

PACKED INDUSTRIAL PC WITH CORE DUO PROCESSOR

The PIP is a low power, highly integrated rugged industrial PC with a specially designed aluminum housing. This allows the PIP to operate in a standard or also in a harsh environment without fan or ventilation holes. The design integrates standard connectors for easy connection. It can be used for any PC application where a complete solution is needed. The PIP is 100% PC/AT compatible, and can easily be mounted on a 35 mm DIN rail.

The PIP housing offers space for a 2.5 inch hard disk and a CD-ROM drive. With the integrated PC/104(-PLUS) interface and the PCI-Express Mini Card Slot there are flexible expansion possibilities available. Fully bootable FLASH disks are supported for projects where hard disks cannot be used. Particular precautions have been taken that the EMC for the entire system is within the CE and FCC limits.

All these features make the PIP the ideal solution for the industry wherever a flexible, rugged and durable complete Industrial PC is needed.

Features:

- Core Duo L2400 1.66 GHz with 2 MByte Level2 Cache
- Intel Mobile Technology components
- Dual Channel DDR2-667 memory
- Up to 3 GB memory with 1 GB soldered down
- Suspend to Disk (S4) support
- 3D graphics with up to 224 MByte shared memory
- 2 Ethernet ports with up to 10M/100M/1G Bit/s
- Up to 2 FireWire 1394b ports (800 Mbit/s)
- Up to 6 USB 2.0 ports (480 MBit/s)
- 2 SATA-I ports (150 MByte/s)
- 1 Ultra DMA-100 IDE port
- 1 MByte Firmware Hub
- Parallel port (SPP, EPP, ECP) with external floppy disk capability
- 2 serial ports with RS232 interface
- Four full featured PC/104(-PLUS) slots without ISA Master and ISA DMA capability
- Watchdog timer with hardware reset capability
- 2 serial ports with RS232 or RS485 interface (optional)
- UPS (optional)
- Galvanically isolated power input (optional)
- AC'97 Codec (optional)
- CAN interface (optional)
- RoHS compliant

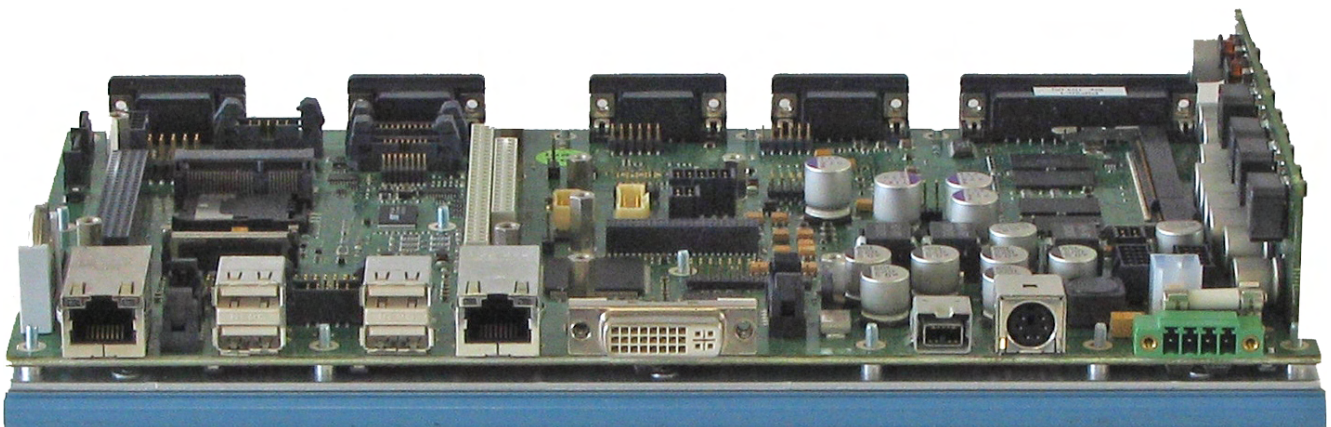


TABLE OF CONTENTS

1 INTRODUCTION.....	6
1.1 ABOUT THIS MANUAL.....	6
1.2 SAFETY PRECAUTIONS AND HANDLING.....	6
1.3 ELECTROSTATIC DISCHARGE (ESD) PROTECTION.....	6
1.4 EQUIPMENT SAFETY.....	6
1.5 MANUAL REVISIONS.....	7
1.5.1 RELATED PRODUCTS.....	7
1.5.2 REVISION HISTORY.....	7
1.6 RELATED DOCUMENTATION.....	8
1.7 STANDARDS COMPLIANCE.....	9
1.7.1 EMC.....	9
1.7.2 Environmental.....	9
1.7.3 Safety.....	9
1.7.4 Type Approval.....	9
1.8 ORDERING INFORMATION.....	10
2 SPECIFICATION.....	11
2.1 ELECTRICAL.....	11
2.1.1 PROCESSOR.....	11
2.1.2 CHIPSET.....	11
2.1.3 BIOS ROM.....	11
2.1.4 MEMORY.....	11
2.1.5 RTC.....	11
2.1.6 PC/104-PLUS INTERFACE.....	11
2.1.7 GRAPHICS.....	11
2.1.8 USB.....	11
2.1.9 SERIAL PORTS.....	11
2.1.10 RS485/RS422 INTERFACE MODULES (OPTIONAL).....	12
2.1.11 PARALLEL PORT.....	12
2.1.12 IDE PORTS.....	12
2.1.13 SATA-I PORTS.....	12
2.1.14 FLOPPY DISK.....	12
2.1.15 FIREWIRE 1394B.....	12
2.1.16 ETHERNET.....	12
2.1.17 KEYBOARD / MOUSE.....	12
2.1.18 AC'97 AUDIO CONTROLLER.....	12
2.1.19 INDICATORS.....	12
2.1.20 RESET BUTTON, POWER BUTTON.....	13
2.1.21 HARDWARE WATCHDOG TIMER.....	13
2.1.22 TEMPERATURE SENSORS.....	13
2.1.23 VOLTAGE SENSORS.....	13
2.1.24 SPECIALTIES.....	13
2.2 PHYSICAL.....	14
2.2.1 HOUSING.....	14
2.2.2 FORM FACTOR.....	14
2.2.3 WEIGHT.....	14
2.3 POWER.....	14
2.3.1 POWER SUPPLY.....	14
2.3.2 FUSE.....	14
2.3.3 RTC BATTERY.....	14

2.3.4 INPUT POWER.....	14
2.4 ENVIRONMENT.....	14
2.4.1 TEMPERATURE RANGE.....	14
2.4.2 RELATIVE HUMIDITY.....	14
3 HARDWARE REFERENCE.....	15
3.1 OPENING THE CASE.....	15
3.2 DIMENSIONS AND PLACEMENT.....	16
3.2.1 DIMENSIONS OF THE PCB.....	16
3.2.2 PARTS LOCATION.....	17
3.3 SWITCH SETTINGS.....	18
3.3.1 DIP SWITCH 1 (S1) – PERIPHERAL SETTINGS.....	18
3.3.2 DIP SWITCH 2 (S2) – ON BOARD LVDS PORT (LCD PANEL) SETTINGS.....	19
3.3.3 DIP SWITCH 3 (S3) – PC/104-PLUS IO-VOLTAGE SETTINGS.....	19
3.3.4 DIP SWITCH 4 (S4).....	19
3.4 CONNECTORS.....	20
3.4.1 EXTERNAL CONNECTORS.....	20
3.4.1.1 Parallel Port Connector (J3).....	20
3.4.1.2 Serial-1 (J49) And Serial-3 (J37) Connector.....	21
3.4.1.3 Serial-2 (J22) And Serial-4 (J12) Connector.....	21
3.4.1.4 External Power Connector (J2).....	22
3.4.1.5 PS/2 Keyboard And Mouse Connectors (J8).....	24
3.4.1.6 FireWire 1394b Connector (J11).....	24
3.4.1.7 Dual USB Connectors (J40, J46).....	24
3.4.1.8 DVI-I Connector (J20).....	25
3.4.1.9 10M/100M/1G Bit/s Ethernet Connectors (LAN1: J52, LAN2: J33).....	25
3.4.2 INTERNAL CONNECTORS.....	26
3.4.2.1 IDE Connector (J41).....	26
3.4.2.2 SATA Signal Connectors (J56, J57).....	26
3.4.2.3 SATA Power Connector (J54).....	26
3.4.2.4 LED Panel Connector 1 (J38).....	27
3.4.2.5 LED Panel Connector 2 (J39).....	27
3.4.2.6 sDVO Expansion Module Connector (J19).....	28
3.4.2.7 LVDS Connector (J27).....	29
3.4.2.8 Touch Panel Connector (J21).....	29
3.4.2.9 Backlight Inverter Connector (J28).....	30
3.4.2.10 Panel Dimming Connector (J24).....	30
3.4.2.11 Internal Power Connector 1 (J4).....	30
3.4.2.12 Internal Power Connector 2 (J6).....	31
3.4.2.13 Power Input Extension Connector (J5).....	31
3.4.2.14 AC'97 Connector (J47).....	31
3.4.2.15 USB2.0 Header Connector (J43).....	31
3.4.2.16 Firewire Header Connector (J14).....	32
3.4.2.17 Reset & Power Button Connector (J7).....	32
3.4.2.18 CAN Expansion Connector (J35).....	32
3.4.2.19 PC/104 Interface Connector (J29/J36).....	33
3.4.2.20 PC/104-PLUS Interface Connector (J53).....	34
3.4.2.21 IPT700 Connector (J14).....	34
3.4.2.22 JTAG Port Connector (J50).....	34
3.4.2.23 SMB Connector (J48).....	34
3.4.3 LPC Bus Expansion Connector (J42).....	34
3.5 MODULE SOCKETS.....	35
3.5.1 MEMORY MODULE.....	35
3.5.1.1 Electrical And Mechanical Requirements.....	35
3.5.1.2 Mounting The Memory Module.....	35
3.5.2 RS232 AND RS485 / RS422 INTERFACE MODULES.....	35
3.5.3 PC/104(-PLUS) MODULES.....	35
3.5.4 PCI-EXPRESS MINI CARD MODULES.....	35
3.6 SYSTEM-VOLTAGES SUPPLIED BY THE PIP.....	36
3.6.1 -12 V, -5 V AND 12 V.....	36

3.6.2 3.3 V AND 5 V.....	36
4 THEORY OF OPERATION.....	37
4.1 BLOCK DIAGRAM.....	37
4.2 PC/AT FUNCTIONALITY.....	38
4.3 STATUS INDICATORS.....	38
4.3.1 POWER INDICATOR LED.....	38
4.3.2 RESET INDICATOR LED.....	38
4.3.3 HDD INDICATOR LED.....	38
4.3.4 IEEE1394b INDICATOR LED.....	38
4.3.5 LAN 1 Activity INDICATOR LED.....	38
4.3.6 LAN 1 Speed INDICATOR LED.....	38
4.3.7 USER1, USER2 INDICATOR LED.....	38
4.3.8 Wireless WAN INDICATOR LED.....	38
4.3.9 Wireless LAN INDICATOR LED.....	38
4.3.10 Wireless PAN INDICATOR LED.....	38
4.3.11 LAN 2 Activity INDICATOR LED.....	39
4.3.12 LAN 2 Speed INDICATOR LED.....	39
4.4 BATTERY CIRCUIT.....	39
4.5 HARDWARE WATCHDOG.....	39
4.6 RS485 / RS422 INTERFACES.....	39
4.7 TEMPERATURE SENSORS.....	39
4.8 VOLTAGE SENSORS.....	40
5 SOFTWARE.....	41
5.1 PIP EXTENSION REGISTER SET.....	41
5.1.1 OVERVIEW.....	41
5.1.2 CAN RESOURCE REGISTER.....	42
5.1.3 CAN CONTROL REGISTER.....	43
5.1.4 USER LED CONTROL REGISTER.....	44
5.1.5 PIP STATUS REGISTER 1.....	44
5.1.6 PIP STATUS REGISTER 2.....	45
5.1.7 PARALLEL PORT FLOPPY REGISTER.....	45
5.1.8 PIP FAMILY ID REGISTER.....	45
5.1.9 PIP20 VARIANT REGISTER.....	46
5.1.10 PLD CODE REVISION REGISTER.....	46
5.2 BIOS.....	47
5.3 DEVICE DRIVERS.....	47
5.4 TOOLS.....	47
6 COPYRIGHT.....	49
7 DISCLAIMER.....	49
8 TRADEMARKS.....	49
9 SUPPORT.....	49
9.1 FAQs.....	49
9.2 SERIAL NUMBER AND REVISION.....	49
9.3 CONTACT MPL AG.....	49

TABLE OF FIGURES

Figure 1: Removing The 6 Screws..... 15

Figure 2: Lift Up The Cover..... 15

Figure 3: Locations Of The Standoff And Mounting Holes..... 16

Figure 4: Parts Location..... 17

Figure 5: DIP Switch 1..... 18

Figure 6: DIP Switch 2..... 19

Figure 7: DIP Switch 3..... 19

Figure 8: DIP Switch 4..... 19

Figure 9: Parallel Port Connector (DSUB 25 Female) (Connector: Compona, 329 156-6)..... 20

Figure 10: Serial Port Connector (DSUB 9 Male) (Connector: Compona, 329 151-6)..... 21

Figure 11: Serial Port Connector (DSUB 9 Male) (Connector: Compona, 329 151-6)..... 21

Figure 12: Power Connector (Connector: Phoenix Contact AG, MC1,5/4GF-3,81)..... 22

Figure 13: External Reset - And Power Button..... 22

Figure 14: Connections Between All The PIP Power Connectors..... 23

Figure 15: PS/2 Keyboard & Mouse Connector (Connector: Compona, 129108-7)..... 24

Figure 16: FireWire 1394b Bilingual Connector (Connector: Molex, 45241-0001)..... 24

Figure 17: Dual USB (Type A) Connector (Connector: FCI, 72309-0010B)..... 24

Figure 18: DVI-I Connector (Connector: Samtec, DVI-29-AW-FT)..... 25

Figure 19: RJ45 Connector (Connector: Bel Fuse 0826-1K1T-23-F)..... 25

Figure 20: IDE Connector (Connector: Samtec, TMM122-01-LDSM)..... 26

Figure 21: SATA Connector (Connector: Molex, 67491-0010)..... 26

Figure 22: Power Connector For SATA Devices (Connector: Samtec, IPL1-105-02-S-D)..... 26

Figure 23: LED Panel Connector 1 (Connector: Samtec, EHF-108-01-L-D-SM-P)..... 27

Figure 24: LED Panel Connector 2 (Connector: Samtec, EHF-110-01-L-D-SM-P)..... 27

Figure 25: DVO Expansion Module Connector (Connector: Samtec, RSM-125-02-L-D)..... 28

Figure 26: LVDS Panel Connector (Connector: Molex, 501190-3017)..... 29

Figure 27: Touch Panel Connector (Connector: Samtec, IPL1-105-02-S-D)..... 29

Figure 28: LVDS Panel Connector (Connector: Molex, 501190-2017)..... 30

Figure 29: Panel Dimming Connector (Connector: Samtec, IPL1-102-02-S-D)..... 30

Figure 30: Internal Power Connector (Connector: Samtec, IPL1-105-02-S-D)..... 30

Figure 31: Internal Power Connector 2 (Connector: Samtec, IPL1-105-02-S-D)..... 31

Figure 32: Power Input Extension Connector (Connector: Molex, 39-28-1043)..... 31

Figure 33: AC'97 Codec Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)..... 31

Figure 34: USB2.0 Header Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)..... 31

Figure 35: Firewire Header Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)..... 32

Figure 36: Reset & Power Button Connector (Connector: Samtec, IPL1-102-02-S-D)..... 32

Figure 37: CAN Expansion Connector (Connector: Samtec, TMM113-01-LD)..... 32

Figure 38: PC/104 Connector (Connector: EPT, 962-60206-03 / 962-60326-03)..... 33

Figure 39: PC/104+ Connector (Connector: Samtec, PTHF-130-03-M-Q368)..... 34

Figure 40: Mounting The Memory Module..... 35

Figure 41: Complete PIP Block Diagram..... 37

Figure 42: Removing the 6 screws..... 39

Figure 43: PIP Label..... 49

1 INTRODUCTION

1.1 ABOUT THIS MANUAL

This manual and the appropriate PIP BIOS User Manual provides all the information necessary to handle and configure the PIP.

This manual is written for **advanced technical personnel** responsible for integrating the PIP into their systems.

1.2 SAFETY PRECAUTIONS AND HANDLING

For personal safety and safe operation of the PIP, follow all safety procedures described here and in other sections of the manual.

- Remove power from the system before installing (or removing) the PIP, to prevent the possibility of personal injury (electrical shock) and / or damage to the product.
- Handle the product carefully; i.e. dropping or mishandling the PIP can cause damage to assemblies and components.
- Do not expose the equipment to moisture.

1.3 ELECTROSTATIC DISCHARGE (ESD) PROTECTION

Various electrical components within the product are sensitive to static and electrostatic discharge (ESD). Even a small static discharge can be sufficient to destroy or degrade a component's operation!

With an open housing, do not touch any electronic components. Handle or touch only the unit chassis.

1.4 EQUIPMENT SAFETY

Great care is taken by MPL AG that all its products are thoroughly and rigorously tested before leaving the factory to ensure that they are fully operational and conform to specification. However, no matter how reliable a product, there is always the remote possibility that a defect may occur. The occurrence of a defect on this device may, under certain conditions, cause a defect to occur in adjoining and/or connected equipment. It is your responsibility to protect such equipment when installing this device. MPL accepts no responsibility whatsoever for such defects, however caused.

1.5 MANUAL REVISIONS

1.5.1 RELATED PRODUCTS

Revision	Related To
A	• PIP20-1

1.5.2 REVISION HISTORY

Revision	Date	Description
A	2007-xx-xx	- Initial release of this document.

1.6 RELATED DOCUMENTATION

The following documents are related to this manual. For detailed Information about a specific PIP setting or feature please refer to this additional manuals or data sheets.

Reference	Description	Available from
[1]	PIP20 BIOS User Manual	MPL AG: www.mpl.ch/t2400.html
[2]	PIP20 User Manual	MPL AG: www.mpl.ch/t2400.html
[3]	SERIF User Manual	MPL AG: www.mpl.ch/t2400.html
[4]	PC/104-PLUS Specification, Rev. 2.2	PC/104 Embedded Consortium: www.pc104.org
[5]	PC/104 Specification, V2.5	PC/104 Embedded Consortium: www.pc104.org
[6]	PCI Local Bus Specification Rev. 2.3	PCI-SIG: www.pcisig.com
[7]	PCI Express Base Specification 1.0a	PCI-SIG: www.pcisig.com
[8]	PCI Express Mini Card Electromechanical Specification 1.1	PCI-SIG: www.pcisig.com
[9]	IEEE P996 draft standard (D2.02)	IEEE Standards Association: standards.ieee.org
[10]	SCH301x Super-IO Datasheet	SMSC: www.smsc.com
[11]	ICH7 I/O Controller Hub Datasheet	Intel: www.intel.com
[12]	82573L GbE Controller Datasheet	Intel: www.intel.com
[13]	TSB82AA2 1394b Controller Data sheet	Texas Instruments: www.ti.com
[14]	TSB81BA3 Three-Port Cable Transceiver Arbiter Data sheet	Texas Instruments: www.ti.com
[15]	945GM Memory Controller Hub Datasheet	Intel: www.intel.com
[16]	SiI1362 DVI Transmitter Datasheet	Silicon Image: www.siimage.com
[17]	Core Duo and Core Solo on 65nm Process Datasheet	Intel: www.intel.com
[18]		

1.7 STANDARDS COMPLIANCE

The PIP20 is designed to meet or exceed the most common industry and military standards. Particular references are:

1.7.1 EMC

- EN 55022 Class B (Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement)
- EN 55024 (Information technology equipment - Immunity characteristics - Limits and methods of measurement)
- EN 61000-4-1 (Electromagnetic compatibility (EMC) -- Part 4-1: Testing and measurement techniques - Overview of IEC 61000-4 series)
- EN 61000-4-2 Level 3, Criterion B (Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test)
- EN 61000-4-3 Level 3, Criterion A (Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test)
- EN 61000-4-4 Class 3 (Electromagnetic compatibility (EMC) -- Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test)
- EN 61000-4-5 Class 3 (Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques - Surge immunity test)
- EN 61000-4-6 Class 3 (Electromagnetic compatibility (EMC) -- Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields)
- EN 61000-6-1 (Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments)
- EN 61000-6-2 (Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards - Immunity for industrial environments)
- EN 61000-6-3 (Electromagnetic compatibility (EMC) -- Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments)
- EN 61000-6-4 (Electromagnetic compatibility (EMC) -- Part 6-4: Generic standards - Emission standard for industrial environments)
- MIL-STD-461E (REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF SUBSYSTEMS AND EQUIPMENT)

1.7.2 Environmental

- EN 50155 (Railway applications - Electronic equipment used on rolling stock)
- MIL-STD-810-F (ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS)

1.7.3 Safety

- EN 60601-1 (Medical electrical equipment -- Part 1: General requirements for safety)
- EN 60950 Class III (Information technology equipment - Safety)

1.7.4 Type Approval

- EN 60945 Protected Equipment (Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results)
- IACS E10 (Test Specification for Type Approval)

1.8 ORDERING INFORMATION

The table below gives you an overview of the different PIP variants and its features:

Product Name	Product Features
PIP20-1	<ul style="list-style-type: none"> • 1.66 GHz Core Duo L2400 with 2 MByte Level2 Cache • 1 GByte soldered down on board DDR2-667 memory • 200 pin DDR2-667 SO-DIMM socket (up to 2GB memory) • Two SATA ports • One IDE Ultra DMA-100 port • Two Gbit Ethernet ports • One IEEE 1394b bilingual port • Four USB 2.0 ports • One parallel port with parallel port floppy possibility • Two RS232 ports, optionally additional two RS232 or RS485 ports possible • PC/104 & PC/104-PLUS interface • One PCI-Express Mini Card Slot • RoHS compliant
	<ul style="list-style-type: none"> • Custom Assembly for series with 100 pieces and more • Please contact MPL AG for further information
	<p>There are also many more options available for:</p> <ul style="list-style-type: none"> • Housing size, displays, touch, IP65 • PC/104-PLUS card -, PCI card -, PCI Express Mini Card -, PC-Card -, CF card- and PMC module extensions • CDROM • UPS • Extended input voltage power module • Extended temperature • etc. <p>Please have a look at our homepage for this on www.mpl.ch/t2400.html or contact MPL AG for further information.</p>

2 SPECIFICATION

This chapter provides an overview of the PIP20 product and its features

2.1 ELECTRICAL

2.1.1 PROCESSOR

- Low voltage 1.66 GHz Intel Core Duo processor L2400 with 2 MByte Level2 Cache in 65 nm technology
- Enhanced Intel SpeedStep technology
- Supports catastrophic thermal protection

2.1.2 CHIPSET

- Intel 945GM & ICH7-MDH
- 667 MHz source-synchronous Front Side Bus
- Supports ACPI-defined power states S1 (Stop Grant), S3 (Suspend to RAM), S4 (Suspend to Disk), S5 (Soft Off)
- Intel DMI interface and PCI-Express bus for high data bandwidth

2.1.3 BIOS ROM

- 1 MByte Firmware Hub
- Easy BIOS update
- BIOS source owned by MPL AG

2.1.4 MEMORY

- Dual channel DDR2-667 (2x PC2-5300) memory
- Up to 1 GByte on board
- 200 pin SO-DIMM slot supports up to 2 GByte memory

2.1.5 RTC

- Backed with field changeable on board battery

2.1.6 PC/104-PLUS INTERFACE

- 8/16 bit memory and I/O PC/104 interface
- PC/104 DMA and ISA Master not supported
- 32 bit PC/104-PLUS interface
- Up to 4 PC/104-PLUS bus masters (PC/104-PLUS Spec. Rev. 2.2)

2.1.7 GRAPHICS

- Intel Generation 3.5 Integrated Graphics Engine and Intel Graphics Media Accelerator 950 (GMA950)
- 250 MHz graphics core with 2D and 3D engine and up to 224 MByte Graphics Memory
- Dual Pipe independent display functionality
- 400 MHz, 24 bit RAMDAC
- LVDS port on 1 mm header supports up to 1600 x 1200 (UXGA)
- Digital Video Interface on DVI-I connector supports up to 1600 x 1200 (UXGA)
- Analog Video Interface on DVI-I connector supports up to 2048 x 1536 (QXGA) @ 75 Hz
- DVI-I connector is ESD protected

2.1.8 USB

- 6 Ports with 1.5 / 12 / 480 MBit/s (4 external, 2 internal)
- Supports USB keyboards and mice as legacy devices
- ESD protected

2.1.9 SERIAL PORTS

- 2 full modem serial RS232 ports, 16C550 compatible
- 2 ports can be equipped either with RS232 or with RS485/RS422 interface modules (both optional). Please refer to the chapter below for more information.

- COM1 - COM4 with 16 byte FIFO
- Selectable transfer rates up to 230.4 kBaud
- Available on standard DB9 connectors
- ESD protected

2.1.10 RS485/RS422 INTERFACE MODULES (OPTIONAL)

- 2 galvanically isolated half- or full-duplex ports
- Automatic RS485 half-duplex direction control
- Selectable transfer rates up to 230.4 kBaud
- Available on standard DB9 connectors
- ESD protected

2.1.11 PARALLEL PORT

- IEEE1284 compliant, SPP, EPP1.7, EPP1.9, ECP mode support
- Configurable as LPT1, LPT2, LPT3
- Floppy disk on parallel port mode (on DB25 connector J3), with floppy power available on connector
- ESD protected

2.1.12 IDE PORTS

- 1 port on 44 pin connectors with Master / Slave capability
- Support of Ultra DMA-100 Mode

2.1.13 SATA-I PORTS

- 2 ports on standard SATA connectors
- Data transfer rates up to 150 MByte/s
- Support of RAID 0 and RAID 1

2.1.14 FLOPPY DISK

- Available over parallel port connector for an external floppy

2.1.15 FIREWIRE 1394B

- TI TSB82AA2 Controller
- 1 port on 1394b bilingual connector and 1 port on internal header supports up to 800 MBit/s
- Provides input power over Polyfuses to the FireWire connectors
- ESD protected

2.1.16 ETHERNET

- 2 Intel 82573L 10M/100M/1G Bit/s Ethernet controllers
- Wake On LAN support
- Connected over PCI-Express bus
- ESD protected

2.1.17 KEYBOARD / MOUSE

- Available on one 6 pin mini DIN connector (PS/2)
- ESD protected

2.1.18 AC'97 AUDIO CONTROLLER

- AC'97 2.2 compliant
- AC'97 function available over optional extension PCB called SoundPAN-1. With internal speaker and external, on the user slot available, line IN, line OUT, headphone and microphone interfaces.

2.1.19 INDICATORS

- Power LED (green: power ok, green / yellow blinking: CPU > 100 °C, green blinking: S3 state, red blinking after restart: CPU temperature was > 125 °C)
- Reset LED (red : reset state, red blinking: power fail)
- HDD LED (green: IDE and / or SATA activity)

- 1394b LED (yellow: FireWire Device connected)
- LAN1 Activity LED (green : link established, green blinking: activity)
- LAN1 Speed LED (dark: 10MBit/s, green: 100MBit/s, yellow: 1GBit/s)
- 2 user-programmable LED's (yellow)
- Wireless WAN LED (green : **Wide Area Network** module powered and ready, green slow blinking: searching, green intermittent blinking: activity)
- Wireless LAN LED (green : **Local Area Network** module powered and ready, green slow blinking: searching, green intermittent blinking: activity)
- Wireless PAN LED (green : **Personal Area Network** module powered and ready, green intermittent blinking: activity)
- LAN2 Activity LED (green : link established, green blinking: activity)
- LAN2 Speed LED (dark: 10MBit/s, green: 100MBit/s, yellow: 1GBit/s)

2.1.20 RESET BUTTON, POWER BUTTON

- Connection for an external remote reset and remote power button
- Power Button on case top
- ESD protected

2.1.21 HARDWARE WATCHDOG TIMER

- Implemented in Intels ICH7-MDH

2.1.22 TEMPERATURE SENSORS

- Monitors the CPU, the on board memory and the PCB board temperature

2.1.23 VOLTAGE SENSORS

- Monitors the CPU core, 2.5V, 5V and 12V board voltages

2.1.24 SPECIALTIES

- UPS function (optional)
- Input voltage up to 48V (optional)
- Galvanic isolated Power Supply input (optional)
- CAN Extension (optional)

2.2 PHYSICAL

2.2.1 HOUSING

- Aluminum
- No ventilation holes
- Easily mountable on 35 mm DIN rail

2.2.2 FORM FACTOR

- Length: 270 mm (10.63 inch) standard version
440 mm (17.32 inch) Wintergarden version with PCI slot extension
- Width: 162 mm (6.38 inch)
- Height: 62.0 mm (2.44 inch) standard version
82.5 mm (3.25 inch)
120 mm (4.72 inch)

2.2.3 WEIGHT

- Typically 2.2 kg (4.85 lb.) (Standard housing, equipped with internal 2.5 inch HDD and CDROM)

2.3 POWER

2.3.1 POWER SUPPLY

- High-efficiency 6 channel switching regulator module
- ATX behavior (Soft off)
- Power input is ESD protected

2.3.2 FUSE

- 5 x 20 mm, 3.15 AT
- Field changeable

2.3.3 RTC BATTERY

- Renata CR2032 3V Lithium Coin Cell Battery (20.0 x 3.2 mm)
- 3 V / 230 mAh
- Field changeable

2.3.4 INPUT POWER

- 8 V_{DC} .. 28 V_{DC}
- Optional 20 V_{DC} .. 48 V_{DC}
- The power usage can change in a wide range according to the amount of installed memory and also according to the needed CPU, memory, graphics and interfaces usage. Please refer to the appropriate product user manuals for more information.

2.4 ENVIRONMENT

2.4.1 TEMPERATURE RANGE

- Storage temperature range -45°C to 85°C (-49°F to +185°F).
- Operating temperature range -20°C to +60°C (-4°F to +140°F) (with full CPU, 3D video and memory usage, mounted on a DIN rail with freely natural convection).
- Extended operating temperature range available (screening).

2.4.2 RELATIVE HUMIDITY

- 5% to 95% non-condensing

3 HARDWARE REFERENCE

3.1 OPENING THE CASE

- Remove the 6 screws from the case top and the 3 screws from the User Slot if a SoundPAN-1 is installed.



Figure 1: Removing The 6 Screws

- Lift up the cover slowly. Please be careful with the cables and, if installed, with the SoundPAN-1 connectors in the user slot.

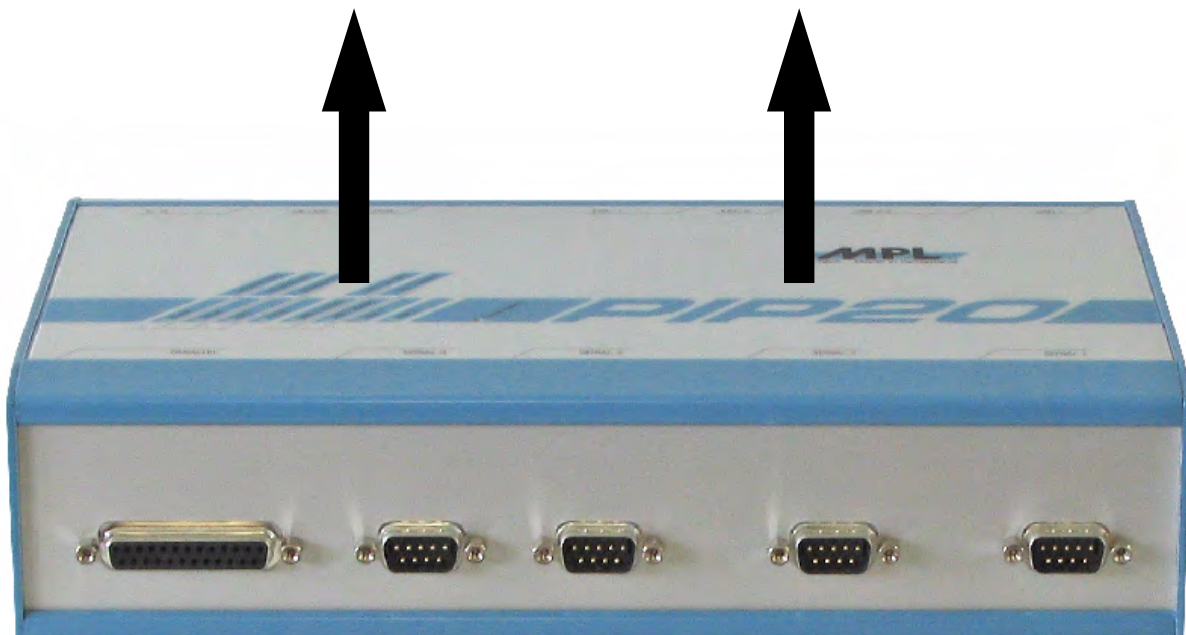


Figure 2: Lift Up The Cover

3.2.2 PARTS LOCATION

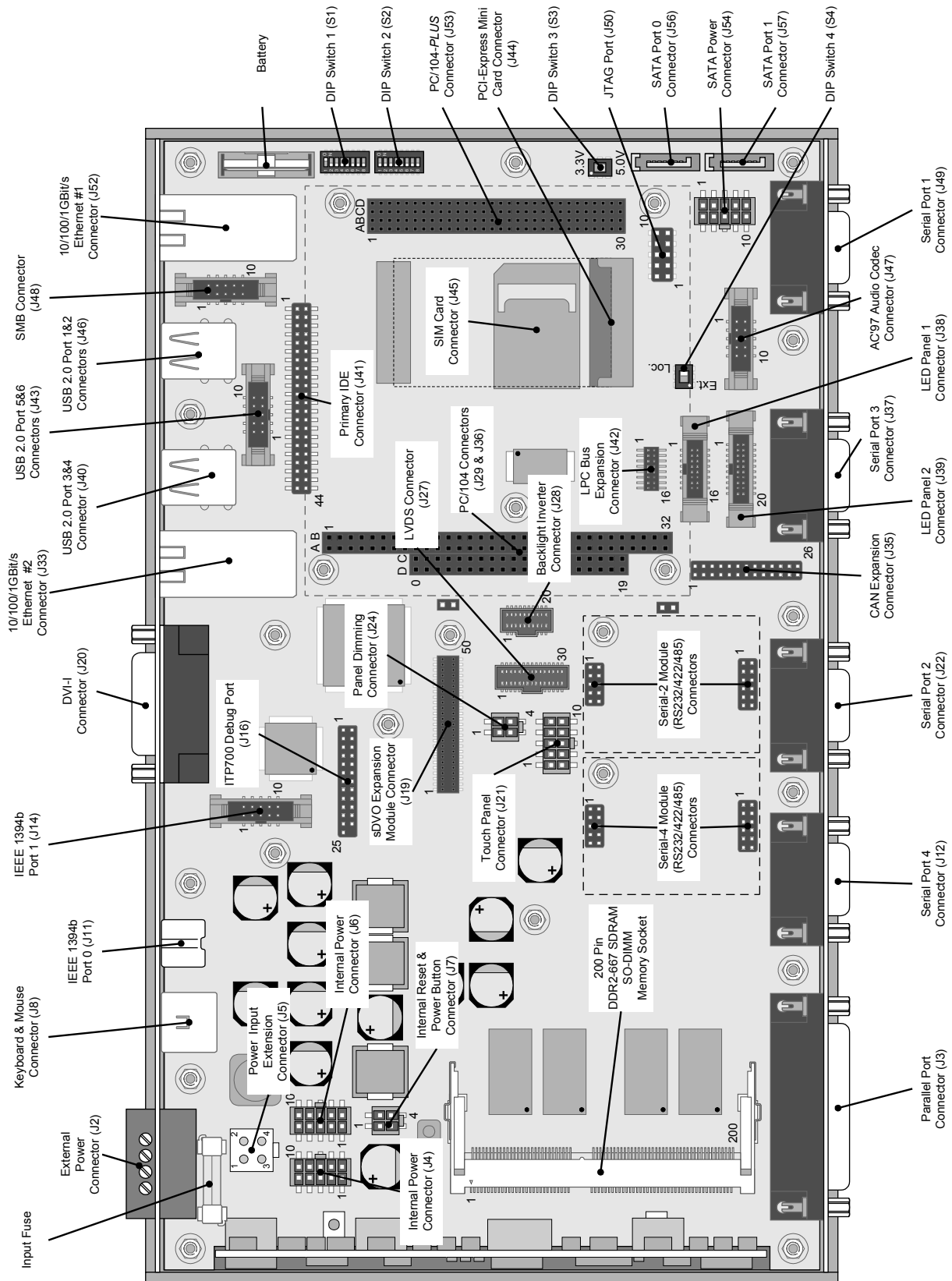


Figure 4: Parts Location

3.3 SWITCH SETTINGS

3.3.1 DIP SWITCH 1 (S1) – PERIPHERAL SETTINGS

Default switch settings are in parentheses.

SW1-1		Battery Backup
OFF		CMOS battery backup off
(ON)		CMOS battery backup on
SW1-2		WLAN Transmitter disable
(OFF)		WLAN Transmitter enabled
ON		WLAN Transmitter disabled
SW1-3	SW1-4	Boot from
(OFF)	(OFF)	LPC bus
OFF	ON	PCI bus
ON	OFF	SPI bus
ON	ON	Reserved
SW1-5		First Boot
(OFF)		Boot from Firmware Hub
ON		Boot from ISA Bus
SW1-6		Ethernet Controller 2 Disable
(OFF)		Ethernet Controller 2 enabled
ON		Ethernet Controller 2 disabled
SW1-7		Ethernet Controller 1 Disable
(OFF)		Ethernet Controller 1 enabled
ON		Ethernet Controller 1 disabled
SW1-8		FireWire Controller Disable
(OFF)		FireWire Controller enabled
ON		FireWire Controller disabled



Figure 5: DIP Switch 1

3.3.2 DIP SWITCH 2 (S2) – ON BOARD LVDS PORT (LCD PANEL) SETTINGS

Default switch settings are in parentheses.

SW2-1		GMCH Graphics disable		
(OFF)		Enable internal Graphics Controller		
ON		Disable internal Graphics Controller		
SW2-2	SW2-3	SW2-4	Backlight Inverter Definition	
(OFF)	(OFF)	(OFF)	Type 1	
OFF	OFF	ON	Type 2	
OFF	ON	OFF	Type 3	
OFF	ON	ON	Type 4	
ON	OFF	OFF	Type 5	
ON	OFF	ON	Type 6	
ON	ON	OFF	Type 7	
ON	ON	ON	Type 8	
SW2-5	SW2-6	SW2-7	SW2-8	Panel Type
(OFF)	(OFF)	(OFF)	(OFF)	Type 1
OFF	OFF	OFF	ON	Type 2
OFF	OFF	ON	OFF	Type 3
OFF	OFF	ON	ON	Type 4
OFF	ON	OFF	OFF	Type 5
OFF	ON	OFF	ON	Type 6
OFF	ON	ON	OFF	Type 7
OFF	ON	ON	ON	Type 8
ON	OFF	OFF	OFF	Type 9
ON	OFF	OFF	ON	Type 10
ON	OFF	ON	OFF	Type 11
ON	OFF	ON	ON	Type 12
ON	ON	OFF	OFF	Type 13
ON	ON	OFF	ON	Type 14
ON	ON	ON	OFF	Type 15
ON	ON	ON	ON	Type 16

For more information about the settings please read the appropriate PIP BIOS User Manual.

For more information about the settings please read the appropriate PIP BIOS User Manual.



Figure 6: DIP Switch 2

3.3.3 DIP SWITCH 3 (S3) – PC/104-PLUS IO-VOLTAGE SETTINGS

Default switch settings are in parentheses.

SW5	Display Mode
(OFF)	PC/104-PLUS IO-Voltage is 5.0 V
ON	PC/104-PLUS IO-Voltage is 3.3 V

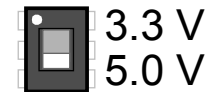


Figure 7: DIP Switch 3

3.3.4 DIP SWITCH 4 (S4)

This DIP Switch is reserved for MPL AG use only.

SW5	Display Mode
(OFF)	Default setting
ON	Do not use

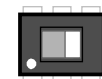


Figure 8: DIP Switch 4

3.4 CONNECTORS

3.4.1 EXTERNAL CONNECTORS

3.4.1.1 Parallel Port Connector (J3)

The parallel port can also operate as an external floppy disk port. The two modes can be switched in the BIOS setup (please refer to the appropriate PIP BIOS User Manual).

Parallel Port Mode			Pin Assignment
Pin	Signal	Description	
1	STROBE	Strobe	
2	DATA0	Data bit 0	
3	DATA1	Data bit 1	
4	DATA2	Data bit 2	
5	DATA3	Data bit 3	
6	DATA4	Data bit 4	
7	DATA5	Data bit 5	
8	DATA6	Data bit 6	
9	DATA7	Data bit 7	
10	ACK	Acknowledge	
11	BUSY	Busy	
12	PE	Paper empty	
13	SELIN	Select in	
14	AUTOFD	Autofeed	
15	ERROR	Error	
16	/INIT	Initialize	
17	/SEL	Select	
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
Floppy Disk Mode			
1	DS0	Drive Select 0	
2	IDX	Index	
3	TR00	Track 0	
4	WP	Write Protected	
5	RDATA	Read Data	
6	DSKCHG	Disk Change	
7	MID0	Media ID 0	
8	MTR0	Motor On 0	
9	MID1	Media ID 1	
10	DS1	Drive Select 1	
11	MTR1	Motor On 1	
12	WDATA	Write Data	
13	WGATE	Write Gate	
14	DRV DEN0	Drive Density 0	
15	HDSEL	Head Select	
16	DIR	Direction	
17	STEP	Step	
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	
21	GND	Ground	
22	GND	Ground	
23	GND	Ground	
24	GND	Ground	
25	+5 V / GND	+5 V or Ground (External Floppy Power Pin)	

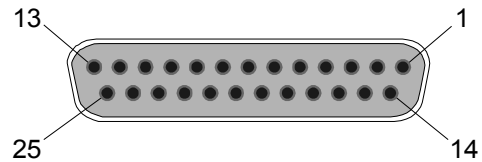


Figure 9: Parallel Port Connector (DSUB 25 Female)
(Connector: Compona, 329 156-6)

3.4.1.2 Serial-1 (J49) And Serial-3 (J37) Connector

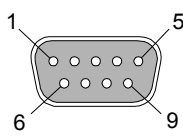
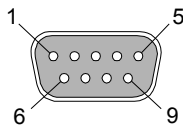
Pin	Signal	Description	Pin Assignment
1	DCD	Carrier detect	
2	RXD	Receive data	
3	TXD	Transmit data	
4	DTR	Data terminal ready	
5	GND	Ground	
6	DSR	Data set ready	
7	RTS	Request to send	
8	CTS	Clear to send	
9	RI	Ring indicator	

Figure 10: Serial Port Connector (DSUB 9 Male)
(Connector: Compona, 329 151-6)

3.4.1.3 Serial-2 (J22) And Serial-4 (J12) Connector

On a PIP with no Serial Port Modules (these are optional), the connectors J12 and J22 are only dummy connectors with no function.

If the PIP is equipped with RS232 or RS485 modules on the Serial-2 and Serial-4 port, the RS232 or RS485 signals will be available on connector J12 and J22.

With RS232 Module			Pin Assignment
Pin	Signal	Description	
1	DCD	Carrier detect	
2	RXD	Receive data	
3	TXD	Transmit data	
4	DTR	Data terminal ready	
5	GND	Ground	
6	DSR	Data set ready	
7	RTS	Request to send	
8	CTS	Clear to send	
9	RI	Ring indicator	
With RS485 Module			<p>Figure 11: Serial Port Connector (DSUB 9 Male) (Connector: Compona, 329 151-6)</p>
Pin	Signal	Description	
1	NC	Not connected	
2	Rx+	Receive data +	
3	Tx+	Transmit data +	
4	NC	Not connected	
5	GND_isolate	Galvanically isolated Ground	
6	NC	Not connected	
7	Rx-	Receive data -	
8	Tx-	Transmit data -	
9	NC	Not connected	

3.4.1.4 External Power Connector (J2)

3.4.1.4.1 Pin Assignment

The counterpart for the 4-pin input connector is: Phoenix Contact AG, MC1,5/4STF-3,81.


Pin	Signal	Description	Pin Assignment
1	VINCON	Input voltage (8 to 28 V, optional 20 to 48 V)	
2	GNDCON	Power Connector Ground	
3	RST_BTN	Reset Button Input	
4	PWR_BTN	Power Button Input	

Figure 12: Power Connector (Connector: Phoenix Contact AG, MC1,5/4GF-3,81)

WARNING:

Wrong polarization of the input voltage can cause serious damage to your PIP!

3.4.1.4.2 Mounting An External Reset And Power Button

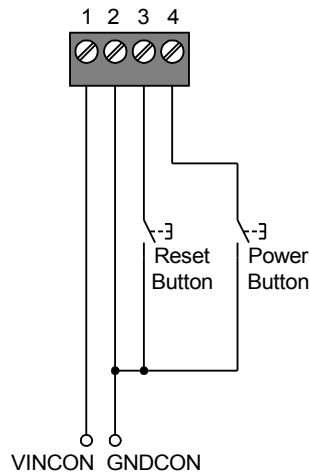


Figure 13: External Reset - And Power Button

3.4.1.4.3 Power Up Behavior

Normally if you adapt to VINCON a voltage greater than 8 V your PIP will start. If you shut down with the OS functionality you have to start the PIP again with a short activation of the Power Button, or you can cycle VINCON.

If you do a Power Button Override (press the Power Button for 4 seconds) the PIP will shut down immediately. To start the PIP again now, you must press the Power Button for a short time. If you cycle the VINCON voltage, the PIP will not start.

3.4.1.4.4 Power Input Circuit

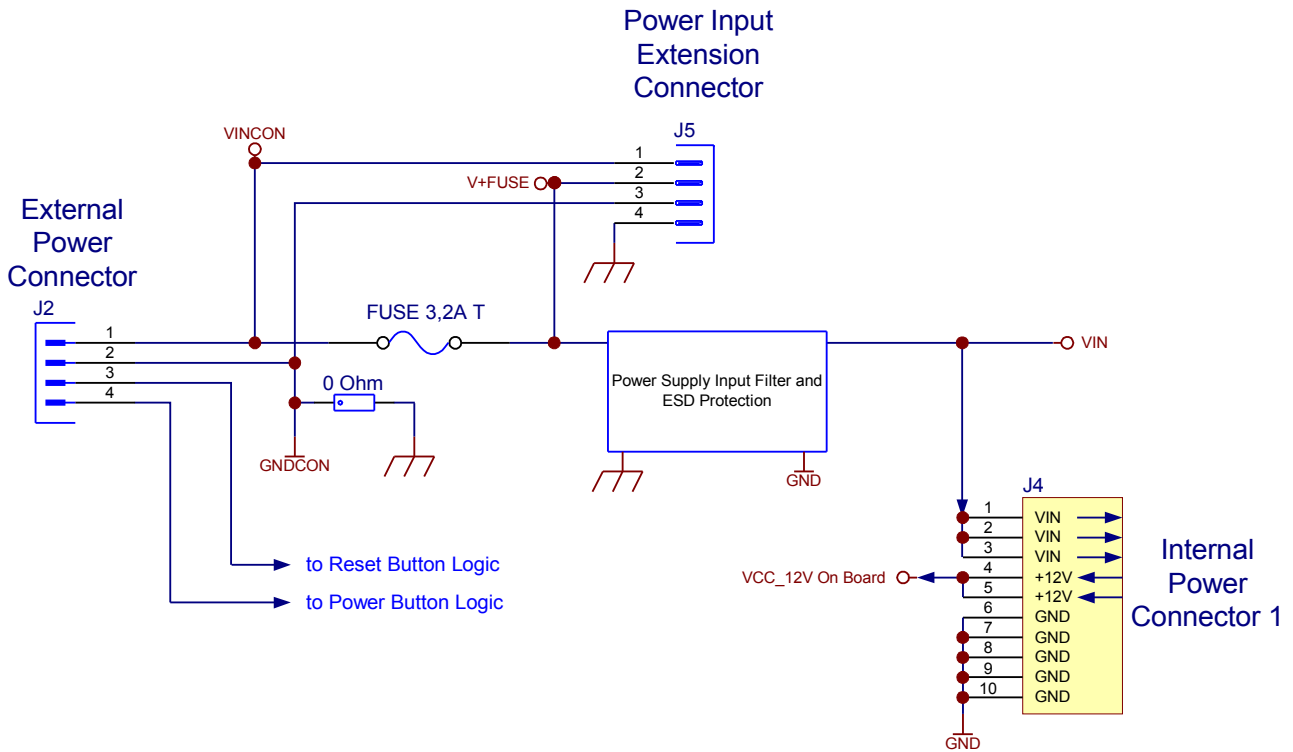


Figure 14: Connections Between All The PIP Power Connectors

Fi

NOTE:

12 V, -12 V and -5 V must be supplied to the Internal Power Connector 1 (J4) or 2 (J6) from a separate power supply. Else these voltages are NOT available on the PIP.

3.4.1.5 PS/2 Keyboard And Mouse Connectors (J8)

Laptop PS/2 pin assignment (6 pin mini-DIN, female). Because the PIP detects the connected device and selects the correct functionality, either a mouse or a keyboard can be connected to the same connector.

With a Y-cable both, a mouse and a keyboard, can be used on this port.

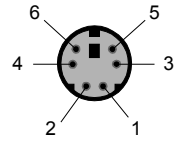
Pin	Signal	Description	Pin Assignment
1	DAT1	Data 1	
2	DAT2	Data 2	
3	GND	Ground	
4	VCC	+5 V	
5	CLK1	Clock 1	
6	CLK2	Clock 2	

Figure 15: PS/2 Keyboard & Mouse Connector (Connector: Compona, 129108-7)

3.4.1.6 FireWire 1394b Connector (J11)

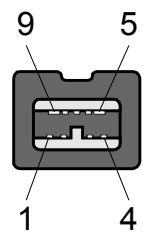
Pin	Signal	Description	Pin Assignment
1	TPB-	Twisted Pair B (Minus)	
2	TPB+	Twisted Pair B (Plus)	
3	TPA-	Twisted Pair A (Minus)	
4	TPA+	Twisted Pair A (Plus)	
5	TPA(R)	Twisted Pair A (Reference Ground)	
6	VG	Power (Ground)	
7	NC	Not Connected	
8	VP	Power (Voltage) is equivalent to VIN on J4 (please refer to chapter 3.4.2.11 for more information)	
9	TPB (R)	Twisted Pair B (Reference Ground)	

Figure 16: FireWire 1394b Bilingual Connector (Connector: Molex, 45241-0001)

3.4.1.7 Dual USB Connectors (J40, J46)

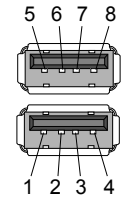
Pin	Signal	Description	Pin Assignment
1	VCC0	Port 0 Cable Power +5 V	
2	P0-	Port 0 Balanced Data Line -	
3	P0+	Port 0 Balanced Data Line +	
4	GND0	Port 0 Cable Ground	
5	VCC1	Port 1 Cable Power +5 V	
6	P1-	Port 1 Balanced Data Line -	
7	P1+	Port 1 Balanced Data Line +	
8	GND1	Port 1 Cable Ground	

Figure 17: Dual USB (Type A) Connector (Connector: FCI, 72309-0010B)

3.4.1.8 DVI-I Connector (J20)

DVI-I Connector with single channel TMDS port and legacy analog port.

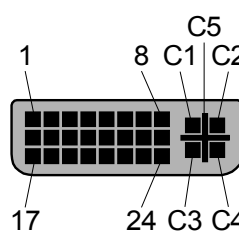
Pin	Signal Description	Pin Assignment
1	TMDS Data2-	
2	TMDS Data2+	
3	Shield Data2	
4	NC	
5	NC	
6	DDC Clock	
7	DDC Data	
8	Analog Vertical Sync	
9	TMDS Data1-	
10	TMDS Data1+	
11	Shield Data1	
12	NC	
13	NC	
14	+5 V Power	
15	Ground	
16	Hot Plug Detect	
17	TMDS Data0-	
18	TMDS Data0+	
19	Shield Data0	
20	NC	
21	NC	
22	Shield Clock	
23	TMDS Clock+	
24	TMDS Clock-	
C1	Analog Red	
C2	Analog Green	
C3	Analog Blue	
C4	Analog Horizontal Sync	
C5	Analog Ground	

Figure 18: DVI-I Connector (Connector: Samtec, DVI-29-AW-FT)

NOTE:

It is not possible to use CRT and digital monitors in parallel on the DVI port. The DVI-I connector has per definition only one DDC Bus to recognize a monitor. But digital and analog monitors answers to the same DDC bus address on requests. And so if a CRT and a digital monitor is connected to the DVI-I connector (with an Y-cable) there is a mismatch with the monitor information on the DDC bus. Then unpredictable things will be happen.

3.4.1.9 10M/100M/1G Bit/s Ethernet Connectors (LAN1: J52, LAN2: J33)

Standard RJ45 connector for a 100 ohm cable.

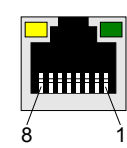
Pin	Signal	Description	Pin Assignment
1	TD0+	Data 0 +	
2	TD0-	Data 0 -	
3	TD1+	Data 1 +	
4	TD1-	Data 1 -	
5	TD2+	Data 2 +	
6	TD2-	Data 2 -	
7	TD3+	Data 3 +	
8	TD3-	Data 3 -	

Figure 19: RJ45 Connector (Connector: Bel Fuse 0826-1K1T-23-F)

3.4.2 INTERNAL CONNECTORS

3.4.2.1 IDE Connector (J41)

Standard 44 pin 2 mm IDE pin out.

Pin	Signal	Description	Pin	Signal	Description	Pin Assignment
1	/RESET	Reset	2	GND	Ground	
3	DD7	Data bit 7	4	DD8	Data bit 8	
5	DD6	Data bit 6	6	DD9	Data bit 9	
7	DD5	Data bit 5	8	DD10	Data bit 10	
9	DD4	Data bit 4	10	DD11	Data bit 11	
11	DD3	Data bit 3	12	DD12	Data bit 12	
13	DD2	Data bit 2	14	DD13	Data bit 13	
15	DD1	Data bit 1	16	DD14	Data bit 14	
17	DD0	Data bit 0	18	DD15	Data bit 15	
19	GND	Ground	20	KEY	Not connected (key pin)	
21	DMARQ	DMA request	22	GND	Ground	
23	/DIOW	I/O write strobe	24	GND	Ground	
25	/DIOR	I/O read strobe	26	GND	Ground	
27	IORDY	I/O ready	28	CSEL	Cable select	
29	/DMACK	DMA acknowledge	30	GND	Ground	
31	INTRQ	Interrupt request	32	IOCS16	Not connected (obsolete)	
33	DA1	Address 1	34	/CBLID	Cable Identifier	
35	DA0	Address 0	36	DA2	Address 2	
37	/CS0	Chip select 0	38	/CS1	Chip select 1	
39	/DASP	Activity LED	40	GND	Ground	
41	VCC	+5 V	42	VCC	+5 V	
43	GND	Ground	44	RES	Not Connected (reserved)	

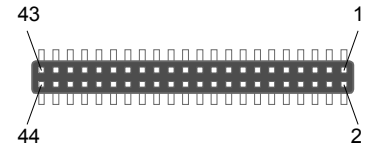


Figure 20: IDE Connector (Connector: Samtec, TMM122-01-LDSM)

3.4.2.2 SATA Signal Connectors (J56, J57)

Standard 7 pin SATA connector.

Pin	Signal	Description	Pin Assignment
1	GND	Ground	
2	A+	Differential signal pair A from PHY	
3	A-		
4	GND	Ground	
5	B+	Differential signal pair B from PHY	
6	B-		
7	GND	Ground	

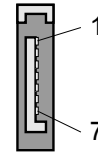


Figure 21: SATA Connector (Connector: Molex, 67491-0010)

3.4.2.3 SATA Power Connector (J54)

10 pin 2.54 mm Header.

Pin	Signal	Description	Pin Assignment
1	+5V	5 V Power	
2	+5V	5 V Power	
3	+5V	5 V Power	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	+3.3V	3.3 V Power	
9	+3.3V	3.3 V Power	
10	+3.3V	3.3 V Power	

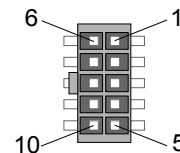


Figure 22: Power Connector For SATA Devices (Connector: Samtec, IPL1-105-02-S-D)

3.4.2.4 LED Panel Connector 1 (J38)

To this connector the MPL AG SoundPAN-x can be connected for visual indication of different activities.

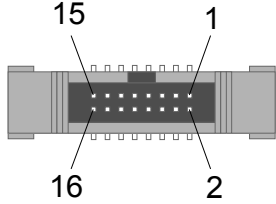
Pin	Signal	Description	Pin Assignment
1	PWRLEDR	Cathode of power LED (Red)	
2	PWRLEDG	Cathode of power LED (Green)	
3	RESETLEDR	Cathode of reset LED (Red)	
4	HDDLEDG	Cathode of HDD LED (Green)	
5	1394bLEDR	Cathode of FireWire 1394b LED (Red)	
6	1394bLEDG	Cathode of FireWire 1394b LED (Green)	
7	NC	Not Connected	
8	LAN1ACTLEDG	Cathode of LAN1 Activity LED (Green)	
9	LAN1SPDLEDR	Cathode of LAN1 Speed LED (Red)	
10	LAN1SPDLEDG	Cathode of LAN1 Speed LED (Green)	
11	USERLED1R	Cathode of user LED 1 (Red)	
12	USERLED1G	Cathode of user LED 1 (Green)	
13	USERLED2R	Cathode of user LED 2 (Red)	
14	USERLED2G	Cathode of user LED 2 (Green)	
15	RESETSW	Reset switch, if 3.3 V then reset	
16	+3.3V	Supply voltage, anode of all LEDs	

Figure 23: LED Panel Connector 1 (Connector: Samtec, EHF-108-01-L-D-SM-P)

3.4.2.5 LED Panel Connector 2 (J39)

To this connector the MPL AG SoundPAN-x can be connected for visual indication of different activities.

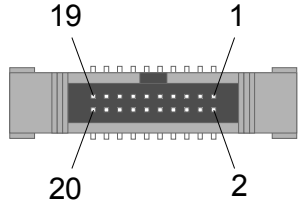
Pin	Signal	Description	Pin Assignment
1	NC	Not Connected	
2	+3.3V	Supply voltage, anode of all LEDs	
3	NC	Not Connected	
4	WWANLEDG	Cathode of W-WAN LED (Green)	
5	NC	Not Connected	
6	1WLANLEDG	Cathode of W-LAN LED (Green)	
7	NC	Not Connected	
8	WPANLEDG	Cathode of W-PAN LED (Green)	
9	NC	Not Connected	
10	NC	Not Connected	
11	NC	Not Connected	
12	LAN2ACTLEDG	Cathode of LAN2 Activity LED (Green)	
13	LAN2SPDLEDR	Cathode of LAN2 Speed LED (Red)	
14	LAN2SPDLEDG	Cathode of LAN2 Speed LED (Green)	
15	NC	Not Connected	
16	NC	Not Connected	
17	NC	Not Connected	
18	NC	Not Connected	
19	+3.3V	Supply voltage, anode of all LEDs	
20	NC	Not Connected	

Figure 24: LED Panel Connector 2 (Connector: Samtec, EHF-110-01-L-D-SM-P)

3.4.2.6 sDVO Expansion Module Connector (J19)

This connector is used for further MPL AG system expansion modules.

Pin	Signal	Description	Pin Assignment
1	BLENA	LVDS Flat panel backlight enable	
2	BLCTL	LVDS Flat panel backlight brightness control	
3	GND	System Ground	
4	GND	System Ground	
5	sDVOCREdp	sDVO Port C Differential Data Red +	
6	sDVOCGREENp	sDVO Port C Differential Data Green +	
7	sDVOCREdn	sDVO Port C Differential Data Red -	
8	sDVOCGREENn	sDVO Port C Differential Data Green -	
9	GND	System Ground	
10	GND	System Ground	
11	sDVOCLBLUEp	sDVO Port C Differential Data Blue +	
12	sDVOCLCLKp	sDVO Port C Differential Clock +	
13	sDVOCLBLUEn	sDVO Port C Differential Data Blue -	
14	sDVOCLCLKn	sDVO Port C Differential Clock -	
15	GND	System Ground	
16	GND	System Ground	
17	sDVO TVCLKINp	sDVO Port Differential TV Clock Input +	
18	sDVO FLDSLTP	sDVO Port Differential Video Field Stall Signal +	
19	sDVO TVCLKINn	sDVO Port Pixel Differential TV Clock Input -	
20	sDVO FLDSLTPn	sDVO Port Differential Video Field Stall Signal -	
21	GND	System Ground	
22	GND	System Ground	
23	sDVO CINTp	sDVO Port Differential Interrupt Signal +	
24	PCIRSTn	PCI Reset	
25	sDVO CINTn	sDVO Port Differential Interrupt Signal -	
26	GND	System Ground	
27	GND	System Ground	
28	GND	System Ground	
29	sDVO SDA	sDVO Port I2C Bus Data	
30	sDVO SCL	sDVO Port I2C Bus Clock	
31	GND	System Ground	
32	GND	System Ground	
33	VCC3	+3.3 V system voltage	
34	VCC3	+3.3 V system voltage	
35	GND	System Ground	
36	GND	System Ground	
37	VCC5	+5 V system voltage	
38	VCC5	+5 V system voltage	
39	GND	System Ground	
40	GND	System Ground	
41	GND	System Ground	
42	GND	System Ground	
43	NC	Not Connected	
44	NC	Not Connected	
45	NC	Not Connected	
46	NC	Not Connected	
47	VIN	Connected to the Input voltage on J4 Pin 1-3 *1	
48	VIN	Connected to the Input voltage on J4 Pin 1-3 *1	
49	VIN	Connected to the Input voltage on J4 Pin 1-3 *1	
50	VIN	Connected to the Input voltage on J4 Pin 1-3 *1	

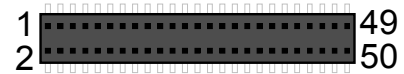


Figure 25: DVO Expansion Module Connector (Connector: Samtec, RSM-125-02-L-D)

Notes:

*1 Please refer to chapter 3.4.1.4.4 for a schematic drawing how this voltage is supplied.

3.4.2.7 LVDS Connector (J27)

This connector allows a direct connection of a LVDS flat panel.

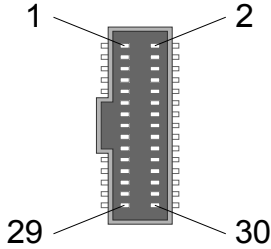
Pin	Signal	Description	Pin Assignment
1	LVDS1_TX0-	Channel1 port 0 data line -	
2	LVDS1_TX1-	Channel1 port 1 data line -	
3	LVDS1_TX0+	Channel1 port 0 data line +	
4	LVDS1_TX1+	Channel1 port 1 data line +	
5	LVDS1_TX2-	Channel1 port 2 data line -	
6	LVDS1_CLK-	Channel1 clock line -	
7	LVDS1_TX2+	Channel1 port 2 data line +	
8	LVDS1_CLK+	Channel1 clock line +	
9	NC	Not Connected	
10	+3.3V	+3.3 V system voltage	
11	NC	Not Connected	
12	+3.3V	+3.3 V system voltage	
13	VDDENA	Flat panel VDD enable	
14	+5V	+5 V system voltage	
15	DDCDAT	DDC bus data	
16	GND	Ground	
17	DDCCLK	DDC bus clock	
18	+5V	+5 V system voltage	
19	GND	Ground	
20	LVDS2_TX0-	Channel2 port 0 data line -	
21	GND	Ground	
22	LVDS2_TX0+	Channel2 port 0 data line +	
23	LVDS2_TX1-	Channel2 port 1 data line -	
24	LVDS2_TX2-	Channel2 port 2 data line -	
25	LVDS2_TX1+	Channel2 port 1 data line +	
26	LVDS2_TX2+	Channel2 port 2 data line +	
27	LVDS2_CLK-	Channel2 clock line -	
28	NC	Not Connected	
29	LVDS2_CLK+	Channel2 clock line +	
30	NC	Not Connected	

Figure 26: LVDS Panel Connector (Connector: Molex, 501190-3017)

3.4.2.8 Touch Panel Connector (J21)

This connector allows the connection of a PS/2 or USB touch panel controller.

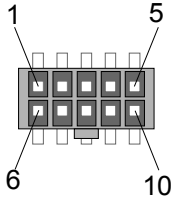
Pin	Signal	Description	Pin Assignment
1	+5V	5 V PS/2 voltage	
2	MSCLK	PS/2 mouse clock	
3	MSDAT	PS/2 mouse data	
4	GND	Ground	
5	+5V	5 V USB voltage	
6	DATAp	USB2.0 Port Balanced Data Line +	
7	DATAN	USB2.0 Port Balanced Data Line -	
8	GND	Ground	
9	NC	Not connected	
10	NC	Not connected	

Figure 27: Touch Panel Connector (Connector: Samtec, IPL1-105-02-S-D)

3.4.2.9 Backlight Inverter Connector (J28)

This connector supports different backlight inverters.

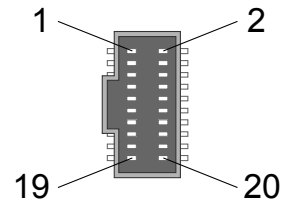
Pin	Signal	Description	Pin Assignment
1	VIN	Connected to the Input voltage on J4 Pin 1-3 ^{*1}	
2	VIN	Connected to the Input voltage on J4 Pin 1-3 ^{*1}	
3	VIN	Connected to the Input voltage on J4 Pin 1-3 ^{*1}	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	+5VSWITCHED	+5 V supply voltage, switched with ENA signal	
8	ENAn	Backlight Enable: On (0 V) or Off (5 V)	
9	ENA	Backlight Enable: On (5 V) or Off (0 V)	
10	DNC	Do not connect	
11	+5V	+5 V supply voltage	
12	+5V	+5 V supply voltage	
13	+5V	+5 V supply voltage	
14	GND	Ground	
15	GND	Ground	
16	GND	Ground	
17	DNC	Do not connect	
18	DNC	Do not connect	
19	DIMM	Backlight Dimming: Dependent on S2 settings different voltage ranges are possible (max. range: 0 V .. 5 V)	
20	DNC	Do not connect	

Figure 28: LVDS Panel Connector (Connector: Molex, 501190-2017)

Notes:

^{*1} With a 14 V over voltage protection to protect the backlight inverter from wrongly applied high PIP input voltages. For PIPs with LVDS Panels it is needed that the PIP supply voltage is exactly 12V.

3.4.2.10 Panel Dimming Connector (J24)

Used for LVDS panel backlight dimming.

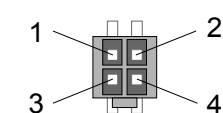
Pin	Signal	Signal Description	Pin Assignment
1	UP#	Increase brightness	
2	DOWN#	Decrease brightness	
3	GND	Ground	
4	GND	Ground	

Figure 29: Panel Dimming Connector (Connector: Samtec, IPL1-102-02-S-D)

3.4.2.11 Internal Power Connector 1 (J4)

Please refer to chapter 3.4.1.4.4 for a schematic diagram about the connections between all the PIP power connectors.

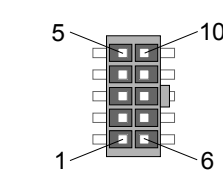
Pin	Signal	Description	Pin Assignment
1	VIN	Input voltage (8 to 28 V)	
2	VIN	Input voltage (8 to 28 V)	
3	VIN	Input voltage (8 to 28 V)	
4	+12 V	Input for PC/104-PLUS supply	
5	+12 V	Input for PC/104-PLUS supply	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	GND	Ground	

Figure 30: Internal Power Connector (Connector: Samtec, IPL1-105-02-S-D)

3.4.2.12 Internal Power Connector 2 (J6)

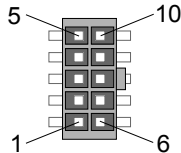
Pin	Signal	Description	Pin Assignment
1	+5 V	+5 V system voltage	
2	+5 V	+5 V system voltage	
3	+3.3 V	+3.3 V system voltage	
4	+3.3 V	+3.3 V system voltage	
5	-5 V	Input for PC/104 supply	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	-12 V	Input for PC/104-PLUS supply	

Figure 31: Internal Power Connector 2 (Connector: Samtec, IPL1-105-02-S-D)

3.4.2.13 Power Input Extension Connector (J5)

Please refer to chapter 3.4.1.4.4 for a schematic diagram about the connections between all the PIP power connectors.

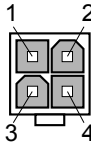
Pin	Signal	Signal Description	Pin Assignment
1	VINCON	Connected to Power Connector VINCON	
2	V+FUSE	Connected to VIN behind the fuse	
3	GNDCON	Connected to Power Connector GNDCON	
4	EARTH	Connected to case earth	

Figure 32: Power Input Extension Connector (Connector: Molex, 39-28-1043)

3.4.2.14 AC'97 Connector (J47)

Used for MPL AGs AC'97 Codec Expansion Module SoundPAN-1 (optional). With this option the standard AC'97 connectors for Microphone In, Line In, Line Out and Headphone Out are available at the User Slot 1 (please refer to the appropriate PIP User Manual).

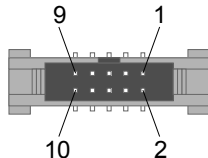
Pin	Signal	Signal Description	Pin Assignment
1	+5.0V	5.0 V System Power	
2	+3.3V	3.3 V System Power	
3	+12.0V	12.0 V System Power	
4	SPKR	Speaker Signal	
5	BIT_CLK	12.288 MHz serial data clock	
6	SDIN	AC'97 Serial Data In	
7	SDOUT	AC'97 Serial Data Out	
8	SYNC	AC'97 48 kHz fixed rate sample sync	
9	RSTn	AC'97 Codec Reset	
10	GND	Ground	

Figure 33: AC'97 Codec Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)

3.4.2.15 USB2.0 Header Connector (J43)

Used for MPL AGs USB 2.0 Expansion Module (FUNI-KIT1).

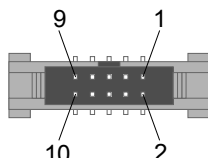
Pin	Signal	Signal Description	Pin Assignment
1	PWR1	USB Power Port 1	
2	PWR2	USB Power Port 2	
3	GND	Ground	
4	P1-	Port 1 Balanced Data Line -	
5	P1+	Port 1 Balanced Data Line +	
6	GND	Ground	
7	P2-	Port 2 Balanced Data Line -	
8	P2+	Port 2 Balanced Data Line +	
9	GND	Ground	
10	GND	Ground	

Figure 34: USB2.0 Header Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)

3.4.2.16 Firewire Header Connector (J14)

Used for MPL AGs Firewire Expansion Module.

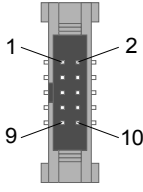
Pin	Signal	Signal Description	Pin Assignment
1	TPB-	Twisted Pair B (Minus)	
2	TPB+	Twisted Pair B (Plus)	
3	GND	Ground	
4	TPA-	Twisted Pair A (Minus)	
5	TPA+	Twisted Pair A (Plus)	
6	GND	Ground	
7	TPA(R)	Twisted Pair A (Reference Ground)	
8	V _P	Power is equivalent to VIN on J4 (please refer to chapter 3.4.2.11 for more information)	
9	V _P		
10	GND	Ground	

Figure 35: Firewire Header Connector (Connector: Samtec, EHT-105-01-S-D-SMLC)

3.4.2.17 Reset & Power Button Connector (J7)

Used for LVDS panel backlight dimming.

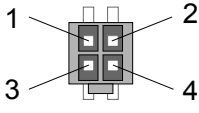
Pin	Signal	Signal Description	Pin Assignment
1	PWRBTN#	Power Button	
2	RSTBTN#	Reset Button	
3	GND	Ground	
4	GND	Ground	

Figure 36: Reset & Power Button Connector (Connector: Samtec, IPL1-102-02-S-D)

3.4.2.18 CAN Expansion Connector (J35)

This connector is reserved for future MPL system expansions.

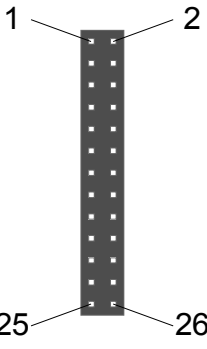
Pin	Signal	Signal Description	Pin Assignment
1	+5V	5 V System Power	
2	GND	Ground	
3	SD0	ISA Bus Data Signal 0	
4	SD1	ISA Bus Data Signal 1	
5	SD2	ISA Bus Data Signal 2	
6	SD3	ISA Bus Data Signal 3	
7	SD4	ISA Bus Data Signal 4	
8	SD5	ISA Bus Data Signal 5	
9	SD6	ISA Bus Data Signal 6	
10	SD7	ISA Bus Data Signal 7	
11	SA0	ISA Bus Address Signal 0	
12	SA1	ISA Bus Address Signal 1	
13	SA2	ISA Bus Address Signal 2	
14	SA3	ISA Bus Address Signal 3	
15	SA4	ISA Bus Address Signal 4	
16	SA5	ISA Bus Address Signal 5	
17	SA6	ISA Bus Address Signal 6	
18	SA7	ISA Bus Address Signal 7	
19	R/Wn	Read (High) / Write (Low Active) Signal	
20	CSn	Chip Select (Low Active)	
21	RSTn	Reset (Low Active)	
22	CLK	8.000 MHz Clock	
23	IRQn	Interrupt (Low Active)	
24	DSACKn	Data Strobe Acknowledge	
25	NC	Not connected	
26	NC	Not connected	

Figure 37: CAN Expansion Connector (Connector: Samtec, TMM113-01-LD)

3.4.2.19 PC/104 Interface Connector (J29/J36)

For more detailed information please refer to the PC/104 Specification, V2.5 and to the IEEE P996 draft standard (D2.02).

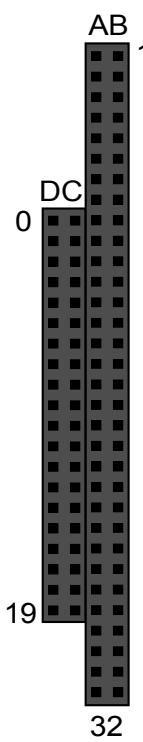
Pin	Row A	Row B	Row C	Row D	Pin Assignment
0	--	--	GND	GND	
1	/IOCHCK	GND	/SBHE	/MEMCS16	
2	SD7	RSTDRV	LA23	/IOCS16	
3	SD6	+5 V	LA22	IRQ10	
4	SD5	IRQ9	LA21	IRQ11	
5	SD4	(-5 V)*1	LA20	IRQ12	
6	SD3	NC (DRQ2)	LA19	IRQ15	
7	SD2	(-12 V)*1	LA18	IRQ14	
8	SD1	Pull-up (/ENDXFR)*2	LA17	pull-up (/DACK0)*2	
9	SD0	(+12 V)*1	/MEMR	NC (DRQ0)*2	
10	IOCHRDY	NC	/MEMW	pull-up (/DACK5)*2	
11	AEN	/SMEMW	SD8	NC (DRQ5)*2	
12	SA19	/SMEMR	SD9	pull-up (/DACK6)*2	
13	SA18	/IOW	SD10	NC (DRQ6)*2	
14	SA17	/IOR	SD11	pull-up (/DACK7)*2	
15	SA16	pull-up (/DACK3)	SD12	NC (DRQ7)*2	
16	SA15	NC (DRQ3)*2	SD13	+5 V	
17	SA14	pull-up (/DACK1)*2	SD14	pull-up (/MASTER)*2	
18	SA13	NC (DRQ1)*2	SD15	GND	
19	SA12	/REFRESH	NC	GND	
20	SA11	SYSCLK	--	--	
21	SA10	IRQ7	--	--	
22	SA9	IRQ6	--	--	
23	SA8	IRQ5	--	--	
24	SA7	IRQ4	--	--	
25	SA6	IRQ3	--	--	
26	SA5	pull-up (/DACK2)*2	--	--	
27	SA4	TC	--	--	
28	SA3	BALE	--	--	
29	SA2	+5 V	--	--	
30	SA1	14.318 MHz Clock	--	--	
31	SA0	GND	--	--	
32	GND	GND	--	--	

Figure 38: PC/104 Connector
(Connector: EPT, 962-60206-03 / 962-60326-03)

Notes:

For the maximum allowed current on each voltage please refer to chapter 3.6.

- *1 -12 V, -5 V and 12 V are only available if supplied to the Internal Power Connector 1 (J4) from a power supply (please refer to chapter 3.4.2.11 and 3.6).
- *2 Signal not used or not available. ISA DMA cycles (with DRQ, DACK signals) and ISA Master cycles (with /MASTER signal) are not supported in the PIP20 design.

3.4.2.20 PC/104-PLUS Interface Connector (J53)

For more detailed information please refer to the PC/104-PLUS Specification, Rev. 2.2.

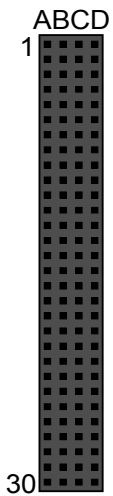
Number	Row A	Row B	Row C	Row D	Pin Assignment
1	GND	NC	+5 V	AD0	
2	V _{IO} *3	AD2	AD1	+5 V	
3	AD5	GND	AD4	AD3	
4	C/BE0	AD7	GND	AD6	
5	GND	AD9	AD8	GND (M66EN)*2	
6	AD11	V _{IO} *3	AD10	GND	
7	AD14	AD13	GND	AD12	
8	+3.3 V	C/BE1	AD15	+3.3 V	
9	SERR	GND	Not Connected	PAR	
10	GND	PERR	+3.3 V	Not Connected	
11	STOP	+3.3 V	LOCK	GND	
12	+3.3 V	TRDY	GND	DEVSEL	
13	FRAME	GND	IRDY	+3.3 V	
14	GND	AD16	+3.3 V	C/BE2	
15	AD18	+3.3 V	AD17	GND	
16	AD21	AD20	GND	AD19	
17	+3.3 V	AD23	AD22	+3.3 V	
18	IDSEL0	GND	IDSEL1	IDSEL2	
19	AD24	C/BE3	V _{IO} *3	IDSEL3	
20	GND	AD26	AD25	GND	
21	AD29	+5 V	AD28	AD27	
22	+5 V	AD30	GND	AD31	
23	REQ0	GND	REQ1	V _{IO} *3	
24	GND	REQ2	+5 V	GNT0	
25	GNT1	V _{IO} *3	GNT2	GND	
26	+5 V	CLK0	GND	CLK1	
27	CLK2	+5 V	CLK3	GND	
28	GND	INTD	+5 V	RST	
29	(+12 V)*1	INTA	INTB	INTC	
30	(-12 V)*1	REQ3	GNT3	GND	

Figure 39: PC/104+ Connector
(Connector: Samtec, PTHF-130-03-M-Q368)

Notes:

For the maximum allowed current on each voltage please refer to chapter 3.6.

- *1 -12 V and 12 V are only available if supplied to the Internal Power Connector 1 (J4) from a power supply (please refer to chapter 3.4.2.11 and 3.6).
- *2 The PC/104-PLUS interface works with 33MHz bus clock.
- *3 The PC/104-PLUS IO-voltage can be set to +3.3 V or to +5.0 V with the DIP Switch 3 (please refer to chapter 3.3.3).

3.4.2.21 IPT700 Connector (J14)

This connector is reserved for MPL test purpose.

3.4.2.22 JTAG Port Connector (J50)

This connector is reserved for MPL production purpose.

3.4.2.23 SMB Connector (J48)

This connector is reserved for future MPL system expansions.

3.4.3 LPC Bus Expansion Connector (J42)

This connector is reserved for future MPL system expansions.

3.5 MODULE SOCKETS

3.5.1 MEMORY MODULE

3.5.1.1 Electrical And Mechanical Requirements

A 200 pin DDR667-SDRAM (PC5300) SO-DIMM socket with JEDEC standard layout is available for the system memory. DDR667-SDRAM SO-DIMM memory modules with up to 2 GByte size (1Gbit chips) can be mounted. The memory modules listed below are tested and approved to work with the PIP. Regarding the special environmental conditions the PIP is normally used, MPL AG recommends to use low power memory modules. MPL AG does not recommend using low cost consumer memory modules.

It is the customers responsibility that memory modules supplied by third party vendors meet the above stated requirements. MPL AG will not be liable for memory modules that are purchased from third party vendors and don't work in the PIP.

Module Manufacturer	Part Number	Chip Manufacturer	Capacity
Qimonda	HYS64T128021HDL-3-B	Qimonda	1024 MByte

3.5.1.2 Mounting The Memory Module

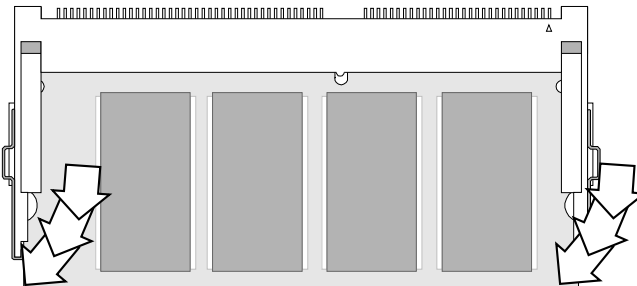


Figure 40: Mounting The Memory Module

3.5.2 RS232 AND RS485 / RS422 INTERFACE MODULES

The SERIAL2 and SERIAL4 interface can be equipped with MPL AGs SERIF Modules (optional). This modules adds either RS232 or RS485 (half duplex) / RS422 (full duplex) support.

For more information please refer to the SERIF User Manual.

3.5.3 PC/104(-PLUS) MODULES

Please follow the appropriate module manuals for installing and setup the PC/104(-PLUS) modules.

3.5.4 PCI-EXPRESS MINI CARD MODULES

There is a PCI-Express Mini Card Slot with a SIM card slot to expand the PIP with different wireless interfaces (like WLAN, GPRS, UMTS, ...).

Please follow the appropriate module manuals for installing and setup the different wireless modules.

3.6 SYSTEM-VOLTAGES SUPPLIED BY THE PIP

The PIP has the possibility to supply -12 V, -5 V, 3.3 V, 5 V and 12 V to different connectors on the PIP PCB. But there are some specialties to pay attention to:

- -12 V, -5 V and 12 V are not generated by the PIP itself.
- There is only a limited current available on -12 V, -5 V, 3.3 V, 5 V and 12 V system voltages (either the PCB is not dimensioned for more current or the switching regulators don't supply more current).
- These voltages are not fused on the internal connectors.

3.6.1 -12 V, -5 V AND 12 V

-12 V, -5 V and 12 V must be generated by a separate power supply, that supplies these voltages to the internal power connectors J4 and J6.

You can use V_{IN} (J4 pin 1-3) for the power source and 3.3V or 5V (J4 pin 3/4 or pin 1/2) for the ON/OFF signal for these power supply.

The maximum currents allowed for all loads on the different voltages are:

Voltage	Maximum current for all loads	Possible loads
-12 V	0.5 A	- PC/104 (J36) - PC/104-PLUS (J53)
-5 V	0.5 A	- PC/104 (J36)
12 V	1 A	- PC/104 (J36) - PC/104-PLUS (J53)

3.6.2 3.3 V AND 5 V

The switching regulators on the PIP for 3.3 V and for 5 V supplies maximum 5 A for all loads not soldered down on the PIP PCB. So each load you add to one of these voltages must be accumulated and the total amount of current must not exceed the below mentioned current values.

Voltage	Maximum current for all loads	Possible loads
3.3 V	5 A	- sDVO expansion (J19) - LVDS flat panel (J27) - SATA Power (J54) - PC/104-PLUS (J53)
5 V	5 A	- sDVO expansion (J19) - LVDS flat panel (J27) - Backlight Inverter (J28) - SATA (J54) - IDE (J41) - USB (J40, J43) - Parallel port floppy disk (J3) - PC/104 (J29/J36) - CAN expansion (J35) - PC/104-PLUS (J53) - DVI (J20)

4.2 PC/AT FUNCTIONALITY

The PIP operates as a standard PC/AT with all dedicated registers for

- Timers
- Interrupt controller
- DMA controller
- Real-time clock
- Keyboard controller
- Parallel, serial ports
- IDE controller
- VGA controller

4.3 STATUS INDICATORS

The PIP provides 13 status indicator LEDs, giving you visual information about the actual operating status.

4.3.1 POWER INDICATOR LED

The power LED indicator lights green if the system has started and is under power. If the System is in Soft Off (S5) mode this LED lights yellow. In S3 State (suspend to RAM) this LED blinks green.

If the CPU temperature is above 100 °C this LED blinks green/yellow. If the CPU temperature is above 125 °C the PIP shuts down to Soft Off immediately, and on the next power up this LED blinks red until VINCON is cycled.

4.3.2 RESET INDICATOR LED

The red reset LED lights if the PIP is in reset state. If this LED is blinking the system is in power-fail state. This means the power supply was overloaded or a short circuit has occurred. In this case the power supply switches off to protect itself.

After removing of the overload or the short circuit cause, you can restart the power supply by cycling the power to the PIP or by pushing the Power Button twice, first for about 4 seconds until the PIP goes to Soft Off state and second for a short time until the PIP starts normally.

4.3.3 HDD INDICATOR LED

The green HDD access indicator lights whenever an IDE or SATA device is accessed.

4.3.4 IEEE1394b INDICATOR LED

The yellow FireWire IEEE1394b indicator lights whenever a FireWire device is connected.

4.3.5 LAN 1 Activity INDICATOR LED

The green LAN 1 Activity indicator lights whenever a link is detected. The LED blinks if network activity is detected.

4.3.6 LAN 1 Speed INDICATOR LED

The LAN 1 Speed indicator lights green whenever a 100 MBit/s link is detected and lights yellow when a GBit/s link is detected. For 10 MBit/s it remains dark.

4.3.7 USER1, USER2 INDICATOR LEDS

The yellow USER1 and USER2 LEDs are programmable, please refer to the chapter 5.1.4 for more information.

4.3.8 Wireless WAN INDICATOR LED

The Wireless WAN (**Wide Area Network**) LED lights green if the module in the PCI-Express Mini Card Slot is powered and ready, blinks slowly green at searching and blinks intermittent green at activity.

4.3.9 Wireless LAN INDICATOR LED

The Wireless LAN (**Local Area Network**) LED lights green if the module in the PCI-Express Mini Card Slot is powered and ready, blinks slowly green at searching and blinks intermittent green at activity.

4.3.10 Wireless PAN INDICATOR LED

The Wireless PAN (**Personal Area Network**) LED lights green if the module in the PCI-Express Mini Card Slot is powered and ready and blinks intermittent green at activity.

4.3.11 LAN 2 Activity INDICATOR LED

The green LAN 2 Activity indicator lights whenever a link is detected. The LED blinks if network activity is detected.

4.3.12 LAN 2 Speed INDICATOR LED

The LAN 2 Speed indicator lights green whenever a 100 MBit/s link is detected and lights yellow when a GBit/s link is detected. For 10 MBit/s it remains dark.

4.4 BATTERY CIRCUIT

An on board battery provides power for the data retention of RTC and CMOS RAM. The battery can be changed in the field (battery type is: Renata CR2032 3V Lithium Coin Cell).

- Remove the 6 screws to open the right side panel.



Figure 42: Removing the 6 screws

- Pull the battery out of its socket and replace it with the new one.

4.5 HARDWARE WATCHDOG

The PIP uses the hardware watchdog implemented in the Intel ICH7-MDH. For further information please refer to the ICH7 I/O Controller Hub Datasheet.

4.6 RS485 / RS422 INTERFACES

If the RS485 / RS422 modules (these are optional) are used as half-duplex interfaces (using a 2-wire connection) it is necessary to control the transmit driver enable. This is done by the UART automatically with the RTS signal. But first this must be enabled with the correct BIOS setting about the serial interface type (please refer to the appropriate BIOS User Manual).

4.7 TEMPERATURE SENSORS

There are four different temperature sensors on the PCB. Three of them are located on the SMBus.

SMBus Address	Sensor Type	Temperature	Readable with
\$30	MAX6681 remote	CPU die (via CPU thermal diode)	Mother Board Monitor 5.3.7.0
\$30	MAX6681 local	PCB	Mother Board Monitor 5.3.7.0
\$90	LM75	Memory	Mother Board Monitor 5.3.7.0

There is also a Digital Thermal Sensor (DTS) directly in each CPU die integrated. This sensors are readable with the CoreTemp tool.

For Links to this Tools please have a look at chapter 5.4.

4.8 VOLTAGE SENSORS

In the SMSC Super-IO SCH3114 are four voltage sensors for CPU core voltage, 2.5 V, 5 V and 12V. Unfortunately until now there is no tool available for reading out this values.

5 SOFTWARE

5.1 PIP EXTENSION REGISTER SET

5.1.1 OVERVIEW

IO-Address	Function	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
\$800	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$801	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$802	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$803	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$804	CAN Resource Register	<i>CANI3</i>	<i>CANI2</i>	<i>CANI1</i>	<i>CANI0</i>	<i>CANA3</i>	<i>CANA2</i>	<i>CANA1</i>	<i>CANA0</i>
\$805	CAN Control Register	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	<i>CANRES</i>
\$806	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$807	RESERVED	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
\$808	MPL AG USE ONLY	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)	Reserved (do not modify)
\$809	User LED Control Register	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	<i>ULED2</i>	<i>ULED1</i>
\$80A	PIP Status Register 1	Reserved	Reserved	<i>BR_UP</i>	<i>BR_DN</i>	<i>WLANDIS</i>	<i>1394DIS</i>	<i>NICDIS2</i>	<i>NICDIS1</i>
\$80B	PIP Status Register 2	<i>DSW2_1</i>	<i>DSW2_2</i>	<i>DSW2_3</i>	<i>DSW2_4</i>	<i>DSW2_5</i>	<i>DSW2_6</i>	<i>DSW2_7</i>	<i>DSW2_8</i>
\$80C	Parallel Port Floppy Register	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	<i>PPEN</i>
\$80D	PIP Family ID Register	<i>PIPID7</i>	<i>PIPID6</i>	<i>PIPID5</i>	<i>PIPID4</i>	<i>PIPID3</i>	<i>PIPID2</i>	<i>PIPID1</i>	<i>PIPID0</i>
\$80E	PIP10 Variant Register	<i>PIPVAR7</i>	<i>PIPVAR6</i>	<i>PIPVAR5</i>	<i>PIPVAR4</i>	<i>PIPVAR3</i>	<i>PIPVAR2</i>	<i>PIPVAR1</i>	<i>PIPVAR0</i>
\$80F	PLD Code Revision Register	<i>PLDCR7</i>	<i>PLDCR6</i>	<i>PLDCR5</i>	<i>PLDCR4</i>	<i>PLDCR3</i>	<i>PLDCR2</i>	<i>PLDCR1</i>	<i>PLDCR0</i>

Notes:

- The RESERVED registers and register bits may be used in other PIPx industrial PCs from MPL AG or in further revisions of this PIP. Do not modify.

5.1.2 CAN RESOURCE REGISTER
CANRES: 804h

Bit Number	7	6	5	4	3	2	1	0
Function	CAN/3	CAN/2	CAN/1	CAN/0	CANA3	CANA2	CANA1	CANA0
Default	0	0	0	0	0	0	0	0

CAN/3 to 0] (Read / Write)

These bits determine the interrupt routing of the IRQ0n pin on the CAN Expansion Interface Connector.

CAN/3 to 0]	Interrupt
0 0 0 0	Disabled
0 0 0 1	Disabled
0 0 1 0	Disabled
0 0 1 1	IRQ3
0 1 0 0	IRQ4
0 1 0 1	IRQ5
0 1 1 0	IRQ6
0 1 1 1	IRQ7
1 0 0 0	Disabled
1 0 0 1	IRQ9
1 0 1 0	IRQ10
1 0 1 1	IRQ11
1 1 0 0	IRQ12
1 1 0 1	Disabled
1 1 1 0	IRQ14
1 1 1 1	IRQ15

A disabled value write into this register results in a readable value of 0000b.

CANA/3 to 0] (Read / Write)

These bits determine the I/O base address of the CSn pin on the CAN Expansion Interface Connector.

CANA/3 to 0]	I/O Address
0 0 0 0	Disabled
0 0 0 1	1000h
0 0 1 0	8000h
0 0 1 1	E000h
0 1 0 0	Disabled
0 1 0 1	Disabled
0 1 1 0	Disabled
0 1 1 1	Disabled
1 0 0 0	Disabled
1 0 0 1	Disabled
1 0 1 0	Disabled
1 0 1 1	Disabled
1 1 0 0	Disabled
1 1 0 1	Disabled
1 1 1 0	Disabled
1 1 1 1	Disabled

A disabled value write into this register results in a readable value of 0000b.

5.1.3 CAN CONTROL REGISTER

CANCTRL: port 805h

Bit Number	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	CANRES
Default	0	0	0	0	0	0	0	1

CANRES (Read / Write)

This bit determines the state of the RSTn pin on the CAN Expansion Interface Connector (please refer to the chapter 3.4.2.18).

CANRES	Function
0	CAN controller reset disabled (running)
1	CAN controller reset active

5.1.4 USER LED CONTROL REGISTER

ULEDCTRL: port 809h

Bit Number	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	ULED2	ULED1
Default	0	0	0	0	0	0	0	0

ULED2 (Read / Write)

This bit controls the user LED2.

ULED2	Function
0	User LED 2 off
1	User LED 2 on

ULED1 (Read / Write)

This bit controls the user LED1.

ULED1	Function
0	User LED 1 off
1	User LED 1 on

5.1.5 PIP STATUS REGISTER 1

STAT1: port 80Ah

Bit Number	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	BR_UP	BR_DN	WLANdis	1394dis	NIC2dis	NIC1dis
Default	0	0	X	X	X	X	X	X

Brightness up / down (Read-Only)

These bits reflect the voltage level on the Panel Dimming Connector (J24). This inputs are used to select the backlight inverter brightness.

WLANdis, 1394dis, NIC2dis, NIC1dis (Read-Only)

These bits reflect the position of the DIP switches SW1-2 and SW1-6 to SW1-8.

5.1.6 PIP STATUS REGISTER 2
STAT2: port 80Bh

Bit Number	7	6	5	4	3	2	1	0
Function	<i>DSW2_1</i>	<i>DSW2_2</i>	<i>DSW2_3</i>	<i>DSW2_4</i>	<i>DSW2_5</i>	<i>DSW2_6</i>	<i>DSW2_7</i>	<i>DSW2_8</i>
Default	0	0	0	0	0	X	X	0

***DSW2_8* to *DSW2_1* (Read-Only)**

These bits reflect the position of DIP switches SW2-1 to SW2-8. These DIP switches are used to select the LVDS panel graphics mode.

5.1.7 PARALLEL PORT FLOPPY REGISTER
PPFLPY: port 80Ch (Read / Write)

Bit Number	7	6	5	4	3	2	1	0
Function	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	<i>PPEN</i>
Default	0	0	0	0	0	0	0	0

<i>PPEN</i>	Function
0	Parallel port power pin disabled (connected to Ground)
1	Parallel port power pin enabled (connected to +5 V)

Please refer to the section 3.4.1.1 for the location of the parallel port power pin.

5.1.8 PIP FAMILY ID REGISTER
PIPID: port 80Dh (Read-Only)

Bit Number	7	6	5	4	3	2	1	0
Function	<i>PIPID7</i>	<i>PIPID6</i>	<i>PIPID5</i>	<i>PIPID4</i>	<i>PIPID3</i>	<i>PIPID2</i>	<i>PIPID1</i>	<i>PIPID0</i>
Default	X	X	X	X	X	X	X	X

This register is used to identify the current PIP PCB Model and Revision (*PIPID* [7 to 0]: *B0h* to *BFh*).

<i>PIPID</i> [7 to 0]	Function
B0h	PIP20 – PCB Rev. A
B1h	PIP20 – PCB Rev. B
B2h	PIP20 – PCB Rev. C
...	...

5.1.9 PIP20 VARIANT REGISTER

PIPVAR: port 80Eh (Read-Only)

Bit Number	7	6	5	4	3	2	1	0
Function	PIPVAR7	PIPVAR6	PIPVAR5	PIPVAR4	PIPVAR3	PIPVAR2	PIPVAR1	PIPVAR0
Default	X	X	X	X	X	X	X	X

PIPVAR[7 to 0] (Read-Only)

This register is used to identify the assembly variant of the PIP20 PCB.

PIPVAR[7 to 0]	PIP Variant (label on PCB)	PIP Product Naming (label on case)
01h	PIP20-1	PIP20-1
02h	PIP20-2	PIP20-2
...	...	
10h	PIP20-C00	Customer Specific PIP20
...	...	

5.1.10 PLD CODE REVISION REGISTER

PLDCR: port 80Fh (Read-Only)

Bit Number	7	6	5	4	3	2	1	0
Function	PLDCR7	PLDCR6	PLDCR5	PLDCR4	PLDCR3	PLDCR2	PLDCR1	PLDCR0
Default	X	X	X	X	X	X	X	X

PLDCR[7 to 0] (Read-Only)

This register is used to identify the code revision of the programmable on board logic.

PLDCR[7 to 0]	Function
00h	Code Revision V00
01h	Code Revision V01
...	...

5.2 BIOS

BIOS upgrading with an additional utility is easily possible. Please refer to the appropriate BIOS User Manual for additional information.

5.3 DEVICE DRIVERS

The drivers can be found on the MPL AG homepage at the respective PIP pages. But the latest driver versions are always available on the Internet:

- Texas Instruments TSB82AA2 1394b FireWire Controller: [?ProductID=2198](#)

No special driver is needed, because the standard Operating System FireWire OHCI driver will work for this controller.

For Microsoft Windows specific 1394b behavior, please have a look at the Microsoft homepage, especially at the KB885222 article.

- Intel 82573L GBit Ethernet Controller:

http://downloadfinder.intel.com/scripts-df/Product_Filter.asp?ProductID=2198

- Intel 82945 GMCH with IGD (Integrated Graphics Device) and ICH7-MDH:

http://downloadfinder.intel.com/scripts-df/Product_Filter.asp?ProductID=2300

Note:

- Links might have changed.

5.4 TOOLS

There are different parameters on the PIP that can be monitored with different freeware tools:

- CoreTemp (CPU information, CPU temperature):

<http://www.thecoollest.zerobrains.com/CoreTemp>

- HD Tune (Hard Disk information):

<http://www.hdtune.com/>

This page intentionally left blank.

This page intentionally left blank.

This page intentionally left blank.

This page intentionally left blank.

6 COPYRIGHT

Copyright © 2007 by MPL AG Elektronikunternehmen. All rights are reserved. Reproduction of this document in part or whole, by any means is prohibited, without written permission from MPL AG Elektronikunternehmen.

7 DISCLAIMER

MPL AG has fully tested the PIPs and reviewed the documentation. However, MPL AG makes no warranty or representation, either expressed, or implied, with respect to this product, its quality, performance, merchantability, or fitness for a particular purpose.

In no event will MPL AG be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect in the product or its documentation, even if advised of the possibility of such damages. In particular MPL AG shall have no liability for any parts connected to this product.

MPL AG reserves the right to make changes to any product herein to improve reliability, function or design.

8 TRADEMARKS

Brand or product names are trademarks and registered trademarks of their respective holders.

9 SUPPORT

9.1 FAQs

Please have a look at our homepage www.mpl.ch/t2400.html. In the menu at the left hand side you will find FAQ's for each PIP.

9.2 SERIAL NUMBER AND REVISION

For support it is needed that you know the product name, the product variant, the serial number and the BIOS number of your PIP. Please have a look at the label on the bottom of the PIP housing for this.

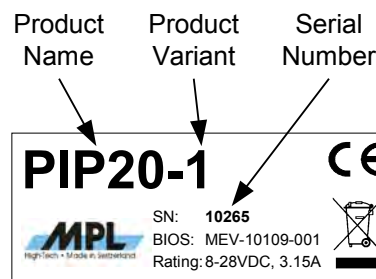


Figure 43: PIP Label

9.3 CONTACT MPL AG

In case of general information questions please feel free to contact us at our homepage (www.mpl.ch) or per email (info@mpl.ch).

In case of sales information questions please send an email to sales@mpl.ch.

If you have a technical problem with a PIP, first please read the BIOS User Manual and this manual carefully. If you can't solve the problem on your own you can contact us for technical support per email at support@mpl.ch.

Our local Distributor: