

Landmark Technology Inc.

MG36 LCD Controller

For

TFT LCDs with Resolution up to 1,920 x 1,200

(Version A)

June 18, 2013

1. Introduction

MG36 is a very compact size LCD controller with analog RGB (VGA) and DVI video inputs. It supports TFT LCDs of 4:3, 5:4, 16:9, and 16:10 aspect ratios with resolutions from VGA (640 x 480) to WUXGA (1920 x 1200). To color depth is 24 bits (16,777,216 colors).

To Proceed:

- A. Make sure to use the correct parts and refer to Fig. 3 - the system connection diagram, to connect the MG36 card to the LCD correctly.
- B. Refer to this User's Guide for operating procedures and cautions

Important 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:

- A. All required and appropriate safety measures are properly implemented.
- B. Obtain regulatory approvals as needed.
- C. Check power specifications and connections before turning on the power

2. Features:

| | |
|--|---|
| Input Video Signal | Analog RGB (0.7 Vp-p), Digital RGB (DVI) |
| LCD Interface | Dual channel LVDS, support up to 1920 x 1200 resolution |
| Supported Resolution (VGA & DVI Inputs) | 640x480, 800x600, 1024x768, 1280x768, 1280x1024, 1140x900 1366x768, 1680x1050, 1600x1200, 1920x1080, 1920x1200 |
| Color Depth | 24 bits (16.8 million) colors |
| LCD Voltage Supported | 3.3V / 5V / 12V |
| Dynamic Contrast Control | Supported |
| Audio Output Power | 2 Watts x 2 Channels |
| Power Input | 12V (\pm 0.6V) DC |
| Controller Dimensions | PCB size - 109 mm x 52 mm x 17 mm (H) |
| OSD Board Dimensions | 104 mm x 22 mm |

3. MG36 Mechanical Dimensions

The dimensions of the main controller board and the locations of the connectors are shown in Fig.1. The dimensions of the OSD board and its connectors are shown in Fig. 2. Both figures are on the next page. All the dimensions are in mm.

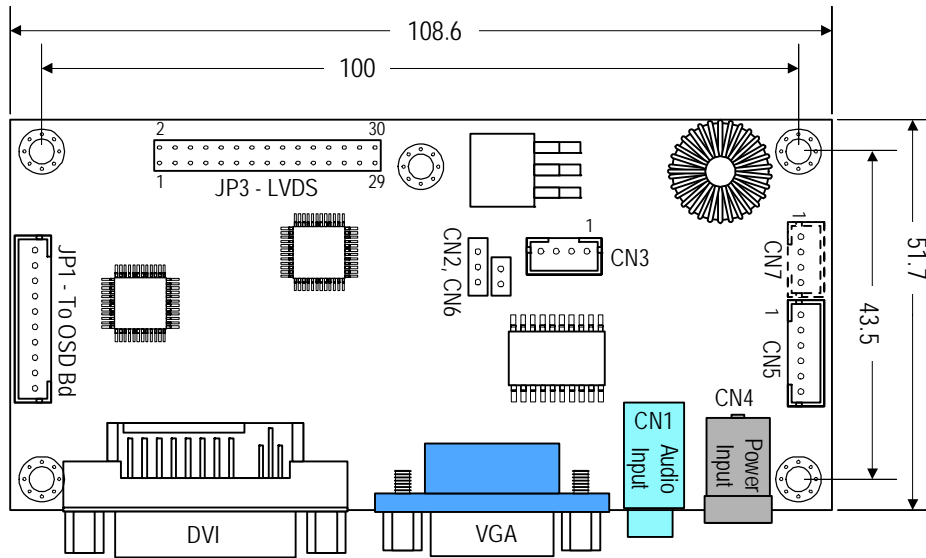


Fig. 1 MG36 board dimensions

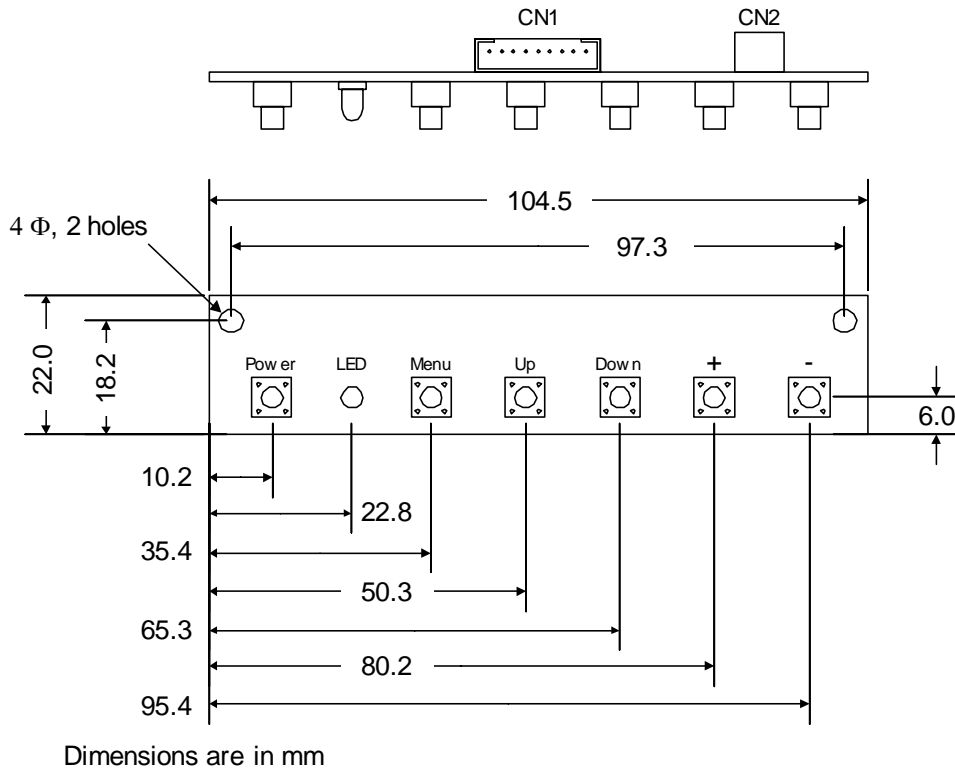


Fig. 2 OSD Board Dimensions

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 a IR sensor board for OSD adjustment with a remote control. This feature is not implemented in Version A MG36 controller.

4. System Connection

4A. For operating Landmark VHB (very high brightness) LCD modules, the typical connection diagram is illustrated in Fig. 3.

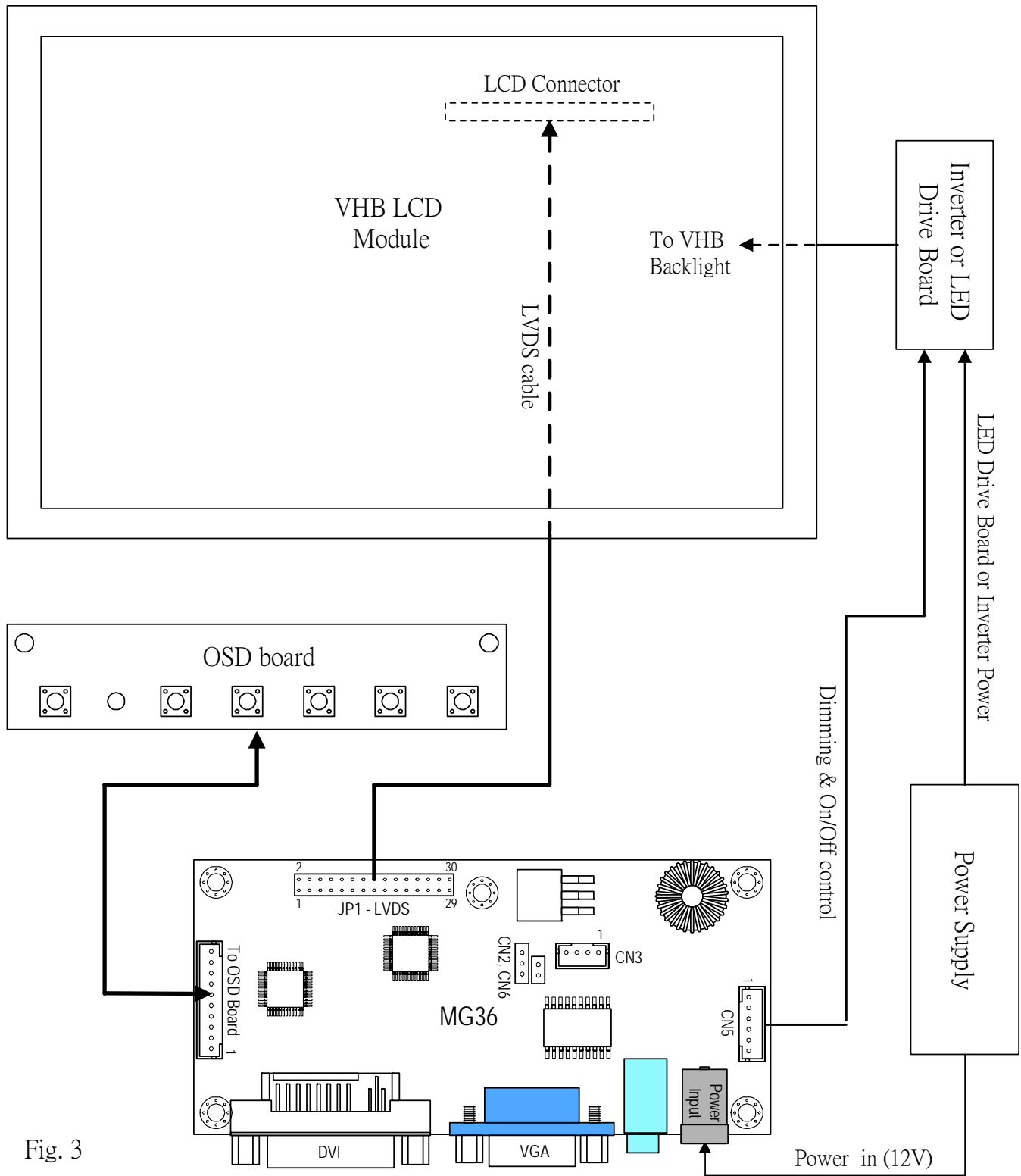
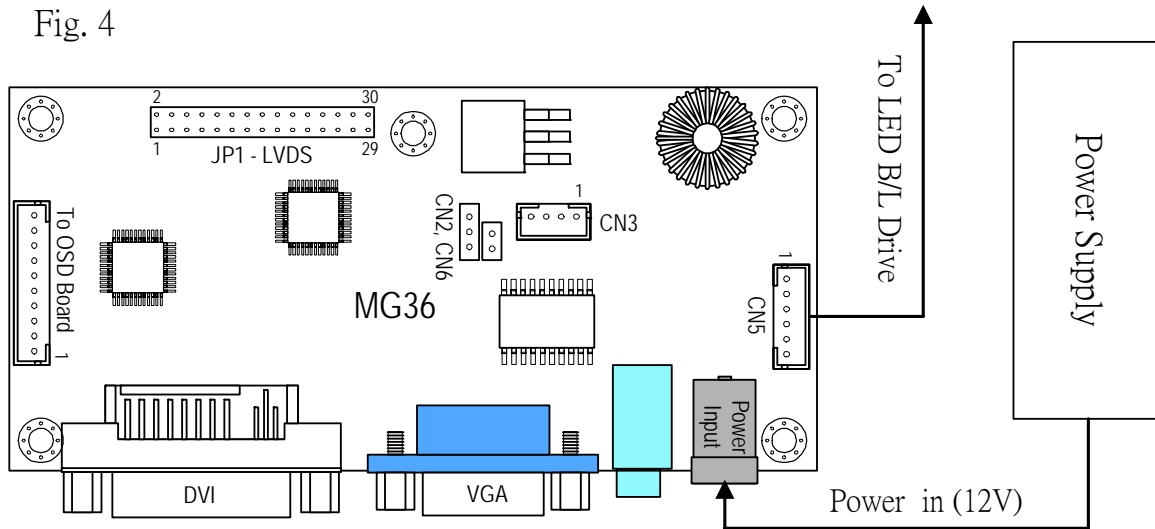


Fig. 3

A VHB LCD with screen brightness over 1,000 nits requires higher backlight power than a regular brightness LCD at about 300 nits. Thus, the 12V power input to the backlight (B/L) drive board should be fed directly from the power supply with wires that can carry the required current.

4B. For operating regular brightness LCDs, in particular with the LED backlights, the 12V power of the backlight driver can be supplied from the CN5 connector on the MG36 card as shown in Fig 4.

Fig. 4



For adjusting the screen brightness, most of the regular brightness LCDs use a PWM signal to turn on and off the backlight. So, the 12V fed to the MG36 card may be slightly modulated with the PWM signal. This may create some noise on the LCD screen, in particular, if the voltage is modulated beyond the +/- 0.6V maximum tolerance of the 12V input. If some noise shows up when the backlight is adjusted down, please contact Landmark Technology Inc. for potential solutions.

Cautions – please never connect or disconnect any parts of the system while the power is turned on as doing so may cause serious damages to the MG36 controller and other parts.

5. Popular Video Modes Supported

| Mode | Resolution | Aspect Ratio | Refresh Freq. (Hz) |
|-------|-------------|--------------|--------------------|
| VGA | 640 x 480 | 4:3 | 60, 66, 70, 72, 75 |
| WVGA | 800 x 480 | 15:9 | 60 |
| SVGA | 800 x 600 | 4:3 | 56, 60, 70, 72, 75 |
| XGA | 1024 x 768 | 4:3 | 60, 70, 72, 75 |
| | 1024 x 800 | | 73 |
| | 1152 x 864 | | 60, 70, 75 |
| | 1152 x 900 | | 66, 76 |
| | 1280 x 720 | 16:9 | 60, 75 |
| | 1280 x 768 | 15:9 | 60, 70, 75 |
| | 1280 x 960 | | 60, 75 |
| SXGA | 1280 x 1024 | 5:4 | 60, 70, 75 |
| FHD | 1366 x 768 | 16:9 | |
| | 1440 x 900 | 16:10 | 60 |
| | 1680 x 1050 | 16:10 | 60 |
| UXGA | 1600 x 1200 | 4:3 | 60 |
| FHD | 1920 x 1080 | 16:9 | 60 |
| WUXGA | 1920 x 1200 | 16:10 | 60 |

Note: The MG36 can support some video modes not listed in the above table. Please contact Landmark Technology Inc. for details.

6. Connectors and Pin Assignments

The connectors on the MG36 card and their functions are listed below:

| | |
|-----|---|
| JP1 | OSD connection |
| JP3 | LVDS Interface |
| CN1 | Audio Input |
| CN2 | LCD Voltage Set - 3.3V or 5V |
| CN3 | Audio Output |
| CN4 | 12V DC Input |
| CN5 | LED Backlight Driver or Inverter connection |
| CN6 | LCD Voltage Set - 12V |
| CN7 | 5V Output |
| VGA | Video Input |
| DVI | Video Input |

Please refer to the dimensional drawing for the locations of these connectors.

The pin Assignments of the connectors besides the OSD connector (JP1) and the standard video connectors (VGA & DVI) are listed below:

JP-3 (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) |

CN1 – Audio Input

The standard CN1 connector for Audio Input is shown in the dimensional drawing.

There is an optional connector with the following connector and pin assignment for significant quantity users. Please contact Landmark Technology Inc. for details.

Alternative CN1 (3-pin, 2.0 mm)

| Pin # | Symbol | Description |
|-------|--------|---------------------|
| 1 | Left | Audio left channel |
| 2 | GND | Ground |
| 3 | Right | Audio right channel |

CN2, CN6 – Setting LCD Voltage

Please refer to the section “LCD Voltage Setting” for details on these two jumper setting connectors.

CN3 – Audio Output (for speaker connectin)

CN3 (4-pin, 2.0 mm)

| Pin # | Type | Description |
|-------|-------|--------------------------------|
| 1 | Right | Audio output for right speaker |
| 2 | GND | Ground |
| 3 | GND | Ground |
| 4 | Left | Audio output for left speaker |

CN4 – 12V DC Power Input

The standard CN4 connector for 12V DC power input is shown in the dimensional drawing.

There is an optional connector with the following connector and pin assignment for significant quantity users. Please contact Landmark Technology Inc. for details.

Alternative CN4 (4-pin 2.0 mm)

| Pin # | Symbol | Description |
|-------|--------|------------------------|
| 1 | GND | Ground |
| 2 | GND | Ground |
| 3 | 12V | 12 Volt DC power input |
| 4 | 12V | 12 Volt DC power input |

CN5 – LED Backlight Driver or Inverter Connector

| Pin # | Symbol | Description |
|-------|---------|-----------------------------|
| 1 | 12V | 12V DC power output |
| 2 | 12V | 12V DC power output |
| 3 | On/Off | Inverter On/Off control |
| 4 | Dimming | Inverter brightness control |
| 5 | GND | Ground |
| 6 | GND | Ground |

This connector is mainly for the On/Off and dimming control of the backlight. In addition, it can provides the 12V power required to run the backlight with some restrictions
 The 12V DC power provided by CN5 connector may not be enough for high brightness LCDs and some large size LCDs. In particular, it may not not have the current capability to run Landmark LED drive board or Inverters for VHB backlights. Please follow Fig. 3 on page 4 for the connections to run very high brightness LCDs.

CN7 – 5V DC Supply (Optional)

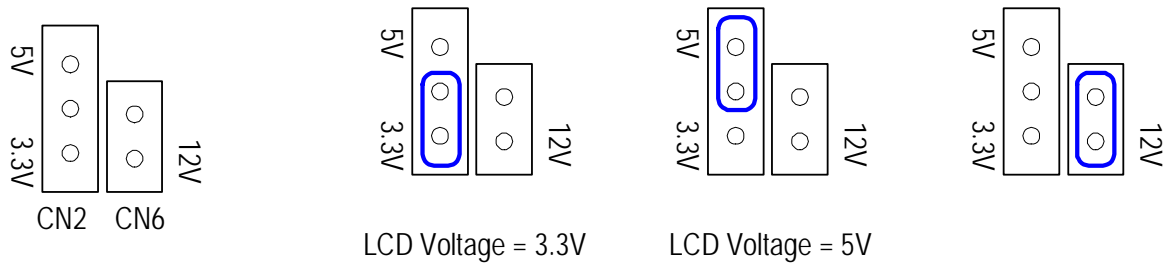
CN5 (4-pin, 2.0 mm)

| Pin # | Type |
|-------|------|
| 1 | GND |
| 2 | GND |
| 3 | 5V |
| 4 | 5V |

7. Setting LCD Voltage

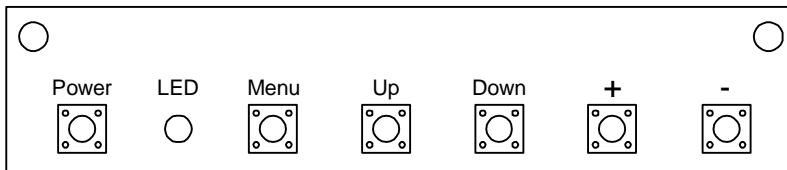
The MG36 supports LCDs with voltage at 3.3V, 5V, and 12V. It is necessary to setup the LCD voltage correctly. In particular, if the voltage is set higher than the LCD spec (for example, use 12V setting for a 5V LCD) can damage the LCD.

MG36 has two connectors for LCD voltage setting. Please refer to the following drawing on using a jumper to set the LCD voltage correctly.



8. OSD & Display Adjustment Procedure

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



There are six push 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 activate the selected item to enter the next Menu. |
| UP & DOWN | Moves through various adjustments in each OSD Menu. Also after the selected adjustment is activated, use Up & Down buttons to increase & decrease the setting. |
| + | Hot key to active the AUTO SETUP function in the OSD Main Menu. |
| - | Reserved for future use. For the current Version A, this button has no function. |

Turn on the LCD Screen

After turning on the 12V power, the LED on the OSD board is in red color. Pushing the POWER button once turns the LED to green and the LCD screen display the image. Push the POWER button again turns the LED to red and the LCD screen image turns off.

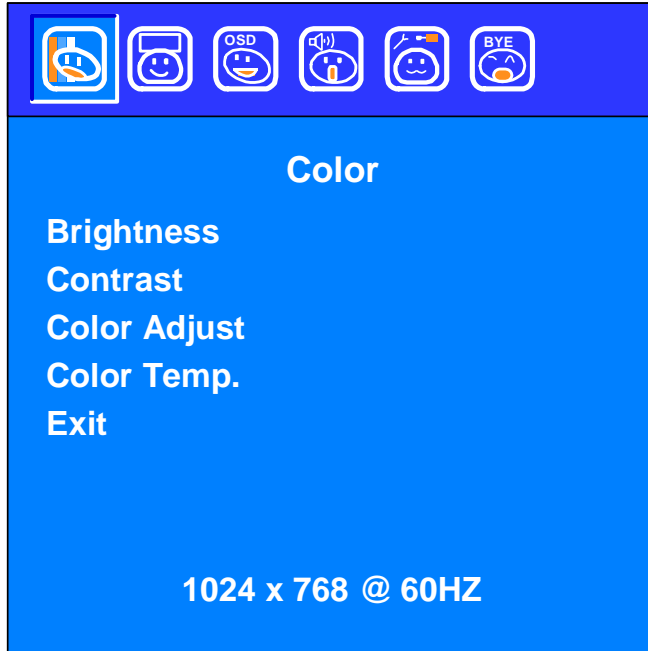
Turn on the OSD Menu

When the MENU button is pressed, the following Color Menu appears on the screen. At the top of the menu, it shows 6 icons for various display adjustment functions. The current activated adjustment, the Color, is high lighted with a square frame around it.

In this Color Menu, there are 4 adjustment tasks and the Exit task.

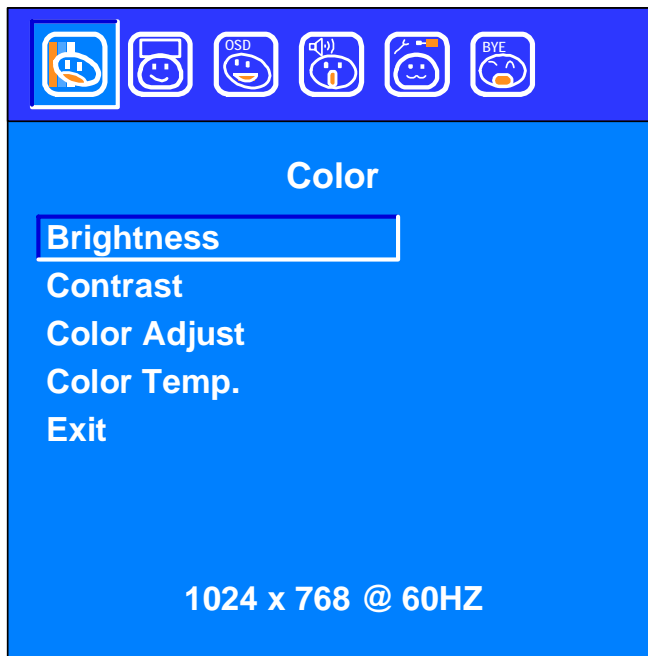
- Brightness
- Contrast
- Color Adjustment
- Color Temp.
- Exit

At the bottom of the menu, the current display resolution and the refresh rate are displayed.



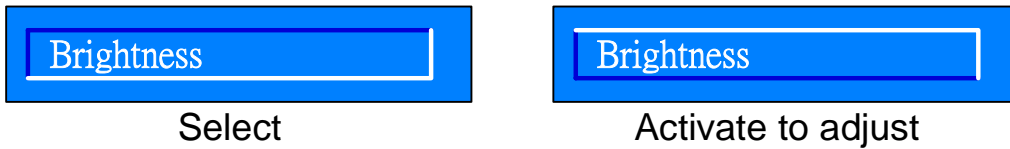
Display Color Adjustment

To confirm that this is the adjustment to be processed, press MENU bottom again, then the first task “Brightness” is selected. The menu shows a rectangular frame with the deep blue and white border lines around the selected adjustment task.

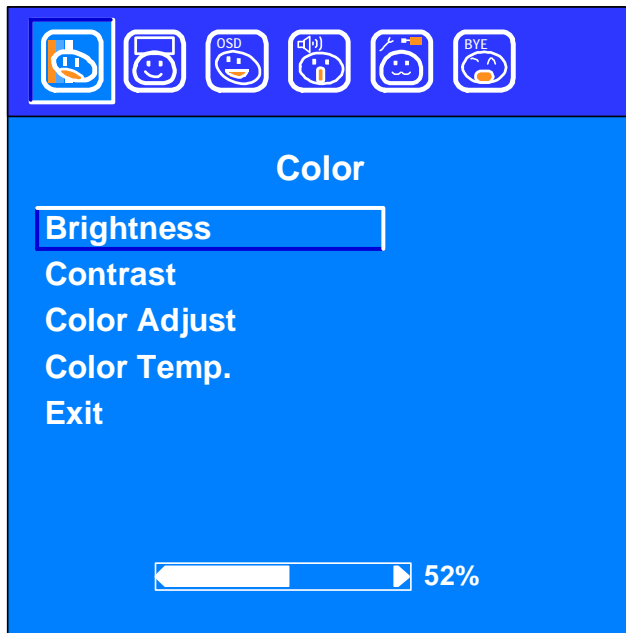


To active or confirm the “Brightness” adjustment, push the MENU button once more, the following sub-menu shows up on the screen. At the bottom of this menu, an adjustment bar shows up to replace the resolution & refresh rate (1024 x 768 @ 60 Hz). In the meantime, the frame around the “Brightness”

turns around vertically with the deep blue border line at the bottom side as illustrated in the following drawing.



Push the UP button to adjust the “Brightness” higher. As the brightness increases, the white section in the bar moves toward the right side and the percent level increases until reaching 100%. Pushing the DOWN button decreases the “Brightness” setting.

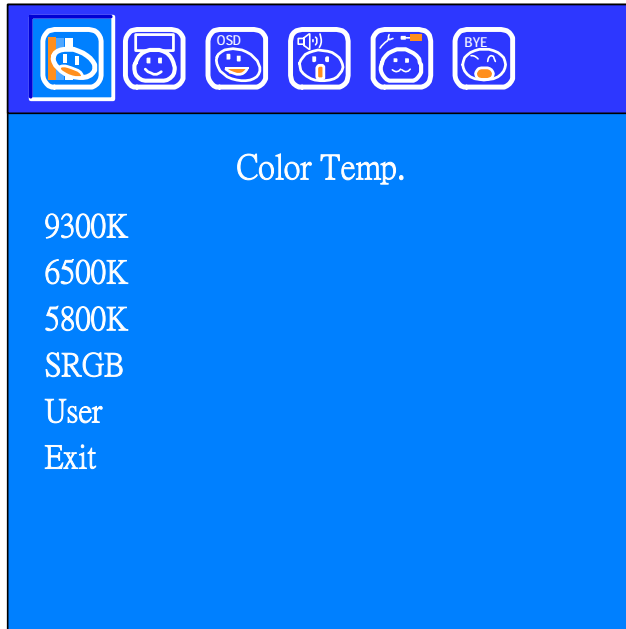


Once the adjustment is completed, push the MENU button again brings it back to the previous menu for selecting the next adjustment. Meanwhile, the rectangular frame around the “Brightness” flips over with the blue line at the top side.

If the next adjustment is Contrast, push the DOWN button to move the rectangular frame around the “Contrast”. Then push MENU button to activate it. Then, the rectangular frame flips over and the adjustment bar for the “Contrast” shows up. Follow the same procedure to adjust the display contrast with the UP and DOWN buttons. After the contrast setting is done, push the MENU button to return to the Color menu for the next adjustment.

If the “Color Adjust” task is selected and activated, there is no sub-menu with the adjustment bar showing up. It just has the screen color adjusted automatically.

If the “Color Temp.” task is selected and activated, the following sub-menu shows up. Use the DOWN or UP button to select the color temperature needed. Then activate it with the MENU button and the display color temperature will be adjusted accordingly.

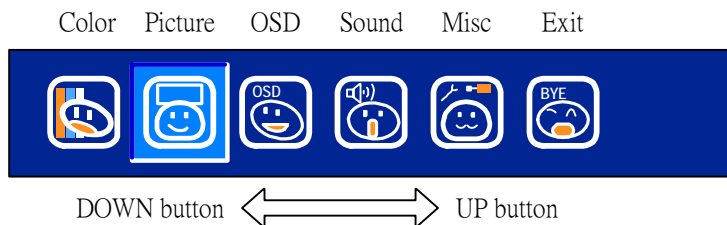


After finishing the “Color Temp.” adjustment, use the DOWN button to select “Exit” and push MENU button to return to the “Color” menu.

Now, if there is no further display adjustments, use the DOWN button to select “Exit”, then push MENU button to exit, and the OSD menu disappears on the screen.

Other Display Adjustments

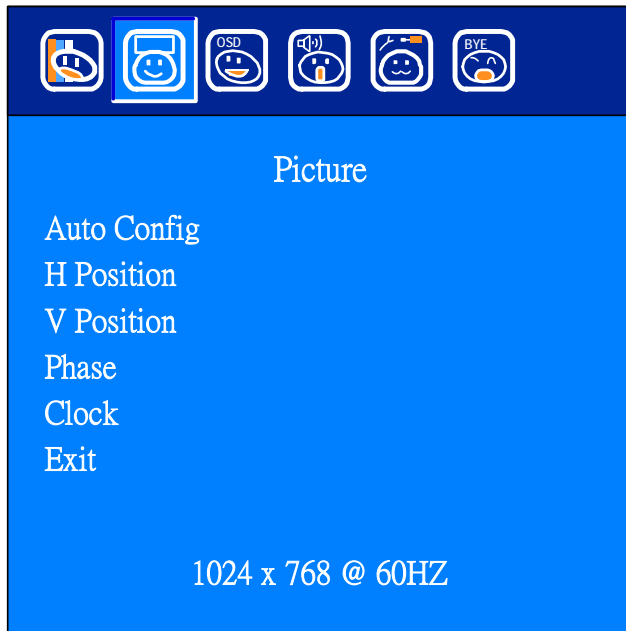
The other display adjustments are shown in the following figure. Use the UP button to move toward right and the DOWN button to move toward the left. The currently selected adjustment (Picture) is highlighted with the square frame.



With the “Picture” adjustment selected, the following menu is displayed on the screen. There are 5 adjustment tasks and the Exit task:

- Auto Config
- H Position
- V Position
- Phase
- Clock
- Exit

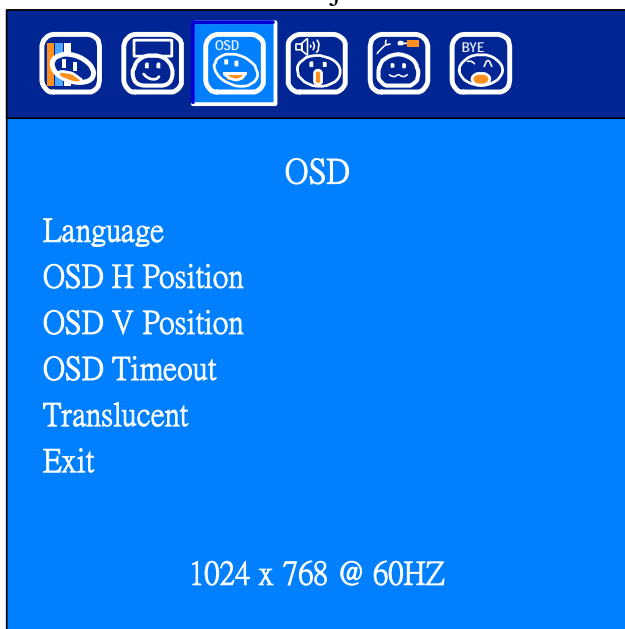
Follow the similar ways as making the “Color” adjustment tasks to perform the “Picture” adjustments. Then use Exit to select the next display adjustments.



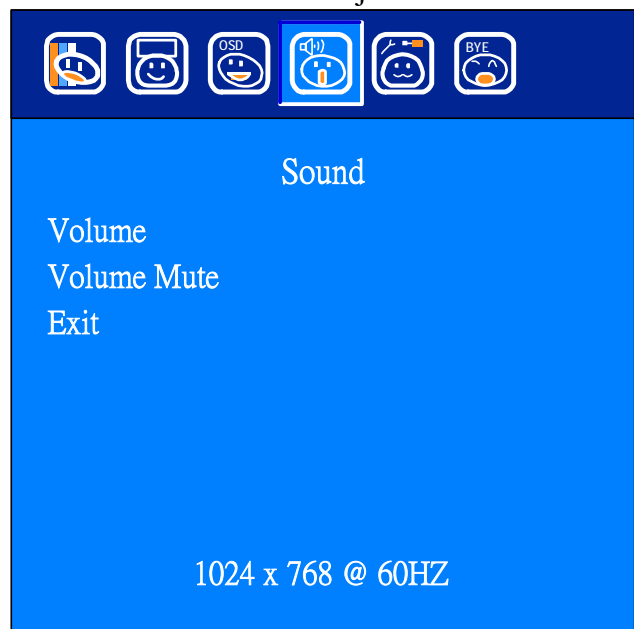
Again use the UP and DOWN buttons to select the other display adjustments, then push the MENU button to active the selection and proceed for the adjustment.

The adjustment tasks of the OSD Menu and the SOUND Menus are shown below::

The OSD Adjustment



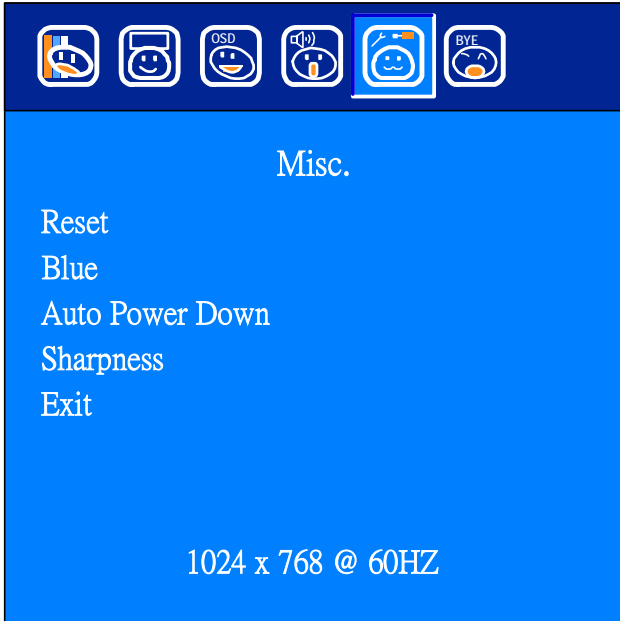
The SOUND Adjustment



The rest of the two OSC menus, the MISC. and the EXIT, are shown on the next page:

Follow the same procedure to perform the adjustment tasks in the OSD, SOUND, and MISC menus. When all the display adjustments are completed, select the EXIT Icon and push MENU button to finish the OSD adjustment.

The MISC Adjustment



EXIT



9. Disclaimer

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