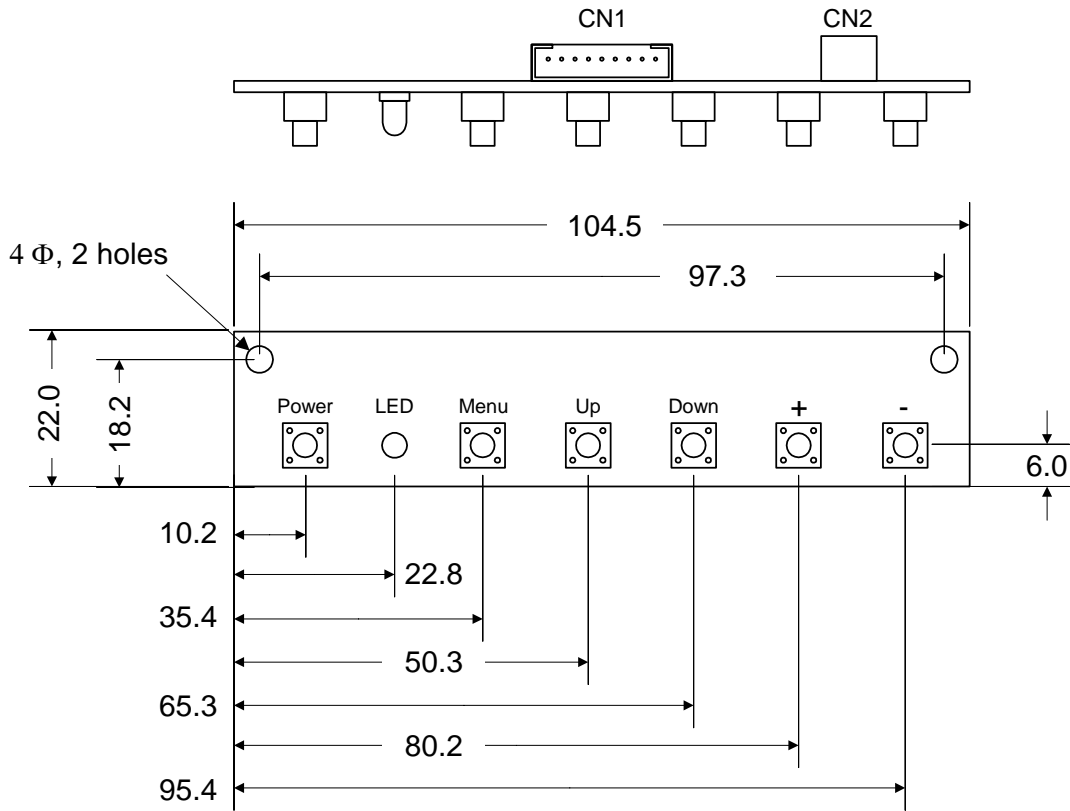


Fig. 2 - all dimensions are in mm with ± 0.5 mm tolerances

The dimensions of the OSD board and its connectors are show in the Fig. 3.



Dimensions are in mm

Fig. 3. The OSD Board Dimensions

There are two connectors on the OSD board. CN1 is for the cable connecting the OSD board to the main controller board. The 3-pin connector CN2 is for an IR sensor board. This board can be mounted onto the display case for OSD adjustment with a remote control.

5. Connectors and Pin Assignments

The connectors on the MG22 card and their functions are listed below:

CN1	Alternative VGA input
CN2	DVI input (reserved)
CN3	VGA, 15-pin D-sub connector
CN4, CN5	Audio output
CN6	Alternative connector for audio inputs
CN7	Inverter interface
CN8	RS232
CN9	TV tuner input (with a proper TV tuner board)
CN10	Alternative connector for video inputs
CN11	OSD connection
CN12	12V power input
CN13	Alternative 12V power input
CN16	TTL interface
CN17	LVDS interface
AV1	Stereo audio input - right channel, RCA connector

AV2	PC audio input
AV3	Stereo audio input - left channel, RCA connector
AV4	Video (CVBS) input, RCA connector
S1	S-video input connector

The pin Assignments of the connectors besides the standard ones (such as VGA, S-video, etc.) are listed below:

CN9 (8 Pins/2.0 mm) – for TV tuner (with a matching tuner board)

Pin No	Symbol	Description
1	TV_CONTROL	TV Tuner Control
2	TV_AUDIO	TV Tuner Audio Output
3	TV_CVBS	TV Tuner Video Output
4	GND	Ground
5	SCL	Clock Interface
6	SDA	Data Interface
7	GND	Ground
8	5V	Power for Tuner

CN11 (14 Pins/2.0 mm) – for OSD board

Pin No	Symbol	Description
1	5V	Power For Key Pad
2	IR	IR Input
3	GND	Ground
4	K0	Key 0
5	LDE_RED	Red LED
6	LED_GRN	Green LED
7	GND	Ground
8	K1	Key 1
9	K2	Key 2
10	K3	Key 3
11	K4	Key 4
12	K5	Key 5
13	K6	Key 6
14	K7	Key 7

CN5 (4 Pins/2.0 mm) – Audio output

Pin No	Symbol	Description
1	LSPK	Left Audio Output
2	GND	Ground
3	GND	Ground
4	RSPK	Right Audio Output

CN6 (6 Pins/2.0 mm) - Alternative audio output

Pin No	Symbol	Description
1	PC_INR	PC Left Audio Input
2	GND	Ground
3	PC_INL	Left Audio Input
4	AV_INR	Video Left Sound Input
5	GND	Ground
6	AV_INL	Video Right Sound Input

CN10 (6 Pins/2.0 mm) – Alternative video input

Pin No	Symbol	Description
1	GND	Ground
2	AV	CVBS Signal
3	GND	Ground
4	S-Y	S-Video Luminance
5	S-C	S-Video Color
6	GND	Ground

CN7 (7 Pins/2.54 mm) – Inverter Interface

Pin No	Symbol	Description
1	NC	Nothing
2	12V	Inverter Power (note)
3	12V	Inverter Power (note)
4	DIMM	Backlight Voltage Control
5	GND	Ground
6	GND	Ground
7	BLON	Inverter On/Off Control

Note: the maximum current rating of the connector is 2A. It is not adequate to supply 12V power to Landmark inverters for VHB backlight. On the other hand, it can power some accessories such as the PS-200 photosensor for automatic LCD brightness control.

CN8 (4 Pins/2.0 mm) – RS232 Interface

Pin No	Symbol	Description
1	5V	5V Power
2	RXD	Receive Data Interface
3	TXD	Send Data Interface
4	GND	Ground

CN13 (4 Pins/2.0 mm) – Alternative 12 V Power Input

Pin No	Symbol	Description
1	GND	Ground
2	GND	Ground
3	12V	12V Power
4	12V	12V Power

CN17 (30 Pins/2.0 mm) – LVDS Interface

Pin No	Symbol	Description
1	VCC	Power
2	VCC	Power
3	VCC	Power
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	RxO0-	Negative LVDS differential data, CH0 (Odd data)
8	RxO0+	Positive LVDS differential data, CH0 (Odd data)
9	RxO1-	Negative LVDS differential data, CH1 (Odd data)
10	RxO1+	Positive LVDS differential data, CH1 (Odd data)
11	RxO2-	Negative LVDS differential data, CH2 (Odd data)
12	RxO2+	Positive LVDS differential data, CH2 (Odd data)
13	GND	Ground
14	GND	Ground
15	RxOC-	Negative LVDS differential clock, (Odd clock)
16	RxOC+	Positive LVDS differential clock, (Odd clock)
17	RxO3-	Negative LVDS differential data, CH3 (Odd data)
18	RxO3+	Positive LVDS differential data, CH3 (Odd data)
19	RxE0-	Negative LVDS differential data, CH0 (Even data)
20	RxE0+	Positive LVDS differential data, CH0 (Even data)
21	RxE1-	Negative LVDS differential data, CH1 (Even data)
22	RxE1+	Positive LVDS differential data, CH1 (Even data)
23	RxE2-	Negative LVDS differential data, CH2 (Even data)
24	RxE2+	Positive LVDS differential data, CH2 (Even data)
25	GND	Ground
26	GND	Ground
27	RxEC-	Negative LVDS differential clock, (Even clock)
28	RxEC+	Positive LVDS differential clock, (Even clock)
29	RxE3-	Negative LVDS differential data, CH3 (Even data)
30	RxE3+	Positive LVDS differential data, CH3 (Even data)

CN16 (40 pins/2.0 mm) - TTL Interface

Pin No	Symbol	Description
1	3.3V	Power Reserved for Extra Boards
2	VCC	LCD Power (+3.3V)
3	VCC	LCD Power (+3.3V)
4	VCC	LCD Power (+3.3V)
5	GND	Ground
6	GND	Ground
7	DVS	Display Vertical Sync Signal
8	GND	Ground
9	DHS	Display Horizontal Sync Signal
10	GND	Ground
11	D-DE	Display Data Enable Signal
12	GND	Ground
13	BA0	Display Port A Blue Output Bit 0
14	BA1	Display Port A Blue Output Bit 1
15	BA2	Display Port A Blue Output Bit 2
16	BA3	Display Port A Blue Output Bit 3
17	BA4	Display Port A Blue Output Bit 4
18	BA5	Display Port A Blue Output Bit 5
19	BA6	Display Port A Blue Output Bit 6
20	BA7	Display Port A Blue Output Bit 7
21	GND	Ground
22	GA0	Display Port A Green Output Bit 0
23	GA1	Display Port A Green Output Bit 1
24	GA2	Display Port A Green Output Bit 2
25	GA3	Display Port A Green Output Bit 3
26	GA4	Display Port A Green Output Bit 4
27	GA5	Display Port A Green Output Bit 5
28	GA6	Display Port A Green Output Bit 6
29	GA7	Display Port A Green Output Bit 7
30	GND	Ground
31	RA0	Display Port A Red Output Bit 0
32	RA1	Display Port A Red Output Bit 1
33	RA2	Display Port A Red Output Bit 2
34	RA3	Display Port A Red Output Bit 3
35	RA4	Display Port A Red Output Bit 4
36	RA5	Display Port A Red Output Bit 5
37	RA6	Display Port A Red Output Bit 6
38	RA7	Display Port A Red Output Bit 7
39	GND	Ground
40	DCLK	Display Clock Signal

CN1 (14-pin/2.0 mm) – Alternative VGA Input

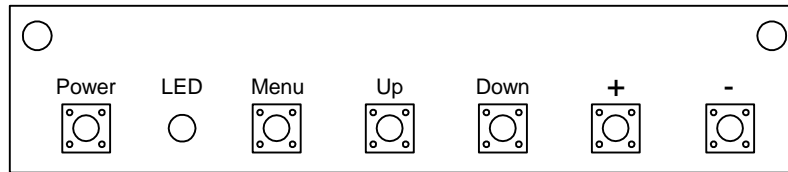
Pin No	Symbol	Description
1	VGA GND	Ground
2	VGA VS	Vertical Sync
3	VGA HS	Horizontal Sync
4	GND	Ground
5	VGA R	Red
6	GND	Ground
7	VGA G	Green
8	GND	Ground
9	VGA B	Blue
10	GND	Ground
11	VGA SDA	Data Interface
12	VGA SCL	Clock Interface
13	RXD	Read Data
14	TXD	Send Data

CN2 (14-pin/2.0 mm) – DVI Interface (reserved)

Pin No	Symbol	Description
1	DVI 5V	DVI Power
2	DVI CAB	Detect Connect Cable
3	DVI SDA	Data Interface
4	DVI SCL	Clock Interface
5	GND	Ground
6	GND	Ground
7	RX2- IN	RX2-
8	RX2+ IN	RX2+
9	RX1- IN	RX1-
10	RX1+ IN	RX1+
11	RX0- IN	RX0-
12	RX0+ IN	RX0+
13	RXC- IN	RXC-
14	RXC+ IN	RXC+

6. OSD

The OSD board and its buttons are shown in the following figure:

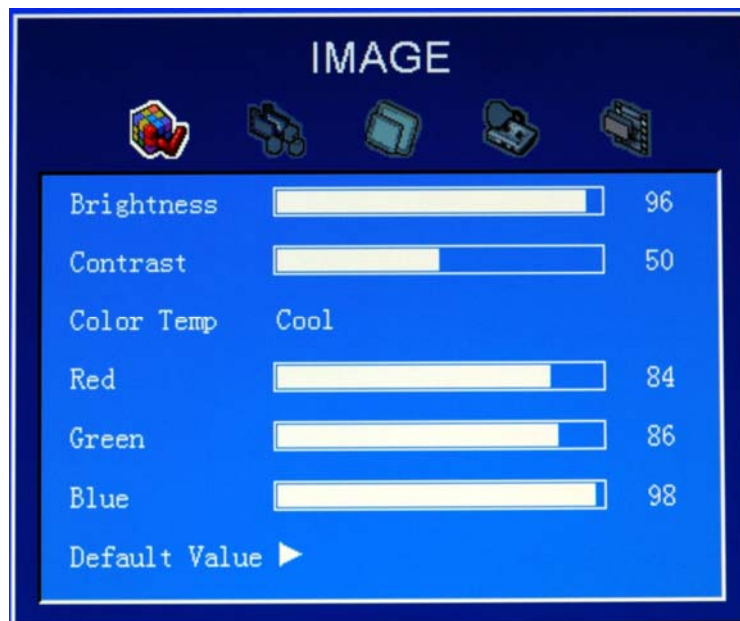


There are six buttons on the OSD board. The functions of the buttons are summarized below:

Power	Turns the LCD power on and off.
Menu	Brings up the OSD menu and exits the OSD menu.
Up & Down	Moves through various adjustments in each OSD Menu.
+ & -	Increases/decreases the settings. Moves through the 5 OSD Menus. The + button also activates the default setting

The OSD Menu

There are five OSD Menus. When the Menu button is pressed, the IMAGE Menu appears:



There are five symbols above the adjustments. The leftmost symbol is highlighted when this IMAGE Menu is activated. Use the + or – buttons to move and activate the other OSD Menus. The symbol corresponding to the selected Menu will be highlighted.

To make adjustments, use the Up or Down button to move to the desirable adjustment (for example, Contrast), then press the + or – button to increase or decrease the setting.

In this IMAGE Menu, there is a Default Value adjustment, which sets the adjustments (i.e. Brightness, Contrast, etc.) to a set of pre-determined default values. To trigger the default setting, use the Up or Down button to move to the Default Value adjustment, then push the + button to trigger the default setting.

The next OSD Menu is the POSITION Menu:



The POSITION Menu is active only when the VGA video source is selected. Once this Menu is activated, follow the same procedure as described above to make adjustments.

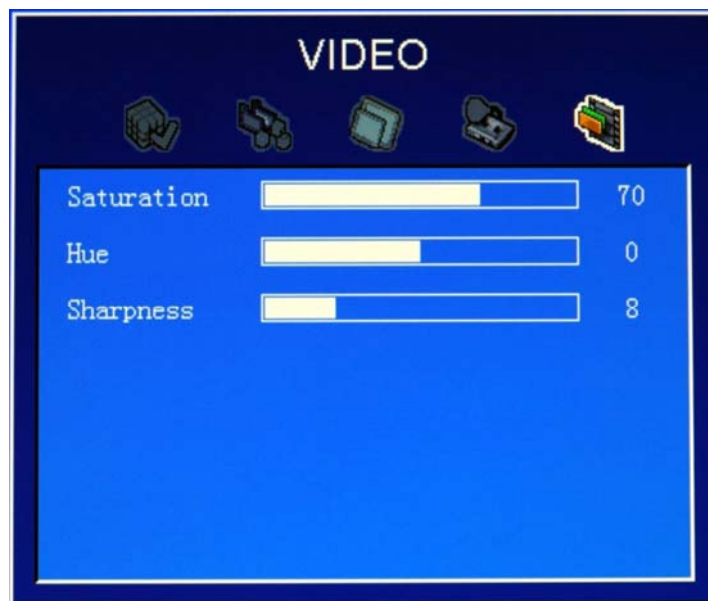
The next is the OSD Menu, which allows the user to change the OSD language, OSD menu size, its positions, and activates the Default OSD Settings.



The next is the SOURCE Menu, which allows the user to select the video sources, change video resolution, and adjust the audio volume.



The next is the VIDEO Menu. This menu allows the user to adjust the Saturation, Hue, and the Sharpness of the video. This VIDEO Menu is active only when the video source selected is AV video or S-Video.



7. Resolution Scaling

Upscale

When the resolution setting of the video source is lower than the native resolution of the LCD, the input video image will be upscaled to fill the entire screen (or nearly the entire screen). The MG22 performs the upscale function well.

Downscale

When the resolution setting of the video input is higher than the native resolution of the LCD, the MG22 displays a window in this video image space. The window size is the native resolution of the display. The user can move this window in the image space with the mouse.

To cite an example, if the LCD has the native resolution of 1,280 x 1,024, and the video input to the MG22 card is set at 2,048 x 1,536, the MG22 will display a window of 1,280 x 1,024 resolution in this 2,048 x 1,536 image space. The user can pan (move) this window through the image space using the mouse.

The MG22 card has been tested for downscale with input video resolution settings of 1,600 x 1,200, 1,920 x 1,080, 1,920 x 1,200, and 2,048 x 1,536.

Disclaimer

Landmark Technology Inc. reserves the right to make changes to this document and the product which it describes without notice. In addition, Landmark Technology Inc. shall not be liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance, and use of this product.

This product shall not be used for or in connection with equipment that requires an extremely high level of reliability, such as military and aerospace applications, telecommunication equipment, nuclear power control equipment and medical or other life support equipment. Landmark Technology Inc. takes no responsibility for damage caused by improper use of this product which does not meet the conditions for use specified in this user's guide.