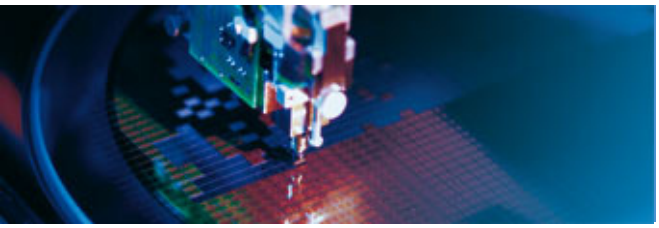
USER MANUAL



CPU-1440 Development Kit

Rev. 1.0 – Mars 2011 - ETH_CPU-1440-DEVKIT_USM

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Disclaimer

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Warranty

This product is supplied with a 1 year limited warranty. The product warranty covers failure of any Eurotech manufactured product caused by manufacturing defects. The warranty on all third party manufactured products utilised by Eurotech is limited to 1 year. Eurotech will make all reasonable effort to repair the product or replace it with an identical variant. Eurotech reserves the right to replace the returned product with an alternative variant or an equivalent fit, form and functional product. Delivery charges will apply to all returned products. Please check www.eurotech.com for information about Product Return Forms.

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Revision history

Issue no.	*PCB*	*Date*	*Comments*
A		24th March 2011	

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For contact details, see page 31.

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Handling your board safely

Anti-static handling

This board contains CMOS devices that could be damaged in the event of static electricity being discharged through them. At all times, please observe anti-static precautions when handling the board. This includes storing the board in appropriate anti-static packaging and wearing a wrist strap when handling the board.

Battery

The CPU-1440-Breakout board contains a lithium non-rechargeable battery. Do not short circuit the battery or place on a metal surface where the battery terminals could be shorted. When disposing of the board or battery, take appropriate care. Do not incinerate, crush or otherwise damage the battery. The battery is inserted in a socket and can be replaced with a 3.0V Lithium CR2032 Coin Cell.

Packaging

Please ensure that, should a board need to be returned to Eurotech, it is adequately packed, preferably in the original packing material.

Electromagnetic compatibility (EMC)

The CPU-1440 is classified as a component with regard to the European Community EMC regulations and it is the user's responsibility to ensure that systems using the board are compliant with the appropriate EMC standards.

RoHS compliance

The European RoHS Directive (Restriction on the use of certain Hazardous Substances – Directive 2002/95/EC) limits the amount of 6 specific substances within the composition of the product.

A full *RoHS Compliance Materials Declaration Form* for the CPU-1440 is included as Appendix B – RoHS Compliance, page 31. Further information regarding RoHS compliance is available on the Eurotech web site at www.eurotech.com.

Conventions

The following symbols are used in this guide:

Symbol	Explanation
	Note - information that requires your attention.
	Warning - proceeding with a course of action may damage your equipment or result in loss of data.

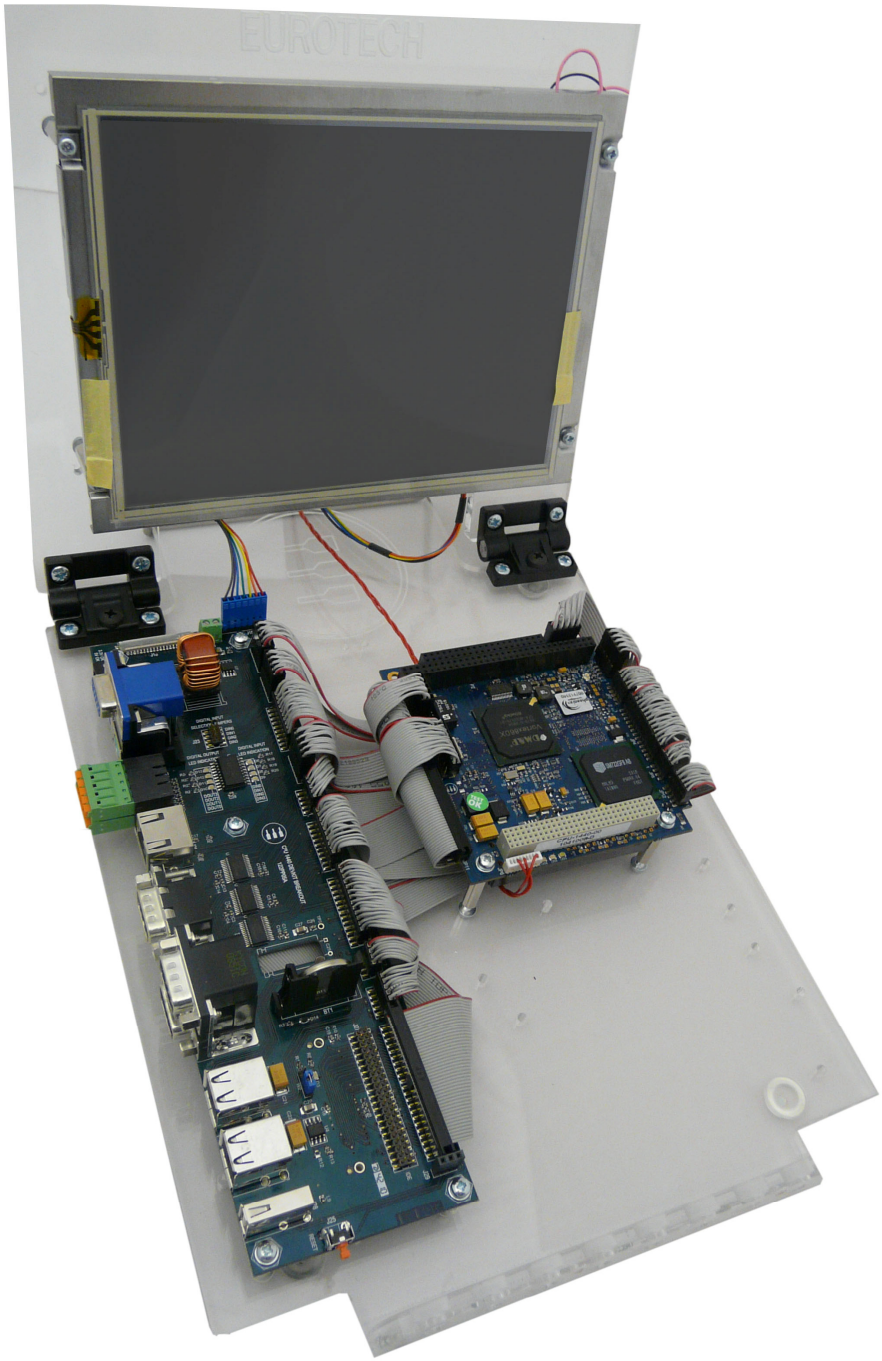
Introduction

The CPU-1440 development kit offers a ready-to-run, rapid application development environment which saves valuable engineering time.

The DevKit contains the CPU-1440 module and its heat sink and an I/O breakout board.

The CPU-1440 development kit supports the following features:

- PC/104-Plus (PCI bus).
- PC/104 (ISA bus).
- 10/100 Ethernet.
- 18-bit LVDS (8.4" 800x600 Flat Panel Display).
- Analogue VGA interface.
- Four USB 2.0 ports.
- Compact Flash socket.
- Three RS232 serial port.
- Touchscreen controller (Eurotech's TSC1).
- PS/2 mouse and keyboard.
- Eight GPIO's.
- USB client connector.



CPU-1440 development kit

CPU-1440 Development Kit features

CPU-1440 PC/104+ board

Processor

- DM&P Vortex86DX
- 600MHz
- 2x16KB L1 cache, 256KB L2 cache

System memory

- DDR2 SDRAM 128 or 512 MB (300MHz)

BIOS

- General Software Embedded BIOS

Expansion buses

- PC/104-Plus (32-bit PCI)
- PC/104 (16-bit ISA)

Graphics

- Analogue VGA interface
- 18-bit TFT and LVDS interfaces
- Composite TV PAL or NTSC output

USB support

- USB 2.0 supporting low/full/high speed modes
- Four ports

Ethernet

- One fast Ethernet port supporting 10/100 Base-T

Standard IO

- Four high speed serial ports 16C550 compatible (one RS-232, three TTL)
- One parallel port

Flash

- 2MB SPI on-board flash disk

IDE support

- Possibility to connect one or two external IDE devices.

Power supply

- 5V only operation
- Power consumption less than 4W
- External battery for RTC backup

Mechanical

- PC/104-Plus form factor, 97x100 mm

CPU-1440-Breakout board

Power supply

- +5V operation (Power brick supply input).
- Power LED's.
- On-board coin cell battery for RTC backup.

Serial port

- One full RS-232 port (COM1). Interfaced to the Touchscreen controller by default.
- Three RS232 ports (COM2,COM3,COM4).

USB

- Four user accessible USB 2.0 ports on USB type A connectors.

Ethernet

- One 10/100 BaseT Ethernet port on RJ45 socket with LED indication.

Graphics

- Analogue VGA interface.

Legacy

- PS/2 keyboard and mouse support.

GPIO

- Four general purpose outputs with Led indication.
- Four general purpose inputs driven externally or set by on board jumpers with LED indication.

Display set

Flat panel display

- 8.4 inch LVDS 24bit FPD (800 x 600 pixels).

Inverter

- +5V operation FPD inverter.

Touchscreen

- 8.4 inch 4 wire resistive touchscreen.

Touchscreen controller

- Eurotech TSC1 RS232 touchscreen controller.

Software specification

Operating system support

The CPU-1440 is compatible with the following operating systems:

- Microsoft Windows CE 6.0.
- Linux AEL.
- DOS 6.22.

Eurotech provides Linux and CE development kits which can be loaded from an external Compact Flash.

Drivers

All system components have drivers available for Windows CE and Linux.

Refer to the relevant Software manual for more information.

BIOS

The CPU-1440-00 board incorporates a General Software Embedded BIOS.

Hardware specification

What's in the Kit?

- Perspex base fitted with the CPU-1440 and Breakout board.
- Perspex panel with the 8.4" flat panel display, inverter and TSC1 mounted on it.
- All interconnecting cables.
- 5V output power supply.
- US, UK or European power cord.
- Eurotech Touchscreen Stylus.
- Eurotech CPU-1440 development kit USB 4Go.
- 1GB Compact flash memory.
- COM1/COM2 breakout cable.
- 2 meter Crossover RJ45 UTP cable.
- 2 meter Null-Modem DB9F to DB9F cable.
- Eurotech cleaning cloth.

What else do I need?

- A PS/2 or USB keyboard.
- A PS/2 or USB mouse.
- A VGA monitor (if not using the flat panel kit or for dual display support).
- A development system with USB drive.

Expansion buses

PC/104-Plus bus interface

The PC/104-Plus bus interface supports PCI local bus compatible peripherals, as defined in the PCI local bus specification revision 2.2. This version of the PCI bus is intended as a 32-bit running at 33MHz (as specified in the PC/104-Plus specification version 2.0).
A standard stack-through connector for the PCI bus (4x30-pin, 2mm pitch) is used for this interface.
The CPU-1440 board supplies the 3.3V and VIO pins with a 3.3V voltage. Total connected boards consumption must be less than 2.5A.
+12V, -12V and -5V are not available, if you require it, it must be supplied directly to the PC/104-Plus.

PC/104 bus interface

PC/104 bus interface supports 16-bit ISA compatible peripherals.
Standard 64+40 way 0.1" stack-through connectors are used. If you are using a PC/104 card that requires +5V, this is automatically supplied via the PC/104 header. If necessary, +12V, -12V and -5V must be supplied directly to the PC/104 stack.

Graphics support

The integrated 2D/3D graphics controller includes a dedicated 8MB graphics memory, and supports hardware accelerated graphics display and video processing capabilities. The maximum resolution is 1280x1024.

The Silicon Motion SM722 controller provides:

- an analogue VGA interface on a 10-pin header (JP2).
- a single channel 18-bit LVDS interface on a 26-pin 2mm header (JP4).
- a 18-bit TFT interface on a 30-pin FPC header (JP1).

USB support

The CPU-1440 supports up to four USB 2.0 high-speed root ports. USB 2.0 allows transfers up to 480 Mb/s. Common modes chokes coils are added to the USB data lines to improve signal integrity. Power distribution switches are used for every USB ports to provide 500 mA current-limited power supply.

USB boot is not supported.

Ethernet

A 10/100 Ethernet interface (MAC and PHY) is available on the CPU-1440 board, implemented in the Vortex86DX processor. It provides a standard IEEE 802.3 Ethernet interface for 100BASE-TX and 10BASE-T applications (802.3, 802.3u). Magnetics are included.

IDE support

The CPU-1440 breakout board provides a single primary IDE controller, with a 44-way 2mm header (J27) to connect one or two external IDE devices.
This gives the user the possibility to connect an external hard drive or CD-drive to the CPU-1440 board. A jumper W2 is used to configure the Compact flash socket support in master mode or slave mode. If you want to use an external hard drive you have to select slave mode for the Compact flash socket.
The BIOS detects the IDE devices during the POST processes and configures the hardware correctly. The BIOS allows either a master or a slave device to be the boot device. It also allows the manual selection of transfer modes (Fast PIO, and up to UDMA-2).

A LED is present on the CPU-1440-Breakout and signals access to the IDE bus.

SPI Flash Drive

The CPU-1440 board integrates a 2MB bootable SPI flash drive. It is recognized by the BIOS and can be used to store a small DOS application. By default, a DOS 6.22 version is installed on the SPI Flash Drive. For that the BIOS must be well configured.

PS/2 interface

Legacy PS/2 keyboard and mouse are supported on standard PC99 MiniDin connectors.

Serial ports

The CPU-1440 provides four 16C550-compatible serial ports. It supports up to 115Kbaud data rates and 16-byte send/receive FIFO's. RS-485 auto-direction flow control is supported on COM3 and COM4.

Touchscreen controller

The CPU-1440 development kit supports the Eurotech's TSC1. The TSC1 is an analogue resistive touchscreen controller that interfaces with the processor board via an RS232 serial port.

For more details about the TSC1, please go to www.eurotech.com or contact the Eurotech sales team (see page 33).

GPIO

Four digital inputs and outputs are provided with +5V and GND on a 2x5 way connector with push-in spring cage connections on the CPU-1440 breakout board.

Input and output levels are indicated by 2 banks of 4 leds on the CPU1440 breakout board. The leds are on with a low logic level and off with a high logic level.

The digital inputs logic level can be set without external wiring by fitting the corresponding jumper to the digital input selection header. If these inputs are controlled by external hardware the jumper must not be fitted to the header. Fitting a jumper sets the logic level low (LED ON).

Power requirements

The CPU-1440 board operates from +5V (+/-5%) power input. All other supply rails are generated on-board.

An external coin cell battery input is available on the breakout board.

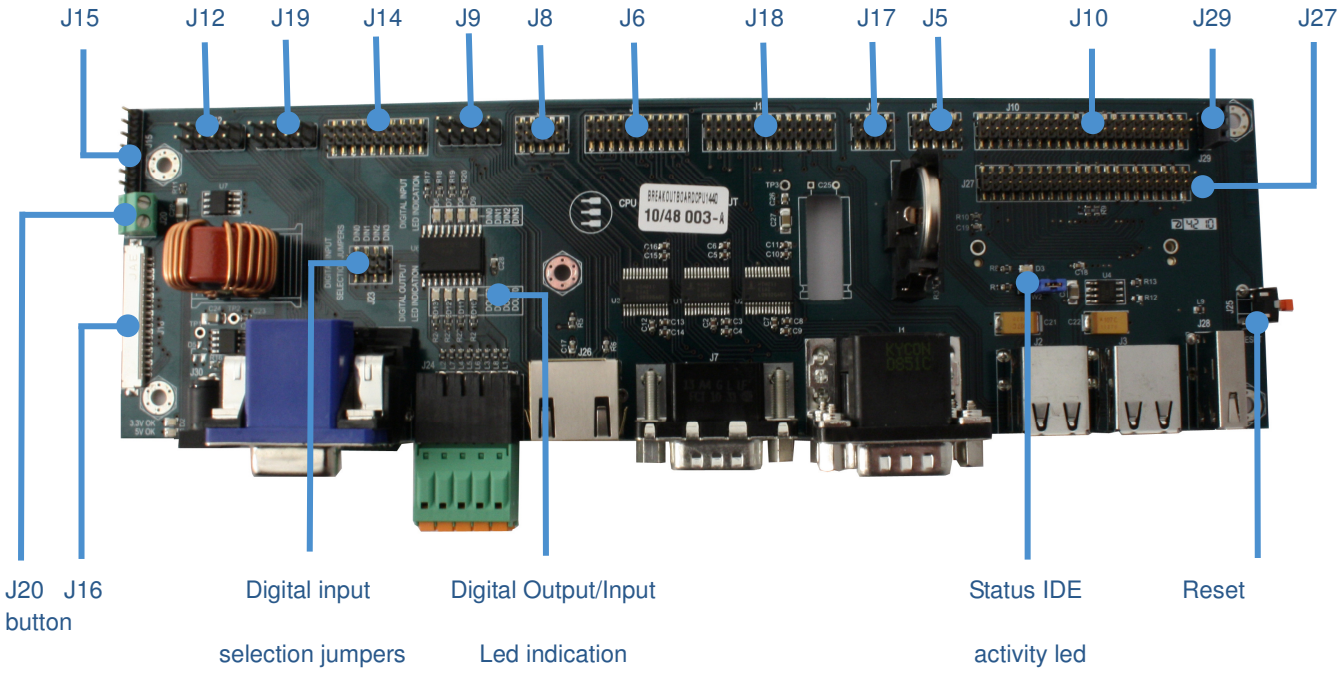
The power consumption of the CPU-1440 board is 3W typical.

Connectors and jumpers

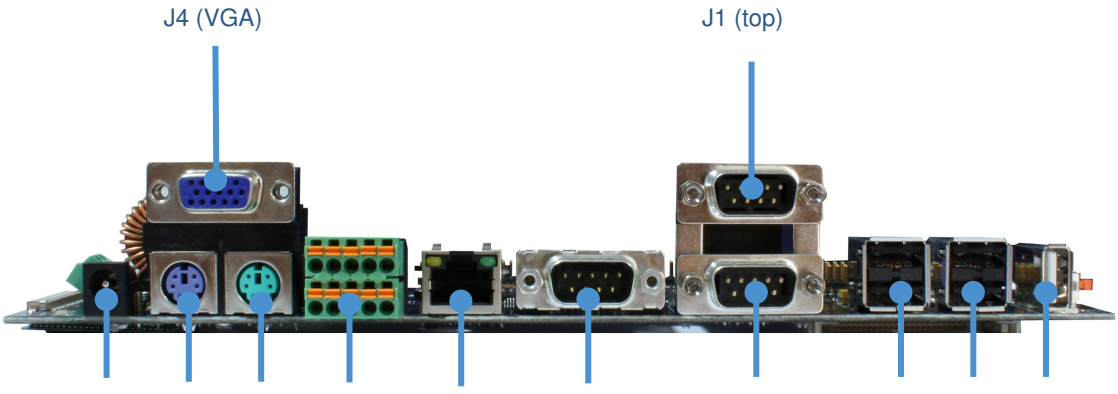
CPU-1440-Breakout

The following diagrams show the location of the connectors and jumpers on the CPU-1440-Breakout.

Top view



Side view



The connectors on the following pages are shown in the same orientation as the picture above, unless otherwise stated.

Summary of connectors and jumpers

The following table lists the connectors on the CPU-1440-Breakout:

Connector	Function	Connector details in section
J30	DC_IN	J30 – DC_IN, page 18
J4	PS/2 mouse and keyboard and VGA	J4 - PS/2 mouse and keyboard and VGA, page 18
J24	GPIO	J24 - GPIO, page 19
J26	Ethernet	J26 - Ethernet and USB4/USB5, page 19
J7	COM2	J7 – COM2, page 20
J1	COM3/COM4	J1 – COM3/COM4, page 20
J2	USB0/USB1	J2 – USB0/USB1, page 21
J3	USB2/USB3	J3 – USB2/USB3, page 21
J28	USB Device	J28 – USB device, page 21
J16	LVDS display control	J18 – LVDS display, page 22
J20	Touchscreen controller power	J20 - TSC1 power, page 23
J15	Power Backlight LVDS	J15 – Power Backlight, page 23
J12	Mouse/keyboard (header)	J12 – Mouse/Keyboard header, page 23
J19	VGA header	J19 –VGA header, page 24
J14	GPIO (header)	J14 – GPIO header, page 24
J9	10/100 Ethernet (header)	J9 - 10/100 Ethernet header, page 24
J8	COM2 (header)	J8 – COM2 header, page 25
J6	COM3/COM4 (header)	J6 – COM3/COM4, page 25
J18	LVDS/USB2/USB3 (header)	J18 – LVDS/USB2/USB3, page 26
J17	USB 2.0 ports 0,1 (header)	J17 - USB 2.0 (ports 0, 1), page 26
J5	Power out/Reset/Battery	J5 - Power out/Reset/Battery, page 26
J10, J27	IDE port connector and header	J10, J27 – IDE port connector and header, Page 27
J29	USB device (header)	J29 – USB Device, page 27

The following table lists the jumpers on the CPU-1440-Breakout:

Jumper	Function	Jumper details in section
J23	Enable inputs	JP1 – BAT-EN, page 28
W2	Master/Slave IDE	JP2 – BEEP-EN, page 28

Connectors

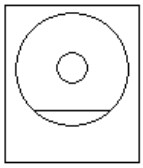
There are 25 connectors on the CPU-1440-Breakout; the use of each one is explained below.

J30 – DC_IN

Socket: 2.5mm DC Jack socket.

Mating plug: 2.5mm DC Jack plug.

Pin	Signal name
Tip	Positive terminal (+5V)
Sleeve	Negative terminal (0V)



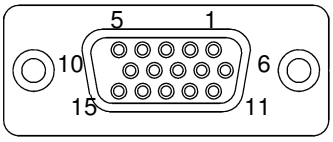
J4 – PS/2 mouse, keyboard and VGA

Connector: Stacked HD15 VGA and dual 6-pin Mini-DIN PS/2 connectors.

Mating plugs: PS/2 and VGA plugs.

VGA

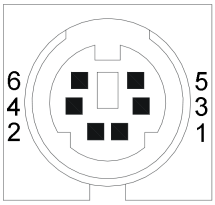
Pin	Signal name	Pin	Signal name
1	RED	9	NC
2	GREEN	10	GND
3	BLUE	11	NC
4	NC	12	NC
5	GND	13	HSYNC
6	GND	14	VSYNC
7	GND	15	NC
8	GND		



Keyboard (left) and Mouse (right)

	Signal name
1	KBDATA
2	NC
3	GND
4	+5V
5	KBCLK
6	NC

Pin	Signal name
1	MSDATA
2	NC
3	GND
4	+5V
5	MSCLK
6	NC

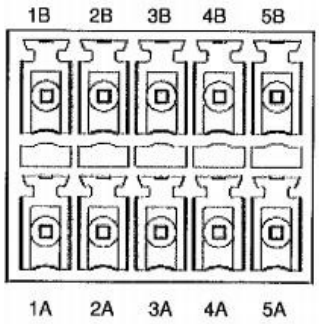


J14 – GPIO connector

Connector: Phoenix contact MCDN 1.5/5-G1-3,5 P26THR.

Mating Plugs: Phoenix contact FMCD 1,5/5-ST-3,5.

Pin	Signal name	Pin	Signal name
1A	GND	1B	+5V
2A	DOUT0	2B	DIN0
3A	DOUT1	3B	DIN1
4A	DOUT2	4B	DIN2
5A	DOUT3	5B	DIN3



J26 – Ethernet

Connector: COMBO RJ45 socket and dual stacked USB type A.

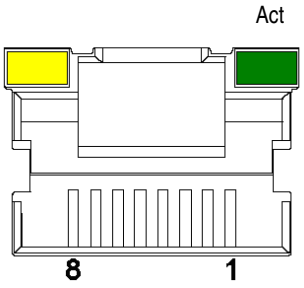
Mating plugs: RJ45 plug and USB type A plugs.

Green LED: Indicates either transmit or receive activity.

Yellow LED: Not used.

Ethernet

Pin	Signal name
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

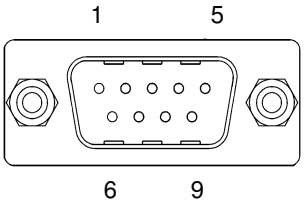


J7 – COM2

Connector: Single SUB D9 male.

Mating socket: SUB D9 female.

Pin (top)	Signal name
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



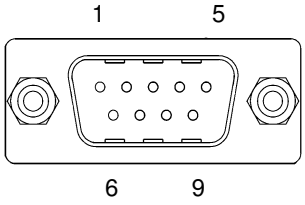
J1 – COM3/COM4

Connector: Dual stacked SUB D9 male.

Mating socket: SUB D9 female.

Pin (top)	Signal name
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Pin (bottom)	Signal name
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI



Serial port 1 is used to interface to the TSC1 by default.

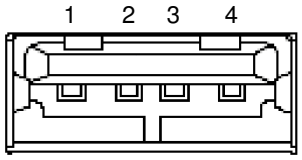
J2 – USB0/USB1

Connector: Dual stacked USB type A.

Mating plug: USB type A plug.

Pin (top)	Signal name
1	+5V
2	D0-
3	D0+
4	GND

Pin (bottom)	Signal name
5	+5V
6	D1-
7	D1+
8	GND



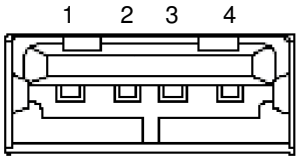
J3 – USB2/USB3

Connector: Dual stacked USB type A.

Mating plug: USB type A plug.

Pin (top)	Signal name
1	+5V
2	D2-
3	D2+
4	GND

Pin (bottom)	Signal name
5	+5V
6	D3-
7	D3+
8	GND

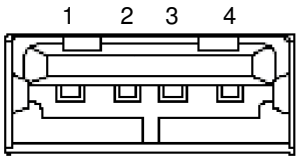


J28 – USB Device

Connector: Dual stacked USB type A.

Mating plug: USB type A plug.

Pin	Signal name
1	+5V
2	D-
3	D+
4	GND

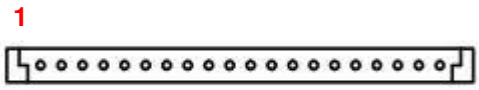


J16 – LVDS Display

Connector: FI-SE20P-HFE.

Mating plugs: HIROSE DF14-20S-1.25C.

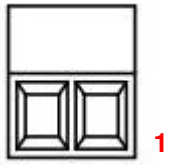
Pin	Signal name	Pin	Signal name
1	LVDS_D3+	11	GND
2	LVDS_D3-	12	LVDS_D1+
3	GND	13	LVDS_D1-
4	LCDVCC	14	GND
5	GND	15	LVDS_D0+
6	LVDS_CLK+	16	LVDS_D0-
7	LVDS_CLK-	17	GND
8	GND	18	GND
9	LVDS_D2+	19	LCDVCC
10	LVDS_D2-	20	LCDVCC



J20 – TSC1 Power

Connector: MKDS1/2-3.81

Pin	Signal name
1	+5V
2	GND

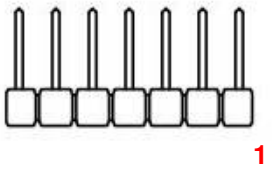


J15 – LVDS Backlight connector

Connector: simple breakable connection strip 2.54mm.

Mating Housing: to be found.

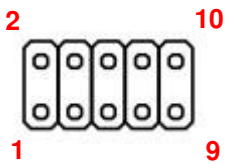
Pin	Signal name
1	VLVDS
2	VLVDS
3	GND
4	GND
5	FPEN
6	NC
7	NC



J12 – Keyboard/Mouse/Reset header

Connector: ITT CANON ZDE9P-1AKN-146, 10-way 2.54mm (.0787") header.

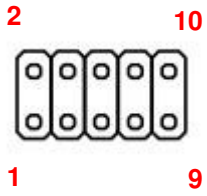
Pin	Signal name	Pin	Signal name
1	MS_DATA	2	KB_DATA
3	NC	4	RESET
5	GND	6	GND
7	KB_+5V	8	MS_+5V
9	MS_CLK	10	KB_CLK



J19 – VGA header

Connector: ITT CANON ZDE9P-1AKN-146, 10-way 2.54mm (.0787") header.

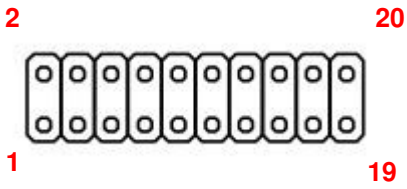
Pin	Signal name	Pin	Signal name
1	GND	2	GND
3	VSYNC	4	HSYNC
5	GND	6	BLUE
7	GREEN	8	RED
9	GND	10	GND



J14 – GPIO header

Connector: SAMTEC tmm-110-06-G-D-SM.

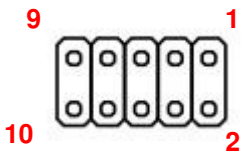
Pin	Signal name	Pin	Signal name
1	NC	2	NC
3	DOUT0	4	NC
5	DOUT1	6	NC
7	DOUT2	8	NC
9	DOUT3	10	NC
11	NC	12	NC
13	NC	14	DIN0
15	DIN1	16	DIN2
17	GND	18	DIN3
19	GND	20	GND



J9 – Ethernet header

Connector: ITT CANON ZDE9P-1AKN-146, 10-way 2.54mm (.0787") header.

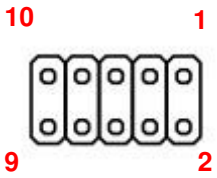
Pin	Signal name	Pin	Signal name
1	GND	2	TX+
3	TX-	4	RX+
5	NC	6	NC
7	RX-	8	NC
9	NC	10	LEDACT



J8 –COM2 header

Connector: SAMTEC TMM-105-06-G-D-SM.

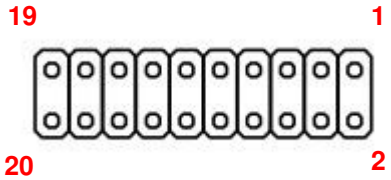
Pin	Signal name	Pin	Signal name
1	DCD	2	DSR
3	RX	4	RTS
5	TX	6	CTS
7	DTR	8	RI
9	GND	10	GND



J6 – COM3/COM4 header

Connector: SAMTEC TMM-110-06-G-D-SM.

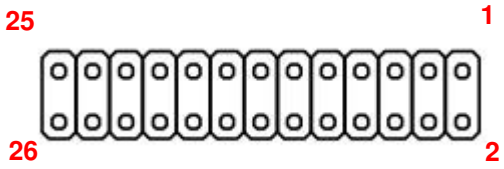
Pin	Signal name	Pin	Signal name
1	DCD3	2	DSR3
3	RX3	4	RTS3
5	TX3	6	CTS3
7	DTR3	8	RI3
9	GND	10	NC
11	DCD4	12	DSR4
13	RX4	14	RTS4
15	TX4	16	CTS4
17	DTR4	18	RI4
19	GND	20	NC



J18 – LVDS/USB2/USB3 header

Connector: SAMTEC TMM-113-06-G-D-SM.

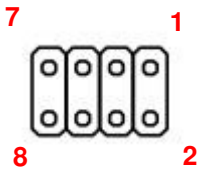
Pin	Signal name	Pin	Signal name
1	LVDS_D0+	2	LVDS_D0-
3	GND	4	GND
5	LVDS_D1+	6	LVDS_D1-
7	DTR3	8	VDD1
9	LVDS_D3+	10	LVDS_D3-
11	LVDS_D2+	12	LVDS_D2-
13	GND	14	GND
15	LVDS_CLK+	16	LVDS_CLK-
17	FPEN	18	VDD1
19	GND	20	+5V
21	+5V	22	D3-
23	D2-	24	D3+
25	D2+	26	GND



J17 – US0/USB1

Connector: SAMTEC TMM-104-06-G-D-SM.

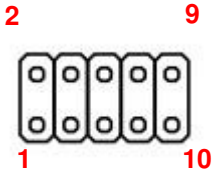
Pin	Signal name	Pin	Signal name
1	+5V	2	GND
3	NC	4	NC
5	D0+	6	D0-
7	D1+	8	D1+



J5 – BAT/POWER

Connector: SAMTEC TMM-104-06-G-D-SM.

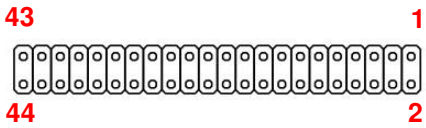
Pin	Signal name	Pin	Signal name
1	VBAT	2	GND
3	VCC3	4	GND
5	VCC5	6	GND
7	NC	8	GND
9	NC	10	NC



J10, J27 – IDE header and IDE port

Connector: SAMTEC TMM-122-06-G-D-SM.

Pin	Signal name	Pin	Signal name
1	RST	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC
21	REQ	22	GND
23	IOW	24	GND
25	IOR	26	GND
27	RDY	28	GND
29	ACK	30	GND
31	INT	32	NC
33	SA1	34	CBLID
35	SA0	36	SA2
37	CS0	38	CS1
39	/HD_ACT	40	GND
41	VCC	42	VCC
43	GND	44	NC



J29 – USB Device

Connector: SAMTEC, ESQ-103-12-L-S.

Pin	Signal name
1	D+
2	D-
3	GND

Jumpers

There are two jumpers on the CPU-1440-Breakout; the use of each one is explained below.

W2 – MASTER/SLAVE option for Compact Flash socket

JP1 function table:

Position	Function
1-2	Compact Flash Master
2-3	Compact Flash Slave

J23 – Selection of GPIO inputs

We use the inputs/outputs of the parallel port to offer the possibility to the customer to have 4 digital inputs and outputs. For testing purpose, the states of inputs are chosen manually by using a jumper on JP23. You can find below the JP23 function table:

Position jumper	DIN0	DIN1	DIN2	DIN3
1-2	ON	OFF	OFF	OFF
3-4	OFF	ON	OFF	OFF
5-6	OFF	OFF	ON	OFF
7-8	OFF	OFF	OFF	ON

It's possible to put several inputs together by connecting several jumpers. A green led on the breakout board is indicating if the input is ON or OFF.

Parallel port signals ACK-/BUSY/PE and SLCT are used respectively for inputs DIN0/DIN1/DIN2/DIN3.

Parallel port signals PD0/PD1/PD2 and PD3 are used respectively for outputs DOUT1/DOUT2/DOUT3/DOUT4.

Inputs are read on port 279h and outputs are written on port 278h.

Appendix A – Reference information

Product information

Product notices, updated drivers, support material:

www.eurotech.com

PCI special interest group

PCI Bus specification and list of manufacturers:

www.pcisig.org

USB information

Universal Serial Bus (USB) specification and product information:

www.usb.org

PC/104 consortium

PC/104 specifications, vendor information and available add-on products:

www.PC/104.org

IEEE Specifications

Information about wired and wireless communication:

www.ieee.org

Trusted Computing Platform Alliance

Information about Trusted Platform:

www.trustedcomputing.org

DM&P

Information about the Vortex86DX processor:

www.dmp.com.tw

Appendix B – RoHS Compliance

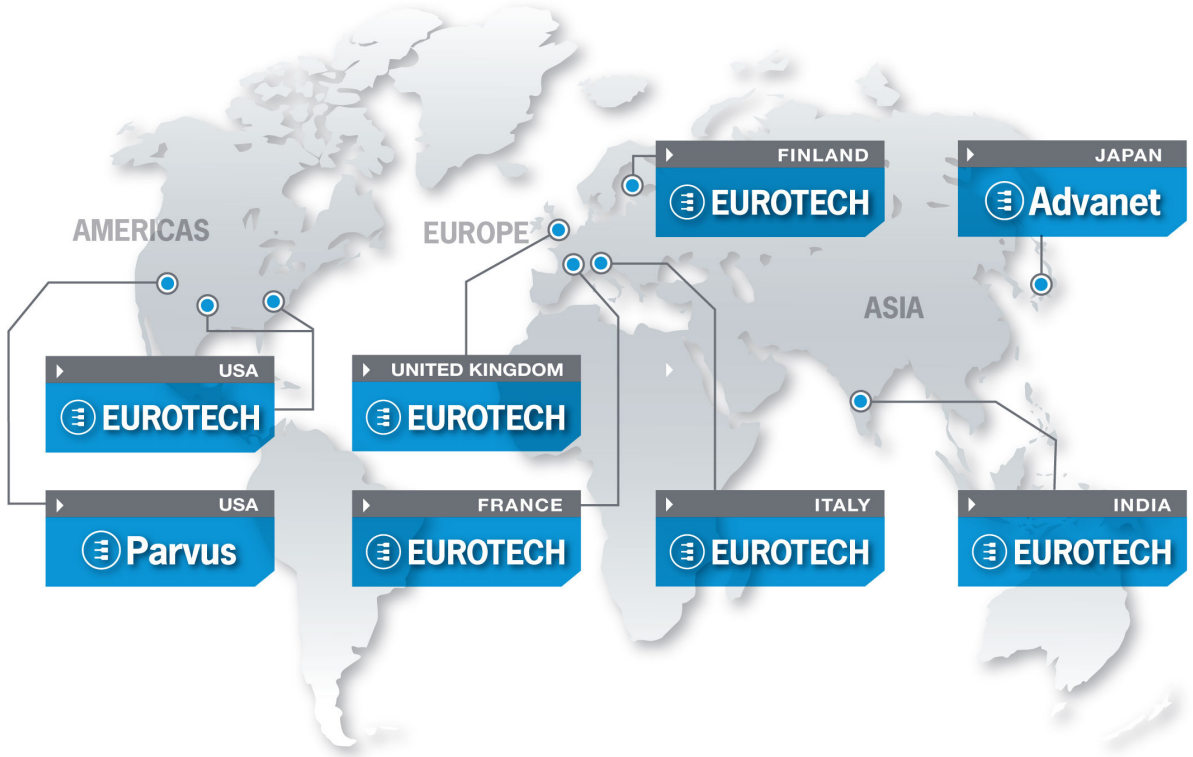
EUROTECH

The Restriction of the use of certain Hazardous Substances (RoHS) Directive came into force on 1st July 2006. The CPU-1440 board shall be designed using RoHS compliant components, and manufactured to comply with the RoHS Directive.

Eurotech has based its material content knowledge on a combination of information provided by third parties and auditing our suppliers and sub-contractor's operational activities and arrangements. This information is archived within the associated Technical Construction File. Eurotech has taken reasonable steps to provide representative and accurate information, though may not have conducted destructive testing or chemical analysis on incoming components and materials.

Additionally, packaging used by Eurotech for its products complies with the EU Directive 2004/12/EC in that the total concentration of the heavy metals cadmium, hexavalent chromium, lead and mercury do not exceed 100ppm.

Eurotech Group Worldwide presence



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