



## PC INTERFACE CONTROLLER WITH OPTIONAL VIDEO SUPPORT FOR XGA, SVGA, VGA RESOLUTION TFT LCD

### **Model: ACL-1024**

(Part number: 4166200-1X)

## INSTRUCTIONS

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**It is essential that the sections on Assembly Notes and Connectors, Pinouts & Jumpers is read and understood before connecting or powering up this controller.**

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## INTRODUCTION

Designed for LCD monitor and other flat panel display applications, the ACL-1024 controller provides an auto-input synchronization and easy to use interface controller for:

- TFT (active matrix) LCDs of 1024x768, 800x600, 640x480 resolution;
- Computer video signals of XGA, SVGA, VGA standard
- Video signal of PAL/NTSC/SECAM (optional video add-on board)\*
- Full RS-232 interface OSD command control\*\*
- Audio volume control (optional audio add-on board)

### HOW TO PROCEED

- Ensure you have all parts and that they are correct, refer to:
  - ◆ Connection diagram (separate document for each panel)
  - ◆ Connector reference (in following section)
  - ◆ Assembly notes
- Check controller switch and jumper settings (errors may damage the panel)
- Prepare the PC
- Connect the parts
- Plug the optional video input add-on board DVB1000 on CNV3 connector to support video input\*
- Understand the operation and functions ( in following section)

### IMPORTANT USAGE NOTE

This product is for use by 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 developer, integrators or other user of this product to:

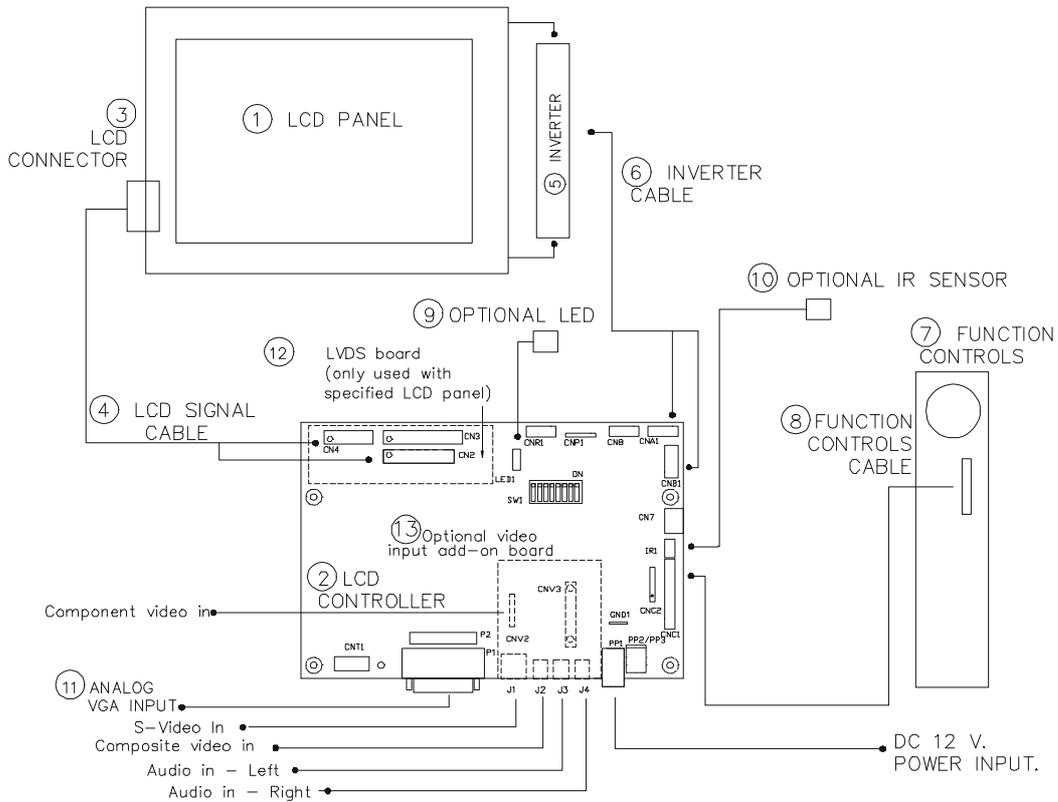
- Ensure that all necessary and appropriate safety measures are taken.
- Obtain suitable regulatory approvals as may be required.
- Check power settings to all component parts before connection.
- Understand the operation and connectivity requirements of this controller.

### DISCLAIMER

There is no implied or expressed warranty regarding this material.

## SYSTEM DESIGN

A typical LCD based display system is likely to comprise the following:



### Summary:

1. LCD panel
2. LCD controller card, ACL-1024
3. LCD connector board (if necessary)
4. LCD signal cables
5. Inverter for CCFT backlight (if not built into LCD)
6. Inverter cable
7. Function controls
8. Function controls cable
9. Status LED
10. IR sensor
11. PC VGA (analog) in
12. LVDS board (only used with specified LCD panel)
13. Optional video input add-on board\* : DVB-1000 P/N : 4165900-20 or up

Digital View offers a range of accessories such as listed above, to make up complete display solution.

## ASSEMBLY NOTES

This controller is designed for monitor and custom display projects using 1024x768, 800x600, 640x480 resolution TFT panels with a XGA, SVGA, VGA signal input with optional video input (PAL/NTSC/SECAM). The following provides some guidelines for installation and preparation of finished display solution.

- **Preparation:** 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. 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 is designed for typical TFT panels with 5V or 3.3V TTL or LVDS interface. For LVDS interface panel a separate add-on board is required. Due to the variation between manufacturers of signal timing and other panel characteristics factory setup and confirmation should be obtained before connecting to a panel. **(NOTE: Check panel power jumper settings before connection)**  
  
**NOTE:** This controller supports up to 8-bit per colour, for panels of lower bits (eg 3 x 3 bit, 3 x 4 bit etc), connection of the panel signal high value should correspond to the controllers highest bit. For example for a 3 x 3 bit panel R2 on the panel should connect to R7 on the controller, in this case R0~4 on the controller will not be connected. For a 3 x 6 bit panel R5 on the panel should be connected to R7 on the controller. For a 3 x 8 bit panel R7 on the panel should be connected to R7 on the controller. Same for G & B.
- **2. Controller card:** Handle the controller card with care as static charge may damage electronic components.
- **3. LCD connector board:** Different makes and models of LCD panel require different panel signal connectors and different pin assignments. The connector board may not necessary for some Digital View cables that direct plug to the LCD panel.
- **4. LCD signal cable:** In order to provide a clean signal it is recommended that LCD signal cables are no longer than 33cm (13 inches). If loose wire cabling is utilized these can be made into a harness with cable ties. Care should be taken when placing the cables to avoid signal interference. Additionally it may be 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 panels have an inverter built in. As panels may have 1 or more backlight tubes and the power requirements for different panel models 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 Cables:** Different inverter models require different cables and different pin assignment. Make sure correct cable pin out to match the inverter. Using wrong cable pin out may damage the inverter.
- **7. Function Controls:** The following section 'Operation' discusses the controls required and the section 'Connectors, jumpers & pinouts' provides the detail. The controls are minimal for ease of use: On/Off, Brightness (depends on inverter), OSD (5 momentary buttons).
- **8. Function controls cable:** The cables to the function switches should be of suitable quality and length so that impedance does not affect performance. Generally lengths up to 1 metre (3 feet) should be acceptable.
- **9. Status LED:** The pin direction of the LED should be corrected for right colour indication. Red colour stands for standby. Green colour stands for signal on. It is an optional part only, can be unconnected.
- **10. Analog VGA Input Cable:** As this may affect regulatory emission test results and the quality of the signal to the controller, a suitably shielded cable should be utilized.
- **11. Video input add-on board\* :** with the optional video add-on board installed it is accept PAL/NTSC/SECAM signals with S-video/composite/component signal.
- **Power Input:** 12V DC is required, this should be a regulated supply. Although the controller provides power regulation for the LCD power this does not relate to the power supplied to the backlight inverter. If an unregulated power supply is provided to an inverter any fluctuations in power may affect operation, performance and lifetime of the inverter and or backlight tubes.
- **Power Safety:** Note that although only 12VDC is supplied as 'power-in' a backlight inverter for panel backlighting produces significantly higher voltages (the inverter does not connect to the ground plane). We strongly advise appropriate insulation for all circuitry.
- **EMI:** Shielding will be required for passing certain regulatory emissions tests. Also the choice of external Controller to PC signal cable and power supply can affect the result.
- **Ground:** The various PCB mounting holes are connected to the ground plane.
- **Servicing:** The controller is not user serviceable or repairable. Warranty does not cover user error in connecting up to the controller and is invalidated by unauthorized modification or repairs.

- **Controller Mounting:** It is recommended that a clearance of at least 10mm is provided above and 5mm below the controller when mounted. Additionally consideration should be given to:
  - ◆ Electrical insulation
  - ◆ Grounding.
  - ◆ EMI shielding.
  - ◆ Cable management. **Note:** It is important to keep panel signal cables apart from the inverter & backlight cables to prevent signal interface.
  - ◆ Heat & ventilation: Heat generated from other sources, for example the backlight of a very high brightness panel may generate significant heat which could adversely affect the controller.
  - ◆ Other issues that may affect safety or performance.
- **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.
  - ◆ Vertical refresh rate should be set to 60Hz preferable.
  - ◆ Non-interlaced is required.

**IMPORTANT: Please read the Application Notes section for more information.**

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## 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

Connection and usage is quite straight forward (it is useful to have the relevant connection diagram available at this time):

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. **TTL type panels:** Plug the signal cables direct to CN2, CN3 and CN4 (necessary for 8-bit panel only) on the controller board. Plug the other end of cables to the LCD connector board (if connector board is required, otherwise the signal can be direct plug to the LCD panel connector). Then plug the board connector to the LCD panel connector.  
**LVDS/PanelLink type panels:** A LVDS/PanelLink transmitter board is required. Plug the transmitter board to CN2, CN3 and CN4 (necessary for 8-bit panel only). Then insert the LCD signal cable with controller end to the connector on the transmitter board. Insert the panel end of the cable the LCD panel connector.
3. **Inverter & Controller:** Plug the inverter cable to CNB1 and CNA1 (if necessary). Plug another end to the connector on the inverter.
4. **Function switch & Controller:** Plug the OSD switch mount cable to CNC1 on the controller board and another to the OSD switch mount.
5. **LED & Controller:** Plug in a 3-way with dual colour LED to connector LED1 on the controller board.
6. **Jumpers & Switches:** Check all jumpers and switches (SW1) are set correctly. Details referring the connection diagram (a separate document) or the jumpers and switches setting table (in the following section).
7. **Jumpers & Inverter & Panel voltage:** Particularly pay attention to the settings of JA3, JB2, JB3, JA5. JB2 & JB3 are used for inverter control (read inverter specification and information on the jumper table to define the correct settings). JA3 & JA5 are used for panel voltage input (read panel specification and information on the jumper table to define the correct settings).
8. **Optional video add-on board\* :** Plug the optional video add-on board to CNV3 connector (Universal Digital Connector)
9. **VGA cable & Controller:** Plug the VGA cable to the connector P1 on the controller board.
10. **Power supply & Controller:** Plug the DC 12V power in to the connector PP1.
11. **Power on:** Switch on the controller board and panel by using the OSD switch mount.

The red LED will light up when power on. The LED will change to green when XGA signal on.

General:

- If you are using supplied cables & connectors, ensure they are correct for the model of panel and controller.
- If you are making your own cables & connectors refer carefully to both the panel & inverter specifications and the section in this manual, "Connector, Pinouts & Jumpers" to ensure the correct pin to pin wiring.

### PC SETTINGS

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

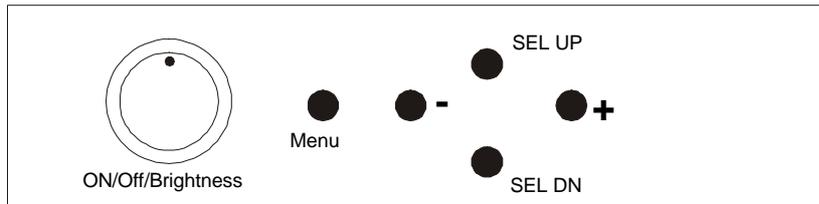
### OPERATION

Once the system has been connected and switched on there are a number of functions available to adjust the display image as summarized in the following sections. The settings chosen will be saved for each mode independently.

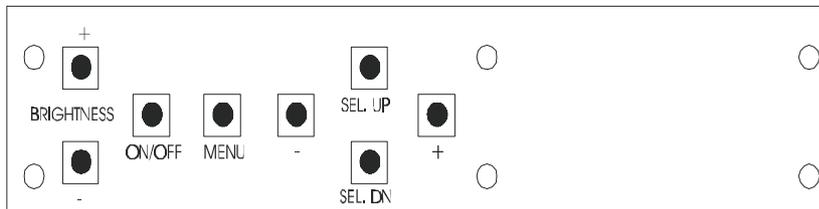
## LCD DISPLAY SYSTEM SETTINGS

NOTE: By way of explanation the following refers to a set of sample buttons that may be obtained as an option. In addition to power on/off and connection for backlight brightness the controller provides an On Screen Display of certain functions which are controlled by 5 momentary type buttons (analog VR type) or 8 momentary type buttons (digital type):

Controls	Analog VR type	Digital type
On/Off – turns controller board power on	VR toggle switch	On/Off button
Brightness – controls backlight brightness	Rotary VR	Brightness +/- buttons
Menu – turns OSD menu On or Off (it will auto time off)	Menu button	Menu button
Select down – moves the selector to the next function (down)	SEL DN	SEL DN
Select up – moves the selector to the previous function (up)	SEL UP	SEL UP
+ – increase the setting/confirm the select	+	+
-- decrease the setting	-	-



Analog VR type



Digital type

## MANUAL & REMOTE CONTROL

The following table shows the comparison of functions available from different controls:

Operation	One for All	Sony multi remote	DV switchmount	DV digital VR switchmount
Menu	Power	Power	Menu	Menu
Default	Mute	Mute	-	-
Select +	Ch+	Ch+	Select +	Select +
Select -	Ch-	Ch-	Select -	Select -
Setting +	Vol+	Vol+	Setting +	Setting +
Setting -	Vol-	Vol-	Setting -	Setting -

Other multi-system IR transmitters will also be suitable if they support common Sony signal timings.

## RS-232 Serial control (Baud rate 2400 bps) Only function in P/N 4166200-15 version

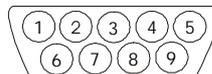
Physical connection :

Controller side  
Connector interface : CN8  
Mating connector : JST XHP-6

Computer side  
Connector interface : Serial port  
Mating connector : DB9 Female



Mating face of CN8



Mating face of RS-232 DB9 Male

PIN#	Description
4	RS-232 Tx Data
5	Ground
6	RS-232 Rx Data

PIN#	Description
2	RS-232 Rx Data
3	RS-232 Tx Data
5	Ground

Remark :

- (1) : RS-232 connection cable, 600mm P/N 4260902-00 can be ordered separately for connection.
- (2) : Jumper JA4 should set to 1-3 & 2-4 closed to activate the RS-232 interface control.

Software connection :

The OSD function can be controlled through sending the RS-232 protocol according to the appendix section on page 19 to 26. The RS-232 program can be custom-made to fit for application or it can be used the demo program provided by Digitalview on request. Please contact your local sales for informations.

## OSD Functions

Audio Mute (Note 1)	OFF/ON
Volume (Note 1)	Increase/decrease the volume level Press – or + (- [ ] +nn), range : 0 to 31
Brightness	Increase/decrease panel brightness level Press – or + (- [ ] +nnn), range : 0 to 236
Contrast	Increase/decrease panel contrast level. Press – or + (- [ ] +nnn), range: 0 to 210
Tuning (display in PC mode)	Fine tune the data sampling position (adjust display quality) Press – or + (- [ ] +nn), range: 0 to 11
Auto Setup (display on PC mode)	Auto setting the display, e.g. positions, image size, tuning, etc. Press + to activate auto setup.
Color (display in video mode)	Increase/decrease the color level Press – or + (- [ ] +nnn), range: 0 to 254
Tint (display in video NTSC mode)	Increase/decrease tint level Press – or + (- [ ] +nnn), range: 0 to 254
Input ▶ (display on plugging DVB-1000)*	Turn on input sub-menu
Image Adjust ▶	Turns on the image adjust submenu
OSD menu ▶	Turns on the OSD submenu
System Info ▶	Turns on system information submenu Shows board information : Vsource Vmode HF:nn.nn kHz VF:nn.n Hz
Extended menu ▶	Turn on the extended menu. Press + turns on the extended menu.
Exit menu	Turn off the OSD menu. Press + turns off the OSD menu.

Item marked ▶ have sub menus

Note 1 : The volume option will activate if dip-switch (SW1) position #4 is ON. This option will not appear if SW1 position #4 is OFF. Restart the board is required after setting of SW1 to enable the setting.

## Input – submenu

Input source	Select input source PC/ Video
Video input (display in video mode)	Select video input Composite/S/Component
Source priority	Select source priority Exclusive / Priority
Video system (display in video mode)	Select video system Auto / NTSC / PAL / SECAM
Back	Press + to go back to previous menu.

## Image Adjust – submenu

Image Horizontal Position	Move the image position horizontally Press – or + (- [ ] + nn), range: 0 to 58
Image Vertical Position	Move the image position vertically Press – or + (- [ ] + nn), range: 0 to 56
Image Horizontal Size	Move the image position horizontally Press – or + (- [ ] + nnnn), range: 1318 to 1358
Image Vertical Size (display on video mode)	Move the image position vertically Press – or + (- [ ] + nnnn), range: 0 to 28
Sharpness	Adjust sharpness level Press – or + (- [ ] + n), range : 0 to 3
Red (display on PC mode only)	Adjust red color level Press – or + (- [ ] + nn), range : 0 to 27
Green (display on PC mode only)	Adjust green color level Press – or + (- [ ] + nn), range : 0 to 27
Blue (display on PC mode only)	Adjust blue color level Press – to + (- [ ] + nn), range : 0 to 27
Reset to RGB default (display on PC mode only)	Default set Red, Green, Blue color level
Gamma (display on video mode only)	Select gamma setting 1.0/1.6/2.2/2.8
Back	Press + to go back to previous menu.

**OSD menu – submenu**

Menu Hori Position ▶	Move the OSD position horizontally Press – or + (- [ ] + nn), range : 0 to 62
Menu Verti Position ▶	Move the OSD position vertically Press – or + (- [ ] + nn), range : 0 to 60
Menu Transparency	Adjust the transparent level of the OSD menu Press – or + (- [ ] + n), range: 0 to 3
Menu Timeout	Set menu time-out period Press – or + (10 / 20 / 30 / 45 / 60 / cont) sec
Menu Auto Save	Set menu auto save Off / On
Back	Press + to go back to previous menu.

**System Info – sub menu**

Display type	Show display type e.g TFT LCD 1024x768
Model	Shows the model number of the board, e.g. ACL-1024
BIOS version	Shows BIOS version : Bios version e.g V0.40 ss.ss-hh.hh
Run time	Shows the accumulated running time of the backlight since last reset (nn Hrs nn Min) Press + for 5 seconds to reset the counter
Back	Press + to returns to main menu.

**Extended menu - sub-menu**

Power down option (display on video mode only)	Turn on auto power down Press Off / On
DOS Text or Graphics (display on PC mode only)	Press – or + (Text / Graphics)
Direct access 1 ▶	Press + turns on direct access direct access sub-sub menu
Direct access 2 ▶	Press + turns on direct access direct access sub-sub menu
Language ▶	Select OSD display language
Back	Press + to exit

**Direct access 1 & 2 – sub-sub menu**

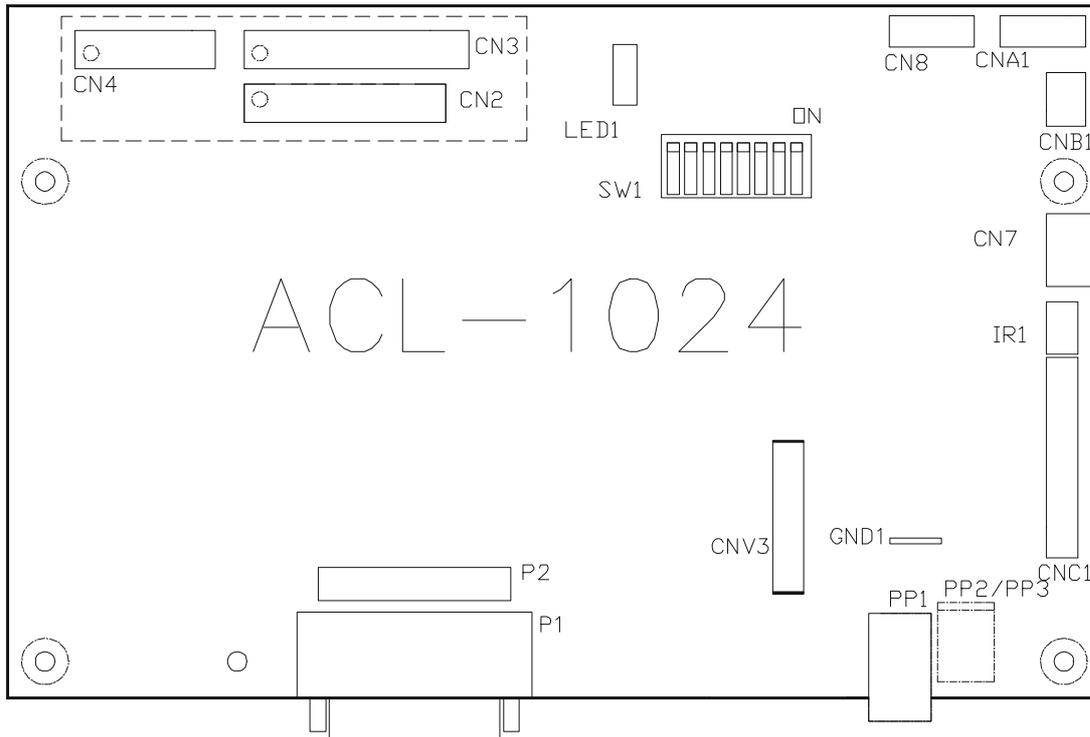
Audio Mute (Note 1)	OFF/ON
Volume (Note 1)	Define hot key as volume level increase/decrease
Brightness	Define hot key as brightness level increase/decrease
Contrast	Define hot key as contrast level increase/decrease
Color (display on video mode only)	Define hot key as color level increase/decrease
Input source (display on plugging DVB-1000)	Define hot key as input source PC/video
Video Input (display on video mode only)	Select video input Composite/S/component
Back	Go back to previous menu

**Languages – sub-sub menu**

English	English menu displayed (default)
Italiano	Italian menu displayed
Francais	French menu displayed
Espanol	Spanish menu displayed
Svenska	Sweden menu displayed
Nederlands	Holland menu displayed
Deutsche	German menu displayed
Back	Press + to returns to previous menu

## CONNECTORS, PINOUTS & JUMPERS

The various connectors are :



### Summary: Connectors

Ref	Purpose	Description
CN2	Panel signal	Hirose 28-pin, DF11-28DP-2DSA (Mating type : DF11-28DS-2C)
CN3	Panel signal	Hirose 32-pin, DF11-32DP-2DSA (Mating type : DF11-32DS-2C)
CN4	Panel signal	Hirose 20-pin, DF11-20DP-2DSA (Mating type : DF11-20DS-2C)
CN7	Audio Board connector	DIL socket header 5x2 right angle
CN8	RS-232 serial control	Header pin 6x1
CNA1	Auxiliary power output	JST 4-way, B4B-XH-A (Mating type : XHP-6)
CNB1	Backlight inverter	JST 5-way, B5B-XH-A (Mating type : XHP-5)
CNC1	Function controls	JST 12-way, B12B-XH-A (Mating type : XHP-12)
CNV3	Universal Digital video connector	Hirose FX8C-60P-SV5 (Mating type : Hirose FX8C-60P-SV5)
LED1	Dual color LED connector	Header pin 3x1
IR1	Infra-Red sensor connector	JST 3-way, B3B-XH-A (Mating type : XHP-3)
P1	VGA analog input	DB15-way DDC version
P2	VGA input (alternative)	Header pin 8 x 2
PP1	DC power in	DC power jack, 2.5mm contact pin diameter positive
PP2	DC power input (alternative)	DC power Molex 2-pin 0.156" pitch
PP3	DC power input (alternative)	DC power Molex 2-pin 0.20" pitch

Summary: Jumpers setting

Ref	Purpose	Note
JA1	On board +5V logic power enable	1-3 & 2-4 closed, factory set, do not remove
JA3	Panel power voltage select	1-3 & 2-4 = +3.3V panel voltage supply 3-5 & 4-6 = +5V panel voltage supply <b>CAUTION:</b> Incorrect setting will cause panel damage
JA4	RS-232 voltage level	1-3 & 2-4 = +12V (Activate RS-232 interface control) 3-5 & 4-6 = +5V
JA5	+12V Panel power voltage select	Open = Disable +12V panel power Enable = +12V safe panel power on CN3 pin 3 <b>CAUTION:</b> Incorrect setting will cause panel damage
JA6	Input power control	Short = External switch control Open = Switch mount control
JA7	Aux 12V optional	1-3 & 2-4 closed, factory set, do not remove
JB2	Backlight inverter on/off control – signal level	1-2 = On/Off control signal 'High' = +12V 2-3 = On/Off control signal 'High' = +5V Open = On/Off control signal 'High' = Open collector <b>CAUTION:</b> Incorrect setting can damage inverter.
JB3	Backlight inverter on/off control – polarity	1-2 = control signal 'high' = CCFT ON 2-3 = control signal 'low' = CCFT ON
JB9	Backlight inverter status	1-2 = active low 2-3 = active high
JB10	Backlight power control	Short = By MCU Open = Always enable
JP9	Image Orientation – Right/Left	1-2 = 4K7 Ohm resistor to panel supply level (High) 2-3 = Grounded (Low)
JP10	Image Orientation – Up/ Down	1-2 = Grounded (Low) 2-3 = 1K Ohm resistor to panel supply level (High)
JP13	Panel Clock Selection	1-2 = Panel with single pixel clock 2-3 = Panel with double pixel clock
JP14	Reserved	1-2 = Default setting
JP15	HSYNC Select	1-2 = Default setting
JP16	VSYNC Select	1-2 = Default setting
SW1	Panel & function selection	See table below

SW1: Panel and function selection

Pos. #	Function	Description
1	Clock phase change	Change this to obtain best image quality
2 & 3	Panel selection	ON, OFF = XGA panel OFF, ON = SVGA panel OFF, OFF = VGA panel
4	Volume selection	ON = Invoke OSD Volume control OFF = Disable OSD Volume control
5 & 6 & 7	Panel option	OFF OFF OFF = Double Pixel Sharp XGA Panel OFF OFF ON = Double Pixel Samsung XGA Panel OFF ON ON = Double Pixel Fujitsu XGA Panel ON OFF ON = Single Pixel LG XGA Panel ON OFF OFF = SVGA, VGA panel ON OFF ON = Mitsubishi SVGA panel ON ON OFF = Reserved for Toshiba SVGA panel ON ON ON = Unipac SVGA panel
8	Reserved	OFF

PINOUTS

CNA1 - Auxiliary power output, JST B4B-XH-A

PIN	SYMBOL	DESCRIPTION
1	AUX_12V	+12V DC, 500mA max.
2	AUX_GND	Ground
3	AUX_GND	Ground
4	AUX_Vcc	+5V DC, 500mA max

**CNV3 – Universal digital video connector, HIROSE FX8C-60P-SV5**

PIN	SYMBOL	DESCRIPTION
1	LIN	Audio Left
2	RIN	Audio Right
3	GNDA	Audio Ground
4	GNDA	Audio Ground
5	RED	Analog Red Signal(Reserved)
6	AGND	Analog Ground(Reserved)
7	Green	Analog Green Signal(Reserved)
8	AGND	Analog Ground(Reserved)
9	Blue	Analog Blue Signal(Reserved)
10	AGND	Analog Ground(Reserved)
11	/RGBHS	RGB H-Sync(Reserved)
12	/RGBVS	RGB V-Sync(Reserved)
13	/CHS	Composite Video Detect
14	/SHS	S-Video C-Sync Detect
15	/YHS	Component Video Detect
16	ID2	UDC ID bit 2
17	GND	Digital Ground
18	GND	Digital Ground
19	Y6	Luma data bit 6
20	Y7	Luma data bit 7
21	Y4	Luma data bit 4
22	Y5	Luma data bit 5
23	Y2	Luma data bit 2
24	Y3	Luma data bit 3
25	Y0	Luma data bit 0
26	Y1	Luma data bit 1
27	CB6	Blue color difference data bit 6
28	CB7	Blue color difference data bit 7
29	CB4	Blue color difference data bit 4
30	CB5	Blue color difference data bit 5
31	CB2	Blue color difference data bit 2
32	CB3	Blue color difference data bit 3
33	CB0	Blue color difference data bit 0
34	CB1	Blue color difference data bit 1
35	GND	Digital Ground
36	GND	Digital Ground
37	CR6	Red color difference data bit 6
38	CR7	Red color difference data bit 7
39	CR4	Red color difference data bit 4
40	CR5	Red color difference data bit 5
41	CR2	Red color difference data bit 2
42	CR3	Red color difference data bit 3
43	CR0	Red color difference data bit 0
44	CR1	Red color difference data bit 1
45	+12V	+12V Supply
46	ID1	UDC ID bit 1
47	+12V	+12V Supply
48	ID0	UDC ID bit 0
49	TVCLK	Pixel Clock(13.5MHz)
50	TVCLK2	Pixel Clock x 2
51	/TVHS	Video H-Sync
52	/TVVS	Video V-Sync
53	TVVACT	Video Active
54	TVODD	Video Odd
55	SCLK	IIC Serial Clock
56	SDATA	IIC Serial Data
57	/RESET	Reset
58	OEN	Output Enable
59	+5V	+5V Supply
60	+5V	+5V Supply

**CN2 – Panel connector: HIROSE DF11-28DP-2DSA**

PIN	SYMBOL	DESCRIPTION
1	GND	Ground
2	GND	Ground
3	P_ER2	Even data bit R2
4	P_OR2	Odd data bit R2
5	P_ER3	Even data bit R3
6	P_OR3	Odd data bit R3
7	P_ER4	Even data bit R4
8	P_OR4	Odd data bit R4
9	P_ER5	Even data bit R5
10	P_OR5	Odd data bit R5
11	P_EG2	Even data bit G2
12	P_OG2	Odd data bit G2
13	P_EG3	Even data bit G3
14	P_OG3	Odd data bit G3
15	P_EG4	Even data bit G4
16	P_OG4	Odd data bit G4
17	P_EG5	Even data bit G5
18	P_OG5	Odd data bit G5
19	P_EB2	Even data bit B2
20	P_OB2	Odd data bit B2
21	P_EB3	Even data bit B3
22	P_OB3	Odd data bit B3
23	P_EB4	Even data bit B4
24	P_OB4	Odd data bit B4
25	P_EB5	Even data bit B5
26	P_OB5	Odd data bit B5
27	GND	Ground
28	GND	Ground

**CN3 – Panel connector: HIROSE DF11-32DP-2DSA**

PIN	SYMBOL	DESCRIPTION
1	+12V	DC +12V, reserved & not normally used
2	+12V	DC +12V, reserved & not normally used
3	NC/VLCD12	No connection or 12V VLCD
4	NC	No connection
5	GND	Ground
6	GND	Ground
7	P_ER6	Even data bit R6
8	P_OR6	Odd data bit R6
9	P_ER7	Even data bit R7 (MSB of lower colour bit panels)
10	P_OR7	Odd data bit R7 (MSB of lower colour bit panels)
11	P_EG6	Even data bit G6
12	P_OG6	Odd data bit G6
13	P_EG7	Even data bit G7 (MSB of lower colour bit panels)
14	P_OG7	Odd data bit G7 (MSB of lower colour bit panels)
15	P_EB6	Even data bit B6
16	P_OB6	Odd data bit B6
17	P_EB7	Even data bit B7 (MSB of lower colour bit panels)
18	P_OB7	Odd data bit B7 (MSB of lower colour bit panels)
19	GND	Ground
20	GND	Ground
21	Vcc	DC +5v, reserved & not normally used
22	Vcc	DC +5v, reserved & not normally used
23	P_VS	Vertical sync
24	/PwrDn	Power down control signal (5V TTL)
25	P_HS	Horizontal sync
26	P_DE	Display enable
27	P_VLCD	Panel supply (switched)
28	P_VLCD	Panel supply (switched)
29	P_CLK	Even dot clock (shift clock)
30	P_CLK	Odd dot clock (shift clock)
31	GND	Ground
32	GND	Ground

**CN4 – Panel connector: HIROSE DF11-20DF-2DSA**

PIN	SYMBOL	DESCRIPTION
1	GND	Ground
2	GND	Ground
3	NC	No connection
4	NC	No connection
5	P_ER0	Even data bit R0 (LSB)
6	P_OR0	Odd data bit R0 (LSB)
7	P_ER1	Even data bit R1
8	P_OR1	Odd data bit R1
9	P_EG0	Even data bit G0 (LSB)
10	P_OG0	Odd data bit G0 (LSB)
11	P_EG1	Even data bit G1
12	P_OG1	Odd data bit G1
13	P_EB0	Even data bit B0 (LSB)
14	P_OB0	Odd data bit B0 (LSB)
15	P_EB1	Even data bit B1
16	P_OB1	Odd data bit B1
17	Up/Dn	Up / Down orientation (set by JP10)
18	R/L	Right / Left orientation (set by JP9)
19	GND	Ground
20	GND	Ground

**CN7 – Audio board connector, DIL SOCKET HEADER 5x2 Right angle**

PIN	SYMBOL	DESCRIPTION
1	Vcc	Audio board logic power supply, +5V
2	VOLSEL0	Volume control select signal
3	VOLSEL1	Volume control select signal
4	DATA/DN	Data for Audio volume control
5	CLK	Clock for Audio volume control
6	GND	Ground
7	+12V	Audio board power supply, +12V
8	LIN	Audio channel L (re-route RCA connector to audio board)
9	RIN	Audio channel R (re-route RCA connector to audio board)
10	AUDIO_GND	Ground for Audio analog

**CN8 – Serial Control In, 6x1 Pin Header**

PIN	SYMBOL	DESCRIPTION
1	SDATA	Reserved
2	SCLK	Reserved
3	Vcc	+5V
4	TXD	RS-232 Tx Data
5	GND	Ground
7	RXD	RS-232 Rx Data

**CNB1 - To backlight inverter, JST B5B-XH-A**

PIN	SYMBOL	DESCRIPTION
1	GND	Ground
2	VBKL	Backlight power supply, +12VDC (switched)
3	BLCTRL	Backlight On/Off control signal (refer to JB2 & JB3)
4	BVR_WIP	Backlight brightness VR pin WIP
5	BVR_A	Backlight brightness VR pin A

**CNC1 – Control switch, JST B12B-XH-A**

PIN	SYMBOL	DESCRIPTION
1	PSWIN	Power button A
2	SW_ON	Power button B
3	BVR_A	Backlight Brightness VR pin A
4	BVR_WIP	Backlight Brightness R pin WIP
5	BVR_B	Backlight Brightness VR pin B (470 ohm resistor to +5V Vcc)
6	GND	Ground
7	MENU	OSD menu
8	-/LEFT	OSD -/Left
9	+ /RIGHT	OSD +/Right
10	SEL_DN	OSD Select down
11	SEL_UP	OSD Select up
12	PWR	Power

**IR1 – Infra-Red sensor connector: JST B3B-XH-A**

PIN	SYMBOL	DESCRIPTION
1	GND	Reserved
2	+5V	Stand by voltage
3	IR Data	IR data

**LED1 – Status LED connector: 3-pin header**

PIN	DESCRIPTION
1	Green LED pin (anode)
2	LED pin common (cathode)
3	Red LED pin (anode)

**P1 & P2 - ANALOG VGA INPUT - 15 way connector**

PIN	SYMBOL	DESCRIPTION
1	PCR	Red, analog
2	PCG	Green, analog
3	PCB	Blue analog
4	ID2	Reserved for monitor ID bit 2 (grounded)
5	AGND	Analog ground
6	AGND	Analog ground red
7	AGND	Analog ground green
8	AGND	Analog ground blue
9	DDC_5V	+5V power supply for DDC (optional)
10	AGND	Analog ground
11	ID0	Reserved for monitor ID bit 0 (grounded)
12	DDC_SDA	DDC serial data
13	CS/HS_IN	Horizontal sync or composite sync, input
14	VS_IN	Vertical sync, input
15	DDC_SCL	DDC serial clock

Pin 16 for P2 is no connection

**PP1 - 12VDC power supply - input**

PIN	DESCRIPTION
1	+12VDC in center pin
2	Ground

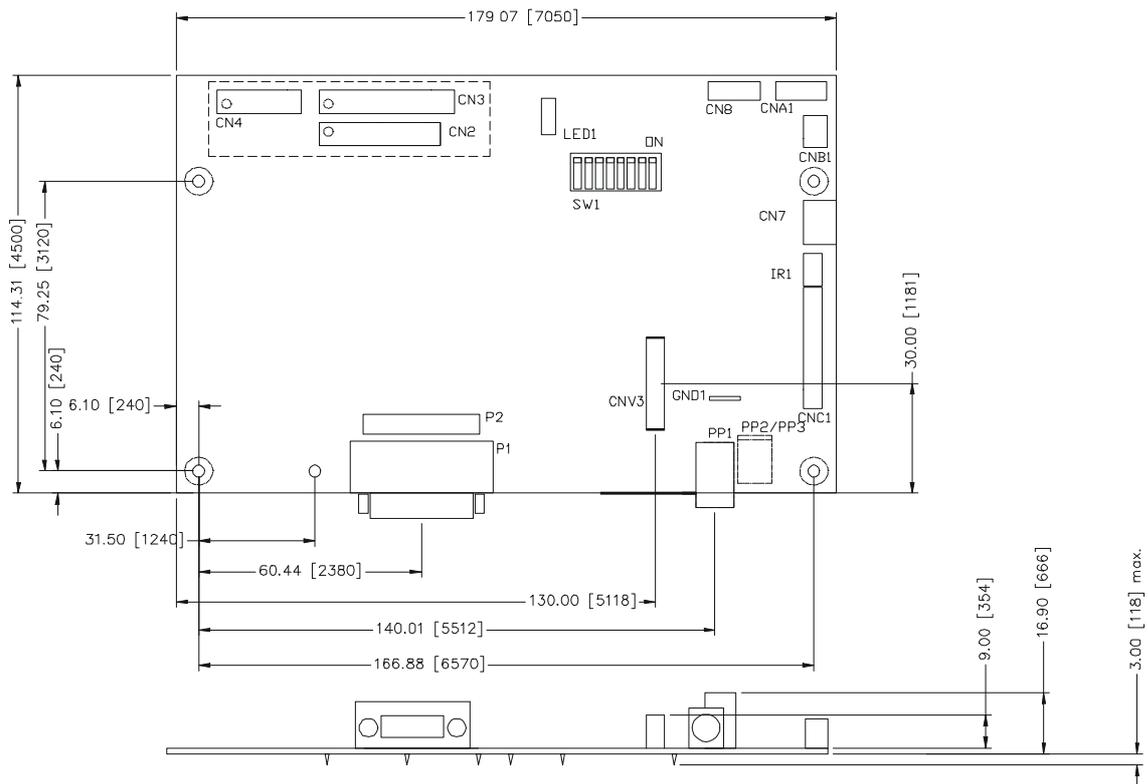
**PP2 – Alternate 12VDC power supply - input**

PIN	DESCRIPTION
1	+12VDC
2	Ground

**PP3 – Alternate 12VDC power supply - input (Not installed normally)**

PIN	DESCRIPTION
1	+12VDC
2	Ground

## CONTROLLER DIMENSIONS



The maximum thickness of the controller is 16.9mm (measured from bottom of PCB to top of components, including any underside components & leads). We recommend clearances of:

- 5mm from bottom of PCB - if mounting on a metal plate we also recommend a layer of suitable insulation material is added to the mounting plate surface.
- 10mm above the components
- 3-5mm around the edges

Any of the holes shown above can be used for mounting the PCB, they are 3.2mm in diameter. Other holes are used for mounting inverters supplied as fitted options.

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

## APPLICATION NOTES

### USING THE CONTROLLER WITHOUT SWITCHES ATTACHED

This is very straightforward:

- With controls attached and display system active make any settings for colour and image position as required then switch everything off.
- Remove the control switches, the 12 way (CNC1) cables.
- Use a jumper or similar to connect pins 1 & 2 on CNC1, this will fix the board On.
- 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.

**Summary:** On CNC1 the only functions that are used are for On/Off and Brightness (if controller mounted inverter is used). On CNC1 the pins are for momentary buttons so it doesn't matter that no buttons are attached.

### INVERTER CONNECTION

There are potentially 3 issues to consider with inverter connection:

1. Power
2. Enable
3. Brightness

Please read the following sections for a guide to these issues.

**Inverter Power:** As per the table for CNB1 pin 1 is ground and pin 2 provides 12V DC. This should be matched with the inverter specification: see table.

#### CNB1

PIN	DESCRIPTION
1	ground
2	+12VDC

**Enable:** This is a pin provided on some inverters for On/Off function and is used by this panel controller for VESA DPMS compliance. If the inverter does not have an enable pin or the enable pin is not used then DPMS will not be operational. Pin 3 should be matched to the inverters specification for the 'enable' or 'disable' pin.

#### CNB1

PIN	DESCRIPTION
3	enable

Further, jumpers JB2 & JB3 should be set to match the inverters specification for the enable pin power and High or Low setting: see table.

Ref	Purpose	Note
JB2	inverter enable voltage	1-2 H=12V, 2-3 H=5V (Vcc), OPEN H=open collector
JB3	inverter control	1-2 H=On, 2-3 L=On

**Brightness:** There are various methods for brightness control and it is important to consider the specifications for the inverter to be used. Generally the situation is:

1. Brightness can be controlled by using a VR.
2. Brightness controlled adding a circuit such as PWM (Pulse Width Modulation).
3. No adjustment of brightness is possible.

CNB1 pins 4 & 5 are available for connecting to an inverter or circuit where VR control is supported.

#### CNB1

PIN	DESCRIPTION
4	VR WIP
5	VR A

This can then be matched with function controls connected to CNB1 pins 3 & 4: see table.

#### CNB1

PIN	DESCRIPTION
3	VR A
4	VR WIP

## TROUBLESHOOTING

### General

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

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

Through step by step cross checking 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 just see some image on the display.
- 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, ie the image adjustment controls will not move the image far enough, then test using another graphics card. This situation can occur with a custom graphics card that is not close to standard timings or if something is in the graphics line that may be affecting the signal such as a signal splitter (please note that normally a signal splitter will not have any bad effect).

### Image appearance:

- A faulty panel can have blank lines, failed sections, flickering or flashing display
- Incorrect graphics card refresh rate, resolution or interlaced mode will probably cause the image to be the wrong size, to scroll, flicker badly or possibly even no image.
- Incorrect jumper settings on the controller may cause everything from total failure to incorrect image. 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.
- For a specific backlight tube check the AC pins orientation (CAUTION: never reverse any DC power pins).

Also:

- If adjusting brightness control has no effect the chances are that the VR rating or method of adjusting brightness is not compatible or correctly connected to the inverter.
- If system does not power down when there is a loss of signal.

### Continued failure:

- If unit after unit keeps failing consider and investigate whether you are short circuiting the equipment or doing something else seriously wrong.

Generally after common sense issues have been resolved we recommend step by step substitution of known working parts to isolate the problem.

## SPECIFICATIONS

Panel compatibility	1024 x 768, 800x600, 640x480 TFT LCD's from manufacturers such as Chi Mei, Fujitsu, Hitachi, LG, Mitsubishi, NEC, Samsung, Sanyo, Sharp.
No. of colours	Up to 3 x 8 bit providing 16.7 million colours.
Vertical refresh rate	XGA resolution up to 60Hz, SVGA resolution up to 60Hz. VGA resolution up to 60Hz
Dot clock (pixel clock) maximum	78.75MHz
Graphics formats	Standard XGA,SVGA,VGA
Standard input at source	VGA analog (15-pin) standard, separate sync only. Composite/ S-video/ component signal source (PAL/NTSC/SECAM) optional by plugging the video input add-on board DVB-1000*
Controls available	- On/Off - Brightness (inverter) - OSD menu, - OSD select up - OSD select down - OSD setting + - OSD setting -
Control interface	- Buttons - Infra-red - RS-232**
Settings memory	Settings are stored in non volatile memory
Multi-language OSD support	7 languages (English, Italian, French, Spanish, Sweden, Holland and German)
VESA DPMS implementation	Yes
Plug & Play	VESA DDC 1, 2/b compatible
Voltage output for LCD	+3.3V DC, +5V DC
Input voltage	12VDC
Power protection	Fuse fitted - auto reset
DC Power handling	An on board relay handles the power load for On/Off and power protection to the LCD.
Power load maximum	The controller has an overall 2.5Amp resettable fuse under current limit.
Controller power consumption	Approx 2.5W (controller logic only, no panel)
Controller dimensions	179.07mm x 114.31mm x 16.9mm
Storage temperature limits	-40°C to +70°C
Operating temperature limits	0°C to +65°C

### NOTES

Please note the following:

- For specific panel setup a sample of an LCD may be required (this will be returned) and a copy of the full technical specifications for the panel from the manufacturer.
- Layout and custom development services are available.

\* Only function in P/N 4166200-14 or up version

\*\* Only function in P/N 4166200-15 version

## Appendix :

### RS-232 interface command protocol

#### 1. Commands to implement switch mount control buttons

Function	Command	Description	Remark
Menu button	0xf7	Menu button pressed	Button equivalent
Select-down button	0xfa	Select-down button pressed	Button equivalent
Select-up button	0xfb	Select-up button pressed	Button equivalent
Right/+ button	0xfc	Right/+ button pressed	Button equivalent
Left/- button	0xfd	Left/- button pressed	Button equivalent

#### 2. Parameter setting - immediate, relative, reset and query

Function	Command	Description	Acknowledge (if enabled)
Volume control - left+right channel	0x80, "a"   "A", nn   "+"   "-"   "r"   "R"   "?"	Set audio (L+R) volume = value/increment/decrement Reset Query	volume left + right. nn : 00 ~ 1F Each division : 01  <i>The volume option will activate if dip switch (SW1) position #4 is ON</i>
Volume control - on/off (mute)	0x80, "m"   "M", "0"   "1"   "r"   "R"   "?"	Disable audio output. Enable audio output. Reset Query	"0" – audio off (muted). "1" – audio on.  <i>The volume option will activate if dip switch (SW1) position #4 is ON</i>
Brightness control	0x81, nn   "+"   "-"   "r"   "R"   "?"	Set brightness = value/increment/decrement Reset Query	Brightness.  PC mode - nn : 10 ~ FC Each division : 04  Video mode – nn : 20 ~ DE Each division : 01
Contrast control - all channels	0x82, "a"   "A", nn   "+"   "-"   "r"   "R"   "?"	Set all contrast = value/increment/decrement Reset Query	Contrast red.  PC mode - nn : 1E ~ F0 Each division : 06  Video NTSC mode – nn : 01 ~ 33, Each division : 01  Video PAL/SECAM mode – nn : 00 ~ 33, Each division : 01
Contrast control - red channel	0x82, "r"   "R", nn   "+"   "-"   "r"   "R"   "?"	Set red contrast = value/increment/decrement Reset Query	Contrast red.  nn : 05 ~ 28 Each division : 01 (In PC mode only)
Contrast control - green channel	0x82, "g"   "G", nn   "+"   "-"   "r"   "R"   "?"	Set green contrast = value/increment/decrement Reset Query	Contrast green.  nn : 05 ~ 28 Each division : 01 (In PC mode only)
Contrast control - blue channel	0x82, "b"   "B", nn   "+"   "-"   "r"   "R"   "?"	Set blue contrast = value/increment/decrement Reset Query	Contrast blue.  nn : 05 ~ 28 Each division : 01 (In PC mode only)

Color control	0x83, nn   "+"   "-"   "r"   "R"   "?"	Set color = value/increment/decrement Reset Query	PAL/NTSC color ( <i>In video mode only</i> )  NTSC/PAL : nn : 00 ~ FE, each division : 02  SECAM – nn : 5A ~ B4, each division : 02
Tint control	0x84, nn   "+"   "-"   "r"   "R"   "?"	Set tint = value/increment/decrement Reset Query	NTSC tint ( <i>In NTSC mode only</i> )  nn : 00 ~ FE, each division : 02
Phase (tuning) control	0x85, nn   "+"   "-"   "r"   "R"   "?"	Set dot clock phase = value/increment/decrement Reset Query	Dot clock phase. ( <i>In PC mode only</i> )  nn : 00~1F, each division : 01
Image H position	0x86, nnnn   "+"   "-"   "r"   "R"   "?"	Set img_hpos = value/increment/decrement Reset Query	Image horizontal position.  Vpos for VGA panel : EGA (640x350) : 70Hz mode – nnnn : 005F ~ 008C EGA (640x400) : 70Hz mode – nnnn : 005E ~ 008C Text (720x400) : 70Hz mode – nnnn : 005E ~ 008C VGA (640x480) : 60Hz – nnnn : 005E ~ 0093 72Hz – nnnn : 003E ~ 0070 75Hz – nnnn : 0036 ~ 0062 Video NTSC : nnnn : 0020 ~ 00d4 PAL/SECAM : nnnn : 0030 ~ 0058  Vpos for SVGA panel : EGA (640x350) : 70Hz mode – nnnn : 0050 ~ 0090 EGA (640x400) : 70Hz mode – nnnn : 0058 ~ 0090 Text (720x400) : 70Hz mode – nnnn : 0048 ~ 0088 VGA (640x480) : 60Hz – nnnn : 0050 ~ 0090 72Hz – nnnn : 0048 ~ 0088 75Hz – nnnn : 0038 ~ 0078 SVGA (800x600) : 56Hz – nnnn : 0020 ~ 0060 60Hz – nnnn : 0010 ~ 0050 72Hz – nnnn : 0030 ~ 0070 75Hz – nnnn : 0000 ~ 0040 Video NTSC : nnnn : 0000 ~ 00C8 PAL/SECAM : nnnn : 0000 ~ 00BC  Vpos for XGA panel : EGA (640x350) : 70Hz mode – nnnn : 005F ~ 0087 EGA (640x400) : 70Hz mode – nnnn : 0066 ~ 0087 Text (720x400) : 70Hz mode – nnnn : 0050 ~ 0078 VGA (640x480) :

			60Hz – nnnn : 0066 ~ 0084 62Hz – nnnn : 005C ~ 007A 72Hz – nnnn : 0044 ~ 0080 75Hz – nnnn : 0040 ~ 0064 SVGA (800x600) : 56Hz – nnnn : 002E ~ 003F 60Hz – nnnn : 001F ~ 003A 72Hz – nnnn : 0038 ~ 0053 75Hz – nnnn : 0000 ~ 0027 XGA (1024x768) : 60Hz – nnnn : 00C4 ~ 00FE 70Hz – nnnn : 00D2 ~ 00FE 72Hz – nnnn : 0004 ~ 0046 75Hz – nnnn : 00D6 ~ 00FE Video : nnnn : 0000 ~ 00FC  Each division : 0001
Image V position	0x87, nnnn   “+”   “-”   “r”   “R”   “?”	Set img_vpos = value/increment/decrement Reset Query	Image vertical position.  Vpos for VGA panel : EGA (640x350) : 70Hz mode – nnnn : 0000 ~ 0038 EGA (640x400) : 70Hz mode – nnnn : 0000 ~ 0030 Text (720x400) : 70Hz mode – nnnn : 0000 ~ 0030 VGA (640x480) : 60~75Hz – nnnn : 0000 ~ 0030 Video : nnnn : 0006 ~ 0027  Vpos for SVGA panel : EGA (640x350) : 70Hz mode – nnnn : 0050 ~ 0080 EGA (640x400) : 70Hz mode – nnnn : 0018 ~ 0048 Text (720x400) : 70Hz mode – nnnn : 0010 ~ 0040 VGA (640x480) : 60Hz – nnnn : 0010 ~ 0040 72Hz – nnnn : 0008 ~ 0038 75Hz – nnnn : 0000 ~ 0030 SVGA (800x600) : 56~72Hz – nnnn : 0000 ~ 0030 75Hz – nnnn : 0000 ~ 0030 Video : nnnn : 000A ~ 0020  Vpos for XGA panel : EGA (640x350) : 70Hz mode – nnnn : 0010 ~ 006F EGA (640x400) : 70Hz mode – nnnn : 0000 ~ 003F Text (720x400) : 70Hz mode – nnnn : 0000 ~ 003F VGA (640x480) : 60~72Hz – nnnn : 0000 ~ 0038 75Hz - nnnn : 0000 ~ 0026 SVGA (800x600) : 56Hz – nnnn : 0000 ~ 002A 60Hz – nnnn : 0000 ~ 0030 72Hz – nnnn : 0000 ~ 0038 75Hz – nnnn : 0000 ~ 002A XGA (1024x768) :

			60~72Hz – nnnn : 0000 ~ 0038 75Hz – nnnn : 0000 ~ 0030 Video : nnnn : 0008 ~ 0027  Each division : 0001
H total size	0x88, nnnn   “+”   “-”   “r”   “R”   “?”	Set hsize = value/increment/decrement Reset Query	Horizontal total size.  Hsize for VGA panel : EGA (640x350) : 70Hz mode – nnnn : 0786 ~ 0814 EGA (640x400) : 70Hz mode – nnnn : 0786 ~ 0814 Text (720x400) : 70Hz mode – nnnn : 0886 ~ 0914 VGA (640x480) : 60Hz – nnnn : 0786 ~ 0814 72Hz – nnnn : 0818 ~ 0846 75Hz – nnnn : 0826 ~ 0854 Video NTSC: nnnn : 0846 ~ 0915 PAL/SECAM : nnnn : 0789 ~ 0850  Vpos for SVGA panel : EGA (640x350) : 70Hz mode – nnnn : 0774 ~ 0826 EGA (640x400) : 70Hz mode – nnnn : 0774 ~ 0826 Text (720x400) : 70Hz mode – nnnn : 0874 ~ 0926 VGA (640x480) : 60Hz – nnnn : 0774 ~ 0826 72Hz – nnnn : 0806 ~ 0858 75Hz – nnnn : 0814 ~ 0866 SVGA (800x600) : 56Hz – nnnn : 998 ~ 1050 60Hz – nnnn : 1030 ~ 1082 72Hz – nnnn : 1014 ~ 1066 75Hz – nnnn : 1030 ~ 1082 Video NTSC : nnnn : 0971 ~ 1051 PAL/SECAM : nnnn : 0978 ~ 1062  Vpos for XGA panel : EGA (640x350) : 70Hz mode – nnnn : 0784 ~ 0814 EGA (640x400) : 70Hz mode – nnnn : 0790 ~ 0814 Text (720x400) : 70Hz mode – nnnn : 0884 ~ 0914 VGA (640x480) : 60Hz – nnnn : 0784 ~ 0814 72Hz – nnnn : 0816 ~ 0846 75Hz – nnnn : 0824 ~ 0854 SVGA (800x600) : 56Hz – nnnn : 1014 ~ 1038 60Hz – nnnn : 1040 ~ 1066 72Hz – nnnn : 1022 ~ 1070 75Hz – nnnn : 1040 ~ 1070 XGA (1024x768) : 60Hz – nnnn : 1318 ~ 1358 70Hz – nnnn : 1296 ~ 1414 72Hz – nnnn : 1264 ~ 1332

			75Hz – nnnn : 1286 ~ 1338 Video NTSC : nnnn : 1241 ~ 1394 PAL/SECAM : 1249 ~ 1404
V total size	0x89, nnnn   “+”   “-”   “r”   “R”   “?”	Set vsize = value/increment/decrement Reset Query	Vertical total size.  (Display in video only)  vsize for VGA panel : Video NTSC : nnnn : 0001 ~ 001F PAL/SECAM : nnnn : 0000 ~ 0019  Vsize for SVGA panel : Video : nnnn : 0000 ~ 0007  Vsize for XGA panel : Video NTSC : nnnn : 0003 ~ 001D PAL/SECAM : nnnn : 0004 ~ 0019  Each division : 0001
Sharpness	0x8a, n   “+”   “-”   “r”   “R”   “?”	Set sharpness = value/increment/decrement Reset Query	Sharpness.  PC : n : 0 ~ 3 Video : n : 0 ~ 7  Each division : 1
OSD H position	0x90, nnn   “+”   “-”   “r”   “R”   “?”	Set osd_hpos = value/increment/decrement Reset Query	OSD horizontal position.  osd hpos for : VGA panel : nnn : 000 ~ 02F SVGA panel : nnn : 000 ~ 022 XGA panel : nnn : 000 ~ 03E  Each division : 001

OSD V position	0x91, nnn   "+"   "-"   "r"   "R"   "?"	Set osd_vpos = value/increment/decrement Reset Query	OSD vertical position.  osd vpos for : VGA panel : nnn : 000 ~ 01B SVGA panel : nnn : 000 ~ 02A XGA panel : nnn : 000 ~ 03C  Each division : 001
OSD Transparency	0x92, n   "+"   "-"   "r"   "R"   "?"	Set OSD transparency = value/increment/decrement Reset Query	OSD transparency.  n : 0 ~ 3, each division : 1
Select menu timeout	0x93, nn   "+"   "-"   "r"   "R"   "?"	Select menu timeout = value/increment/decrement Reset Query	OSD menu timeout value. "00" : Continuous. Acknowledge : 05 Range in "01"- "10": round up to "10":10s Acknowledge : 00 Range in "11"- "20": round up to "20":20s Acknowledge : 01 Range in "21"- "30": round up to "30":30s Acknowledge : 02 Range in "31"- "45": round up to "45":45s Acknowledge : 03 Range in "46"- "60": round up to "60":60s Value > "60" : round off to "60" Acknowledge : 04
Select autosave mode	0x94, "0"   "1"   "r"   "R"   "?"	Select autosave = On/Off Reset Query	"0" – autosave off. "1" – autosave on.
Select OSD language	0x95, n   "r"   "R"   "?"	Select language = English, Italian,... Reset Query	"0" – English. "1" – Italian. "2" – French. "3" – Spanish. "4" – Swedish. "5" – Dutch. "6" – German.
Input main select	0x98, n   "+"   "-"   "r"   "R"   "?"	Select input main = PC or VIDEO or next available Reset Query	"0" – PC. "1" – VIDEO.
Source Priority	0x99, "0"   "1"   "r"   "R"   "?"	Set exclusive or priority = Exclusive/Priority Reset Query	"0" – Exclusive. "1" – Priority.
Video type select	0x9a, n   "+"   "-"   "r"   "R"   "?"	Select video type = S-Video or Composite Video or Component Video or next Reset Query	Video model detected. "0" – Composite video. "1" – S-video. "2" – Component video. (In video mode only)

Video System	0x9b, “0”   “1”   “2”   “3”   “r”   “R”   “?”	Set video system = Auto/NTSC/PAL/SECAM Reset Query	“0” – Auto. “1” – NTSC “2” – PAL “3” – SECAM <i>(In video mode only)</i>
GAMMA value select	0x9d, n   “r”   “R”   “?”	Select GAMMA value = Value Reset Query	GAMMA value: “0” – 1.0 “1” – 1.6 “2” – 2.2 “3” – 2.8 <i>(In video mode only)</i>
Set text/graphics mode	0x9e, “0”   “1”   “r”   “R”   “?”	Set x400 mode = 720x400 or 640x400 mode Reset Query	“0” – 720x400 mode. “1” – 640x400 mode. <i>(In PC mode only)</i>
Power Down / DPMS Option	0x9f, “0”   “1”   “r”   “R”   “?”	Set power down option = On/Off Reset Query	“0” – Off. “1” – On. <i>(In video mode only)</i>
Direct Access (Hotkeys)	0xa0, “1”, n   “r”   “R”   “?”	Set Hotkey 1= value Reset Query	“0” – audio mute. “1” – volume. “2” – brightness. “3” – contrast. “4” – color. “5” – input source. “6” – video input.
Direct Access (Hotkeys)	0xa0, “2”, n   “r”   “R”   “?”	Set Hotkey 2 = value Reset Query	“0” – audio mute. “1” – volume. “2” – brightness. “3” – contrast. “4” – color. “5” – input source. “6” – video input.
Set runtime counter	0xa1, nnnnn   “r”   “R”   “?”	Set runtime counter value = nnnnn (* 0.5 hour) Reset Query	Runtime = nnnnn.
OSD status enquiry	0xbb	Status of OSD	“0” – OSD turned off “1” – OSD turned on
OSD turn off	0xbd	Turn off the OSD.	“0” – fail. “1” – successful.

### 3. System information query

Function	Command	Description	Return
Display type	0xc0, "1"	Display panel type.	Display type = nn.
BIOS version	0xc0, "5"	BIOS version = Vnn.nn.	F/W version = "V"mm.nn.

### 4. Other control

Function	Command	Description	Acknowledge (if enabled)
Select RS-232 acknowledge	0xc1, "0"   "1"	Disable/enable command acknowledge.	"1" – acknowledge enabled. "0" – acknowledge disabled.
Select video mode	0xc2, nn	Current vmode = nn. Select video mode table refer to section 5	Current video mode selected.
Auto-setup	0xc3	Start auto-setup of current vmode.	"0" – fail. "1" – successful.
Command availability	0xc4, nn	Check whether a command is available.	"0" – not available. "1" – available.
Reset parameter	0xce	Reset all parameters to default value	"1" – successful.
Reset all parameter	0xcf	Reset all parameters for all video modes to default value	"1" – successful.

n = 1-byte ascii-coded hex number, e.g., parameter value of 0x1 is represented by "1" (0x31).

nn = 2-byte ascii-coded hex number, e.g., parameter value of 0x1e is represented by "1", "e" | "E" (0x31, 0x6e|0x4e).

Remarks:

1. If the volume control is disabled in DIP Switch setting, the RS-232 command will have no control on volume.
2. If the data sent to the controller is out of range, the controller will not set that value and there will be no acknowledgement.
3. If the command sent to the controller is not available for that controller, there will be no acknowledgement.
4. The controller will response to RS-232 command when the controller is in standby, no video input or normal operating condition.
5. If the following parameters are changed through RS-232: Power Down Option, Exclusive/Priority, Input Source, Video Input, the controller should change state according to the latest setting immediately.
6. If there is no video input, all the image adjustment command should only set the EEPROM value. No actual hardware programming is required.
7. This controller has been designed to take wide range of input signals. But however to optimize the PC's graphics performance, we recommend choosing 60Hz vertical refresh rate to avoid the screen flickering

### 5 Select video mode table

Mode	Video mode (0xc2,nn)
EGA 640x350@70Hz	20
EGA 640x400@70Hz	22
EGA 720x400@70Hz	24
VGA 640x480@60Hz	29
VGA 640x480@72Hz	2b
VGA 640x480@75Hz	2c
SVGA 800x600@56Hz	30
SVGA 800x600@60Hz	31
SVGA 800x600@72Hz	33
SVGA 800x600@75Hz	34
XGA 1024x768@60Hz	39
XGA 1024x768@70Hz	3a
XGA 1024x768@75Hz	3c
NTSC 60Hz	80
PAL 50Hz	88
SECAM	90

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## WARRANTY

The products are warranted against defects in workmanship and material for a period of one (1) year from the date of purchase provided no modifications are made to it and it is operated under normal conditions and in compliance with the instruction manual.

The warranty does not apply to:

- Product that has been installed incorrectly, this specifically includes but is not limited to cases where electrical short circuit is caused.
- Product that has been altered or repaired except by the manufacturer (or with the manufacturer's consent).
- Product that has subjected to misuse, accidents, abuse, negligence or unusual stress whether physical or electrical.
- Ordinary wear and tear.

Except for the above express warranties, the manufacturer disclaims all warranties on products furnished hereunder, including all implied warranties of merchantability and fitness for a particular application or purpose. The stated express warranties are in lieu of all obligations or liabilities on the part of the manufacturer for damages, including but not limited to special, indirect consequential damages arising out of or in connection with the use of or performance of the products.

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## CAUTION

Whilst care has been taken to provide as much detail as possible for use of this product these instructions cannot be relied upon as an exhaustive source of information. This product is for use by suitably qualified persons who understand the nature of the work they are doing and are able to take suitable precautions and design and produce a product that is safe and meets regulatory requirements.

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## LIMITATION OF LIABILITY

The manufacturer's liability for damages to customer or others resulting from the use of any product supplied hereunder shall in no event exceed the purchase price of said product.

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