

# TFT-LCD Control Board

**MODEL : G19AL-02, WUXGA**

(Rev1.0)

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## 1. General Description

G19AL-02 interface board is designed to support high resolution and large size TFT-LCD panels for professional monitor applications. G19AL-02 is a fully buffered multi-sync interface controller for providing analog and digital connection for a wide range of TFT-LCD panels up to **WUXGA** resolution. It is also featuring **PIP/POP/PBP** functions. This board supports Analog RGB, DVI, Component, Composite video and S-Video signal inputs and also can support video standards NTSC, PAL and SECAM. Also this board has audio processor and amplifier for stereo audio signal. This user interface board includes Auto-Adjust, Brightness, Contrast, Position adjustment etc. via on-screen display (OSD).

## 2. Feature

- Analog RGB, DVI, Component (YPbPr), Composite Video (CVBS), S-Video input
- Audio input and Headphone output
- Up to WUXGA (1920x1200) panel support
- LVDS 1port / 2 port, 6bit / 8bit output enable (up to 16.7 million colors)
- PIP, POP, PBP function
- 3D Deinterlace
- 3D Comb Filter (CVBS, S-Video)
- Full CRT multi-sync monitor compatible
- CGA free mode (under 21khz)
- External OSD buttons, Remote Control, RS232C(option) control available
- VESA DDC 1/2B compliant
- Compatible with VESA DPMS power saving modes
- Speaker output Max. 3W (Audio amplifier included)
- SMPS connector ready for large size panel
- 12 / 18V / 24VDC (DC Jack or SMPS) power input
- 5V and 12V panel power support
- Dimension : 183mm x 130mm

## 3. Specification

ITEM	Description	ivHD-AV1
<b>Output</b>	Resolution	Up to WUXGA(1920X1200)
	Color Depth	6bit / 8bit (up to 16.7 million colors)
	Interface	1port (Under XGA) LVDS, 2port (SXGA ~WUXGA) LVDS
	Panel Power	5V / 12V
	Inverter Additional VDD	Ready to fit large size LCD panel
	Headphone Output	Stereo Jack x1
	Speaker	2pin Connector x2, 3W Max
<b>Input</b>	DC Power	12V / 18V / 24V
	PC Analog RGB	DSUB-15
	DVI	DVI-D
	Component	YPbPr (480i ~ 1080i), 7pin Mini-Din x1
	A/V	CVBS + L/R, RCA x3
	S-Video	Y/C, 4pin Mini-Din
	Audio In	Stereo Jack x1 (for PC)
<b>Function</b>	3D-Deinterlace	All interlace signal
	Comb Filter	3D-Comb Filter
	Image Enhancement	CTI, Flesh Tone, YUV Color Domain, H/V Peaking
	Zoom	4Mode (FULL, ASPECT, ZOOM, USER)
	Double Window	3Mode (PIP, POP, PBP)
	CGA Free mode	It can accept any CGA mode under 21khz (HV size auto adjust)
<b>Controller</b>	OSD Key	MENU, UP, DOWN, LEFT (Decrease), RIGHT (Increase), SOURCE, POWER
	Remote Controller	Yes
	RS232C	Ready (Option)

## 4. Connection

CN1	INV1
1	GND
2	GND
3	GND
4	GND
5	GND
6	ON/OFF
7	DIM
8	VDD
9	VDD
10	VDD
11	VDD
12	VDD

CN2	INV2
1	VDD
2	VDD
3	ON/OFF
4	DIM
5	GND
6	GND
7	GND

CN3	EXT. PWR
1	INV
2	INV
3	INV
4	INV
5	NC
6	PWR_MAIN
7	PWR_MAIN
8	GND
9	GND
10	GND
11	GND

CN5	OSD
1	KEY1
2	KEY2
3	GND
4	5VS
5	IR
6	GND
7	LED1
8	LED2

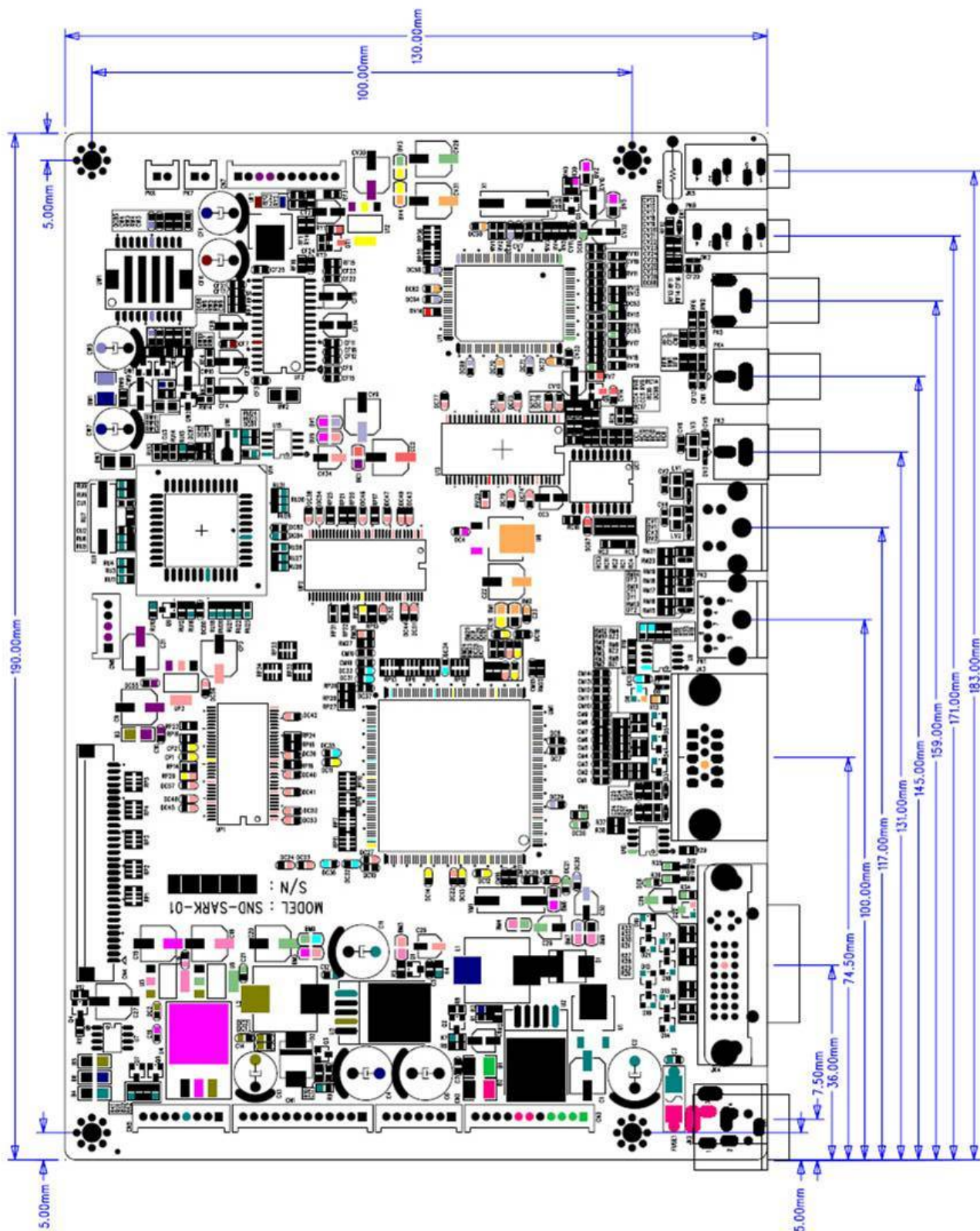
CN7	TUNER I/F
1	SCL
2	SDA
3	5V
4	5V
5	GND
6	NC
7	AUDIO
8	GND
9	CVBS
10	GND

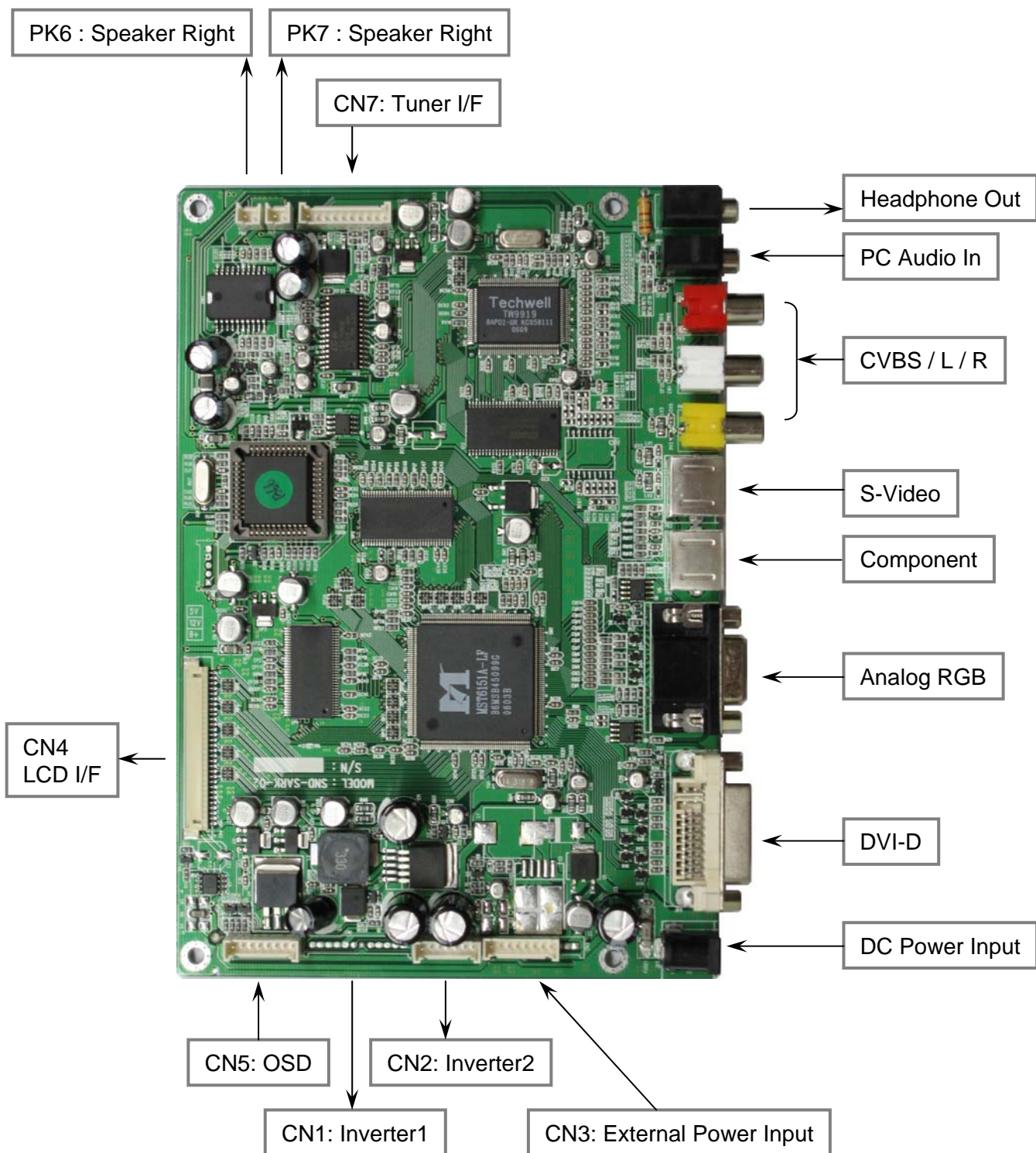
PK6	SPK_R
1	SPK1+
2	SPK1-

PK7	SPK_L
1	SPK2+
2	SPK2-

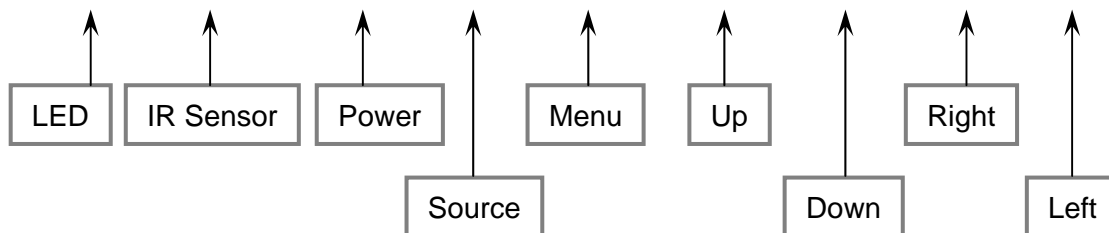
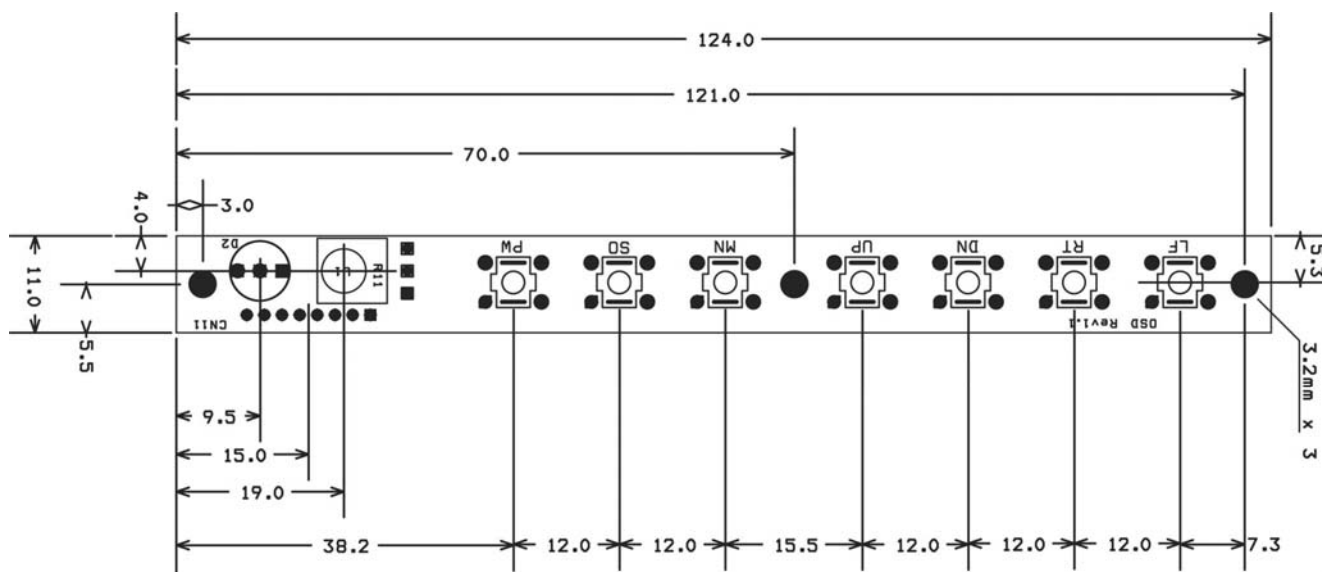
CN4	LCD I/F (LVDS)
1	VDD
2	VDD
3	VDD
4	VDD
5	NC
6	GND
7	GND
8	GND
9	TXO0-
10	TXO0+
11	TXO1-
12	TXO1+
13	TXO2-
14	TXO2+
15	TXOC-
16	TXOC+
17	TXO3-
18	TXO3+
19	GND
20	TXE0-
21	TXE0+
22	TXE1-
23	TXE1+
24	TXE2-
25	TXE2+
26	TXEC-
27	TXEC+
28	TXE3-
29	TXE3+
30	GND

### 5. Dimension & Picture





## 6. OSD Board

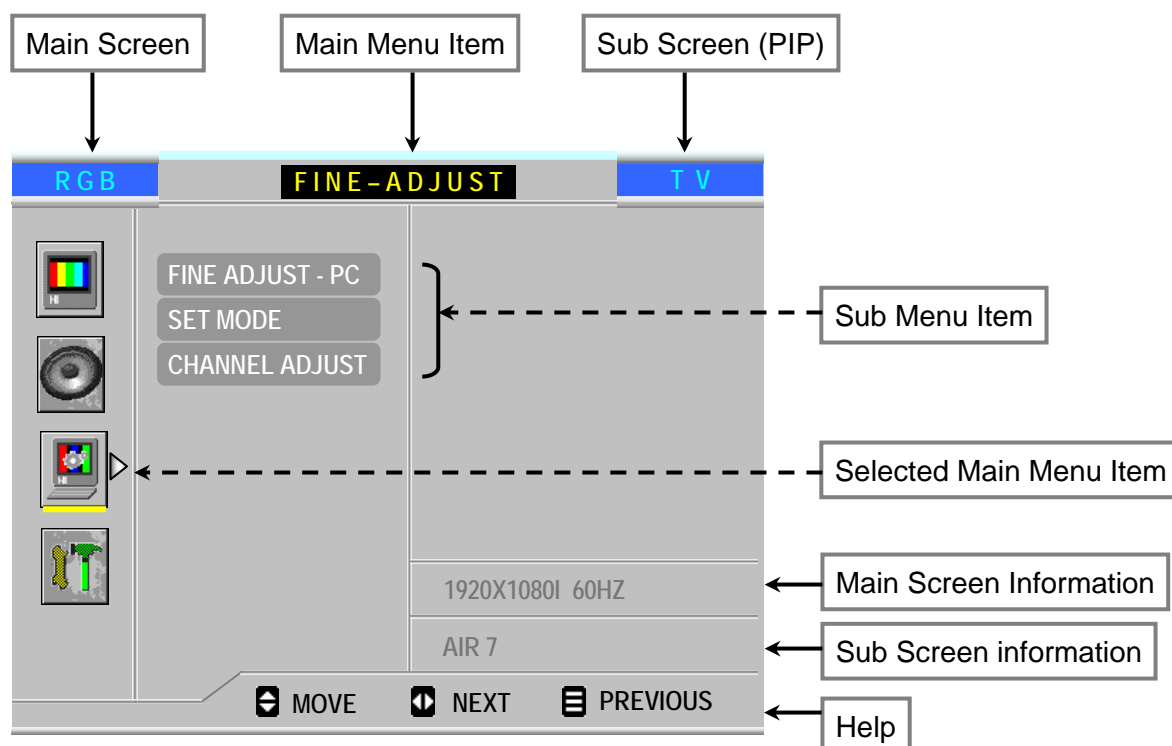


- Power** Turns power On or Off
- Source** Change input video signal in sequence
- Menu** Turns OSD menu On or Off (it will auto time off)  
Back to previous OSD menu page
- Up** Moves the cursor upward
- Down** Moves the cursor downward
- Right** Go into the sub-menu page  
Increase the OSD parameter values  
Increase audio volume when OSD window off
- Left** Decrease the OSD parameter values  
Decrease audio volume when OSD window off



## 7. OSD Menu

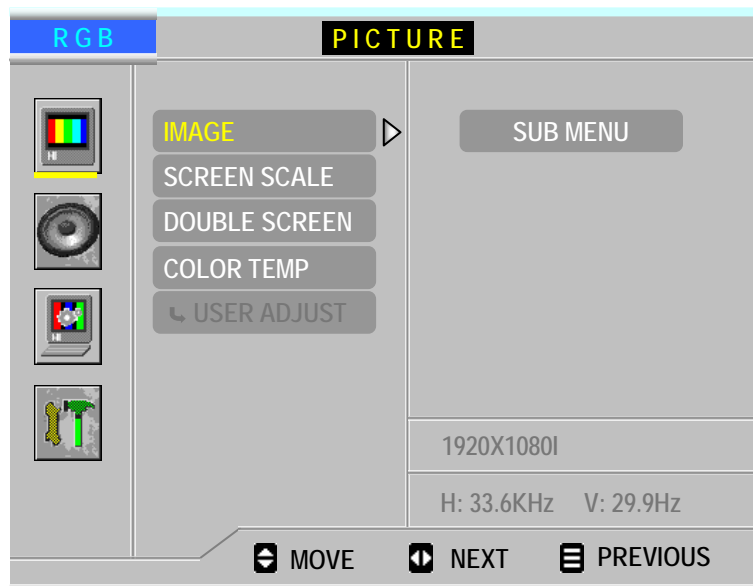
### Construction of OSD Menu Window (in case of PIP screen activated)



1. Main Screen : Current input signal
2. Sub Screen : Sub input signal when PIP function is activated
3. Menu Item : Selected menu item
4. Main Screen Information : Main screen signal information
5. Sub Screen Information : Sub screen signal information

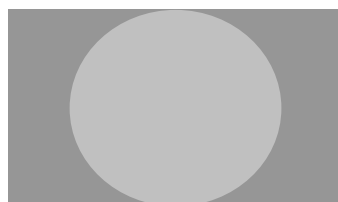


**PICTURE**

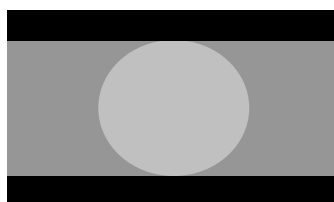


- IMAGE**    **BRIGHTNESS**    : Increase/decrease brightness level
- CONTRAST**        : Increase/decrease contrast level
- SATURATION**    : Increase/decrease saturation level
- HUE**                 : Increase/decrease hue level
- SHARPNESS**    : Increase/decrease sharpness

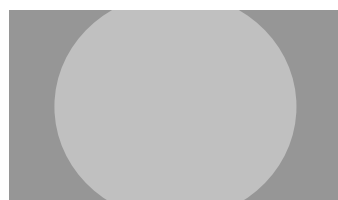
**SCREEN SCALE**



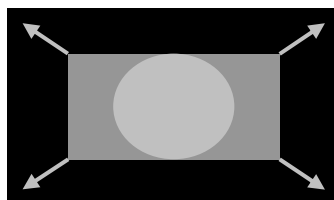
FULL



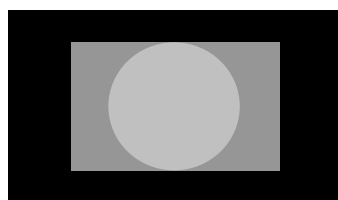
ASPECT



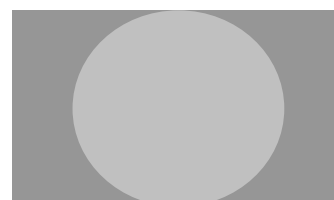
ZOOM



USER



ZOOM RATIO = 0  
(1 : 1 Aspect)



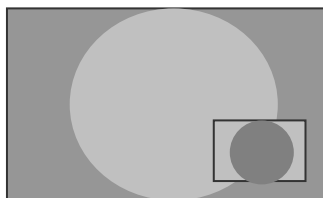
ZOOM RATIO = 50  
(Full Screen)



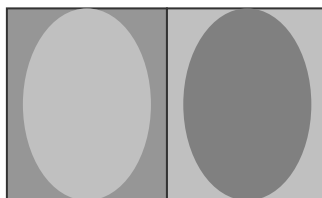
ZOOM RATIO = 100  
(150% Over Scan)

**DOUBLE SCREEN**

## MODE



PIP



POP



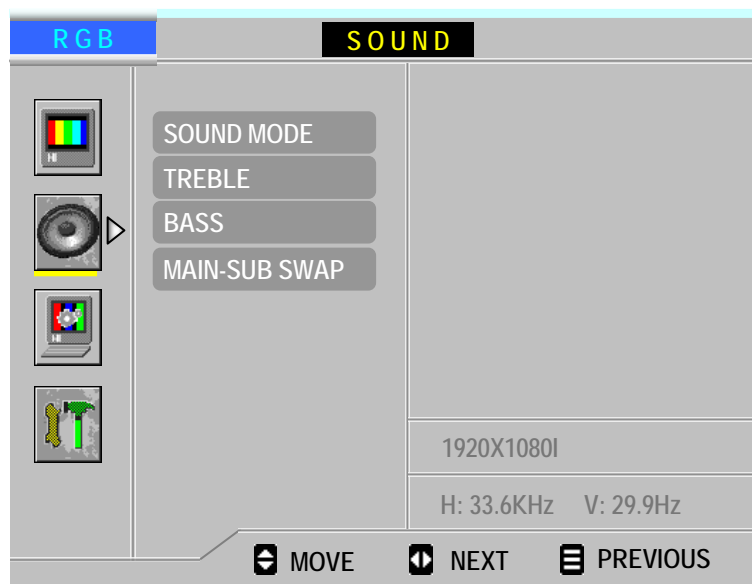
PBP

- PIP SIZE : Adjust PIP size at PIP mode  
 PIP POSITION : Select one of 9 positions at PIP mode  
 MAIN-SUB SWAP : Swap main screen for sub screen  
 SUB INPUT : Select sub screen signal

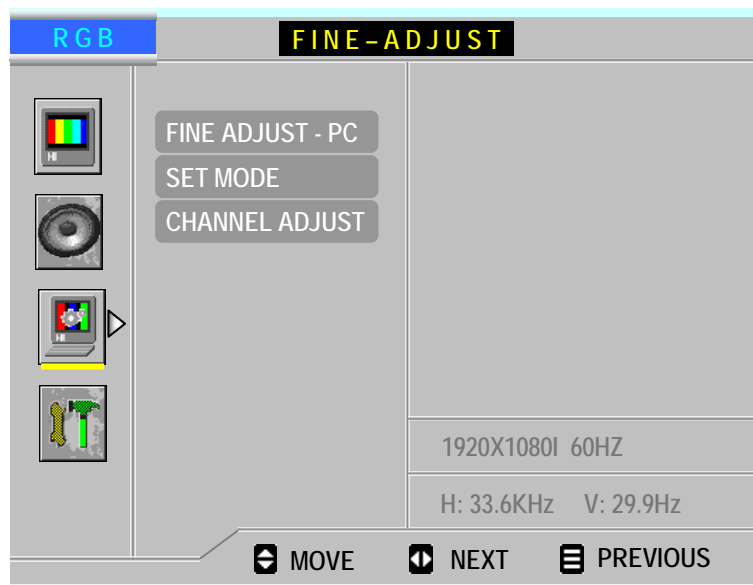
**COLOR TEMP**

5500K / 6500K / 9300K / USER

USER ADJUST : Increase/decrease saturation level each Red, Green and Blue

 **SOUND**


- SOUND MODE** : NEWS / MUSIC / SPORTS / MOVIE / FLAT / USER  
**TREBLE** : Increase/decrease treble level at USER mode  
**BASS** : Increase/decrease bass level at USER mode  
**MAIN-SUB SWAP** : Swap main screen sound for sub screen sound

 **FINE ADJUST**
**FINE ADJUST - PC**

- AUTO ADJUST : Adjust image quality automatically listed below
- H-POSITION : Move the image horizontally
- V-POSITION : Move the image vertically
- CLOCK : Adjust the image horizontal size
- PHASE : Fine tune the data sampling position

**SET MODE**

- DOS MODE : Choose between 640x400 and 720x400
- WXGA MODE : Choose among 1280x768, 1360x768 and 1366x768
- UXGA MODE : Choose between 1600x1200 and 1920x1200

**CHANNEL ADJUST** (TV Option)

 **UTILITY**
**OSD CONFIG**

TIME OUT : Adjust the OSD menu timeout at 10sec / 20 sec / 30 sec / OFF

LANGUAGE : English / Korean

**INPUT SOURCE** : Select the input video signal

**REVERSAL COLOR** : Reverse white and black

**BLUE BACK** : Blue screen at no input signal

**RESET** : Recall factory default settings

## 8. Analog RGB Mode Table

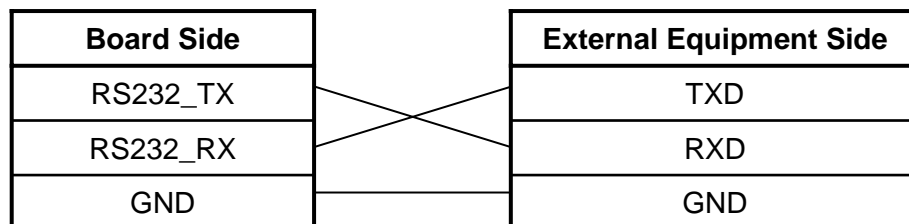
Num	Resolution	H-freq	V-freq	Num	Resolution	H-freq	V-freq
0	640*350	31.36kHz	70.00Hz	32	1152*900	61.79kHz	65.95Hz
1	640*400	24.82kHz	56.42Hz	33	1152*900	71.90kHz	76.20Hz
2	640*400	31.36kHz	70.00Hz	34	1280*720	44.77kHz	59.85Hz
3	640*400	37.86kHz	85.08Hz	35	1280*720	56.45kHz	74.77Hz
4	640*480	31.46kHz	59.94Hz	36	1280*720	64.39kHz	84.84Hz
5	640*480	35.00kHz	66.66Hz	37	1280*768	47.74kHz	60.00Hz
6	640*480	37.86kHz	72.81Hz	38	1280*768	60.02kHz	75.03Hz
7	640*480	37.50kHz	75.00Hz	39	1280*768	68.68kHz	85.00Hz
8	640*480	43.26kHz	85.00Hz	40	1280*960	60.00kHz	60.00Hz
9	720*400	31.46kHz	70.08Hz	41	1280*960	70.00kHz	70.00Hz
10	720*400	37.92kHz	85.03Hz	42	1280*960	72.00kHz	72.00Hz
11	800*600	35.15kHz	56.25Hz	43	1280*960	75.00kHz	75.00Hz
12	800*600	37.87kHz	60.31Hz	44	1280*960	85.93kHz	85.00Hz
13	800*600	44.63kHz	70.10Hz	45	1280*1024	63.58kHz	60.00Hz
14	800*600	48.07kHz	72.18Hz	46	1280*1024	71.69kHz	67.18Hz
15	800*600	46.87kHz	75.00Hz	47	1280*1024	74.88kHz	69.85Hz
16	800*600	53.67kHz	85.06Hz	48	1280*1024	78.12kHz	72.00Hz
17	832*624	49.71kHz	74.55Hz	49	1280*1024	79.98kHz	75.02Hz
18	1024*768	35.52kHz	43.47Hz	50	1280*1024	81.13kHz	76.11Hz
19	1024*768	48.20kHz	59.80Hz	51	1280*1024	91.15kHz	85.02Hz
20	1024*768	53.96kHz	66.13Hz	52	1366*768	47.72kHz	60.00Hz
21	1024*768	56.47kHz	70.06Hz	53	1360*768	47.72kHz	60.00Hz
22	1024*768	57.52kHz	72.00Hz	54	1600*1200	75.20kHz	60.20Hz
23	1024*768	60.02kHz	75.02Hz	55	1600*1200	81.25kHz	65.00Hz
24	1024*768	60.24kHz	74.92Hz	56	1600*1200	87.50kHz	70.00Hz
25	1024*768	68.67kHz	84.99Hz	57	1600*1200	93.97kHz	75.00Hz
26	1024*800	70.83kHz	84.03Hz	58	1920*1200	61.83kHz	50.07Hz
27	1152*864	63.85kHz	70.00Hz	59	1920*1200	75.20kHz	60.20Hz
28	1152*864	67.50kHz	75.00Hz	60	1920*1200	81.25kHz	65.00Hz
29	1152*864	77.09kHz	85.00Hz	61	1920*1200	87.50kHz	70.00Hz
30	1152*870	68.68kHz	74.98Hz	62	1920*1200	93.97kHz	75.00Hz
31	1680*1050	65.40kHz	59.98Hz	63	1920*1080	67.50kHz	60.00Hz

## 9. RS-232C (TBD)

### Application

These specifications cover the communications control of the SND-SARK by external equipment.

### Connections



### Communication Parameters

Set the RS-232C communications settings on the computer to match the board's communications conditions. The board's communications settings are as follows:

<b>Baud rate</b>	9600 bps (UART)
<b>Data length</b>	8 bits
<b>Parity</b>	None
<b>Stop bit</b>	1 bit
<b>Communication code</b>	ASCII code

### Communication Procedure

Send the control commands from the computer via the RS-232C connector. The board operates according to the received command and sends a response message to the computer. Do not send multiple commands at the same time. Wait until the computer receives the OK response before sending the next command.

### Set ID

Use this function to specify a monitor **ID** number.

Press the MENU button and then use the UP/DOWN button to select the UTILITY menu.

Press the RIGHT button and then use UP/DOWN button to select **Set ID**.

Press the RIGHT button and then use LEFT/RIGHT button to adjust **Set ID** to choose the desired monitor ID number. The adjustment range of **Set ID** is 0 ~ 99.

## Communication Format

### 1. Transmission

**[S][Command][ ][Set ID][ ][Data][Cr]**

[S] : The transmission of control data from the computer starts with a S signal.

[Command] : To control board.

[Set ID] : You can adjust the Set ID to choose desired monitor ID number in Special menu.

Adjustment range is 0 ~ 99. When selecting Set ID '0', every connected LCD set is controlled. Set ID is indicated as decimal (0~99) on menu and as Hexadecimal (0x0~0x63) on transmission.

[Data] : To transmit command data (Hexadecimal).

Transmit 'FF' data to read status of command.

[Cr] : Carriage Return ASCII code '0x0D'

[ ] : ASCII code 'space (0x20)'

### 2. OK Acknowledgement

**[Command][ ][Set ID][ ][OK][Data][x]**

The board transmits ACK (acknowledgement) based on this format when receiving normal data. At this time, if the data is data read mode, it indicates present status data. If the data is data write mode, it returns the data of the computer.

### 3. Error Acknowledgement

**[Command][ ][Set ID][ ][NG][x]**

The board transmits ACK (acknowledgement) based on this format when receiving abnormal data from non-viable functions or communication errors.



## Communication Format

	Command Name	Command	Data (Hexadecimal)
01.	Power	a	0~1
02.	Source	b	0~4
03.	Volume	c	0~64
04.	Mute	d	0~1
05.	Image Mode	e	0~2
06.	Brightness	f	0~3F
07.	Contrast	g	0~3F
08.	Saturation	h	0~64
09.	Hue	i	-32~0~32
10.	Sharpness	j	0~F
11.	Screen Scale	k	0~3
12.	Zoom Ratio	m	0~14
13.	Double Screen	n	0~3
14.	PIP Size	p	0~3
15.	PIP Position	q	0~8
16.	Video Swap	r	
17.	Sub input	s	
18.	Color Temp	t	0~3
19.	Red Adjustment	u	0~3F
20.	Green Adjustment	v	0~3F
21.	Blue Adjustment	w	0~3F
22.	Sound Mode	y	0~5
23.	Treble	z	0~3F
24.	Bass	@	0~3F
25.	Sound Swap	#	0~1
26.	Auto Adjust	\$	0
27.	DOS Mode	%	0~1
28.	WXGA Mode	^	0~2
29.	UXGA Mode	&	0~1
30.	Reversal Color	*	0~1
31.	Blue Back	<	0~1
32.	Reset	>	0

**01. Power (Command : a)**

Transmission            **[S][a][ ][Set ID][ ][Data][Cr]**

Data            0 : Power Off  
1 : Power On

Acknowledgement      **[a][ ][Set ID][ ][OK][Data][x]**

● To show Power On/Off status :

Transmission            **[S][a][ ][Set ID][ ][FF][Cr]**

Acknowledgement      **[a][ ][Set ID][ ][OK][Data][x]**

Data            0 : Power Off  
1 : Power On

In a like manner, if other functions transmit 'FF' data based on this format, acknowledgement data feedback presents status about each function.

**02. Source (Command : b)**

Transmission            **[S][b][ ][Set ID][ ][Data][Cr]**

Data            0 : DVI            1 : RGB            2 : Component  
3 : CVBS        4 : S-Video

Acknowledgement      **[b][ ][Set ID][ ][OK][Data][x]**

**03. Volume (Command : c)**

Transmission            **[S][c][ ][Set ID][ ][Data][Cr]**

Data            0 : Min (Step 0) ~ 64 : Max (Step 100)

Acknowledgement      **[c][ ][Set ID][ ][OK][Data][x]**

**04. Mute (Command : d)**

Transmission            **[S][d][ ][Set ID][ ][Data][Cr]**

Data            0 : Audio Mute  
1 : Mute Off

Acknowledgement      **[d][ ][Set ID][ ][OK][Data][x]**

**05. Image Mode (Command : e)**

Transmission            **[S][e][ ][Set ID][ ][Data][Cr]**

Data            0 : Standard    1 : Vivid        2 : User

Acknowledgement      **[e][ ][Set ID][ ][OK][Data][x]**

**06. Brightness (Command : f)**

Transmission        **[S][f][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Min (Step 0) ~ 3F : Max (Step 63)  
 Acknowledgement   **[f][ ][Set ID][ ][OK][Data][x]**

**07. Contrast (Command : g)**

Transmission        **[S][g][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Min (Step 0) ~ 3F : Max (Step 63)  
 Acknowledgement   **[g][ ][Set ID][ ][OK][Data][x]**

**08. Saturation (Command : h)**

Transmission        **[S][h][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Min (Step 0) ~ 64 : Max (Step 100)  
 Acknowledgement   **[h][ ][Set ID][ ][OK][Data][x]**

**09. Hue (Command : i)**

Transmission        **[S][i][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Green (Step -50)  
   ⋮  
   32 : Normal (Step 0)  
   ⋮  
   64 : Max (Step 50)  
 Acknowledgement   **[i][ ][Set ID][ ][OK][Data][x]**

**10. Sharpness (Command : j)**

Transmission        **[S][j][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Soft (Step 0) ~ F : Sharp (Step 16)  
 Acknowledgement   **[j][ ][Set ID][ ][OK][Data][x]**

**11. Screen Scale (Command : k)**

Transmission        **[S][k][ ][Set ID][ ][Data][Cr]**  
                          Data     0 : Full     1 : Aspect     2 : Zoom     3 : User Defined  
 Acknowledgement   **[k][ ][Set ID][ ][OK][Data][x]**

**12. Zoom Ratio (Command : m)**

Transmission            **[S][m][ ][Set ID][ ][Data][Cr]**

                            Data    0 : Aspect (Step 0)  
  ⋮  
  A : Full (Step 10)  
  ⋮  
  14 : 150% Over Scan (Step 20)

Acknowledgement      **[m][ ][Set ID][ ][OK][Data][x]**

**13. Double Screen (Command : n)**

Transmission            **[S][n][ ][Set ID][ ][Data][Cr]**

                            Data    0 : Off    1 : PIP    2 : POP    3 : PBP

Acknowledgement      **[n][ ][Set ID][ ][OK][Data][x]**

**14. PIP Size (Command : p)**

Transmission            **[S][p][ ][Set ID][ ][Data][Cr]**

                            Data    0 : Min ~ 3 : Max

Acknowledgement      **[p][ ][Set ID][ ][OK][Data][x]**

**15. PIP position (Command : q)**

Transmission            **[S][q][ ][Set ID][ ][Data][Cr]**

                            Data    0 : Upper Left    1 : Upper Center    2 : Upper Right  
  3 : Middle Left    4 : Middle Center    5 : Middle Right  
  6 : Down Left    7 : Down Center    8 : Down Right

Acknowledgement      **[q][ ][Set ID][ ][OK][Data][x]**

**16. Video Swap (Command : r)**

Transmission            **[S][r][ ][Set ID][ ][Data][Cr]**

                            Data    0 : Main Screen is DVI, RGB or Component  
  1 : Main Screen is CVBS or S-Video

Acknowledgement      **[r][ ][Set ID][ ][OK][Data][x]**

**17. Sub input (Command : s)**

Transmission            **[S][s][ ][Set ID][ ][Data][Cr]**

                            Data    0 :  
  1 :

Acknowledgement      **[s][ ][Set ID][ ][OK][Data][x]**



**25. Sound Swap (Command : #)**

Transmission           [S][#][ ][Set ID][ ][Data][Cr]

Data           0 : Main Screen Sound  
              1 : Sub Screen Sound

Acknowledgement   #[ ][Set ID][ ][OK][Data][x]

**26. Auto Adjust (Command : \$)**

Transmission           [S][\$][ ][Set ID][ ][Data][Cr]

Data           0 : Execute auto adjustment

Acknowledgement   \$[ ][Set ID][ ][OK][Data][x]

**27. DOS Mode (Command : %)**

Transmission           [S][%][ ][Set ID][ ][Data][Cr]

Data           0 : 640           1 : 720

Acknowledgement   %[ ][Set ID][ ][OK][Data][x]

**28. WXGA Mode (Command : ^)**

Transmission           [S][^][ ][Set ID][ ][Data][Cr]

Data           0 : 1280       1 : 1360       2 : 1366

Acknowledgement   ^[ ][Set ID][ ][OK][Data][x]

**29. UXGA Mode (Command : &)**

Transmission           [S][&][ ][Set ID][ ][Data][Cr]

Data           0 : 1600       1 : 1920

Acknowledgement   &[ ][Set ID][ ][OK][Data][x]

**30. Reversal Color (Command : \*)**

Transmission           [S][\*][ ][Set ID][ ][Data][Cr]

Data           0 : Off           1 : On

Acknowledgement   \*[ ][Set ID][ ][OK][Data][x]

**31. Blue Back (Command : <)**

Transmission           [S][<][ ][Set ID][ ][Data][Cr]

Data           0 : Off           1 : On

Acknowledgement   <[ ][Set ID][ ][OK][Data][x]

**32. Reset (Command : >)**

Transmission           [S][>][ ][Set ID][ ][Data][Cr]

Data           0 : Execute factory default setting

Acknowledgement   >[ ][Set ID][ ][OK][Data][x]