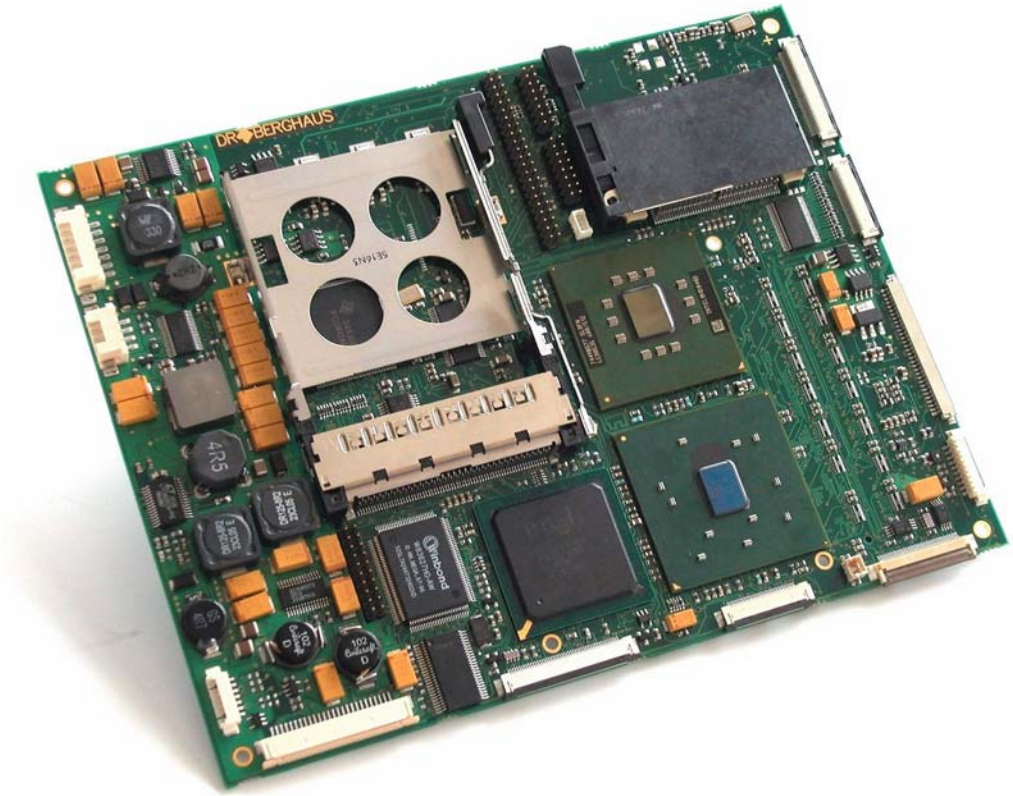
Kontron User's Guide



ePanel PM

Document Revision 1.3

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1. User Information

1.1 About This Document

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1.2 Copyright Notice

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1.4 Standards

Kontron Embedded Modules GmbH is certified to ISO 9000 standards.

1.5 Warranty

This Kontron Embedded Modules GmbH product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron Embedded Modules GmbH will at its discretion decide to repair or replace defective products.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

Kontron Embedded Modules GmbH will not be responsible for any defects or damages to other products not supplied by Kontron Embedded Modules GmbH that are caused by a faulty Kontron Embedded Modules GmbH product.

1.6 Technical Support

Technicians and engineers from Kontron Embedded Modules GmbH and/or its subsidiaries are available for technical support. We are committed to making our product easy to use and will help you use our products in your systems.

Before contacting Kontron Embedded Modules GmbH technical support, please consult our Website at http://www.kontron-emea.com/emd for the latest product documentation, utilities, and drivers. If the information does not help solve the problem, contact us by telephone or email.

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2. Introduction

2.1 ePanel Concept

Time is something no one has enough of. „Short time-to-market“ is a nightmare everybody suffers from. A new concept promises a lot of advantages, but how to actually realize them in these short time frames? Especially embedded boards are not always easy connectable, think of tangling cables or missing adapters. Kontron recognized this problem and developed the **ePanel**, a platform for OEM and ODM. Its main benefit is the high integration of mobile accessories and components in conjunction with mechanical fit and function. To build a mobile computer, just add a battery, TFT display, inverter and housing and you are set. Now system design and application development gets a great boost forward. Others still look for adapters while your project already started.

In order to stay close to state-of-the-art computer technologies of the desktop PC market, the ECT business (**E**mbedded **C**omputer **T**echnology) demands adequate processor performance for many applications. There are many standards for CPU boards with a lot of advantages or restrictions. Unfortunately none of these products care about the increasing customer specialization. A board that suits all your requirements out of the box is pretty much impossible to find, but the **ePanel** fits almost all mobile and space critical applications. Only a customized module will fulfill all requirements. But away from standard products, a customer has to tolerate long development cycles and costly problems when it comes to quick replacements or easy upgrades. The solution to these obviously conflicting demands for a customized solution from standard parts now got a name: **ePanel.**

Quick integration and nevertheless standard PC technology.
The **ePanel** is a complete PC with standard interfaces including USB and additional options such as Sound capabilities, PC-Card, Touch & Matrix controller, TV-In, Flat panel interface and 100 MBit Ethernet, etc.

Smallest Dimensions to meet smallest space requirements.
With 252 cm^2 the **ePanel** uses only a little more space compared to a current slot CPU, which needs 219 cm^2. But the most surprising fact is the module height.

How about the ISA bus?
Nowadays the ISA bus is considered a legacy bus, therefore it is discarded in favor of the more recent Buses like miniPCI, Cardbus and USB.

There must be replacements or upgrades for future requirements.
Kontron will expand and improve this innovative and handy **ePanel** concept. New PC technologies will be obtainable the same way as in other Kontron product families. An **ePanel** board does not force you in excessive, expensive cabling or baseboard design. Only the really required interfaces have to be connected to their respective connectors. Which ones to implement, others to skip - the decision is up to you. Evaluation adapters and kits are available for initial testing.

The application requests low power.
Do not worry about that. Depending on OS and used options, the **ePanel** consumes approximately 24 Watts depending on input voltage and selected CPU type and speed.

Finally the ePanel suits you well?
Great, glad to hear that... just start mass production. Before doing so I would like to let you know that Kontron is aware of the short life cycles of PC products. To prevent you costly redesigns we ensured longevity for the **ePanel** in this volatile PC market

2.2 ePanel Overview

The **ePanel** is structured in a modular way, so we can offer you different flavours in processing power, power consumption and I/O capabilities. Please refer to the following matrix to choose the product that suits your needs best.

Article number	CPU	Touch	Smart Battery	Video In
22242	CM 600 MHz	✔	✔	✔
22243	CM 1.0 GHz	✔	✔	✔
22244	PM 1.4 GHz	✔	✔	✔
22245	CM 600 MHz	✔		
22246	CM 1.0 GHz	✔		
22247	PM 1.4 GHz	✔		

3. Specifications

3.1 Functional Specifications

- **Processor**
  - Intel® Pentium® M Processor 1.4 GHz
  - Intel® Celeron® M Processor 600 MHz or 1.0 GHz
- **Bus**
  - 400 MHz CPU bus
  - 200 MHz, 266 MHz or 333 MHz (only 855GME) memory bus
- **Chipset**
  - Intel® 852GM (Celeron M 600 MHz), 855GME (others)
- **Super I/O**
  - Winbond W83627 connected by LPC interface
- **Cache**
  - On-die Second level 2 MB (1.4 GHz) or 512 kB (Celeron M 600 MHz, 1.0 GHz)
- **Memory**
  - One 200-pin DDR-SODIMM
  - 2.5 V unbuffered DDR-SDRAM up to 1 GB
- **Two Serial Ports (COM1 and COM2)**
  - TTL signals only
  - 16550 compatible
- **Infrared Device Association (IrDA) interface**
- **One Parallel Port (LPT1)**
  - Enhanced Parallel Port (EPP) and Extended Capabilities Port (ECP) with bi-directional capability
- **Floppy**
  - 3.5” standard drive via Flex Foil adapter
- **EIDE-Interface (P-ATA)**
  - PCI Bus Master IDE port (up to two devices) support
  - Ultra Direct Memory Access (UDMA) modes
  - Programmed Input/Output (PIO) modes up to Mode 4 timing
  - Multiword DMA Mode 0,1,2 with independent timing

Compact Flash Socket

- Supports UDMA modes

Universal Serial Bus (USB)

- Three USB 1.1/2.0 ports (UHCI and EHCI)
- USB legacy keyboard support
- USB floppy, CD-ROM, Hard drive and Memory stick boot support

Integrated Ethernet

- Intel 82562 10/100 Mbps Fast Ethernet controller
- Integrated WfM 2.0 and IEEE 802.3 compliant 10BASE-T and 100BASE-TX compatible PHY

Onboard Video Graphics Array (VGA)

- Integrated in Intel 852GM/855GME
- Graphics memory controller hub with Intel Extreme Graphics 2 technology
- Up to 32 MB Video RAM (UMA)
- CRT and LVDS interfaces

Audio

- Integrated in Intel 82801DB southbridge
- AC97 and Windows Sound System™ compatible

Video In

- Conexant Video Broadcast decoder CX23883

Matrix Keyboard (up to 7x8 keys)

PC Card

- 16 bit PC Card components and 32 bit Cardbus components

PS/2 Keyboard Controller

PS/2 Mouse Interface

Touch Controller

miniPCI Socket

BIOS

- PHOENIX 1MB Flash-BIOS in Firmware Hub Flash Memory
- NV-EEPROM for CMOS setup retention without battery

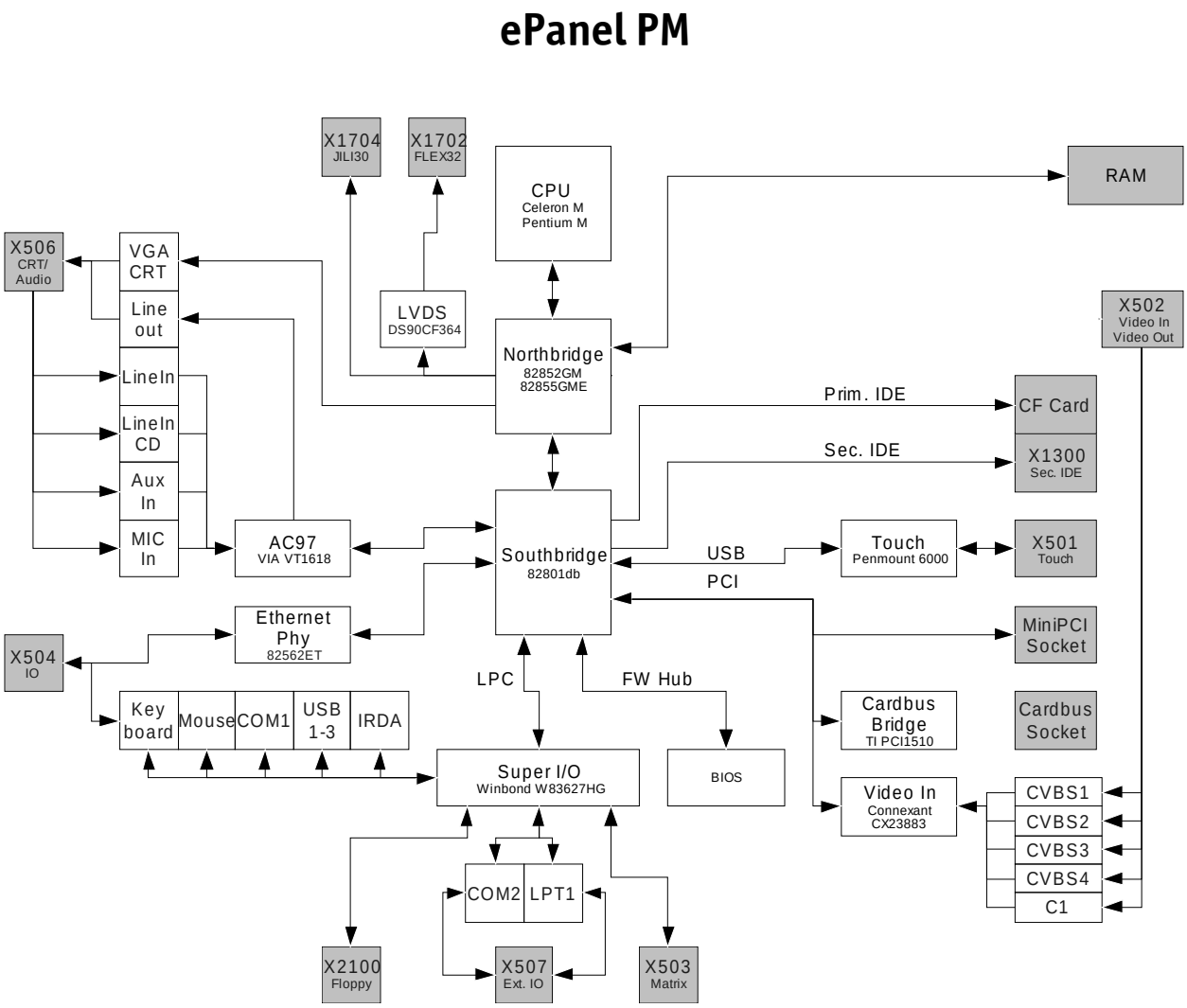
Watchdog Timer (WDT)

Real-Time Clock (requires external battery)

Power Management

- ACPI support
- Suspend to RAM (S3) support

3.2 Block Diagram



3.3 Mechanical Specifications

3.3.1 Module Dimensions

- 180 mm x 140 mm ±0.2 mm

3.3.2 Height on Top

- Maximum approx. 16 mm
- Height is depending upon optionally CPU cooler/fan

3.3.3 Height on Bottom

- Maximum approx. 6 mm

3.4 Electrical Specifications

3.4.1 Supply Voltage

➤ 8 V to 28 V DC

3.4.2 Supply Voltage Ripple

➤ 100 mV peak to peak 0 - 20 MHz

3.4.3 Supply Current (typical, DOS prompt)

Power consumption tests were executed during the DOS prompt with keyboard (PS/2), CF card and CRT attached to it. All boards were equipped with 512 MB DDR SDRAM. Modules were tested using maximum CPU frequency.

	Normal	Standby	Suspend
Power Consumption Pentium M (LV) 1.4 GHz	1.64 A 19.7 W	n.a	n.a
Power Consumption Celeron M (ULV) 1.0 GHz	1.26 A 15.0 W	n.a	n.a
Power Consumption Celeron M (ULV) 600 MHz	1.24 A 14.9 W	n.a	n.a

3.4.4 Supply Current (typical, Windows XP SP2)

The tested boards were equipped with a mouse (USB), a keyboard (PS/2) and CF card. The Power consumption tests were executed during Windows XP SP2 by using the tool CPU stress. To ensure a stable die-temperature a corresponding heatsink was used to hold the temperature under the critical trip point. All boards were equipped with 512MB DDR SDRAM. Modules were tested using maximum CPU frequency.

	Normal	Idle	Standby S1	Suspend S3
Power Consumption Pentium M (LV) 1.4 GHz	1.98 A 23.8 W	1.15 A 13.8 W	0.83 A 10.0 W	0.06 A 0.72 W
Power Consumption Celeron M (ULV) 1.0 GHz	1.30 A 15.6 W	1.00 A 12.0 W	0.80 A 9.6 W	0.06 A 0.72 W
Power Consumption Celeron M (ULV) 600 MHz	1.26 A 15.1 W	0.96 A 11.5 W	0.78 A 9.4 W	0.06 A 0.72 W

Note: *It is difficult to test for all possible applications on the market. There may be an application that draws more power from the CPU than the measured values in the table above. This should be taken into consideration if you are on the limit of the thermal specification. If this is the case improvements to your thermal solution are recommended.*

3.4.5 External RTC Battery

- Voltage range: 2.0 V - 3.6 V (typ. 3.0 V)
- Maximum current: 3,5 µA @ 3.0 V

English:
CAUTION ! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Deutsch:
VORSICHT ! Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch den selben oder einen vom Hersteller empfohlenen gleichwertigen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

French:
ATTENTION ! Risque d'explosion avec l'échange inadéquat de la batterie. Remplacement seulement par le même ou un type équivalent recommandé par le producteur. L'évacuation des batteries usagées conformément à des indications du fabricant.

Danish:
ADVARSEL ! Lithiumbatteri – Eksplosionsfare ved fejlagtig Håndtering. Udskifting må kun ske med batteri af samme fabrikant og type. Lever det brugte batteri tilbage til leverand∅ren.

Finnish:
VAROITUS ! Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laltevalmistajan suosittelmaan tyyppiln. Havita kaytetty paristo valmistajan ohjeiden mukaisesti.

Spanish:
Precaución ! Peligro de explosión si la batería se sustituye incorrectamente. Sustituya solamente por el mismo o tipo equivalente recomendado por el fabricante. Disponga las baterías usadas según las instrucciones del fabricante.

The battery of this product is not considered to be accessible by the end user. Therefore the safety instructions are only given in english, german, french, danish, finish and spanish language.

If the battery of this product however is accessible by the end user, it is in the responsibility of the customer to give the corresponding safety instructions in the required language(s).

3.5 Environmental Specifications

3.5.1 Temperature

The Intel® Mobile Pentium®-M is specified for proper operation when junction temperature is within the specified range of 0°C to 100°C.

The Intel® 852GM/855GME Chipset temperature and the Intel® ICH4 I/O Controller Hub 4 (82801DB) case temperature are maximum 110°C.

- Operating (with appropriate airflow): 0 to +60°C *(1)*
- Non operating: -30 to +85°C

Note: *1 The maximum operating temperature is the maximum measurable temperature on any spot on a module's surface. You must maintain the temperature according to the above specification.*

3.5.2 Humidity

- Operating: 10% to 90% (non condensing)
- Non operating: 5% to 95% (non condensing)

3.6 MTBF

The following MTBF (Mean Time Between Failure) values were calculated using a combination of manufacturer's test data, if the data was available, and a Bellcore calculation for the remaining parts. The Bellcore calculation used is "Method 1 Case 1". In that particular method the components are assumed to be operating at a 50% stress level in a 40°C ambient environment and the system is assumed to have not been burned in. Manufacturer's data has been used wherever possible. The manufacturer's data, when used, is specified at 50°C, so in that sense the following results are slightly conservative. The MTBF values shown below are for a 40°C in an office or telecommunications environment. Higher temperatures and other environmental stresses (extreme altitude, vibration, salt water exposure, etc.) lower MTBF values.

- System MTBF (hours) : tbd

Note: *Fans usually shipped with Kontron Embedded Modules GmbH products have 50,000-hour typical operating life. The above estimates assume no fan, but a passive heat sinking arrangement. Estimated RTC battery life (as opposed to battery failures) is not accounted for in the above figures and need to be considered for separately. Battery life depends on both temperature and operating conditions. When the Kontron unit has external power; the only battery drain is from leakage paths.*

4. CPU, Chipset and Super I/O

4.1 CPU

Intel® Mobile Pentium®-M / Celeron®-M CPU features include:

- Supports Intel® Architecture with Dynamic Execution
- High performance, low-power core
- On-die, primary 32 kbyte instruction cache and 32 kbyte write-back data cache
- On-die, 1 MByte (BANIAS), 2 MByte (DOTHAN) or 512 kByte (CELERON) second level cache with Advanced Transfer Cache Architecture
- Advanced Branch Prediction and Data Prefetch Logic
- Streaming SIMD Extensions 2 (SSE2)
- 400 MHz Source-synchronous processor system bus
- Advanced Power Management features, including Enhanced Intel SpeedStep® technology (only for Pentium® M processors)

4.2 Chipset

The chipset of the ePanel PM consists of the Intel® 852GM/855GME chipset (GMCH = Graphics and Memory Controller Hub) and the Intel ® 82801DB ICH4 (I/O Controller Hub 4).

4.2.1 GMCH (852GM/855GME Chipset)

- **Processor/Host Bus Support**
  - Intel® Pentium® M (only 855GME) and Celleron® M processors
  - Supports system bus at 400 MHz
  - Supports Enhanced Intel® SpeedStep® technology
- **Memory System**
  - Directly supports one DDR SDRAM channel, 64-bits wide
  - Supports 200 MHz, 266 MHz and 333 MHz (only 855GME) DDR SDRAM devices with double-sided SO-DIMMs (four rows populated).
  - Supports 128-Mbit, 256-Mbit, and 512-Mbit technologies providing maximum capacity of 1 GB with x16 devices
  - All supported devices have four banks

➤ **Internal Graphics Features**
- Up to 32MB of dynamic video memory allocation
- Display image rotation
- Graphics core frequency
- Display core frequency at 133 MHz or 200 MHz (only 855GME)
- Render core frequency at 100 MHz,133 MHz or 200 MHz
- 2D graphics engine
- 3D graphics engine
- Single- or dual-channel LVDS panel support up to UXGA panel resolution with frequency range from 25 MHz to 112 MHz (single channel/dual channel)

➤ **Video Stream Decoder**
- Improved hardware motion compensation for MPEG2
- Software DVD at 60 Fields/second and 30 frames/second full screen
- Support for standard definition DVD (i.e. NTSC pixel resolution of 720x480, etc.) quality encoding at low CPU utilization

➤ **Power Management**
- ACPI 1.0b, 2.0 support
- Enhanced Intel® SpeedStep Technology support

4.2.2 ICH4 (82801DB)

➤ **PCI 2.2 Bus Interface at 33MHz**

➤ **Integrated LAN Controller**
- WfM 2.0 and IEEE802.3 compliant with 10/100 Mbit/s Ethernet support

➤ **USB**
- Three UHCI USB 1.1 or one EHCI high speed USB 2.0 host controller(s)

➤ **Integrated IDE Controller**
- Ultra ATA33/66 and PIO mode support
- One channel for up to 2 devices with independent timing
- Support of “Native Mode” register and interrupts

➤ **Interrupt Controller**
- Two cascade 83C59 with 15 interrupts
- Integrated I/O APIC capability with 24 interrupts

➤ **Enhanced DMA**
- Two cascaded 8237 controllers
- Supports PC/PCI DMA and LPC DMA
- Supports DMA collection buffers

➤ **Timers based on 82C54**

➤ **Power Management Logic**
- ACPI 2.0 compliant
- Supports PCI /PME

➤ **Low Pin Count (LPC) Interface**

➤ **SM Bus 2.0 interface (System Management Bus)**

4.2.3 Super I/O

The external Super I/O WINBOND W83627 offers the following features:

- Integrated keyboard controller with PS/2 mouse support
- One floppy disk controller compatible with the industry standard 82077/765
- Two serial ports and one multi-mode parallel port
- Hardware monitor for temperature and onboard voltages

5. System Memory

The ePanel PM uses only 200-pin Small Outline-Dual Inline Memory Modules (SODIMMs). One socket is available for 2.5 Volt (power level) unbuffered DDR200, DDR266 or DDR333 (only 855GME) module of up to 1 GB.

The total amount of memory available on the DDR SDRAM module is used for main memory and graphics memory on the ePanel PM. The Unified Memory Architecture (UMA) manages how the system shares memory between the graphics controller and the processor.

6. Graphics Interface

The ePanel PM uses the graphics accelerator integrated in the Intel® 852GM/855GME chipset, which delivers high-performance 2D, 3D and video capabilities. With its interface to UMA (Unified Memory Architecture) up to 32 MB of system memory are used as video memory.

The graphics accelerator supports CRT monitors and a variety of LCD panels with single or dual clock, color depths of 18/24 bit and resolutions up to UXGA (1600x1200).

6.1 CRT Connector

The CRT monitor interface is available through the X506 connector (40 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	DSUB-15
25	**GREEN**	Analog video green	2
27	**BLUE**	Analog video blue	3
29	**RED**	Analog video red	1
26, 28, 30, 33, 35, 37	**GND**	Signal ground	5, 6, 7, 8, 10
31	**DDC_SDA**	DDC data line	12
32	**DDC_SCL**	DDC clock line	15
34	**VSYNC**	Vertical sync	14
36	**HSYNC**	Horizontal sync	13

To find the location of the X506 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

6.2 LCD Panel Connectors

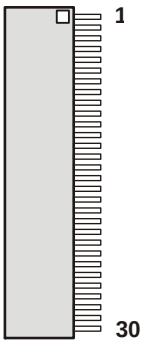
The LVDS interface for the LCD Panel is available through the X1704 connector (30 pins) on the top side of the board. This connector represents the JILI interface (**J**UMPtec **I**ntelligent **L**VDS **I**nterface). The implementation of this subsystem complies with the JILI specification of Kontron Embedded Modules GmbH. A variety of cables for different display types are available from Kontron. Please refer to the actual cable list on the Kontron Website for part numbers and cable names.

Another option for connecting a display to ePanel PM is a (LV)TTL compatible 18 bit RGB interface available on X1702 (32 pins). A variety of cables for different display types are available from Kontron. Please refer to the actual cable list on the Kontron Website for part numbers and cable names.

When using a LCD Panel, additional voltages may be required to drive the displays logic and to supply the backlight converter. The display logic may require +5V for standard or +3.3V for low-power LCDs. Backlight converters usually are +5V or +12V types. The onboard 3.3V and 5V circuitry of the ePanel PM and the 3.3V or 5V panel logic voltage share the same voltage regulators.

To find the location of the LCD Panel interface connectors on the ePanel PM board, please see the Appendix “Connector Layout”.

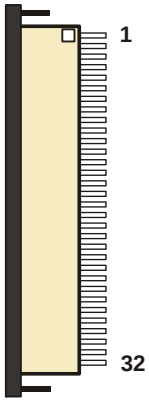
6.2.1 JILI30 Connector

Header	Pin	Signal Name	Function
	1	**FTX0-**	First channel data output 0 (negative)
	2	**FTX0+**	First channel data output 0 (positive)
	3	**FTX1-**	First channel data output 1 (negative)
	4	**FTX1+**	First channel data output 1 (positive)
	5	**FTX2-**	First channel data output 2 (negative)
	6	**FTX2+**	First channel data output 2 (positive)
	7	**GND**	Signal ground
	8	**FTXC-**	First channel clock output (negative)
	9	**FTXC+**	First channel clock output (positive)
	10	**FTX3-**	First channel data output 3 (negative)
	11	**FTX3+**	First channel data output 3 (positive)
	12	**STX0-**	Second channel data output 0 (negative)
	13	**STX0+**	Second channel data output 0 (positive)
	14	**GND**	Signal ground
	15	**STX1-**	Second channel data output 1 (negative)
	16	**STX1+**	Second channel data output 1 (positive)
	17	**GND**	Signal ground
	18	**STX2-**	Second channel data output 2 (negative)
	19	**STX2+**	Second channel data output 2 (positive)
	20	**STXC-**	Second channel clock output (negative)
	21	**STXC+**	Second channel clock output (positive)
	22	**STX3-**	Second channel data output 3 (negative)
	23	**STX3+**	Second channel data output 3 (positive)
	24	**GND**	Signal ground
	25	**SDA**	I2C data line
	26	**DATAENA**	Data enable output
	27	**SCL**	I2C clock line
	28 - 30	**VCC** *(1)*	Power supply

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

Attention: *Check jumper block J1702 (Panel Power) for correct settings for your panel – not doing so might cause permanent damage to your panel.*

6.2.2 18 Bit Digital Connector

Header	Pin	Signal Name	Function
	1	**GND**	Signal ground
	2	**PCLK**	Data shift clock
	3	**PHS**	Horizontal sync pulse
	4	**PVS**	Vertical sync pulse
	5	**GND**	Signal ground
	6	**PR0**	Red color data line 0
	7	**PR1**	Red color data line 1
	8	**PR2**	Red color data line 2
	9	**PR3**	Red color data line 3
	10	**PR4**	Red color data line 4
	11	**PR5**	Red color data line 5
	12	**GND**	Signal ground
	13	**PG0**	Green color data line 0
	14	**PG1**	Green color data line 1
	15	**PG2**	Green color data line 2
	16	**PG3**	Green color data line 3
	17	**PG4**	Green color data line 4
	18	**PG5**	Green color data line 5
	19	**GND**	Signal ground
	20	**PB0**	Blue color data line 0
	21	**PB1**	Blue color data line 1
	22	**PB2**	Blue color data line 2
	23	**PB3**	Blue color data line 3
	24	**PB4**	Blue color data line 4
	25	**PB5**	Blue color data line 5
	26	**GND**	Signal ground
	27	**PDE**	Data enable
	28 - 29	**VCC** *(1)*	Power supply
	30	**R/L**	Rotate image left or right (option)
	31	**U/D**	Rotate image up or down (option)
	32	**NC**	Reserved

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

Attention: *Check jumper block J1702 (Panel Power) for correct settings for your panel – not doing so might cause permanent damage to your panel.*

6.3 Connecting a LCD Panel

To determine whether your panel display is supported, check the Kontron Website for panel lists. We regularly update the list of panels that have been tested with the ePanel PM.

If you use one of those adapters supplied by Kontron, configuration is easy:

❶ Check whether you have the correct adapter and cable for the panel you plan to use. Inspect the cable for damages. Disconnect the power from your system.

❷ Check Jumper J1702 for correct Panel voltage (R1700 = 12V R1701 = 5V R1702 = 3.3V).

❸ Check Jumper J1700 for correct Backlight voltage (Pos. 1-2 = 5V 2-3 = 12V).

❹ Check Jumper J1701 for correct Backlight on/off polarity (Pos. 1-2 = Low 2-3 = High).

❺ Connect the cable to the LCD Panel connector X1702 or X1704 on the ePanel PM and connect the other end to your display.

❻ Connect the backlight converter.

❼ Supply power to your system.

❽ If no image appears on your display, connect a CRT monitor to the CRT connector.

❾ If you still do not see improvement, consider contacting the dealer for technical support.

6.4 Available Video Modes

The following list shows the video modes supported by the graphics controller with maximum frame buffer size. When configured for smaller frame buffers and/or using a LCD panel on the JILI interface, not all of the video modes listed below may be available. Capability depends on system configuration and on display capabilities. Different operating systems also may not support all listed modes by the available drivers.

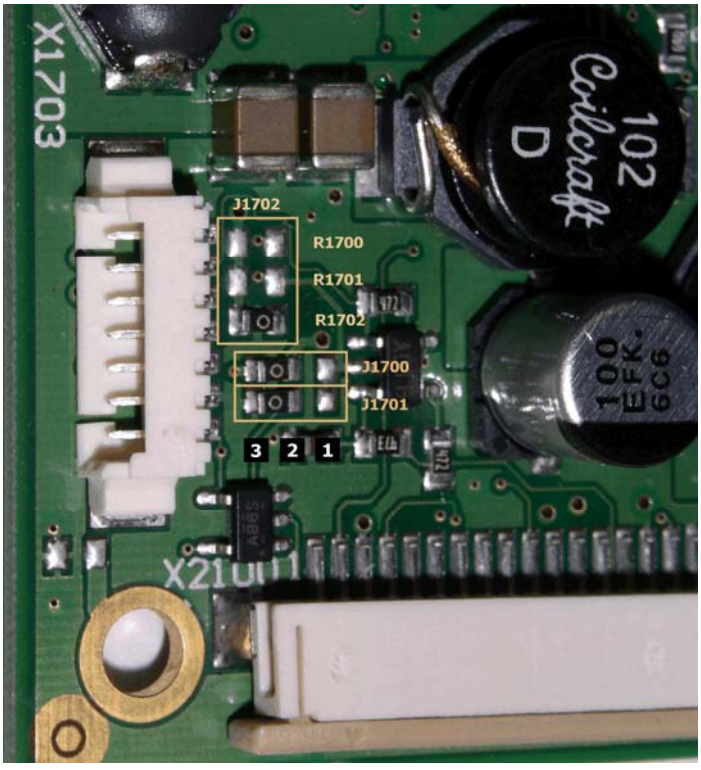
6.4.1 Standard IBM-Compatible VGA Modes

Video Mode	Type	Characters/Pixels	Colors
00h/01h	Text	40x25	16
02h/03h	Text	80x25	16
04h/05h	Graphics	320x200	4
06h	Graphics	640x200	2
0Dh	Graphics	320x200	16
0Eh	Graphics	640x200	16
0Fh	Graphics	640x350	Mono
10h	Graphics	640x350	16
11h	Graphics	640x480	2
12h	Graphics	640x480	16
13h	Graphics	320x200	256

6.4.2 Extended VESA VGA Modes

VESA Mode	Type	Pixels	Colors
101h	Graphics	640x480	256
103h	Graphics	800x600	256
105h	Graphics	1024x768	256
107h	Graphics	1280x1024	256
111h	Graphics	640x480	64K
112h	Graphics	640x480	16M
114h	Graphics	800x600	64K
115h	Graphics	800x600	16M
117h	Graphics	1024x768	64K
118h	Graphics	1024x768	16M
11Ah	Graphics	1280x1024	64K
11Bh	Graphics	1280x1024	16M
13Ah	Graphics	1600x1200	256
14Bh	Graphics	1600x1200	64K
15Ah	Graphics	1600x1200	16M

6.5 Jumper Localization



Jumper J1702
(Panel Voltage)

R1700	+12V
R1701	+5V
R1702	+3.3V

Jumper J1700
(Backlight Voltage)

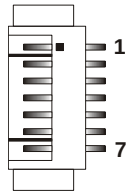
1-2	+5V
2-3	+12V

Jumper J1701
(Backlight Polarity)

1-2	Low
2-3	High

6.6 Backlight Connector

Backlight is available through the X1703 connector (7 pins).

Header	Pin	Signal Name	Function
	1	**NC**	Not connected
	2	**BKLTADJ**	Brightness control (0V - 5V)
	3	**GND**	Ground
	4	**VCC** *(1)*	5V or 12V power supply
	5	**VCC** *(1)*	5V or 12V power supply
	6	**GND**	Ground
	7	**BKLTON**	Backlight on/off

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the backlight connector on the ePanel PM board, please see the Appendix “Connector Layout”.

7. Serial-Port Interfaces

Two fully functional serial ports (COMA and COMB) provide asynchronous serial communications. COMA and COMB support RS-232 operation modes. They are 16550 high-speed UART compatible and support 16-byte FIFO buffers for transfer rates from 50 Baud to 115.2 KBaud.

7.1 Connector

COMA is available through the X504 connector (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	DSUB-25	DSUB-9
8	**/DSR (COMA)**	Data Set Ready	6	6
9	**/DCD (COMA)**	Data Carrier Detect	8	1
10	**/DTR (COMA)**	Data Terminal Ready	20	4
11	**/RTS (COMA)**	Request to Send	4	7
12	**/CTS (COMA)**	Clear to Send	5	8
13	**RXD (COMA)**	Receive Data	3	2
14	**TXD (COMA)**	Transmit Data	2	3
15	**/RI (COMA)**	Ring Indicator	22	9
16	**GND**	Signal Ground	7	5

COMB is available through the X507 connector (32 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	DSUB-25	DSUB-9
3	**/DSR (COMB)**	Data Set Ready	6	6
4	**/DCD (COMB)**	Data Carrier Detect	8	1
5	**/DTR (COMB)**	Data Terminal Ready	20	4
6	**/RTS (COMB)**	Request to Send	4	7
7	**/CTS (COMB)**	Clear to Send	5	8
8	**RXD (COMB)**	Receive Data	3	2
9	**TXD (COMB)**	Transmit Data	2	3
10	**/RI (COMB)**	Ring Indicator	22	9
11	**GND**	Signal Ground	7	5

To find the location of the X504 and X507 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

Attention: *Usage of baud rates larger than 9600 results in communication errors. The only solution to this currently is to disable USB Legacy Support in the BIOS Setup (Advanced / IO Device Config. / USB Options / Legacy USB Support).*

8. Parallel-Port Interface

The ePanel PM incorporates a parallel port that can be set to uni-/bidirectional and supports EPP/ECP operating modes.

8.1 Connector

The parallel port is available through the X507 connector (32 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	DSUB-25
12	**/AFD**	Autofeed	14
13	**/STB**	Strobe	1
14	**/ERR**	Error	15
15	**D0**	Data 0	2
16	**/INIT**	Init	16
18	**D1**	Data 1	3
19	**/SLIN**	Select in	17
20	**D2**	Data 2	4
21	**D3**	Data 3	5
23	**D4**	Data 4	6
24	**D5**	Data 5	7
25	**D6**	Data 6	8
26	**D7**	Data 7	9
28	**/ACK**	Acknowledge	10
29	**/BUSY**	Busy	11
30	**PE**	Paper out	12
31	**/SLCT**	Select out	13
2,11	**GND**	Signal ground	18 - 25
17,22	**GND**	Signal ground	18 - 25
27,32	**GND**	Signal ground	18 - 25

To find the location of the X507 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

9. PS/2 Keyboard and Mouse Interface

The Super I/O of the ePanel PM supports a PS/2 keyboard and mouse.

9.1 PS/2 Keyboard Connector

The keyboard interface is available through Connector X504 (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	5 pin DIN (Diode)	6 pin MiniDIN (PS/2)
1	**VCC** *(1)*	+5V	5	4
2	**KBCLK**	Keyboard clock	1	5
3	**KBDAT**	Keyboard data	2	1
4	**GND**	Ground	4	3

9.2 PS/2 Mouse Connector

The mouse interface is available through Connector X504 (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function	6 pin MiniDIN (PS/2)
1	**VCC** *(1)*	+5V	4
5	**MSDAT**	Mouse data	1
6	**MSCLK**	Mouse clock	5
7	**GND**	Ground	3

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the X504 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

10. USB Interface

The USB interface comes with three USB ports, which follow the UHCI/EHCI specification and are USB 2.0 compliant. You can expand the amount of USB connections by adding external hubs.

10.1 Connector

The USB ports are available through the X504 connector (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function
22 - 24	**VCC** *(1)*	+5V
25	**PWR_ENA**	USB Power enable
26	**/OVRCUR**	Overcurrent detect
27	**GND**	Signal ground
28	**USB0+**	USB port 0 (positive)
29	**USB0-**	USB port 0 (negative)
30	**GND**	Signal ground
31	**USB1+**	USB port 1 (positive)
32	**USB1-**	USB port 1 (negative)
33	**GND**	Signal ground
34	**USB2+**	USB port 2 (positive)
35	**USB2-**	USB port 2 (negative)

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the X504 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

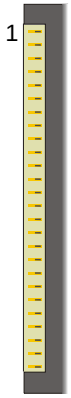
11. Floppy-Drive Interface

The floppy-drive interface of the ePanel PM uses a 2.88 MB super I/O floppy-disk controller and can support one floppy disk drive with densities that range from 360 kB to 2.88 MB. The controller is 100% IBM compatible.

11.1 Connector

The floppy disk interface is available on the flat-foil connector X2100 (26 pins). This type of connector is often internally used in notebooks to connect a slim-line floppy drive.

Accessories are available for this interface from Kontron. To connect a standard 3.5" floppy drive, use an adapter cable (ADA-FLOPPY-2, Part Number 96001-0000-00-0). If you have a slim-line 3.5" floppy drive, you may need a flat foil cable (KAB-FLOPPY/ MOPS-1, Part Number 96019-0000-00-0). It also is possible to get a slim line 3.5" floppy drive with cable from Kontron (FLOPPY-MOPS-1, Part Number 96010-0000-00-0).

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	**VCC** *(1)*	+5V	2	**/IDX**	Index
	3	**VCC** *(1)*	+5V	4	**/DRO**	Drive Select 0
	5	**VCC** *(1)*	+5V	6	**/DSKCHG**	Disk Change
	7	**NC**	Not connected	8	**NC**	Not connected
	9	**NC**	Not connected	10	**/MTRO**	Motor on 0
	11	**NC**	Not connected	12	**/FDIR**	Direction Select
	13	**NC**	Not connected	14	**/STEP**	Step
	15	**GND**	Ground	16	**/WDATA**	Write Data
	17	**GND**	Ground	18	**/WGATE**	Write Gate
	19	**GND**	Ground	20	**/TRKO**	Track 00
	21	**GND**	Ground	22	**/WRTPRT**	Write Protect
	23	**GND**	Ground	24	**/RDATA**	Read Data
	25	**GND**	Ground	26	**/HDSEL**	Side One Select

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of floppy-drive interface on the ePanel PM board, please see the Appendix "Connector Layout".

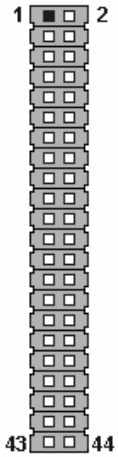
12. EIDE Interface

The ePanel PM features one EIDE interface (Secondary channel) that can drive two hard disks. When two devices share a single adapter, they are connected in a master/slave, daisy-chain configuration. If only one drive is in the system, you must set it as the master.

12.1 Connector

The EIDE interface is available through Connector X1300 (44 pins). This interface is designed in 2mm grid for optimal connectivity to a 2.5" hard disk.

You can use two cables to directly connect a hard disk in a 2.5" form factor (KAB-IDE-2MM, Part Number 96021-0000-00-0) or a 3.5" form factor (KAB-IDE-25, Part Number 96020-0000-00-0).

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	**/RESET**	Reset	2	**GND**	Signal ground
	3	**D7**	Data 7	4	**D8**	Data 8
	5	**D6**	Data 6	6	**D9**	Data 9
	7	**D5**	Data 5	8	**D10**	Data 10
	9	**D4**	Data 4	10	**D11**	Data 11
	11	**D3**	Data 3	12	**D12**	Data 12
	13	**D2**	Data 2	14	**D13**	Data 13
	15	**D1**	Data 1	16	**D14**	Data 14
	17	**D0**	Data 0	18	**D15**	Data 15
	19	**GND**	Signal ground	20	**KEY (NC)**	Key pin
	21	**DRQ**	DMA Request	22	**GND**	Signal ground
	23	**/IOW**	I/O write	24	**GND**	Signal ground
	25	**/IOR**	I/O read	26	**GND**	Signal ground
	27	**IOCHRDY**	I/O channel ready	28	**CSEL** *(2)*	Cable select
	29	**/DACK**	DMA Acknowledge	30	**GND**	Signal ground
	31	**IRQ**	Interrupt	32	**NC**	Not connected
	33	**SA1**	Address 1	34	**/PDIAG**	Passed diag
	35	**SA0**	Address 0	36	**SA2**	Address 2
	37	**/CS1**	Chip select 1	38	**/CS3**	Chip select 3
	39	**NC**	Not connected	40	**GND**	Signal ground
	41	**VCC** *(1)*	+5V	42	**VCC** *(1)*	+5V
	43	**GND**	Signal ground	44	**NC**	Not connected

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.
2 Pin 28 is connected with 470Ω to Ground for Cable Select IDE devices.

To find the location of EIDE interface on the ePanel PM board, please see the Appendix “Connector Layout”.

12.2 Compact Flash Card Interface

The primary IDE channel is realized as a CF-Card interface, also capable of UDMA.

Warning: *Inserting or removing the Compact Flash Card while in operation can cause serious damage and must be avoided.*

13. Ethernet Controller

The Ethernet interface of the ePanel PM uses the ICH4 integrated 32-bit PCI LAN controller in combination with the Intel® 82562 platform LAN connect device. The network controllers support 10/100 Base-T interfaces. The devices auto-negotiate the use of a 10 Mbit/sec or 100 Mbit/sec connection.

A stable connection can be assured up to 70 meters CAT5 ethernet cable.

13.1 Connector

The Ethernet interface is available through Connector X504 (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function
37	**RXD+**	10/100 BASE-T receive
38	**RXD-**	10/100 BASE-T receive
39	**GND**	Signal ground
40	**TXD+**	10/100 BASE-T transmit
41	**TXD-**	10/100 BASE-T transmit
42	**GND**	Signal ground
43	**LILED**	Valid LAN link LED
44	**SPEEDLED**	LAN speed LED
45	**ACTLED**	LAN activity LED

Note: *TXD+, TXD- differential-output pair drives 10 and 100 Mb/s Manchester-encoded data to 10/100 BASE-T transmit lines. RXD+, RXD- differential input pair receives 10 and 100 Mb/s Manchester-encoded data from 10/100 BASE-T receive lines.*

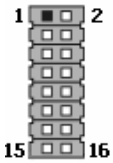
To find the location of the X504 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

14. Touch Interface

The ePanel PM touch controller supports 4-wire, 5-wire and 8-wire touch panels. The built-in 10 bit A/D converter transmits the sampled data over an USB 1.1 interface to the host.

14.1 Connector

The touch interface is available through the X501 connector (16 pins).

Header	Pin	Signal Name	Function
	1	**GND**	Signal ground
	2	**YB / UL**	Bottom / Upper left
	3	**SYB**	Sense bottom
	4	**GND**	Signal ground
	5	**YT / UR**	Top / Upper right
	6	**SYT**	Sense top
	7	**GND**	Signal ground
	8	**XL / LL**	Left / Lower left
	9	**SXL**	Sense left
	10	**GND**	Signal ground
	11	**XR / LR**	Right / Lower right
	12	**SXR**	Sense right
	13	**GND**	Signal ground
	14	**NC**	Not connected
	15	**SENSE**	Sense (5-wire)
	16	**GND**	Signal ground

To find the location of the touch interface on the ePanel PM board, please see the Appendix “Connector Layout”.

14.2 4-Wire / 8-Wire Touch

The following table shows the pin assignment for 4-wire / 8-wire touch panels.

Signal Name	4-Wire	8-Wire
Bottom (YB)	connect Pin 2 and 3	Pin 2
Sense Bottom (SYB)		Pin 3
Top (YT)	connect Pin 5 and 6	Pin 5
Sense Top (SYT)		Pin 6
Left (XL)	connect Pin 8 and 9	Pin 8
Sense Left (SXL)		Pin 9
Right (XR)	connect Pin 11 and 12	Pin 11
Sense Right (SXR)		Pin 12

14.3 5-Wire Touch

The following table shows the pin assignment for a 5-wire touch panel.

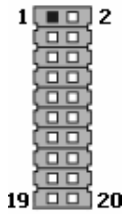
Signal Name	5-Wire
Upper Left (UL)	Pin 2
Upper Right (UR)	Pin 5
Lower Left (LL)	Pin 8
Lower Right (LR)	Pin 11
SENSE	Pin 15

15. Matrix Keyboard Interface

The ePanel PM supports a matrix keyboard of up to 7x8 keys. The necessary decoupling diodes are not present on the ePanel PM and must be placed externally.

15.1 Connector

The matrix keyboard is available through the X503 connector (20 pins).

Header	Pin	Signal Name	Function
	1	**GND**	Signal ground
	2	**VCC** *(1)*	+5V
	3	**MAT_OUT0**	Row 0
	4	**MAT_OUT1**	Row 1
	5	**MAT_OUT2**	Row 2
	6	**MAT_OUT3**	Row 3
	7	**MAT_OUT4**	Row 4
	8	**MAT_OUT5**	Row 5
	9	**MAT_OUT6**	Row 6
	10	**MAT_OUT7**	Row 7
	11	**GND**	Signal ground
	12	**VCC** *(1)*	+5V
	13	**MAT_IN0**	Column 0
	14	**MAT_IN1**	Column 1
	15	**MAT_IN2**	Column 2
	16	**MAT_IN3**	Column 3
	17	**MAT_IN4**	Column 4
	18	**MAT_IN5**	Column 5
	19	**MAT_IN6**	Column 6
	20	**NC**	Reserved

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the matrix keyboard interface on the ePanel PM board, please see the Appendix “Connector Layout”.

16. Infrared Interface

The Super I/O of the ePanel PM incorporates a infrared interface. IrDA 1.0 SIR protocol and ASK-IR are supported.

16.1 Connector

The infrared interface is available through Connector X504 (50 pins).

Pin	Signal Name	Function
17	**IRRX**	Infrared receive
18	**IRTX**	Infrared transmit
19	**GND**	Signal ground
20	**VCC** *(1)*	+5V

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

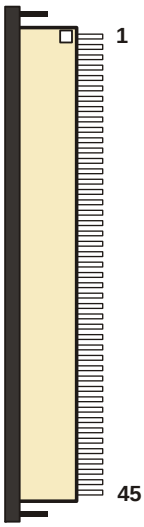
To find the location of the X504 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

17. VideoIn Interface

The ePanel PM features a 10 bit NTSC/PAL/SECAM composite and S-Video decoder. The multiplexer can select between four composite inputs, or between three composite inputs and one S-Video input.

17.1 Connector

The VideoIn interface is available through Connector X502 (45 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt/TV, Part Number 22224).

Header	Pin	Signal Name	Function	Pin	Signal Name	Function
	1	**GND**	Signal ground	2	**CVBS_IN0**	Composite 0
	3	**GND**	Signal ground	4	**CVBS_IN1**	Composite 1
	5	**GND**	Signal ground	6	**CVBS_IN2**	Composite 2
	7	**GND**	Signal ground	8	**SVID_C**	S-Video chroma
	9	**GND**	Signal ground	10	**CVBS_IN3** **SVID_L** *(2)*	Composite 3 S-Video luma
	11	**GND**	Signal ground	12	**NC**	Not connected
	13	**GND**	Signal ground	14	**NC**	Not connected
	15	**GND**	Signal ground	16	**NC**	Not connected
	17	**GND**	Signal ground	18	**NC**	Not connected
	19	**GND**	Signal ground	20	**NC**	Not connected
	21	**GND**	Signal ground	22	**NC**	Not connected
	23	**GND**	Signal ground	24	**NC**	Not connected
	25	**GND**	Signal ground	26	**NC**	Not connected
	27	**GND**	Signal ground	28	**NC**	Not connected
	29	**GND**	Signal ground	30	**NC**	Not connected
	31	**GND**	Signal ground	32	**NC**	Not connected
	33	**GND**	Signal ground	34	**GND**	Signal ground
	35	**NC**	Not connected	36	**GND**	Signal ground
	37	**NC**	Not connected	38	**GND**	Signal ground
	39	**NC**	Not connected	40	**GND**	Signal ground
	41	**NC**	Not connected	42	**GND**	Signal ground
	43 - 44	**VCC** *(1)*	+3.3V	45	**VCC** *(1)*	+5V

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.
2 The luma component is fed through the composite multiplexer, any composite input can be used.

18. Audio Interface

The ePanel PM supports an AC'97 V2.3 audio codec with 18 bit resolution and sampling rates up to 96 kHz. The interface includes for example LINE OUT, LINE IN and MICROPHONE IN.

For further information on how to use the microphone input, please contact your local distributor.

18.1 Connector

The audio interface is available through Connector X506 (40 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function
1	**GND**	Signal ground
2	**AUX_L**	Auxiliary input left
3	**GND**	Signal ground
4	**AUX_R**	Auxiliary input right
5	**GND**	Signal ground
6	**LINEIN_L**	Line input left
7	**GND**	Signal ground
8	**LINEIN_R**	Line input right
9	**GND**	Signal ground
10	**CD_L**	CD input left
11	**GND**	Signal ground
12	**CD_R**	CD input right
13	**GND**	Signal ground
14	**MIC**	Microphone input
15	**GND**	Signal ground
16	**LINEOUT_L**	Line out left
17	**GND**	Signal ground
18	**LINEOUT_R**	Line out right
19	**GND**	Signal ground

To find the location of the X506 connector on the ePanel PM board, please see the Appendix “Connector Layout”.

19. PC Card Interface

The adapter allows the use of 16 bit PC Card components (Type I and II) and 32 bit Cardbus components. These are PCI components, so there are no restrictions. The situation is different for PC Card components, which requires often a legacy interrupt. Please ensure via System Bios that at least one legacy IRQ is available.

20. MiniPCI Interface

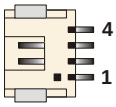
On the underside of the ePanel PM is a 124 pin miniPCI connector (Type III), as is commonly used in laptop computers. Some optional signals, however, are not available among others: /MPCIACT, RING, TIP and LED signals. Support of 66 MHz operation is not specified.

21. Power Supply

After switching on the supply voltage the board is then immediately ready to operate, though only on standby power. When the power button is pressed the remaining supply voltages are connected and the board begins to work.

21.1 Power Connector

The power connector is available as X2001 (4 pins).

Header	Pin	Signal Name	Function
	1	**DC_IN** *(1)*	Power supply (+8V to +28V)
	2	**DC_IN** *(1)*	Power supply (+8V to +28V)
	3	**GND**	Ground
	4	**GND**	Ground

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the power connector on the ePanel PM board, please see the Appendix “Connector Layout”.

21.2 Power Pins

Every power pin on the power connector is limited to a maximum current and the following limitations apply:

Power	Number of Pins	Max. Current per Pin
DC_IN	2	2A (AWG26)

21.3 Power / Reset Button

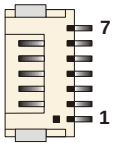
Both buttons are available through Connector X504 (50 pins). A suitable adapter with cable set is disposable from Kontron (ePanel-Adapt-V2, Part Number 22223).

Pin	Signal Name	Function
47	**PWR_LED**	Power LED (low active)
48	**RST_BTN**	Reset button (low active)
49	**PWR_BTN**	Power button (low active)
50	**GND**	Signal ground

21.4 Battery Connector

If an optional battery (accumulator) is employed, the power adapter voltage should be a few volts above the battery voltage. A 12V battery can't be loaded with a 12V power voltage, for this, at least 15V would be required.

The battery connector is available as X2000 (7 pins).

Header	Pin	Signal Name	Function
	1	**DC_BAT** *(1)*	Battery supply
	2	**DC_BAT** *(1)*	Battery supply
	3	**SCL**	SMBus clock line
	4	**SDA**	SMBus data line
	5	**NC**	Not connected
	6	**GND**	Ground
	7	**GND**	Ground

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the battery connector on the ePanel PM board, please see the Appendix “Connector Layout”.

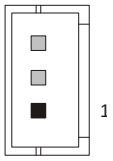
22. Fan Interface

If a fan has to be changed or added, use this interface to connect a fan to cool off the CPU. The onboard system controller monitors the fan speed. The connector supports 5V fans only.

A three pin fan includes a pulse output (Sense), which allows the control of fan speed.

22.1 Connector

The fan interface is available through Connector X2101 (3 pins).

Header	Pin	Signal Name	Function
	1	**SENSE**	Speed Monitoring
	2	**VCC** *(1)*	+5V
	3	**GND**	Signal ground

Note: *1 To protect the external power lines of peripheral devices, make sure that*
- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

To find the location of the fan interface on the ePanel PM board, please see the Appendix “Connector Layout”.

23. Watchdog Timer

The watchdog timer (WDT) is integrated in the Winbond W83627 controller of the ePanel PM and can issue a reset to the system. The watchdog timer circuit has to be triggered within a specified time by the application software. If the watchdog timer is not triggered because proper software execution fails or a hardware malfunction occurs, it resets the system.

23.1 Configuration

You can set the watchdog timer to Disabled or Reset. You can specify the delay time and the time-out (trigger period) from 1 second to 30 minutes. The delay time is the time after first initialization before the trigger period starts. The timeout is the time the watchdog timer has to be triggered within. You can make the initialization settings in the BIOS setup.

23.2 Programming

23.2.1 Initialization

You can initialize the watchdog timer from the BIOS setup. You also can set up the initialization from the application software with help of the JIDA (**J**UMPtec **I**ntelligent **D**evice **A**rchitecture) programmer's interface.

23.2.2 Trigger

The watchdog needs to be triggered out of the application software within a specified timeout period. You can only do this in the application software by using low-level programming or with help of the JIDA programmer's interface.

For information about the JIDA programmer's interface refer to the JIDA software packages on the Kontron Website.

24. Hardware Monitor

The Winbond W83627 controller monitors several critical hardware parameters of the system, including power-supply voltages, fan speed and CPU temperature, which are very important for a high-end computer system to remain stable and function properly.

The following parameters are monitored:

- +3.3V from onboard DC/DC
- CPU core voltage
- +5V standby voltage
- Battery voltage
- CPU temperature with on-die diode
- CPU fan speed

24.1 Configuration

You can use the Hardware Monitor submenu in the BIOS Setup Utility to obtain information on voltages, fan speed and to check the temperature of the CPU die.

To monitor the parameters of this feature from your operating system, Kontron recommends that you use the 32-bit protected mode **J**UMPtec's **I**ntelligent **D**evice **A**rchitecture driver (JIDA32) with the test and demo application for Windows 95/98/ME/NT/2000/XP, which is available on the KONTRON Website

25. Thermal Management

The Thermal Management feature of the ePanel PM helps control the processor's temperature by activating the automatic thermal throttling after the processor silicon reaches a certain temperature. This feature can be enabled and configured in the BIOS Setup utility. You can specify the temperature level when throttling starts, define a hysteresis value to get back to 100% CPU performance, and specify the percentage for CPU performance in throttling mode. Automatic thermal throttling mode does not require additional hardware, software drivers, or interrupt-handling routines.

Additionally the processor of the ePanel PM protects itself from catastrophic overheating by use of an internal thermal sensor. This sensor is set well above the normal operating temperature to ensure that there are no false trips. The processor will stop all execution when the junction temperature exceeds the sensor setting. This is signaled to the system by the THERMTRIP# (Thermal Trip) pin. Once activated, the signal remains latched, and the processor stopped, until RESET# goes active. There is no hysteresis built into the thermal sensor itself; as long as the die temperature drops below the trip level, a RESET# pulse will reset the processor and execution will continue. If the temperature has not dropped below the trip level, the processor will continue to drive THERMTRIP# and remain stopped. The temperature level for catastrophic overheating being activated is 135°C.

26. Power Management

For possible wakeup events from the different power states, please see below table.

Power State	Wake-Up Events from
S1	PS/2 Keyboard and Mouse, USB Devices
S3	LAN, Power Button
S5	LAN, Power Button

27. Onboard Device Configuration

Many of the onboard devices offer several configuration settings in the System BIOS setup. Refer to chapter SETUP GUIDE for more configuration information.

Onboard Device	see Main Menu / Sub Menu
Graphics Interface	Advanced / Advanced Chipset Control / Graphics Memory Advanced / Advanced Chipset Control / Graphics Engine 1 Advanced / Advanced Chipset Control / Graphics Engine 2 Advanced / PCI-PNP Configuration / Assign IRQ to VGA Advanced / Display Control / Display Mode Advanced / Display Control / Flat Panel Type Advanced / Display Control / Flat Panel Scaling Advanced / Display Control / Flat Panel Backlight
CPU/Memory Interface	Advanced / Advanced Chipset Control / Enable Memory Gap Advanced / Advanced Chipset Control / Max. supported Mem. Freq. Advanced / Memory Cache / Memory Cache Advanced / Memory Cache / Cache System BIOS Area Advanced / Memory Cache / Cache Video BIOS Area Advanced / Memory Cache / Cache Base 0-512k Advanced / Memory Cache / Cache Base 512k-640k Advanced / Memory Cache / Cache Extended Memory Area Advanced / Memory Cache / Cache D0000-D3FFF Advanced / Memory Cache / Cache D4000-D7FFF Advanced / Memory Cache / Cache D8000-DBFFF Advanced / Memory Cache / Cache DC000-DFFFF Power / Max. CPU Frequency
Serial Port Interfaces	Advanced / IO Device Configuration / SIO Options / Serial Port A Advanced / IO Device Configuration / SIO Options / Serial Port B
Parallel Port Interface	Advanced / IO Device Configuration / SIO Options / Onboard LPT
Keyboard Interface	Advanced / Keyboard Features / NumLock Advanced / Keyboard Features / Key Click Advanced / Keyboard Features / Keyboard Auto-Repeat Rate Advanced / Keyboard Features / Keyboard Auto-Repeat Delay
PS/2 Mouse Interface	Advanced / Miscellaneous / PS2 Mouse
USB Interface	Advanced / PCI-PNP Configuration / Onboard USB EHCI IRQ Line Advanced / IO Device Configuration / USB Options / USB UHCI Contr. 1 Advanced / IO Device Configuration / USB Options / USB UHCI Contr. 2 Advanced / IO Device Configuration / USB Options / USB Touch Controller Advanced / IO Device Configuration / USB Options / USB EHCI Controller Advanced / IO Device Configuration / USB Options / Legacy USB Support Advanced / IO Device Configuration / USB Options / EHCI Legacy Support Advanced / IO Device Configuration / USB Options / EHCI Handoff Patch

Audio Interface	Advanced / IO Device Configuration / AC97 Audio Controller
Network Interface	Advanced / PCI-PNP Configuration / Onboard LAN IRQ Line Advanced / IO Device Configuration / LAN Options / Onboard LAN Controller Advanced / IO Device Configuration / LAN Options / Onboard LAN PXE ROM Advanced / IO Device Configuration / LAN Options / Enable WOL
PC Card Interface	Advanced / IO Device Configuration / CardBus Controller
IDE Interface	Main / Compact Flash, Secondary Master (Slave) / Type Main / Compact Flash, Secondary Master (Slave) / Multi-Sector Transfers Main / Compact Flash, Secondary Master (Slave) / LBA Mode Control Main / Compact Flash, Secondary Master (Slave) / 32 Bit IO Main / Compact Flash, Secondary Master (Slave) / Transfer Mode Main / Compact Flash, Secondary Master (Slave) / Ultra DMA Mode Main / SMART Device Monitoring Main / Hard Disk Pre-Delay Advanced / IO Device Configuration / Primary IDE UDMA66/100 Advanced / IO Device Configuration / Secondary IDE UDMA66/100 Advanced / IO Device Configuration / Local Bus IDE Adapter Advanced / Miscellaneous / Large Disk Access Mode
Floppy Interface	Main / Legacy Diskette A: Advanced / IO Device Configuration / SIO Options / Onboard FDC Advanced / Miscellaneous / Floppy Check
SMBus Interface	Advanced / PCI-PNP Configuration / Assign IRQ to SMB
Watchdog Timer	Advanced / Watchdog Settings / Mode Advanced / Watchdog Settings / Timeout Advanced / Watchdog Settings / Delay
miniPCI Slot	Advanced / PCI-PNP Conf. / PCI Device, miniPCI Slot / Enable Slot Advanced / PCI-PNP Conf. / PCI Device, miniPCI Slot / Option ROM Scan Advanced / PCI-PNP Conf. / PCI Device, miniPCI Slot / Enable Master Advanced / PCI-PNP Conf. / PCI Device, miniPCI Slot / Latency Timer Advanced / PCI-PNP Configuration / miniPCI Slot IRQ Line
BIOS Extensions (Miscellaneous)	Advanced / Advanced Chipset Control / Serial Interrupt Mode Advanced / PCI-PNP Configuration / PNP OS Installed Advanced / PCI-PNP Configuration / Reset Configuration Data Advanced / PCI-PNP Configuration / Secured Setup Configuration Advanced / Keyboard Features / PS2 Scanner Workaround Advanced / Miscellaneous / Summary Screen Advanced / Miscellaneous / Quickboot Mode Advanced / Miscellaneous / Extended Memory Testing Advanced / Miscellaneous / Dark Boot Advanced / Miscellaneous / Halt on Errors Advanced / Miscellaneous / Spread Spectrum Advanced / Miscellaneous / CMOS Backup Type Advanced / Miscellaneous / Enable SMBIOS UUID

28. Setup Guide

The PHOENIX BIOS Setup Utility changes system behavior by modifying the BIOS configuration. The setup program uses a number of menus to make changes and turn features on or off.

Whenever you contact technical support about BIOS issues, providing a BIOS version <ePPMR???> is especially helpful.

28.1 Start PHOENIX BIOS Setup Utility

To start the PHOENIX BIOS Setup Utility, press the **<F2>** key when the following string appears during boot up.

```
Press <F2> to enter Setup
```

The Main Menu then appears with the serial number. The board's serial number has valuable information for technical support.

28.2 General Information

The **Setup Screen** is composed of several sections:

Setup Screen	Location	Function
Menu Bar	Top	Lists and selects all top-level menus.
Legend Bar	Bottom	Lists setup navigation keys.
Item Specific Help Window	Right	Help for selected item.

Menu Bar

The menu bar at the top of the window lists different menus. Use the left/right/up/down arrow keys to make a selection.

Legend Bar

Use the keys listed in the legend bar on the bottom to make your selections or exit the current menu.

Note: *In the Option column,* ***bold*** *shows default settings.*

28.3 Info Menu

Feature	Description
Bios Version	Shows the actual BIOS version
BIOS Date	Shows the BIOS production date
Board Name	Shows the KONTRON specific board name (JIDA entry)
Board Class	Shows the KONTRON specific board class (JIDA entry)
Serial Number	Shows the KONTRON specific serial number (JIDA entry)
Manufacturing Date	Shows the KONTRON specific manufacturing date (JIDA entry)
Hardware Revision	Shows the KONTRON specific hardware revision (JIDA entry)
Boot Counter	Shows the actual boot counter
CPU Type	Shows the CPU type
CPU Speed	Shows the CPU speed
Microcode	Shows the version number of microcode
System Memory	Displays amount of conventional memory detected during boot-up
Extended Memory	Displays amount of extended memory detected during boot-up Extended memory = capacity of memory module – selected frame buffer memory size
Shadow RAM	Displays shadow part of BIOS components (including D-segment)
Cache RAM	Displays amount of cache memory

28.4 Main Menu

Feature	Option	Description
System Time	HH:MM:SS	Sets system time
System Date	MM/DD/YYYY	Sets system date
Legacy Diskette A:	**Disabled**, 360 kB, 1.2 MB 720 kB, 1.44/1.25 MB, 2.88 MB	Sets type of floppy disk drive
▸ Compact Flash	Autodetected drive	Displays result of CF autotyping
▸ Secondary Master	Autodetected drive	Displays result of IDE autotyping
▸ Secondary Slave	Autodetected drive	Displays result of IDE autotyping
SMART Device Monitoring	Disabled **Enabled**	Turns on Self-Monitoring Analysis-Reporting Technology which monitors the condition of the hard drive
Hard Disk Pre-Delay	**Disabled**, 3 Sec., 6 Sec., 9 Sec 12 Sec., 15 Sec., 21 Sec., 30 Sec.	Adds a delay before the first access of a IDE drive by the BIOS

28.4.1 Compact Flash, Secondary Master or Slave Submenus

Feature	Option	Description
Type	**Auto**, None ATAPI Removable CD-ROM IDE Removable Other ATAPI, User	Defines the IDE drive ATAPI Removable = read- and writeable media e.g. LS120 and USB-ZIP Other ATAPI = for ATAPI devices not supported by other HDD features
Cylinders	N/A	Number of cylinders
Heads	N/A	Number of read/write heads
Sectors	N/A	Number of sectors per track
Maximum Capacity	N/A	Displays the calculated size of the drive in CHS
Total Sectors	N/A	Number of total sectors in LBA mode
Maximum Capacity	N/A	Displays the calculated size of the drive in
Multi-Sector Transfers	**Disabled**, 2 Sectors 4 Sectors, 8 Sectors 16 Sectors	Any selection except Disabled determines the number of sectors transferred per block
LBA Mode Control	**Disabled** Enabled	Enabling LBA causes Logical Block Addressing to be used in place of CHS
32 Bit I/O	**Disabled** Enabled	Enables 32-bit communication between CPU and IDE card
Transfer Mode	**Standard** Fast PIO 1, Fast PIO 2 Fast PIO 3, Fast PIO 4 FPIO 3 / DMA 1 FPIO 4 / DMA 2	Selects the method for transferring the data between the hard disk and system memory
Ultra DMA Mode	**Disabled** Mode 0, Mode 1 Mode 2, Mode 3 Mode 4, Mode 5	Selects the UDMA mode to move data to/from the drive. Autotype the drive to select the optimum transfer mode. This feature is autodetected
SMART Monitoring	N/A	Shows whether a disk supports SMART

28.5 Advanced Menu

Feature	Description
▸ Advanced Chipset Control	Opens Advanced Chipset Control submenu
▸ PCI/PNP Configuration	Opens PCI/PNP Config submenu
▸ Memory Cache	Opens Cache Control submenu
▸ I/O Device Configuration	Opens Peripheral Config submenu
▸ Keyboard Features	Opens Keyboard Features submenu
▸ Hardware Monitor	Shows Hardware Monitor current state
▸ Watchdog Settings	Opens Watchdog Config submenu
▸ Display Control	Opens Display Control submenu
▸ Miscellaneous	Opens submenu with Miscellaneous Options

28.5.1 Advanced Chipset Control Submenu

Feature	Option	Description
Enable Memory Gap	**Disabled** Enable	If enabled turn system RAM off to free address space for use with an extension card
Graphics Engine 1	Disabled **Enabled**	Enable or disable the integrated graphics engine 1
Graphics Engine 2	Disabled **Enabled**	Enable or disable the integrated graphics engine 2
Graphics Memory	UMA = 1MB **UMA = 8MB** UMA = 16MB UMA = 32MB	Select the amount of Main Memory that the integrated graphics device will use
Max. supported Memory Frequency	DDR200, DDR266 **DDR333**	Defines the maximum memory speed
Serial Interrupt Mode	**Quiet** Continuous	Defines the mode of SERIRQ signal between Southbridge, Super-I/O and ISA-Bridge

28.5.2 PCI/PNP Configuration Submenu

Feature	Option	Description
PNP OS installed	No **Yes**	If your system has a PnP OS (such as Win9x), select Yes to let the OS configure PnP devices not required for booting. No allows the BIOS to configure them
Reset Configuration Data	**No** Yes	Yes erases all configuration data in ESCD, which stores the configuration settings for plug-in devices. Select Yes when required to restore the manufacturer's defaults
Secured Setup Configuration	No **Yes**	Yes prevents a Plug and Play OS from changing system settings
▸ PCI Device, miniPCI Slot	Submenu	Opens submenu to configure the miniPCI slot
miniPCI Slot IRQ Line Onboard LAN IRQ Line Onboard USB EHCI IRQ Line	Disabled **Auto Select** IRQ 3, 4, 5, 7 IRQ 9, 10, 11 IRQ 12, 14, 15	Select IRQs for the miniPCI slot and the onboard LAN and USB2.0 host controller. Select Auto to let the BIOS assign the IRQ
Assign IRQ to SMB	Disabled **Enabled**	Determines whether the integrated SMBus host controller gets an IRQ assigned
Assign IRQ to VGA	**Enabled** Disabled	Determines whether the integrated VGA controller gets an IRQ assigned

28.5.3 PCI Device, miniPCI Slot Submenu

Feature	Option	Description
Enable Slot	**Enabled** Disabled	Enables support for miniPCI devices
Option ROM Scan	**Enabled** Disabled	Initialize device expansion ROM
Enable Master	**Disabled** Enabled	Enables the device in miniPCI slot as a PCI bus master
Latency Timer	**Default**, 20h, 40h 60h, 80h, A0h C0h, E0h	Minimum guaranteed time slice allocated for bus master in units of PCI bus clocks. A high-priority, high-throughput device may benefit from a greater value

28.5.4 Memory Cache Submenu

Feature	Option	Description
Memory Cache	Disabled **Enabled**	Enables or Disables L2 cache
Cache System BIOS Area	Uncached **Write Protect**	Controls caching of System BIOS area
Cache Video BIOS Area	Uncached **Write Protect**	Controls caching of Video BIOS area
Cache Base 0-512k	Uncached, Write Through Write Protect, **Write Back**	Controls caching of 512k base memory
Cache Base 512k-640k	Uncached, Write Through Write Protect, **Write Back**	Controls caching of 512k to 640k base memory
Cache Extended Memory Area	Uncached, Write Through Write Protect, **Write Back**	Controls caching of system memory above 1MB
Cache D000 - D3FF Cache D400 - D7FF Cache D800 - DBFF Cache DC00 - DFFF	**Disabled** Write Through Write Protect Write Back	Disabled: Block is not cached Write Through: Writes are cached and sent to main memory at once Write Protect: Writes are ignored Write Back: Writes are cached but not sent to main memory until necessary

28.5.5 I/O Device Configuration Submenu

Feature	Option	Description
Local Bus IDE Adapter	Disabled, Primary Secondary, **Both**	Enables the onboard PCI IDE controller
Primary IDE UDMA66/100	Disabled **Enabled**	Enabled allows UDMA66 mode and above
Secondary IDE UDMA66/100	Disabled **Enabled**	Enabled allows UDMA66 mode and above
CardBus Controller	**Enabled** Disabled	Enables PC Card support
AC97 Audio Controller	Disabled **Enabled**	Enables the onboard audio controller
‣ USB Options	Submenu	Opens USB options submenu
‣ LAN Options	Submenu	Opens LAN options submenu
‣ SIO Options	Submenu	Opens Super-I/O options submenu

28.5.6 USB Options Submenu

Feature	Option	Description
USB UHCI Host Contr. 1	Disabled **Enabled**	Enable / Disable UHCI host controller for port 1
USB UHCI Host Contr. 2	Disabled **Enabled**	Enable / Disable UHCI host controller for port 2
USB Touch Controller	Disabled **Enabled**	Enable / Disable touch controller
USB EHCI Host Controller	Disabled **Enabled**	Controls USB 2.0 functionality. If enabled the USB ports are multiplexed between UHCI and EHCI. Ports are routed to EHCI if an USB 2.0 high speed device is connected and an EHCI driver is loaded
Legacy USB Support	Disabled **Enabled**	Enable support for USB keyboard and mice and boot from USB 1.1 mass storage devices
EHCI Legacy Support	Disabled **Enabled**	Enable USB 2.0 support for boot from USB 2.0 mass storage devices
EHCI Handoff Patch	Disabled **Enabled**	This patch must be applied if an OS before WINXP SP2 have problems gaining control over EHCI ports

28.5.7 LAN Options Submenu

Feature	Option	Description
LAN MAC Address	N/A	Shows the LAN controller MAC address
Onboard LAN Controller	**Enabled** Disabled	Enables the ICH4 internal LAN controller
Onboard LAN PXE ROM	**Disabled** Enabled	Enables the remote boot BIOS extension for the onboard LAN controller
Enable WOL	**OS Control** Enabled Disabled	Controls the Wake On Lan function

28.5.8 SIO Options Submenu

Feature	Option	Description
Onboard FDC	Disabled **Enabled**	Enables onboard floppy disk controller
Serial Port A, B	**Disabled** (Port B) Enabled **Auto** (Port A)	Enabled requires end user to enter the base I/O address and the IRQ Auto makes the BIOS configure the port
Mode *(1)*	**Normal** IR	Only Serial Port B option. Allows the infrared communication
Base I/O Address *(2)*	**3F8h** (A), **2F8h** (B) 3E8h, 2E8h	Selects I/O base of port
Interrupt *(2)*	**IRQ3** (B), **IRQ4** (A)	Selects IRQ of Port A and B
Onboard LPT	Disabled Enabled **Auto**	See Description of Serial Port A, B
Mode	Output only **Bi-directional** EPP, ECP	Sets the mode for the parallel port
Base I/O Address *(3)*	**378h**, 278h, 3BCh	Selects I/O base of port
Interrupt *(3)*	IRQ5, **IRQ7**	Selects IRQ of parallel port
DMA Channel *(4)*	DMA1, **DMA3**	Selects DMA channel of parallel port

Note:
1. *Only available if 'Serial Port B' not disabled.*
2. *Only available if 'Serial Port A/B' set to Enabled.*
3. *Only available if 'Onboard LPT' set to Enabled.*
4. *Only available if 'Mode' set to ECP.*

28.5.9 Keyboard Features Submenu

Feature	Option	Description
NumLock	Auto, **On**, Off	On or Off turns NumLock on or off at boot-up Auto turns NumLock on if it finds a numeric key pad
Key Click	**Disabled**, Enabled	Turns audible key click on
Keyboard Auto-Repeat Rate	**30/sec**, 26.7/sec 21.8/sec, 18,5/sec 13.3/sec, 10/sec 6/sec, 2/sec	Sets the number of times to repeat a keystroke per second if you hold the key down
Keyboard Auto-Repeat Delay	¼ sec, **½ sec** ¾ sec, 1 sec	Sets the delay time after the key is held down before it begins to repeat the keystroke
PS2 Scanner Workaround	**Disabled** Enabled	Some PS/2 scanner require to be enabled after a reset

28.5.10 Hardware Monitor Submenu

Feature	Option	Description
VCC 3.3V Voltage	N/A	3.3V power plane
5Vsb Voltage	N/A	5V standby voltage
CPU Core Voltage	N/A	CPU core voltage
Battery Voltage	N/A	Battery voltage
CPU Temperature	N/A	CPU temperature in °C and °F
CPU Fan Speed *(1)*	N/A	CPU fan speed in rpm
Edges per Fan Revolution	1, **2**, 3 - 15	Patch for fan speed display

28.5.11 Watchdog Settings Submenu

Feature	Option	Description
Mode	**Disabled** RESET	Selects operation mode
Timeout *(2)*	1s, 5s, 10s, **30s** 1min, 5.5min 10.5min, 30.5min	Selects maximum trigger period
Delay *(2)*	1s, 5s, 10s, **30s** 1min, 5.5min 10.5min, 30.5min	Selects time until the watchdog counter starts the counting. Useful to handle longer boot times

Note: *1 'No Function' will be displayed on boards with passive cooling or when fans without a sense line are used.*
2 Only available if 'Mode' not disabled.

28.5.12 Display Control Submenu

Feature	Option	Description
Display Mode	**CRT only** LFP only CRT+LFP	Selects display mode
JDA Revision	N/A	Displays the revision of the JILI data area image
Flat Panel Type	VGA 1x18 SVGA 1x18 **XGA 1x18** XGA 1x24 XGA 2x18 SXGA 2x24 UXGA 2x18 Enter PAID Enter FPID Auto	Select Auto to let the BIOS automatically detect the panel type or use one of the predefined fixed panel types Choose Enter PAID or Enter FPID to manually set JILI3 ID values
PAID/FPID *(1)*	0 – FFFF default **0**	Enter the JILI3 ID
Flat Panel Scaling	Centered **Stretched**	Selects scaling mode
IGD - ACPI LCD Address	**0x110** 0x400	This option is under development
Flat Panel Backlight	0 – 255 default **128**	Backlight brightness

Note: *1 Only available if flat panel type 'Enter PAID' or 'Enter FPID' are selected.*

28.5.13 Miscellaneous Submenu

Feature	Option	Description
Floppy Check	**Disabled** Enabled	Enabled verifies floppy type
Summary Screen	**Disabled** Enabled	If enabled, a summary screen is displayed just before booting the OS to let see the configuration
QuickBoot Mode	Disabled **Enabled**	Allows the system to skip certain tests while booting. This decreases the time needed to boot the system
Extended Memory Testing	Normal **Just Zero it** None	Determines which type of tests will be performed on memory above 1MB. The option Normal is not visible when QuickBoot is enabled
Dark Boot	Enabled **Disabled**	If enabled, system comes up with a blank screen instead of the diagnostic screen during boot-up
Halt on Errors	No, **Yes**	Determines if post errors cause the system to halt
PS/2 Mouse	Disabled Enabled **Auto Detect**	Selecting Disabled prevents any installed PS/2 mouse from functioning but frees up IRQ12. Selecting Autodetect frees IRQ12 if no mouse is detected
Large Disk Access Mode	Other **DOS**	A large disk is one that has more than 1024 cylinders, more than 16 heads or more than 63 sectors
Spread Sprectrum	**Disabled** Enabled	Controls the spread spectrum feature of the clock generator
CMOS Backup Type	No Backup **Restore every boot** Restore if CMOS invalid	Selects how often the CMOS values should be restored
Enable SMBIOS UUID	Enabled **Disabled**	Enables the SMBIOS Unique Universal Identifier

28.6 Security Menu

Feature	Option	Description
Supervisor Password is	**Clear** Set	Displays whether password is set
User Password is	**Clear** Set	Displays whether password is set
Set Supervisor Password	Up to seven alpha-numeric characters	Pressing <Enter> displays the dialog box for entering the user password. In related systems, this password gives full access to setup
Set User Password	Up to seven alpha-numeric characters	Pressing <Enter> displays the dialog box for entering the user password. In related systems, this password gives restricted access to setup
Fixed Disk Boot Sector	**Normal** Write Protected	Write protect the boot sector on the hard disk for virus protection. Requires a password to format or Fdisk the hard disk
Virus Check Reminder	**Disabled**, Daily Weekly, Monthly	Displays a message during boot-up asking (Y/N) if you backed up the system or scanned for viruses. Message returns on each boot until you respond with Y Daily displays the message on the first boot of the day, Weekly on the first boot after Sunday, and monthly on the first boot of the month
System Backup Reminder	**Disabled**, Daily Weekly, Monthly	Displays a message during boot-up asking (Y/N) if you backed up the system or scanned for viruses. Message returns on each boot until you respond with Y Daily displays the message on the first boot of the day, Weekly on the first boot after Sunday, and monthly on the first boot of the month
Password on Boot	**Disabled** Enabled	Enabled requires a password on boot. Requires prior setting of the supervisor password If supervisor password is set and this option is disabled, BIOS assumes user is booting
Password on Bootmenu	**Disabled** Enabled	Enabled requires a password on the bootmenu. Requires prior setting of the supervisor password

28.7 Power Menu

Feature	Option	Description
Enable ACPI	No **Yes**	Enables/Disables ACPI BIOS (Advanced Configuration and Power Interface). IRQ9 is used for SCI (System Control Interrupt)
▸ ACPI Control	Submenu	Opens the ACPI submenu
▸ Thermal Management	Submenu	Defines thermal management values
Max. CPU Frequency	1400MHz, 1300MHz 1200MHz, 1100MHz 1000MHz, 900MHz 800MHz, 600MHz	Selects the actual CPU frequency. The default value is depending on the CPU used

28.7.1 ACPI Control Submenu

Feature	Option	Description
APIC - IO APIC Mode	Disabled **Enabled**	This item is valid only for Windows XP. Also, a fresh install of the OS must occur when APIC Mode is desired
Native IDE Support	**Disabled** Enabled	Enable Native IDE support for WINXP by setting this item. The NATA Package will be created if this item is set to Enabled Changing this item will have no effect in WIN98, WINME, or WIN2K
Deepest Sleep State for Standby	None, S1 S3, **S3/S1**	Defines ACPI sleep state

28.7.2 Thermal Management Submenu

Feature	Option	Description
Automatic Thermal Control Circuit	Disabled **TM1** TM2	Enables the thermal control circuit (TCC) of the thermal monitor feature of the Pentium-M CPU TM1 = 50% duty cycle / TM2 = Geyserville III Automatic TTC must be enabled to ensure that the processor operates within specification
Passive Cooling Trip Point	Disabled 40°C - 100°C default **90°C**	Determines the temperature of the ACPI Passive Trip Point, the point at which the OS will turn on/off CPU clock throttling
Passive TC1 Value *(1)*	**1**, 2, 3, ... 15, 16	Determines the TC1 (temperature coefficient 1) value for the ACPI passive cooling formula
Passive TC2 Value *(1)*	1, 2, ... **5**, ... 15, 16	Determines the TC2 (temperature coefficient 2) value for the ACPI passive cooling formula
Passive TSP Value *(1)*	2, 4, 6, 8, **10**, ... 30	Determines the Tsp (sampling period) value for the ACPI passive cooling formula
Critical Trip Point	40°C – 110°C default **100°C**	This value controls the temperature of the ACPI Critical Trip Point - the point at which the OS will shut the system off
Active Trip Point	Disabled 40°C - 100°C default **65°C**	Determines the temperature of the ACPI Active Trip Point, the point at which the OS will turn on/off the CPU fan

Note: *1 Only available if 'Passive Cooling Trip Point' not disabled.*

28.8 Exit Menu

Feature	Option	Description
Exit Saving Changes	**Yes** No	Saves selections and exits setup. The next time the system boots, the BIOS configures the system according to the Setup selection stored in CMOS
Exit Discarding Changes	**Yes** No	Exits Setup without storing in CMOS any new selections you may have made. The selections previously in effect remain in effect
Load Setup Defaults	**Yes** No	Sets default values for all the Setup menus
Discard Changes	**Yes** No	If, during a Setup session, you change your mind about changes you have made and have not yet saved the values to CMOS, you can restore the values you saved to CMOS
Save Changes	**Yes** No	Saves all the selection without exiting Setup. You can return to the other menus to review and change your selection

28.9 Kontron BIOS Extensions

Besides the PHOENIX System BIOS, the ePanel PM comes with a few BIOS extensions that support special features. All extensions are located in the onboard Flash. Some extensions are permanently available; some are loaded if required during boot-up.

Supported features include:

- JIDA standard
- Remote Control feature (JRC)
- Onboard LAN PXE ROM

All enabled BIOS extensions require shadow RAM. However, if the system memory cannot find free memory space because all the memory is already used for add-on peripherals, the BIOS extensions do not load.

28.9.1 JIDA BIOS Extension

The **J**UMPtec **I**ntelligent **D**evice **A**rchitecture (JIDA) interface is integrated into the BIOS of the ePanel PM board. This interface enables hardware-independent access to features that cannot be accessed via standard APIs. Functions such as watchdog timer, brightness of LCD backlight and user bytes in the EEPROM can be configured with ease by taking advantage of this standard board feature.

The JIDA BIOS extension is not a true extension BIOS. It is part of the system BIOS and is located in the system BIOS segments after boot-up. It is permanently available and supports the JIDA 16-bit standard and the JIDA 32-bit standard.

The JIDA 16-bit standard is a software interrupt 15h driven interface for programmers and offers lots of board information functions. For detailed information about programming, refer to the JIDA specification and a source code example (JIDAI???.ZIP), which you can find on the Kontron Website. The three question marks represent the revision number of the file. You also can contact technical support for this file.

For other operating systems, special drivers (JIDAIA??.ZIP) are available. You can download the zip file from the Kontron Website.

28.9.2 Remote Control Client Extension

You can remotely control the ePanel PM using software available from Kontron (JRC-1, Part Number 96047-0000-00-0). This software tool can communicate with the board via one of the serial ports. During boot-up, the system BIOS scans the serial ports for an available JRC connection. If detected, it loads the JRC client BIOS extension into the memory. With the JRC client loaded into the first detected free memory location between C0000h and DFFFFh, a 16K block is shadowed.

For more information on the Remote Control usage, refer to the JRC-1 technical manual or Application Note JRCUsage_E???.PDF, which you can find on the Kontron Website.

28.9.3 LAN PXE ROM

This optional ROM allows you to boot the ePanel PM over an Ethernet connection. If the onboard LAN PXE ROM is enabled in the system BIOS setup, an optional ROM for the Ethernet controller loads into memory during boot up. A server with Intel PXE boot support is required on the other side of the Ethernet connection. The setup and configuration of the server, including PXE support, is not the responsibility of Kontron.

The PXE ROM extension is loaded into the first free memory area between D0000h and DFFFFh.

28.10 Updating/Restoring BIOS using PHOENIX Update Tool

The PHOENIX Update Tool allows you to update the BIOS by using a floppy disk without having to install a new ROM chip. The Update Tool is a utility used to flash a BIOS to the Flash ROM installed on the ePanel PM.

Use the PHOENIX Update Tool to:

- Update the current BIOS with a newer version
- Restore a corrupt BIOS

28.10.1 Flashing a BIOS

Use the following procedure to update or restore the BIOS.

❶ Download the PHOENIX Update Tool compressed file, ePPMR???.ZIP, from the KONTRON Embedded Modules Website or contact your local technical support for it. The ZIP-file contains the following:

File	Description
MAKEBOOT.EXE	Creates the custom boot sector on the Crisis Recovery Diskette.
CRISBOOT.BIN	Serves as the Crisis Recovery boot sector code.
MINIDOS.SYS	Allows the system to boot in Crisis Recovery Mode.
PHLASH16.EXE	Programs the Flash ROM (Update program).
WINCRIS.EXE	Creates the Crisis Recovery Diskette from Windows.
WINCRIS.HLP	Serves as the help file of WINCRIS.EXE.
CRISDISK.BAT	Batch file for Crisis Disk.
ePPMR???.WPH	Serves as the actual BIOS image to be programmed into Flash ROM.

❷ Install the PHOENIX Update Tool on a hard disk by unzipping the contents of the ePPMR???.ZIP into a local directory such as C:\PHLASH.

❸ Create a Crisis Recovery Diskette by inserting a blank diskette into Drive A: or B: and execute WINCRIS.EXE. This copies three files onto the diskette.

File	Description
MINIDOS.SYS	Allows the system to boot in Crisis Recovery Mode.
PHLASH16.EXE	Programs the Flash ROM (Update program).
ePPMR???.WPH	Serves as the actual BIOS image to be programmed into Flash ROM.

❹ If the BIOS image (ePPMR???.WPH) changes because of an update or bug fix, copy the new BIOS onto the diskette. Phlash16 runs in either command line mode or crisis recovery mode.

❺ Use the command line mode to update or replace the BIOS. To execute Phlash16 in this mode, move to the Crisis Recovery Disk and type:

```
PHLASH16 <bios name>    (Example: PHLASH16 ePPMR100.WPH)
```

Phlash16 will update the BIOS. Phlash16 can fail if the system uses memory managers. If this occurs, the utility displays the following message: Cannot flash when memory manager are present. If you see this message after you execute Phlash16, disable the memory manager or use parameter /x for Phlash16.exe.

```
PHLASH16 /X <bios name>
```

28.10.2 Preventing Problems when Updating or Restoring BIOS

Updating the BIOS represents a potential hazard. If Power failures or fluctuations occur while updating the Flash ROM, the BIOS code can be damaged, rendering the system unbootable.

To prevent this hazard, many systems come with a boot-block Flash ROM. The boot-block region contains a fail-safe recovery routine. If the boot-block code finds a corrupted BIOS (checksum fails), it boots into the crisis recovery mode and loads a BIOS image from a crisis diskette (see above).

Additionally, the end user can insert an update key into the serial or parallel port to force initiating the boot block recovery routine.

Appendix A: System Resourcen

A.1 Interrupt Request Lines

Please ensure that the chosen interrupt is not already in use by PCI devices.

A.1.1 PIC Mode

IRQ #	Use	Available	Comment
0	Timer0	No	
1	Keyboard	No	
2	Cascade	No	
3	PCI / COM2	for PCI / No	Dynamic (BIOS default) / *Note (1)*
4	COM1	No	*Note (1)*
5	PCI	for PCI	Dynamic (BIOS default)
6	FDC	No	*Note (1)*
7	LPT1	No	*Note (1)*
8	RTC	No	
9	ACPI	No	*Note (2)*
10	PCI	for PCI	Dynamic (BIOS default)
11	PCI	for PCI	Dynamic (BIOS default)
12	PS/2 Mouse	No	*Note (1)*
13	FPU	No	
14	Primary IDE	No	*Note (1)*
15	Secondary IDE	No	*Note (1)*

Note: *1 If the „used for" device is disabled in setup, the corresponding interrupt is available for other devices.*
2 Not available if ACPI is used.

A.1.2 APIC Mode

IRQ #	Use	Available	Comment
0	Timer0	No	
1	Keyboard	No	
2	Cascade	No	
3	(COM2)	Yes	*Note (1)*
4	COM1	No	*Note (1)*
5		Yes	
6	FDC	No	*Note (1)*
7	LPT1	No	*Note (1)*
8	RTC	No	
9	ACPI	No	*Note (2)*
10		Yes	
11		Yes	
12	PS/2 Mouse	No	*Note (1)*
13	FPU	No	
14	Primary IDE	No	*Note (1)*
15	Secondary IDE	No	*Note (1)*
16	PIRQ[A] PCI	for PCI	Dynamic (BIOS default)
17	PIRQ[B] PCI	for PCI	Dynamic (BIOS default)
18	PIRQ[C] PCI	for PCI	Dynamic (BIOS default)
19	PIRQ[D] PCI	for PCI	Dynamic (BIOS default)
20	PIRQ[E] PCI	for PCI	Dynamic (BIOS default)
21	PIRQ[F]	--	
22	PIRQ[G]	--	
23	PIRQ[H] PCI	for PCI	Dynamic (BIOS default)

Note: *1 If the „used for" device is disabled in setup, the corresponding interrupt is available for other devices.*
2 Not available if ACPI is used.

A.2 Direct Memory Access (DMA) Channels

DMA #	Used for	Available	Comment
0		Yes	
1	(LPT1)	Yes	*Note (2)*
2	FDC	No	*Note (1)*
3	(LPT1)	Yes	*Note (2)*
4	Cascade	No	
5		Yes	
6		Yes	
7		Yes	

Note: *1 If the „used for“ device is disabled in setup, the corresponding interrupt is available for other devices.*
2 Possible setting for LPT1 if configured for ECP mode

A.3 I/O Address Map

The I/O-port addresses of the ePanel PM are functionally identical to a standard PC/AT. All addresses not mentioned in this table should be available. We recommend that you do not use I/O addresses below 0100h with additional hardware for compatibility reasons, even if available.

I/O Address (h)	Use	Available	Comment
0000 - 001F	DMA Controller 1	No	Fixed
0010	System Control	No	Fixed
0020 - 003F	Interrupt Controller 1	No	Fixed
0040 - 005F	Timer, Counter	No	Fixed
0060 - 006F	Keyboard controller	No	Fixed
0070	NMI Enable Register	No	Fixed
0070 - 0077	Real Time Clock and CMOS Registers	No	Fixed
0080	BIOS POST	No	Fixed
0081 - 008F	DMA Page Register	No	Fixed
0092	System Control	No	Fixed
00A0 00BF	Interrupt Controller 2	No	Fixed
00C0 - 00DF	DMA Controller 2	No	Fixed
00E0 - 00EF	System Control	No	Fixed
00F0 - 00FF	Math Coprocessor	No	Fixed
01F0 - 01F7	Fixed Disk	No	Available if IDE port 1 is disabled
0274 - 0279	ISA PnP Read / Address	No	Fixed
0278 - 027F		Yes	Possible address of LPT2
0290 - 0297	System Resources	No	Fixed
02E8 - 02EF		Yes	Possible address of COM4
02F8 - 02FF	Serial Port 2	No	Default for COM2, free with different configuration
0378 - 037F	Parallel Port 1	No	Default for LPT1; free with different configuration
03BC - 03C4		Yes	Possible address of LPT3
03B0 - 03DF	VGA	No	Fixed
03E8 - 03EF		Yes	Possible address of COM3
03F0 - 03F7	Diskette Controller	No	Available if device is disabled
03F8 - 03FF	Serial Port 1	No	Default for COM1, free with different configuration
04D0 - 04D1	PIC Extension	No	Fixed
0600 - 060F	System Resources	No	Fixed
0678 - 067F	LPT ECP Mode	Yes	Used if LPT base address 278h
0778 - 077F	LPT ECP Mode	Yes	Used if LPT base address 378h
0A79	ISA PnP Write	No	Fixed
0CF8 - 0CFF	PCI Configuration	No	Fixed
1000 - 107F	Power Management	No	Fixed
1180 - 11BF	Power Management	No	Fixed

1800 - 1807	PCI VGA Controller	No	Dynamic (BIOS default address)
1C00 - 1C1F	PCI USB Controller	No	Dynamic (BIOS default address)
2000 - 201F	PCI USB Controller	No	Dynamic (BIOS default address)
2400 - 240F	PCI IDE Controller	No	Dynamic (BIOS default address)
2800 - 281F	PCI SMBus Controller	No	Dynamic (BIOS default address)
3000 - 303F	PCI LAN Controller	No	Dynamic (BIOS default address)

A.4 Memory Map

The ePanel PM can support up to 1 GB memory modules. The first 640 kB of DRAM are used as main memory.

Using DOS, you can address 1 MB of memory directly. Memory area above 1 MB (high memory, extended memory) is accessed under DOS via special drivers such as HIMEM.SYS and EMM386.EXE, which are part of the operating system. Please refer to the operating system documentation or special textbooks for information about HIMEM.SYS and EMM386.EXE.

Other operating systems (Linux or Windows versions) allow you to address the full memory area directly.

Upper Memory	Use	Available	Comment
A0000h – BFFFFh	VGA Memory	No	Mainly used by graphic adapter cards
C0000h – CFFFFh	VGA BIOS PXE ROM	No	Used by onboard extension ROMs
D0000h – DFFFFh		Yes	Free for ISA bus or shadow RAM in standard configurations If onboard LAN PXE ROM is enabled or JRC is used, a block is shadowed for BIOS extensions, starting with first free area at D0000h, D4000h, D8000h or DC000h. (BIOS extensions do not use the whole shadow block)
E0000h – FFFFFh	System BIOS	No	Fixed

A.5 PCI Devices

All devices follow the Peripheral Component Interconnect 2.1 (PCI 2.1) specification. The BIOS and OS control memory and I/O resources. Please see the PCI 2.1 specification for details.

PCI Device (IDSEL)	PCI IRQ	REQ / GNT	Comment
Host Bridge	None		Integrated in chipset
DDR SDRAM Controller	None		Integrated in chipset
Configuration Process Control	None		Integrated in chipset
VGA Graphics	INTA		Integrated in chipset
Graphic Controller	None		Integrated in chipset
PCI to PCI Bridge	None		Integrated in chipset
ISA Bridge	None		Integrated in chipset
IDE Controller	INTA		Integrated in chipset
UHCI USB Controller 1	INTA		Integrated in chipset
UHCI USB Controller 2	INTB		Integrated in chipset
UHCI USB Controller 3	INTC		Integrated in chipset
EHCI Controller	INTD		Integrated in chipset
SMBus Controller	INTB		Integrated in chipset
AC'97 Audio Controller	INTB		Integrated in chipset
PC Card Controller	INTA	REQ1 / GNT1	External TI1510
Video Controller	INTA	REQ2 / GNT2	External CX2388x
Network Controller	INTA		External i82562

A.6 SMBus Devices

The ePanel PM uses an onboard System Management (SM) Bus. This bus is not available on an peripheral connector and therefore cannot be used for external SMBus devices.

SMBus Address	SM Device	Comment
10h/11h	SMBus Host	Integrated in Intel ICH4 Do not use under any circumstances
12h/13h	Battery Charger	MAX8713
16h/17h	Smart Battery	Variable
A0h/A1h	SPD EEPROM	Part of the DDR RAM module
D2h/D3h	Clock Generator	ICS950811 Do not use under any circumstances

Note: *There are more devices connected to the SMBus than listed in this table, but access to these devices is not permitted. Don't access any other device addresses except those listed above.*

Appendix B: Technology Information

The following technological information is designed to give the reader a better understanding of some features of the ePanel PM.

B.1 Thermal Monitor and Catastrophic Thermal Protection

The Thermal Monitor within the Pentium M processor helps to control the processor temperature by activating the TCC (Thermal Control Circuit) when the processor silicon reaches its maximum operating temperature. The temperature at which the Intel Thermal Monitor activates the TCC is **not** user-configurable and is **not** software visible.

The Thermal Monitor controls the processor temperature by modulating (starting and stopping) the CPU core clocks at a 50% duty cycle (TM1) or by initiating an Enhanced Intel SpeedStep technology transition (TM2) when the processor silicon reaches its maximum operating temperature (selectable in setup).

Note: *TM2 is the recommended mode for the Intel Pentium M processor. Not supported on the ePanel PM Celeron M version.*

Thermal Monitor supports two modes to activate the TCC: Automatic and On-Demand mode. The Intel Thermal Monitor Automatic Mode must be enabled via BIOS for the processor to be operating within specification.

Automatic mode does not require any additional hardware, software drivers, or interrupt handling routines.

Note: *With a properly designed thermal solution, the TCC is only active for very short periods, hence processor performance impact is expected to be so minor that it would not be detectable. For more details see* chapter *5.1.2 of the Intel Pentium M Processor Datasheet.*

The Intel Pentium M processor supports the THERMTRIP# signal for catastrophic thermal protection.

In the event of a catastrophic cooling failure, the processor will automatically shut down when the silicon has reached a temperature of approximately 125°C. At this point the system BUS signal THERMTRIP# will go active.

THERMTRIP# activation is independent of processor activity and does not generate any bus cycles.

Thermal Control Circuit reduces performance when the processor reaches its max. operating temperature (100°C). THERMTRIP# shuts down the system in case of catastrophic cooling failure.

B.2 Processor Performance Control

The Pentium M processor can run in different performance states (multiple frequency/voltage operating points). The CPU performance can be altered while the computer is functioning. This allows the processor to run at different core frequencies and voltages depending on CPU thermal state and OS policy.

Windows XP includes built-in processor performance control to operate the processor more efficiently when it is not fully utilized. Win2k, WinME and Win9x do not support processor performance control. Special software is required for Operating Systems not capable of processor performance control.

In Windows, the processor performance control policy is linked to the Power Scheme setting in the control panel power option applet.

Note: *Windows always runs at the highest performance state when the "Home/Office" or "Always On" power scheme is selected.*

B.3 Thermal Management

ACPI allows the OS to play a role in the thermal management of the system. With the OS in control of the operating environment, cooling decisions can be made based on the application load on the CPU and the thermal heuristics of the system.

The ACPI thermal solution on ePanel PM supports three cooling policies:

- **Active Cooling**
  The OS is turning the fan on/off. Active cooling devices typically consume power and produce noise, but are able to cool a thermal zone without limiting system performance. The **active cooling trip point** declares the temperature threshold the OS uses to decide when to start/stop active cooling devices.

- **Passive Cooling**
  The OS reduces the power consumption of the processor by throttling the processor clock to reduce the temperature of the thermal zone. Passive cooling devices (processor) produce no noise. The **passive cooling trip point** declares the temperature threshold where the OS will start or stop passive cooling.

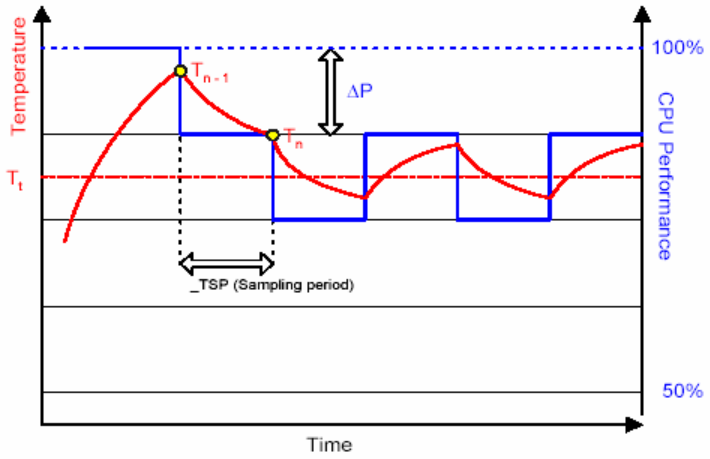
- **Critical Trip Point**
  The OS performs an orderly, but critical, shutdown of the system when the temperature reaches the **critical trip point**.

B.4 FAN Connector

This section describes how to connect a fan to the connector located directly on the ePanel PM. With certain BIOS-settings it is possible to control the fan depending on the Active Trip Point temperature. The fan switches on/off depending on the adjusted Active Trip Point temperature. In order for this feature to function properly an ACPI compliant OS is necessary.

B.5 Processor Clock Throttling

The ACPI OS assesses the optimum CPU performance change necessary to lower the temperature using the following equation:



$$\Delta P[\%] = TC1\,(T_n - T_{n-1}) + TC2\,(T_n - T_t)$$

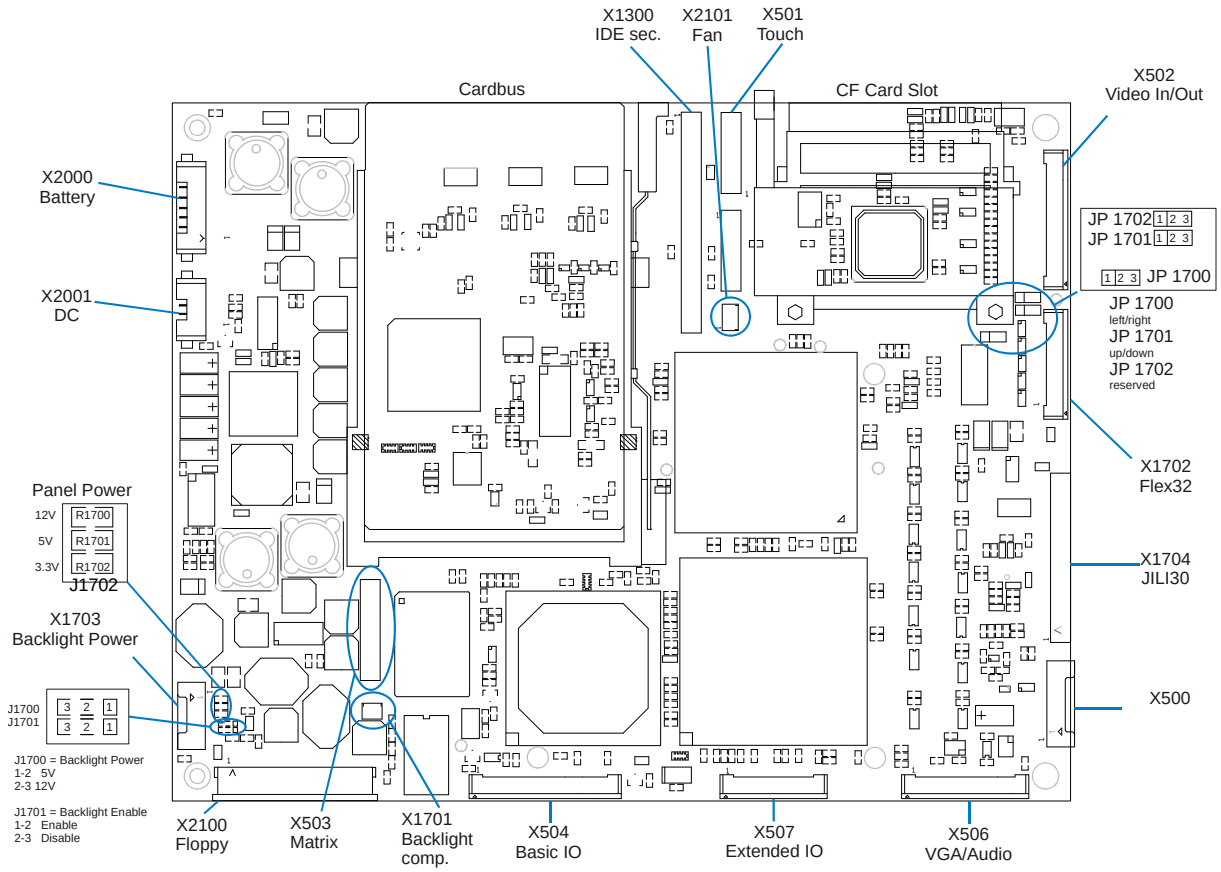
ΔP is the performance delta, T_t is the target temperature = critical trip point. The two coefficients TC1 and TC2 and the sampling period TSP are hardware dependent constants the end user must supply.

It's up to the end user to set the cooling preference of the system by setting the appropriate trip points in the BIOS setup.

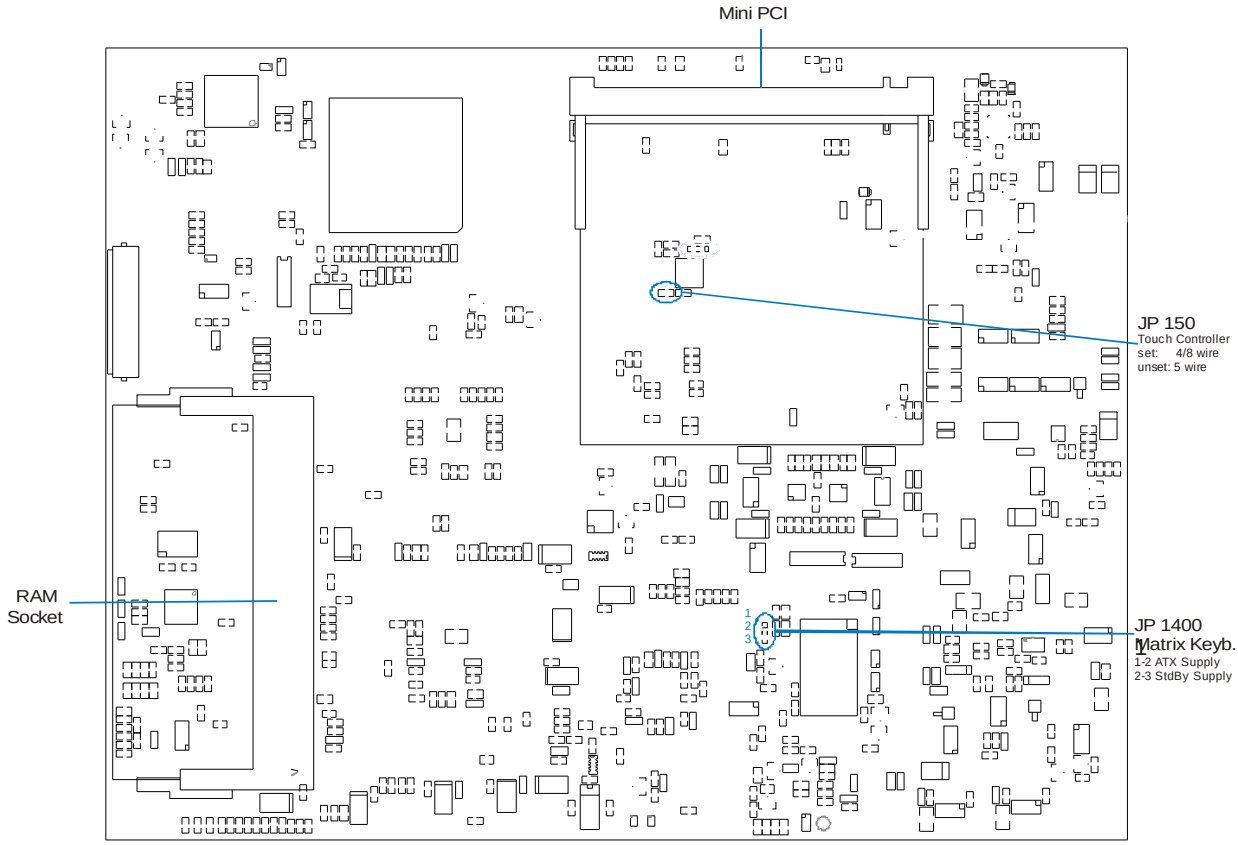
Appendix C: Connector Layout

C.1 Connector Locations

C.1.1 Top Side



C.1.2 Bottom Side



C.2 Pinout Tables

C.2.1 Signal Definition

Term	Description
IO-3.3	Bi-directional 3.3V I/O-Signal
IO-5	Bi-directional 5V I/O-Signal
I-3.3	3.3V Input
I-5	5V Input
O-3.3	3.3V Output
O-5	5V Output
OD-5	Open Drain 5V Output
PU	Pull-Up Resistor
PD	Pull-Down Resistor
PWR	Power Connection
NC	Not Connected / Reserved

C.2.2 Connector X504 - Basic I/O

Pin	Signal	Description	Type	Termination	Comment
1	**VCC**	Power +5V	**PWR**		
2	**KBCLK**	PS/2 Keyboard Clock	**IO-5**	PU 4k7	
3	**KBDAT**	PS/2 Keyboard Data	**IO-5**	PU 4k7	
4	**GND**	Ground	**PWR**		
5	**MSDAT**	PS/2 Mouse Data	**IO-5**	PU 4k7	
6	**MSCLK**	PS/2 Mouse Clock	**IO-5**	PU 4k7	
7	**GND**	Ground	**PWR**		
8	**/DSR (COMA)**	Data Set Ready	**I-5**		
9	**/DCD (COMA)**	Data Carrier Detect	**I-5**		
10	**/DTR (COMA)**	Data Terminal Ready	**O-5**		
11	**/RTS (COMA)**	Request To Send	**O-5**		
12	**/CTS (COMA)**	Clear To Send	**I-5**		
13	**RXD (COMA)**	Serial Receive	**I-5**		
14	**TXD (COMA)**	Serial Transmit	**O-5**		
15	**/RI (COMA)**	Ring Indicator	**I-5**		
16	**GND**	Ground	**PWR**		
17	**IRRX**	Infrared Receive	**I-5**		

18	**IRTX**	Infrared Transmit	**OD-5**		max. 12mA sink
19	**GND**	Ground	**PWR**		
20	**VCC**	Power +5V	**PWR**		
21	**VCC**	Power +5V	**PWR**		
22	**VCC**	Power +5V	**PWR**		
23	**VCC**	Power +5V	**PWR**		
24	**VCC**	Power +5V	**PWR**		
25	**PWR_ENA**	USB Power Enable	**O-3.3**	PU 10k	
26	**/OVRCUR**	USB Overcurrent Detect	**I-5**		
27	**GND**	Ground	**PWR**		
28	**USB0+**	USB Port 0 (positive)	**IO**		
29	**USB0-**	USB Port 0 (negative)	**IO**		
30	**GND**	Ground	**PWR**		
31	**USB1+**	USB Port 1 (positive)	**IO**		
32	**USB1-**	USB Port 1 (negative)	**IO**		
33	**GND**	Ground	**PWR**		
34	**USB2+**	USB Port 2 (positive)	**IO**		
35	**USB2-**	USB Port 2 (negative)	**IO**		
36	**GND**	Ground	**PWR**		
37	**RXD+**	Ethernet Receive (positive)	**I**		
38	**RXD-**	Ethernet Receive (negative)	**I**		
39	**GND**	Ground	**PWR**		
40	**TXD+**	Ethernet Transmit (positive)	**O**		
41	**TXD-**	Ethernet Transmit (negative)	**O**		
42	**GND**	Ground	**PWR**		
43	**LILED**	Valid LAN Link LED	**O-5**		
44	**SPEEDLED**	LAN Speed LED	**O-5**		
45	**ACTLED**	LAN Activity LED	**O-5**		
46	**VCC**	Power +3.3V	**PWR**		
47	**/PWR_LED**	Power LED	**O-5**		
48	**/RST_BTN**	Reset Button	**I-3.3**		
49	**/PWR_BTN**	Power Button	**I-5**	PU 4k7	
50	**GND**	Ground	**PWR**		

C.2.3 Connector X506 - VGA / Sound

Pin	Signal	Description	Type	Termination	Comment
1	GND	Ground	PWR		
2	AUX_L	Auxiliary Input Left	I		max. 1V RMS
3	GND	Ground	PWR		
4	AUX_R	Auxiliary Input Right	I		max. 1V RMS
5	GND	Ground	PWR		
6	LINEIN_L	Line Input Left	I		max. 1V RMS
7	GND	Ground	PWR		
8	LINEIN_R	Line Input Right	I		max. 1V RMS
9	GND	Ground	PWR		
10	CD_L	CD Input Left	I		max. 1V RMS
11	GND	Ground	PWR		
12	CD_R	CD Input Right	I		max. 1V RMS
13	GND	Ground	PWR		
14	MIC	Microphone Input	I		max. 1V RMS
15	GND	Ground	PWR		
16	LINEOUT_L	Line Output Left	O		max. 1V RMS
17	GND	Ground	PWR		
18	LINEOUT_R	Line Output Right	O		max. 1V RMS
19	GND	Ground	PWR		
20	VCC	Power +5V	PWR		
21	VCC	Power +5V	PWR		
22	VCC	Power +5V	PWR		
23	VCC	Power +5V	PWR		
24	GND	Ground	PWR		
25	GREEN	CRT Green	O		max. 0.7Vpp
26	GND	Ground	PWR		
27	BLUE	CRT Blue	O		max. 0.7Vpp
28	GND	Ground	PWR		
29	RED	CRT Red	O		max. 0.7Vpp
30	GND	Ground	PWR		
31	DDC_SDA	CRT DDC Data	IO-5		
32	DDC_SCL	CRT DDC Clock	IO-5		
33	GND	Ground	PWR		
34	VSYNC	CRT Vertical Sync	O-5		
35	GND	Ground	PWR		
36	HSYNC	CRT Horizontal Sync	O-5		

37	GND	Ground	PWR		
38	SPDIF_OUT	Digital I/F Output	O		
39	NC		NC		
40	BBAT	Battery Voltage RTC	PWR		typ. 3.0V

C.2.4 Connector X507 - Extended I/O

Pin	Signal	Description	Type	Termination	Comment
1	VCC	Power +5V	PWR		
2	GND	Ground	PWR		
3	/DSR (COMB)	Data Set Ready	I-5		
4	/DCD (COMB)	Data Carrier Detect	I-5		
5	/DTR (COMB)	Data Terminal Ready	O-5		
6	/RTS (COMB)	Request To Send	O-5		
7	/CTS (COMB)	Clear To Send	I-5		
8	RXD (COMB)	Serial Input	I-5		
9	TXD (COMB)	Serial Output	O-5		
10	/RI (COMB)	Ring Indicator	I-5		
11	GND	Ground	PWR		
12	/AFD	Autofeed	O-5		
13	/STB	Strobe	O-5		
14	/ERR	Error	I-5		
15	D0	Data 0	IO-5		
16	/INIT	Init	O-5		
17	GND	Ground	PWR		
18	D1	Data 1	IO-5		
19	/SLIN	Select In	O-5		
20	D2	Data 2	IO-5		
21	D3	Data 3	IO-5		
22	GND	Ground	PWR		
23	D4	Data 4	IO-5		
24	D5	Data 5	IO-5		
25	D6	Data 6	IO-5		
26	D7	Data 7	IO-5		
27	GND	Ground	PWR		
28	/ACK	Acknowledge	I-5		
29	/BUSY	Busy	I-5		
30	PE	Paper Out	I-5		
31	/SLCT	Select Out	I-5		
32	GND	Ground	PWR		

C.2.5 Connector X1702 - Flat Panel 18 Bit Digital

Pin	Signal	Description	Type	Termination	Comment
1	**GND**	Ground	**PWR**		
2	**PCLK**	Shift Clock	**O**		
3	**PHS**	Horizontal Sync	**O**		
4	**PVS**	Vertical Sync	**O**		
5	**GND**	Ground	**PWR**		
6	**PR0**	Red Color 0	**O**		
7	**PR1**	Red Color 1	**O**		
8	**PR2**	Red Color 2	**O**		
9	**PR3**	Red Color 3	**O**		
10	**PR4**	Red Color 4	**O**		
11	**PR5**	Red Color 5	**O**		
12	**GND**	Ground	**PWR**		
13	**PG0**	Green Color 0	**O**		
14	**PG1**	Green Color 1	**O**		
15	**PG2**	Green Color 2	**O**		
16	**PG3**	Green Color 3	**O**		
17	**PG4**	Green Color 4	**O**		
18	**PG5**	Green Color 5	**O**		
19	**GND**	Ground	**PWR**		
20	**PB0**	Blue Color 0	**O**		
21	**PB1**	Blue Color 1	**O**		
22	**PB2**	Blue Color 2	**O**		
23	**PB3**	Blue Color 3	**O**		
24	**PB4**	Blue Color 4	**O**		
25	**PB5**	Blue Color 5	**O**		
26	**GND**	Ground	**PWR**		
27	**PDE**	Data Enable	**O**		
28	**VCC**	Flat Panel Power	**PWR**		Check J1702
29	**VCC**	Flat Panel Power	**PWR**		Check J1702
30	**R/L**	Rotate Right or Left (Option)	**O**		Check JP1700
31	**U/D**	Rotate Up or Down (Option)	**O**		Check JP1701
32	**NC**		**NC**		

C.2.6 Connector X1704 - Flat Panel JILI30

Pin	Signal	Description	Type	Termination	Comment
1	**FTX0-**	First Channel Data 0 (negative)	**O**		1.5V level
2	**FTX0+**	First Channel Data 0 (positive)	**O**		1.5V level
3	**FTX1-**	First Channel Data 1 (negative)	**O**		1.5V level
4	**FTX1+**	First Channel Data 1 (positive)	**O**		1.5V level
5	**FTX2-**	First Channel Data 2 (negative)	**O**		1.5V level
6	**FTX2+**	First Channel Data 2 (positive)	**O**		1.5V level
7	**GND**	Ground	**PWR**		
8	**FTXC-**	First Channel Clock (negative)	**O**		1.5V level
9	**FTXC+**	First Channel Clock (positive)	**O**		1.5V level
10	**FTX3-**	First Channel Data 3 (negative)	**O**		1.5V level
11	**FTX3+**	First Channel Data 3 (positive)	**O**		1.5V level
12	**STX0-**	Second Channel Data 0 (negative)	**O**		1.5V level
13	**STX0+**	Second Channel Data 0 (positive)	**O**		1.5V level
14	**GND**	Ground	**PWR**		
15	**STX1-**	Second Channel Data 1 (negative)	**O**		1.5V level
16	**STX1+**	Second Channel Data 1 (positive)	**O**		1.5V level
17	**GND**	Ground	**PWR**		
18	**STX2-**	Second Channel Data 2 (negative)	**O**		1.5V level
19	**STX2+**	Second Channel Data 2 (positive)	**O**		1.5V level
20	**STXC-**	Second Channel Clock (negative)	**O**		1.5V level
21	**STXC+**	Second Channel Clock (positive)	**O**		1.5V level
22	**STX3-**	Second Channel Data 3 (negative)	**O**		1.5V level
23	**STX3+**	Second Channel Data 3 (positive)	**O**		1.5V level
24	**GND**	Ground	**PWR**		
25	**SDA**	I2C Data	**IO-3**		
26	**DATAENA**	Data Enable	**O-3**		
27	**SCL**	I2C Clock	**IO-3**		
28	**VCC**	Flat Panel Power	**PWR**		Check J1702
29	**VCC**	Flat Panel Power	**PWR**		Check J1702
30	**VCC**	Flat Panel Power	**PWR**		Check J1702

C.2.7 Connector X1703 - Backlight

Pin	Signal	Description	Type	Termination	Comment
1	**NC**		**NC**		
2	**BKLTADJ**	Brightness Control	**O**		
3	**GND**	Ground	**PWR**		
4	**VCC**	Backlight Power	**PWR**		Check J1700
5	**VCC**	Backlight Power	**PWR**		Check J1700
6	**GND**	Ground	**PWR**		
7	**BKLTON**	Backlight On/Off	**O**		Check J1701

C.2.8 Connector X501 - Touch

Pin	Signal	Description	Type	Termination	Comment
1	**GND**	Ground	**PWR**		
2	**YB / UL**	Bottom	**I/O**		
3	**SYB**	Sense Bottom	**I/O**		
4	**GND**	Ground	**PWR**		
5	**YT / UR**	Top	**I/O**		
6	**SYT**	Sense Top	**I/O**		
7	**GND**	Ground	**PWR**		
8	**XL / LL**	Left	**I/O**		
9	**SXL**	Sense Left	**I/O**		
10	**GND**	Ground	**PWR**		
11	**XR / LR**	Right	**I/O**		
12	**SXR**	Sense Right	**I/O**		
13	**GND**	Ground	**PWR**		
14	**NC**		**NC**		
15	**SENSE**	Sense (5-wire)	**I/O**		
16	**GND**	Ground	**PWR**		

C.2.9 Connector X502 - VideoIn

Pin	Signal	Description	Type	Termination	Comment
1	**GND**	Ground	**PWR**		
2	**CVBS_IN0**	CVBS Channel 0	**I**		max. 1Vpp
3	**GND**	Ground	**PWR**		
4	**CVBS_IN1**	CVBS Channel 1	**I**		max. 1Vpp
5	**GND**	Ground	**PWR**		
6	**CVBS_IN2**	CVBS Channel 2	**I**		max. 1Vpp
7	**GND**	Ground	**PWR**		
8	**SVID_C**	S-Video Chroma	**I**		max. 1Vpp
9	**GND**	Ground	**PWR**		
10	**CVBS_IN3**	CVBS Channel 3	**I**		max. 1Vpp
11	**GND**	Ground	**PWR**		
12	**NC**		**NC**		
13	**GND**	Ground	**PWR**		
14	**NC**		**NC**		
15	**GND**	Ground	**PWR**		
16	**NC**		**NC**		
17	**GND**	Ground	**PWR**		
18	**NC**		**NC**		
19	**GND**	Ground	**PWR**		
20	**NC**		**NC**		
21	**GND**	Ground	**PWR**		
22	**NC**		**NC**		
23	**GND**	Ground	**PWR**		
24	**NC**		**NC**		
25	**GND**	Ground	**PWR**		
26	**NC**		**NC**		
27	**GND**	Ground	**PWR**		
28	**NC**		**NC**		
29	**GND**	Ground	**PWR**		
30	**NC**		**NC**		
31	**GND**	Ground	**PWR**		
32	**NC**		**NC**		
33	**GND**	Ground	**PWR**		
34	**GND**	Ground	**PWR**		
35	**NC**		**NC**		
36	**GND**	Ground	**PWR**		

37	**NC**		**NC**		
38	**GND**	Ground	**PWR**		
39	**NC**		**NC**		
40	**GND**	Ground	**PWR**		
41	**NC**		**NC**		
42	**GND**	Ground	**PWR**		
43	**VCC**	Power +3.3V	**PWR**		
44	**VCC**	Power +3.3V	**PWR**		
45	**VCC**	Power +5V	**PWR**		

C.2.10 Connector X503 - Matrix Keyboard

Pin	Signal	Description	Type	Termination	Comment
1	**GND**	Ground	**PWR**		
2	**VCC**	Power +5V	**PWR**		
3	**MAT_OUT0**	Row 0	**O-5**		
4	**MAT_OUT1**	Row 1	**O-5**		
5	**MAT_OUT2**	Row 2	**O-5**		
6	**MAT_OUT3**	Row 3	**O-5**		
7	**MAT_OUT4**	Row 4	**O-5**		
8	**MAT_OUT5**	Row 5	**O-5**		
9	**MAT_OUT6**	Row 6	**O-5**		
10	**MAT_OUT7**	Row 7	**O-5**		
11	**GND**	Ground	**PWR**		
12	**VCC**	Power +5V	**PWR**		
13	**MAT_IN0**	Column 0	**I-5**		
14	**MAT_IN1**	Column 1	**I-5**		
15	**MAT_IN2**	Column 2	**I-5**		
16	**MAT_IN3**	Column 3	**I-5**		
17	**MAT_IN4**	Column 4	**I-5**		
18	**MAT_IN5**	Column 5	**I-5**		
19	**MAT_IN6**	Column 6	**I-5**		
20	**NC**		**NC**		

C.2.11 Connector X2100 - Floppy

Pin	Signal	Description	Type	Termination	Comment
1	**VCC**	Power +5V	**PWR**		
2	**/IDX**	Index	**I-5**		
3	**VCC**	Power +5V	**PWR**		
4	**/DRO**	Drive Select 0	**O-5**		
5	**VCC5**	Power +5V	**PWR**		
6	**/DSKCHG**	Disk Change	**O-5**		
7	**NC**		**NC**		
8	**NC**		**NC**		
9	**NC**		**NC**		
10	**/MTRO**	Motor 0 On	**O-5**		
11	**NC**		**NC**		
12	**/FDIR**	Direction	**O-5**		
13	**NC**		**NC**		
14	**/STEP**	Step	**O-5**		
15	**GND**	Ground	**PWR**		
16	**/WDATA**	Write Data	**O-5**		
17	**GND**	Ground	**PWR**		
18	**/WGATE**	Write Gate	**O-5**		
19	**GND**	Ground	**PWR**		
20	**/TRKO**	Track 0	**I-5**		
21	**GND**	Ground	**PWR**		
22	**/WRTPRT**	Write Protect	**I-5**		
23	**GND**	Ground	**PWR**		
24	**/RDATA**	Read Data	**I-5**		
25	**GND**	Ground	**PWR**		
26	**/HDSEL**	Side One Select	**O-5**		

C.2.12 Connector X2001 - Power DC

Pin	Signal	Description	Type	Termination	Comment
1	**DC_IN**	Power Supply 8-28V	**PWR**		
2	**DC_IN**	Power Supply 8-28V	**PWR**		
3	**GND**	Ground	**PWR**		
4	**GND**	Ground	**PWR**		

C.2.13 Connector X2000 - Power Battery

Pin	Signal	Description	Type	Termination	Comment
1	**DC_BAT**	Power Supply 8-28V	**PWR**		
2	**DC_BAT**	Power Supply 8-28V	**PWR**		
3	**SCL**	SMBus Clock	**IO-3**		
4	**SDA**	SMBus Data	**IO-3**		
5	**NC**		**NC**		
6	**GND**	Ground	**PWR**		
7	**GND**	Ground	**PWR**		

C.2.14 Connector X2101 - Fan

Pin	Signal	Description	Type	Termination	Comment
1	**SENSE**	Tacho Signal	**I-5**		PWM
2	**VCC**	Power +5V	**PWR**		
3	**GND**	Ground	**PWR**		

Appendix D: Literature Hints

The following sources of information can help you better understand PC architecture.

D.1 General PC Architecture

- *Embedded PCs*, Markt&Technik GmbH, ISBN 3-8272-5314-4 (German)
- *Hardware Bible*, Winn L. Rosch, SAMS, 1997, 0-672-30954-8
- *Interfacing to the IBM Personal Computer*, Second Edition, Lewis C. Eggebrecht, SAMS, 1990, ISBN 0-672-22722-3
- *The Indispensable PC Hardware Book*, Hans-Peter Messmer, Addison-Wesley, 1994, ISBN 0-201-62424-9
- *The PC Handbook: For Engineers, Programmers, and Other Serious PC Users*, John P. Choisser and John O. Foster, Annabooks, 1997, ISBN 0-929392-36-1

D.2 Buses

D.2.1 ISA, Standard PS/2 - Connectors

- AT Bus Design: Eight and Sixteen-Bit ISA, E-ISA and EISA Design, Edward Solari, Annabooks, 1990, ISBN 0-929392-08-6
- AT IBM Technical Reference Vol 1&2, 1985
- *ISA & EISA Theory and Operation*, Edward Solari, Annabooks, 1992, ISBN 0929392159
- ISA Bus Specifications and Application Notes, Jan. 30, 1990, Intel
- *ISA System Architecture, Third Edition,* Tom Shanley and Don Anderson, Addison-Wesley Publishing Company, 1995, ISBN 0-201-40996-8
- *Personal Computer Bus Standard P996*, Draft D2.00, Jan. 18, 1990, IEEE Inc.
- Technical Reference Guide, Extended Industry Standard Architecture Expansion Bus, Compaq 1989

D.2.2 PCI/PC-104

- *Embedded PC 104 Consortium*. The consortium provides information about PC/104 and PC/104-Plus technology. You can search for information about the consortium on the Web
- *PCI SIG*. The PCI SIG provides a forum for its ~900 member companies, who develop PCI products based on the specifications that are created by the PCI SIG. You can search for information about the SIG on the Web
- *PCI & PCI-X Hardware and Software Architecture & Design*, Fifth Edition, Edward Solari and George Willse, Annabooks, 2001, ISBN 0-929392-63-9
- *PCI System Architecture,* Tom Shanley and Don Anderson, Addison-Wesley, 2000, ISBN 0-201-30974-2

D.3 Ports

D.3.1 RS-232 Serial

- *EIA-232-E standard*. The EIA-232-E standard specifies the interface between (for example) a modem and a computer so that they can exchange data. The computer can then send data to the modem, which then sends the data over a telephone line. The data that the modem receives from the telephone line can then be sent to the computer. You can search for information about the standard on the Web
- RS-232 Made Easy: Connecting Computers, Printers, Terminals, and Modems, Martin D. Seyer, Prentice Hall, 1991, ISBN 0-13-749854-3
- *National Semiconductor*. The Interface Data Book includes application notes. Type “232” as a search criteria to obtain a list of application notes. You can search for information about the data book on National Semiconductor’s Website

D.3.2 ATA

- *AT Attachment (ATA) Working Group*. This X3T10 standard defines an integrated bus inter- face between disk drives and host processors. It provides a common point of attachment for systems manufacturers and the system. You can search for information about the working group on the Web. We recommend you also search the Web for information on *4.2 I/O cable*, if you use hard disks in a DMA3 or PIO4 mode.

D.3.3 USB

- *USB Specification*. USB Implementers Forum, Inc. is a non-profit corporation founded by the group of companies that developed the Universal Serial Bus specification. The USB-IF was formed to provide a support organization and forum for the advancement and adop- tion of Universal Serial Bus technology. You can search for information about the standard on the Web

D.4 Programming

- *C Programmer's Guide to Serial Communications*, Second Edition, Joe Campbell, SAMS, 1987, ISBN 0-672-22584-0
- *Programmer's Guide to the EGA, VGA, and Super VGA Cards*, Third Edition, Richard Ferraro, Addison-Wesley, 1990, ISBN 0-201-57025-4
- *The Programmer's PC Sourcebook,* Second Edition, Thom Hogan, Microsoft Press, 1991, ISBN 1-55615-321-X
- *Undocumented PC, A Programmer's Guide to I/O, CPUs, and Fixed Memory Areas*, Frank van Gilluwe, Second Edition, Addison-Wesley, 1997, ISBN 0-201-47950-8

APPENDIX E: REVISION HISTORY

Revision	Date	Edited by	Changes
0.1	02/20/2007	SCT M. Hüttmann	First revision
0.2	09/08/2007	SCT	Updated for version 4 of ePanel PM
0.3	09/18/2007	SCT	Clarified voltage labels
0.4	09/25/2007	STG	Amended chapter 'BIOS operation'
1.0	12/14/2007	M. Hüttmann	Fundamental rework
1.1	03/04/2008	M. Hüttmann	Cleared the EIDE interface limitations (UDMA restriction). Added some Setup entries
1.2	04/03/2008	M. Hüttmann	Changed some Setup entries. Added restrictions to chapter 'Audio Interface', 'Ethernet Controller' and 'Serial Port Interfaces'
1.3	04/29/2008	M. Hüttmann	Changed restriction in chapter 'Ethernet Controller'