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VGA-104*Plus*
User's Manual

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1. Introduction

The VGA-104*Plus* is a high performance PC/104*Plus* (PCI) based VGA controller that supports CRT, TFT, and LCD Flat Panel Displays. This board is software compatible with multiple video standards - including VGA, SVGA, XVGA and beyond. The VGA-104*Plus* is capable of resolutions from 640 x 480 to 1280 x 1024 at 24-bit true color. Included on the board is a graphical user interface (GUI) accelerator that dramatically boosts the performance of Windows and many other graphics-intensive applications. Though primarily designed to work with a broad variety of LCD and EL flat panels, the VGA-104*Plus* can also be used with analog VGA/SVGA CRT monitors and has a 135Mhz RAMDAC. Depending on the flat panel chosen, simultaneous flat panel and CRT display is also possible.

1.1 Feature List

- Supports 3.3V and 5V flat panels.
- All panel lines are buffered and terminated.
- 32-bit PCI Interface.
- Interfaces to a broad variety of LCD, TFT, and EL flat panels.
- Microsoft Windows® (GUI) acceleration.
- 4 Mbyte on-board video memory.
- Supports 24-bit "True Color" VGA display.
- Supports resolutions up to 1280 x 1024 x 24-bit color depth.
- PCI Rev 2.1 5V or 3.3V signaling
- Simultaneous drive for flat panel and CRT available.
- PC/104*Plus* form-factor.
- +5V only operation. (+12V passed through to backlight)
- Low power, rugged, and reliable.
- Wide operating temperature range.

1.2 Functional Specifications

Video Controller:	Chips and Technologies 65555 Video Controller
Memory:	4 Mbyte
Resolutions:	640 x 480 @ 16 Million colors (True color) 800 x 600 @ 16 Million colors (True color) 1024 x 768 @ 16 Million colors (True color) 1280 x 1024 @ 16 Million colors (True color)

1.3 Physical Specifications

Mechanical:	3.55" x 3.78" x .9" (including stackthrough pins)
Mounting:	Per PC/104*Plus* standard - Four mounting holes
Temperature:	0 - 70 °C (Standard) 0 - 50 °C (w/ 3.3V Flat Panel power internally supplied)
Humidity:	5 - 95% RH (non-condensing)
Power:	600mA at 5 volt (typical) 900mA at 5 volt (maximum)

1.4 Technical Support

Adastra Systems Corporation technicians and engineers are available for technical support should the need arise. We are committed to making our product easy to use and will help in any way we can when you apply our products in your systems.

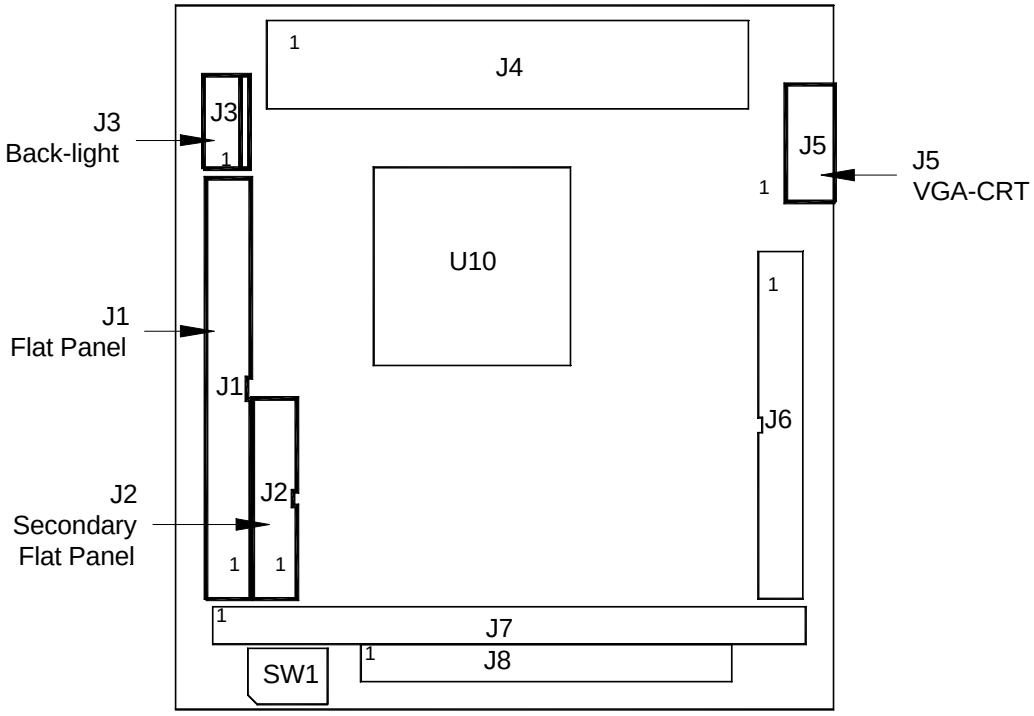
Technical support may be reached at (510) 732-6900, 8:00 am to 5:00 p.m. Pacific Time. Additional information and technical support is available on our web site, http:\\www.adastra.com. Advanced technical information requires contacting Adastra for a user identification and password.

1.5 About This Manual

Adastra Systems strives to provide a thorough and complete manual that facilitates the process of working with our products. This manual will be undergoing additional revisions to add documentation of features and application notes not available at publication time. If there is a feature for which you require additional information, please contact Adastra technical support.

2. VGA Interface

The VGA-104*Plus* is a PCI (PC/104*Plus*) based VGA interface with 4 Mbyte of on-board memory. The interface can drive flat panels and conventional CRT displays at standard resolutions up to 1280x1024 in 24-bit "True Color". In addition to driving standard CRT monitors, it is also capable of driving a variety of flat-panel displays including electro-luminescent (EL), gas plasma, passive LCD, and active LCD.



2.1 VGA BIOS

The VGA BIOS is stored on a removable 128Kb flash or ROM device. The BIOS can not be updated in-system; it has to be physically removed if alterations are required. Two copies of the BIOS are stored in separate 64Kb portions of the ROM. The SEL4 jumper located on jumper block E1 makes the selection between the two copies. Each BIOS allows one of 16 flat panel settings to be selected. These selections are made with the SEL3 through SEL0 jumpers also located on jumper block E1. The physical location of jumper block E1 can be determined by referring to Appendix C.

2.1.1 Jumper SEL4

The jumper SEL4 is used to determine in which sub-mode the board will function. When SEL4 is loaded, the BIOS looks for the presence of a CRT monitor connected to the board. If a CRT is detected, the VGA-104*Plus* is put into CRT Only Mode and the flat panel interface is inactive. The advantage of CRT only mode is that CRT monitors are more accommodating than flat panels are to video mode changes. If no CRT is detected, the VGA-104*Plus* sets itself into Flat Panel Only mode which disables the CRT interface. The advantage of this mode is that the flat panel timing can be adjusted in a way that is best for the flat panel but may be incompatible with the CRT.

When SEL4 is not loaded, the VGA-104*Plus* is put into Simultaneous Mode. In this mode, both the CRT and flat panel interfaces are active, and show the same image. The overall vertical refresh rate of the CRT and flat panel are restricted to be the same, but all other aspects of the flat panel timing are adjusted for the flat panel selected by the option jumpers.

SEL4	Function
IN	CRT Only or Flat Panel Only Mode
OUT	Simultaneous Mode

2.1.2 CRT or Flat Panel Only Mode

The chart below illustrates the panels supported while CRT/FP Only mode is enabled.

SEL4	SEL3	SEL2	SEL1	SEL0	Display
IN	IN	IN	IN	IN	1024x768 Dual Scan STN Color
IN	IN	IN	IN	OUT	1280x1024 TFT Color
IN	IN	IN	OUT	IN	640x480 Dual Scan STN Color
IN	IN	IN	OUT	OUT	800x600 Dual Scan STN Color
IN	IN	OUT	IN	IN	640x480 Sharp 12-bit TFT Color
IN	IN	OUT	IN	OUT	640x480 18-bit TFT Color
IN	IN	OUT	OUT	IN	1024x768 TFT Color
IN	IN	OUT	OUT	OUT	800x600 TFT Color
IN	OUT	IN	IN	IN	800x600 TFT Color
IN	OUT	IN	IN	OUT	800x600 TFT Color
IN	OUT	IN	OUT	IN	800x600 Dual Scan STN Color
IN	OUT	IN	OUT	OUT	800x600 Dual Scan STN Color
IN	OUT	OUT	IN	IN	1024x768 TFT Color (Dual 12-bit)
IN	OUT	OUT	IN	OUT	1280x1024 Dual Scan STN Color
IN	OUT	OUT	OUT	IN	1024x600 Dual Scan STN Color
IN	OUT	OUT	OUT	OUT	1024x600 TFT Color

2.1.3 Simultaneous Mode

The chart below illustrates the panels supported while simultaneous mode is enabled.

SEL4	SEL3	SEL2	SEL1	SEL0	Display
OUT	IN	IN	IN	IN	Reserved
OUT	IN	IN	IN	OUT	Reserved
OUT	IN	IN	OUT	IN	Reserved
OUT	IN	IN	OUT	OUT	Reserved
OUT	IN	OUT	IN	IN	640x480 Sharp 12-bit TFT Color
OUT	IN	OUT	IN	OUT	Reserved
OUT	IN	OUT	OUT	IN	1024x768 TFT Color (Sharp LQ14X01)
OUT	IN	OUT	OUT	OUT	800x600 TFT Color (Lucky Goldstar LP104S2)
OUT	OUT	IN	IN	IN	Reserved
OUT	OUT	IN	IN	OUT	Reserved
OUT	OUT	IN	OUT	IN	Reserved
OUT	OUT	IN	OUT	OUT	Reserved
OUT	OUT	OUT	IN	IN	Reserved
OUT	OUT	OUT	IN	OUT	Reserved
OUT	OUT	OUT	OUT	IN	Reserved
OUT	OUT	OUT	OUT	OUT	Reserved

Note: The Reserved displays are subject to change with future BIOS releases.

2.2 Connectors

There are three VGA display connectors on the VGA-104*Plus*; one for standard CRT VGA monitors and a pair for flat-panel displays. There is also a power connector added to provide +12V or +5/+3.3V power to a back light inverter.

Ref Des	Function	Connector on VGA-104		Mating Cable Connector	
J1	Flat Panel	Astron	AT-SRDPH2-50-2-1-15G	Astron	AT-IDCSK2-50-11-15G
J2	Flat Panel	Astron	AT-SRDPH2.20-2-1-15G	Astron	AT-IDCSK2-20-11-15G
J3	Back-light	AMP	640457-5	AMP	640044-5 (for #22 AWG)
J5	VGA - CRT	Hirose	DF11-14DP-2DS	Hirose	DF11-14DS-2C

The VGA connector is a 14-pin, 2mm pitch, dual in-line, right angle, Hirose DF11 connector used for CRT monitors. A cable adapter can be used to map this connector to the standard 15-pin high density D-SUB connector commonly used for VGA. This cable is available from Adastra Systems. See Appendix A for ordering information.

The pin-out for the VGA connector is:

J5			
Pin #	**Signal**	**Pin #**	**Signal**
1	RED	2	GREEN
3	BLUE	4	CK_DDC_OUT
5	Signal GND	6	VGA Chassis GND
7	VGA Chassis GND	8	VGA Chassis GND
9	NC	10	Signal GND
11	NC	12	DDC_DATA_OUT
13	HSYNC	14	VSYNC

VGA chassis and signal grounds are tied together on the VGA-104*Plus* printed circuit board.

The Flat Panel connectors consist of a 50-pin and a 20-pin connector. The 50-pin connector at J1 is a 2mm pitch, dual in-line, right angle connector and is solely used when integrating TFT or LCD displays up to 24-bit. The 20-pin connector at J2 is a 2mm pitch, dual in-line connector and is used in conjunction with J1 to drive 36-bit panels. Flat Panel pigtail cables for mating to these connectors are available from Adastra Systems. See Appendix A for ordering information.

Connectors J1 and J2 are used for flat-panel displays. The pin-out for these connectors is:

J1					
Pin #	**Signal**	**Description**	**Pin #**	**Signal**	**Description**
1	GND	Signal Ground	2	P23	Panel Data 23
3	P22	Panel Data 22	4	GND	Signal Ground
5	P21	Panel Data 21	6	P20	Panel Data 20
7	GND	Signal Ground	8	P19	Panel Data 19
9	P18	Panel Data 18	10	GND	Signal Ground
11	P17	Panel Data 17	12	P16	Panel Data 16
13	GND	Signal Ground	14	P15	Panel Data 15
15	P14	Panel Data 14	16	GND	Signal Ground
17	P13	Panel Data 13	18	P12	Panel Data 12
19	GND	Signal Ground	20	P11	Panel Data 11
21	P10	Panel Data 10	22	GND	Signal Ground
23	P9	Panel Data 9	24	P8	Panel Data 8
25	GND	Signal Ground	26	P7	Panel Data 7
27	P6	Panel Data 6	28	GND	Signal Ground
29	P5	Panel Data 5	30	P4	Panel Data 4
31	GND	Signal Ground	32	P3	Panel Data 3
33	P2	Panel Data 2	34	GND	Signal Ground
35	P1	Panel Data 1	36	P0	Panel Data 0
37	FP_Voltage	Flat Panel Voltage	38	+5V	VCC
39	ENABLK	Enable Back Light	40	ENAVEE	Enable LCD Bias
41	ENAVDD	Enable VDD Control	42	GND	Signal Ground
43	SHFCLK	Data Shift Clock	44	GND	Signal Ground
45	LP	Line Load Pulse	46	GND	Signal Ground
47	M/DE	LCD M or Display enable	48	GND	Signal Ground
49	FLM	First Line Marker	50	GND	Signal Ground

To reduce cable noise, the connector is pinned-out so that each two data lines are bracketed by two ground lines on a ribbon cable. The clock and synch signals have a ground on each side to maximize the noise reduction.

J2					
Pin #	**Signal**	**Description**	**Pin #**	**Signal**	**Description**
1	GND	Signal Ground	2	P35	Panel Data 35
3	P34	Panel Data 34	4	GND	Signal Ground
5	P33	Panel Data 33	6	P32	Panel Data 32
7	GND	Signal Ground	8	P31	Panel Data 31
9	P30	Panel Data 30	10	GND	Signal Ground
11	P29	Panel Data 29	12	P28	Panel Data 28
13	GND	Signal Ground	14	P27	Panel Data 27
15	P26	Panel Data 26	16	GND	Signal Ground
17	P25	Panel Data 25	18	P24	Panel Data 24
19	GND	Signal Ground	20	NC	No Connect

J3					
Pin #	**Signal**	**Description**	**Pin #**	**Signal**	**Description**
1	+12V	+12 Volt (fused)	2	NC	No Connect
3	ENABLK	Enable Back Light	4	FP_Voltage	+5 or +3.3V
5	GND	Ground			

2.3 Panel Voltage

Many display panels, LCD's in particular, require lower voltages for operation. The VGA-104*Plus* has the ability to drive panels at either +3.3V or +5V. The voltage is determined by E2, included on the board. The voltage of all the drive signals and switched flat panel voltage pins (FP_Voltage) will be determined by the chart below. This jumper is to be set while no power is being applied to the board.

E2-5	FP_Voltage
IN	+5V
OUT	+3.3V

2.4 VGA Video Modes

The VGA BIOS supports all standard VGA modes as well as a wide selection of extended modes. The following tables list the modes and vertical refresh rates that this BIOS can support.

Standard Video Display Modes

Video Mode	VESA ® VBE Mode	Pixel Resolution	Colors	Mode Type	Display Adapter	Font Size	Char. Display	Dot Clock (MHz)	Horiz. Freq. (KHz)	Vert. Freq. (Hz)	Video Mem. (KB)
00h	—	320x200	16(gray)	Text	CGA	8x8	40x25	25	31.5	70	256
		320x350	16(gray)		EGA	8x14	40x25	25	31.5	70	256
		360x400	16		VGA	9x16	40x25	28	31.5	70	256
01h	—	320x200	16	Text	CGA	8x8	40x25	25	31.5	70	256
		320x350	16		EGA	8x14	40x25	25	31.5	70	256
		360x400	16		VGA	9x16	40x25	28	31.5	70	256
02h	—	640x200	16(gray)	Text	CGA	8x8	80x25	25	31.5	70	256
		640x350	16(gray)		EGA	8x14	80x25	25	31.5	70	256
		720x400	16		VGA	9x16	80x25	28	31.5	70	256
03h	—	640x200	16	Text	CGA	8x8	80x25	25	31.5	70	256
		640x350	16		EGA	8x14	80x25	25	31.5	70	256
		720x400	16		VGA	9x16	80x25	28	31.5	70	256
04h	—	320x200	4	Graph	All	8x8	40x25	25	31.5	70	256
05h	—	320x200	4(gray)	Graph	CGA	8x8	40x25	25	31.5	70	256
		320x200	4(gray)		EGA	8x8	40x25	25	31.5	70	256
		320x200	4		VGA	8x8	40x25	25	31.5	70	256
06h	—	640x200	2	Graph	All	8x8	80x25	25	31.5	70	256
07h	—	720x350	Mono	Text	MDA	9x14	80x25	28	31.5	70	256
		720x350	Mono		EGA	9x14	80x25	28	31.5	70	256
		720x400	Mono		VGA	9x16	80x25	28	31.5	70	256
08h-0Ch	—	Reserved	-	-							
0Dh	—	320x200	16	Graph	E/VGA	8x8	40x25	25	31.5	70	256
0Eh	—	640x200	16	Graph	E/VGA	8x8	80x25	25	31.5	70	256
0Fh	—	640x350	Mono	Graph	E/VGA	8x14	80x25	25	31.5	70	256
10h	—	640x350	16	Graph	E/VGA	8x14	80x25	25	31.5	70	256
11h	—	640x480	2	Graph	VGA	8x16	80x30	25	31.5	60	256
12h	—	640x480	16	Graph	VGA	8x16	80x30	25	31.5	60	256
13h	—	320x200	256	Graph	VGA	8x8	40x25	25	31.5	70	256
20h	120	640x480	16	Graph(L)	PackPix	8x16	80x30	25.175	31.5	60	256
								31.5	37.5	75	256
								36	43.3	85	256
22h	122	800x600	16	Graph(L)	PackPix	8x16	100x37	36	35.1	56	256
								40	37.9	60	256
								49.5	46.9	75	256
								56.25	53.7	85	256
24h	124	1024x768	16	Graph(L)	PackPix	8x16	128x48	44.9	35.5	43(I)	384
								65	48.4	60	384

								78.75	60	75	384
								94.5	68.7	85	384
28h	128	1280x1024	16	Graph(L)	PackPix	8x16	160x64	78.75	47	43(I)	640
								108	64	60	640
2Ah*	—	1600x1200	16	Graph(L)	PackPix	8x16	200x75	—	—	—	938
30h	101h	640x480	256	Graph(L)	PackPix	8x16	80x30	25.175	31.5	60	300
								31.5	37.5	75	300
								36	43.3	85	300
31h	100h	640x400	256	Graph(L)	PackPix	8x16	80x25	25.175	31.5	70	256
32h	103h	800x600	256	Graph(L)	PackPix	8x16	100x37	36	35.1	56	469
								40	37.9	60	469
								49.5	46.9	75	469
								56.25	53.7	85	469
34h	105h	1024x768	256	Graph(L)	PackPix	8x16	128x48	44.9	35.5	43(I)	768
								65	48.4	60	768
								78.75	60	75	768
								94.5	68.7	85	768
38h	107h	1280x1024	256	Graph(L)	PackPix	8x16	160x64	78.75	47	43(I)	1280
								108	64	60	1280
3Ah*	—	1600x1200	256	Graph(L)	PackPix	8x16	200x75	—	—	—	1875
40h	110h	640x480	32K	Graph(L)	PackPix	8x16	80x30	25.175	31.5	60	600
								31.5	37.5	75	600
								36	43.3	85	600
41h	111h	640x480	64K	Graph(L)	PackPix	8x16	80x30	25.175	31.5	60	600
								31.5	37.5	75	600
								36	43.3	85	600
42h	113h	800x600	32K	Graph(L)	PackPix	8x16	100x37	36	35.1	56	938
								40	37.9	60	938
								49.5	46.9	75	938
								56.25	53.7	85	938

Notes: I = Interlaced L = Linear * = Modes 2Ah and 3Ah are for flat panel only.

Video Mode	VESA ® VBE Mode	Pixel Resolution	Colors	Mode Type	Mem. Org	Font Size	Char. Display	Dot Clock (MHz)	Horiz. Freq. (KHz)	Vert. Freq. (Hz)	Video Mem. (KB)
43h	114h	800x600	64K	Graph(L)	PackPix	8x16	100x37	36	35.1	56	938
								40	37.9	60	938
								49.5	46.9	75	938
								56.25	53.7	85	938
44h	116h	1024x768	32K	Graph(L)	PackPix	8x16	128x48	44.9	35.5	43(I)	1536
								65	48.4	60	1536
45h	117h	1024x768	64K	Graph(L)	PackPix	8x16	128x48	44.9	35.5	43(I)	1536
								65	48.4	60	1536
50h	112h	640x480	16M	Graph(L)	PackPix	8x16	80x30	25.175	31.5	60	900
								31.5	37.5	75	900
								36	43.3	85	900
52h	115h	800x600	16M	Graph(L)	PackPix	8x16	100x37	36	35.1	56	1407
								40	37.9	60	1407
54h	118h	1024x768	16M	Graph(L)	PackPix	8x16	128x48	44.9	35.5	43(I)	2304
								65	48.4	60	2304
								78.75	60	75	2304
								94.5	68.7	85	2304
58h	11Bh	1280x1024	16M	Graph(L)	PackPix	8x16	160x64	78.5	47	43(I)	3840
								108	64	60	3840
								135	79.98	75(5)	3840
6Ah	102h	800x600	16	Graph	Planar	8x16	100x37	36	35.1	56	256
								40	37.8	60	256
								49.5	46.9	75	256
								56.25	53.7	85	256
64h	104h	1024x768	16	Graph	Planar	8x16	128x48	44.9	35.5	43(I)	384
								65	48.4	60	384
								78.75	60	75	384
								94.5	68.7	85	384
68h	106	1280x1024	16	Graph	Planar	8x16	160x64	78.75	47	43(I)	640
								108	64	60	640
70h	101h	640x480	256	Graph	PackPix	8x16	80x30	25.175	31.5	60	300
								31.5	37.5	75	300
								36	43.3	85	300
71h	100h	640x400	256	Graph	PackPix	8x16	80x25	25.175	31.5	70	256
72h	103h	800x600	256	Graph	PackPix	8x16	100x37	36	35.1	56	469
								40	37.9	60	469
								49.5	46.9	75	469
								56.25	53.7	85	469
74h	105h	1024x768	256	Graph	PackPix	8x16	128x48	44.9	35.5	43(I)	768
								65	48.4	60	768
								78.75	60	75	768
								94.5	68.7	85	768
78h	107h	1280x1024	256	Graph	PackPix	8x16	160x64	78.75	47	43(I)	1280
								108	64	60	1280

Notes: I = Interlaced L = Linear

3. Video Overlay

The VGA-104*Plus* accepts 16-bit YcrCb, 4:2:2 format digitized video on the Video Overlay Input connector, J6. This is the format used for "Zoom Video". The video is stored in a portion of the VGA-104*Plus* video memory and can be "overlaid" on the VGA output in a window.

3.1 Connector

The Video Overlay connector is a right angle, 40-pin, 2 row, 2mm, pitch box header.

Ref Des	Function	Connector on VGA-104*plus*		Mating Cable Connector	
J6	Video Overlay	Astron	AT-SRDPH2-40-2-1-15G	Astron	AT-IDCSK2-40-11-15G

The pin-out for the Video Overlay is shown below.

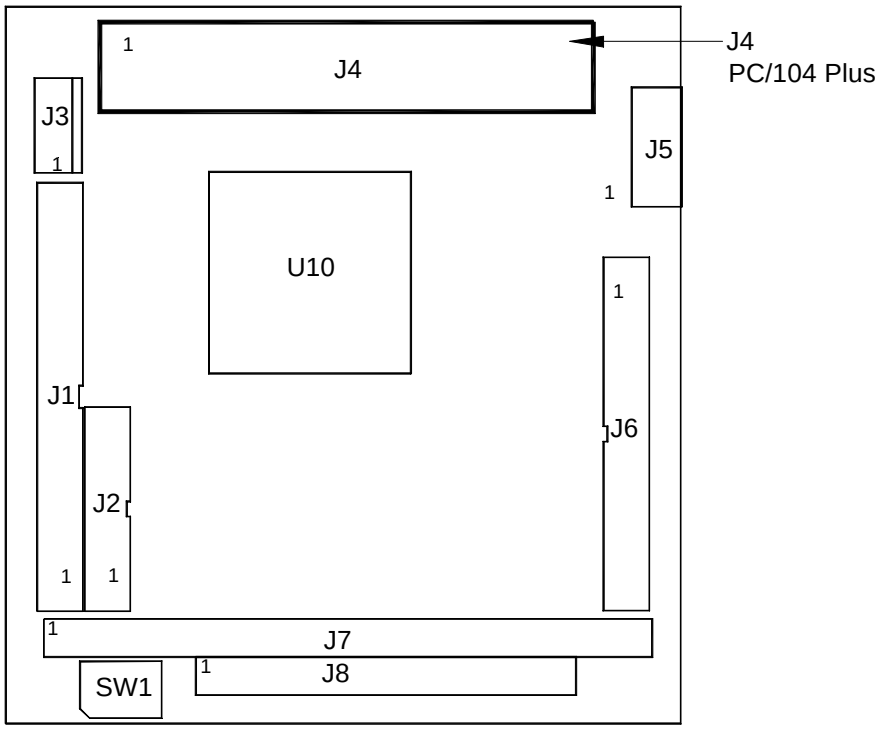
J6					
Pin	**Signal**	**Description**	**Pin**	**Signal**	**Description**
1	GND	Signal Ground	2	UV7	UV color component
3	GND	Signal Ground	4	UV6	UV color component
5	GND	Signal Ground	6	UV5	UV color component
7	CK_REF	External pixel clock input	8	UV4	UV color component
9	VREF	External vertical sync input	10	UV3	UV color component
11	GND	Signal Ground	12	Reserved	No Connect
13	GND	Signal Ground	14	UV2	UV color component
15	GND	Signal Ground	16	UV1	UV color component
17	GND	Signal Ground	18	UV0	UV color component
19	HREF	External horizontal sync input	20	Y7	Luminance component
21	GND	Signal Ground	22	Y6	Luminance component
23	GND	Signal Ground	24	Y5	Luminance component
25	GND	Signal Ground	26	Y4	Luminance component
27	GND	Signal Ground	28	Y3	Luminance component
29	GND	Signal Ground	30	Y2	Luminance component
31	GND	Signal Ground	32	Y1	Luminance component
33	GND	Signal Ground	34	Y0	Luminance component
35	I2C_CK	I^2C clock	36	I2C_DAT	I^2C data
37	GND	Signal Ground	38	VCC	+5V to peripheral
39	GND	Signal Ground	40	+12V	Fused +12V to peripheral

3.2 Video Storage Formatting

The incoming video stream has no timing correlation to the VGA-104*Plus* video. It is usually stored in a 320 x 240 format, coming in at approximately 30 frames per second. However, the VGA-104*Plus* can be configured using a 640 x 480 storage format for the incoming video. There is a tradeoff in the video memory bandwidth required for VGA display refresh and the bandwidth required for the video overlay. The performance of the high-resolution VGA modes may suffer if 640 x 480 video overlay format is used.

4. PC/104 PCI Bus Interface

The PCI interface on the VGA-104*Plus* provides full 32-bit PCI bus capability. The pin-out of the connector is compatible with the PC/104 *plus* standard recently released by the PC/104 consortium. The signal definition is compatible to PCI Local Bus Specification Revision 2.1.



4.1 Connector

There is one physical connector associated with the 32-bit PC/104*Plus* interface supported by the VGA-104*Plus*.

J4 is a quad row socket connector, with 2mm x 2mm pitch, which implements the standard 32-bit PCI bus signals.

J7 & J8 are non-functional on this board. They are included solely to pass ISA bus signals from a CPU baseboard through PC/104*Plus* board stack to PC/104 (ISA) boards stacked on top of the PC/104*Plus* boards.

Ref Des	**Function**	**Connector on VGA-104*Plus***	
J4	PC104 / PCI	Samtec	ESQT-1-30-02-G-Q-368
J7	PC104 / ISA 8	Samtec	ESQ-132-39-G-D
J8	PC104 / ISA 16	Samtec	ESQ-120-39-G-D

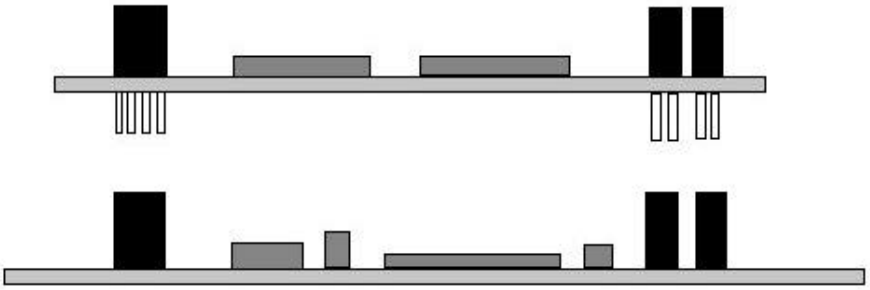
The pin-out for PCI is shown below.

J4				
Pin	**A**	**B**	**C**	**D**
1	5.0V KEY[1]	Reserved	+5V	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0-	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1-	AD15	+3.3V
9	SERR-	GND	SB0-	PAR
10	GND	PERR-	+3.3V	SDONE
11	STOP-	+3.3V	LOCK-	GND
12	+3.3V	TRDY-	GND	DEVSEL-
13	FRAME-	GND	IRDY-	+3.3V
14	GND	AD16	+3.3V	C/BE2-
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3-	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0-	GND	REQ1-	VI/O
24	GND	REQ2-	+5V	GNT0-
25	GNT1-	VI/O	GNT2-	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD-	+5V	RST-
29	+12V	INTA-	INTB-	INTC-
30	-12V	Reserved	Reserved	3.3V KEY[1]

Note: 1. The KEY pins are used to guarantee proper voltages for PCI modules. Pin A1 is removed and the socket side is plugged for 5V PCI boards. Pin D30 is removed and the socket side plugged for 3.3V PCI boards

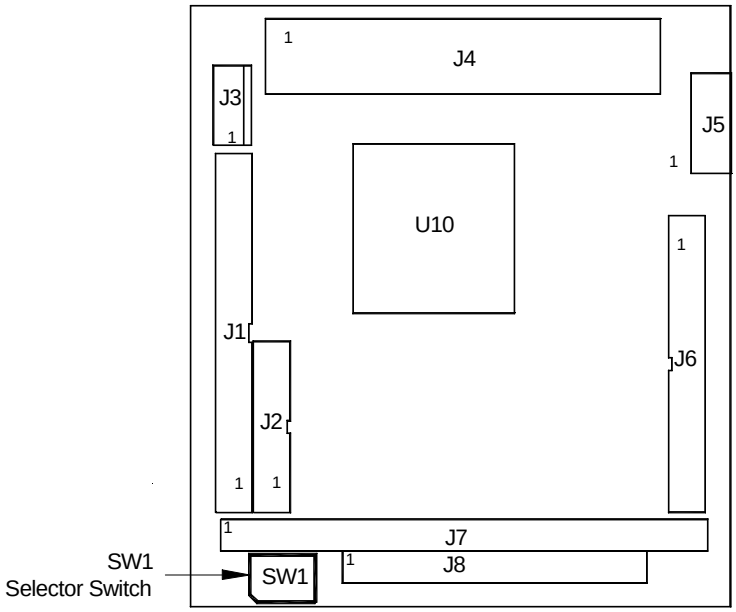
4.2 Adapter Card Mounting

PC/104*Plus* adapter cards are mounted in a "stackthrough" manner. Adapter cards are designed with plugs on their undersides that mate with the PC/104 socket connectors of the board below.



4.3 PC/104*Plus* Selector Switch

Switch SW1 is an octal rotary switch used to select the PC/104*Plus* board's position in the PC/104 stack per the PC/104*Plus* specifications. Switch setting 0 is used for the 1st board in the stack (above a CPU baseboard); setting 1 for the 2nd; setting 2 for the 3rd; and setting 3 for the 4th. Switch settings 4 - 7 are repeats of settings 0 - 3.



5. Power

The VGA-104*Plus* only requires +5V to operate. It draws the +5V from the PC104 Plus header pins. The VGA-104*Plus* has an on-board linear regulator to produce the +3.3V used by the C&T 65555 and the video memory.

The flat panel interface is +5V or +3.3V, selected by the "5V panel" jumper in the E2 block. If the jumper is out, the flat panel interface is +3.3V. The linear regulator also provides the +3.3V flat panel power. The +12V from the PC104 Plus header is passed through to the VGA-104*Plus* backlight header and the video overlay header. The board itself does not use +12V.

5.1 Power Consumption

Users should expect the VGA-104*Plus* to draw approximately 600mA at 5V and should design their system power supply accordingly. This should allow for sufficient safety margin. Maximum load estimates are based on Upper Control Limits of product specifications.

Power Consumption (Current at 5V)		
Maximum	**Typical**	**Condition**
900mA	600mA	VGA-104*Plus* & CRT Monitor
925mA	625mA	VGA-104*Plus* & Flat Panel (5V, On-board)
1025mA	675mA	VGA-104*Plus* & Flat Panel (3.3V, Separate power)
1525mA	1000mA	VGA-104*Plus* & Flat Panel (3.3V, On-board)

6. Appendix A: Options and Adapters

Listed below are the options available for the VGA-104*Plus*. Use the specified part number referred to in the description of the following options and adapters when ordering.

6.1 Cables

The following table describes the cables available for the VGA-104*Plus*. These cables mate to the on-board connectors of the VGA-104*Plus*, and terminate in a connector style common to the peripheral they serve.

Part Number	Description	VGA-104+ Connector	Notes
620-116	Cable, VGA CRT Adapter	J5	2mm Hirose to 15 pin D-sub
620-190	Cable, 50 Conductor Flat Panel Video	J1	18", 1mm pitch cable ass.
620-192	Cable, 20 Conductor Flat Panel Video	J2	18", 1mm pitch cable ass.

6.1.1 Flat Panel Cables

The two flat panel video cables (620-190 & 192) are used for integration with a flat panel display. One end of these cables is equipped with 2mm pitch IDC socket connectors for mating to J1 & J2 on the VGA-104*Plus*. The other ends have Hirose DF11 crimps on them. These are not complete flat panel cables as the pin-out for each flat panel is different. They are designed to simplify the integration process.

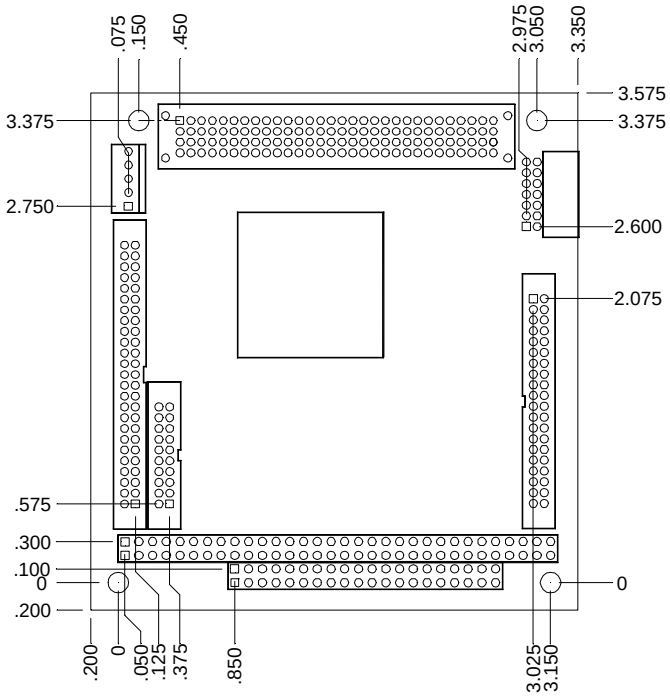
6.2 Software, Drivers and Utilities

Part Number 930-038: Chips & Technologies 655XX VGA Drivers and Utilities

7. Appendix B: Flat Panel Bit Relation

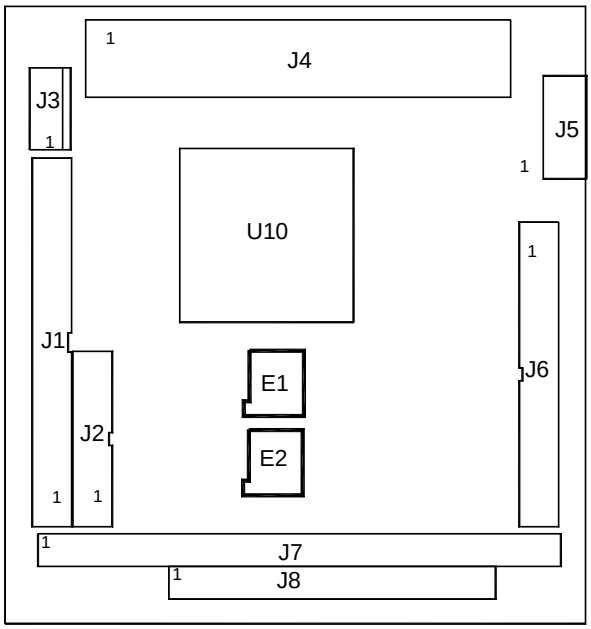
		Mono SS	**Mono DD**	**Mono DD**	**Color TFT**	**Color TFT**	**Color TFT**	**Color TFT HR**	**Color STN SS**	**Color STN SS**	**Color STN DD**	**Color STN DD**	**Color STN DD**
Pin#	Pin Name	8-bit	8-bit	16 bit	9/12/16 bit	18/24 bit	36-bit	18/24 bit	8-bit (4bP)	16-bit (4bP)	8-bit (4bP)	16-bit (4bP)	24-bit
W6	P0	P0	UD3	UD7	B0	B0	FB0	FB0	R1	R1	UR1	UR0	UR0
V7	P1	P1	UD2	UD6	B1	B1	FB1	FBI	B1	G1	UG1	UG0	UG0
Y6	P2	P2	UD1	UD5	B2	B2	FB2	FB2	G2	B1	UB1	LB0	LB0
W7	P3	P3	UD0	UD4	B3	B3	FB3	FB3	R3	R2	UR2	UR1	LR0
V8	P4	P4	LD3	UD3	B4	B4	FB4	SB0	B3	G2	LR1	LR0	LG0
Y7	P5	P5	LD2	UD2	G0	B5	FB5	SB1	G4	B2	LG1	LG0	LB0
W8	P6	P6	LD1	UD1	G1	B6	SB0	SB2	R5	R3	LB1	LB0	UR1
U9	P7	P7	LD0	UD0	G2	B7	SB1	SB3	B5	G3	LR2	LR1	UG1
V9	P8	-		LD7	G3	G0	SB2	FG0	-	B3	-	UG1	UB1
Y8	P9	-		LD6	G4	G1	SB3	FG1	-	R4	-	UB1	LR1
W9	P10	-		LD5	G5	G2	SB4	FG2	-	G4	-	UR2	LG1
Y9	P11	-		LD4	R0	G3	SB5	FG3	-	B4	-	UG2	LB1
V10	P12	-		LD3	R1	G4	FG0	SG0	-	R5	-	LG1	UR2
W10	P13	-		LD2	R2	G5	FG1	SG1	-	G5	-	LB1	UG2
Y10	P14	-		LD1	R3	G6	FG2	SG2	-	B5	-	LR2	UB2
U10	P15	-		LD0	R4	G7	FG3	SG3	-	R6	-	LG2	LR2
U11	P16	-		-	-	R0	FG4	FR0	-	-	-	-	LG2
Y11	P17	-		-	-	R1	FG5	FR1	-	-	-	-	LB2
W11	P18	-		-	-	R2	SG0	FR2	-	-	-	-	UR3
V11	P19	-		-	-	R3	SG1	FR3	-	-	-	-	UG3
Y12	P20	-		-	-	R4	SG2	SR0	-	-	-	-	UB3
Y13	P21	-		-	-	R5	SG3	SR1	-	-	-	-	LR3
V12	P22	-		-	-	R6	SG4	SR2	-	-	-	-	LG3
U12	P23	-		-	-	R7	SG5	SR3	-	-	-	-	LB3
W13	P24	-		-	-	-	FR0	-	-	-	-	-	-
Y14	P25	-		-	-	-	FR1	-	-	-	-	-	-
V13	P26	-		-	-	-	FR2	-	-	-	-	-	-
W14	P27	-		-	-	-	FR3	-	-	-	-	-	-
Y15	P28	-		-	-	-	FR4	-	-	-	-	-	-
V14	P29	-		-	-	-	FR5	-	-	-	-	-	-
W15	P30	-		-	-	-	SR0	-	-	-	-	-	-
Y16	P31	-		-	-	-	SR1	-	-	-	-	-	-
V15	P32	-		-	-	-	SR2	-	-	-	-	-	-
Y17	P33	-		-	-	-	SR3	-	-	-	-	-	-
W16	P34	-		-	-	-	SR4	-	-	-	-	-	-
U15	P35	-		-			SR5	-	-	-	-	-	-
Y5	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK	CLK
Pixels/Clock:		8	8	16	1	1	2	2	2-2/3	5-1/3	2-2/3	5-1/3	8

8. Appendix C: Mechanical Specification



9. Appendix D: Jumper Definitions

9.1 **Jumper Locations**



9.2 Jumper Functions

9.2.1 Jumper Block E1

Jumper Block E1 is used for selecting VGA BIOS'. A detailed description is available in Chapter 2.

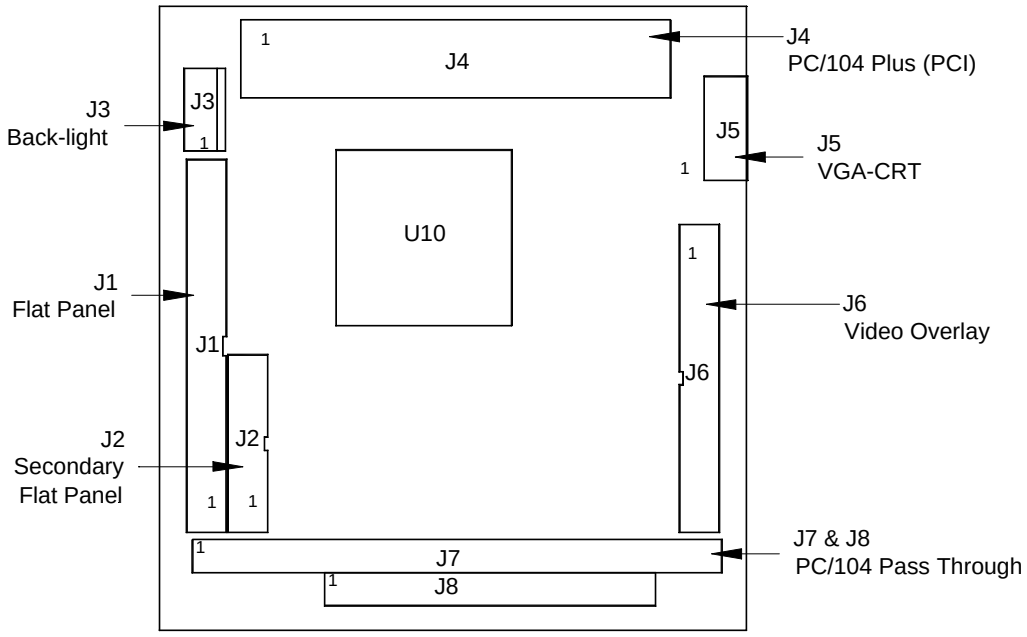
9.2.2 Jumper Block E2

Designation	Function	Setting	Selection
CK POL	Shift Clock Polarity	IN* OUT	Data valid on falling edge of clock Data valid on rising edge of clock
ENAVDO POL	VDD Enable Polarity	IN* OUT	ENAVDD signal is active high ENAVDD signal is active low
ENAVEE POL	VEE Enable Polarity	IN* OUT	ENAVEE signal is active high ENAVEE signal is active low
ENABKL POL	Enable Back-light	IN* OUT	ENABKL signal is active high ENABKL signal is active low
5V PANEL	5V / 3.3V Panel Selection	IN* OUT	Panel signals and VCC are 5V Panel signals and VCC are 3.3V

* Default setting

10. Appendix E: Connectors

10.1 Connector Layout

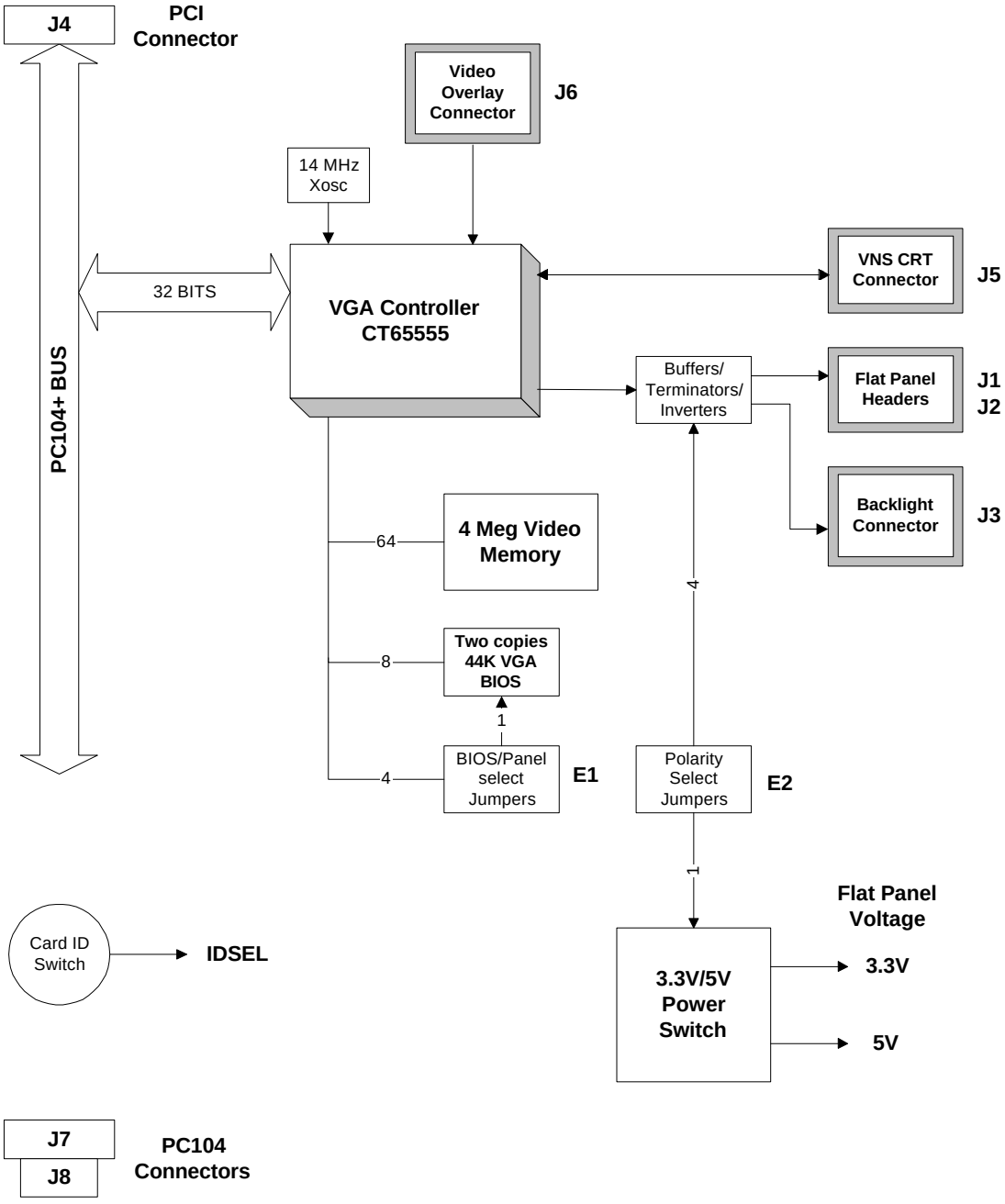


10.2 Mating Connector Specifications

The following table provides connector information for on-board and mating connectors for the VGA-104*Plus*.

Ref Des	Function	Connector on VGA-104*Plus*		Mating Cable Connector	
J1	Flat Panel (Primary)	Astron	AT-SRDPH2-50-2-1-15G	Astron	AT-IDCSK2-50-11-15G
J2	Flat Panel (Secondary)	Astron	AT-SRDPH2-20-2-0-15G	Astron	AT-IDCSK2-20-11-15G
J3	Flat Panel Backlight	AMP	640457-5	AMP	640044-5 (for #22 AWG)
J4	PC104 / PCI	Samtec	ESQT-1-30-02-G-Q-368	N/A	Not Applicable
J5	VGA - CRT	Hirose	DF11-14DP-2DS	Hirose	DF11-14DS-2C
J6	Video Overlay	Astron	AT-SRDPH2-40-2-1-15G	Astron	AT-IDCSK2-40-11-15G
J7	PC104 / ISA8	Samtec	ESQ-132-39-G-D	N/A	Not Applicable
J8	PC104 / ISA16	Samtec	ESQ-120-39-G-D	N/A	Not Applicable

11. Appendix F: Block Diagram



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