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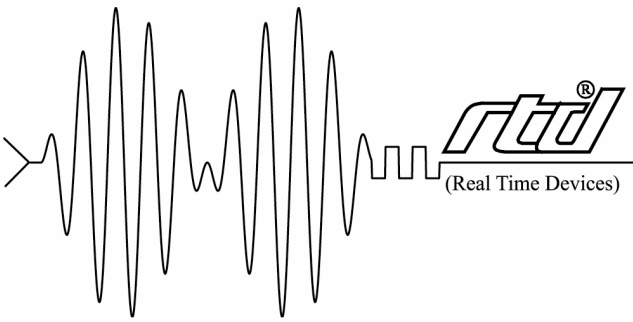
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CM112HR
VGA + Flat Panel utilityModule with IDE and Floppy Controllers

User's Manual



RTD Embedded Technologies, Inc.
"Accessing the Analog World"®

BDM-610020022
Rev. B

CM112HR
VGA + Flat Panel utilityModule with IDE and Floppy Controllers User's Manual



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98.07.27	Fixed JS1 and JS2 error
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Rev. A	New Manual Naming Method
Rev. B	Temperature ranges changed to indicated extended temperature support, HR designation added. Board diagrams and jumper settings changed to reflect new board layout. Software section changed to reflect new companion CD.

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Chapter 1 INTRODUCTION

This manual gives information on the CM112HR VGA + Flat Panel utilityModule. This module supports VGA video using analog CRTs and Flat Panels including LCD, Plasma, and EL. The CM112HR video and flat panel features are identical to those of the CM112HR utilityModule, which does not include interfaces for Floppy and Hard Drives.

CM112HR VGA utilityModule

The CM112HR VGA utilityModule was designed to provide VGA video, flat panel, and floppy and hard drive support for RTD cpuModules such as the CMC16686GX and other standard PC/104 and PC/104-*Plus* processor modules.

Features

The following are major features of the CM112HR utilityModule.

Chips and Technologies 65545 VGA controller

- 32-bit Hardware graphics-accelerator
- Linear memory addressing
- Hardware cursor

VGA CRT interface

- Maximum 640 x 480 resolution
- Up to 16 colors

Advanced Flat-panel interface

- Supports passive and active color, monochrome, EL and plasma displays
- Power switching and sequencing
- Variable bias-voltage supply
- Simultaneous CRT and Flat Panel operation

High-performance memories

- 1MB of 32-bit-wide display memory
- 512KB Frame buffer
- Flash-Programmable User Video BIOS

Low power-consumption

- 2W typical from single +5V power supply
- Panel-off and Standby modes (1.5W and 0.5W)

Software Included

- VGA and Flat Panel Utilities
- BIOS versions for Flat Panels

Floppy Drive Controller

- Supports 1.44MB, 1.2MB, 720KB, and 360KB floppies
- Solder blob selectable to primary or secondary address

IDE Hard Drive Controller

- Supports IDE and Extended IDE drives
- Jumper selectable to primary or secondary address

Connectors

Connectors provided are:

- CN1: Floppy drive
- CN2: IDE hard drive
- CN3: HDD Activity LED
- CN4: VGA monitor
- CN5: Flat Panel
- CN6: Flat Panel Power
- CN7: Powerdown Control
- CN8: Power Connector
- CN9: PC/104 Bus (XT)
- CN10: PC/104 Bus (AT)

Recommended Cables

To allow maximum flexibility, cables are not included with the CM112HR. We offer a ready-made cable kit for the module which may be purchased separately:

CM112HR uses cable kit XK-CM15, which contains:

- VGA monitor cable (DIL10 to DSUB15)
- Floppy cable (DIL34 to two DIL34)
- IDE Hard drive cable (DIL40 to two DIL40)
- Power cable (DIL8 to wire leads)

General Specifications

- Dimensions: 3.8 x 3.9 x 0.6" (97 x 100 x 16 mm)
- Weight (mass): 3.0 ounces (85 grams)
- 8-layer PCB
- Operating conditions:
- temperature: -40 to +85 degrees C
- relative humidity: 0 - 90%, non-condensing
- Storage temperature: -55 to +125 degrees C

Chapter 2 CONFIGURING THE UTILITYMODULE

The following sections contain information on configuring the utilityModule.

Please read this entire section before attempting to use the utilityModule!

Jumpers

Jumpers configure the following functions:

- Floppy drive controller enable
- Hard drive controller enable
- Hard drive controller base address
- Interrupt line IRQ9 enable
- Flat Panel options
    - User/Factory VGA BIOS
    - User VGA BIOS programming enable
    - Back light power supply voltage selection
    - Flat Panel Blank*/DE pin output selection

Default Settings

The utilityModule is delivered from the factory configured according to the following table.

Default Jumper Settings new		
Jumper	**Setting**	**Function**
JP1	1-2	FDD enabled
JP2	1-2	HDD enabled
JP3	2-3	IRQ9 disabled
JP4	1-2	Factory VGA BIOS enabled
JP5	1-2	User BIOS programming disabled
JP6	1-2	+12V Backlight supply
JP7	1-2	M signal to Blank*/DE pin
JP8	NC	Factory Use Only
JP9	1-2	Primary HDD address By Default
JP10	NC	Factory Use Only
JP11	NC	Factory Use Only

Table 1 Default Jumper Settings

For most applications, you will not have to change these settings. If you do, refer to the following pages for details.

Locations

The figure below shows jumper locations.

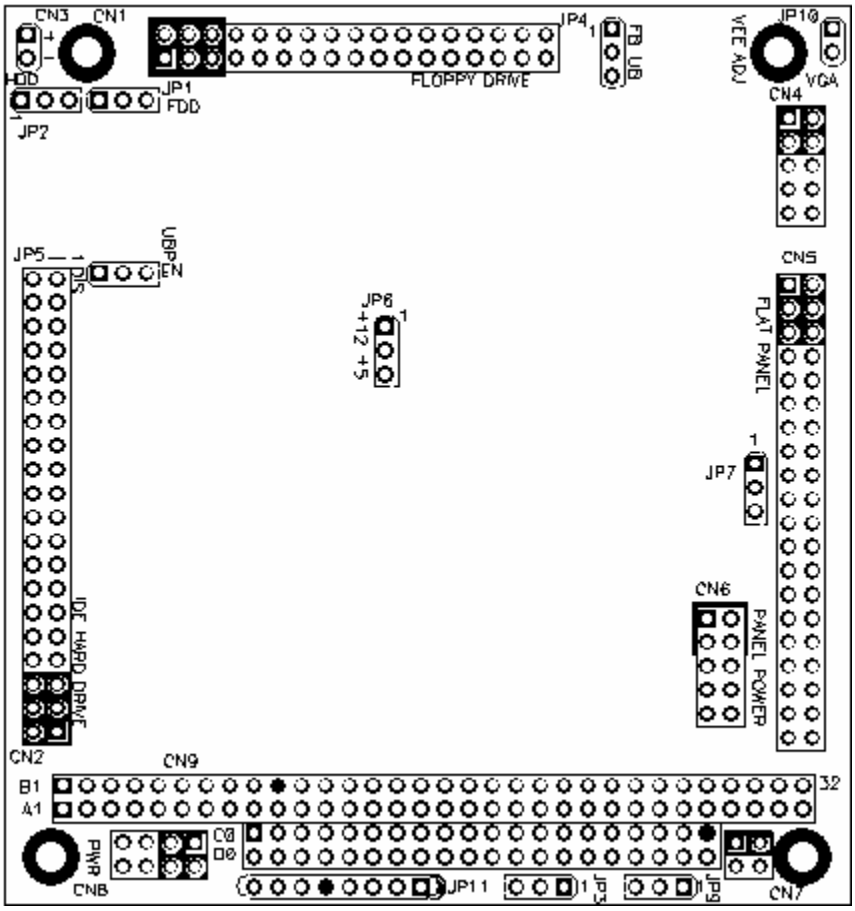


Figure 1 Jumper Locations

Descriptions

The following table describes the functions of the jumpers.

Jumper	Use
JP 1	Enables or disables the floppy drive controller. 1-2: Enabled 2-3: Disabled Default: 1-2, FDD Enabled
JP 2	Enables or disables the IDE hard drive controller. 1-2: Enabled 2-3: Disabled Default: 1-2, HDD Enabled
JP3	Enables or disables interrupt line IRQ9 from the VGA controller to the bus. IRQ9 is not normally used by the VGA controller. 1-2: IRQ9 Enabled 2-3: IRQ9 Disabled Default: 2-3, IRQ9 Disabled
JP 4	Selects which VGA BIOS is used. 1-2: Factory BIOS 2-3: User BIOS Default: 1-2, Factory BIOS
JP 5	Enables or disables programming of the User VGA BIOS. CAUTION: Ensure memory range C800-CFFFh is not in use before placing this jumper in position 2-3. 1-2: Disables User BIOS programming. 2-3: Enables User BIOS programming. Default: 1-2, User BIOS programming disabled.
JP 6	Selects the back light power supply voltage. This voltage is switched to the Vbkl (backlight) pin of the Flat Panel interface. 1-2: +12V Backlight supply 2-3: +5V Backlight supply Default: 1-2, +12V supply
JP 7	Selects the signal output on the Blank*/DE pin of the Flat Panel connector. 1-2: M signal to Blank*/DE pin 2-3: LP signal to Blank*/DE pin Default: 1-2, M signal to Blank*/DE pin

JP 9	Selects the address for the IDE drive 1-2 IDE Primary Address 2-3 IDE Secondary Address Default 1-2 (Primary)
JP 10	Factory Use Only
JP 11	Factory Use Only

Table 2 Jumper Functions

Solder Jumpers

Solder jumpers are used to configure less-frequently-changed options. These are:

- Floppy drive controller address
- Flat Panel bias-voltage-supply source

Default Settings

The utilityModule is delivered from the factory configured according to the following table.

Default Solder Jumper Settings		
Jumper	**Setting**	**Function**
JS2	1-2	FDD at primary address
JS3	1-2	Flat-Panel bias voltage generated from +5V bus
JS4	NC	Factory Use Only
JS5	1-2	Factory Use Only
JS6	NC	Factory Use Only
JS7	1-2	Factory Use Only
JS8	NC	Factory Use Only

Table 3 Default Solder Jumper Settings

For most applications, you will not have to change these settings. If you do, refer to the following pages for details.

Locations

The figure below shows solder jumper locations.

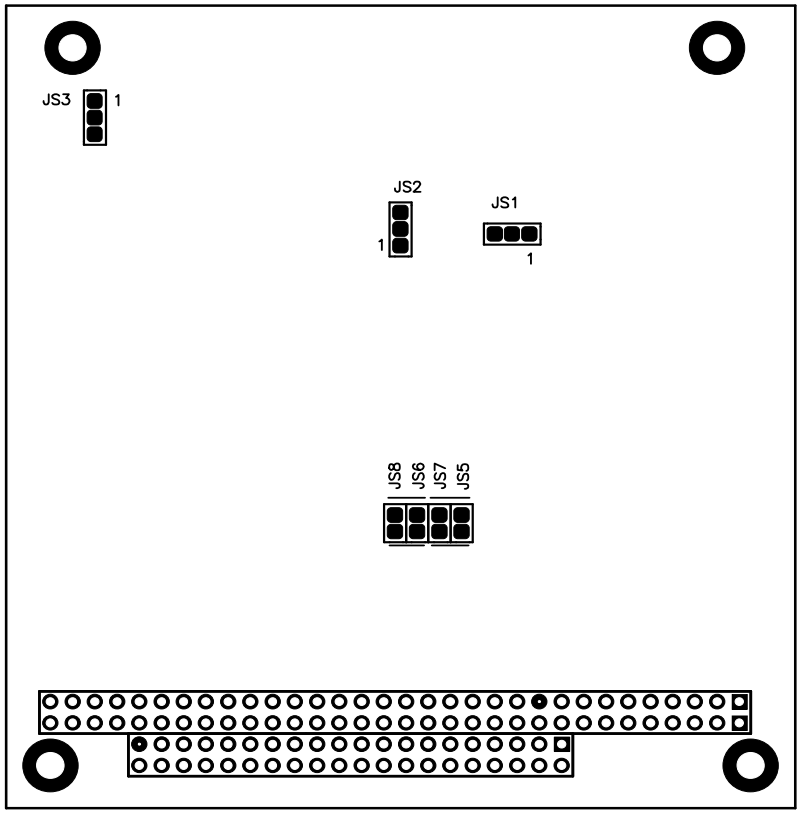


Figure 2 Solder Jumper Locations

Descriptions

The following table describes the functions of the solder jumpers.

Jumper	Default	Use
JS2	1-2	Selects the I/O address of the Floppy Drive controller. 1-2: Primary address (3F0-3F7h) 2-3: Secondary address (370-377h)
JS3	1-2	Selects the source of power for the DC-DC converter. This converter generates Flat Panel bias-voltages. 1-2: +5Vdc from PC/104 bus 2-3: +12Vdc from PC/104 bus
JS4	Open	Factory use only.
JS5	Closed	Factory use only.
JS6	Open	Factory use only.
JS7	Closed	Factory use only.
JS8	Open	Factory use only.

Table 4 Solder Jumper Functions

Bias-Voltage Adjustment

If you are using a Flat Panel Display which requires a positive or negative bias voltage, you can use potentiometer R16 to adjust the bias voltages.

Bias voltages are output on CN5 pins 3 (Vee+) and 4 (Vee-). We strongly recommend you follow the procedure below when adjusting the bias voltages.

For details on the use of the bias-voltage supply, refer to the section on Interfacing a Flat Panel Display.

CAUTION: The module is *not* intended to simultaneously supply both positive and negative bias voltages. Attempting to do so could overload the supply and result in damage.

CAUTION: The bias supplies produce voltages which can *very easily* damage other components of the module. Use extreme care when connecting to CN5 to measure the bias voltages. If you short bias voltage to surrounding pins the module *will be damaged* and this damage *is not covered by the warranty*.

Adjustment Procedure

To minimize risk of damage to your Flat Panel, we suggest you adjust the bias voltages using this procedure:

- From the flat-panel datasheet, determine the approximate bias voltage required.
- Connect a voltmeter between the bias voltage pin and ground.
- Turn on the system.
- Adjust the bias supply to approximately the desired voltage.
- Turn off the system.
- From the panel datasheet, determine the approximate current the panel will draw from the bias supply.
- Select a load resistor which will draw that current at the desired voltage.
- Connect the load resistor between the bias voltage pin and ground.
- Turn on the system.
- Verify the bias voltage, adjusting again if necessary.
- Turn off the system.

You can now connect your flat panel display.

CAUTION: Although potentiometer R16 adjusts both positive (Vee+) and negative (Vee-) bias supplies, the two output voltages will not necessarily be equal in magnitude. Do not adjust one output voltage by measuring the other.

NOTE:	The output of the bias voltage supply cannot be adjusted below 12 volts when solder jumper JS3 is in position 2-3.

Chapter 3 INSTALLING THE UTILITYMODULE

Since the utilityModule uses a PC/104 stackthrough bus, the only hardware installation you will do is placing the module to the PC/104 stack. To do this, you will connect the PC/104 bus connector with the matching connector of another module.

Recommended Procedure

We recommend you follow the procedure below to ensure that stacking of the modules does not damage connectors or electronics.

- Turn off power to the PC/104 system or stack.
- Select and install standoffs to properly position the utilityModule on the PC/104 stack.
- Touch a grounded metal part of the stack to discharge any buildup of static electricity.
- Remove the utilityModule from its anti-static bag.
- Check that keying pins in the PC/104 bus connector are properly positioned.
- Check the stacking order: make sure an XT bus card will not be placed between two AT bus cards, or it will interrupt the AT bus signals.
- Hold the utilityModule by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
- Gently and evenly press the utilityModule onto the PC/104 stack.

CAUTION: Do not force the module onto the stack! Wiggling the module or applying too much force may damage it. If the module does not readily press into place, remove it, check for bent pins or out-of-place keying pins, and try again.

Connecting the utilityModule

The following sections describe connectors of the utilityModule.

Finding Pin 1 of Connectors

Pin 1 of connectors is indicated by a white area silk-screened on the PC board. It is also indicated by a square solder pad visible on the bottom of the PC board.

Locations

The figure below shows connector locations.

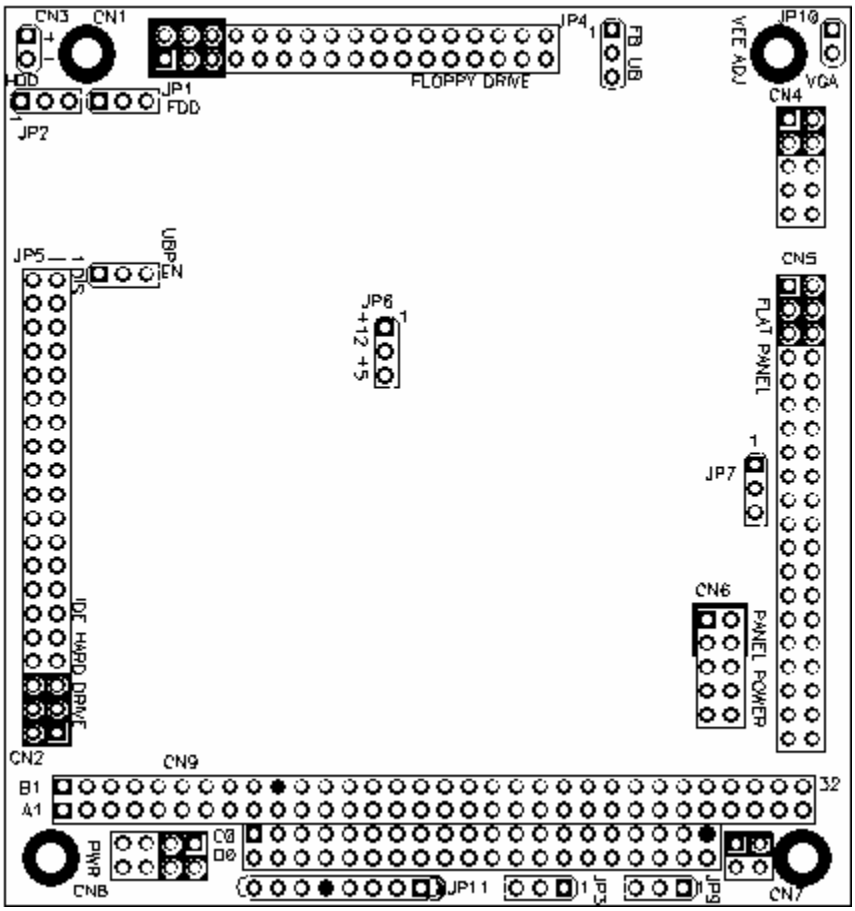


Figure 3 Connector Locations

Table 5 Board Connectors List

Connectors		
Connector	**Function**	**Size**
CN1	Floppy Drive	34 pin
CN2	IDE Hard Drive	40 pin
CN3	HDD activity LED	2 pin
CN4	VGA monitor	10 pin
CN5	Flat Panel	40 pin
CN6	Flat Panel Power	10 pin
CN7	Powerdown control	4 pin
CN8	Power connector	10 pin
CN9	PC/104 XT Bus	64 pin
CN10	PC/104 AT Bus	40 pin

Floppy Disk, CN1

CN1 is a 34-pin DIL connector which provides the standard signals to connect one or two floppy disk drives. The pinout of this connector is shown below.

If you are using our cable kit, you can simply connect the hard drive cable in this kit between connector CN1 and your floppy drive(s).

Floppy Drive Connector, CN1			
Pin	**Signal**	**Function**	**In/out**
2	RWC*	write precompensation	out
4	n.c.		--
6	n.c.		--
8	INDEX*	index pulse	in
10	MOTEN1*	motor 1 enable	out
12	DRVSEL1*	drive select 1	out
14	DRVSEL2*	drive select 1	out
16	MOTEN2*	motor 2 enable	out
18	DIRECTION*	step direction	out
20	STEP*	step pulse	out
22	WRDATA*	write data	out
24	WREN*	write enable	out
26	TRACK0*	track 0 signal	In
28	WRPROT*	write protect	In
30	RDDATA*	read data	In
32	HEADSEL*	head select	out
34	DSKCHG*	disk change	In
ODD PINS	GND	Ground signal	--

IDE Hard Drive, CN2

CN2 is a 40-pin DIL connector which provides signals to connect one or two IDE hard disk drives. The pinout of this connector is shown below. If you are using our cable kit, you can simply connect the hard drive cable in this kit between connector CN2 and your hard disk drive(s).

Table 6 CN2 IDE Hard Drive Connector

IDE Hard Drive Connector, CN2			
Pin	**Signal**	**Function**	**in/out**
1	RESET*	Reset HD	out
2	GND	Ground signal	--
3	HD7	HD data 7	in/out
4	HD8	HD data 8	in/out
5	HD6	HD data 6	in/out
6	HD9	HD data 9	in/out
7	HD5	HD data 5	in/out
8	HD10	HD data 10	in/out
9	HD4	HD data 4	in/out
10	HD11	HD data 11	in/out
11	HD3	HD data 3	in/out
12	HD12	HD data 12	in/out
13	HD2	HD data 2	in/out
14	HD13	HD data 13	in/out
15	HD1	HD data 1	in/out
16	HD14	HD data 14	in/out
17	HD0	HD data 0	in/out
18	HD15	HD data 15	in/out
19	GND	Ground signal	--
20	n.c.		--
21	AEN	Address Enable	Out
22	GND	Ground signal	--
23	IOW*	I/O Write	Out
24	GND	Ground signal	--
25	IOR*	I/O Read	Out
26	GND	Ground signal	--
27	IOCHRDY	I/O Channel Ready	In
28	BALE	Bus Address Latch Enable	Out
29	n.c.		
30	GND	Ground signal	--
31	IRQ	Interrupt Request	In
32	IOCS16*	16 bit transfer	In
33	A1	Address 1	Out
34	GND	Ground signal	--
35	A0	Address 0	Out
36	A2	Address 2	Out
37	HCS0*	HD Select 0	Out
38	HCS1*	HD Select 1	Out
39	LED	HDD activity LED (-)	In
40	GND	Ground signal	--

HDD Activity LED, CN3

CN3 is a 2-pin connector which allows connection of an LED to indicate hard drive activity. The LED(-) signal on this connector comes from the hard disk drive, which must be able to sink the desired LED current.

The pinout of this connector is shown below:

Pin	Signal	Function
1	LED (+)	+5Vdc through 390 ohm resistor
2	LED (-)	LED drive signal from HDD

VGA Video, CN4

CN4 is a 10-pin DIL connector which provides standard signals to connect an analog VGA video monitor. The pinout of this connector is shown below:

If you are using our cable kit, you can simply connect the video cable in this kit between connector CN4 and your VGA monitor.

VGA Video Connector, CN4			
DIL Pin	**Signal**	**Function**	**DB15 Pin**
1	VSYNC	Vertical sync	14
2	HSYNC	Horizontal sync	13
3	-	-	4
4	RED	Red signal	1
5	-	-	12
6	GREEN	Green signal	2
7	-	-	11
8	BLUE	Blue signal	3
9	AGND	Analog Ground	6
-	AGND	Analog Ground	7,8
10	GND	Digital Ground	10
-	GND	Digital Ground	5

Table 7 CN4 VGA Video Connector

Shown another way, the pinout of this connector (facing the pins) is:

1	VSYNC	HSYNC	2
3	-	RED	4
5	-	GREEN	6
7	-	BLUE	8
9	AGND	GND	10

Note: In our XK-CM15 cable kit, not all ground pins of the DB15 VGA connector are wired to the utilityModule. In a very few cases, a particular monitor will require all

ground pins to be connected. In these cases, it will be necessary to use a cable with all ground signals connected to the utilityModule.

Note: High-resolution video uses very high-speed signals. For optimum video performance, you should:
- use a short video cable between the module and VGA connector
- provide a low-impedance ground between your system and the VGA connector

Flat Panel Interface, CN5

CN5 is a 40-pin DIL connector which provides signals to connect Flat Panel displays. Please refer to the chapter on Flat Panel Displays for more details. The pinout of this connector is shown below:

Table 8 CN5 Flat Panel Connector

Flat Panel Interface Connector, CN5			
Pin	**Signal**	**Function**	**Note**
1	VDDSW	Switched Panel Vdd	
2	VBKLSW	Switched Backlight supply	1
3	Vee(+)	Positive Panel Bias	2
4	Vee(-)	Negative Panel Bias	2
5	ENABKL	Backlight Enable signal	
6	GND		
7	M	Modulation clock	
8	Blank*/DE	Blank/Display enable	3
9	GND		
10	LP	Latch pulse	
11	FLM	First line marker	
12	GND		
13	SHFCLK	Shift clock	
14	GND		
15	PNL0	Panel 0	
16	PNL1	Panel 1	
17	PNL2	Panel 2	
18	PNL3	Panel 3	
19	PNL4	Panel 4	
20	PNL5	Panel 5	
21	PNL6	Panel 6	
22	PNL7	Panel 7	
23	PNL8	Panel 8	
24	PNL9	Panel 9	
25	PNL10	Panel 10	
26	PNL11	Panel 11	
27	PNL12	Panel 12	
28	PNL13	Panel 13	
29	PNL14	Panel 14	
30	PNL15	Panel 15	
31	GND		
32	PNL16	Panel 16	
33	PNL17	Panel 17	
34	PNL18	Panel 18	
35	PNL19	Panel 19	
36	PNL20	Panel 20	
37	PNL21	Panel 21	
38	PNL22	Panel 22	
39	PNL23	Panel 23	
40	GND		

Notes: 1) VBKLSW can provide switched +5Vdc or +12Vdc, as selected by jumper JP5.

2) The magnitude of bias voltages Vee(+) and Vee(-) are adjusted by trimpot R16.

3) The Blank*/DE pin may be connected to either M or LP signals from the VGA controller by positioning jumper JP7.

For more information, refer to the section on Configuring the utilityModule.

Flat Panel Power, CN6

CN6 is a 10-pin DIL connector which provides power and control signals which may be used when interfacing a Flat Panel display. The pinout of this connector is shown below:

Flat Panel Power Connector, CN6			
DIL Pin	**Signal**	**Function**	**in/out**
1	ENAVDD	Enable Panel Vdd	out
2	ENABKL	Enable Panel Vbkl	out
3	ENAVEE	Enable Panel Vee	out
4	GND	Ground	-
5	+5Vdc	Power supply	-
6	+5Vdc	Power supply	-
7	GND	Ground	-
8	GND	Ground	-
9	+12Vdc	Power supply	-
10	-12Vdc	Power supply	-

Table 9 CN6 Flat Panel Power Connector

Shown another way, the pinout of this connector (facing the pins) is:

1	ENAVDD	ENABKL	2
3	ENAVEE	GND	4
5	+5V	+5V	6
7	GND	GND	8
9	+12V	-12V	10

Note: The +12V and -12V pins are connected to the PC/104 bus and power supply connector. These voltages *are not* generated on the utilityModule.

Powerdown Control, CN7

A location is provided for connector CN7, which is a 4-pin connector providing access to powerdown control signals of the VGA controller. These signals are described in the section on Power Management.

The right-angle header for CN7 is *not* factory installed.

The pinout of this connector (facing the pins) is shown below:

1	STANDBY*	GND	2
3	ACTI	GND	4

Table 10 CN7 Powerdown Control Connector

Note: The STANDBY* signal is pulled high by a 10k ohm resistor.

Power Connector, CN8

CN8 is an 8-pin connector which can be used to connect power to the utilityModule. The signals on this connector are directly connected to corresponding power signals on the PC/104 bus connectors.

The pinout of this connector (facing the pins) is shown below:

7	5	3	1
GND	-5	-5	GND
+5	-12	+12	+5
8	6	4	2

Table 11 CN8 Power Connector

Note: Power wiring to the utilityModule must be sufficiently heavy to supply needed current without excessive voltage drop, or erratic operation may occur.

We strongly recommend you connect bypass capacitors as close as possible to this power connector. A 0.1uF ceramic and 470uF electrolytic capacitor in parallel are usually sufficient.

PC/104 Bus Connectors, CN9 and CN10

Connectors CN9 and CN10 provide PC/104 bus connections. CN9 carries XT bus signals, and CN10 carries additional signals for the AT bus. The signals on CN9 and CN10 conform to the IEEE P966 standard for the PC/104 bus.

The following tables list the connector pinouts:

PC/104 XT Bus Connector, CN9		
Pin	**Row A**	**Row B**
1	IOCHCHK*	0V
2	SD7	RESETDRV
3	SD6	+5V
4	SD5	IRQ9
5	SD4	-5V
6	SD3	DRQ2
7	SD2	-12V
8	SD1	ENDXFR*
9	SD0	+12V
10	IOCHRDY	(KEYING PIN)
11	AEN	SMEMW*
12	SA19	SMEMR*
13	SA18	IOW*
14	SA17	IOR*
15	SA16	DACK3
16	SA15	DRQ3
17	SA14	DACK1*
18	SA13	DRQ1
19	SA12	REFRESH
20	SA11	SYSCLK
21	SA10	IRQ7
22	SA9	IRQ6
23	SA8	IRQ5
24	SA7	IRQ4
25	SA6	IRQ3
26	SA5	DACK2*
27	SA4	TC
28	SA3	BALE
29	SA2	+5V
30	SA1	OSC
31	SA0	0V
32	0V	0V

Table 12 CN9 XT Bus Connector

PC/104 AT Bus Connector, CN10		
Pin	**Row C**	**Row D**
0	0V	0V
1	SBHE*	MEMCS16*
2	LA23	IOCS16*
3	LA22	IRQ10
4	LA21	IRQ11
5	LA20	IRQ12
6	LA19	IRQ15
7	LA18	IRQ14
8	LA17	DACK0*
9	MEMR*	DRQ0
10	MEMW*	DACK5*
11	SD8	DRQ5
12	SD9	DACK6*
13	SD10	DRQ6
14	SD11	DACK7*
15	SD12	DRQ7
16	SD13	+5V
17	SD14	MASTER*
18	SD15	0V
19	(KEYING PIN)	0V

Table 13 CN10 AT Bus Connector

Note: Two locations on the bus have mechanical keying pins to help prevent misconnection of the PC/104 bus. These keying pins are a part of the PC/104 standard, and we strongly recommend you leave them in place.

If you have other modules without keying pins, we suggest you modify them to include keying.

Chapter 4 USING THE UTILITYMODULE

Video

The video interface of the utilityModule appears as a standard VGA card. It will support interlaced and non-interlaced analog RGB VGA monitors, but does not support digital RGB monitors.

The module supports the following general video modes:

- VGA
- EGA
- CGA
- MCGA
- Monochrome

For a complete list of supported video modes, please refer to the Chip and Technologies 65545 datasheet (see the following section).

To use certain features of the video controller, you may need to use utility programs included on floppy disk. Refer to the following sections for information on these utilities.

Chips & Technologies Documentation

Due to the complexity of the Chips & Technologies 65545 VGA controller chip, it is impossible for us to reproduce all programming information in this manual. If you will be doing in-depth programming of the VGA controller, we suggest you obtain the 65545 datasheet from the manufacturer.

The 65545 datasheet is available on-line in electronic format as an Adobe Acrobat (.PDF) file on the Asiliant Technologies website:

www.asiliant.com

You may also contact:

Asiliant Technologies

256 East Gish Road

San Jose, California 95112

Or by phone/fax:

Telephone: 408-467-0755

Fax: 408-467-0750

Floppy Disk

The floppy disk controller of the utilityModule appears as a standard PC floppy controller.

You may need to run the setup program for your cpuModule or computer to configure the correct floppy type.

The interface supports:

- 3.5" 1.44MB and 720k floppy disks
- 5.25" 1.2MB and 360k floppy disks

The floppy controller can be mapped at a secondary I/O address. This allows you to use up to four floppy drives in systems with a BIOS which supports these drives. Refer to the section on solder jumpers for details on changing the I/O address.

IDE Hard Disk

The hard drive controller of the utilityModule appears as a standard PC IDE hard drive controller. It will support standard IDE drives (less than 528MB) and enhanced IDE drives (over 528MB).

You may need to run the setup program for your cpuModule or computer to configure the correct hard drive type.

The IDE controller can be mapped at a secondary I/O address. This allows you to use up to four hard drives in systems with a BIOS which supports four drives. Refer to the section on jumpers for details on changing the I/O address.

Included Software

The CM112HR ships with several software utilities and sample VGA BIOS files. This software is provided on CD with the board. Newer versions of the utilities may be available from the RTD web site at http://www.rtd.com, or the Asiliant web site at http://www.asiliant.com.

Utilities

- **CHIPSEXT** and **CHIPSVGA** are Windows utilities to view/edit registers in the 65545.
- **CT.COM** is a DOS command-line utility to switch the VGA controller to CRT mode.
- **DEBUGVGA** is DOS a utility that reads, writes, dumps and loads registers, sets VGA BIOS modes and computes CRT timings for the current mode.
- **FP.COM** is a DOS command-line utility to switch the VGA controller to flat panel mode.
- **MODETEST** is a DOS diagnostic to set and display information for each video mode.
- **SM.COM** is a DOS utility that switches the VGA controller to simultaneous CRT and Flat Panel mode

VGA BIOS Files

If you are using Flat Panel displays, you may need these files, which are versions of the video BIOS. Each one supports a different Flat Panel or class of Flat Panels. Refer to the section on Interfacing Flat Panels for more information on using these files.

Additional BIOS versions for other displays will be made available on our website and from factory technical support.

- 18BTFT.DAT - 640x480 Color TFT 18-Bit Interface
- 1K768TFT.DAT - 1024x768 Color TFT (Sharp LQ10dx01)
- 800STN.DAT - 800x600 Color STN
- 800TFT.DAT - 800x600 Color TFT
- ELDD640.DAT - 640x480 EL DD (Sharp LJ64H052)
- HTCTFT.DAT - 640x480 Color TFT (Hitachi 26DS2, Hitachi TX26D02VC2AA)
- MONODD.DAT - 640x480 Dual Scan Monochrome (Sharp LM64P80)
- MONODDEX.DAT - 640x480 Dual Scan Monochrome using external buffer (Sharp LM64P80)
- MONODDNA.DAT - 640x480 Dual Scan Monochrome using external buffer & No Accelerator (Sharp LM64P80)
- STN4BIT.DAT - 640x480 4-Bit Pack STN Color (Sanyo LCM5327-24NAK, LM-CK33-33-22NEZ, LCM 5330)
- STNDD.DAT - 640x480 Color STN DD -8/16 Bit Interface (Sharp LM64C08)
- STNDD1DR.DAT - 640x480 Color STN DD -8/16 Bit Interface (Sharp LM64C08) for 1-DRAM Memory Configuration.
- STNDDEX.DAT - 640x480 Color STN DD -8/16 Bit Interface using external buffer (Sharp LM64C08) for 2-DRAM Memory Configuration.
- STNDDNA.DAT - 640x480 Color STN DD -8/16 Bit Interface using external buffer & No Accelerator (Sharp LM64C08)
- STNE4BIT.DAT - 640x480 4-Bit Extended Pack STN Color (Sharp LM64C031)
- TFTCLR.DAT - 640x480 Color TFT With Display Enable (Sharp LQ9D011, Toshiba LTM09C015-1)

VGA User BIOS Programmer (112_USER.EXE)

This utility program is used to program the User portion of the video BIOS to support various Flat Panels. The utilityModule is supplied from the factory with the Factory video BIOS programmed with a settings identical to MONODDEX.DAT and the User video BIOS programmed with STNDDEX.DAT (see above). To use a different Flat Panel type, you will need to reprogram the User video BIOS using this utility.

The procedure is:

- Select the BIOS file you wish to program into the User BIOS.
- Make certain *no* hardware or software is using address range C8000h to CFFFFh.
- Make sure shadowing of address range C8000h to CFFFFh is disabled in Setup.
- Make sure EMM386 or other memory managers are *not* using address range C8000h to CFFFFh.
- Set jumper JP4 to boot using the Factory BIOS.
- Set jumper JP5 to disable User BIOS programming.
- Boot the system.
- Run 112_USER.EXE and follow the directions displayed.

Once you have reprogrammed the User BIOS, move jumper JP4 to select whether the utilityModule boots using the Factory BIOS or User BIOS.

VGA BIOS Modification Utilities

Depending on the application, it may be necessary to make a custom version of the VGA BIOS. The most common reason to make a custom VGA BIOS is to support a non-standard flat panel type.

Asiliant provides a BIOS modification program (BMP), to generate custom VGA BIOSes. The BMP is included on the companion CD for the board. For detailed information on using the BMP, refer to the documentation provided with the program. Once you have created a custom VGA BIOS, you can program it onto the board using 112_USER.EXE.

Power Protection Circuitry

To reduce the risk of damage due to power-supply problems, the utilityModule includes several protective components.

Module Power-Supply Protection

The utilityModule includes components to help prevent damage due to problems with the +5Vdc power supply from the PC/104 bus or power-supply connector. Protection is provided for:

- Over-current
- Reversed polarity
- Excessive voltage

This protection is only for the utilityModule, and will not protect other devices in a PC/104 stack or any of the Flat Panel power supplies.

The protective fuse is replaceable and is available from electronics suppliers. Its description and part number are:

Littelfuse Nano^2 SMF 2.0 amp, R451-002

Caution:	Replace fuses only with parts of identical current and voltage rating.

Flat-Panel Power-Supply Protection

The Flat-Panel power supplies of the utilityModule are protected against overcurrent by the following devices:

Vbkl: fuse F2, 2A rating, Littelfuse ALF SMF, R418-002

Vdd: fuse F3, 2A rating, Littelfuse ALF SMF, R418-002

We suggest you return the utilityModule to the factory for replacement of these components, as they are surface-mounted to the board.

Caution: RTD Embedded Technologies cannot be responsible for damage resulting from attempts to replace these components.

Caution: Replace fuses only with parts of identical current and voltage rating.

Chapter 5 INTERFACING FLAT PANELS

The utilityModule can display VGA graphics data on a CRT video monitor, Flat Panel display, or even simultaneously on both a CRT and a Flat Panel.

The utilityModule can be programmed to work with virtually any Flat Panel display in the following classes:

- Active Color TFT (Thin-Film-Transistor) LCD
- Passive Color STN (Super-Twist Nematic) LCD
- Monochrome LCD
- Monochrome EL (electroluminescent)
- Monochrome Plasma

To use the utilityModule with a Flat Panel, you will need to do these things:

- Select a Flat Panel which is compatible with the module.
- Correctly wire the Flat Panel to the module.
- Correctly program the USER BIOS to support the Flat Panel.

The following sections will guide you through these steps.

Selecting a Flat Panel

Caution: Flat Panel displays are expensive and delicate devices. RTD Embedded Technologies cannot be responsible for damage to a display caused by misconnection, misuse, or misapplication of our product. Please use extreme care and good engineering practice when connecting a Flat Panel to the utilityModule.

The Chips & Technologies 65545 VGA controller chip can support a tremendous variety of flat panels, but you will find it easiest to use a panel which has been tested with the chipset.

Abbreviated List of Supported Panels

Some of the panels known to work with the 65545 VGA controller are:

Active Color (TFT)

- Hitachi TM26D50VC2AA 640x480
- Sharp LQ9D011 640x480
- Sharp LQ10D311 640x480
- Sharp LQ10DX01 1024x768
- Toshiba LTM-09C015-1 640x480

Passive Color (STN)

- Sanyo LM-CK53-22NEZ 640x480
- Sanyo LCM5327-24NAK 640x480
- Sanyo LCM5331-22NTK 640x480
- Sharp LM64C031 640x480
- Sharp LM64C08P 640x480
- Kyocera KCL6448 640x480
- Hitachi LMG9720XUFC 640x480
- Hitachi LMG9721XUFC 640x480
- Toshiba TLX-8062S-C3X 640x480
- Optrex DMF-50351NC-FW 640x480

Monochrome

- Epson EG-9005F-LS 640x480
- Epson ECM-A9071 1024x768
- Citizen G6481L-FF 640x480
- Sharp LM64P80 640x480
- Sanyo LCM-6494-24NTK 640x480
- Sanyo LCM-5491-24NAK 1024x768
- Hitachi LMG5364XUFC 640x480

Plasma

- Matsushita S804 640x480

Electroluminescent (EL)

- Sharp LJ64ZU50 640x480

Other panels are frequently added. To obtain the most current panel list, contact our website:

www.rtd.com

A panel list is maintained under the CM110HR and CM112HR utilityModules.

We strongly recommend you use a panel in these lists. If you do not, you will need to determine wiring connections and register settings yourself. We suggest you start by trying to match the unlisted panel to a similar one in our listings. You may then need to change parameter settings of the video chipset for proper operation.

Wiring to the Flat Panel

Connections between a Flat Panel and the utilityModule consist of three types of signals:

- Power signals
- Timing and control signals
- Data signals

These signals types are briefly described below.

Power Signals

Most Flat Panels require several power supply voltages. Almost all panels require a +5Vdc logic supply. Most LCD panels also require a bias voltage supply, which can be a positive or negative voltage, usually in the range of 12 to 36Vdc. If the panel uses a backlight, a +12Vdc supply is also usually required.

Power Sequencing

The order in which power is applied to a flat panel display is usually very important. Improperly switching power to the panel may even result in damage to the display. For this reason, the utilityModule includes switching circuitry which can be programmed to properly sequence supplies to most Flat Panels.

Using On-board Power Switching

If the power supply needs of your Flat Panel are within the utilityModule capabilities listed below, you can use the on-board power switching circuitry.

Vdd: +5Vdc, 2A maximum

Vee: -36Vdc to +36Vdc, adjustable

Vbkl: +5Vdc or +12Vdc (selectable by JS3), 2A maximum

If your Flat Panel will not operate within these limits, you will need to implement external power switching. Please read the following section.

Using External Power Switching

If you need voltages or currents which exceed those available on the utilityModule, you must implement your own power switching circuitry. You may be able to control your switching circuitry with control signals of the utilityModule. These signals are:

- ENAVEE - Bias-voltage-supply control signal
- ENBKL - Backlight-supply control signal
- ENVDD - Logic-supply control signal

Caution: These signals *are not* power supplies for a Flat Panel! Do *not* connect them to power supply pins of a Flat Panel.

These signals are logic outputs controlled by the VGA controller. They are switched on and off in a sequence which can be programmed to be compatible with most Flat Panels. You may use these signals to control relay drivers or transistor switches to switch power to your flat panel.

The signals are active-high, meet TTL logic levels, and can source or sink up to 8 mA of current.

Before designing external switching circuitry, verify that the control signals listed above can be programmed to the power-supply sequence you require. Refer to the Chips & Technologies 65545 datasheet for information on programming of the signals.

Timing and Control Signals

Flat panels also require timing and control signals which clock data into the display logic and control other aspects of display operation.

The utilityModule supplies the following timing and control signals:

Table 14 Flat Panel Timing and Control Signals

Signal	Name	Purpose	Other Common Names	Alternate Programmable Functions
SHFCLK	Shift clock	Shifts (clocks) individual pixel data into panel.	CL2, VDCLK, XCK, CP2	
FLM	First Line Marker	Indicates start of new screen of data. Similar to video VSYNC.	LFS, YD, S	
LP	Latch Pulse	Indicates end of a line of data. Similar to video HSYNC.	CL1, LLCLK, CP1	DE, BLANK*
M	Modulation	AC modulation clock for panel	ACDCLK, MOD, MCLK	DE, BLANK*
BLANK*	Blank	Disables display of data while each line is being updated.		
DE	Display Enable	Enables display of data.	DISP, Display Off*	

Data Signals

All panels require data signals, though the number required by each panel type will vary. Each pixel (dot) displayed on the panel has its color and/or brightness determine by a group of data signals. For a color panel, three groups of data signals are usually used: a red group, a green group, and a blue group. The overall color or brightness of each pixel is determined by the settings of the data signals within the groups.

For dual scan panels, the data signals are also divided into upper and lower groups. On each pixel clock, an upper pixel is loaded from the upper data signals, and a lower pixel is simultaneously loaded from the lower data signals.

Programming the User BIOS

The memory device which contains the video BIOS has two portions, a Factory BIOS and a User BIOS. You may reprogram the User BIOS portion to support various Flat Panels. This is done using the utility 112_USER.EXE, which is described in the chapter Using the utilityModule.

Once you have programmed the User BIOS, you can set jumper JP4 to boot from the User BIOS or from the Factory BIOS. If you find that the User BIOS does not work, position jumper JP4 to boot with the Factory BIOS, returning to a known state.

Caution: Do *not* attempt to reprogram the Factory portion of the video BIOS! Doing so may leave the utilityModule inoperative.

Switching Between CRT and Flat Panel Modes

At power-up, the utilityModule defaults to VGA video mode. It may be switched to Flat-Panel mode or simultaneous CRT/Flat Panel mode by using three batch files supplied on the Flat Panel Support disk:

FP.COM - Switches to Flat Panel mode

CT.COM - Switches to CRT mode

SM.COM - Switches to simultaneous CRT and Flat Panel mode

You may automatically switch to one of these modes by including the appropriate file on your boot drive and calling it from the autoexec.bat file of the boot drive.

Chapter 6 POWER MANAGEMENT

Modes

The VGA controller provides two power-saving modes, Panel Off and Standby. For complete details of Power-saving modes, please refer to the Chips & Technologies 65545 datasheet.

Panel Off

In the (somewhat mis-named) Panel Off mode, the controller turns off both the Flat Panel and CRT interfaces. The VGA controller core remains active so the cpu can access I/O registers and read and write VGA memory. In this mode, the video clock can be reduced to a much lower frequency to save power.

Panel Off mode is entered via software only. This is done by programming Extended Register XR52 bit 3 to a '1'.

Standby

In Standby mode, the VGA controller halts all cpu, memory, and display activities. The controller then places the video DRAM into self-refresh mode, which means the controller clock can be stopped. Because the controller is fully static, all register contents are maintained.

Standby mode may be entered by hardware or software. Forcing the STANDBY* pin of CN7 low places the controller in Standby mode, as does programming Extended Register XR52 bit 4 to a '1'.

Note:	Chips and Technologies warns that proper procedure must be followed before entering and after exiting Standby mode, or intermittent failures may occur. Refer to their Application Note AN87, titled "65535/540/545 Suspend/Resume Procedure", for more information on the procedure.

Signals

Two signals are provided for power management. These signals, ACTI and STANDBY*, are available on connector CN7.

ACTI

The ACTI signal is an active-high output from the VGA controller. It goes active on every valid read or write of VGA memory or the VGA I/O space. This signal may be monitored by power control circuitry and used to indicate when the VGA interface is inactive.

The VGA controller may also monitor this signal internally and use an internal timer to place itself in a power-saving mode. Refer to Extended Register XR5C in the 65545 datasheet. STANDBY*

The STANDBY* signal is an active-low input to the VGA controller. It is pulled high on the module by a 10k resistor. It may be driven by external circuitry to place the VGA controller into Standby mode.

Chapter 7 RETURN POLICY AND WARRANTY

Return Policy

If you wish to return a product to the factory for service, please follow this procedure:

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

Please have the following available:

- Complete board name
- Board serial number
- A detailed description of the board's behavior

List the name of a contact person, familiar with technical details of the problem or situation, **along with their phone and fax numbers, address, and e-mail address** (if available).

List your shipping address!!

Indicate the shipping method you would like used to return the product to you.
We will not ship by next-day service without your pre-approval.

Carefully package the product, using proper anti-static packaging.

Write the RMA number in large (1") letters on the outside of the package.

Return the package to:

RTD Embedded Technologies, Inc.
103 Innovation Blvd.
State College PA 16803-0906
USA

Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, INC. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for an RMA number.

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