Embedded Solutions

Standard Product Overview

Board-Level Computers for Industrial Applications

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Contents

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MEN Product Lines

Contents by Page

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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What this Catalog is about

MEN Mikro Elektronik (Germany), MEN Micro (USA), MEN Mikro Elektronik (France) and MEN Micro (UK) provide failure-safe computer boards and completely configured systems for industrial and embedded applications in the worldwide Windows/Linux and real-time arena.
In addition, most products can be qualified for extreme environmental conditions.

This catalog gives an introduction to our standard board and rack product range with the corresponding BSP and driver software support. MEN also offers custom development and production services of computer boards and complete systems as well as development and integration of IP cores for MEN boards.
The most complete and up-to-date information is accessible at our websites under **www.men.de, www.men-france.fr, www.menmicro.co.uk, www.menmicro.com,** where you will find the complete overview of all our product data sheets (PDF and HTML) with additional product description, block diagrams, related product info and ordering numbers. If you do not find the product you are looking for in this catalog, please don't hesitate to contact our international sales offices through our websites.

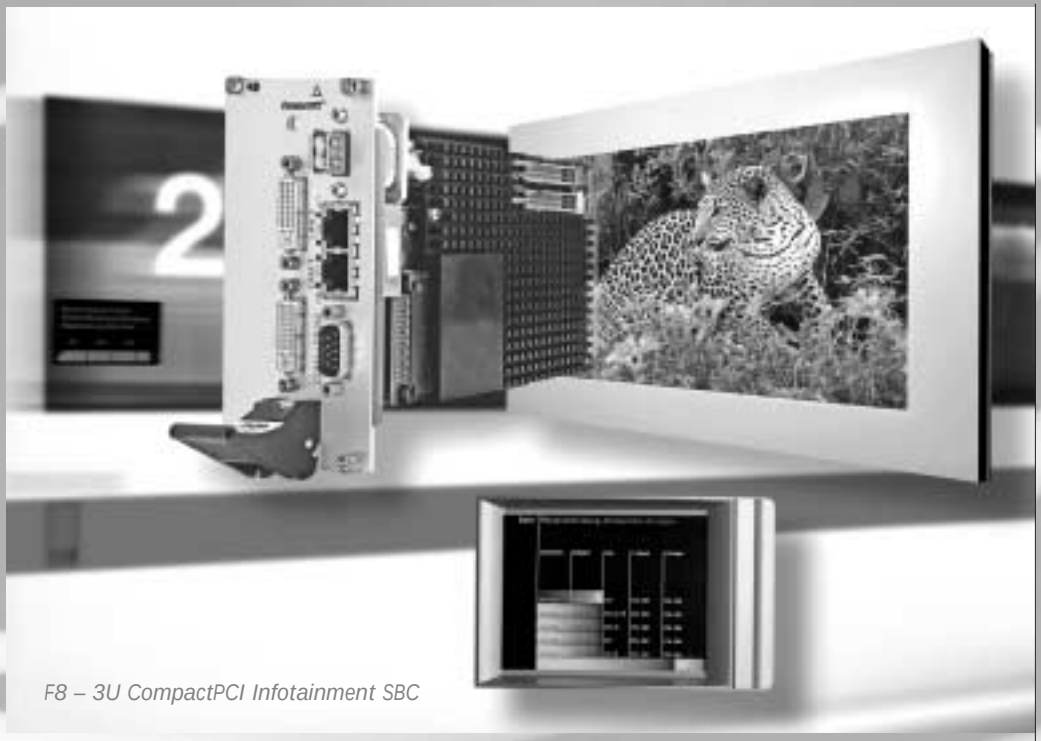
CompactPCI

Overview – 3U/6U CompactPCI Boards

MEN offers a complete range of 3U and 6U CompactPCI single-board computers based on PC and PowerPC architectures for rugged industrial and embedded applications. In addition to state-of-the-art PC functionality, all CPU boards feature industrial functions such as CompactFlash, real-time clock, or watchdogs for temperature and voltage control. Many cards also include M-Module, PC-MIP and PMC mezzanine slots for flexible and individual extension by further industrial and computing I/O functions. Serial interface adapters (SA-Adapters) provide access to additional line physics. A growing number of MEN boards are available with on-board FPGA which allows to implement IP cores tailored to the application. Software support comprises Windows, Linux and several popular real-time operating systems. MEN CompactPCI boards have been developed to work also in rugged environments – shock, vibration, drop, resonance, humidity, chemicals, -40 to +85°C operating temperature.

3U CompactPCI Boards

	Type	CPU	CompactPCI/ PXI	Memory max.	Interfaces	Local Extensions	Software	Applications
F11 *p. 6*	SBC	ULV/ULP Pentium® III / Celeron® 400...933MHz	32-bit/33MHz PCI system slot, 3 CompactPCI slots or stand-alone	512MB DRAM, 2MB SRAM, CompactFlash	2 Fast Ethernet, COM 1, 2 USB 1.1, opt. COM 2 VGA/digital video output, keyboard/mouse	FPGA for custom I/O, 7 SA-Adapters, local hard disk	Windows, Linux, VxWorks	Transportation, mobile computing, industrial automation
F10 *p. 7*	SBC	Pentium® M / Celeron® M 1 up to 2GHz	64-bit/66MHz PCI system slot, 1 CompactPCI slot	8GB ECC DRAM, 4MB SRAM, 1GB NAND Flash	4 Gigabit Ethernet, 2 COMs, USB, AC'97, keyb./mouse, parallel ATA	FPGA for custom I/O, hard disk, SA-Adapters	Windows, Linux, VxWorks	Industrial automation, instrumentation
F9 *p. 8*	SBC	Pentium® M / Celeron® M 600MHz...1.8GHz	32-bit/33MHz PCI system slot, 1 or 2 cPCI slots	1 GB DDR RAM, CompactFlash	DVI, 1 Gigabit Ethernet, 4 USB 2.0, 2 IDE	Rear I/O card (Ethernet, IDE, 2 USB, VGA, keyb./mouse, COM1), extension card	Windows, Linux, VxWorks	Industrial automation, instrumentation
F8 *p. 9*	SBC	TM5900/800MHz (Transmeta Crusoe)	32-bit/33MHz PCI system slot, 12 HP cPCI or stand-alone	1 GB DDR RAM, CompactFlash	DVI, DVI-I, 2 Fast Ethernet, 1 COM, 1 USB 1.1	FPGA for custom I/O, 8 SA-Adapters, local hard disk	Windows, Linux	Transportation, mobile computing, industrial automation
F7N *p. 10*	SBC	Pentium® III / Celeron® up to 1.26GHz	32-bit/33MHz PCI system slot, 1 or 2 cPCI slots	512MB DRAM, CompactFlash	DVI (VGA/TFT), Gigabit Ethernet, USB	Extension card (keyboard/mouse, 2 COMs, IDE, floppy)	Windows, Linux, QNX, VxWorks	Industrial automation, instrumentation
F7 –	SBC	Pentium® III / Celeron® up to 850MHz	32-bit/33MHz PCI system slot, 1 or 2 cPCI slots	256MB DRAM, CompactFlash	DVI (VGA/TFT) Fast Ethernet, USB	Extension card (keyboard/mouse, 2 COMs, IDE, floppy)	Windows, Linux, QNX, VxWorks	Industrial automation, instrumentation
F6 *p. 11*	SBC	PowerPC MPC8260/ 200MHz	64-bit/66MHz system or peripheral slot, hot swap, 1 CompactPCI slot	256MB DRAM, CompactFlash	2 Fast Ethernet, 4 SCC, 2 multichannel ports, 1 FCC for COM	Extension card (for ATM, ISDN, T1/E1, HDLC etc.) optional	Linux, VxWorks	Telecom, industrial automation
F1N *p. 12*	SBC	PowerPC MPC8245/ 300MHz	32-bit/33MHz PCI system slot, 1 CompactPCI slot	512MB DRAM, CompactFlash	2 COMs, IDE, keyboard/mouse, USB	2 PC-MIP slots Type I/II, 2 SA-adapters	Linux, VxWorks, QNX, OS-9	Transportation, mobile computing, industrial automation
F301 *p. 13*	Ethernet Switch	---	32-bit/33-MHz, 2 CompactPCI slots	---	Up to 8 Fast Ethernet ports (front);1 Fast Ethernet controller (rear J1); Opt.: 1 Fast Ethernet (J2)	---	Driver software not necessary	Transportation, mobile computing, industrial automation
F207 *p. 13*	PCI-104 Carrier	---	32-bit/33-MHz, 2 cPCI slots with 1 PCI-104 module	---	---	Up to 4 PCI-104 modules	PCI-104 driver software	Transportation, mobile computing, industrial automation
F206I *p. 15*	PC/104 Carrier	---	32-bit/33-MHz, 2 CompactPCI slots	---	---	1 PC/104 slot, PCI-to-ISA bridge	PC/104 driver software	Transportation, mobile computing, industrial automation
F206N *p. 14*	Slave SBC	NIOS Soft Core	32-bit/33..66-MHz 1 cPCI system or peripheral slot	16 MB SDRAM, 2 MB Flash	1 debug interface	FPGA for custom I/O	NIOS sample designs, update tools	Transportation, mobile computing, industrial automation
F206 *p. 15*	Octal UART	---	32-bit/33..66-MHz 1 CompactPCI slot, 3.3V VIO	2MB Flash, 16MB DRAM	Octal 16450 UART PHYs via SA- Adapters (RS232/422/485/TTY)	FPGA for custom I/O	Linux, VxWorks, Windows XP	Transportation, mobile computing, industrial automation
F205 *p. 16*	M-Module Carrier	---	1 CompactPCI slot	---	---	2 M-Module slots	M-Module driver sw	Industrial automation, instrumentation
F204 *p. 16*	M-Module Carrier	---	1 CompactPCI slot	---	---	1 M-Module slot	M-Module driver sw	Industrial automation, instrumentation
F203 *p. 17*	PC-MIP Carrier	---	1 CompactPCI slot	---	---	3 PC-MIP slots	PC-MIP driver sw	Industrial automation, instrumentation



F8 – 3U CompactPCI Infotainment SBC

CompactPCI

6U CompactPCI Boards

	Type	CPU	CompactPCI/ PXI	Memory max.	Interfaces	Local Extensions	Software	Applications
D6 *p. 18*	SBC	Pentium® M / Celeron® M 1 up to 2GHz	64-bit/66MHz 1 cPCI system slot, hot swap, PICMG 2.16	16GB ECC DRAM, 4MB SRAM, 1GB NAND Flash	4 Gigabit Ethernet 2 COMs, USB, AC'97, keyboard/mouse, parallel ATA	FPGA for custom I/O, hard disk, SA-Adapters, 2 PMC slots	Linux, Windows, VxWorks	Industrial automation, communication, instrumentation
D5 *p. 19*	SBC	PowerPC MPC8560/800MHz	64-bit/66MHz 1 cPCI system slot	2GB ECC DRAM, 32KB FRAM, 1GB NAND Flash	2 Gigabit/1 Fast Ethernet, 2 COMs, parallel ATA	FPGA for custom I/O, local hard disk, 2 PMC slots	Linux, VxWorks, QNX	Industrial automation, telecom, instrumentation
D4 *p. 20*	SBC	Mobile Pentium® 4 1.7 and 2.2GHz	64-bit/66MHz 1 cPCI system slot, hot swap, PICMG 2.16	1GB DRAM, CompactFlash	DVI (VGA/TFT), 3 Gigabit Ethernet, 2 COMs, 3 USB, LPT,floppy, keyboard/mouse	2 PC-MIP slots Type I/II, or 1 PMC slot	Windows, Linux, VxWorks	Industrial automation, communication, instrumentation
D3c *p. 21*	SBC	PowerPC MPC8245/300MHz	32-bit/33MHz 1 cPCI system slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	2 PMC slots	Linux, VxWorks, OS-9, QNX	Industrial automation
D3b *p. 22*	SBC	PowerPC MPC8245/300MHz	32-bit/33MHz 1 cPCI system slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 M-Module slots	Linux, VxWorks, OS-9, QNX	Industrial automation
D3a *p. 22*	SBC	PowerPC MPC8245/300MHz	32-bit/33MHz 1 cPCI system slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 PC-MIP slots Type I/II	Linux, VxWorks, OS-9, QNX	Industrial automation
D2 –	SBC	Pentium® 266MHz	32-bit/33MHz 1 cPCI system slot	640MB DRAM 4MB SRAM, CompactFlash	Fast Ethernet, 2 COMs, USB, 2 IDE, keyboard/ mouse, floppy, parallel	3 PC-MIP slots Type I/II	Windows, Linux, VxWorks	Industrial automation, instrumentation
D302 *p. 23*	Binary I/O	---	1 cPCI slot	---	---	---	Windows, RTX, Linux, VxWorks, OS-9, QNX	Industrial automation, instrumentation
D203 *p. 24*	M-Module Carrier	---	1 cPCI slot	---	---	4 M-Module slots	M-Module driver software	Industrial automation, instrumentation
D202 *p. 24*	PC-MIP Carrier	---	1 cPCI slot	---	---	6 PC-MIP slots	PC-MIP driver software	Industrial automation, instrumentation

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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CompactPCI

F11 – 3U CompactPCI/PXI Pentium® III SBC

- 32-bit cPCI/PXI system slot or stand-alone, 12 HP
- ULP Pentium® III up to 933 MHz
- ULV Celeron® up to 650 MHz
- Up to 512 MB DRAM, 2MB SRAM, CompactFlash
- 2 Fast Ethernet, COM 1, 2 USB 1.1 (front)
- Option: COM 2 (front)
- VGA/digital video output, keyboard/mouse (front)
- Up to 1600 x 1200 pixels
- IDE (on-board)
- Prepared for 2.5" hard disk on board
- FPGA – further programmable I/O functions
- Option: up to 7 SA-Adapters

CompactPCI Bus

- 3U CompactPCI CPU board PICMG Spec. 2.0 R3.0 compliant
- 32-bit CompactPCI system slot functionality with 7 possible external loads
  - The board only functions properly with a 32-bit backplane and rear I/O, no 64-bit backplane
- PCI-to-PCI bridge
- Double-slot solution (plus 1 mechanical slot for hard disk)
- V(I/O): +3.3V or +5V (Universal Board)
- Also available as busless version (with ext. 5V)

CPU

- Celeron® or Pentium® III
- 400MHz or 650MHz or 933MHz processor core frequency
- 256KB or 512KB L2 cache
- 100MHz or 133MHz system bus frequency

Graphics

- Integrated VGA graphics controller
  - VGA connector at front panel
  - Up to 1600 x 1200 pixels

Memory

- 512MB SDRAM
  - One 144-pin SO-DIMM socket for synchronous DRAM modules
  - 133/100MHz memory bus frequency
- CompactFlash interface
  - Type I, True IDE
  - DMA is supported
- Serial EEPROM 4kbit for factory settings

Interfaces

- Two 10/100Mbits/s Ethernet channels
  - 82551(ER) controller
  - Two RJ45 interfaces at front panel
  - Four onboard LEDs to signal LAN Link and Activity status
  - Supports network boot
- Two USB 1.1 interfaces
  - UHCI implementation
  - Via rear I/O (J2)
  - Data throughput up to 12Mbits/s
  - Supplies High-Power (500mA) without external power supply
- PS/2 keyboard/mouse
- UART RS232 serial interfaces COM1 / COM2
  - One 9-pin D-Sub connector at front panel
  - One via onboard SA-Adapter
  - Up to 230 kbaud
  - FPGA-controlled
- UART serial interface
  - Via onboard SA-Adapter
  - FPGA-controlled

Mass Storage

- Fast IDE ports (UDMA4)
  - One IDE hard-disk/CD-ROM port via I/O connector to carrier board
  - One IDE port for local CompactFlash

Additional I/O through FPGA

- Available at I/O connector
- Depending on FPGA composition
- COM 1 and 2 at the front (see Interfaces)
- SRAM
- GPIO

PCI Interface

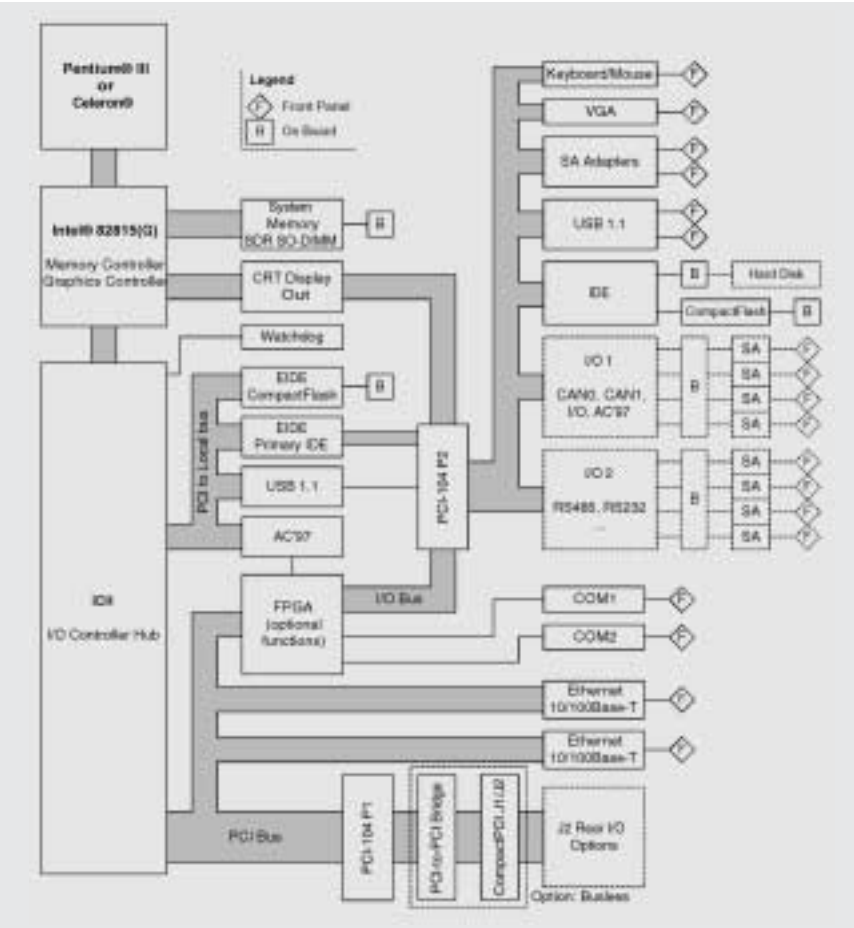
- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous

- Real-time clock, backed up by the carrier board
- Integrated hardware monitor

Software Support

- Award BIOS, Windows, Linux, VxWorks, QNX, RTX



Product Options

SA-Adapters

- Up to 8 SA-Adapters
- Mostly implemented in onboard FPGA
- RS232, RS422/485, binary I/O, AC'97, CAN...
- Example config.: 2 CAN (SA08), 2 RS485 (SA02), 1 RS232 (SA03), 1 digital I/O (5 O, 5 I, 3 I/O – SA15), 1 AC'97 w. opt. isolation (SA12)

Rear I/O on F11

- Via rear I/O transition module F9R
- Primary IDE (onboard)
- Two USB 1.1 ports (back panel, alternatively to F11 front panel)
- PS/2 keyboard/mouse (back panel, alternatively to F11 front panel)
- COM1 (onboard, TTL level), for connection of MEN SA-Adapters

IDE 2.5" hard disk

AC'97 AC'97 instead of SRAM

Busless Also available with ext. 5V

F10 – 3U CompactPCI/PXI Pentium® M SBC

- Pentium® M up to 2GHz
- 1-slot CompactPCI 32-bit/66MHz
- System slot or stand-alone
- Up to 4GB ECC DRAM
- NAND Flash, SRAM
- Graphics via FPGA (VGA front, LVDS rear)
- Up to 4 Gigabit Ethernet
- Parallel ATA for on-board hard disk
- PC connectivity as available in chipset
- Further I/O individually via FPGA

Product available Q IV / 2005

Processor

- Single Pentium® M Processor 760 at 2GHz
- Single Pentium® M LV Processor 738 at 1.4GHz
- Single Pentium® M ULV Processor 373 at 1GHz
- Passive heatsink

Chipset

- Intel E7320/7520 and ICH6300
- Front Side Bus: 400/533/800MHz
- I/O bandwith
  - Up to 3 x 8 PCI Express lanes
  - 32-bit/66MHz PCI bus
  - 32-bit/33MHz PCI bus
- High-end memory controller
  - One registered memory DDR channel operating in lock-step DDR2-400
  - Support of Intel® x4 Single Device Data Correction (x4 SDDC)
  - Support of standard SEC-DED (72, 64) ECC
  - Support of automatic read retry on uncorrectable errors
  - Hardware periodic memory scrubbing, including demand scrub support
  - 3.2 GB/s bandwidth

Memory

- 1 to 4GB ECC DDR2 400 memory
  - SO-DIMM
  - Prepared for 8GB (as soon as chips are avail.)
- 4MB nonvolatile SRAM, linear addressing
- 2MB BIOS/FPGA NOR Flash
- Up to 1GB NAND Flash (depending on chip availability)

CompactPCI Bus Interface

- System-slot or stand-alone operation
- 32-bit/66MHz 3.3V VIO

PCI Express

- 2 x 4 lanes to connect local Gigabit Ethernet controllers
- 2 x 8 lanes for extension such as high-end graphics (7520 only)

I/O

- ICH6300
  - COM1, COM2 available with SA-Adapter at the front or on rear I/O
  - Parallel ATA available on board for on-board hard disk extension or rear I/O
  - USB 1.1/2.0: 1 channel at front, 2 via rear I/O
  - Supports legacy keyboard/mouse SW with USB devices
  - Real-time clock with 256B GoldCap backup CMOS RAM
  - AC'97 via rear I/O
- FPGA
  - 2D graphics controller (VGA upto XGA)
  - VGA connector at front, LVDS at rear
  - SRAM controller
  - NAND Flash controller for on-board Flash disk
  - Open for additional functions such as HDLC controllers, CAN etc.

Front I/O

- VGA or serial lines via SA-Adapter
- USB
- 2 Ethernet channels
- Network
  - Two 1Gigabit Ethernet channels at the rear
  - Four 1Gigabit Ethernet channels at the front
  - Ethernet controllers are connected by 8 PCIE lanes to guarantee real throughput

BIOS

- Industrial AWARD BIOS in NOR Flash with recovery code
- Save set-ups in Flash option
- Boot from LAN and from USB capability
- Extended set-up
- Disk-less, keyboard-less and video-less operation is supported
- System, video and LAN BIOS shadowing
- Advanced Configuration and Power Interface (ACPI)
- Intelligent System Monitoring (thermal management)
- Set-up console redirection to serial port

Supervisor

- Support of a system management interface via non-intelligent IPMI
- Flexible Watchdog timers based on FPGA
- Detection of restart cause from memory

Compliance

- CompactPCI Core Specification PICMG 2.0 R3.0

Mechanical Specifications

- 6U, 4HP standard cPCI 6U board

Power Requirements

(Pentium® M 1.4GHz, 1GB memory)

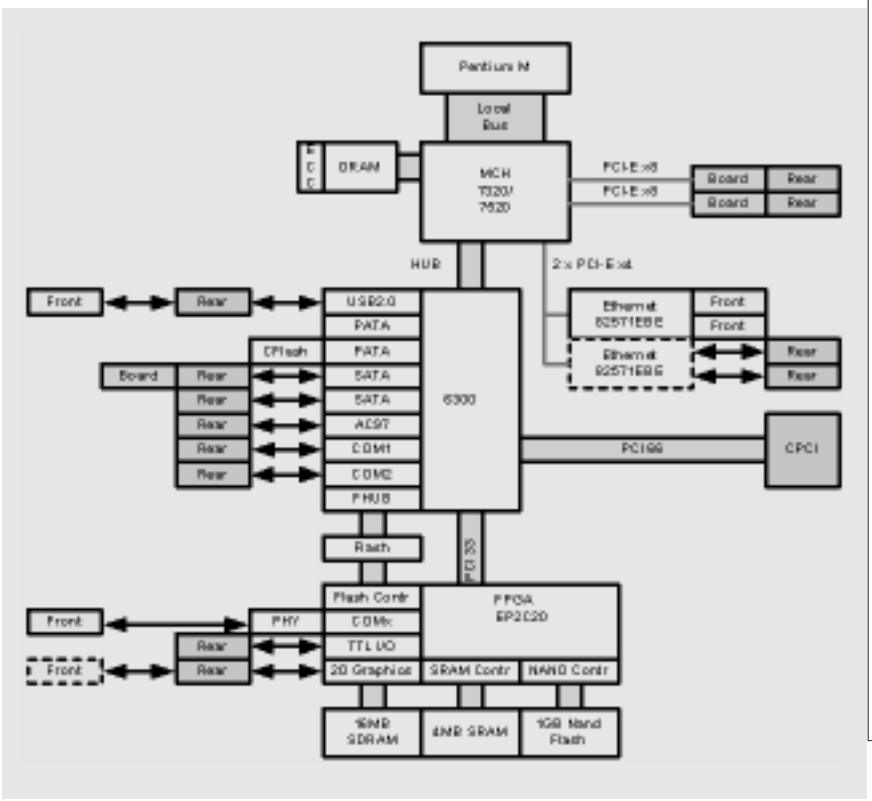
- +5V (+5%, -3%), 5A typ.
- +3.3V (+5%, -3%), 2A typ.

Environmental Specifications

- Temperature range (operation):
  - 0..+50°C
  - Airflow: min. 10m³/h
  - Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Operating System Compatibility

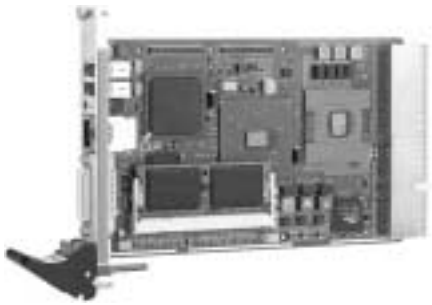
- Windows XP, Windows XP Embedded, Windows Server
- Linux
- VxWorks



CompactPCI

F9 – 3U CompactPCI/PXI Pentium® M SBC

- Pentium® M (LV) up to 1.8 GHz
- Celeron® M (ULV) 600 MHz
- 1-slot 32-bit CompactPCI system master
- PXI system controller
- 1 GB DDR RAM (SO-DIMM), CompactFlash
- Graphics controller / DVI-I (front)
- Gigabit Ethernet (front)
- Dual USB 2.0 (front)
- COM 1, IDE, 2 USB, keyboard/mouse via rear I/O



CompactPCI Bus
- 3U CompactPCI CPU board PICMG Spec. 2.0 R3.0 compliant
- 32-bit CompactPCI system slot functionality with 7 possible external loads
- PCI-to-PCI bridge
- Single-slot solution
- Rear I/O via J2/P2
- V(I/O): +5V (+3.3V on request)

CPU
- Intel® Celeron® M (ULV) or Pentium® M
- 600MHz..1.8GHz

Chipset
- Intel® i855 chip set consisting of:
  - 82855GME Graphics/Memory Controller Hub (GMCH)
  - 82801D I/O Controller Hub (ICH4)
  - 82802 Firmware Hub (FWH)

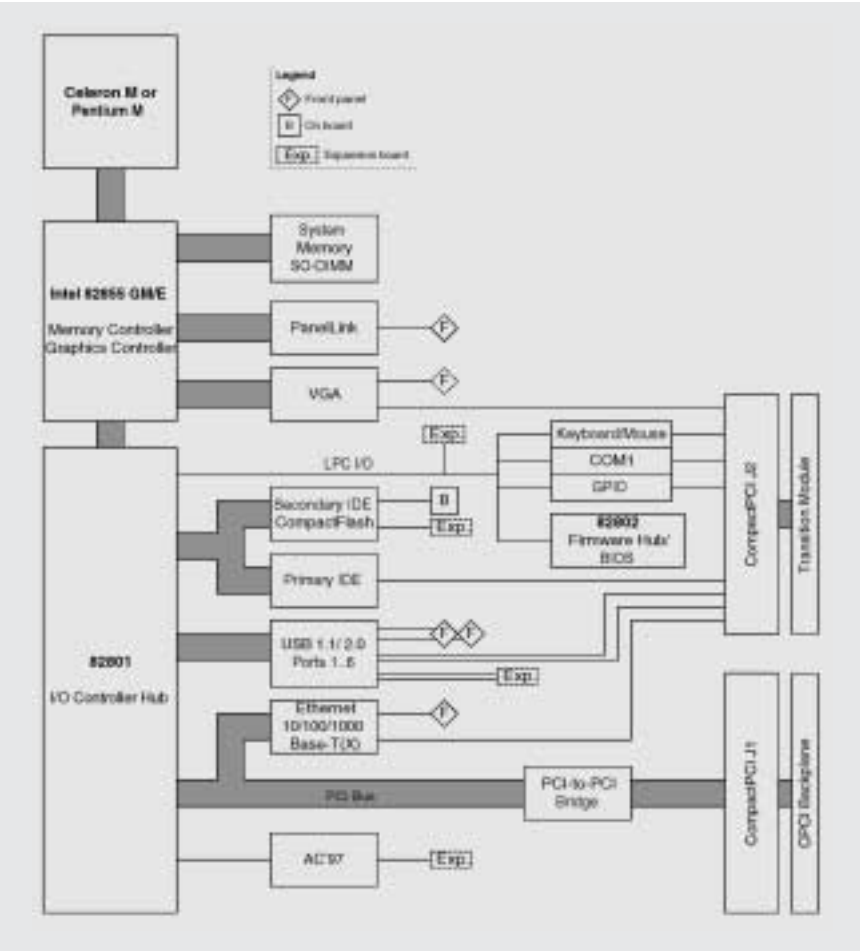
Graphics
- Integrated VGA graphics controller
  - Connection at front panel (DVI-I connector) or via rear I/O / transition module
  - Maximum resolution: 2048 x 1536, 16M colors @ 75Hz refresh rate (analog); 1600 x 1200, 16M colors @ 60Hz refresh rate (digital)
  - PanelLink Digital technology

Memory
- CPU L2 Cache
  - Celeron® M: 512KB
  - Pentium® M: 1MB or 2MB
- Up to 1 GB DRAM
  - One 200-pin SO-DIMM socket for DDR SDRAM modules
  - PC2100/2700
  - DDR266/333-SDRAM

Interfaces
- 10/100/1000Mbits/s Gigabit Ethernet controller
  - RJ45 interface at front panel or via rear I/O transition module
  - Two display LEDs in RJ45 connector to signal LAN Link and Activity status
  - Supports network boot
- USB 2.0 interfaces
  - Conforming to Open HCI 1.0a
  - Two ports via Type A connectors at front panel
  - Two ports via rear I/O transition module
  - Data throughput up to 480Mbits/s

Mass Storage
- Fast IDE ports (UDMA5)
  - One IDE port for local CompactFlash or 1.8" hard disk or connection to mezzanine expansion board with onboard hard disk drive or external device (Secondary IDE)
  - One IDE port via rear I/O transition module (Primary IDE)
- CompactFlash interface (Secondary IDE)
  - Type I and Type II
  - True IDE
  - For CFA ATA memory card or Microdrive

Software Support
- Phoenix BIOS for industrial applications
- Windows NT, Windows 2000/XP, Embedded Windows
- Linux (on request)
- VxWorks (on request)
- QNX (on request)
- RTX (on request)



Product Options

Secondary IDE
- 1.8" hard disk adapter instead of CompactFlash

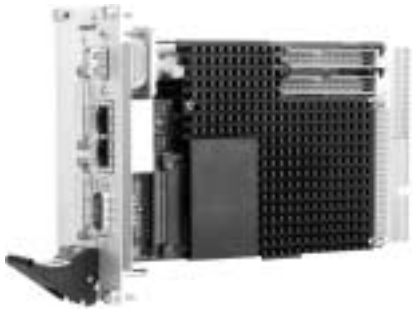
Rear I/O on F9
- Via rear I/O transition module F9R
- Primary IDE (onboard)
- Two USB 2.0 ports (back panel)
- PS/2 keyboard/mouse (back panel)
- COM1 (onboard, TTL level), for connection of MEN SA-Adapters
- Gigabit Ethernet (back panel)
- VGA analog video (back panel)

I/O on Expansion Board F9E
- COM1 (front)
- USB 2.0 (front)
- AC'97 audio (front)
- PS/2 keyboard/mouse (front)
- Secondary IDE usage for
  - CompactFlash, or 1.8", or 2.5" hard disk
- Floppy disk
- Local GPIO
- Rear I/O

Miscellaneous
- F9 for usage in 64-bit CompactPCI systems
- Extension possibility for F9 to 6U height
- 2nd Ethernet port via I/O extension board
- More different legacy I/O combinations via special I/O extension board
- One-piece 3U/8TE front panel for F9 in combination with different I/O extension boards

F8 – 3U CompactPCI Infotainment SBC

- 32-bit cPCI system slot or stand-alone, 12 HP
- Transmeta TM5900 / 800 MHz
- 512 MB DDR RAM (SO-DIMM) installed
- CompactFlash slot
- 2.5" hard disk slot
- Dual Fast Ethernet, COM 1, USB1.1 (front)
- DVI and DVI-I (front)
- LCD (up to UXGA) and CRT
- 16 MB integrated graphics RAM
- Up to 1600 x 1200 pixels
- AC'97 (opt. isolation), keyboard/mouse, CAN, COMs... optional via FPGA with SA-Adapters
- Option: up to 8 SA-Adapters



CompactPCI Bus
- 3U CompactPCI CPU board PICMG Spec. 2.0 R3.0 compliant
- 32-bit CompactPCI system slot functionality with 7 possible external loads
- PCI-to-PCI bridge
- Double-slot solution (plus 1 mechanical slot for hard disk)
- V(I/O): +3.3V or +5V (Universal Board)
- Also available as busless version (with ext. 5V)

CPU
- Transmeta Crusoe TM5900 Microprocessor with integrated Northbridge
- 800MHz

Graphics
- SM731 controller
- DVI and DVI-I connectors at front panel
- 235-MHz, 24-bit RAMDAC
- Maximum resolution: 1600 x 1200 pixels
- DualMon support

Memory
- 64KB L1 and 512KB L2 Cache integrated in Crusoe CPU
- Up to 1GB SO-DIMM DDR RAM (512MB installed)
- 133MHz memory bus operation
- 64-bit data bus, 2.5V
- Flash 4MB
- 8-bit data bus, 3.3V
- Hardware data protection
- Serial EEPROM 4kbit for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE
- Up to 8MB SDRAM, connected to FPGA, e.g. for video data
- 16MB embedded SGRAM in SM731 graphics controller

Interfaces
- Two 10/100Mbits/s Ethernet channels
- GD82551ER internal controllers
- Two RJ45 connectors at front panel
- UART RS232 serial interface COM1
- One 9-pin D-Sub connector at front panel
- Up to 230 kbaud
- USB 1.1
- Type A at front panel
- Option: second interface via onboard connector
- Option: Up to 8 SA-Adapters
- Mostly implemented in onboard FPGA
- RS232, RS422/485, binary I/O, keyboard/mouse, AC'97 audio, CAN...

Mass Storage
- Fast IDE ports (UDMA5)
- One IDE port for local CompactFlash
- One IDE hard-disk/CD-ROM port via 44-pin ribbon cable connector Ultra DMA100

PCI Interface
- 32-bit PCI interface at PCI-104 connector J1
- Support of 2 external masters

Software Support
- Award BIOS, Linux, Windows
- CANopen support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- MSCAN/Layer2 support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

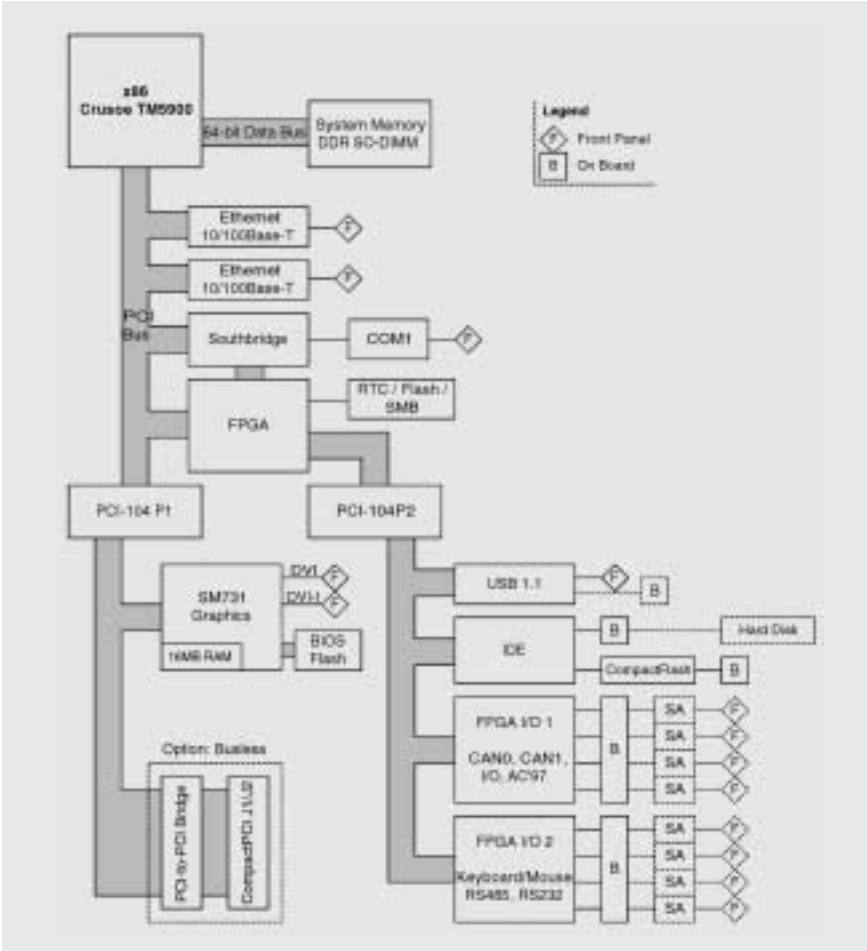
Product Options

SA-Adapters
- Up to 8 SA-Adapters
- Mostly implemented in onboard FPGA
- RS232, RS422/485, binary I/O, AC'97, CAN...
- Example config.: 2 CAN (SA08), 2 RS485 (SA02), 1 RS232 (SA03), 1 digital I/O (5 O, 5 I, 3 I/O – SA15), 1 AC'97 w. opt. isolation (SA12)

Front Connections
- Ethernet with D-Sub instead of RJ45
- COM1 with RJ45 instead of D-Sub
- COM2 also available at front

USB 1.1
- Second interface via onboard connector

Busless Also available with ext. 5V



F7N – 3U/6U CompactPCI/PXI Pentium® III SBC

- Pentium® III (Celeron®) up to 1.26GHz
- 1-slot 32-bit CompactPCI system master
- PXI system controller
- 512MB DRAM, CompactFlash
- Graphics controller/digital video output
- Gigabit Ethernet
- USB
- 2 COMs, IDE, floppy, parallel keyboard/mouse via extension card
- On-board hard disk via extension card
- Extension kit for 6U systems

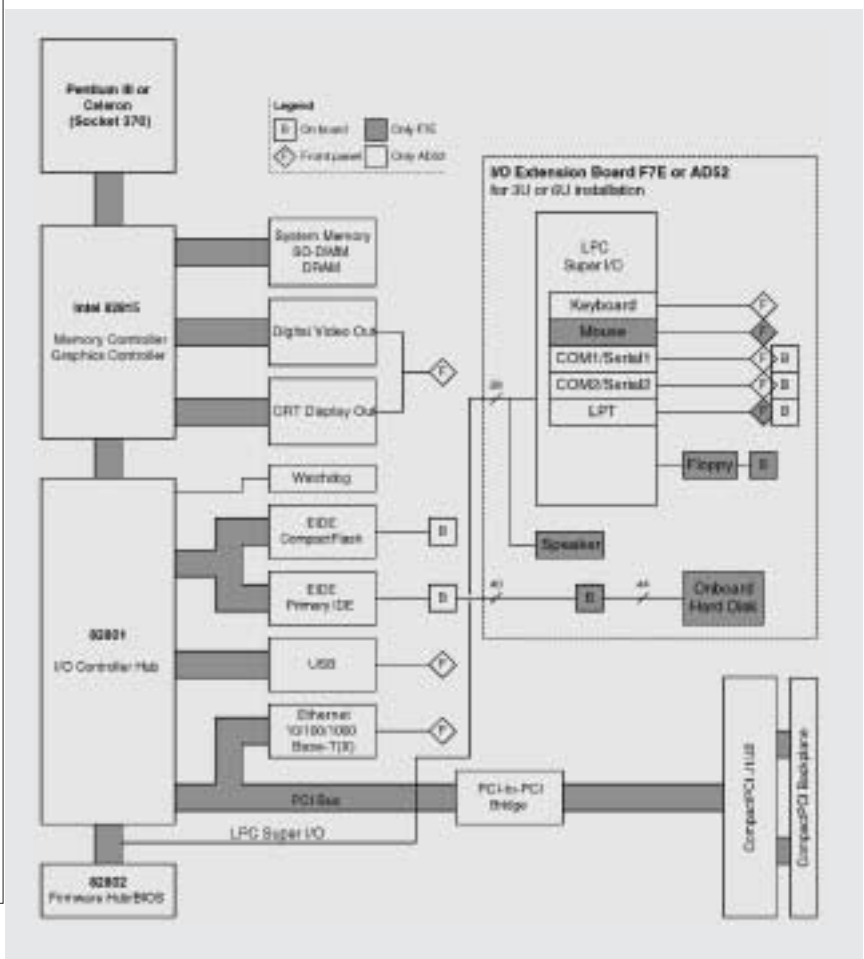
CompactPCI Bus
- 3U CompactPCI CPU board rev. 3.0 compliant
- 32-bit CompactPCI system slot functionality with 7 possible external loads due to PCI-to-PCI bridge
- PCI-to-PCI bridge
- Single-slot solution
- V(I/O): +5V (+3.3V on request)

CPU
- Celeron® or Pentium® III up to 1.26GHz
- 100/133MHz host frequency
- Socket 370

Graphics
- Integrated VGA graphics controller and TFT support
- DVI-I connection at front panel
- PanelLink® Digital technology
- Maximum resolution: 1280 x 1024 true-color (or 1600 x 1200, 8-bit color)

Memory
- Up to 512MB DRAM
- One 144-pin SO-DIMM socket for PC133, non ECC, unbuffered SDRAM
- 133MHz memory bus frequency
- CompactFlash interface
- Type I and Type II, true IDE

Interfaces
- Full-duplex 10/100/1000Base-TX PCI Ethernet controller 82540
- RJ45 interface at front panel
- Three display LEDs in RJ45 connector to signal LAN connection speed, LAN Link and Activity status
- Supports network boot
- USB (Universal Serial Bus) interface
- Conforming to UHCI 1.1
- At front panel
- Data throughput up to 12Mbits/s PXI
- Two trigger lines PXI compliant



Mass Storage
- Fast IDE ports (UDMA4)
- One IDE hard-disk/CD-ROM port via 40-pin ribbon cable connector U-DMA66
- One IDE port for local CompactFlash

I/O Extension
- 4/8HP I/O extension board F7E for standard interfaces at front panel
- For expansion of F7N as a 2-slot 3U, or 1- or 2-slot 6U solution using a special mounting kit
- COM1/COM2 serial (9-pin D-Sub)
- Keyboard/mouse (PS/2)
- LPT parallel (25-pin D-Sub) (only with 8HP I/O extension board)
- U-DMA66 via 44-pin connector for onboard hard disk, via 40-pin connector for ext. HD
- Floppy disk connection via 34-pin connector
- Connection to F7N via 40-pin IDE and 26-pin LPC connectors
- I/O extension card AD52
- For expansion of F7N as a 6U solution using a special mounting kit
- Two serial interfaces (9-pin D-Sub), as RS232 COM1/COM2 or via serial interface adapters for flexible configuration as RS232..TTY
- Keyboard/mouse (PS/2)
- LPT parallel (26-pin connector)
- Connection to F7N via 26-pin LPC connector

Miscellaneous
- Battery-backed real-time clock
- Integrated hardware monitor
- Reset button with "alive" LED at front panel
- Stand-alone operation possible with suitable MEN adapter

Electrical Specifications
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 5.8A max. (PIII / Celeron® 1.26GHz)
- +3.3V (3.2V..3.4V), 2.4A max. (PIII 1.26GHz), 2.2A max. (Celeron® 1.26GHz)
- +12V (11.5V..12.5V), 0.45A max. (PIII / Celeron® 1.26GHz)
- F7E: +5V (4.85V..5.25V), 1.75A max. (+80°C)
- MTBF: 65,500h @ 50°C

Software Support
- Phoenix BIOS for industrial applications
- Windows NT, Windows 2000/XP, Embedded Windows, VxWorks
- Linux (on request), QNX (on request), RTX (on request)

F6 – 3U CompactPCI/PXI PowerPC Communication SBC

- PowerPC MPC8260/200MHz
- 1-slot 64-bit CompactPCI system or peripheral board
- PXI system controller
- 256MB DRAM, CompactFlash
- Dual 10/100MBit Fast Ethernet
- 4 SCC, 2 multichannel interfaces
- 1 FCC for COM extension (ATM, T1/E1, HDLC etc.)
- Hot plug functionality
- MENMON BIOS for PowerPC cards

CompactPCI Bus

- 3U CompactPCI CPU board
- PICMG Spec. 2.0 R3.0 compliant
- Up to 66MHz PCI frequency
- 64-bit/66-MHz CompactPCI system and peripheral slot functionality
- V(I/O): +3.3V or +5V (Universal Board)
- CompactPCI hot-swap support
- I2O message unit

CPU

- PowerQUICC II (TM) MPC8260 @ 200 MHz

Memory

- Level 1 Cache integrated in MPC8260
- Up to 256MB optional SDRAM SO-DIMM
  - 64 bits
- 16MB SDRAM on local bus
  - Up to 64MB on request
  - 32 bits
- 8MB Flash
  - Up to 32MB on request
  - 64 bits
- 4Kbit serial EEPROM
  - For factory settings
- 32KB CAM on request

Interfaces

- Ethernet
  - Two FCC ports
  - 10/100Base-T/TX
  - 2 RJ45 connectors at front panel
- COM1/COM2
  - Two SCC ports
  - For RS232 UART operation
  - 2 RJ45 connectors at front panel
- COM3/COM4 or Ethernet
  - Two SCC ports
  - For HDLC/SDLC/UART/Ethernet/Transparent operation
  - Physical interface using SA-Adapter via 10-pin ribbon cable or COM extension
  - RS232..RS485, 10Base-T, isolated or not: for free use in system (cable to front or back)
- Additional ATM/Ethernet
  - One FCC port
  - Via COM extension adapter for ATM, Ethernet 10/100Base-T/TX
- Additional serial channels
  - Two multichannel controllers (MCC)
  - 128 serial full-duplex data channels (256x64kbps)
  - Via onboard COM extension adapters

Mass Storage

- IDE interface
  - 44-pin on-board connector for 1-mm ribbon cable
- CompactFlash (TM) interface (true IDE)

PXI

- Eight trigger lines compliant with PXI Specification

Miscellaneous

- Hardware watchdog
- Real-time clock
- Temperature sensor
- Hex switch for user settings and 33-MHz operation
- User LEDs
- Abort/reset buttons

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 1200mA typ.
  - +3.3V (3.21V..3.45V), 620mA typ.
- MTBF: 98,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to CompactPCI specification for 3U boards
- Weight: 230g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

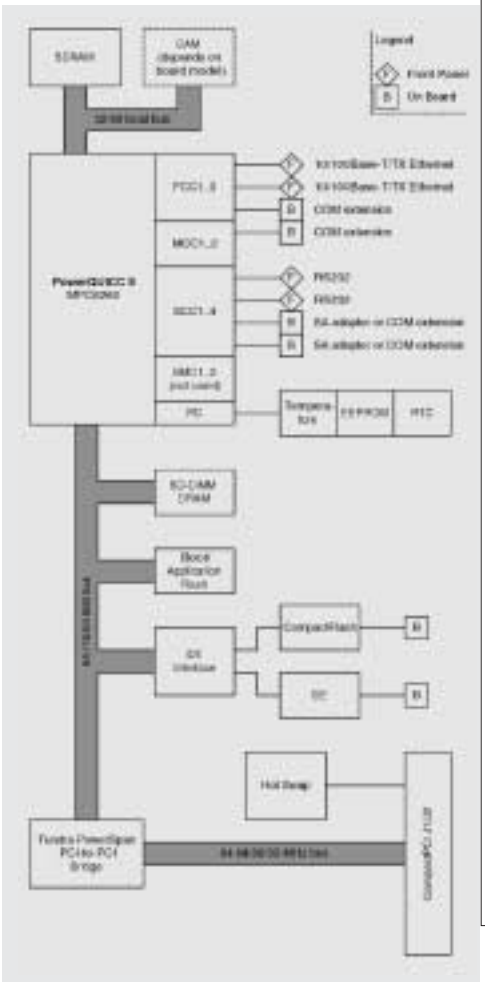
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MENMON
- Linux
- VxWorks



CompactPCI

F1N – 3U CompactPCI PowerPC SBC

- PowerPC MPC8245/300MHz
- 1-slot 32-bit CompactPCI system master
- 1MB ultra-fast DPRAM
- 512MB DRAM, CompactFlash
- Graphics via PC-MIP
- Ethernet via PC-MIP
- 2 COMs, IDE, USB, keyboard/mouse
- 2 PC-MIP slots
- Option: 4 RS232 and 100Base-T with 5 RJ45
- MENMON BIOS for PowerPC cards

CompactPCI Bus
- 3U CompactPCI CPU board rev. 2.1 compliant
  - Compliance with PCI specification 2.1
  - Up to 33MHz PCI frequency
- 32-bit CompactPCI system slot functionality
- 6 possible external loads due to PCI-to-PCI bridge
- V(I/O): +3.3V or +5V (Universal Board)

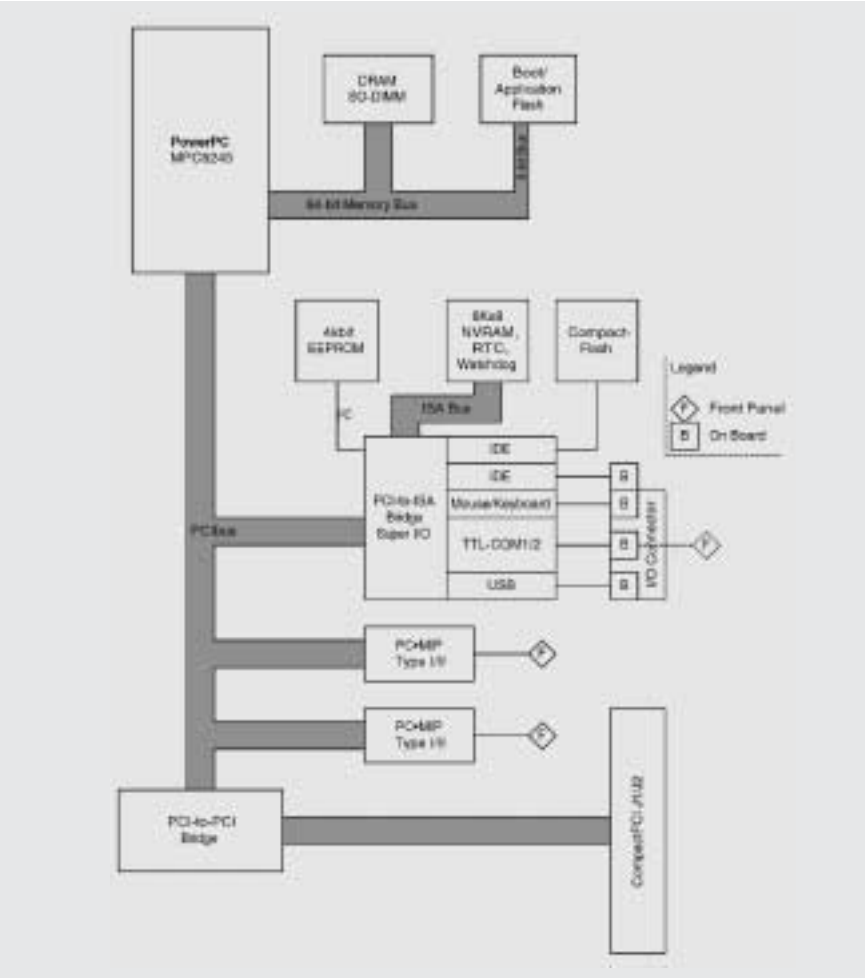
CPU
- PowerPC MPC8245/300MHz

Memory
- Level 1 Cache integrated in MPC8245
- SDRAM SO-DIMM up to 512MB
  - 64 bits
- Flash 2MB
  - 8 bits
- Serial EEPROM 4Kbit
  - For factory settings
- CompactFlash (TM) interface (true IDE)

Interfaces
- Two serial COM ports
  - Physical interface using SA-Adapter via 10-pin ribbon cable
  - RS232..RS485, isolated or not: for free use in system (cable to front or back)
- IDE
- Keyboard/mouse
- USB

Local Extensions
- PC-MIP I/O at front panel
  - Two PC-MIP mezzanine extension slots
  - Compliant with PC-MIP specification (Type I/II slots)

Miscellaneous
- Real-time clock with 8k NVRAM
- Hardware monitor and watchdog for on-board temperature control
- Hex switch for user settings



Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), 0.44A typ.
  - +3.3V (3.0V..3.6V), 1.25A typ. w/o SO-DIMM; increases up to 2A depending on installed SO-DIMM
- MTBF: 159,000h @ 50°C

Mechanical Specifications
- Dimensions: conforming to CompactPCI specification for 3U boards
- Weight: 180g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

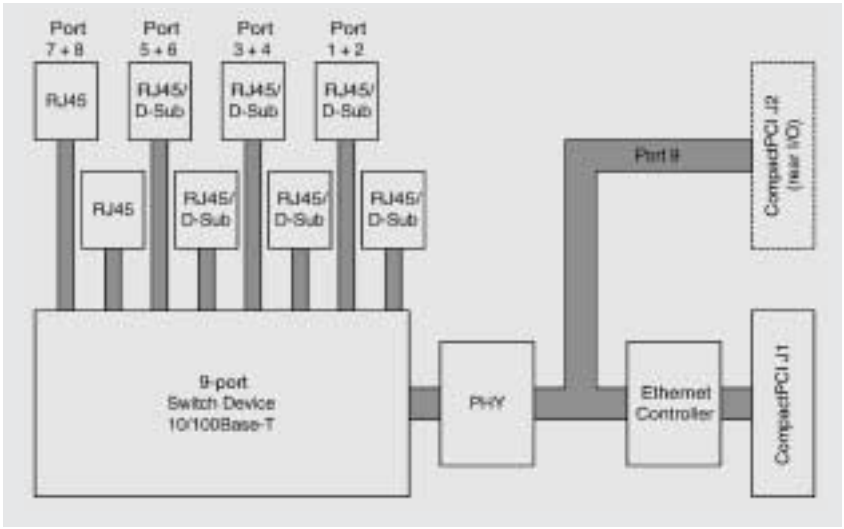
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MENMON
- Linux
- VxWorks
- QNX
- OS-9

F301 – 3U CompactPCI 9-Port Ethernet Switch

- 8 HP 32-bit/33-MHz CompactPCI
- Up to 8 Fast Ethernet ports (front)
- 1 Fast Ethernet controller (rear J1)
- Option: 1 Fast Ethernet port (rear J2)



CompactPCI Bus
- Compliance with CompactPCI Specification 2.0 R3.0
- Only one slot required on 3U CompactPCI bus
- Compliance with PCI Specification 2.1
- 32-bit PCI data bus
- V(I/O): +3.3V or +5V (Universal Board)

Ethernet
- 9-port Ethernet switch device KS8999
- Eight 10/100Base-T transceivers
- Nine MAC units with integrated Layer 2 switch
- 82551ER Fast Ethernet Controller

Peripheral Connections
- Via front panel on 8 RJ45 or 6 D-Sub connectors

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), tbd.
  - +3.3V (3.0V..3.6V), tbd.
- MTBF: tbd. @ 50°C

Mechanical Specifications
- Dimensions: conforming to CompactPCI specification for 3U boards
- Front panel: aluminum with 1 handle
- Weight: tbd.

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

F207 – 3U CompactPCI Carrier Board for PCI-104

- 1 PCI-104 slot
- For stacking of up to 4 PCI-104 modules
- 8 HP CompactPCI with one PCI-104 module
- PCI-to-PCI bridge

CompactPCI Bus
- Compliance with CompactPCI Specification 2.0 R3.0
- Only one slot required on 3U CompactPCI bus
- PCI2050 PCI-to-PCI bridge
  - Max. clock frequency 33MHz
- Compliance with PCI Specification 2.1
- 32-bit PCI data bus
- V(I/O): +3.3V or +5V (Universal Board)

PCI-104
- One slot for PCI-104
- Up to four stacked PCI-104 modules
- 8HP solution with one PCI-104 module mounted
  - Second front panel as needed (filler panel or with connector cut-outs)
- Local 32-bit PCI bus
- V(I/O): +3.3V or +5V (on request)

Peripheral Connections
- Via front panel

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), tbd.
  - +3.3V (3.0V..3.6V), tbd.
- MTBF: tbd. @ 50°C

Mechanical Specifications
- Dimensions: conforming to CompactPCI specification for 3U boards
- Front panel: aluminum with 1 handle
- Weight: tbd.

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Depending on PCI-104 module

F206N – 3U CompactPCI Intelligent NIOS Slave Board

- 32-bit/33 to 66MHz CompactPCI
- System or peripheral slot function
- Cyclone FPGA with NIOS softcore
- Up to 16 MB SDRAM, 2 MB Flash
- Flexible FPGA-Flash structure

CompactPCI Bus

- Compliance with CompactPCI Specification
- Only one slot required on 3U CompactPCI
- More supplementary cPCI slots required depending on SA-Adapters
- V(I/O): +3.3V

Universal Design

- FPGA Altera® Cyclone™ EP1C12 (optional EP1C20)
- 2MB Flash for FPGA configurations
- 16MB SDRAM
- Simple functional updates via software

Peripherals

- Four status LEDs
- RS232 interface for debugging purpose
- 64 user-defined I/O pins
- Different physical layers by means of SA-Adapters, e.g.
  - RS232
  - RS422
  - RS485
  - TTY
  - CAN
  - Binary I/O
  - Audio

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), current depends only on SA-Adapters mounted
  - +3.3V (3.0V..3.6V), current 500mA typ.
- MTBF: 154,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to CompactPCI specification for 3U boards
- Single 3U front panel slot for up to two 9-pin D-Sub connectors
- Front panel: aluminum with 1 handle
- Weight: tbd.

Environmental Specifications

- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

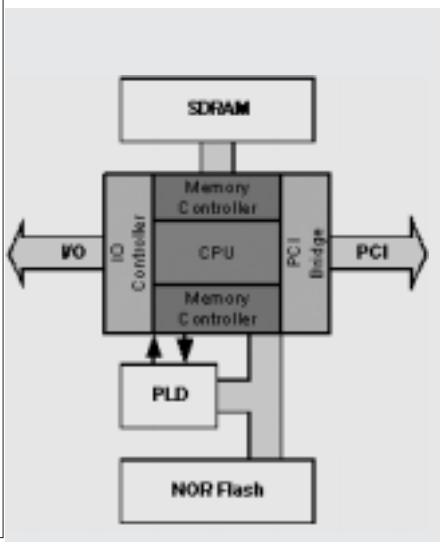
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

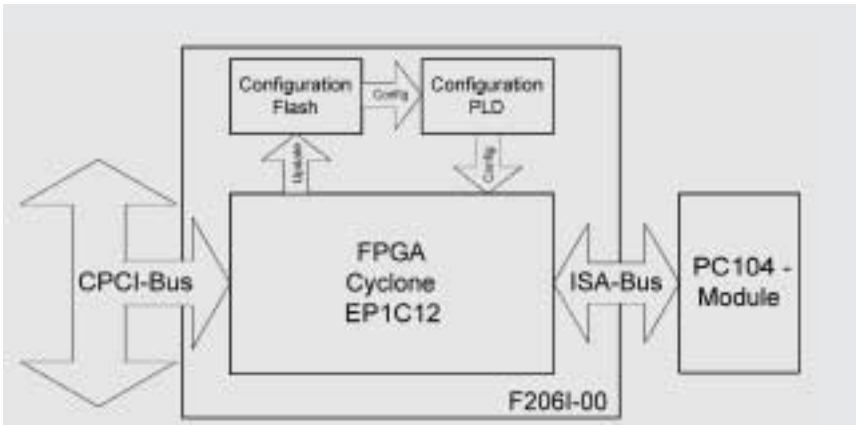
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

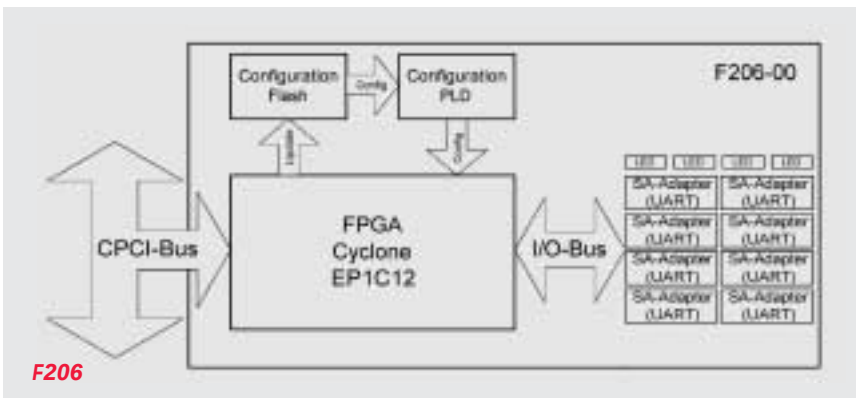
- NIOS sample design for QuartusII™ development tools
- MENMON for NIOS
- Flash update tools for Linux, VxWorks, Windows
- More software tbd.



F206N



F206I



F206

F206I – 3U CompactPCI-ISA Carrier Board for PC/104

- 1 CompactPCI slot 32-bit/33MHz (opt. 66MHz)
- 4HP closed front panel
- 1 to 4 PC/104 slots
- PCI-to-ISA bridge

CompactPCI Bus
- Compliance with CompactPCI Specification
- 32bit PCI data bus, 33MHz (opt. 66MHz)
- V(I/O): +3.3V

Universal Design
- FPGA Altera® Cyclone™ EP1C12
- 2MB Flash for FPGA configurations
- Simple functional updates via software

Function
- cPCI to PC/104 bridge

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), current depends only on PC/104 modules mounted
  - +3.3V (3.0V..3.6V), current typ. > 500mA
  - MTBF: 158,000h @ 50°C

Mechanical Specifications
- Dimensions: conforming to CompactPCI specification for 3U boards
- Single 3U front panel slot (additional slots may be required for PC/104 modules mounted)
- Front panel: aluminum with 1 handle
- Weight: tbd

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Depending on PC/104 module

F206 – 3U CompactPCI Octal UART for SA-Adapters

- Octal 16450 UART
- Large receive and transmit FIFOs
- Very high data rates up to 2Mbits/s
- Full handshake support
- Hardware flow control for RS485 half duplex
- EP1C12 Cyclone FPGA
- 2MB Flash, opt. 16MB DRAM
- 32-bit/33-MHz PCI bus (opt. 66MHz), 3.3V VIO
- Physical layer via SA-Adapters (RS232/422/485/TTY, isolated/not isolated)
- Prepared for 4 SA-Adapters (2 slots)
- Opt. 2 SA (1 slot) / 8 SA-Adapters (4 slots)
- Appl. for other protocols like HDLC
- Appl. as intell. I/O node (NIOS)

CompactPCI Bus
- Compliance with CompactPCI Specification
- Only one slot required on 3U CompactPCI bus for up to two UARTs
- Up to three supplementary cPCI slots required for overall eight UARTs
- V(I/O): +3.3V

Universal Design Bus
- FPGA Altera® Cyclone™ EP1C12
- 2MB Flash for FPGA configurations
- Simple functional updates via software

Peripherals
- Up to eight UARTs via front panel
- Different variations with SA-Adapters possible:
  - RS232
  - RS422
  - RS485
  - TTY
- Four status LEDs

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), current depends only on SA-Adapters mounted
  - +3.3V (3.0V..3.6V), current typ. > 500mA
- MTBF: 154,000h @ 50°C

Mechanical Specifications
- Dimensions: conforming to CompactPCI specification for 3U boards
- Single 3U front panel slot for up to two UARTs
- Front panel: aluminum with 1 handle
- Weight: tbd.

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

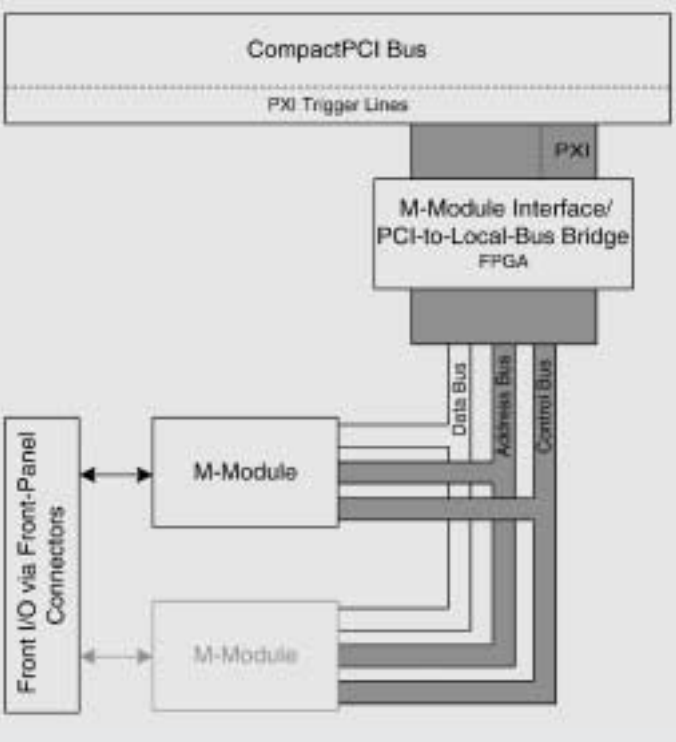
EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Linux
- VxWorks
- Windows XP

F205 / F204 – 3U CompactPCI/PXI Carrier Boards for M-Modules

- 1 CompactPCI bus slot
- 2 M-Module slots
- Flexible PXI trigger routing

- 1 CompactPCI bus slot
- 1 M-Module slot
- Flexible PXI trigger routing



CompactPCI Bus

- Compliance with CompactPCI Specification 2.0 R2.1
- Only one slot required on the 3U CompactPCI bus
- FPGA-based PCI-to-M-Module bridge
  - Target on PCI bus
  - Max. clock frequency 33MHz
- Compliance with PCI Specification 2.2
- 32-bit PCI data bus
- V(I/O): +5V (+3.3V on request)

M-Modules

- F204: one M-Module slot on the board
- F205: two M-Module slots on the board
- M-Module compliance: D08, D16, A08, INTA, TRIGA, TRIGB
- Eight trigger lines compliant with PXI Specification
- Routing of PXI trigger lines to M-Module interface TRIGA, TRIGB

Peripheral Connections

- Via front panel

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 20mA typ.
  - +3.3V (3.0V..3.6V), 20mA typ.
- MTBF: tbd. @ 50°C

Mechanical Specifications

- F204:
  - Dimensions: conforming to CompactPCI specification for 3U boards
  - Front panel: aluminum with 1 handle, cut-out for front connector of M-Module
  - Weight: tbd. (without M-Modules)
- F205:
  - Dimensions: 111.7mm x 160mm
  - Usable in 3U racks with standard 19“ low profile rails
  - Front panel: aluminum without handles, cut-outs for front connectors of 2 M-Modules
  - Weight: tbd. (without M-Modules)

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support

- M-Module drivers for Windows, VxWorks, Linux, OS-9, RTX as supported

F203 – 3U CompactPCI/PXI Carrier Boards for PC-MIP

- 1 CompactPCI bus slot
- 3 PC-MIP slots

CompactPCI Bus

- Compliance with CompactPCI Specification 2.0 R2.1
- Only one slot required on the 3U CompactPCI bus
- DECchip 21150 PCI-to-PCI bridge
  - Target and/or initiator on PCI bus
  - Max. clock frequency 33MHz
  - Power supply 5V and 3.3V
- Compliance with PCI Specification 2.1
- 32-bit PCI data bus
- V(I/O): +3.3V or +5V (Universal Board)

PC-MIPs

- Up to three PC-MIP modules on one board
- Support of 1 Type I and 2 Type II modules
- Local 32-bit PCI bus

Peripheral Connections

- Via front panel

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 5mA typ.
  - +3.3V, 150mA typ.
- MTBF: 80,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to CompactPCI specification for 3U boards
- Front panel: aluminum with 1 handle
- Weight: 160g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

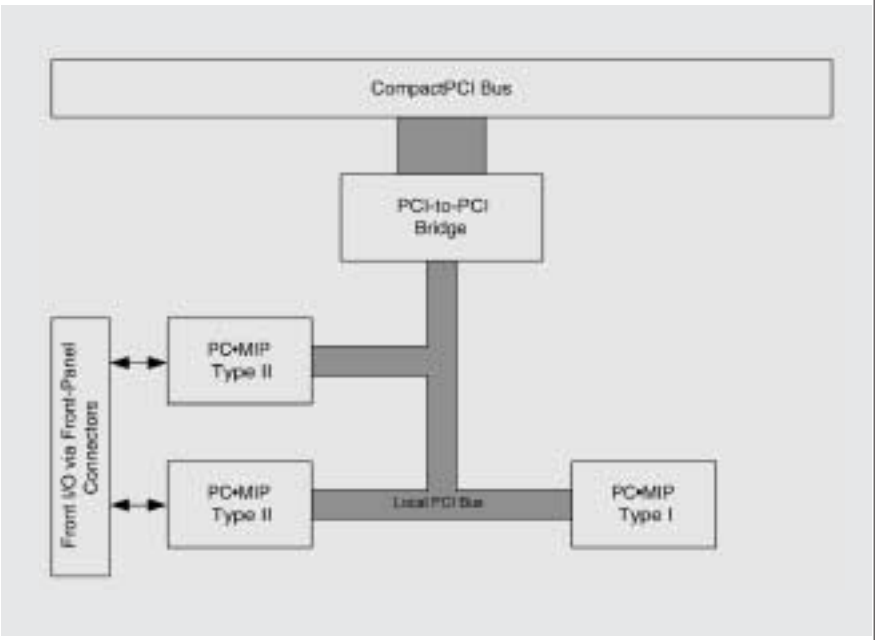
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- PC-MIP drivers for Windows, VxWorks, Linux, OS-9, RTX as supported



CompactPCI

D6 – 6U CompactPCI/PXI Pentium® M SBC

- Pentium® M up to 2GHz
- Prepared for dual Pentium® M
- 1-slot CompactPCI 64-bit/66MHz
- System slot, peripheral slot or stand-alone
- Hot-swap and PICMG 2.16 support
- Up to 8GB ECC DRAM
- NAND Flash, SRAM
- Graphics via FPGA (VGA front, LVDS rear)
- Up to 4 Gigabit Ethernet
- Parallel ATA for on-board hard disk
- PC connectivity as available in chipset
- Further I/O individually via FPGA
- 2 PMC slots

Product available Q IV / 2005

Processor

- Single Pentium® M Processor 760 at 2GHz
- Single Pentium® M LV Processor 738 at 1.4GHz
- Single Pentium® M ULV Processor 373 at 1GHz
- Board architecture prepared for Dual Pentium® M
- Passive heatsink

Chipset

- Intel E7320/7520 and ICH6300
- Front Side Bus: 400/533/800MHz
- I/O bandwith
- Up to 3 x 8 PCI Express lanes
- 64-bit/66MHz PCI bus
- 32-bit/33MHz PCI bus
- High-end memory controller
- Up to two registered memory DDR channels operating in lock-step DDR2-400
- Support of Intel® x4 Single Device Data Correction (x4 SDDC)
- Support of standard SEC-DED (72, 64) ECC on each channel
- Support of automatic read retry on uncorrectable errors
- Hardware periodic memory scrubbing, including demand scrub support
- Memory mirroring (7520 only)
- 6.4 GB/s bandwidth

Memory

- 1 to 8GB ECC DDR2 400 memory
- Up to two SO-DIMM banks
- Prepared for 16GB (as soon as chips are avail.)
- 4MB nonvolatile SRAM, linear addressing
- 2MB BIOS/FPGA NOR Flash
- Up to 1GB NAND Flash (depending on chip availability)

CompactPCI Bus Interface

- Universal bridge
- System, peripheral or stand-alone operation
- 64-bit/66MHz 3.3V VIO

PMC Slots

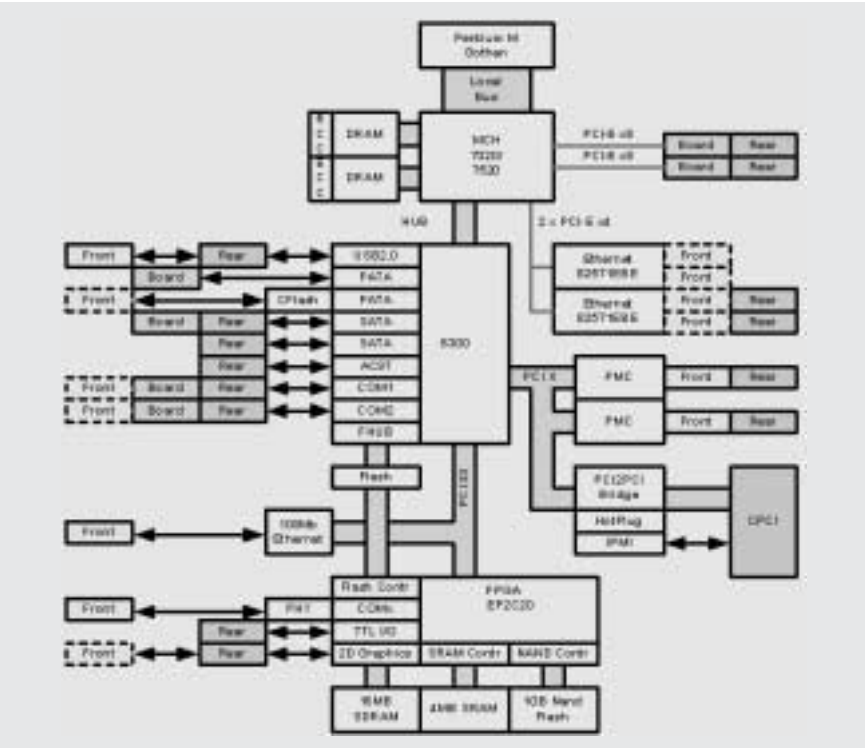
- Two PMC slots up to 64-bit/66MHz, 3.3V VIO
- PMC I/O module (PIM) support through J4

PCI Express

- 2 x 4 lanes to connect local Gigabit Ethernet controllers
- 2 x 8 lanes for extension such as high-end graphics (7520 only)

I/O

- ICH6300
- COM1, COM2 available with SA-Adpater at the front or on rear I/O
- Parallel ATA available on board for on-board hard disk extension or rear I/O
- USB 1.1/2.0: one channel at front, two via rear I/O
- Supports legacy keyboard/mouse SW with USB devices
- Real-time clock with 256B GoldCap backup CMOS RAM
- AC'97 via rear I/O



- FPGA
- 2D graphics controller (VGA upto XGA)
- VGA connector at front, LVDS at rear
- SRAM controller
- NAND Flash controller for on-board Flash disk
- Open for additional functions such as HDLC controllers, CAN etc.

Connectivity

- Debug/service on front I/O
- USB
- 100Mb Ethernet
- VGA or serial lines
- Network
- Two 1Gigabit Ethernet channels compatible with PICMG 2.16
- Four 1Gigabit Ethernet channels at the front instead of one PMC (option)
- Ethernet controllers are connected by 8 PCIE lanes to guarantee real throughput

BIOS

- Industrial AWARD BIOS in NOR Flash with recovery code
- Save set-ups in Flash option
- Boot from LAN and from USB capability
- Extended set-up
- Disk-less, keyboard-less and video-less operation is supported
- System, video and LAN BIOS shadowing
- Advanced Configuration and Power Interface (ACPI)
- Intelligent System Monitoring (thermal management)
- Set-up console redirection to serial port

Supervisor

- Support of a system management interface via non-intelligent IPMI
- Flexible Watchdog timers based on FPGA
- Detection of restart cause from memory

Compliance

- CompactPCI Core Specification PICMG 2.0 R3.0
- CompactPCI Hot Swap Specification PICMG 2.1 R2.0
- CompactPCI System Management PICMG 2.9 R1.0
- CompactPCI Packet Switching Backplane PICMG 2.16 R1.0

Mechanical Specifications

- 6U, 4HP standard cPCI 6U board

Power Requirements

(Pentium® M 1.4GHz, 1GB memory)

- +5V (+5%, -3%), 6A typ.
- +3.3V (+5%, -3%), 2A typ.
- +12V, ±5%, only used for PMCs
- -12V, ±5%, only used for PMCs

Operating System Compatibility

- Windows XP, Windows XP Embedded, Windows Server
- Linux
- VxWorks

D5 – 6U CompactPCI PowerPC SBC

- PowerPC MPC8560/800MHz
- 1-slot CompactPCI 64-bit/66MHz
- System slot, peripheral slot or stand-alone
- Hot-swap and PICMG 2.16 support
- Up to 2GB ECC DRAM
- NAND Flash, FRAM
- Graphics via PMC or FPGA
- 2 Gigabit/1 Fast Ethernet
- Parallel ATA for on-board hard disk
- Further I/O individual via FPGA
- 2 PMC slots
- MENMON BIOS for PowerPC cards

Product available Q II / 2005

Processor
- MPC8560/800MHz (1GHz optional)
- Passive heatsink
- e500 PowerPC core with FPU and MMU
- Integrated Northbridge and Southbridge
- High memory bandwidth

Memory
- SO-DIMM socket for DDRAM 333
- Up to 2GB ECC DRAM
- SO-DIMM
- 32KB nonvolatile FRAM
- 2MB FPGA NOR Flash
- Up to 1GB NAND Flash (depending on chip availability)

CompactPCI Bus Interface
- Universal bridge, system, peripheral or stand-alone operation
- 64-bit/66MHz 3.3V VIO

PMC Slots
- Two PMC slots up to 64-bit/64MHz, 3.3V VIO
- PMC I/O module (PIM) support through J4

I/O
- MPC8560
- COM1 available at the front or on rear I/O
- COM2 available at the rear
- Two 1Gb Ethernet channels compatible with PICMG 2.16
- One 100Mb Ethernet channel compatible with PICMG 2.16
- Ethernet controllers are integrated in the CPU to guarantee real throughput
- FPGA
- Parallel ATA available on board for on-board hard disk extension or rear I/O
- SRAM controller
- NAND Flash controller for on-board Flash disk
- Open for additional functions like 2D graphics, CAN etc.

Supervisor
- Real-time clock with 256B GoldCap backup CMOS RAM
- Support of a system management interface via non-intelligent IPMI
- Flexible Watchdog timers based on the FPGA
- Detection of restart cause from memory

Mechanical Specifications
- 6U, 4HP standard cPCI 6U board

Compliance
- CompactPCI Core Specification PICMG 2.0 R3.0
- CompactPCI Hot Swap Specification PICMG 2.1 R2.0
- CompactPCI System Management PICMG 2.9 R1.0
- CompactPCI Packet Switching Backplane PICMG 2.16 R1.0

Power Requirements
(MPC8560, 1GB Memory)
- +5V (+5%, -3%), 3A typically
- +3.3V (+5%, -3%), 1Amps typically
- +12V, ±5%, only used for PMCs
- -12V, ±5%, only used for PMCs

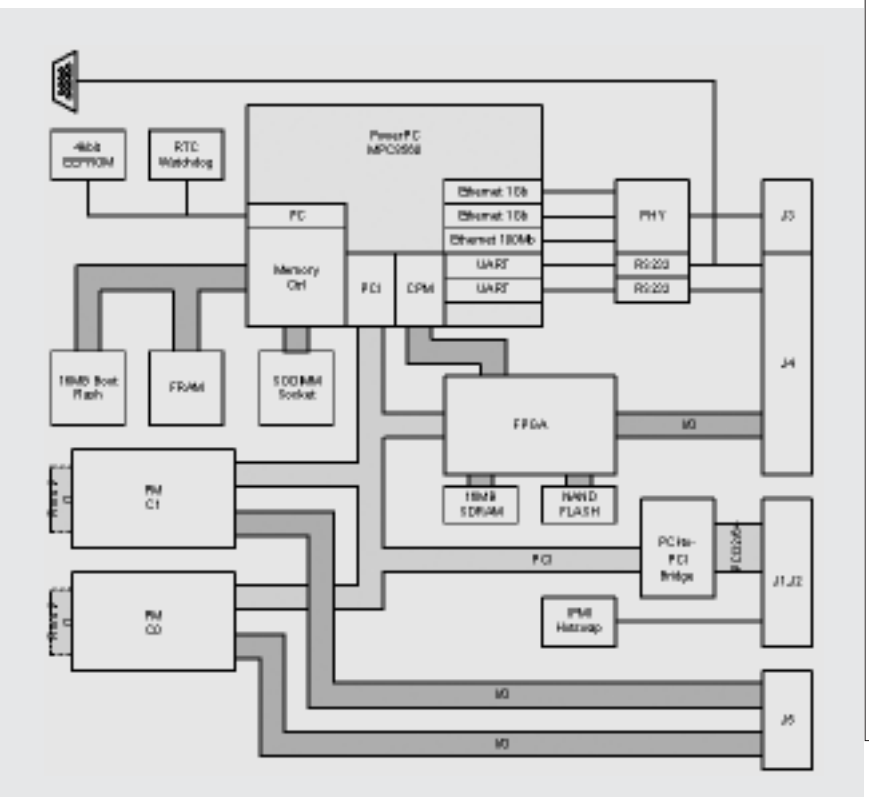
Environmental Specifications
- Temperature range (operation):
- 0..+50°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

MENMON
- New MENMON Hurricane
- Telnet server
- MENMON console over network and Flash update over network
- HTTP Server, setup/control via browser
- VGA/framebuffer devices
- Optional touch/virtual keyboard
- Boot Logo while booting
- BMP file from onboard medium (CF)
- Setup menu
- Extended diagnostics
- Program update
- Load file from disk
- From root directory of DOSFS
- From PReP partition
- Disk update

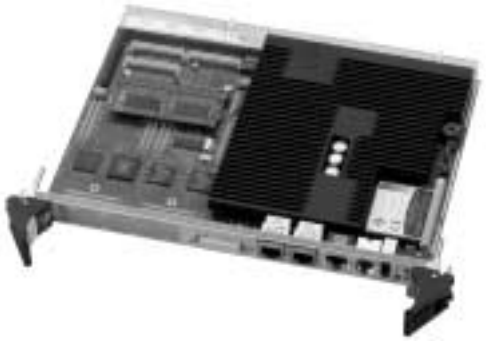
Software Support
- Linux
- VxWorks
- QNX



CompactPCI

D4 – 6U CompactPCI/PXI Pentium® 4 SBC

- Mobile Pentium® 4 up to 2.2GHz
- 1-slot CompactPCI 64-bit/66MHz
- PXI system controller
- 1GB DRAM, CompactFlash
- Graphics controller/digital video output
- 2 Gigabit Ethernet (front)
- 1 Gigabit Ethernet (PICMG 2.16) – depending on model
- 3 USB
- 2 COMs, IDE, floppy, parallel, keyboard/mouse
- 1 PMC or 2 PC-MIP mezzanine slots



CPU
- Pentium® 4 Mobile Processor
- MPGA478 Socket
- 1.2 to 2.2GHz
- 25..35W power consumption

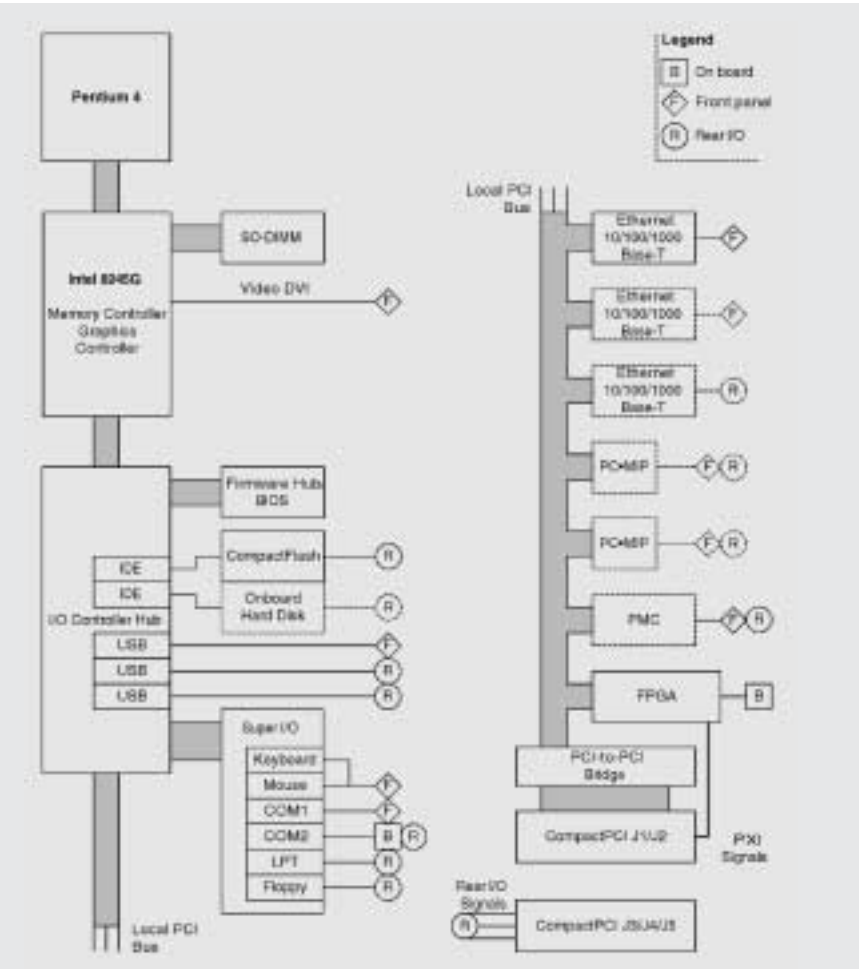
Host Bridge
- 845G Brookdale Chipset
- 400MHz local bus frequency
- 200MHz DDRAM support
- Internal graphics controller

Memory
- 200MHz DDRAM support
- Up to 1GB SO-DIMM
- Onboard CompactFlash via IDE

I/O
- One USB 2.0 at front (Type A connector)
- Two USB 2.0 at rear
- Three Ethernet interfaces
- Two Ethernet 10/100/1000Mbits/s at front
- One Ethernet 10/100/1000Mbits/s at rear (2.16)
- Supports network boot (depending on BIOS version)
- Graphics via DVI at front
- PS/2 keyboard/mouse at front
- COM1 at front
- COM2 via onboard ribbon cable or rear I/O
- LPT at rear
- Floppy at rear

Mass Storage
- Fast IDE ports (UDMA4)
- Primary IDE hard-disk/CD-ROM port; either via rear I/O (40-pin ribbon-cable connector U-DMA66) or onboard hard disk
- Secondary IDE port for local CompactFlash (or 44-pin ribbon cable connector)

PXI
- Prepared for eight trigger lines compliant with PXI specification (on request)



Rear I/O
- Mainly compatible with D2 board

CompactPCI Bus
- 66-MHz/64-bit PCI-to-PCI Bridge
- CompactPCI system slot
- CompactPCI peripheral slot available on request
- Full hot swap
- Blue LED at front
- 2.16 compatible
- V(I/O): +5V (+3.3V on request)
- Rear I/O compatible with D2

Mezzanine Extensions
- Two PC-MIPs Type I/II compliant with PC-MIP specification or
- One PMC module compliant with PMC standard IEEE P1386

Graphics
- Integrated in 845G chipset
- DVI connector at front

Miscellaneous
- Real-time clock
- Watchdog timer
- Temperature measurement
- User LEDs
- Reset button

Electrical Specifications
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 0.9A (1.7 GHz, modest load), 5.4A (1.7 GHz full load), 1.1A (2.2 GHz, modest load), 7.2A (2.2 GHz, full load)
- +3.3V (3.0V..3.6V), 2.2A (1.7 GHz, modest load), 2.9A (1.7 GHz full load), 2.2A (2.2 GHz, modest load), 2.9A (2.2 GHz, full load)
- MTBF: 88,000h @ 20°C

Environmental Specifications
- Temperature range (operation):
- 0..+45°C or 0..+60°C
- Industrial temperature range on request
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support
- Phoenix BIOS
- Windows 2000/XP
- Linux (on request)
- VxWorks (on request)
- QNX (on request)
- RTX (on request)

D3c – 6U CompactPCI PowerPC SBC with PMCs

- PowerPC MPC8245 with 603e core
- 1-slot CompactPCI system slot
- 512MB DRAM, CompactFlash
- Graphics via PMC
- Dual Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 2 PMC slots
- MENMON BIOS for PowerPC cards

CPU
- PowerPC, MPC8245, 300MHz

Memory
- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 100MHz memory bus operation
- Flash 2MB, 8-bit data bus
- Serial EEPROM 2KB for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE

Interfaces
- Two 10/100Mbits/s Ethernet channels
  - 82559ER controller
  - RJ45 at front panel with two LEDs
- One UART RS232 serial interface (COM1)
  - 16-byte send/receive buffer
  - RJ45 at front panel
- One UART (COM2)
  - 16-byte send/receive buffer
  - Physical interface using SA-Adapter via 10-pin ribbon cable on I/O connector
  - RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
- Two MPC8245 UARTs
  - Accessible via I/O connector
- IDE port for hard disk drives
  - Drive can be connected via ribbon cable or mounted directly on the CPU board using MEN's adapter kit
  - Only one CompactPCI slot needed even with hard disk
- Keyboard/mouse
  - PS/2 compatible
  - External adapters for line drivers required
- USB port
  - External line drivers

Local PCI Bus
- PCI Spec. 2.2 compliant
- 32-bit data bus, 33MHz, 3.3V

CompactPCI Bus
- CompactPCI system slot
  - PICMG Spec. 2.0 R3.0 compliant
  - 32-bit data bus, 33MHz
- V(I/O): +3.3V or +5V (Universal Board)
- Concurrent primary and secondary bus operation
- Compact PCI hot-swap support

PXI
- Two trigger lines compliant with PXI Specification

Mezzanine Extensions
- D3a: three PC-MIPs Type I/II on local PCI bus
  - Compliant with PC-MIP specification
- D3b: three M-Modules
  - Compliant with M-Module standard
  - Characteristics: D16, D32, A08, A24, INTA, INTC
- D3c: two PMCs
  - Compliant with PMC standard IEEE P1386

Miscellaneous
- Serial real-time clock with integrated 56-byte NVRAM
- Serial hardware watchdog in supervisory circuit
- Temperature sensor
- Hex switch for user settings
- User LEDs (external)

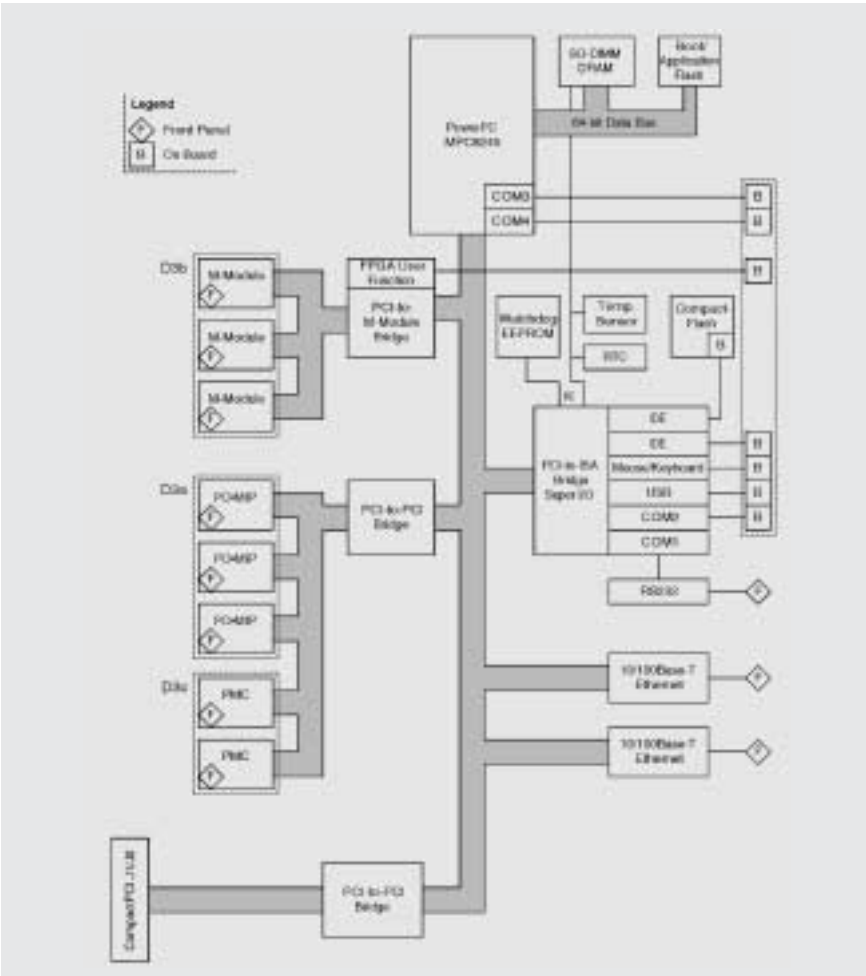
Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 1.65 A typ.
  - ±12V for mezzanines only, tbd.
- MTBF: 63,000h @ 50°C

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

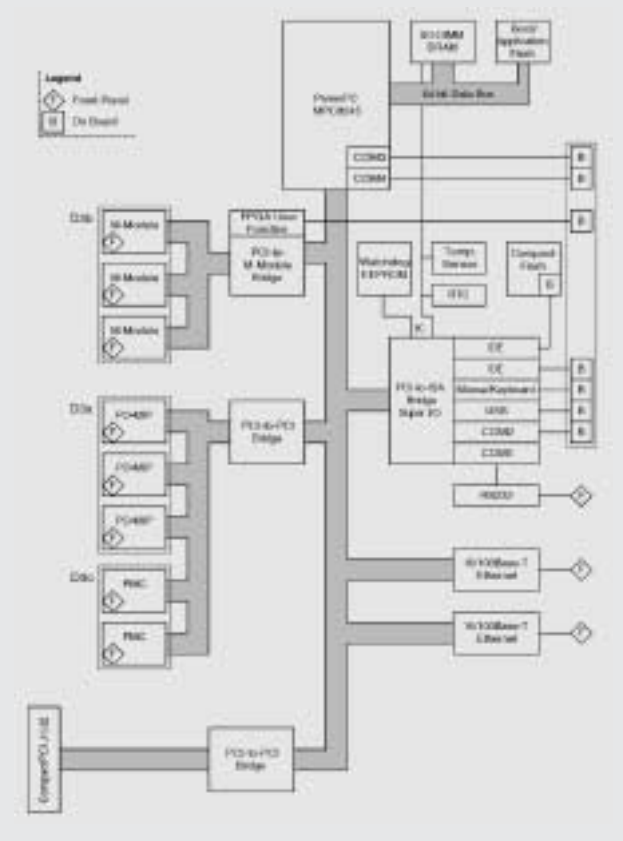
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support
- MENMON
- Linux
- VxWorks
- QNX
- OS-9



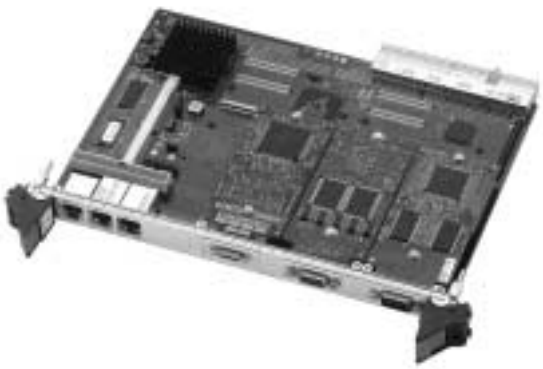
D3b – 6U CompactPCI PowerPC SBC with M-Modules

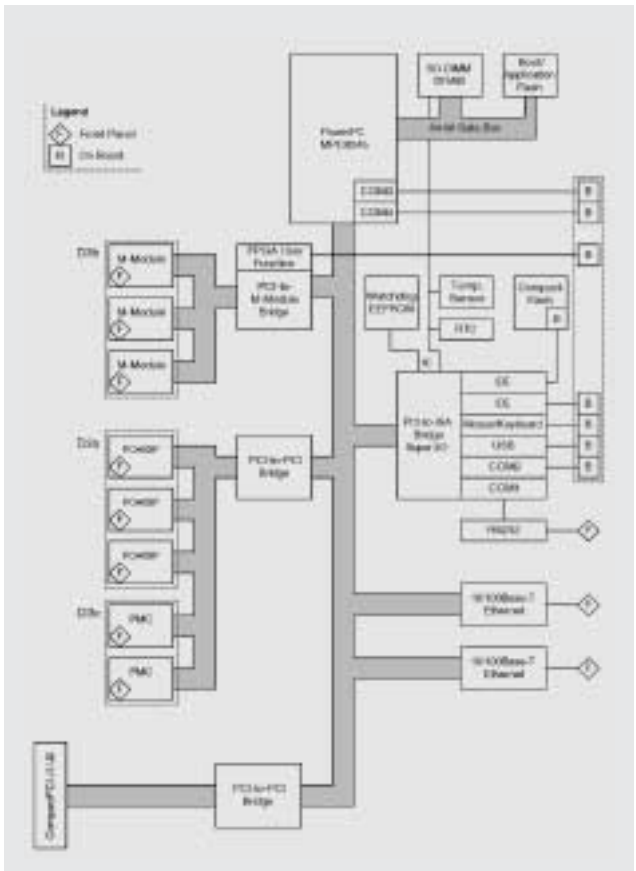


- PowerPC MPC8245 with 603e core
- 1-slot CompactPCI system slot
- 512MB DRAM, CompactFlash
- Dual Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 M-Module slots
- MENMON BIOS for PowerPC cards

D3a – 6U CompactPCI PowerPC SBC with PC-MIPs

- PowerPC MPC8245 with 603e core
- 1-slot CompactPCI system slot
- 512MB DRAM, CompactFlash
- Graphics via PC-MIP
- Dual Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 PC-MIP slots (Type I/II)
- MENMON BIOS for PowerPC cards





D302 – 6U CompactPCI Card with 128 Binary I/Os

- 1-slot CompactPCI peripheral board
- 4 optically isolated units with 32 channels for each unit
- Individual use of each channel as input or output
- Individual edge-triggered interrupts
- Input/output load on ground
- High-side output switches
- High output current: max. 1.9A per channel or 16A per unit
- Over-current and over-temperature protection

Binary I/Os

- 128 binary signals
- 4 optically isolated units
- 32 channels for each unit
- Individual use of each channel as input or output
- Individual edge-triggered interrupts
- Input/output load on ground
- High-side output switches
- High output current
- Max. 1.9A per channel
- Max. 16A per unit
- Over-current and over-temperature protection

Output Characteristics

- Output voltage range: 12V..32V
- Output current log. 0: max. 10mA
- Output current log. 1: max. 1.9A
- Switching time for output change: < 200µs
- Isolation voltage (optocoupler): 500V DC

Input Characteristics

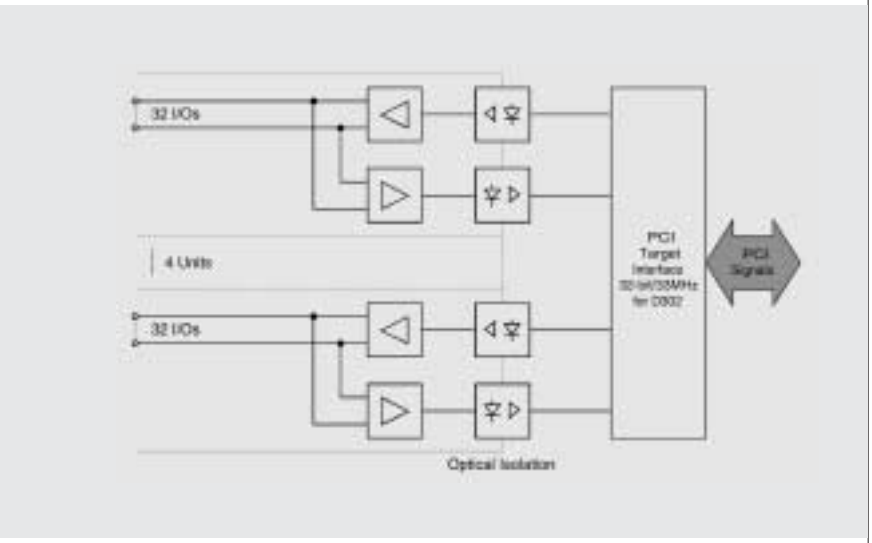
- Input voltage min.: 0V
- Input voltage max. external supply voltage (12..32V)
- Voltage level log. 0: 0V..6V or open
- Voltage level log. 1: 12V..32V
- Input current log. 1: 2.03mA @ 24V
- Switching threshold: 9.2V @ 0.78mA typ.
- Switching time for input change: min. 33µs, max. 44µs
- Excess voltage protection: max. +47V

Peripheral Connections

- Via front panel on four shielded 44-pin HD-Sub receptacle connectors

CompactPCI Bus

- CompactPCI peripheral slot
- PICMG Spec. 2.0 R3.0 compliant
- 32-bit data bus
- 33MHz
- V(I/O): +5V
- Concurrent primary and secondary bus operation



Electrical Specifications

- Isolation voltage
- 500V DC between isolated side and digital side
- 180V DC between the channels
- Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 106mA
- +3.3V (3.0V..3.6V), 27mA
- +24V (external supply voltage 12..32V), 78mA (total for all units)
- MTBF: 129,000h @ 50°C

Mechanical Specifications

- Dimensions: standard double Eurocard, 233.3mm x 160mm
- Weight: 324g

Environmental Specifications

- Temperature range (operation):
- 0..+60°C or -40..+85°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% without condensation
- Relative humidity range (storage): max. 95% without condensation
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

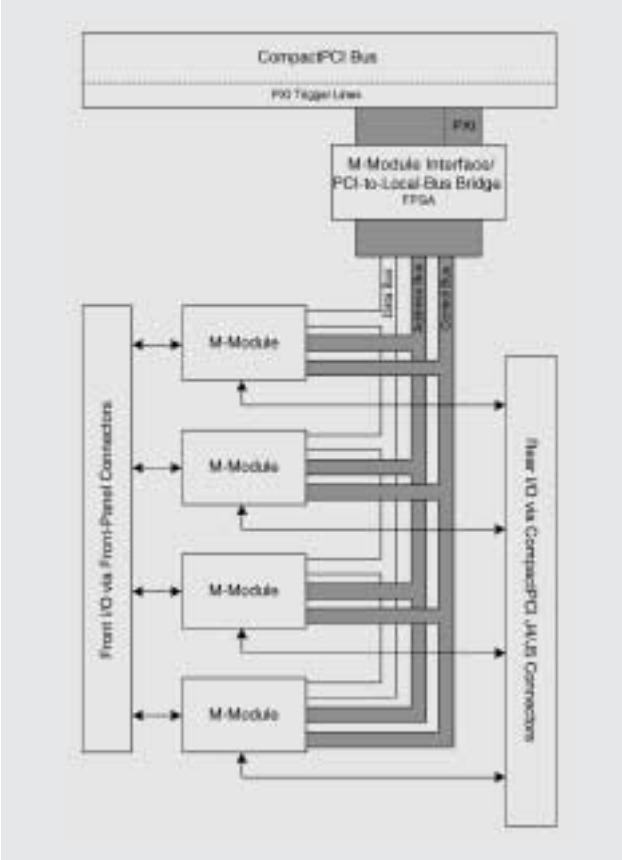
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

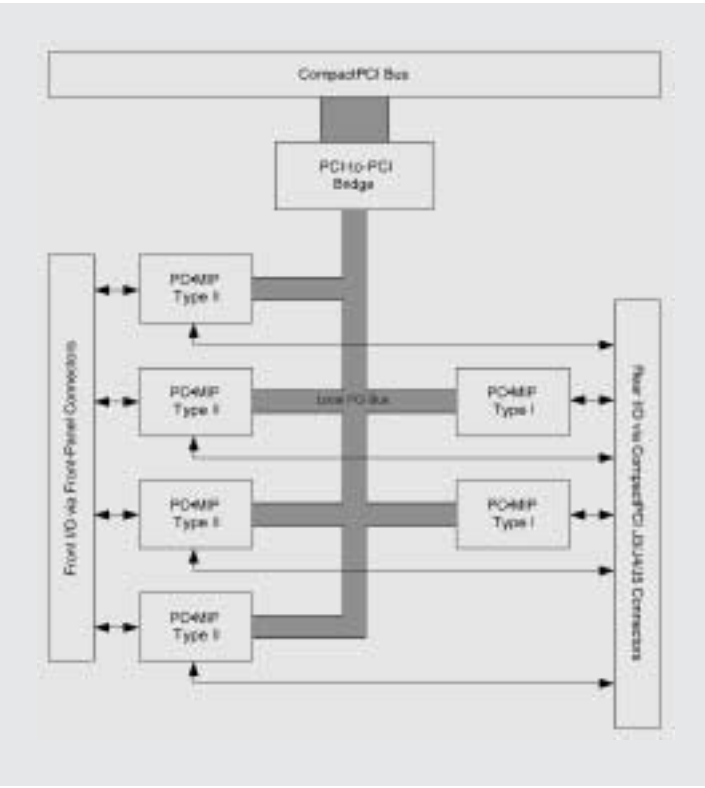
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

D203 – 6U CompactPCI/PXI Carrier Board for M-Modules

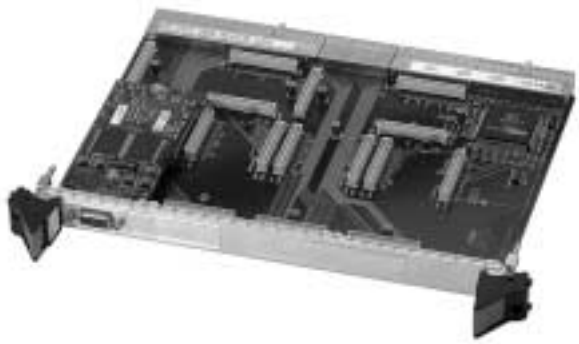
- 1 CompactPCI bus slot
- 4 M-Module slots
- Full PXI trigger support
- Flexible PXI trigger routing



D202 – 6U CompactPCI/PXICarrier Board for PC-MIP



- 1 CompactPCI bus slot
- 6 PC-MIP slots



CompactPCI Basic Systems – 4U, 84HP, 3U card vertical

- 19" rack-mountable
- IEEE 1101.10/11 compliance
- Highly compact 3U subrack
- 8-slot 3U CompactPCI backplane
- Prepared for rear I/O
- PXI backplane optional
- Space for hard-disk drive, floppy drive, CD-ROM drive
- 300W ATX power supply
- 1U fan tray extension
- For MEN SBCs F1N, F2, F6, F7/N, F9, F10, F11

General System Characteristics

- Compliance with IEC 60 297-3, IEEE 1101.10
- 8 slots for 3U Eurocard boards (32-bit PCI bus) with rear I/O
- 8HP on the right for I/O extension, additional front panels etc.

Mechanical Specifications

- 19" rack-mount standard
- 3U card vertical
- 1U fan chassis with two vertical fans
- 3U/12HP bay for 3.5" floppy disk drive, 3.5" hard disk drive
- Space for slim-line CD-ROM
- Dimensions: 3U, 84HP, 278mm depth
- Weight: tbd.

CompactPCI Backplane

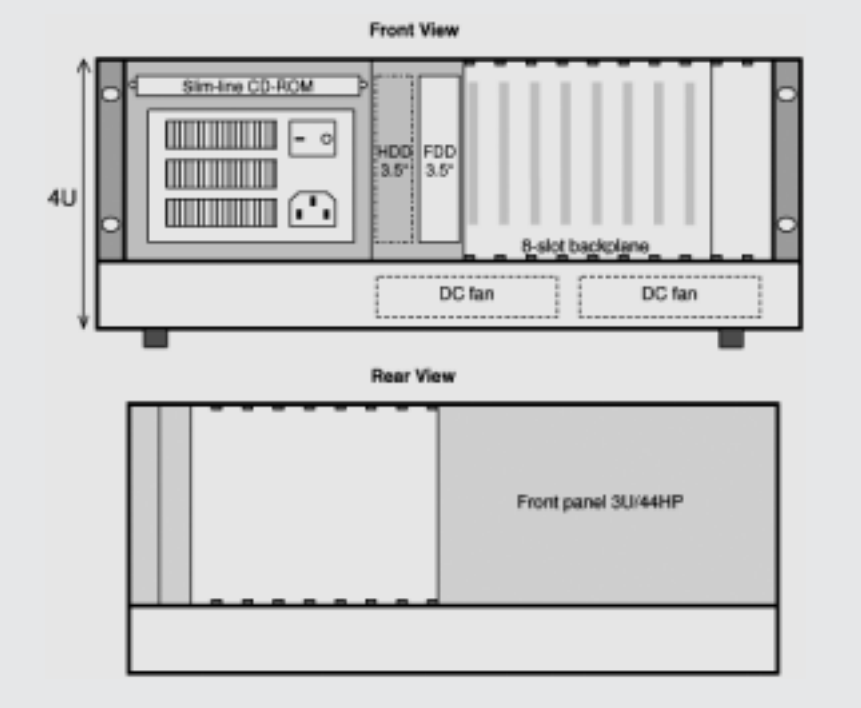
- Compliance with CompactPCI Spec. 2.0 Rev. 2.1 and IEC 61 076-4-101 (connectors)
- 8-slot, 32 bits
- 3U with rear I/O
- System slot on the right

Power Supply

- PC power supply PS/2
  - 3U/32HP
  - ATX-PSU 300W
  - 5V@30A
  - 3.3V@14A
  - 100V..240V AC wide range
  - 48..63Hz
  - Agency-approved: CE, UL Recognized Component mark
- Front-panel power connectors
- Front-panel power-on switch

Environmental Specifications

- Temperature range (operation):
  - 0..+50°C
  - Power supply: 0..+40°C without derating
- Temperature range (storage):
  - -40..+85°C
  - Power supply: -20..+65°C without derating
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz



EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Suited for MEN Boards...

- F1N
- F2
- F6
- F7/N
- F9
- F10
- F11

CompactPCI Basic System – 4U, 84HP, 3U card vertical

- 19" rack-mountable
- IEEE 1101.10/11 compliance
- Highly compact 3U subrack
- 8-slot 3U CompactPCI backplane
- Space for hard-disk drive, floppy drive
- 300W ATX power supply
- 1U fan tray extension
- For MEN SBCs F1N, F2, F6, F7/N, F8, F9, F10, F11

General System Characteristics

- Compliance with IEC 60 297-3, IEEE 1101.10
- 8 slots for 3U Eurocard boards (32-bit PCI bus)
- 8HP on the right for I/O extension, additional front panels etc.

Mechanical Specifications

- 19" rack-mount standard
- 3U card vertical
- 1U fan chassis with two vertical fans
- 3U/14HP bay for 3.5" floppy disk drive, 3.5" hard disk drive
- Option: 5 1/4" chassis for CD-ROM
- Dimensions: 4U, 84HP, 278mm depth
- Weight: tbd.

CompactPCI Backplane

- Compliance with CompactPCI Spec. 2.0 Rev. 2.1 and IEC 61 076-4-101 (connectors)
- 8-slot, 32 bits
- System slot on the right

Power Supply

- PC power supply PS/2
  - 3U/30HP
  - ATX-PSU 300W
  - 5V@30A
  - 3.3V@14A
  - 100V..240V AC wide range
  - 48..63Hz
  - Agency-approved: CE, UL Recognized Component mark
- Front-panel power connectors
- Front-panel power-on switch

Environmental Specifications

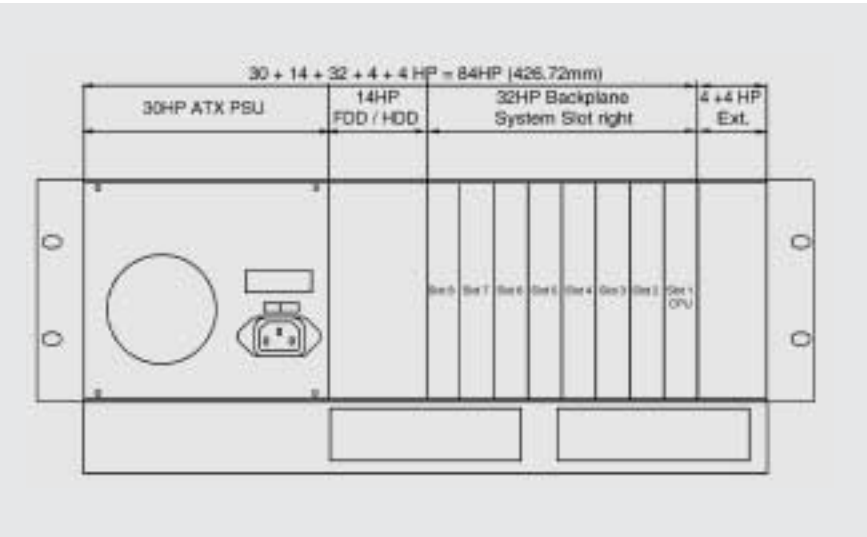
- Temperature range (operation):
  - 0..+50°C
  - Power supply: 0..+40°C without derating
- Temperature range (storage):
  - -40..+85°C
  - Power supply: -20..+65°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

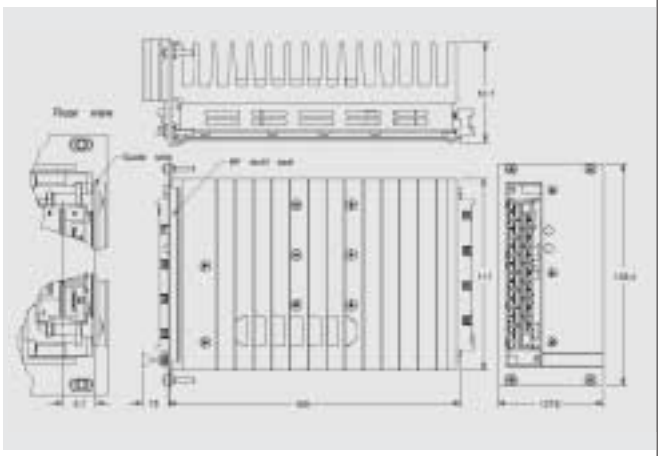
Suited for MEN Boards...

- F1N
- F2
- F6
- F7/N
- F8
- F9
- F10
- F11



Plug-in PSU for 19" systems, 3U, 12HP

- 19" rack mountable (VMEbus, CompactPCI)
- 3U, 12HP
- Input 110V DC nom. (66-154V)
- Output 5.1V, 75W
- -40..+85°C operation temperature without derating
- Conformal coating
- Complies with EN 50155
- H15 DIN41612 male connector (front and rear)



CompactPCI Basic System – 7U, 84HP, 6U card vertical

- 19" rack mountable
- Highly compact subrack
- IEEE 1101.10/11 compliance
- 8-slot 6U CompactPCI backplane
- PXI backplane optional
- Space for hard drive, floppy drive, CD-ROM
- 300W ATX power supply
- Fan
- For MEN SBCs D2, D3, D4, D5, D6

General System Characteristics
- Compliance with IEC 60 297-3, IEC 60 297-4, IEEE 1101.10, IEEE 1101.11
- 8 slots for 6U Eurocard boards

Mechanical Specifications
- 19" rack-mount standard
- 6U card vertical
- Dimensions: 6U, 84HP, 278mm depth
- Weight: tbd.

Chassis
- 3U/32T bay for 3.5" floppy disk drive, 3.5" hard disk drive, 5.25" CD-ROM drive
- 1U fan tray

CompactPCI Backplane
- Compliance with CompactPCI Spec. 2.0 Rev. 2.1 and IEC 61 076-4-101 (connectors)
- 8-slot
- 6U with rear I/O
- System slot on the right

Power Supply
- PC power supply PS/2
  - ATX-PSU 300W
  - 5V@30A
  - 3.3V@14A
  - 120V/230V AC
  - 60/50Hz
  - Agency-approved: CE, UL, CSA, EN 60 950
- Front-panel power connector
- Front-panel power-on switch

Environmental Specifications
- Temperature range (operation):
  - 0..+50°C
  - Power supply: 0..+40°C without derating
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Suited for MEN Boards...
- D2
- D3
- D4
- D5
- D6

CompactPCI Basic System – 3U, 84HP, 6U card horizontal

- 19" rack mountable
- IEEE 1101.10/11 compliance
- Highly compact 3U subrack
- 5-slot 6U CompactPCI backplane
- Prepared for rear I/O
- Optional rear I/O on front
- PXI backplane optional
- Space for hard-disk drive, floppy drive, CD-ROM drive
- 300W ATX power supply
- Fan
- For MEN SBCs D2, D3, D4, D5, D6

General System Characteristics

- Compliance with IEC 60 297-3, IEC 60 297-4, IEEE 1101.10, IEEE 1101.11
- 5 slots for 6U Eurocard boards
- 5 slots for 6U rear I/O 80mm I/O bords
- Ventilation using DC fan through side panels

Mechanical Specifications

- 19" rack-mount standard
- 6U card horizontal
- 3U/32T bay for 3.5" floppy disk drive, 3.5" hard disk drive, laptop CD-ROM drive
- Rear-I/O cut-outs:
  - Optional on front 3U bay
  - 2 cut-outs for USB
  - 1 cut-out for COM (for 9-pin D-Sub or 15-pin HD-Subconnector)
  - 1 cut-out for parallel port (for 25-pin D-Sub or 44-pin HD-Sub connector)
- Dimensions: 3U, 84HP, 360mm depth
- Weight: tbd.

CompactPCI Backplane

- Compliance with CompactPCI Spec. 2.0 Rev. 2.1 and IEC 61 076-4-101 (connectors)
- 5-slot
- 6U with rear I/O on J3/J4/J5
- System slot on the left (bottom)

Power Supply

- PC power supply PS/2
  - ATX-PSU 300W
  - 100V..240V AC
  - 50/60Hz
  - Agency-approved: CE, TÜV Rheinland, UL Recognized Component mark, UL Canadian Recognized Component mark
- Back-panel power connectors
- Power-on switch

Environmental Specifications

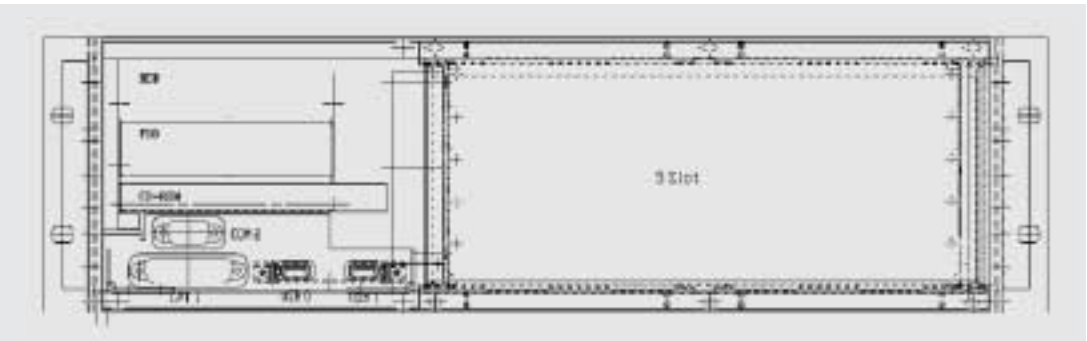
- Temperature range (operation):
- 0..+50°C
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Suited for MEN Boards...

- D2, D3, D4, D5, D6



PXI in Instrumentation

Desktop PC packaging is not always suited to the demanding industrial environments envisioned for new instrument designs. PCs were not designed for industrial environments, and therefore do not provide the connectivity, cooling support, EMI resistance, and the slot capacity needed for many high-performance instrumentation systems. To solve these problems, the PXI standard (PCI eXtensions for Instrumentation) was developed in 1998 defining additional trigger lines on top of the CompactPCI standard. In fact, most PXI products are fully interoperable with CompactPCI products. In development and bench top instrument applications, the most economical way to use PXI instruments is with a desktop PC for control and a host-to-slave link for connection to the PXI modules. For many other applications, the PXI instruments will ultimately reside in a rack with other equipment such as on a factory floor or remote site or where portable operation is desired. In these settings the use of desktop PCs is not feasible and an embedded PC must be used. A monitor and keyboard may be attached to the controller for development or debugging and then removed or replaced with a LAN connection for later use. This configuration is somewhat higher in cost but allows the highest flexibility in operational setting and smaller system size.

PXI System Controllers

CompactPCI Single-Board Computers can in general be used as PXI system controllers as well. Nevertheless, many of MEN's 6U and 3U x86 or PowerPC-based CompactPCI SBCs are equipped with additional PXI trigger lines in accordance with the PXI specification.

M-Modules – I/O for PXI Systems

M-Modules in PXI Systems. M-Modules are especially well suited for instrumentation tasks. The board space provided for components allows implementation of complex instrumentation functions and this also includes the best signal isolation possible, using onboard DC/DC converters. The generous space provided for dedicated connectors guarantees protection of sensitive signals. The simple and cost-effective architecture of the M-Module interface results in optimum cost-per-channel.

Front Panel I/O. M-Modules offer direct front panel connection rather than requiring a separate adapter panel with flat cable connections. This provides a clean path for sensitive signals without loss of data or signal quality-using, for example, shielded D-Sub connectors and COAX cables.

M-Module Interface. A fast asynchronous parallel interface offers sophisticated functions such as 32-bit data bus, burst transfers up to 100MB/s, DMA and trigger capabilities. The simple architecture of the M-Module interface allows the development of M-Modules within very short time.

M-Module PXI Carrier Cards. The carrier card for 6U systems can accommodate up to four M-Modules, while the carrier cards for 3U systems come with one or two M-Module slots.

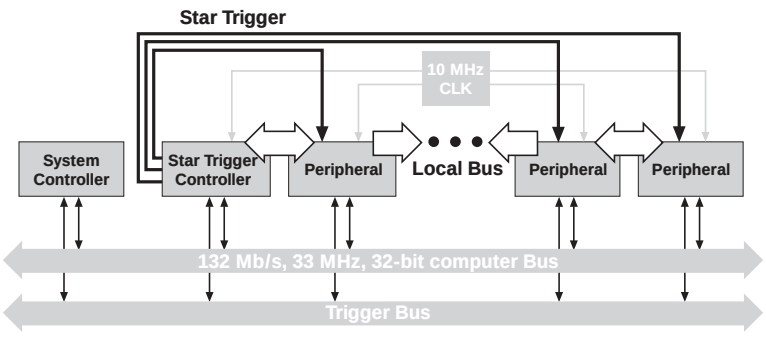
All carrier cards support five PXI trigger lines with two onboard trigger sources (one-shot or continuous trigger; 243Hz..5.33MHz frequency). They also have flexible trigger routing: First, the on-board trigger sources may be routed to the M-Module interface or to the PXI trigger lines. Second, the PXI trigger lines may be routed to the M-Module interface trigger lines and vice versa.

Prepared for Harsh Environments. In order to meet rugged mounting requirements, M-Modules can be fixed to the carrier board using four screws. Air flow and cooling are optimized in order to make M-Modules suitable for the industrial operation temperature range of -40 to +85°C.

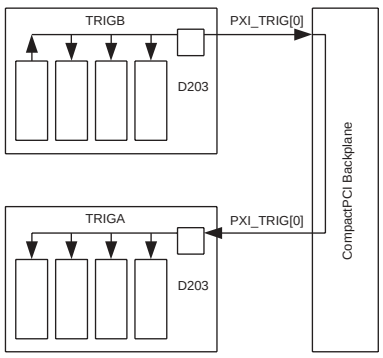
ANSI Standard. M-Modules are ANSI standard since 1997 (ANSI/VITA 12). The full specification is available from www.vita.com and www.ansi.org.

PXI Software Support

PXI requires that all peripheral modules have device driver software that runs in the appropriate framework. For all M-Modules MEN supports National Instrument's LabWindows/CVI based on Windows.
Support of LabWindows/CVI is included in MDIS4 (MEN Driver Interface System) for Windows. MDIS4 is a standard interface layer for most M-Modules. Together with a specific application note, the MDIS4 system package and the low-level M-Module drivers can be downloaded from MEN's web site for free.
LabWindows/CVI support is also included for M-Modules with native Windows drivers.
In addition, user-ready standard IVI drivers for M-Modules are available for the instrument classes of switches, multimeters and function generators.



Organization of a PXI system



PXI trigger routing on M-Module carrier cards

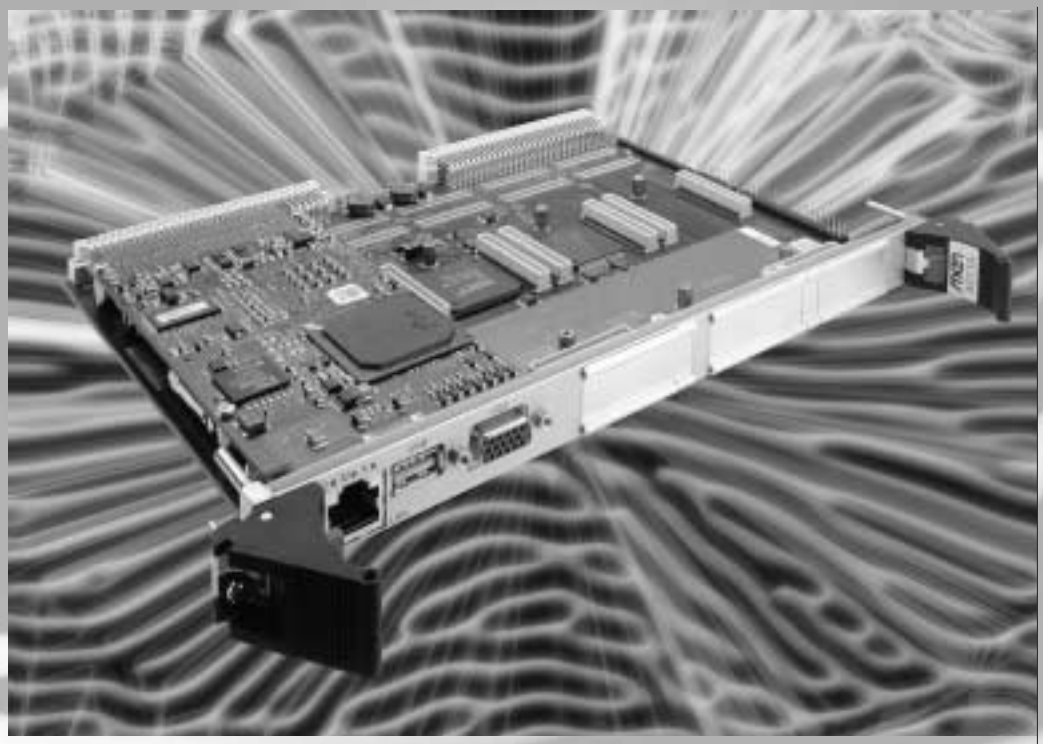
VMEbus

Overview – 3U/6U VMEbus Boards

MEN offers a complete range of 3U and 6U VMEbus single-board computers based on PC and PowerPC architectures for rugged industrial and embedded applications. In addition to state-of-the-art SBC functionality, all CPU boards feature industrial functions such as CompactFlash, real-time clock, or watchdogs for temperature and voltage control. Many cards also include M-Module, PC-MIP and PMC mezzanine slots for flexible and individual extension by further industrial and computing I/O functions. Serial interface adapters (SA-Adapters) provide access to additional line physics. A growing number of MEN boards are available with on-board FPGA which allows implementation of IP cores tailored to the application. Software support comprises Linux, several popular real-time operating systems and Windows (VME-PC). MEN VMEbus boards have been developed to work also in rugged environments – shock, vibration, drop, resonance, humidity, chemicals, -40 to +85°C operating temperature.

6U VMEbus Boards

	Type	CPU	VMEbus	Memory max.	Interfaces	Local Extensions	Software	Applications
A15c *p. 35*	SBC	PowerPC MPC8245/400MHz	A32/D64 master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 PMC slots	Linux, VxWorks, OS-9, QNX	Industrial automation
A15b *p. 36*	SBC	PowerPC MPC8245/400MHz	A32/D64 master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 M-Module slots	Linux, VxWorks, OS-9, QNX	Industrial automation
A15a *p. 36*	SBC	PowerPC MPC8245/400MHz	A32/D64 master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 PC-MIP slots Type I/II	Linux, VxWorks, OS-9, QNX	Industrial automation
A14 *p. 37*	SBC	PowerPC MPC8540/800MHz	A32/D64 master/slave, 1 VMEbus slot	2GB ECC DRAM, 32KB FRAM, 1GB NAND Flash	2 Gigabit/1 Fast Ethernet, 6 COMs, parallel ATA	FPGA for custom I/O, local hard disk, 2 PMC slots	Linux, VxWorks, QNX	Industrial automation
A13c *p. 38*	SBC	Pentium® III / Celeron® 400...933MHz	A32/D64 master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	Gigabit/Fast Ethernet, 4 COMs, USB, graphics TFT/video, audio etc. via transition module	2 PMC slots	Windows, Linux, QNX, RTX, Vxworks	Industrial automation, instrumentation
A13a *p. 38*	SBC	Pentium® III / Celeron® 400...933MHz	A32/D64 master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	Gigabit/Fast Ethernet, 4 COMs, USB, graphics TFT/video, audio etc. via transition module	3 PC-MIP slots Type I/II	Windows, Linux, QNX, RTX, Vxworks	Industrial automation, instrumentation
A12c *p. 39*	SBC	PowerPC MPC8245/300MHz	Master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	2 PMC slots	VxWorks, Linux, OS-9, QNX	Industrial automation
A12b *p. 40*	SBC	PowerPC MPC8245/300MHz	Master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 M-Module slots	VxWorks, Linux, OS-9, QNX	Industrial automation
A12a *p. 40*	SBC	PowerPC MPC8245/300MHz	Master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 Fast Ethernet, 4 COMs, USB, IDE, keyboard/mouse	3 PC-MIP slots Type I/II	VxWorks, Linux, OS-9, QNX	Industrial automation
A11 *p. 41*	SBC	PowerPC MPC740 up to 500MHz	Master/slave, 1 VMEbus slot	288MB DRAM, 16MB Flash, CompactFlash	Fast Ethernet, 4 COMs, Ultra SCSI-2, floppy, parallel port, IDE, keyboard/mouse	2 PC-MIP slots Type I/II	VxWorks, Linux, OS-9, QNX	Industrial automation, data communication
A10 –	SBC	MC68060/50MHz with MC68360/33 MHz (incl. VGA/TFT)	Master/slave, 1 VMEbus slot	48MB DRAM, 8MB Flash, 2MB SRAM	10 Mbit Ethernet, 4 COMs, SCSI-2, CAN, keyboard/mouse	4 M-Module slots (8TE front panel)	VxWorks, OS-9	Industrial automation
A9 –	SBC	MC68040/33MHz with MC68360/33 MHz (incl. VGA/TFT)	Master/slave, 1 VMEbus slot	48MB DRAM, 8MB Flash, 2MB SRAM	10 Mbit Ethernet, 4 COMs, SCSI-2, CAN, keyboard/mouse	4 M-Module slots (8TE front panel)	VxWorks, OS-9	Industrial automation
A4N –	Peripheral controller	MC68332/20MHz	Master/slave, 1 VMEbus slot	2MB DRAM, 2MB Flash,	2 COMs	3 M-Module slots	VxWorks, OS-9	Industrial automation
A302 *p. 42*	Binary I/O	---	1 VMEbus slot	---	---	---	Windows, Linux, VxWorks, OS-9, QNX, RTX	Industrial automation, instrumentation
A201S *p. 42*	M-Module Carrier	---	1 VMEbus slot	---	---	4 M-Module slots	M-Module driver software	Industrial automation, instrumentation



A13c – 6U VME64 Pentium® III SBC with PC-MIPs

3U VMEbus Boards

	Type	CPU	VMEbus	Memory max.	Interfaces	Local Extensions	Software	Applications
B12 *p. 32*	SBC	PowerPC MPX823/66MHz	Master/slave, 1 VMEbus slot	128MB DRAM, CompactFlash, 32MB Flash	10 Mbit Ethernet, 2 RS232, 3 CAN, 1 RS422, (opt. side card with PCMCIA and TFT)	1 M-Module slot	VxWorks, OS-9	Aerospace, transportation, industrial automation
B11 *p. 33*	SBC	PowerPC MPC8245/300MHz	Master/slave, 1 VMEbus slot	512MB DRAM, CompactFlash	2 COMs, IDE, USB, keyboard/mouse	2 PC-MIP slots Type I/II	VxWorks, Linux, OS-9, QNX,	Transportation, industrial automation
B6 –	Communication Controller	MC68360/33MHz	Master, 1 VMEbus slot	4MB DRAM, 4MB SRAM, 4MB Flash	6 serial lines	1 M-Module slot	OS-9	Transportation, industrial automation
B5 –	Communication controller	MC68040/33MHz, MC68060/50MHz in companion mode with MC68360/33MHz	Master/slave, 1 VMEbus slot	36MB DRAM, 1MB SRAM, 8MB Flash	10 Mbit Ethernet, 5 serial lines, 2 CAN	1 M-Module slot (dual-ported)	VxWorks, OS-9	Automotive, industrial automation
B202S *p. 34*	M-Module Carrier	---	1 VMEbus slot	---	---	2 M-Module slots	M-Module driver software	Industrial automation, instrumentation
B201S *p. 34*	M-Module Carrier	---	1 VMEbus slot	---	---	1 M-Module slot	M-Module driver software	Industrial automation, instrumentation

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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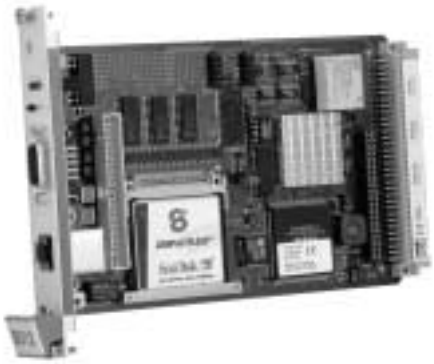
VMEbus

B12 – 3U VMEbus PowerPC SBC

- MPC823e/66MHz
- 1-slot VMEbus master/slave or busless
- 128MB DRAM, 32MB Flash, CompactFlash
- 10Mbit Ethernet
- 3 COMs, 3 CAN
- 1 M-Module slot
- CANopen support
- Full EN50155 complianc
- MENMON BIOS for PowerPC cards



CPU

- PowerPC
  - MPC823e
  - 66MHz CPU clock
  - 33MHz memory clock

Memory

- SDRAM 32MB
  - 32 bits
  - 3.3V
- Flash up to 32MB
  - 32 bits
  - 3.3V
- Non-volatile FRAM 32KB
  - 8 bits
  - 5V
- Serial EEPROM 4kbit
  - For factory settings
- CompactFlash (TM) interface (true IDE)
- PCMCIA/PC-Card interface

Interfaces

- Two serial RS232 interfaces COM1/COM2
  - Optically isolated
  - One 9-pin D-Sub connector at front panel
- Ethernet
  - 10Base-T
  - One RJ45 connector at front panel
- IDE
  - For external hard disk drives
  - Ribbon cable connection
- Three SJA1000 CAN controllers
  - CAN 2.0B functionality, Extended CAN
  - Max. data rate 1Mbits/s (ISO high speed)
  - Ribbon cable connection or via single adapter cards at front panel (on request)
- One serial RS422/RS485 interface COM3
  - Half-duplex or full-duplex operation
  - Physical interface using SA-Adapter via 10-pin ribbon cable, RS232..RS485, isolated or not, for free use in system (cable to front or back)

M-Module Extension

- One M-Module mezzanine extension slot
- Compliant with M-Module Standard
- Characteristics: A08, D16, INTA

VMEbus

- Master D08(EO):D16:A24:A16:RMW; transfer rate max. 7MB/s
- Slave D08(EO):D16:A24:BLT
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Slot-1 autodetection
- Level 3 arbiter, bus timer, arbitration timer
- VME requester

Miscellaneous

- Real-time clock
- Watchdog
- Four front-panel LEDs
- Reset button at front panel
- Temperature sensor for in-system diagnosis

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), 0.6A typ.
- MTBF: tbd. @ 50°C

Mechanical Specifications

- Dimensions: standard single Eurocard, 100mm x 160mm
- Weight: 160g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

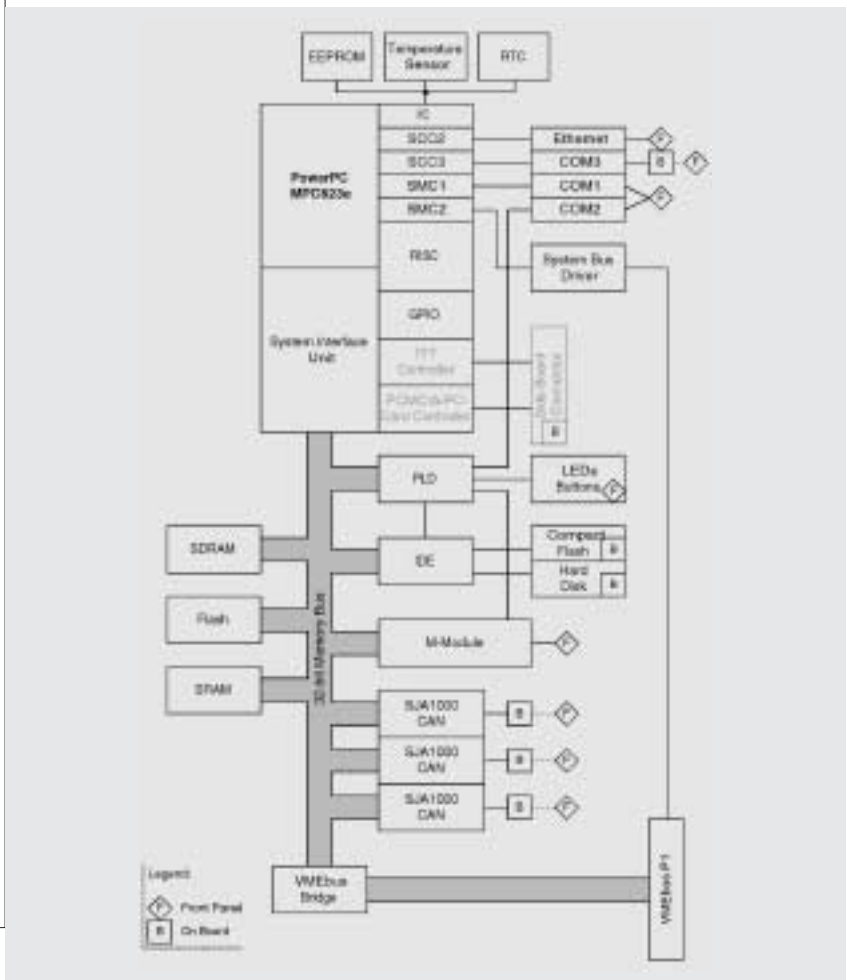
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MENMON
- VxWorks
- OS-9



B11 – 3U VMEbus PowerPC SBC

- PowerPC MPC8245 up to 400MHz
- 1-slot VMEbus master/slave
- 1MB ultra-fast DPRAM
- 512MB DRAM, CompactFlash
- Graphics via PC-MIP
- Ethernet via PC-MIP
- 2 COMs, IDE, USB, keyboard/mouse
- 2 PC-MIP slots
- Option: 4 RS232 and 100Base-T with 5 RJ45
- MENMON BIOS for PowerPC cards

CPU
- PowerPC
  - MPC8245
  - Up to 400MHz

Memory
- Level 1 Cache integrated in MPC8245
  - 16K data cache
  - 16K instruction cache
- SDRAM SO-DIMM up to 512MB
  - 64 bits
- Flash 2MB
  - 8 bits
- Serial EEPROM 2KB
  - For factory settings
- CompactFlash (TM) interface (true IDE)

Interfaces
- Two serial COM ports
  - Physical interface using SA-Adapter via 10-pin ribbon cable
  - RS232..RS485, isolated or not: for free use in system (e.g. cable to front)
- IDE
- Keyboard/mouse PS2
- USB

Local PCI Bus
- PCI Spec. 2.1 compliant
- 32 bit data bus, 33MHz, 3.3V

Local Extensions
- PC-MIP I/O at front panel
  - Two PC-MIP mezzanine extension slots
  - Compliant with PC-MIP specification (Type I/II slots)

VMEbus
- Slot-1 function with autodetection
- Master D08(EO):D16:A24:A16:RMW; transfer rate max. 7MB/s
- Slave D08(EO):D16:A24:BLT; transfer rate max. 30MB/s
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Single level 3 fair requester
- Single level 3 arbiter
- Bus timer
- Arbitration timer
- Utility functions

Miscellaneous
- Real-time clock
- Watchdog and hardware monitor for on-board temperature control
- Hex switch for user settings

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), 6W
- MTBF: 124,000h @ 50°C

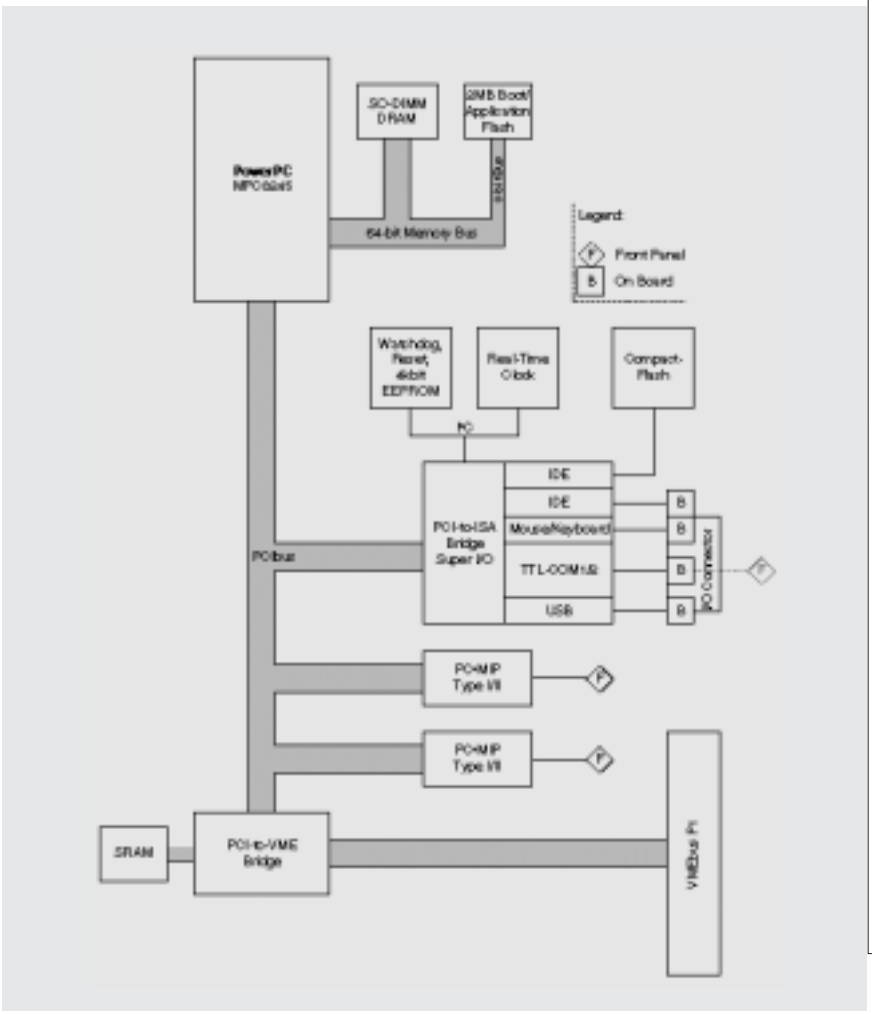
Mechanical Specifications
- Dimensions: standard single Eurocard, 100mm x 160mm
- Weight: 138g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

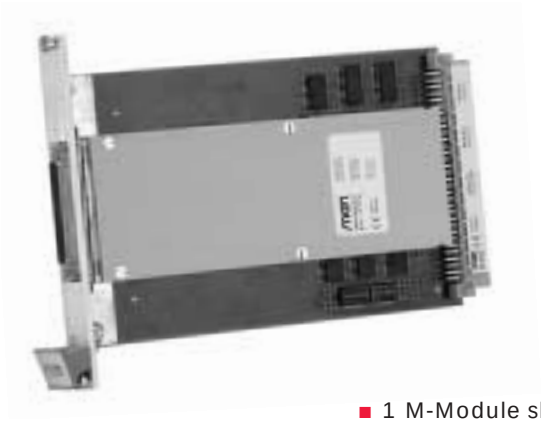
EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MENMON
- Linux
- VxWorks
- QNX
- OS-9



B202S / B201S – 3U VMEbus Carrier Boards for M-Modules

- 2 M-Module slots
- 1 VMEbus slot



- 1 M-Module slot
- 1 VMEbus slot

VMEbus

- Only one slot required on the VMEbus
- A24, A16, D16, D08 (E/O) slave
- D08(O) interrupter

M-Modules

- B201S: one M-Module slot on the board
- B202S: two M-Module slots on the board
- M-Module characteristics: D08, D16, A08, INTA, INTC

Peripheral Connections

- Via front panel

Electrical Specifications

- Supply voltage/power consumption:
  - B201S: +5V (+5%, -0%), 350mA typ. (without M-Modules)
  - B202S: +5V (+5%, -0%), 320mA typ. (without M-Modules)
- MTBF: 52,000h @ 50°C

Mechanical Specifications

- B201S:
  - Dimensions: standard single Eurocard, 100mm x 160mm
  - Front panel: aluminum with 1 handle, cut-out for front connector of M-Module
  - Weight: 108g
- B202S:
  - Dimensions: 110mm x 155mm
  - Front panel: aluminum without handles, cut-outs for front connectors of 2 M-Modules
  - Weight: 102g (without M-Modules)

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

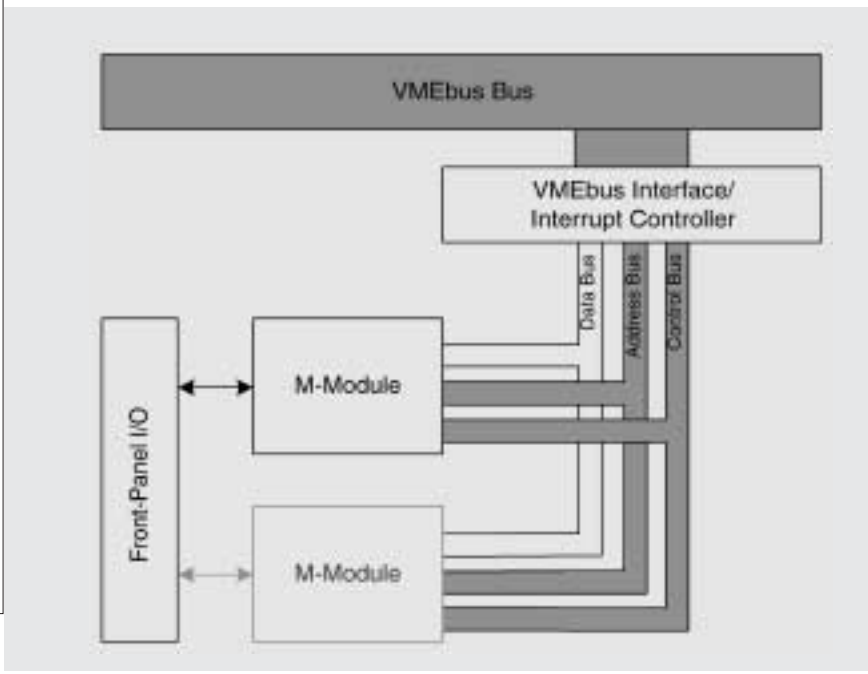
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- M-Module drivers for Windows, VxWorks, Linux, OS-9, RTX as supported



A15c – 6U VME64 PowerPC SBC with PMCs

- PowerPC MPC8245/400MHz
- 1-slot 64-bit VMEbus master and slave
- 512MB DRAM, CompactFlash
- Graphics via PMC
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 2 PMC slots
- MENMON BIOS for PowerPC cards

CPU

- PowerPC MPC8245, 400MHz

Memory

- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 133MHz memory bus operation
- Boot Flash 2MB or 4MB
- 8-bit data bus
- Optional 32MB application Flash
- 64-bit data bus
- Serial EEPROM 4kbits for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE

Interfaces

- Two 10/100Mbits/s Ethernet channels
- 82551ER controller
- RJ45 at front panel with two LEDs
- One UART RS232 serial interface (COM1)
- 16-byte send/receive buffer
- RJ45 at front panel
- One UART (COM2)
- 16-byte send/receive buffer
- Physical interface at front panel or using SA-Adapter via 10-pin ribbon cable on I/O connector, depending on board version
- RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
- Two MPC8245 UARTs
- Accessible via I/O connector
- IDE port for hard disk drives
- Drive can be connected via ribbon cable or mounted directly on the CPU board using MEN's adapter kit
- Only one VMEbus slot needed even with hard disk
- Keyboard/mouse
- PS/2 compatible
- External adapters for line drivers required
- USB port
- External line drivers

Local PCI Bus

- PCI Spec. 2.2 compliant
- 32-bit data bus, 33MHz, 3.3V

VMEbus

- Compliant with VME64 Specification
- Slot-1 function with autodetection
- Master D08(EO):D16:D32:D64:A16:A24:A32: ADO:BLT:RMW; transfer rate max. 25MB/s
- Slave D08(EO):D16:D32:D64:A16:A24:A32: BLT:RMW; transfer rate max. 25MB/s
- 1MB dual-ported fast SRAM
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Single level 3 fair requester
- Single level 3 arbiter
- Bus timer
- Location Monitor
- DMA
- Mailbox

Mezzanine Extensions

- A15a: three PC-MIPs Type I/II on local PCI bus
- Compliant with PC-MIP specification
- A15b: three M-Modules
- Compliant with M-Module standard
- Characteristics: D16, D32, A08, A24, INTA, INTC
- A15c: two PMCs
- Compliant with PMC standard IEEE P1386
- Rear I/O for mezzanine I/O on P2

Miscellaneous

- Serial real-time clock with integrated 56-byte NVRAM
- Serial hardware watchdog in supervisory circuit
- Temperature sensor
- Hex switch for user settings
- User LEDs (integrated into COM1 connector)
- Reset button in ejector handle
- Abort button via I/O connector
- JTAG/BDM connector

Electrical Specifications

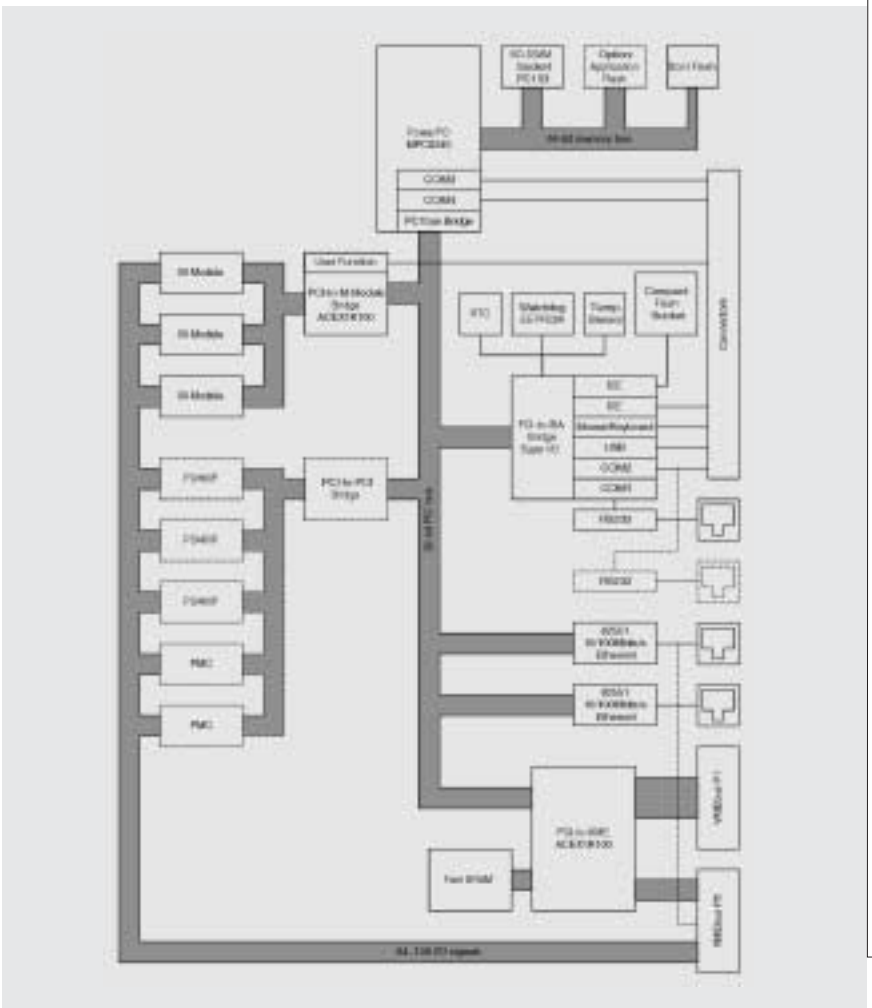
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 1.3A typ.
- ±12V for mezzanines only, tbd.
- MTBF: 63,000h @ 50°C

Environmental Specifications

- Temperature range (operation):
- 0..+60°C or -40..+85°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

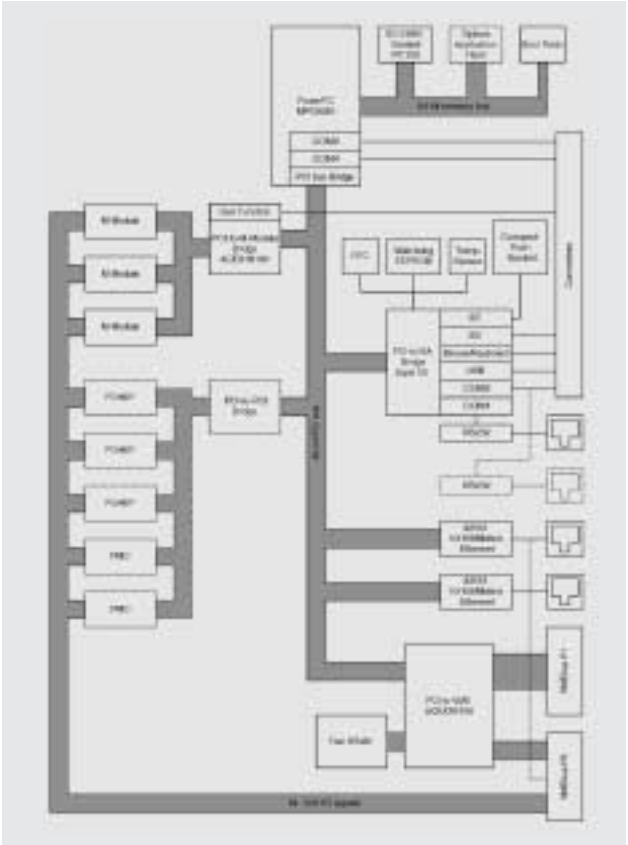
Software Support

- MENMON, Linux, VxWorks, OS-9, QNX

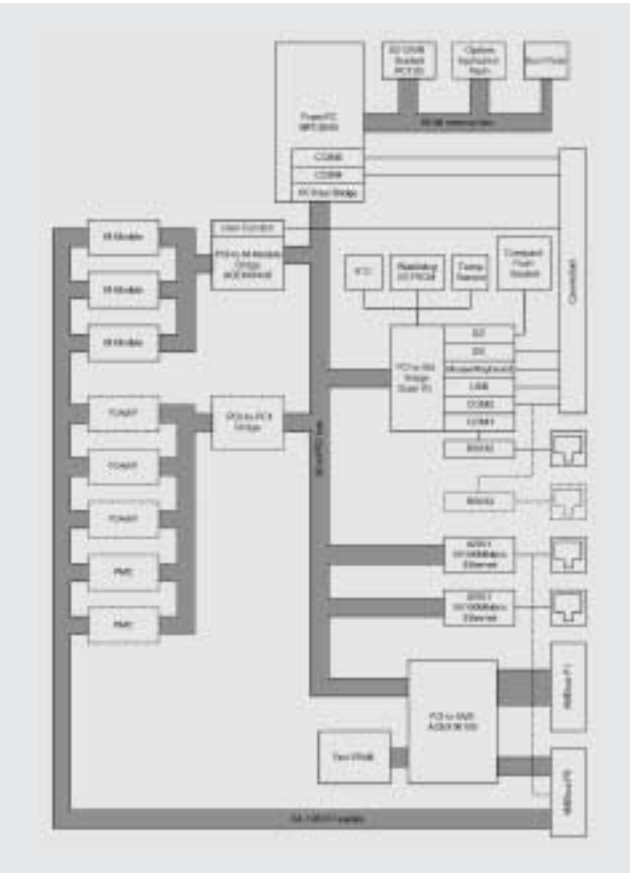


A15b – 6U VME64 PowerPC SBC with M-Modules

- PowerPC MPC8245/400MHz
- 1-slot 64-bit VMEbus master and slave
- 512MB DRAM, CompactFlash
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 M-Module slots
- MENMON BIOS for PowerPC cards



A15a – 6U VME64 PowerPC SBC with PC-MIPs



- PowerPC MPC8245/400MHz
- 1-slot 64-bit VMEbus master and slave
- 512MB DRAM, CompactFlash
- Graphics via PC-MIP
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 PC-MIP slots (Type I/II)
- MENMON BIOS for PowerPC cards

A14 – 6U VME64 PowerPC SBC

- PowerPC MPC8540/800MHz
- 1-slot 64-bit VMEbus master and slave
- Up to 2GB ECC DRAM
- NAND Flash, FRAM
- Graphics via PMC or FPGA
- 2 Gigabit/1 Fast Ethernet
- Up to 6 COMs
- Parallel ATA for on-board hard disk
- Further I/O individual via FPGA
- 2 PMC slots
- MENMON BIOS for PowerPC cards

Product available Q II / 2005

Processor
- MPC8540/800MHz (1GHz optional)
- Passive heatsink
- e500 PowerPC core with FPU and MMU
- Integrated Northbridge and Southbridge
- High memory bandwidth

Memory
- SO-DIMM socket for DDRAM 333
- Up to 2GB ECC DRAM
- SO-DIMM
- 32KB non-volatile FRAM
- 2MB FPGA NOR Flash
- Up to 1GB NAND Flash (depending on chip availability)

VMEbus Interface
- Slot-1 function with auto-detection
- Master D08(EO):D16:D32:D64:A16:A24:A32:A64; BLT; transfer rate max. 25MB/s
- Slave D08(EO):D16:D32:D64:A16:A24:A32:A64; BLT; transfer rate max. 25MB/s
- 1MB shared fast SRAM
- Local PCI bus accessible
- DMA controller with scatter gather DMA
- Mailbox functionality
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Requester, arbiter, bus timer

PMC Slots
- Two PMC slots up to 64-bit/64MHz, 3.3V VIO
- PMC I/O module (PIM) support through P2

I/O
- MPC8560
- COM1 available at the front or on rear I/O
- COM2 available at rear
- Two 1Gb Ethernet channels compatible
- One 100Mb Ethernet channel compatible
- Ethernet controllers are integrated in the CPU to guarantee real throughput
- FPGA
- Parallel ATA available on board for on-board hard disk extension
- SRAM controller
- NAND Flash controller for on-board Flash disk
- Open for additional functions like 2D graphics, CAN etc.
- Option: OX16PCI954 Quad UART
- Via serial interface (SA) adapters for flexible configuration as RS232..TTY

Supervisor
- Real-time clock with 256B GoldCap backup CMOS RAM
- Flexible Watchdog timers based on the FPGA
- Detection on storage of re-start reason

Compliance
- VME64

Mechanical Specifications
- 6U, 4HP standard VME64 6U board

Power Requirements
(MPC8560, 1GB Memory)
- +5V (+5%, -3%), 5A typically
- +3.3V (+5%, -3%), not used
- +12V, ±5%, only used for PMCs
- -12V, ±5%, only used for PMCs

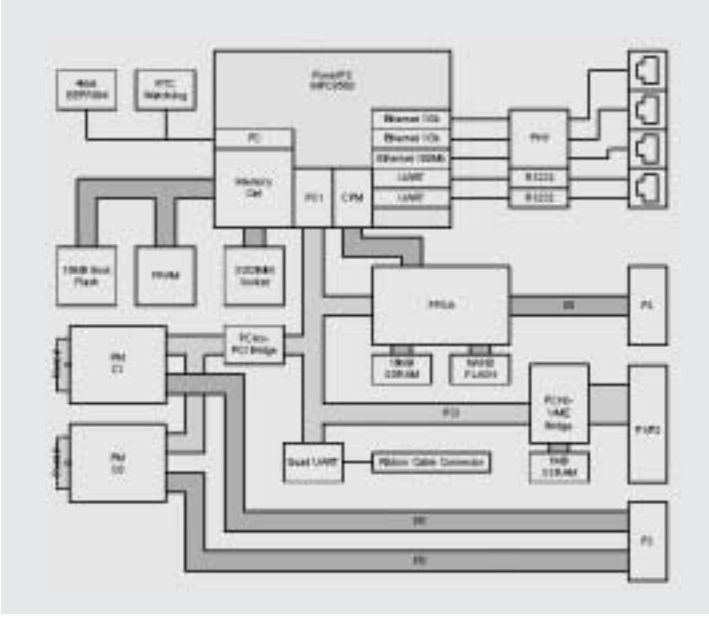
Environmental Specifications
- Temperature range (operation):
- 0..+50°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

MENMON
- New MENMON Hurricane
- Telnet server
- MENMON console via network and Flash update via network
- HTTP Server, setup/control via browser
- VGA/framebuffer devices
- Optional touch/virtual keyboard
- Boot logo while booting
- BMP file from on-board medium (CF)
- Set-up menu
- Extended Diagnostics
- Program update
- Load file from disk
- From root directory of DOSFS
- From PReP partition
- Disk update

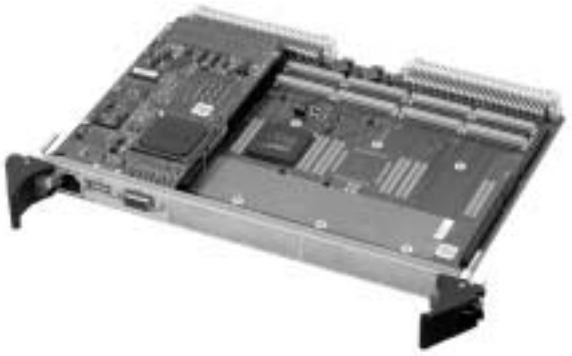
Software Support
- Linux
- VxWorks
- QNX



VMEbus

A13c – 6U VME64 Pentium® III SBC with PMCs

- Pentium® III (Celeron®) up to 933MHz
- 1-slot 64-bit VME master or slave
- 512MB DRAM, CompactFlash
- Graphics
- Fast Ethernet (Gigabit Ethernet with 933MHz version)
- USB
- Quad UART
- Further I/O via transition module (e.g. TFT/video, audio)
- 2 PMC slots
- Optional onboard hard disk (IDE)



CPU

- Celeron® or Pentium® III
- 400MHz or 933MHz processor core frequency
- 256KB or 512KB L2 cache
- 100MHz or 133MHz system bus frequency
- 33MHz APIC bus frequency

Graphics

- Integrated VGA graphics controller
- Connection at front panel via VGA connector

Memory

- 256MB or 512MB SDRAM
- One 144-pin SO-DIMM socket for synchronous DRAM modules
- 133/100MHz memory bus frequency
- CompactFlash interface
- Type I, True IDE

Interfaces

- 10/100/1000Base-T PCI Ethernet controller
- 82540(EM) controller for 1000Base-T
- 82551(ER) controller for 10/100Base-T
- RJ45 interface at front panel
- Three onboard LEDs to signal LAN Link, Activity status and connection speed (10/100/1000Base-T)
- Supports network boot
- USB 1.1 interface, Type A
- UHCI implementation
- At front panel
- Data throughput up to 12Mbits/s
- OX16PCI954 Quad UART
- Via serial interface (SA) adapters for flexible configuration as RS232..TTY

Mass Storage

- Fast IDE ports
- One IDE hard-disk/CD-ROM port via on-board connector
- One IDE port for local CompactFlash

Mezzanine Extensions

- A13a: three PC-MIPs Type I/II on local PCI bus
- Compliant with PC-MIP specification
- A13c: two PMCs
- Compliant with PMC standard IEEE P1386 VMEbus Interface
- Slot-1 function with auto-detection
- Master D08(EO):D16:D32:D64:A16:A24:A32:A64; BLT; transfer rate max. 25MB/s
- Slave D08(EO):D16:D32:D64:A16:A24:A32:A64; BLT; transfer rate max. 25MB/s
- 1MB shared fast SRAM
- Local PCI bus accessible
- DMA controller with scatter gather DMA
- Mailbox functionality
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Single level 3 fair requester (can be enabled or disabled)
- Single level 3 arbiter
- Bus timer
- Utility functions
- Support of address only cycle

Miscellaneous

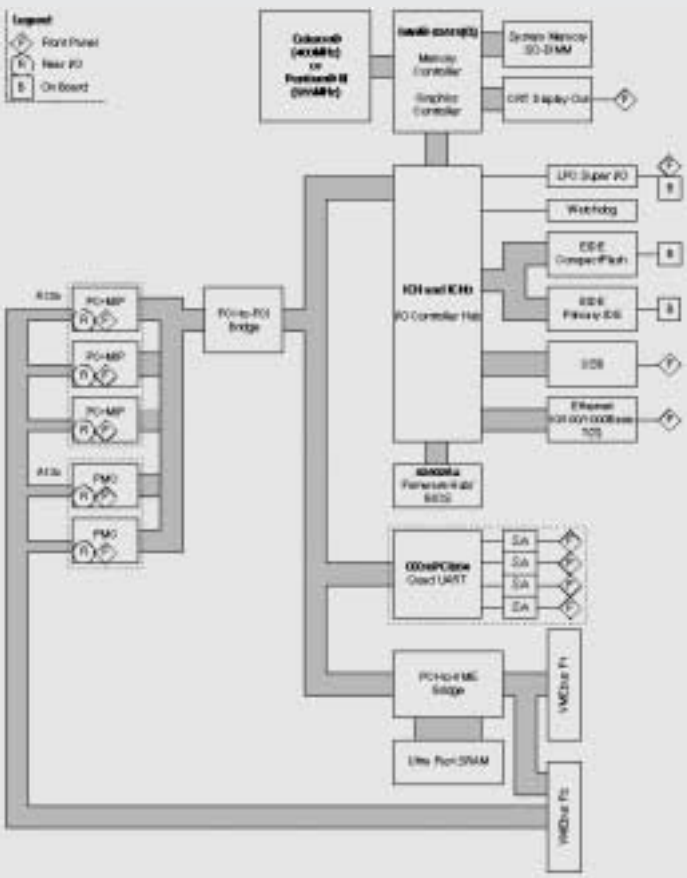
- Battery-backed real-time clock
- Integrated hardware monitor

Electrical Specifications

- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 1A typ. (with Celeron®/400MHz), 5.3A typ. (with Pentium®/933MHz)
- ±12V for mezzanines only
- MTBF: tbd. @ 50°C

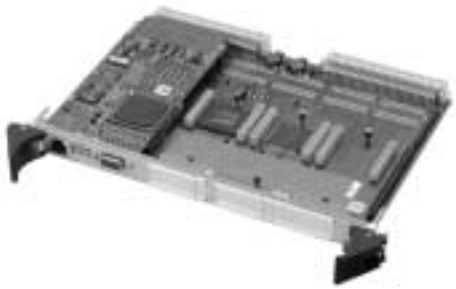
Software Support

- Phoenix BIOS
- Linux
- Windows 2000/XP
- VxWorks (on request)
- QNX (on request)



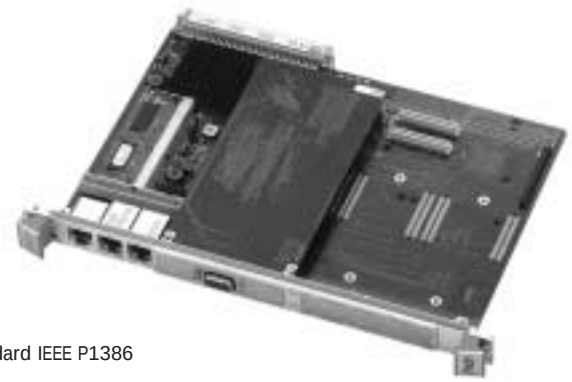
A13a – with PC-MIPs

- 3 PC-MIP slots (Type I/II)



A12c – 6U VMEbus PowerPC SBC with PMCs

- PowerPC MPC8245/300MHz
- 1-slot VMEbus master and slave
- 512MB DRAM, CompactFlash
- Graphics via PMC
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 2 PMC slots
- MENMON BIOS for PowerPC cards



CPU
- PowerPC
  - MPC8245, 300MHz

Memory
- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 100MHz memory bus operation
- Flash 2MB
  - 8-bit data bus
- Serial EEPROM 2KB for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE)via on-board IDE

Interfaces
- Two 10/100Mbits/s Ethernet channels
  - 82559ER controller
  - RJ45 at front panel with two LEDs
- One UART RS232 serial interface (COM1)
  - 16-byte send/receive buffer
  - RJ45 at front panel
- One UART (COM2)
  - 16-byte send/receive buffer
  - Physical interface using SA-Adapter via 10-pin ribbon cable on I/O connector
  - RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
- Two MPC8245 UARTs
  - Accessible via I/O connector
- IDE port for hard disk drives
  - Drive can be connected via ribbon cable or mounted directly on the CPU board using MEN's adapter kit
  - Only one CompactPCI slot needed even with hard disk
- Keyboard/mouse
  - PS/2 compatible
  - External adapters for line drivers required
- USB port
  - External line drivers

Local PCI Bus
- PCI Spec. 2.2 compliant
- 32-bit data bus, 33MHz, 3.3V

VMEbus
- Slot-1 function with autodetection
- Master D08(EO):D16:A24:A16; transfer rate 7MB/s
- Slave D08(EO):D16:A24:BLT; transfer rate 15MB/s
- Up to 1MB dual-ported fast SRAM
- Interrupter D08(O):I(7-1):ROAK
- Interrupt handler D08(O):IH(7-1)
- Single level 3 fair requester
- Single level 3 arbiter
- Bus timer

Mezzanine Extensions
- A12a: three PC-MIPs Type I/II on local PCI bus
  - Compliant with PC-MIP specification
- A12b: three M-Modules
  - Compliant with M-Module standard
  - Charact.: D16, D32, A08, A24, INTA, INTC
- A12c: two PMCs
  - Compliant with PMC standard IEEE P1386

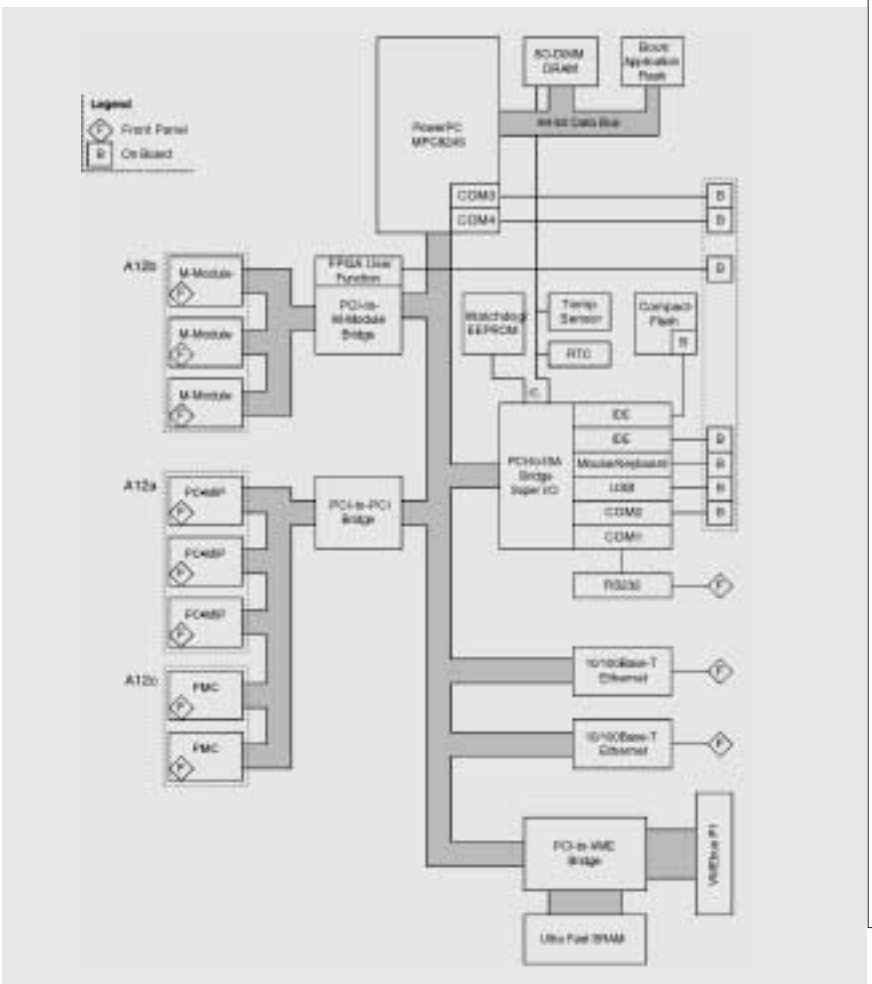
Miscellaneous
- Serial real-time clock with integrated 56-byte NVRAM
- Serial hardware watchdog in supervisory circuit
- Temperature sensor
- Hex switch for user settings
- User LEDs (external)

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 1.65 A typ.
  - ±12V for mezzanines only, tbd.
- MTBF: 63,000h @ 50°C

Mechanical Specifications
- Dimensions: standard double Eurocard, 233.3mm x 160mm
- Weight (without mezzanines and accessories):
  - A12a: 275g
  - A12b: 273g
  - A12c: 270g

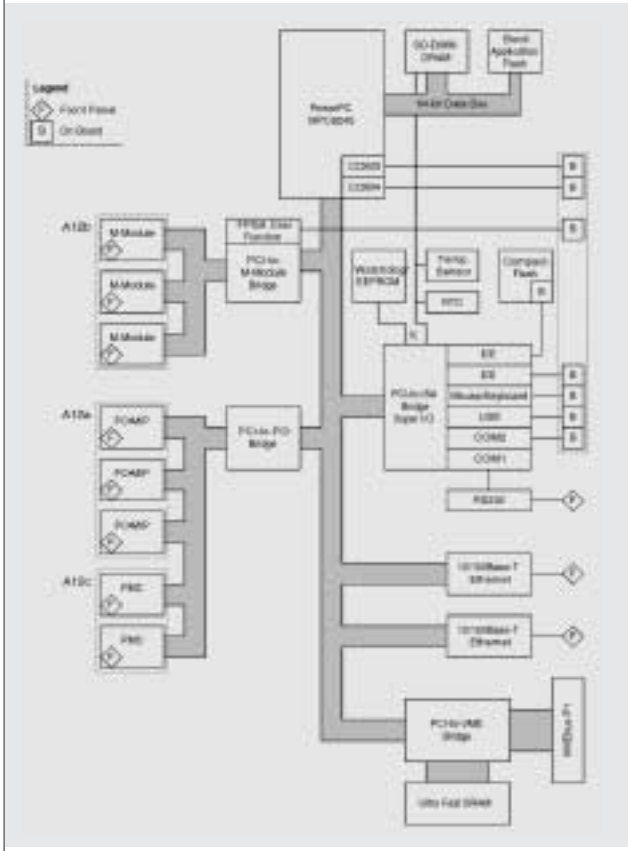
Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Software Support
- MENMON
- Linux
- VxWorks
- QNX
- OS-9



VMEbus

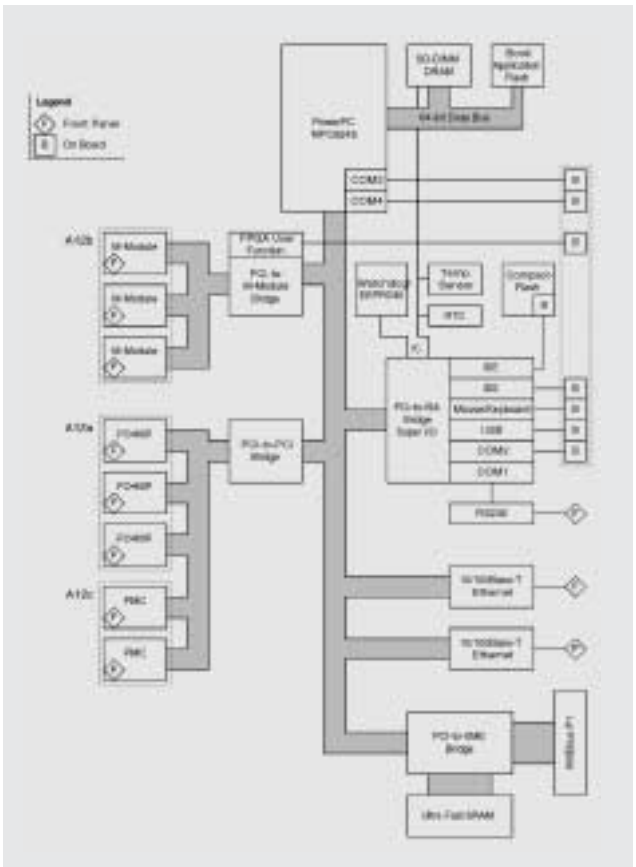
A12b – 6U VMEbus PowerPC SBC with M-Modules



- PowerPC MPC8245/300MHz
- 1-slot VMEbus master and slave
- 512MB DRAM, CompactFlash
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 M-Module slots
- MENMON BIOS for PowerPC cards

A12a – 6U VMEbus PowerPC SBC with PC-MIPs

- PowerPC MPC8245/300MHz
- 1-slot VMEbus master and slave
- 512MB DRAM, CompactFlash
- Graphics via PC-MIP
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 3 PC-MIP slots (Type I/II)
- MENMON BIOS for PowerPC cards



A11 – 6U VMEbus PowerPC Workstation

- PowerPC 603e, 740 up to 500MHz
- 1-slot VMEbus master or slave
- Up to 256MB DRAM (SO-DIMM)
- 32MB soldered DRAM
- 16MB Flash, CompactFlash
- Graphics via PC-MIP
- 100Mbit Ethernet
- 4 COMs, Ultra2 SCSI, floppy, IDE, keyboard/mouse
- 2 PC-MIP slots (Type I/II)
- MENMON BIOS for PowerPC cards

CPU

- PowerPC
  - 603e / 100..300MHz, up to 423 MIPS @ 300MHz
  - 740 / 200..500MHz, up to 928 MIPS @ 500MHz

Memory

- Level 1 Cache
  - 603e: 16KB instruction/16KB data
  - 740: 32KB instruction/32KB data
- Level 2 Cache
  - Up to 512KB
- SDRAM soldered 32MB
  - 64-bit data bus
  - 66MHz
  - No parity checking
- SO-DIMM slot up to 256MB (as of MENMON version 3.7, otherwise up to 64MB)
- Flash up to 16MB
  - 64-bit data bus, two banks
- CompactFlash card interface for Flash ATA via on-board IDE

Local PCI Bus

- MPC106 Host-to-PCI bridge
- PCI Spec. 2.1 compliant
- 32 bit data bus, 33MHz
- One local PCI expansion slot, e.g. for carrier boards with PMC or IP modules

VMEbus

- VMEbus Spec. IEEE-1014-87 compatible
- VME64x extension except A64
- 3-row or 5-row connectors
- Tundra Universe II chip
- Up to 70MB/s transfer rate
- A16, A24, A32 master/slave
- D08(EO), D16, D32, D64
- BLT, ADOH, RMW, LOCK
- 7-level interrupter
- 7-level interrupt handler
- System controller

PC-MIP Mezzanine Extension

- Two PC-MIPs Type I/II
- On local PCI bus via DEC21150 PCI-to-PCI bridge
- Compliant with PC-MIP specification

Interfaces

- COM1/2 with RS232 interface at 9-pin micro D-Sub connector at front panel or via P2 I/O
- COM3/4 sync./async. UART Z85230 via P2 I/O
- Standard floppy disk controller interface using on-board connector
- Ultra2 SCSI with LVD interface on front panel or 16/8-bit interface at P2 I/O
- Full-duplex 10/100Mbits/s PCI Ethernet controller with 100Base-TX/10Base-T interface at front panel and 10Base-5 interface via P2 I/O
- Keyboard and mouse with 6-pin PS/2 connector at front panel
- Multimode parallel port (ECP, EPP, PS/2, SPP) via P2 I/O
- IDE interface on-board for AD35 CompactFlash adapter

Miscellaneous

- Real-time clock with 8Kx8 NVRAM
- 6 programmable 16-bit timers Z8536
- Hardware monitor with alarm function for
  - On-board temperature control
  - Voltage control
- Reset/abort button at front panel
- Four user LEDs at front panel
- Four control LEDs at front panel
- Hex switch for user settings
- Watchdog

Electrical Specifications

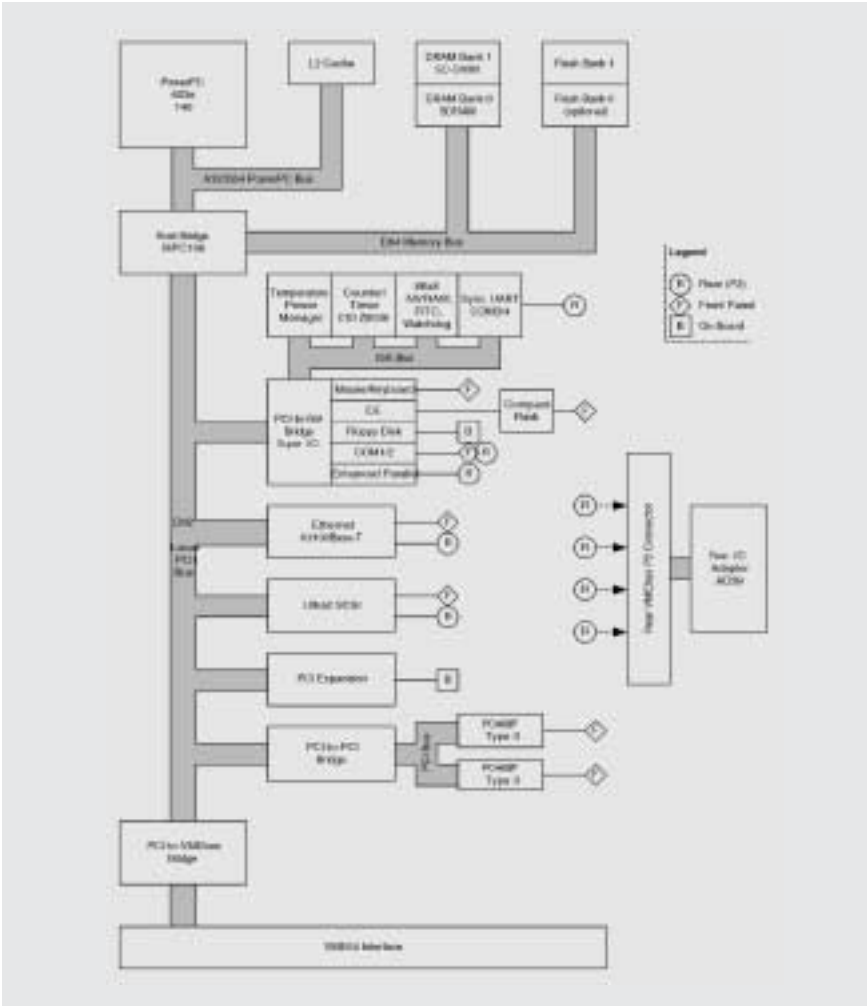
- Supply voltage/power consumption: +5V (4.85V..5.25V), 5.5A max.
- MTBF: 66,000h @ 50°C

Environmental Specifications

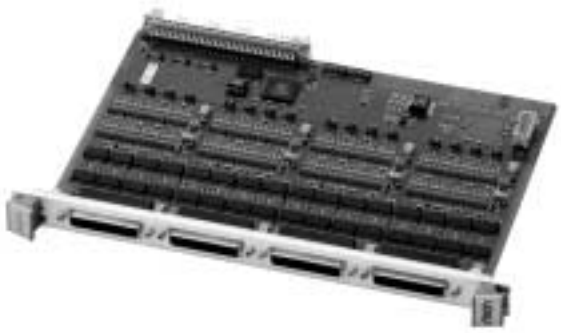
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support

- MENMON
- VxWorks
- QNX
- OS-9



A302 – 6U VMEbus Card with 128 Binary I/Os



- 1-slot A24/D16 VMEbus slave
- 4 optically isolated units with 32 channels for each unit
- Individual use of each channel as input or output
- Individual edge-triggered interrupts
- Input/output load on ground
- High-side output switches
- High output current: max. 1.9A per channel or 16A per unit
- Over-current and over-temperature protection

Binary I/Os

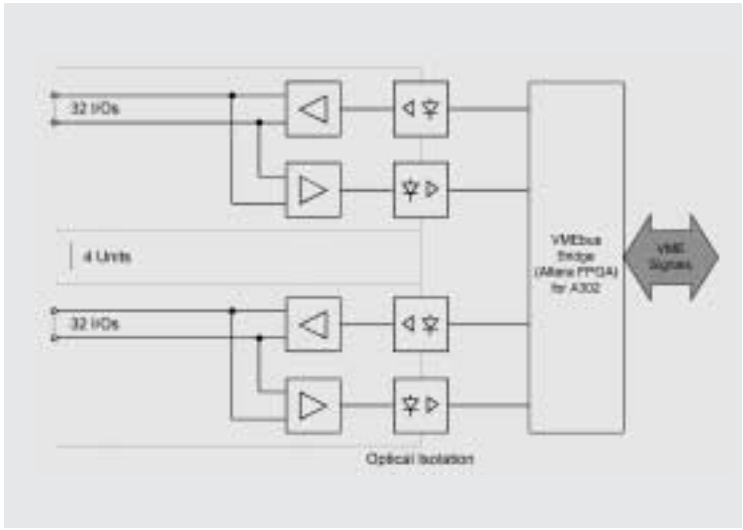
- 128 binary signals
- 4 optically isolated units, 32 channels for each unit
- Individual use of each channel as input or output
- Individual edge-triggered interrupts
- Input/output load on ground
- High-side output switches
- High output current
- Max. 1.9A per channel, max. 16A per unit
- Over-current and over-temperature protection

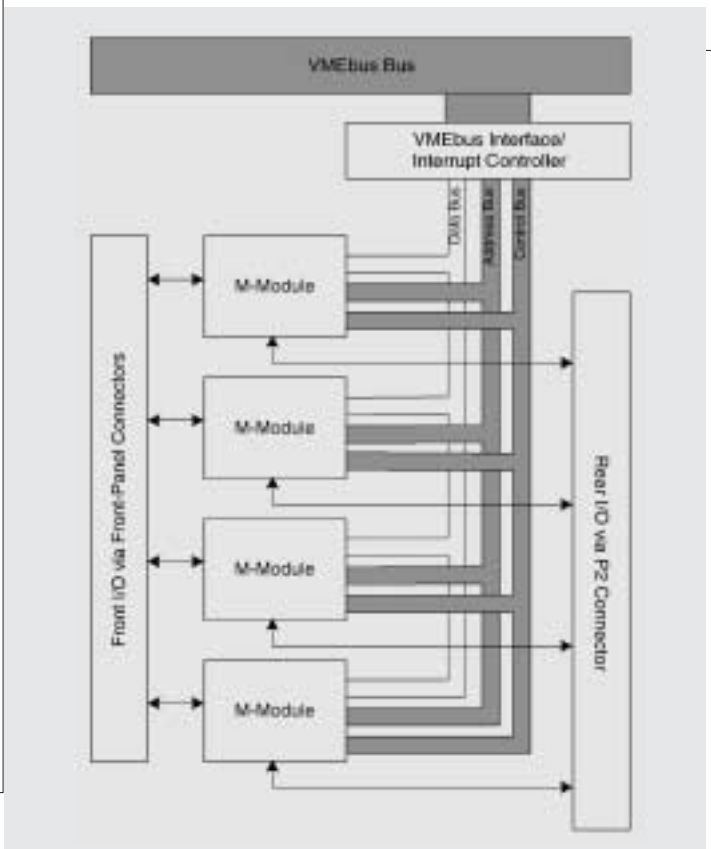
Output Characteristics

- Output voltage range: 12V..32V
- Output current log. 0: max. 10mA
- Output current log. 1: max. 1.9A
- Switching time for output change: < 200µs
- Isolation voltage (optocoupler): 500V DC

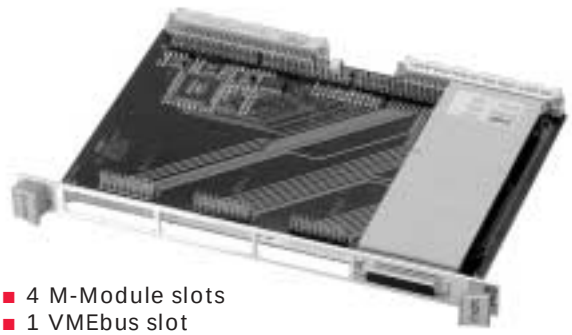
Input Characteristics

- Input voltage min.: 0V
- Input voltage max. external supply voltage (12..32V)
- Voltage level log. 0: 0V..6V or open
- Voltage level log. 1: 12V..32V
- Input current log. 1: 2.03mA @ 24V
- Switching threshold: 9.2V @ 0.78mA typ.
- Switching time for input change: min. 33µs, max. 44µs
- Excess voltage protection: max. +47V





A201S – 6U VMEbus Carrier Board for M-Modules



- 4 M-Module slots
- 1 VMEbus slot
- VMEbus slave A16/A24/D16, interrupter

The A201S is an M-Module carrier board for universal I/O on the VMEbus, allowing high flexibility in applications such as process and motion control, measuring and instrumentation, communication or special-purpose tasks. The M-Modules are screwed tightly on the carrier board, but the board needs only one slot on the VMEbus. An interrupt controller handles the M-Modules individually. In VMEbus D16 systems the I/O signals of the M-Modules can be accessed from P2/J2 inside the rack.

VMEbus Basic System – 4U, 84HP, 3U card vertical

- 19" rack mountable
- Highly compact subrack
- 9-slot J1 VMEbus backplane
- Space for hard drive, floppy drive
- Power supply
- Fan
- For all of MEN's 3U VMEbus SBCs

General System Characteristics

- 9 slots for 3U Eurocard boards
- Ventilation using DC fan (85..170m³/h) through back panel

Mechanical Specifications

- 19" rack-mount standard
- 3U card vertical
- Dimensions: 3U, 84HP, 383mm depth
- Weight: tbd.

VMEbus Backplane

- System bus J1, 3U, IN board
- Compliance with VMEbus Specifications IEEE 1014 and IEC 821
- 9-slot

Power Supply

- Power supply
  - 150/220W
  - 120V/230V AC/DC @ 3A
  - 47..63Hz
  - Agency-approved: VDE, UL, CSA
- Back-panel power connectors
- Power-on switch

Environmental Specifications

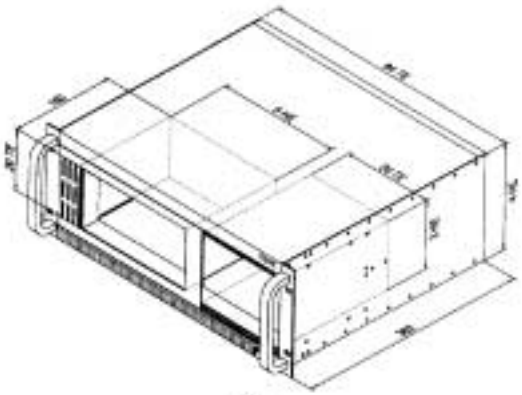
- Temperature range (operation): 0..+50°C
- Temperature range (storage): -25..+70°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

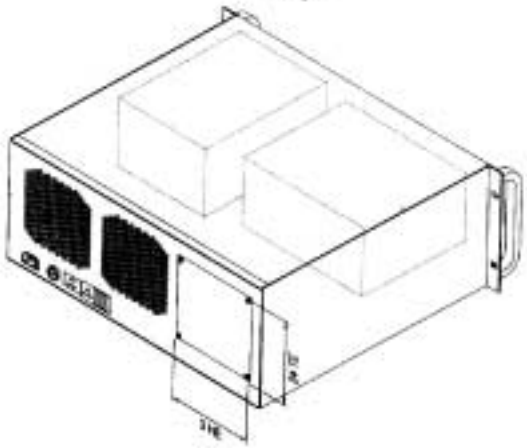
EMC

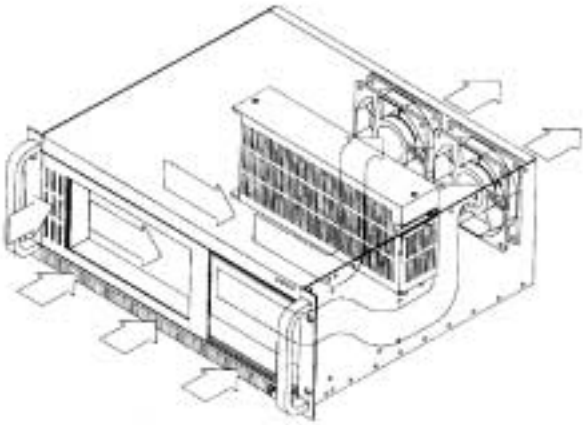
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Suited for MEN Boards...

- All 3U VMEbus SBCs







VMEbus Basic System – 5U, 84HP, 6U card horizontal

- 19" rack mountable
- Highly compact subrack
- 7-slot J1/J2 VMEbus backplane
- Space for hard drive, floppy drive
- Power supply
- 2 fans
- For all of MEN's 6U VMEbus SBCs

General System Characteristics

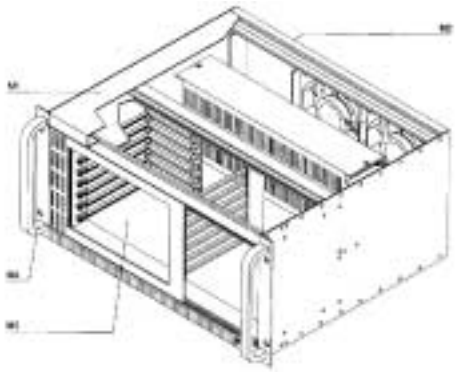
- 7 slots for 6U Eurocard boards
- Ventilation using 2 DC fans (85..170m³/h) through back panel

Mechanical Specifications

- 19" rack-mount standard
- 6U card horizontal
- Dimensions: 5U, 84HP, 383mm depth
- Weight: tbd.

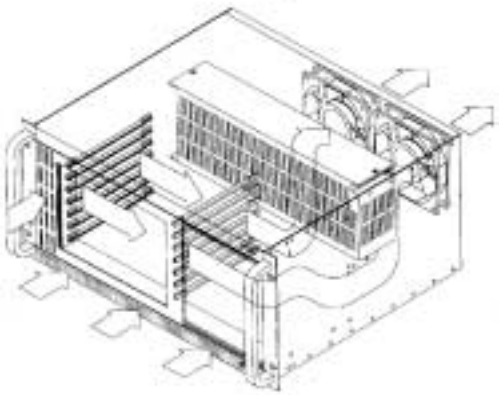
VMEbus Backplane

- System bus J1/J2, 6U, IN board
- Compliance with VMEbus Specifications IEEE 1014 and IEC 821
- 7-slot



Power Supply

- Power supply
  - 150/220W
  - 120V/230V AC/DC @ 3A
  - 47..63Hz
  - Agency-approved: VDE, UL, CSA
- Back-panel power connector
- Power-on switch



Environmental Specifications

- Temperature range (operation): 0..+50°C
- Temperature range (storage): -25..+70°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

EMC

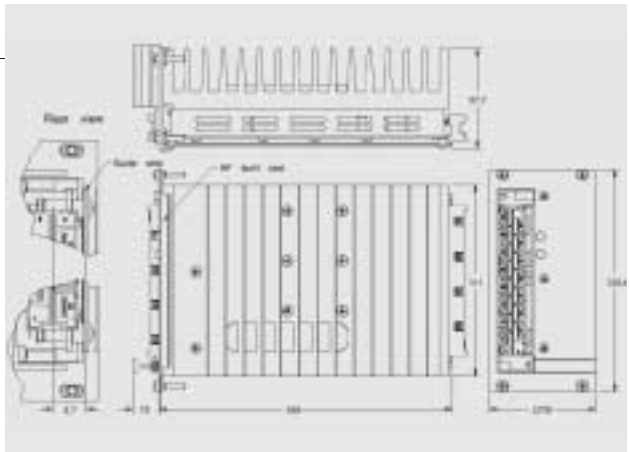
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Suited for MEN Boards...

- All 6U VMEbus SBCs
- Not suited for A201S versions with a VME P2 connector

Plug-in PSU for 19" systems, 3U, 12HP

- Input 110V DC nom. (66-154V)
- Output 5.1V, 75W
- -40..+85°C without derating
- Conformal coating
- Complies with EN 50155
- H15 DIN41612 male connector (front and rear)



SA-Adapters – Serial Line Physics for MEN Boards

SA-Adapters are small universal boards providing the physics for legacy serial I/O, fieldbus interfaces and other small I/O functions. One serial line is provided per adapter, which can be plugged directly to the CPU board as a mezzanine. Alternatively, the adapter can be connected to the front panel via ribbon cable. The SA concept allows to add additional I/O interfaces to many of MEN's CPU boards, enhancing flexibility with regard to the line transceivers and isolation requirements.
SA-Adapters can be used on the majority of MEN's VMEbus, CompactPCI, ESM, PCI-104 or busless SBCs. Whether a specific SA-Adapter (or a mix of different SA-Adapters) fits on a specific CPU board is determined by a combination of mechanical and performance features, as well as FPGA and operating system criteria and needs to be verified for every board configuration requested.

SA12 – Audio Codec AC'97

	Interface	Isolation	Supported on MEN Boards
08SA01-00	RS232	No	EM01, EM03, EM04/N, EM05, EM07, EM08, PP01 A4N, A9, A10, A11, A12a/b/c, A13a/c, A14, A15a/b/c, B5, B6, B11, B12 D2, D3a/b/c, D5, D6, F1N, F6, F7/N, F8, F9, F10, F11 SC13a/b/c, 090009 (Kahlua Box) P10, AD39, AD67, CT02, VT01
08SA02-00	RS422/RS485, half duplex	Yes	As on 08SA01-00
08SA02-01	RS422/RS485, full duplex	Yes	As on 08SA01-00
08SA02-07	RS422/RS485, full duplex, -40..+85°C	Yes	As on 08SA01-00
08SA03-00	RS232	Yes	As on 08SA01-00
08SA03-01	RS232, -40..+85°C	Yes	As on 08SA01-00
08SA04-00	TTY	Yes	As on 08SA01-00
08SA08-00	CAN ISO high-speed	Yes	F8, F11 + call
08SA08-01	CAN ISO high-speed, -40..+85°C	Yes	F8, F11 + call
08SA09-01	Interbus-S master	Yes	Call
08SA10-00	Ethernet 10Base-FL, FiberOptic UART, full duplex	Yes	B5, B6
08SA12-00	Audio Codec AC'97, -40..+85°C	Yes	F8, F11 + call
08SA13-00	PS/2 for keyboard/mouse, -40..+85°C	No	F8, F11 + call
08SA15-00	8 digital I/O lines, -40..+85°C	Yes	F8, F11 + call

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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Busless

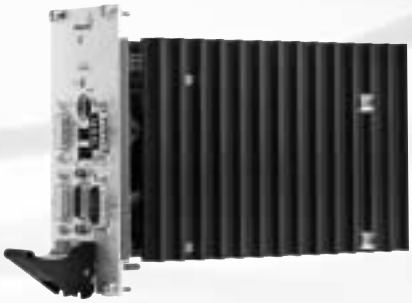
ESM – Embedded System Modules

ESM modules are complete computers on a plug-on module. The ESM consists of a computing core (x86 or RISC CPU, chipset and memory), board-specific I/O, an FPGA that can be used for a range of application-specific functions, and board support packages for various operating systems. A complete embedded control consists either of a stand-alone ESM (the power supply connection is sufficient to operate the module), an ESM with an application-specific carrier card and/or an ESM with an additional plugged PCI-104 module.

For detailed description see page 52-65.

F11 – 3U Pentium® III SBC

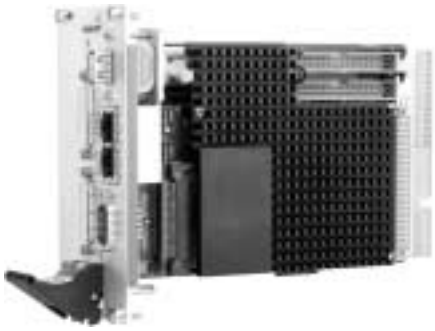
- 32-bit cPCI/PXI system slot or stand-alone, 12 HP
- ULP Pentium® III up to 933 MHz
- ULV Celeron® up to 650 MHz
- Up to 512 MB DRAM, 2MB SRAM, CompactFlash
- 2 Fast Ethernet, COM 1, 2 USB 1.1 (front)
- Option: COM 2 (front)
- VGA/digital video output, keyboard/mouse (front)
- Up to 1600 x 1200 pixels
- IDE (on-board)
- Prepared for 2.5" hard disk on board
- FPGA – further programmable I/O functions
- Option: up to 7 SA-Adapters



For detailed description see page 6.

F8 – 3U Infotainment SBC

- 32-bit cPCI system slot or stand-alone, 12 HP
- Transmeta Crusoe TM5900 / 800 MHz
- 512 MB DDR RAM (SO-DIMM) installed
- CompactFlash slot
- 2.5" hard disk slot
- Dual Fast Ethernet, COM 1, USB1.1 (front)
- DVI and DVI-I (front)
- LCD (up to UXGA) and CRT
- 16 MB integrated graphics RAM
- Up to 1600 x 1200 pixels
- AC'97 (opt. isolation), keyboard/mouse, CAN, COMs... optional via FPGA with SA-Adapters
- Option: up to 8 SA-Adapters



For detailed description see page 9.

B12 – 3U PowerPC SBC

- MPC823e/66MHz
- 1-slot VMEbus master/slave or busless
- 128MB DRAM, 32MB Flash, CompactFlash
- 10Mbit Ethernet
- 3 COMs, 3 CAN
- 1 M-Module slot
- CANopen support
- Full EN50155 compliance

For detailed description see page 32.

SC13c – 6U Busless PowerPC SBC with PMCs

- PowerPC MPC8245/300MHz
- 6U form factor
- 512MB DRAM, CompactFlash
- Graphics via PMC
- Dual 10/100Mbit Fast Ethernet
- 4 COMs, USB, IDE, keyboard/mouse
- 2 PMC slots
- MENMON BIOS for PowerPC cards

CPU
- PowerPC
  - MPC8245
  - 300MHz

Memory
- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 100MHz memory bus operation
- Flash 2MB
  - 8-bit data bus
- Serial EEPROM 2KB for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE

Interfaces
- Two 10/100Mbits/s Ethernet channels
  - 82559ER controller
  - RJ45 at front panel with two LEDs
- One UART RS232 serial interface (COM1)
  - 16-byte send/receive buffer
  - RJ45 at front panel
- One UART (COM2)
  - 16-byte send/receive buffer
  - Physical interface using SA-Adapter via 10-pin ribbon cable on I/O connector
  - RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
- Two MPC8245 UARTs
  - Accessible via I/O connector
- IDE port for hard disk drives
  - Drive can be connected via ribbon cable or mounted directly on the CPU board using MEN's adapter kit
  - Only one CompactPCI slot needed even with hard disk
- Keyboard/mouse
  - PS/2 compatible
  - External adapters for line drivers required
- USB port
  - External line drivers

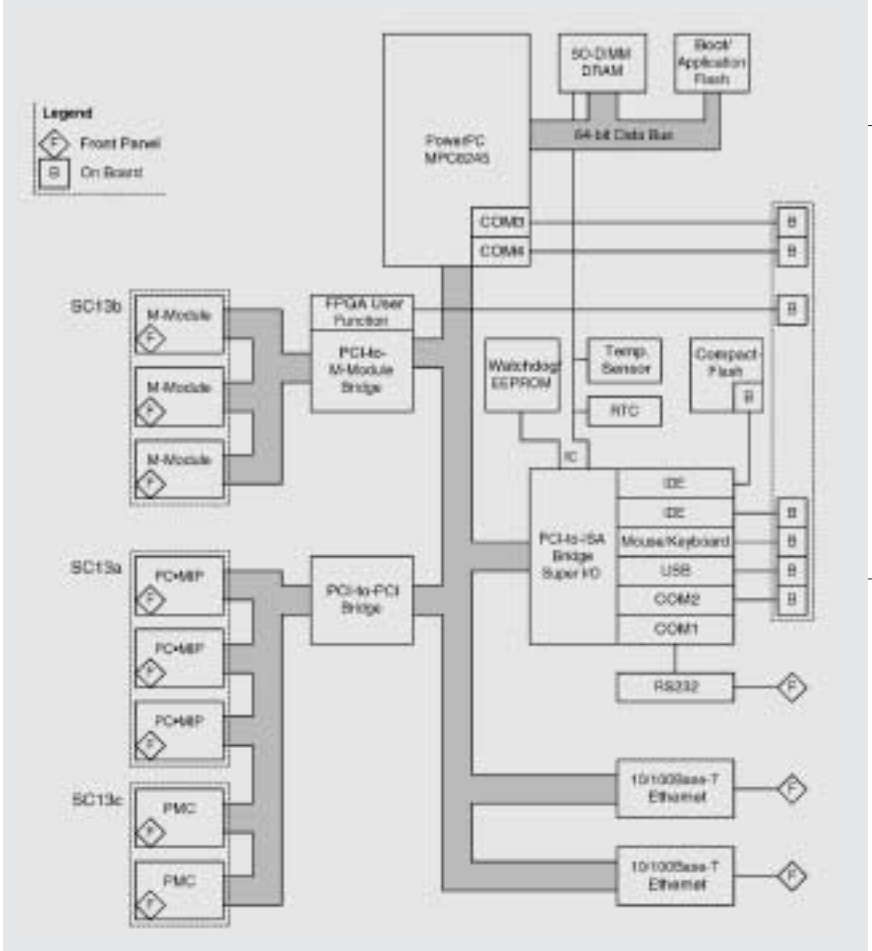
Local PCI Bus
- PCI Spec. 2.2 compliant
- 32-bit data bus, 33MHz, 3.3V

Mezzanine Extensions
- SC13a: three PC-MIPs Type I/II on local PCI bus
  - Compliant with PC-MIP specification
- SC13b: three M-Modules
  - Compliant with M-Module standard
  - Characteristics: D16, D32, A08, A24, INTA, INTC
- SC13c: two PMCs
  - Compliant with PMC standard IEEE P1386

Miscellaneous
- Serial real-time clock with integrated 56-byte NVRAM
- Serial hardware watchdog in supervisory circuit
- Power supply via onboard 4-pin power connector
- Temperature sensor
- Hex switch for user settings
- User LEDs (external)

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 1.65 A typ.
  - ±12V for mezzanines only, tbd.
  - MTBF: 63,000h @ 50°C

Software Support
- VxWorks
- OS-9
- Linux
- MENMON



SC13b – with M-Modules

- 3 M-Module slots

SC13a – with PC-MIPs

- 3 PC-MIP slots (Type I/II)

Human-Machine Interfaces – Individual Solutions

For example:
- Aluminum EMC enclosure
- 24V power supply
- TFT with touch interface
- Integrated keyboard
- Resolution 480 x 640 to 600 x 800
- Printer, CompactFlash at front
- I/O connections at rear
- MPC8245/266..400MHz
- DRAM, CompactFlash
- CAN, Ethernet, serial ... interfaces
- Additional I/O via on-board FPGA
- Java (Internet access)

Mechanical Specifications
- Aluminum enclosure
- Dimensions (d x w x h):
  75(max.) x 483 x 288 mm³
- IP rating: IP20 according to EN 60529

CPU
- PowerPC Kahlua II, 266..400MHz

Memory
- 32..512MB SO-DIMM / 133MHz
- Two CompactFlash slots
  - One located at the front, dust protection cover
  - One inside the system, for program data

Graphics
- 32MHz video frequency
- 16MB video SDRAM
- 16 bits/pixel (5-5-6)
- Linearly organized frame buffer interface TFT
- Hitachi TX31D30VC1CAA
- 800 x 600 pixels, 6 bits/color
- 300 cd/m2
- TTL interface

Touch panel
- Analog resistive touch panel

Printer
- Fast thermal printer, e.g. Seiko LP1245
- Printing speed > 15mm/s
- Paper feed speed > 30mm/s
- Push button for form feed

Interfaces
- Serial Connection
  - RS232/RS422/RS485 selectable through software setup
  - Isolated
  - Standard baud rates up to 115.2 kbaud
  - Two handshake lines in RS232 mode
- Ethernet
  - 10/100Mbits/s Ethernet interface
  - One or two channels
  - RJ45 connectors at rear side
- CAN bus
  - ISO high speed
  - Optically isolated
  - Baud rate up to 1Mbit/s
- Debug/Service Connection
  - RS232
  - Standard connector at front

(Further I/O options through FPGA)
- All functions optional, can be factory-programmed as needed
- IDE interface
- SRAM controller
- Quad UART
- GPIO

PCI bus Extension Interface
- PCI-104 extension slot

Miscellaneous Features
- SA-Adapter extension interface
  - For flexible serial interfacing
  - Connection at rear side

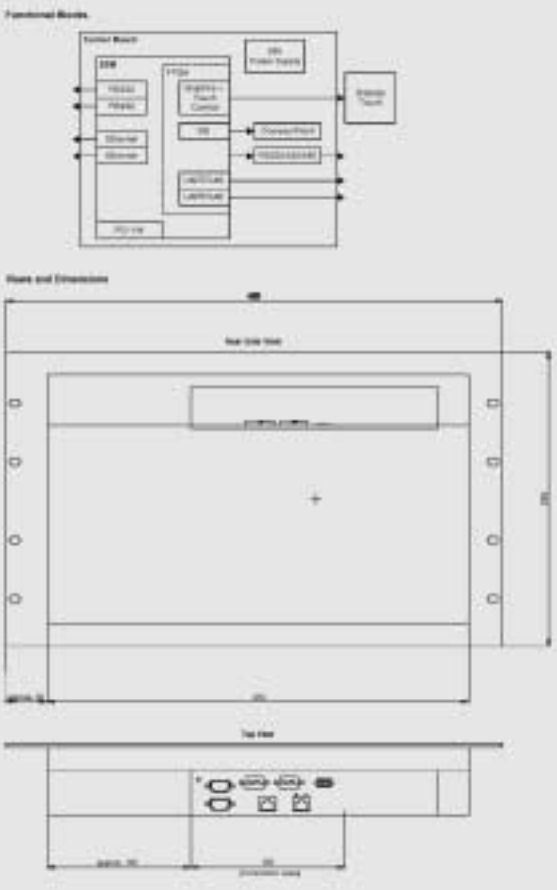
Power Supply
- 24V +/-25%, 0,8A typical, 2A max.
- 3.15t fuse

Environmental Specifications
- Temperature range (operation):
  - 0..+50°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -20..+60°C
- Relative humidity (operation): max. 85% nc
- Relative humidity (storage): max. 85% nc
- Altitude: -300m to + 3,000m
- Shock: 6g/6ms
- Crash: 15g/0.33ms
- Vibration (sinusoidal): 1g/5..2000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support
- Embedded Linux
- VxWorks
- OS-9



Kahlua Box – Industrial Control System

- Compact aluminum EMC enclosure
- 24V / 40W DC power supply
- MPC8245/300MHz (Kahlua II)
- 256MB DRAM (max. 512MB)
- 32MB CompactFlash
- Configurable with:
  - M-Modules
  - PC-MIPs
  - PMCs
  - SA-Adapters

Mechanical Specifications

- Aluminum enclosure
- Dimensions (d x w x h): 245 x 266 x 80 mm³
- IP rating: IP30 according to EN 60529
- Weight: tbd. kg (depending on set-up)

CPU

- 6U/4HP single-board computer for sandwich mounting
- PowerPC MPC8245 @ 300MHz

Memory

- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 100MHz memory bus operation
- Flash 2MB
  - 8-bit data bus
- Serial EEPROM 2KB for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE

Interfaces

- Two 10/100Mbits/s Ethernet channels
  - 82559ER controller
  - RJ45 at front panel with two LEDs
- One UART RS232 serial interface (COM1)
  - 16-byte send/receive buffer
  - RJ45 at front panel
- Three UARTs (COM2..COM4)
  - 16-byte send/receive buffer
  - Physical interfaces using SA-Adapters via 10-pin ribbon cable on I/O connector
  - RS232..RS485, isolated or not: for free use in system (e. g. cable to front)
- IDE port for hard disk drives
  - Drive can be connected via ribbon cable or mounted directly on the PCB using MEN's adapter kit
- PS/2 keyboard/mouse
- USB

Mezzanine Extensions

- 090009-04: three PC-MIPs Type I/II on local PCI bus
  - Compliant with PC-MIP specification
- 090009-03: three M-Modules
  - Compliant with M-Module standard
  - Characteristics: D16, D32, A08, A24, INTA, INTC
- 090009-05: two PMCs
  - Compliant with PMC standard IEEE P1386
- Option for all three versions: carrier board for four additional M-Modules

Miscellaneous

- Serial real-time clock with integrated 56-byte NVRAM
- Serial hardware watchdog in supervisory circuit
- Temperature sensor
- Hex switch for user settings
- User LEDs (external)
- Reset/abort buttons

Electrical Specifications

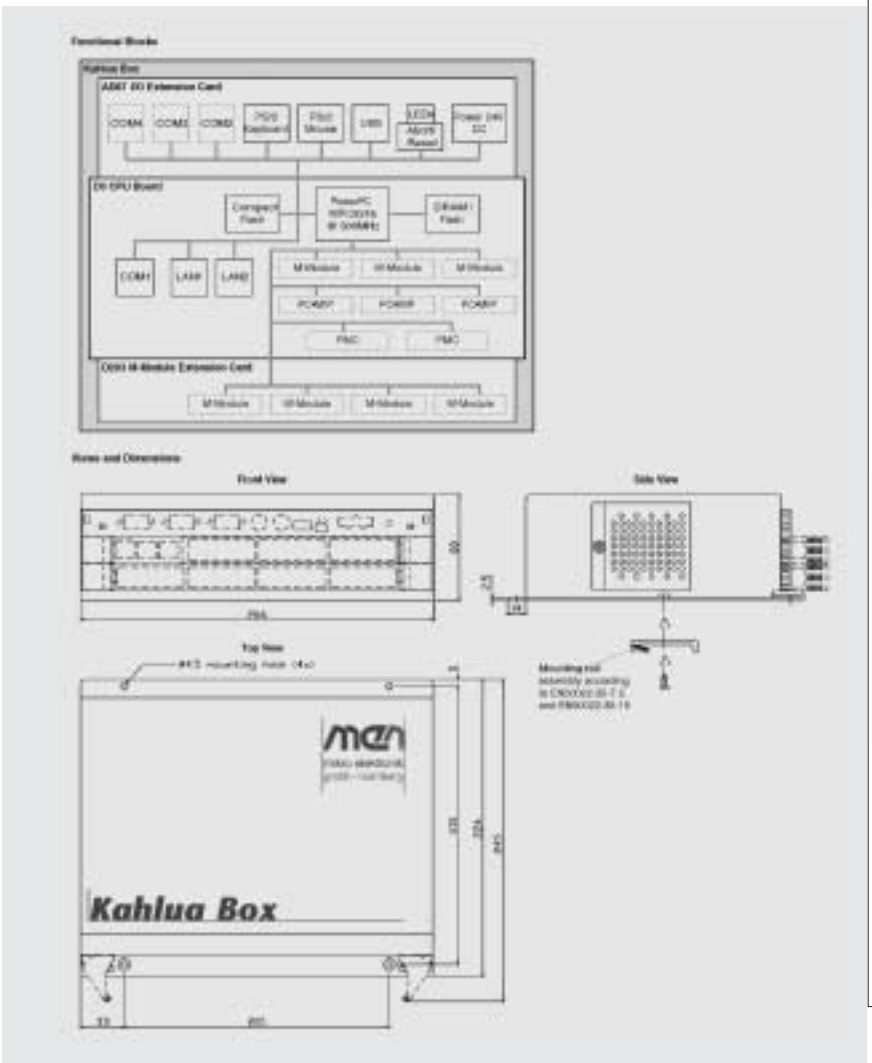
- Power supply unit PSU
  - Input: 18..36V DC; 0.8A typ., 2A max.
  - Output current of internal DC/DC converter: +5.1V/6A, +12V/+0.4A, -12V/-0.4A
  - Output current for keyboard/mouse connector: 200mA max. each
  - Output current for USB conn.: 300mA max.
  - Output current for SA-Adapter: 200mA max. each
  - Output current total: 1.05A max.

Environmental Specifications

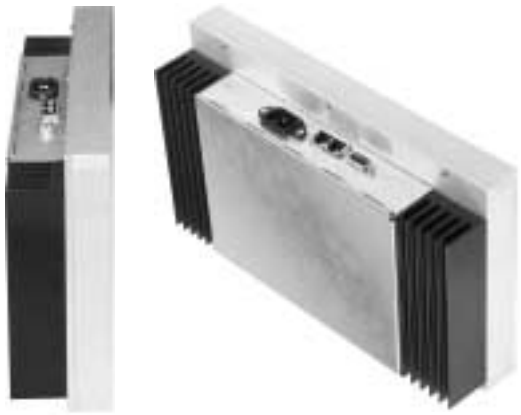
- Temperature range (operation):
  - 0..+45°C (w/o fan: derated by 2.25°C per Watt power dissipation on mezzanines; with fan: no deration)
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Software Support

- VxWorks
- OS-9
- Linux
- QNX
- MENMON



The UBox™ Family of Rugged Computer Systems



UBox is a very compact and versatile family of computer systems for any type of control, diagnosis, measurement, visualization and interactive functions in harsh environments. Not only the electronics inside but also the housing, the power supply and the display are designed to operate under extended temperature, shock and vibration conditions.

Instead of consisting of a range of different catalog products, the UBox family is by choice a very flexible concept for an individually boxed computing solution. It consists of:

- A standard conductive cooled box, which is the back side of the final system
- A standard ESM – Embedded System Module
- A customized FPGA on the ESM
- A customized carrier board for the ESM
- A customized front panel, for example a graphics display
- A customized connector area
- Customized mounting possibilities on the housing

Embedded Computer UBox Base – x86/PowerPC

UBox Base is a robust computer for deeply embedded applications. Its computing core is either a fully PC-compliant x86 platform (for example with a low-power Pentium® III) that runs under Windows or Linux and makes for an ideal industrial PC, for example for infotainment. Or it comes on a PowerPC platform (for example with MPC 8245/400 MHz) that runs under Linux and real-time operating systems, for example for machine control and supervision. UBox Base comes with the latest state-of-the-art (PC) computer technology like Ethernet, UARTs, USBs etc. In addition UBox Base offers the highest flexibility in terms of further I/O configuration by having all these functions – such as CAN, graphics, additional UARTs, digital I/O etc. – customized and implemented in FPGA.

Housing
- Aluminum/zinc-plated steel plate, EMC enclosure
- 202 x 315 x 49.8 mm

PSU
- 85-264 VAC, 50/60 Hz, 25 W
- Over-voltage protection
- 25 to +60°C operation temperature

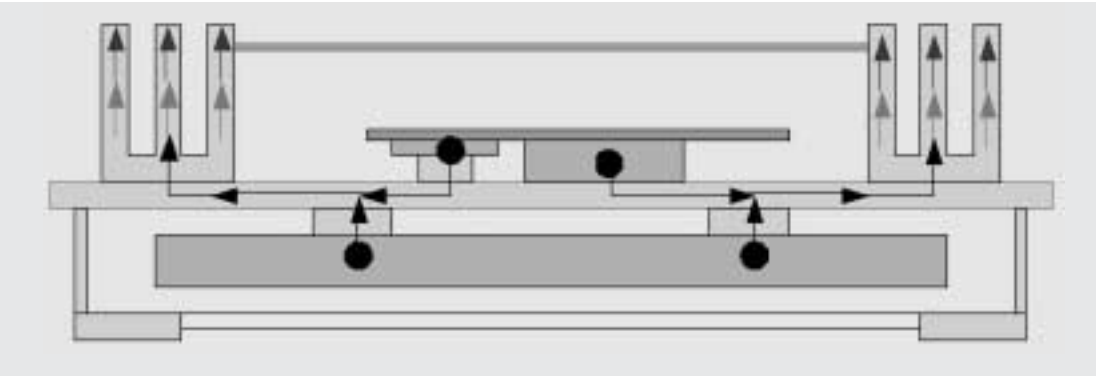
Electronics
- EM01 with PowerPC MPC 5200 / 384MHz
- EM03 with PowerPC MPC 8560 / 800MHz
- EM04N with PowerPC MPC 8245 / 400MHz
- EM05 with TM5900 / 800MHz
- EM07 with ULV/ULP Celeron®/Pentium® III up to 933MHz
- EM08 with PowerPC MPC 8540 / 800MHz

- Up to 1GB SDRAM
- CompactFlash or NAND Flash
- Standard serial connections depending on type of ESM
- Further COMs, Ethernet, USB, floppy, CAN, IDE, graphics, audio, keyboard/mouse, digital I/O etc. customizable via FPGA

Thanks to the comparably low power consumption, particularly of the PowerPC, but also the Pentium®-based ESM – Embedded System Modules, the complete system comes without any fan to achieve better reliability and higher MTBF values. Consequently, the complete area of the processor is connected via a massive heat block with the carrier plate for all electronic components – which at the same time forms the back side of the housing and thus transfers the heat from inside the system to the outside air.
The operating temperature range of the UBox depends on the power dissipation of the ESM module choosen. Based, for example, on a PowerPC MPC 5200 core, the complete UBox runs within -25 to +60°C (limited by the PSU). The UBox itself is closed, whilst airflow outside the system is in general requested.

To withstand shock and vibration demands, the electronics is tightly screwed to the massive metal carrier plate.

The front panel of the housing can be equipped with customized fastening facilities according to the requirements of the application. A dedicated customizable space is reserved for all kinds of input and output connectors that may be required differently by each application. The standard mass storage configuration is CompactFlash or Disk-On-Chip up to several Gigabytes.



The principle

Panel Computer UBox Vision – x86/PowerPC

UBox Vision is identical with UBox Base in terms of the electronics inside the system and the housing technology. An additional digital flat panel allows for visualization, for example in infotainment applications. The size and the features of the display can be flexibly adapted to the requirements of each individual application – for example:

- System incl. 10.4“ display 202 x 315 x 78.2 mm
- TFT-LCD panel
- 640 x 3 x 480 pixels @ 266,144 colors (6 bits/color)
- 4 timing signals
- Supply voltage for backlight
- Low reflection/high color saturation
- 10 to +65°C operation temperature
- Shock and vibration qualified
- Integrated touch screen
- Other types and sizes of displays on request

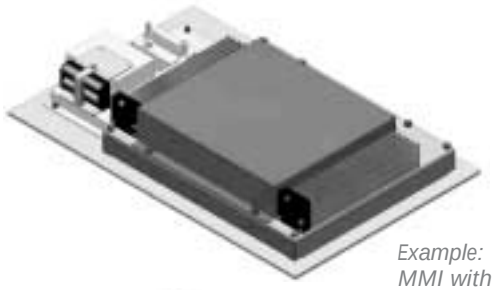
UBox Vision is also the basic model for Human-Machine Interfaces.

DIN-Rail Computer UBox Rail – x86/PowerPC

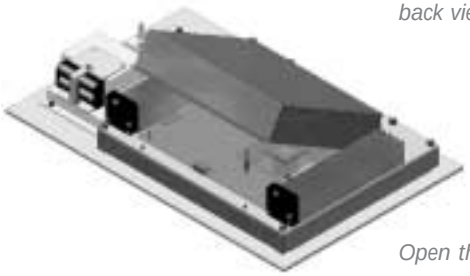
UBox Rail is identical with UBox Base in terms of the electronics inside the system and the housing technology. Additional mechanics on a different carrier plate on the back side of the housing is provided to mount the computer on a DIN rail.

Design and integration services for the UBox

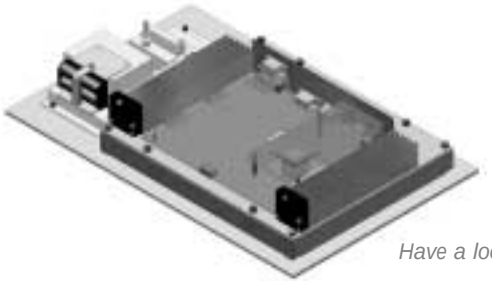
As standard components MEN delivers the ESM of choice together with the conduction-cooled box. If higher quantities are requested, MEN and its Know-How Centers and partners provide different FPGA configurations, development of new IP cores, development and production of ESM carrier boards, as well as the selection and adaptation of the front panel or display of the UBox.



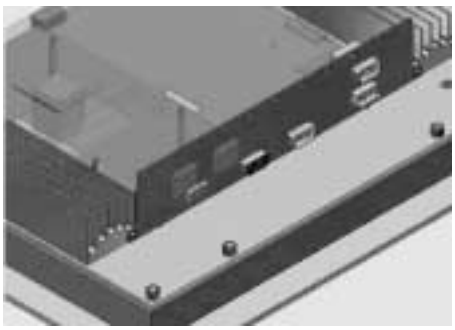
Example:
MMI with a printer, back view



Open the cover



Have a look inside



Simple “Front Panel”

Overview – ESM – Embedded System Modules

ESM – Embedded System Modules are complete computers on a module (System-On-Module – SOM). They consist of the hardware (PC or RISC CPU, chip set, memory, I/O) which is not fixed to any application-specific function, an FPGA programmed in VHDL code, which provides I/O that is also still independent of a specific application, and the BSP support – i.e. Linux, Windows or a real-time operating system.

ESM modules are based on PCI. They have two system connectors: J1 has a fixed signal assignment, while J2 is variable depending on the final application-specific configuration of the ESM and the carrier board. J2 also feeds the I/O signals of the functions programmed in the FPGA to the carrier card. Some ESM modules include an additional J3 connector that is used to replace the front I/O connectors to route the signals to the carrier board or to the backplane of a CompactPCI or VMEbus system.

ESM modules can be used stand-alone, plugged onto a customized carrier card and/or stacked with PCI-104 modules. Serial interface adapters (SA-Adapters) provide access to additional line physics on any type of ESM carrier board. The FPGA on every ESM additionally allows implementation of IP cores tailored to the application. ESM modules have been developed to work also in rugged environments – shock, vibration, drop, resonance, humidity, chemicals, -40 to +85°C operation temperature.

	Type	CPU	Memory max.	Interfaces	On-board FPGA	Software	Applications
EM08 *p. 54*	SBC – front I/O	PowerPC MPC8540/800MHz	2 GB DDRAM (SO-DIMM) 1 GB NAND Flash	2 Gigabit Ethernet, 2 COMs, further I/O in FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Industrial automation
EM07 *p. 55*	SBC – front I/O	Tualatin ULP Pentium III / 933MHz Tualatin ULV Celeron® / 400MHz, 650MHz	512 MB DRAM, CompactFlash	2 Fast Ethernet, 2 COMs (front); graphics, 2 USB, (E)DIE (rear); further I/O via FPGA	Altera Cyclone for user-defined I/O functions	Windows, Linux, QNX, RTX, VxWorks	Industrial automation
EM05 *p. 56*	SBC – front I/O	Transmeta TM5900/800MHz	512 MB DRAM, CompactFlash	2 Fast Ethernet, 2 COMs, video (VGA, TFT) and audio via FPGA, USB, keyboard/mouse, (E)IDE, floppy via carrier board	Altera Cyclone for user-defined I/O functions	Windows, Linux	Industrial automation
EM04 –	SBC – front I/O	PowerPC MPC8245/400MHz	512MB DRAM, CompactFlash	2 Fast Ethernet, 2 COMs, graphics, further COMs, CAN, IDE via FPGA	Altera 1k100 for user-defined I/O functions	Linux, VxWorks	Industrial automation
EM04N *p. 57*	SBC – front I/O	PowerPC MPC8245/400MHz	512MB DRAM, CompactFlash	2 Fast Ethernet, 2 COMs, graphics, further COMs, CAN, IDE via FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Industrial automation
EM03 *p. 58*	SBC – front I/O	PowerPC MPC8560/800MHz	2 GB DDRAM (SO-DIMM) 1 GB NAND Flash	2 Gigabit Ethernet, 2 COMs, further I/O in FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Telecom
EM03A *p. 58*	SBC – rear I/O	PowerPC MPC8560/800MHz	2 GB DDRAM (SO-DIMM) 1 GB NAND Flash	2 Gigabit Ethernet, 1 Fast Ethernet, 2 COMs on J3 rear I/O connector, further I/O in FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Telecom
EM02 *p. 59*	SBC – front I/O	Tualatin ULP Pentium III / 933MHz Tualatin ULV Celeron® / 400MHz, 650MHz	512MB DRAM, CompactFlash	Graphics, Gigabit or Fast Ethernet, USB, 1 COM, TFT/video, audio, keyboard/mouse, (E)IDE, floppy via carrier board	---	Windows, Linux, QNX, RTX, VxWorks	Industrial automation, instrumentation
EM01 *p. 60*	SBC – front I/O	PowerPC MPC5200/384MHz	256MB DDRAM SDRAM, NAND Flash, 2 MB NVRAM	2 Fast Ethernet, 1 COM, 1 USB (front); 2 CAN, graphics, serial lines etc. via FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Industrial automation, transportation, automotive
EM01A *p. 60*	SBC – rear I/O	PowerPC MPC5200/384MHz	256MB DDRAM SDRAM, NAND Flash, 2 MB NVRAM	2 Fast Ethernet, 1 COM, 1 USB on J3 rear I/O connector; 2 CAN, graphics, serial lines etc. via FPGA	Altera Cyclone for user-defined I/O functions	Linux, VxWorks	Industrial automation, transportation, automotive

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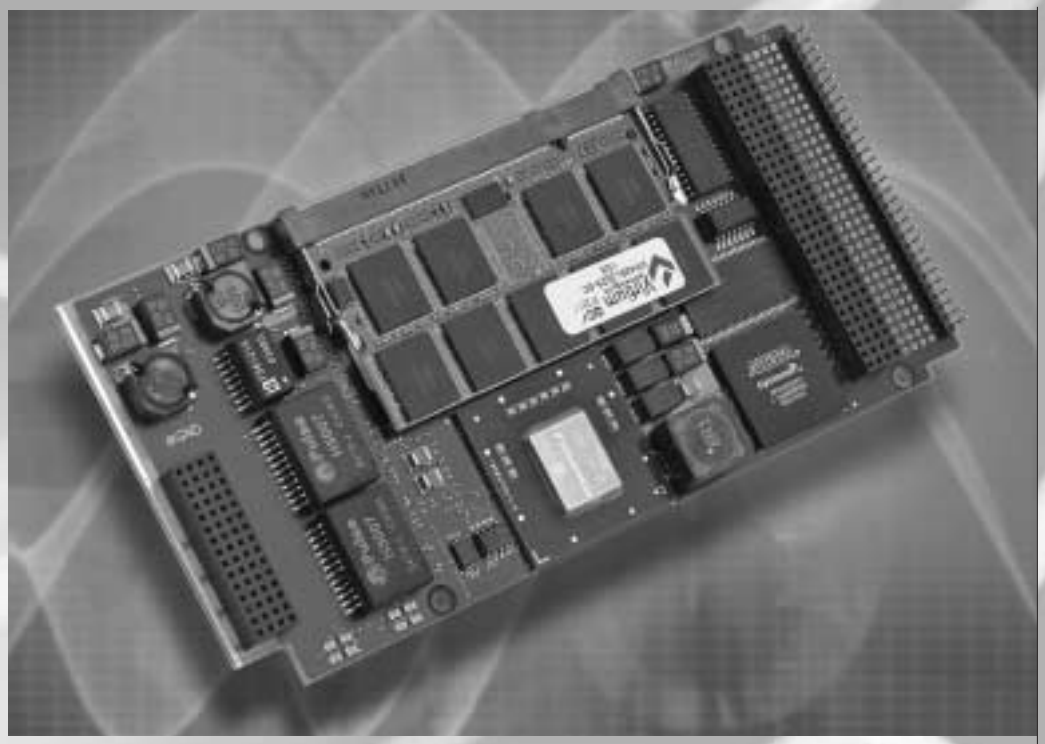
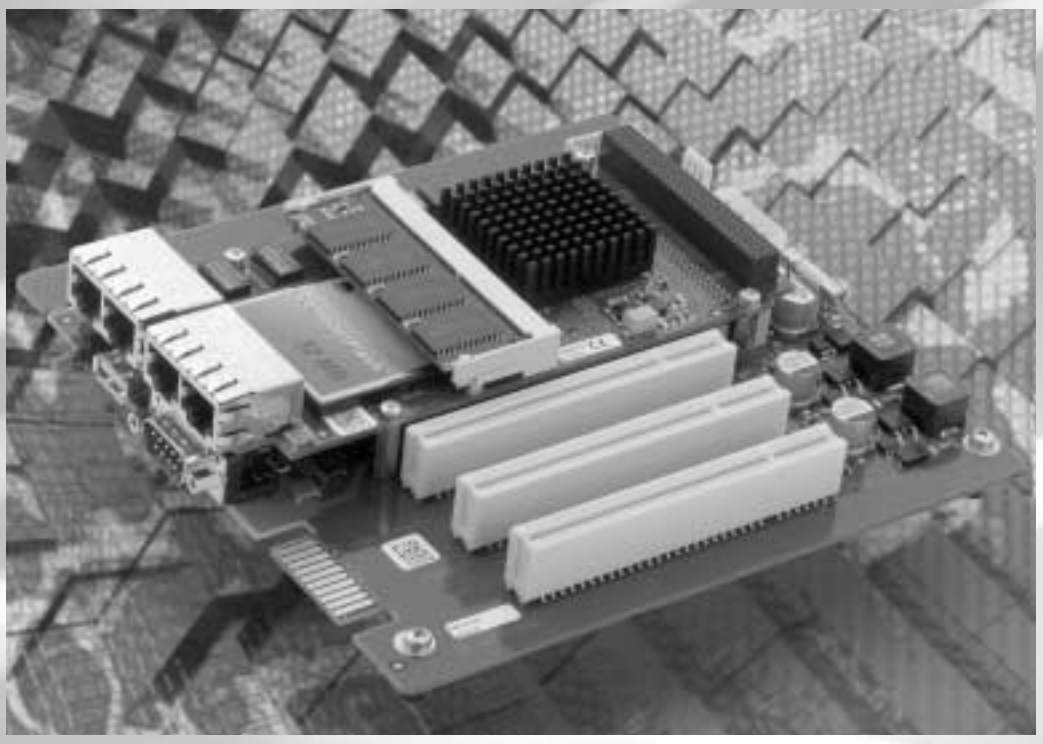
System-on-Module ESM



EM03A – ESM with MPC8560 (PowerQUICC III)



ESM Starter Kit

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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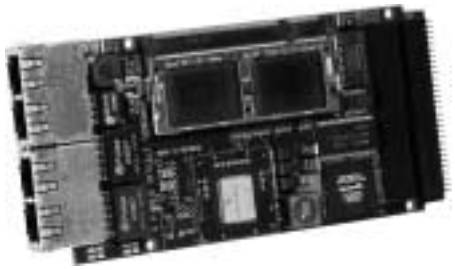
EM08 – ESM with PowerPC MPC8540

Embedded System Module with:

- MPC8540, 800MHz
- 32-bit/33-MHz PCI, opt. 64-bit/66-MHz
- Up to 2 GB DDR DRAM (SO-DIMM)
- NAND Flash
- 2 Gigabit Ethernet, 1 Fast Ethernet, 1 COM (RJ45 on front)
- Further COMs, CAN, graphics, IDE etc. optional via FPGA (USB, keyboard/mouse, floppy etc. optional on carrier board)
- Stackable with PCI-104
- MENMON BIOS for PowerPC cards



CPU

- PowerPC
  - MPC8540 / 800MHz (1GHz optional)

Memory

- 2x32kB L1 data and instruction cache, 256kB L2 cache / SRAM integrated in MPC8560
- SO-DIMM slot for up to 2GB DDR SDRAM
- 133MHz (DDR2100) memory bus operation with ECC
- Up to 1 GB NAND Flash
- Flash 8MB
  - 16-bit data bus
- Serial EEPROM 4kbit for factory settings
- Up to 32MB SDRAM, connected to FPGA, e.g. for video data

Interfaces

- Two 10/100/1000Mbits/s Ethernet channels + one 10/100Mbits/s Ethernet channel
  - MPC8560 internal controllers
  - Three RJ45 connectors at front panel
- One UART RS232 serial interface (COM1)
  - One RJ45 connectors at front panel
- IDE port for hard-disk drives
  - Available at I/O Connector

Additional I/O through FPGA

- Available at I/O connector
- Depending on FPGA composition
- FPGA Altera 1C12
  - 12000 Logic elements
  - Standard and user-defined functions
- UARTs
- Floppy disk interface
- Display control
- Touch panel control
- Other/further I/O options on request

PCI Interface

- 32- or 64-bit, 33- or 66-MHz PCI interface at PCI-104 connectors J1 and J2
- Support of 4 external masters

Miscellaneous

- Real-time clock
- Power supervision and watchdog

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), tbd.
  - +3.3V (3.0V..3.6V), tbd.
- MTBF: tbd. @ 50°C

Mechanical Specifications

- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: tbd.

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

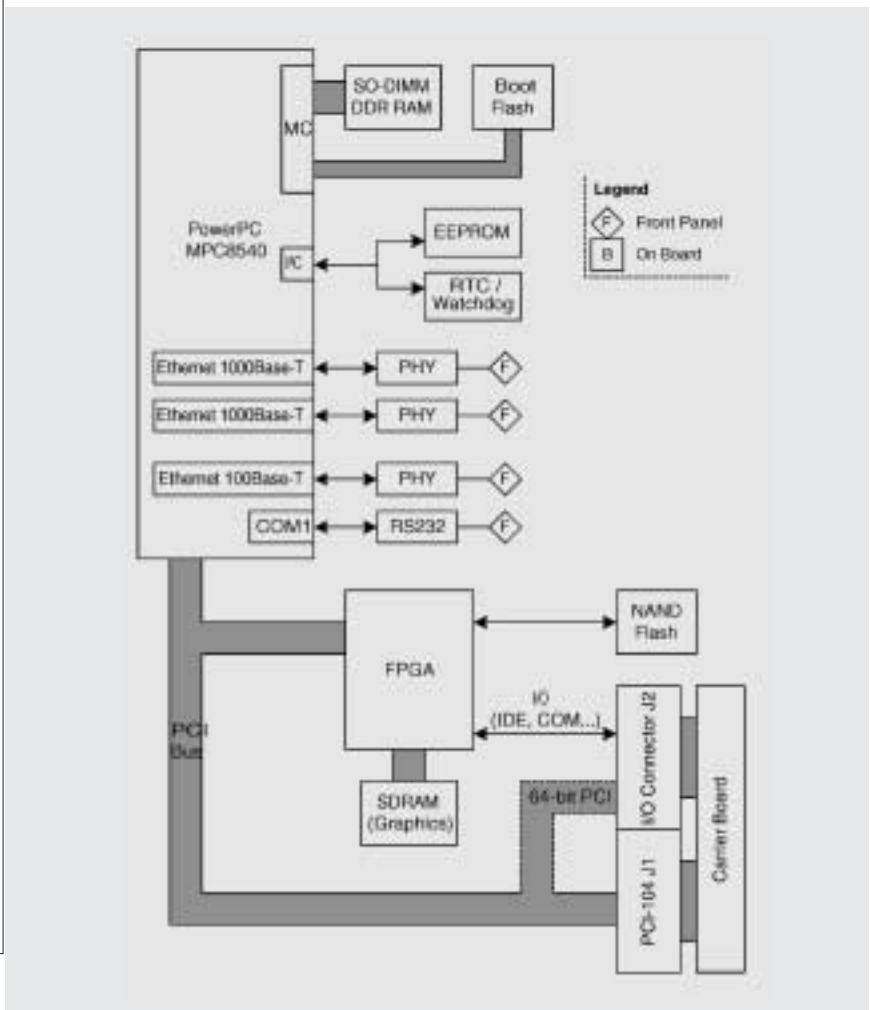
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MENMON
- VxWorks (on request)
- Linux (ELinOS) (on request)



EM07 – ESM with Pentium® III

Embedded System Module with:
- ULP Pentium® III / 933 MHz
- ULV Celeron® / 400 or 650 MHz
- Up to 512 MB DRAM, CompactFlash
- Dual Fast Ethernet, dual RS232 (front)
- Graphics (rear), 2 USB 1.1 (rear), (E)IDE (rear)
- FPGA – programmable I/O functions (rear)
- Stackable with PCI-104

CPU
- Celeron® or Pentium® III
- 400MHz or 650MHz or 933MHz processor core frequency
- 256KB or 512KB L2 cache
- 100MHz or 133MHz system bus frequency
- 33MHz APIC bus frequency

Graphics
- Integrated VGA graphics controller
- Connection via rear I/O connector (J2)

Memory
- 512MB SDRAM
- One 144-pin SO-DIMM socket for synchronous DRAM modules
- 133/100MHz memory bus frequency
- CompactFlash interface
- Type I
- True IDE
- DMA is supported

Interfaces
- 10/100Base-T PCI Ethernet controller
- 82551(ER) controller
- Two RJ45 (or 9-pin D-Sub) interfaces at front panel
- Four onboard LEDs to signal LAN Link and Activity status
- Supports network boot
- Two USB 1.1 interfaces
- UHCI implementation
- Via rear I/O (J2)
- Data throughput up to 12Mbits/s
- Supplies High-Power (500mA) without external power supply
- AC'97 audio

Mass Storage
- Fast IDE ports UDMA4)
- One IDE hard-disk/CD-ROM port via I/O connector to carrier board
- One IDE port for local CompactFlash

Additional I/O through FPGA
- Available at I/O connector
- Depending on FPGA composition
- COM 1 and 2 at the front via RJ45 (or 9-pin D-Sub) connector

PCI Interface
- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous
- Real-time clock, backed up by the carrier board
- Integrated hardware monitor

Electrical Specifications
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), tbd.
- +3.3V (3.2V..3.4V), tbd.
- MTBF: 100,000h @ 50°C

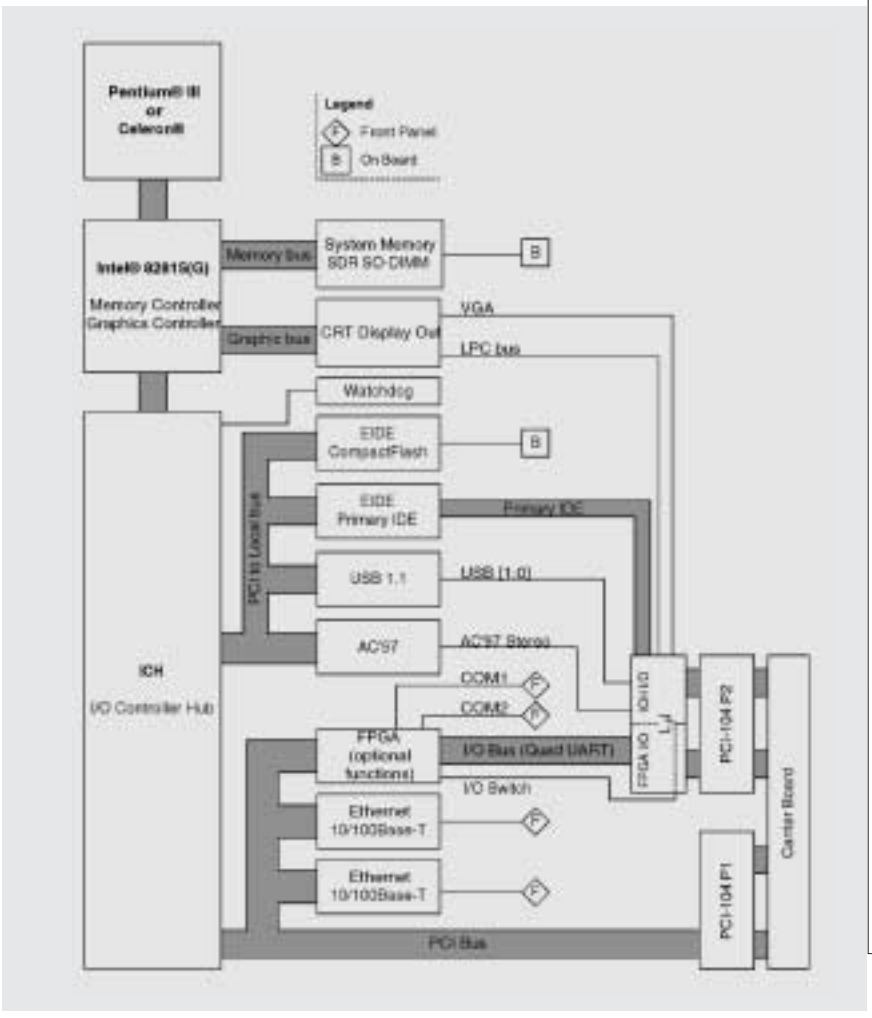
Mechanical Specifications
- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: tbd. (incl. heat sink)

Environmental Specifications
- Temperature range (operation):
- 0..+60°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Award BIOS
- Windows (on request)
- Linux (on request)
- VxWorks (on request)
- QNX (on request)
- RTX (on request)



EM05 – ESM with TM5900

Embedded System Module with:
- TM5900 / 800 MHz
- Up to 512 MB DDR RAM (SO-DIMM), CompactFlash
- Dual Fast Ethernet, dual COM (front)
- Graphics optional via FPGA (plus 8 MB SDRAM)
- Further COMs, CAN, IDE etc. optional via FPGA (USB, keyboard/mouse, floppy etc. optional on carrier board)
- Stackable with PCI-104

CPU
- CPU
  - Transmeta Crusoe TM5900 Microprocessor with integrated Northbridge
  - 800MHz

Memory
- 64KB L1 and 512KB L2 Cache integrated in Crusoe CPU
- SO-DIMM slot for up to 512MB DDR RAM (1GB on request)
  - 133MHz memory bus operation
  - 64-bit data bus, 2.5V
- Flash 4MB
  - 8-bit data bus, 3.3V
  - Hardware data protection
- Serial EEPROM 4kbit for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE) via on-board IDE
- Up to 8MB SDRAM, connected to FPGA, e.g. for video data

Interfaces
- Two 10/100Mbits/s Ethernet channels
  - GD82551ER controllers
  - Two RJ45 connectors or one 9-pin D-Sub connector at front panel
- Two UART RS232 serial interfaces (COM1/COM2)
  - Two RJ45 connectors or one 9-pin D-Sub connector at front panel
  - Up to 230 kbaud
  - COM1/COM2 also available for rear I/O
- One UART RS232 serial interface (COM3), via rear I/O
- IDE port for hard-disk drives via rear I/O
  - UDMA5 support

Additional I/O through FPGA and Super I/O
- Available at I/O connector
- Super I/O
  - USB 1.1
  - Keyboard
  - Mouse
  - Floppy disk interface
  - AC'97
- FPGA I/O
  - Depending on FPGA composition
  - TFT
  - VGA
  - SRAM
  - Other/further I/O options on request

PCI Interface
- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous
- Real-time clock
- Power supervision and watchdog

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 2A max.
  - +3.3V (3.0V..3.6V), 2A max.
- MTBF: 84,000h @ 50°C

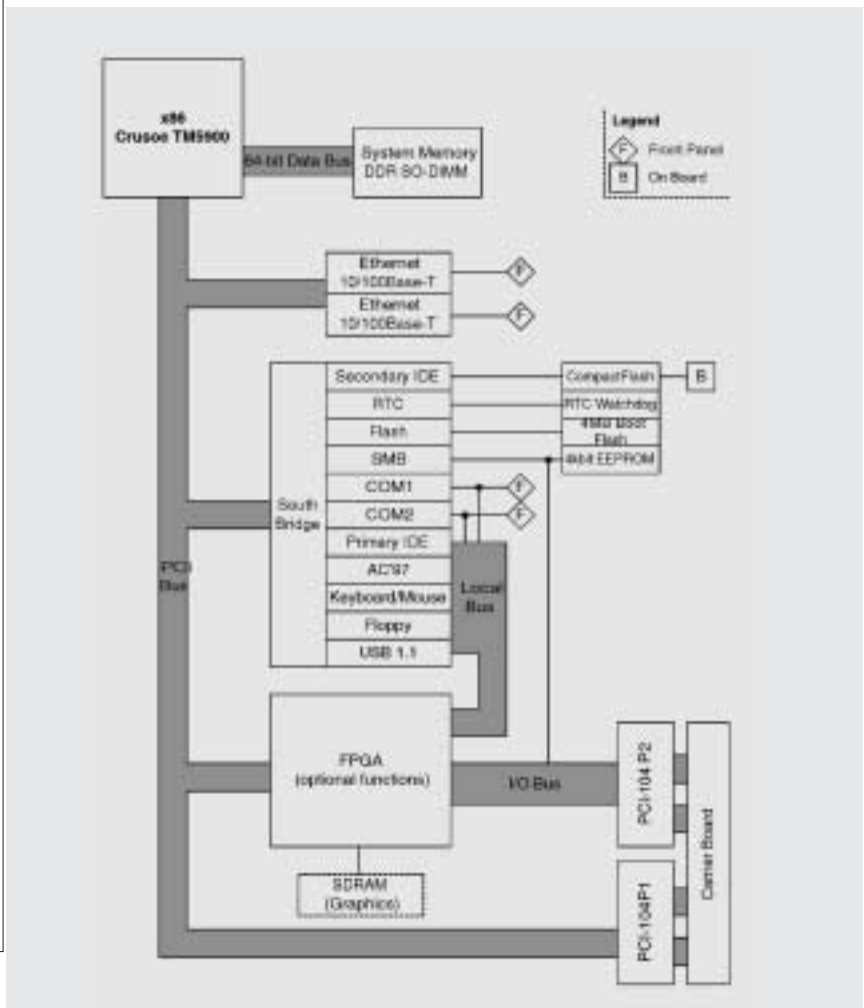
Mechanical Specifications
- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: 110g (w/o heat sink, w/o CompactFlash card); heat sink: 155g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

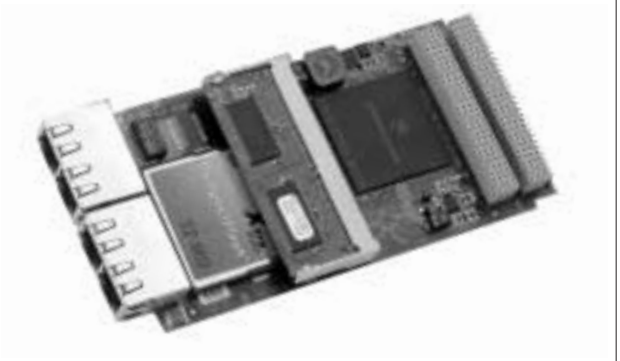
Software Support
- Award BIOS
- Linux
- Windows
- VxWorks (on request)
- MSCAN/Layer2 support:
  MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



EM04N – ESM with PowerPC MPC 8245

Embedded System Module with:

- PowerPC MPC8245 up to 400 MHz
- FPGA 250,000 gates
- Up to 512 MB SDRAM, CompactFlash
- Dual Fast Ethernet, dual COM (front)
- Graphics optional via FPGA (plus 16 MB SDRAM)
- Further COMs, CANopen, IDE etc. optional via FPGA (USB, keyboard/mouse, floppy etc. optional on carrier board)
- Stackable with PCI-104
- MENMON BIOS for PowerPC cards



CPU

- PowerPC
  - MPC8245
  - 266MHz..400MHz

Memory

- Level 1 Cache integrated in MPC8245
- SO-DIMM slot for up to 512MB SDRAM
- 133MHz memory bus operation
- Flash 2MB
  - 8-bit data bus
- Serial EEPROM 4kbit for factory settings
- CompactFlash (TM) card interface for Flash ATA (true IDE)via on-board IDE
- 32MB SDRAM, connected to FPGA, e.g. for video data

Interfaces

- Two 10/100Mbits/s Ethernet channels
  - GD82551 controllers
  - Two RJ45 connectors at front panel
- Two UART RS232 serial interfaces (COM1/COM2)
  - Two RJ45 connectors at front panel
- IDE port for hard-disk drives
  - Available at I/O Connector
  - If implemented in FPGA

I/O options through FPGA

- Available at I/O connector
- All functions optional, depending on FPGA composition
- IDE interface
- SPI interface (e.g. for touch panel control)
- SRAM controller
- Quad UART
- RTS-controlled UART
- CAN interface
- GPIO
- Display control for TFT panels, 800 x 600 pixels, 16-bit color

PCI Interface

- 32-bit PCI interface at PCI-104 connector J1
- Support of 2 external masters

Miscellaneous

- Real-time clock
- Power supervision and watchdog

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 500mA
  - +3.3V (3.0V..3.6V), 1A, w/o SO-DIMM; increases up to 1.6A depending on installed SO-DIMM
- MTBF: 160,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: 100g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

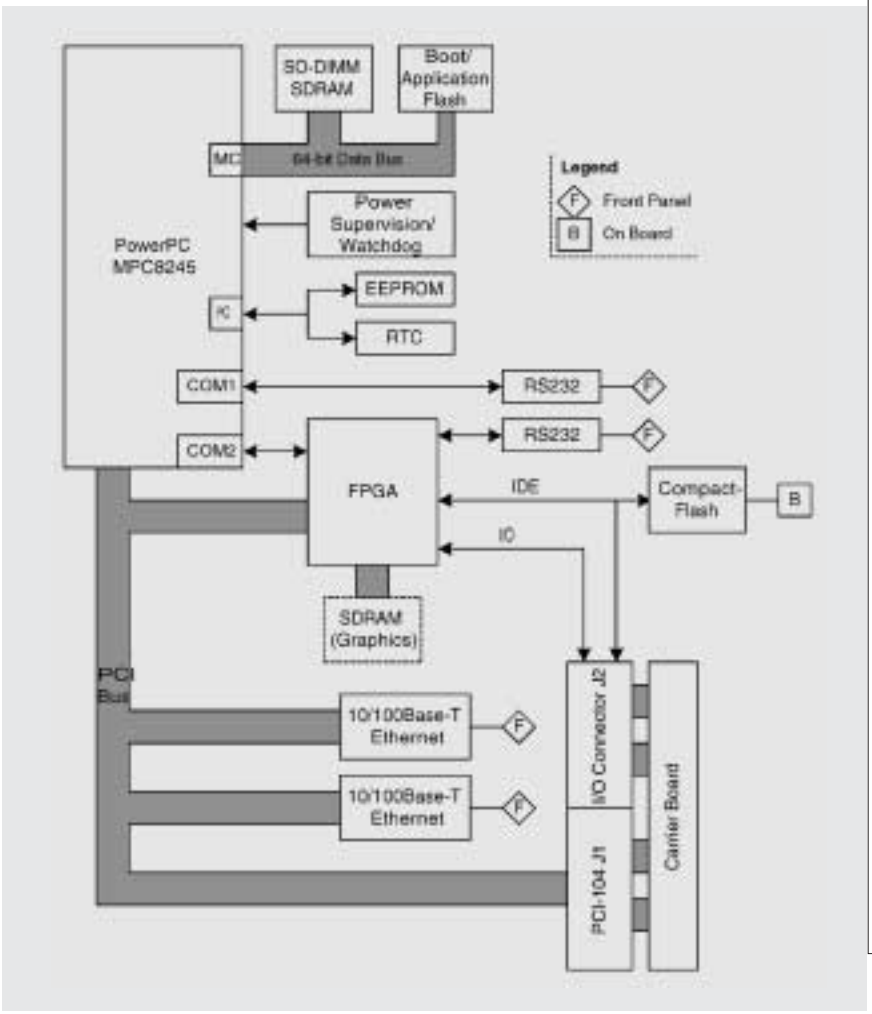
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

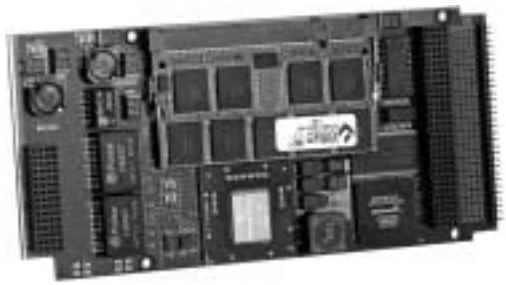
Software Support

- MENMON
- Linux (ELinOS)
- VxWorks
- QNX (on request)
- OS-9 (on request)
- CANopen support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- MSCAN/Layer2 support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



EM03A – ESM with MPC8560 (PowerQUICC III) – I/O on J3

Embedded System Module with:
- MPC8560, 800MHz
- 32-bit/33-MHz PCI, opt. 64-bit/66-MHz
- Up to 2 GB DDR DRAM (SO-DIMM)
- Up to 1 GB NAND Flash
- 2 Gigabit Ethernet, 1 Fast Ethernet, 2 COMs (on J3)
- Telco I/O optional via FPGA
- Further COMs, CAN, graphics, IDE etc. optional via FPGA (USB, keyboard/mouse, floppy etc. optional on carrier board)
- Stackable with PCI-104
- MENMON BIOS for PowerPC cards



CPU
- PowerPC
  - MPC8560 PowerQUICC III, 833MHz

Memory
- 2x32kB L1 data and instruction cache, 256kB L2 cache / SRAM integrated in MPC8560
- SO-DIMM slot for up to 2GB DDR SDRAM
- 133MHz (DDR2100) memory bus operation with ECC
- 32MB NAND Flash
- Flash 8MB, 16-bit data bus
- Serial EEPROM 4kbit for factory settings
- Up to 32MB SDRAM, connected to FPGA, e.g. for video data
- FRAM memory 32KB non-volatile

Interfaces
- Two 10/100/1000Mbits/s Ethernet channels + one 10/100Mbits/s Ethernet channel
  - MPC8560 internal controllers
  - One board-to-board connector J3
- Two UART RS232 serial interfaces (COM1/COM2)
  - On board-to-board connector J3
- IDE port for hard-disk drives
  - Available at I/O Connector

Additional I/O through FPGA
- Available at I/O connector
- Depending on FPGA composition
- FPGA Altera 1C12
  - 12000 Logic elements
  - Standard and user-defined functions
- UARTs
- Floppy disk interface
- Display control
- Touch panel control
- Other/further I/O options on request

PCI Interface
- 32- or 64-bit, 33- or 66-MHz PCI interface at PCI-104 connectors J1 and J2
- Support of 4 external masters

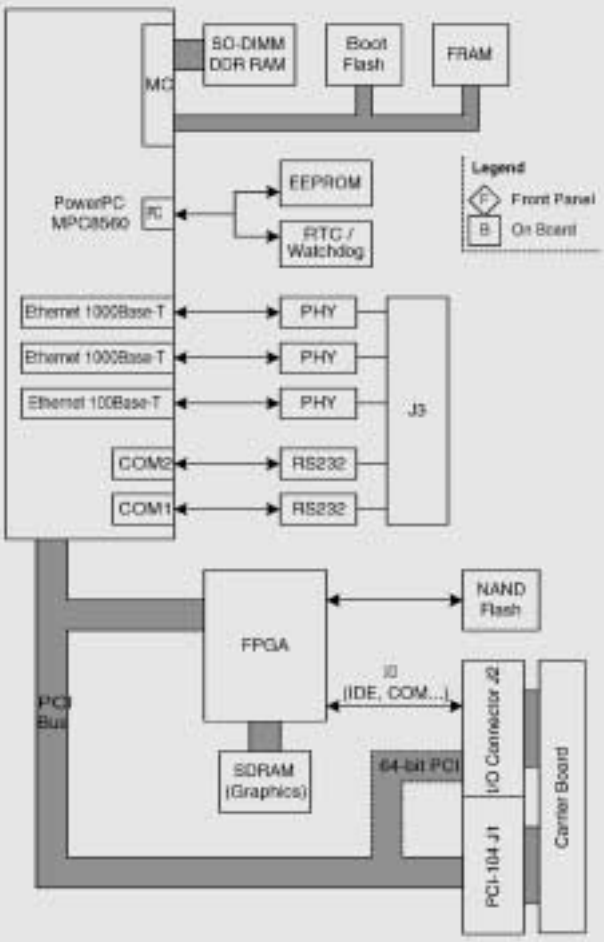
Miscellaneous
- Real-time clock
- Power supervision and watchdog

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 3A
- MTBF: tbd. @ 50°C

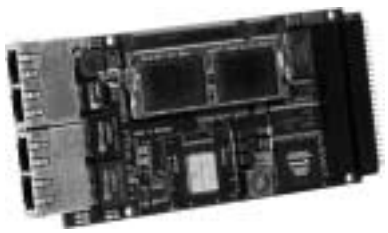
Mechanical Specifications
- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: tbd.

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Software Support
- MENMON
- MontaVista Linux, Professional Edition 3.1
- VxWorks (on request)
- Linux (ELinOS) (on request)



EM03 – Front I/O ESM with MPC8560



EM03 offers 2 Gigabit Ethernet, 1 Fast Ethernet and 1 COM via RJ45 on front instead of 2 Gigabit Ethernet, 1 Fast Ethernet and 2 COMs via J3 rear I/O connector (EM03A).

EM02 – ESM with Pentium® III

Embedded System Module with:
- ULP Pentium® III / 933 MHz
- ULV Celeron® / 400 MHz
- Up to 512 MB DRAM, CompactFlash
- Graphics, USB 1.1 (front)
- Gigabit Ethernet (front)
- 1 COM, keyboard/mouse, (E)IDE, floppy (rear)
- Stackable with PCI-104

CPU
- Celeron® or Pentium® III
- 400MHz or 933MHz processor core frequency
- 256KB or 512KB L2 cache
- 100MHz or 133MHz system bus frequency
- 33MHz APIC bus frequency

Graphics
- Integrated VGA graphics controller
  - Connection at front panel via VGA connector

Memory
- 512MB SDRAM
  - One 144-pin SO-DIMM socket for synchronous DRAM modules
  - 133/100MHz memory bus frequency
- CompactFlash interface
  - Type I
  - True IDE

Interfaces
- 10/100/1000Base-T PCI Ethernet controller
  - 82540(EM) controller
  - RJ45 interface at front panel
  - Three onboard LEDs to signal LAN Link, Activity status and connection speed (10/100/1000Base-T)
  - Supports network boot
- USB 1.1 interface
  - Type A
  - UHCI implementation
  - At front panel
  - Data throughput up to 12Mbits/s
  - Supplies High-Power (500mA) without external power supply

Mass Storage
- Fast IDE ports (UDMA4)
  - One IDE hard-disk/CD-ROM port via I/O connector to carrier board
  - One IDE port for local CompactFlash

I/O Extension
- Super I/O
- Accessible via J2
  - Keyboard
  - Mouse
  - COM1
  - Floppy
  - TFT panel
  - AC'97 audio (on request)

PCI Interface
- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous
- Battery-backed real-time clock
- Integrated hardware monitor

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 796mA (Celeron® version)
  - +3.3V (3.2V..3.4V), 794mA (Celeron® version)
- MTBF: 165,000h @ 50°C

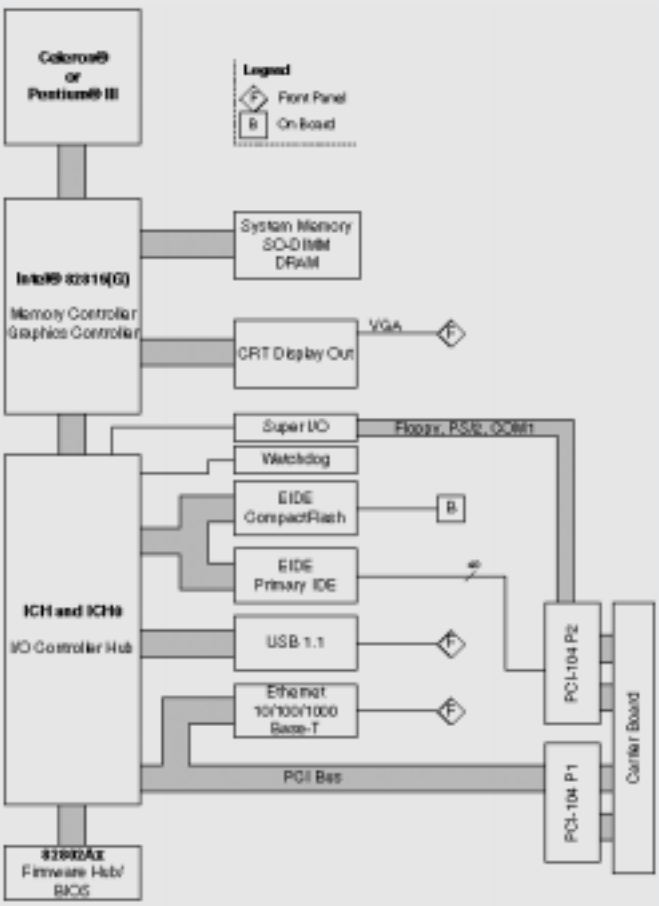
Mechanical Specifications
- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: 215g (incl. heat sink)

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

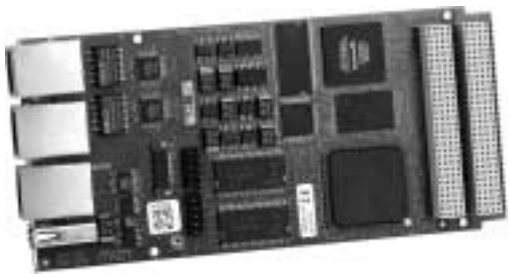
Software Support
- Phoenix BIOS
- Windows
- Linux (on request)
- VxWorks (on request)
- QNX (on request)
- RTX (on request)



EM01 – ESM with PowerPC MPC5200

Embedded System Module with:

- MPC5200 / 384 MHz
- Up to 256MB onboard DDR SDRAM
- NAND Flash
- Up to 2MB NVRAM
- Up to 16MB graphics memory
- Dual Fast Ethernet, COM, USB (front)
- Dual CAN controller
- Further COMs, graphics, IDE etc. optional via FPGA
- Stackable with PCI-104
- MENMON BIOS for PowerPC cards



CPU

- PowerPC MPC5200 up to 400MHz

Memory

- Level 1 Cache integrated in MPC5200
- Onboard DDR SDRAM up to 256MB
- 64MHz memory bus operation
- Flash up to 8MB, 8-bit data bus
- 2MB battery-backed SRAM
- Non-volatile memory
- 8-bit data bus
- Serial EEPROM 16kbit for factory settings
- Up to 1GB NAND Flash
- Up to 16MB SDRAM, connected to FPGA, e.g. for video data Interfaces

Ethernet

- Two 10/100Mbits/s Ethernet interfaces
- One controlled by MPC5200 internal controller
- One controlled by FPGA
- Accessible at front panel on two RJ45 or one D-Sub connector

Serial Interfaces

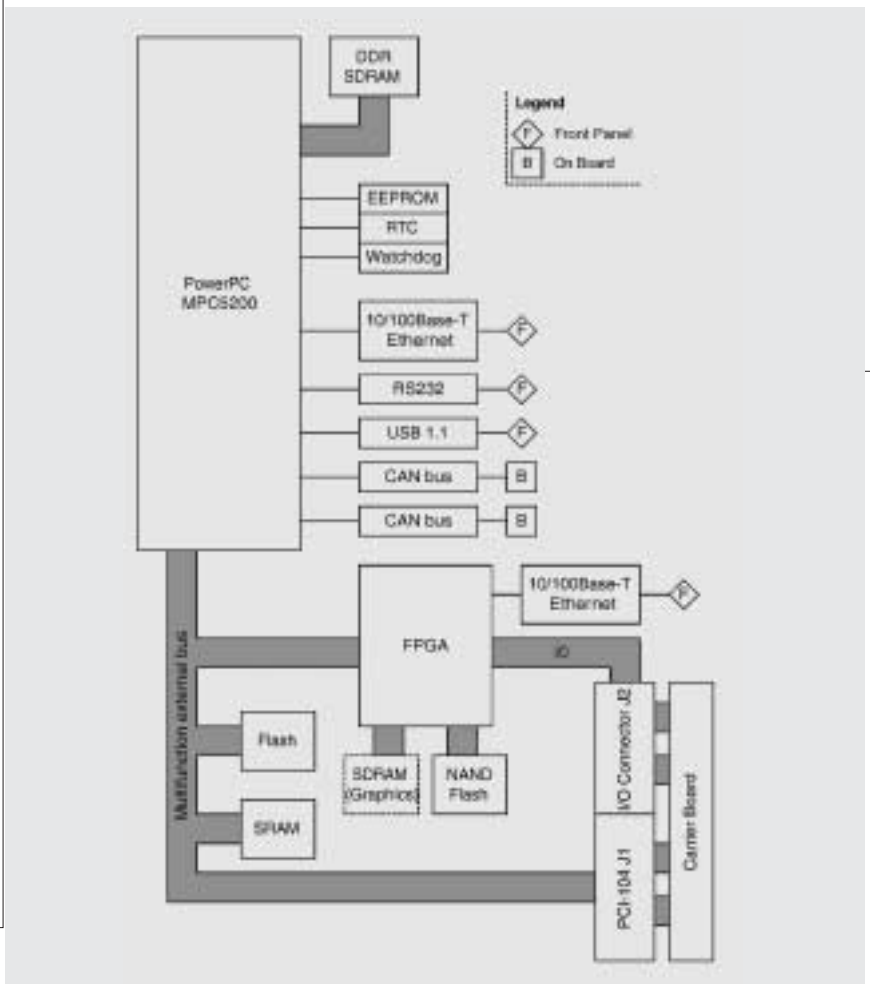
- One UART RS232 serial interface (COM1)
- Accessible at front panel on RJ45 or D-Sub connector
- USB 1.1
- Accessible at front panel on standard Type A connector

CAN Bus

- Dual CAN controller
- MPC5200 internal controller
- Accessible via onboard connectors

Additional I/O through FPGA

- Available at I/O connector
- Depending on FPGA composition
- IDE port
- Further UARTs
- Floppy disk interface
- Display control
- Touch panel control
- Other/further I/O options on request



PCI Interface

- 32-bit PCI interface at PCI-104 connector J1
- Support of 4 external masters

Miscellaneous

- Real-time clock
- Power supervision and watchdog

Electrical Specifications

- Supply voltage/power consumption:
- +5V (4.85V..5.25V), tbd.
- +3.3V (3.0V..3.6V), tbd.
- MTBF: tbd. @ 50°C

Mechanical Specifications

- Dimensions: conforming to ESM specification (PCB: 149mm x 71mm)
- Weight: tbd.

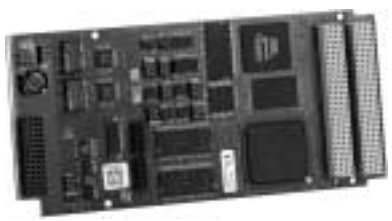
Environmental Specifications

- Temperature range (operation):
- -40..+85°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Software Support

- VxWorks
- Linux (ELinOS)
- MENMON

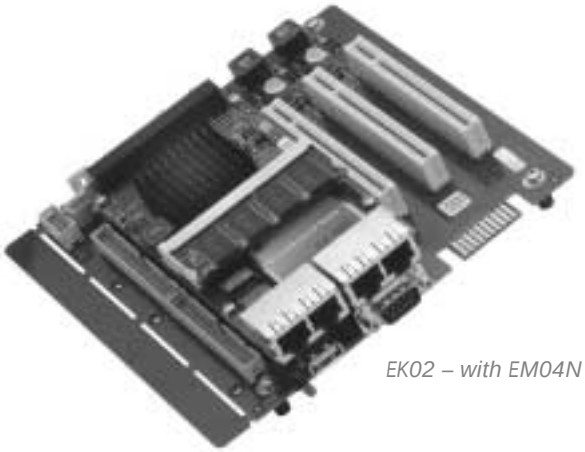
EM01A – I/O on J3 ESM with MPC5200



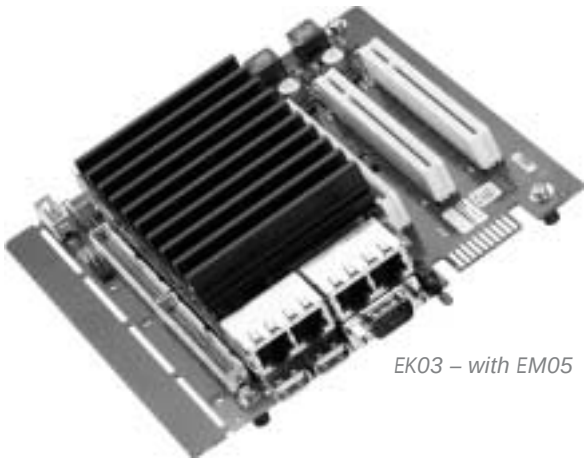
EM01A offers 2 Fast Ethernet, COM and USB via J3 rear I/O connector instead of 2 Fast Ethernet, COM and USB via RJ45 on front (EM01).

ESM Starter Kits

EK01 – with EM02



EK02 – with EM04N



EK03 – with EM05

Embedded System Modules are complete computers on a module. A final application consists either of a stand-alone ESM, an ESM with an application-specific carrier card and/or an ESM with additionally plugged PCI-104 modules.

An ESM starter kit allows evaluation of most of the functions of a specific Embedded System Module. The kit usually consists of the CPU module (the ESM), an FPGA with additional I/O functions, the carrier card, DRAM memory, PSU, several cables depending on the ESM features, and an adapter for mounting a PCI-104 module. Each ESM starter kit provides versatile mounting options and can also be installed in a standard PC.

After evaluation, the design overhead for each application is limited to I/O. Depending on the application and quantity it may be necessary to develop a simple carrier card, choose PCI-based standard components, load additional I/O functions into the FPGA, write software drivers for those additional functions, or design a housing.

Carrier board and FPGA IP core design as well as mechanical design and integration services are offered by the MEN headquarters and by MEN Know-How Centers and partners – for example in the USA, in France, or in the Benelux.

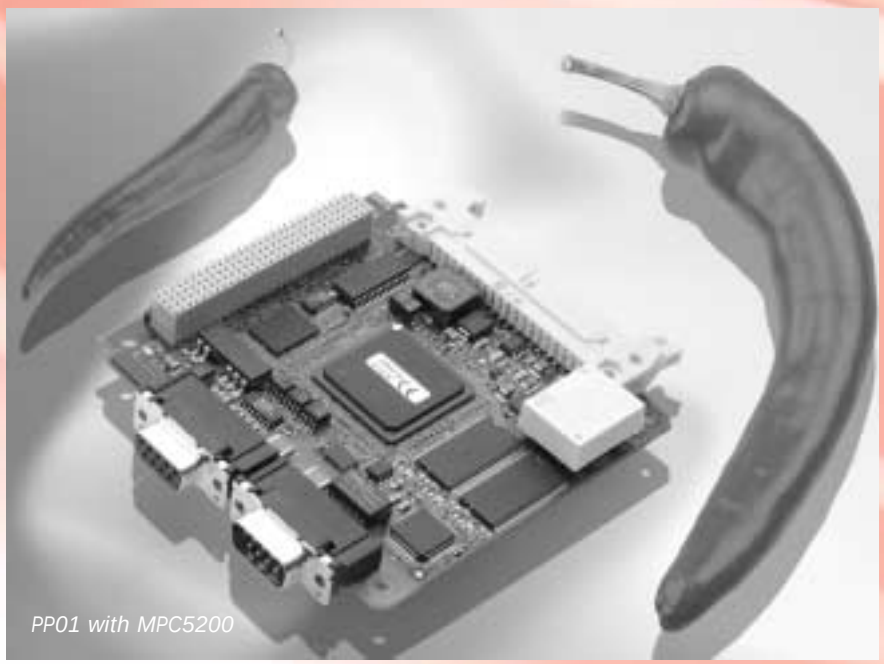
Starter Kit Overview

EK01 – with EM02 (ULV/ULP Celeron®/Pentium® III)
EK02 – with EM04N (PowerPC® MPC 8245)
EK03 – with EM05 (Transmeta Crusoe®)
EK05 – with EM07 (ULV/ULP Celeron®/Pentium® III)
EK06 – with EM01 (PowerPC® MPC 5200)
EK07 – with EM03 (PowerPC® MPC 8560)
and EM08 (PowerPC® MPC 8540)

Overview – PCI-104 Modules

MEN has started to build up a rugged PowerPC-based product line of single-board computers and companion boards of different flavors in accordance with the PCI-104 specification. Unlike the PC/104 modules (ISA bus only) and PC/104-Plus modules (ISA bus plus PCI bus) the PCI-104 modules support PCI bus exclusively. All modules measure 3.6 x 3.8 inches (90 x 96 mm), and can be used for implementation of entire compact single-board computers or modular expansion for such systems. One of the key features of PCI-104 is its unique pin-and-socket bus connectors. The bus connectors are designed in such a way as to allow more than a single module to be self-stacked, without requiring the overhead of an external backplane.

PCI-104 modules can also be stacked with ESM – Embedded System Modules. 3U CompactPCI carrier boards for PCI-104 and PC/104 modules are also available from MEN.



PP01 with MPC5200

	Type	CPU	Memory max.	Interfaces	Software	Standard Environment	Applications
PP05 *p. 63*	Fieldbus Controller	---	16MB SDRAM, 2MB Flash	WTB interface, 2 redundant channels	Windows, Linux, VxWorks, QNX, RTX, OS-9	-40...+85°C operating temp.	Railways
PP04 *p. 64*	Fieldbus Controller	---	16MB SDRAM, 2MB Flash	MVB transmitter/receiver interface, 1 redundant channel, Isolated EMD (optionally ESD and OGF)	Windows, Linux, VxWorks, QNX, RTX, OS-9	-40...+85°C operating temp.	Railways
PP01 *p. 65*	SBC	PowerPC MPC5200/384MHz	32MB SDRAM, 16MB Flash, 64KB FRAM	1 Fast Ethernet, 2 RS232, 2 CAN (via SA-Adapters) 1 USB 1.1 (via SA-Adapter)	MENMON, VxWorks, Linux, CANopen firmware (Vector Informatik), CANopen and MSCAN/Layer2 support under MDIS	-40...+85°C operating temp.	Railways, automotive, aerospace, naval, medical engineering, industrial automation

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

PP05 – PCI-104 Module with WTB Interface

- 32-bit/33-MHz PCI target
- WTB transmitter/receiver interface
- 2 redundant channels
- 1kV isolation
- 48V local fritting voltage
- 2MB Flash, optional 16MB SDRAM
- Complies with PCI-104 specification

Product available Q II / 2005

WTB Physical Layer
- Wire Train Bus WTB IEC61375-1 compliant
- Two redundant channels
- Fully isolated (1kV isolation voltage)
- Generation of local fritting voltage 48V (pulsed)

Universal Design
- Controller board connected by an 80-pin connector to the PHY board
- FPGA Altera® Cyclone™ EP1C12 (optional EP1C20)
- 2MB Flash for FPGA configurations
- Optional 16MB DRAM
- Simple functional updates via software

PCI-104 Bus
- Compliance with PCI-104 Specification
- Two slots required
- V(I/O): +3.3V

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.75V..5.25V), current 250mA typ.
  - +3.3V (3.0V..3.6V), current 500mA typ.
- MTBF: tbd @ 50°C

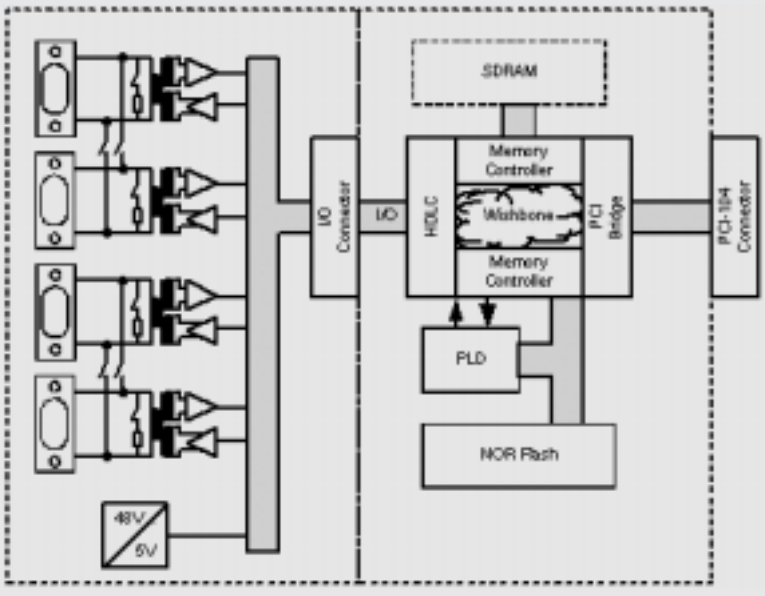
Mechanical Specifications
- Dimensions: conforming to PCI-104 specification
- Double slot to handle four 9-pin D-Sub connectors
- Weight: tbd.

Environmental Specifications
- Fully compliant with EN50155 Tx
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



PP04 – PCI-104 Module with MVB Interface

- 32-bit/33-MHz PCI target
- MVB transmitter/receiver interface
- 1 redundant channel
- Isolated EMD (optionally ESD and OGF)
- Up to 16MB SDRAM, 2MB Flash
- Complies with PCI-104 specification

MVB Multifunction Vehicle Bus Interface

- Interface implemented in ASIC and FPGA
- Electrical Middle Distance (EMD) medium
  - RS485/422 transceiver
- Option: ESD (Electrical Short Distance medium) and OGF (Optical Glass Fiber medium), on request
- Accessible on two 9-pin D-Sub front connect.

Memory

- SDRAM 16MB
  - 16-bit data bus
  - Traffic Memory (TM) for MVB interface
- Flash 2MB
  - For FPGA configuration data

PCI Interface

- 32-bit/33-MHz PCI interface at PCI-104 connector J1

Miscellaneous

- Two yellow status LEDs to signal MVB activity

Electrical Specifications

- Isolation voltage: 1500V DC / 1000V AC between isolated side and digital side
- Supply voltage/power consumption:
  - +5V, ±5%, tbd.
  - +3.3V, +3.3V..+3.6V, tbd.
- MTBF: tbd. @ 50°C

Mechanical Specifications

- Dimensions: conforming to PCI-104 specification
- Weight: 72g

Environmental Specifications

- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

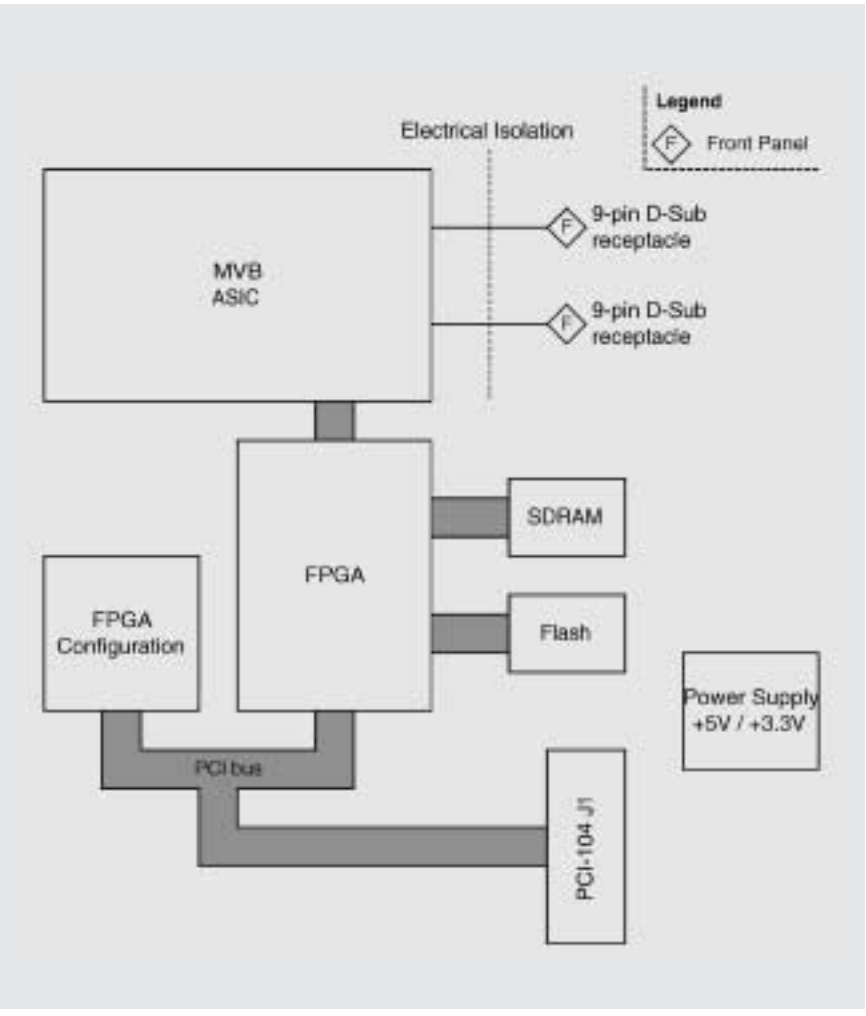
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



PP01 – PCI-104 Module with PowerPC MPC 5200

- PowerPC MPC5200 / 384 MHz
- 32-bit/33-MHz PCI
- Up to 128 MB SDRAM
- Up to 64 KB FRAM
- Fast Ethernet, dual RS232
- Dual CAN with CANopen support
- USB 1.1
- Complies with PCI-104 specification
- MENMON BIOS for PowerPC cards

CPU
- PowerPC
  - MPC5200 up to 400MHz

Memory
- 64MHz memory bus operation
- SDRAM up to 64MB
- Flash 16MB
  - 8-bit data bus
- FRAM 64KB non-volatile
  - 8-bit data bus
- Serial EEPROM 16kbit for factory settings

Interfaces
- 10/100Mbits/s Ethernet
  - 9-pin D-Sub connector at front panel
- Two UART RS232 serial interfaces (COM1/COM2)
  - Via one 9-pin D-Sub connector at front panel
- USB 1.1
  - Physical line interface via SA-Adapter on I/O connector P2
- Two independent CAN interfaces
  - Physical line interface via SA-Adapter on I/O connector P2

Display interface
- Four characters, 5 by 7 pixels
- For additional display adapter PCB (on req.)

PCI Interface
- 32-bit PCI interface at PCI-104 connector J1
- Support of one external master

Miscellaneous
- Real-time clock
- Temperature sensor
- Three push buttons and LED on optional display PCB (on request)

Electrical Specifications
- Supply voltage/power consumption:
  - +5V, ±5%, 100mA typ.
  - +3.3V, ±5%, 900mA typ.
- MTBF: 225,000h @ 50°C

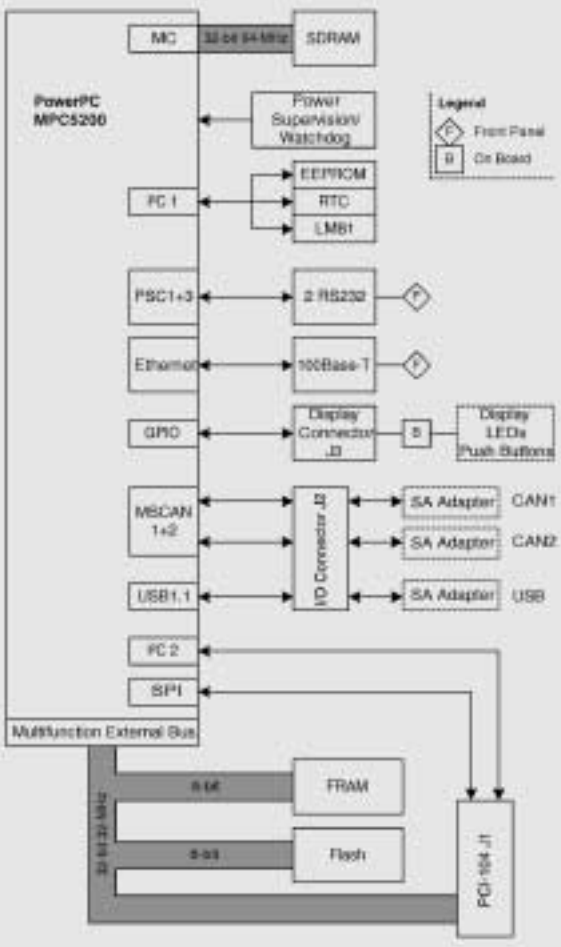
Mechanical Specifications
- Dimensions: conforming to PC-104 specification
- Weight: 90g

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support
- MENMON
- VxWorks
- Linux
- CANopen firmware (Vector Informatik)
- CANopen support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- MSCAN/Layer2 support: MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



Overview – PMC & PC-MIP mezzanine modules

MEN offers a range of PCI-based mezzanine modules with typical computer I/O functions such as graphics, Ethernet, UARTs, USB, FireWire, TTL I/O, memory and fieldbus interfaces, in accordance with the relevant PC-MIP or PMC standard.

PC-MIP, ANSI-standardized since 2002, is a PCI-based mezzanine standard perfectly suited for adding typical computing I/O to the system in a flexible, "component-like" manner. PC-MIPs are modular, economical I/O extensions for all types of industrial computers, from embedded systems up to high-end workstations. The pure 100% PCI interface comes with a 32-bit data bus and a single 3.3-V signaling voltage only. There are two compatible types of modules: Type I with rear I/O only (50 I/O pins incl. PXI trigger signals and 14 ground pins) and Type II with both rear and front I/O for direct connection of sensitive signals. 6 PC-MIPs (300 I/O lines) fit, for example, on a 6U carrier board, 3 PC-MIPs fit on a 3U carrier board. PC-MIP modules have also been developed to work in rugged environments – shock, vibration, drop, resonance, humidity, chemicals, -40 to +85°C operating temperature.

The PMC standard is a combination of two IEEE standards, IEEE 1386 Standard Mechanics for a Common Mezzanine Card Family (CMC) and IEEE 1386.1 Standard Physical and Environmental Layers for PCI Mezzanine Cards (PMC). It provides a mezzanine module standard used to add the more complex I/O functionally (such as telecom interfaces) independent of the form factor.

	Function	Intelligence	I/O Lines	Memory	Miscellaneous	Front Connector	Isolation	Consumption typ.	Software
P18 *p. 69*	Frame Buffer Interface	FPGA	VGA or DVI (front), LVDS (rear)	16MB SGRAM	---	1 DVI	No	n.a.	Linux, Windows 2000/XP
P17 *p. 69*	Multiple Display Controller	SM731	DVI-I, S-Video I/O, Composite Video (front), LVDS1 and 2 (rear)	16MB SGRAM	Double PC-MIP	1 DVI-I, 1x 9-pin D-Sub	No	+5V: 3mA +3.3V: 1.4A	Windows 2000/XP, OS-9
P16 *p. 70*	Dual 100Base-T Ethernet	i8259	2 full-duplex channels	---	---	2x 8-pin RJ45	Yes	+3.3V: 300mA typ.	Linux, QNX, VxWorks, OS-9
P15 *p. 70*	Non-volatile SRAM	PLX9030	---	256KB, 512KB	Non volatile, w/o battery	---	No	+5V: 25mA +3.3V: 90mA	Linux, VxWorks, OS-9
P14 *p. 71*	IEEE 1394 OHCI FireWire Controller	TI TSB43AA22 OHCI PHY/ Link Layer Controller	1 channel	---	400 Mbits/s	6-pin JFW	No	+5V: 100mA +3.3V: 300mA +12V: 100mA	Windows NT/2000/XP
P13 *p. 71*	48-bit TTL I/O Interface	---	48 (6 groups input or output)	---	Fast I/O with line termination	36-pin half-pitch D-Sub	No	+5V: 1.1A +3.3V: 68mA	Windows, Linux, VxWorks, RTX, OS-9, QNX
P12 *p. 72*	10/100Base-T Ethernet	DS21143	1 full-duplex channel	---	---	8-pin RJ45	Yes	+5V: 120mA +3.3V: 150mA	Windows, Linux, VxWorks
P11 *p. 72*	Quad RS422/ 485 UART	16C950	4 asynchronous full-duplex chann.	---	---	26-pin half-pitch D-Sub	No	+5V: 130mA +3.3V: 40mA	Windows, Linux, VxWorks
P10 *p. 73*	Quad RS232 UART	16C950	4 asynchronous full-duplex chann.	---	TTL level at rear alternatively	26-pin half-pitch D-Sub	No	+5V: 130mA +3.3V: 40mA	Windows, Linux, VxWorks, OS-9
P9 *p. 73*	10/100/1000 Base-T Ethernet	---	1 full-duplex or 1 half-duplex channel	---	---	8-pin RJ45	Yes	+3.3V: 400mA typ.	Linux, Windows
P6 *p. 74*	Profibus DP Master	ASPC 2 MC68331	1 channel Class 1 or Class 2 master	---	Complete software on board (Softing)	9-pin D-Sub	Yes	+5V: 450mA typ.	Windows, Linux, VxWorks, RTX, OS-9, QNX
P5 *p. 74*	Intelligent CAN Interface	i82527 MC68331	1 channel full and extended CAN	---	CANopen master/ slave software on board (Vector)	9-pin D-Sub	Yes	+5V: 470mA max. (2 channels)	Windows, Linux, VxWorks, RTX, OS-9, QNX
P4 *p. 75*	Ultra2 SCSI Controller	SYM53C895	Single-ended and LVD	---	40MB/s data throughput	---	No	+5V: 80mA +3.3V: 100mA	Windows
P1 –	CRT/LCD Graphics Accelerator	SM710	VGA on front and/or LCD via carrier board	4MB video DRAM	---	15-pin HD-Sub	No	+5V: 50mA +3.3V: 250mA	Windows, Linux, VxWorks, QNX

P517 – PMC Graphics Accelerator

	Function	Intelligence	I/O Lines	Memory	Front Connector	Isolation	Consumption typ.	Software
P518 *p. 68*	Frame Buffer Interface	FPGA	VGA or DVI (front), LVDS (rear)	16MB SGRAM 16MB SGRAM	1 DVI	No	n.a.	Linux, Windows 2000/XP
P517 *p. 68*	Multiple Display Controller	SM731	DVI-I, S-Video I/O, Composite Video (front), LVDS1 and 2 (rear)	2MB video DRAM	1 DVI-I, 1 9-pin D-Sub	No	+5V: 3mA +3.3V: 1.4A	Windows 2000/XP, OS-9
P501 –	CRT/LCD Graphics Accelerator	SM710			15-pin HD-Sub	No	+5V: 50mA +3.3V: 250mA	Windows 95 / 2000 / NT, VxWorks

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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P518 – PMC Frame Buffer Interface

- Frame buffer functionality in FPGA
- Color depth 16-bit RGB
- 640 x 480 up to 1280 x 1024 pixels resolution
- Frequencies 60 Hz and 75 Hz
- 16 MB integrated graphics RAM
- VGA analog video output (front) or
- DVI digital video output (DVI-I front connector)
- LVDS TFT via rear-I/O connector

Product available Q II / 2005

Video Signals

- DVI interface; FP to DVI conversion
- VGA interface; FP to VGA conversion
- TFT interface via rear I/O
- Color depth 16-bit RGB
- Resolutions DVI/VGA
  - 640 x 480
  - 800 x 600
  - 1024 x 768
  - 1280 x 1024
- Resolutions LVDS
  - 640 x 480 or 800 x 600 with one LVDS connector
  - 1024 x 768 with two LVDS connections
  - 1280 x 1024 not supported
- Frequencies: 60Hz and 75Hz

Memory

- SDRAM 32MB 133MHz 32-bit memory interface

FPGA

- Configuration data stored in 2MB Flash
- Change of FPGA contents via software update

PCI Characteristics

- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- 33MHz or 66MHz
- Target

Peripheral Connection

- Flat-panel and VGA signals via DVI-I connector at front
- LVDS signals via P4 rear I/O

Software Support

- tbd.

P517 – PMC Graphics Accelerator

- Graphics controller SM731
- 16 MB integrated graphics RAM
- 4 Mbit video BIOS ROM
- Up to 1600 x 1200 pixels
- Up to 16.7 M colors
- Up to 85Hz refresh rate
- LCD (up to UXGA) and CRT via DVI-I (front)
- PanelLink via DVI-I (front)
- S-Video I/O and Composite Video out via D-Sub (front)
- 2x LVDS via on-board connector

Graphics Control

- SM731 controller
- Video
  - Zoom video port, Video filtering
  - Multiple independent hardware video windows
- Memory
  - 16MB embedded SGRAM
  - 64-bit memory interface
  - Various on-chip DRAM memory configurations
- DVI via PanelLink transmitter
  - Integrated Dual Channel LVDS transmitters
  - Single or dual pixel per clock
  - DualMon support
  - Up to 1600 x 1200 resolution
  - Up to 16.7M colors
- RAMDAC
  - 235MHz, 24 bits
  - Up to 1600 x 1200 resolution
  - Up to 16.7M colors
- Video BIOS ROM
  - 4 Megabit (512K x 8 bits)

Interfaces

- DVI-I via front-panel connector
- S-Video Output/Input and Composite Video Output viafront-panel connector
- LVDS1 and LVDS2 via onboard connectors

PCI Characteristics

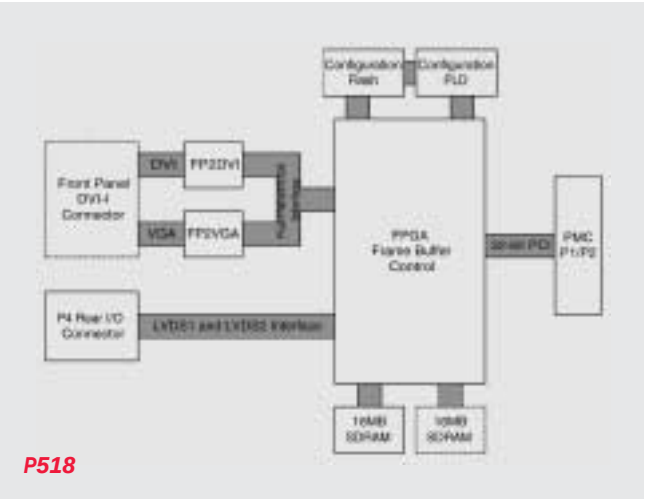
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- 33MHz
- Target

Peripheral Connection

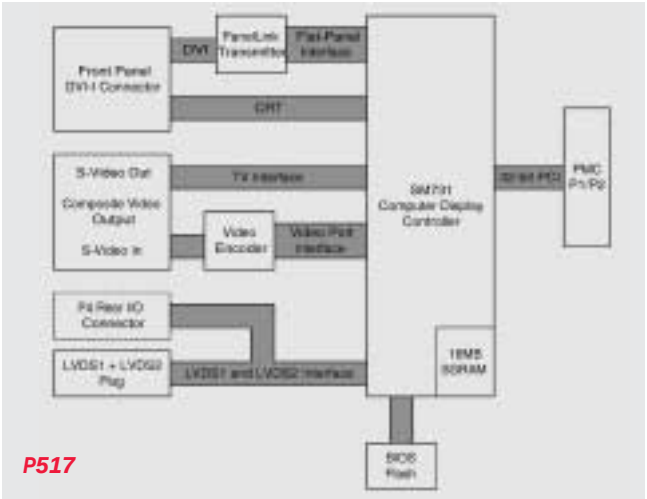
- Via front panel on one DVI-I connector and one standard 9-pin D-Sub receptacle connector
- Via optional onboard 50-pin plug connector
- Option: Via P4 rear I/O

Software Support

- Driver support for Windows 2000/XP, OS-9 (incl. C library and shared library module for XiBase9)

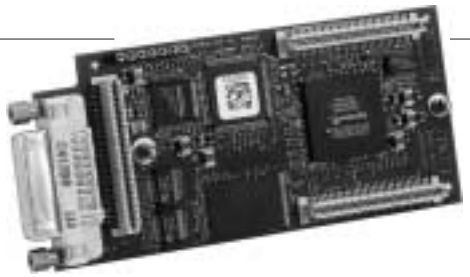


P518



P517

P18 – PC-MIP Frame Buffer Interface



- Frame buffer functionality in FPGA
- Color depth 16-bit RGB
- 640 x 480 up to 1280 x 1024 pixels resolution
- Frequencies 60 Hz and 75 Hz
- 32 MB integrated graphics RAM
- VGA analog video output (front) or DVI digital video output (DVI-I front connector)
- LVDS TFT via rear-I/O connector

Video Signals

- DVI interface; FP to DVI conversion
- VGA interface; FP to VGA conversion
- TFT interface via rear I/O
- Color depth 16-bit RGB
- Resolutions DVI/VGA
  - 640 x 480, 800 x 600, 1024 x 768, 1280 x 1024
- Resolutions LVDS
  - 640 x 480 or 800 x 600 with one LVDS connector
  - 1024 x 768 with two LVDS connections
  - 1280 x 1024 not supported
- Frequencies: 60Hz and 75Hz

Memory

- SDRAM 32MB 133MHz 32-bit memory interface

FPGA

- Configuration data stored in 2MB Flash
- Change of FPGA contents via software update

PCI Characteristics

- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- 33MHz or 66MHz
- Target

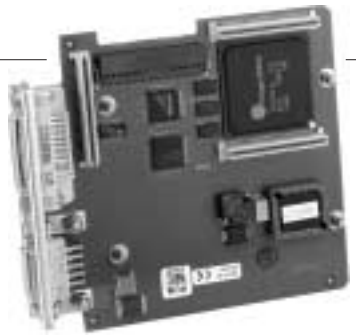
Peripheral Connection

- Flat-panel and VGA signals via DVI-I connector at front
- LVDS signals via J3 rear I/O
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Software Support

- tbd.

P17 – PC-MIP Display Controller



- Graphics controller SM731
- 16 MB integrated graphics RAM
- 4 Mbit video BIOS ROM
- Up to 1600 x 1200 pixels
- Up to 16.7 M colors
- Up to 85Hz refresh rate
- LCD (up to UXGA) and CRT via DVI-I (front)
- PanelLink via DVI-I (front)
- S-Video I/O and Composite Video out via D-Sub (front)
- 2x LVDS via rear I/O adapter and on-board

Graphics Control

- SM731 controller
- Video
  - Zoom video port
  - Video filtering
  - Multiple independent hardware video windows
- Memory
  - 16MB embedded SGRAM
  - 64-bit memory interface
  - Various on-chip DRAM memory configurations
- DVI via PanelLink transmitter
  - Integrated Dual Channel LVDS transmitters
  - Single or dual pixel per clock
  - DualMon support
  - Up to 1600 x 1200 resolution
  - Up to 16.7M colors
- RAMDAC
  - 235MHz
  - 24 bits
  - Up to 1600 x 1200 resolution
  - Up to 16.7M colors
- Video BIOS ROM
  - 4 Megabit (512K x 8 bits)

Interfaces

- DVI-I via front-panel connector
- S-Video Output/Input and Composite Video Output via front-panel connector
- LVDS1 and LVDS2 via onboard connectors

PCI Characteristics

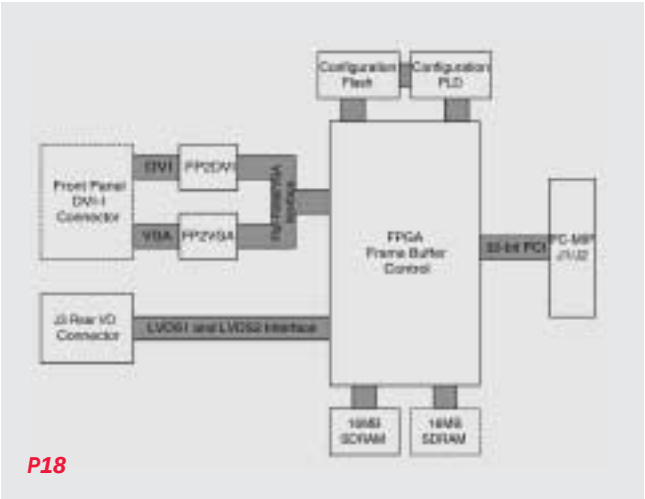
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- 33MHz
- Target

Peripheral Connection

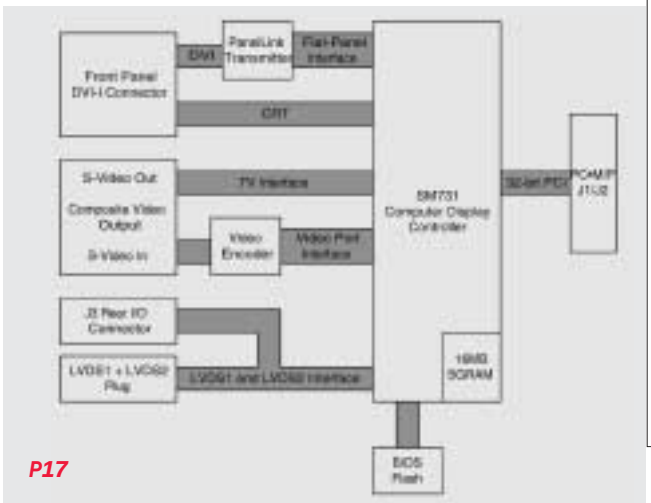
- Via front panel on one DVI-I connector and one standard 9-pin D-Sub receptacle conn.
- Via optional onboard 50-pin plug connector
- Via J3 rear I/O

Software Support

- Driver support for Windows 2000/XP, OS-9 (incl. C library and shared library module for XiBase9)



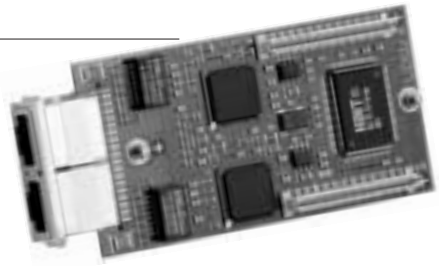
P18



P17

P16 – PC-MIP Dual 100Base-T Ethernet

- Dual 10/100Base-T Fast Ethernet
- Dual Intel® 82559 Controller
- Dual RJ45 connector
- Full duplex
- Electrical isolation



Ethernet Interface
- Two 10/100Base-T interfaces
- Two 82559ER controllers
- Full duplex support
- Media Access Control (MAC) address stored in onboard serial EEPROM

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target and initiator

Peripheral Connection
- Via front panel on two standard 8-pin RJ45 receptacle connectors

Electrical Specifications
- Isolation voltage: 1kV RMS (0..1000m above sea level)
- Supply voltage/power consumption:
  - +3.3V (3.0V..3.6V), 300mA typ., 450mA max.
- MTBF: 490,000h @ 50°C

Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP Standard
- Weight: 30g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

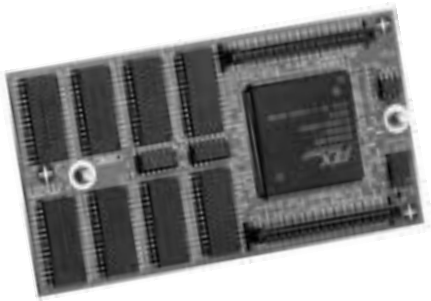
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Drivers from Intel® for many operating systems
- Drivers already implemented in VxWorks, Linux, QNX, OS-9

P15 – PC-MIP Non-volatile SRAM

- FRAM technology
- No batteries required
- 256KB or 512KB
- PC-MIP Type I



Memory
- 256KB or 512KB FRAM
- Four memory banks with 512KB
- Two memory banks with 256KB
- Access time: 70ns
- Cycle time: 130ns

PCI Characteristics
- 32-bit/33-MHz PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target

Peripheral Connection
- No peripheral connections

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 22.5mA typ.
  - +3.3V (3.0V..3.6V), 86.3mA typ.
- MTBF: tbd. @ 50°C

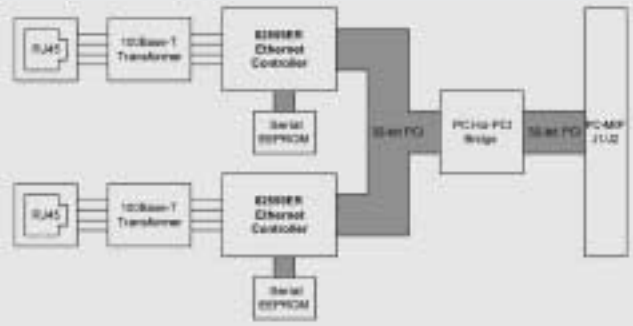
Mechanical Specifications
- Dimensions: PC-MIP Type I conforming to PC-MIP Standard, without J3
- Weight: 34g

Environmental Specifications
- Temperature range (operation):
  - -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

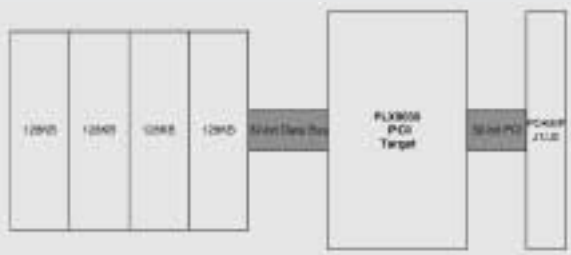
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Driver support for Linux, VxWorks, OS-9



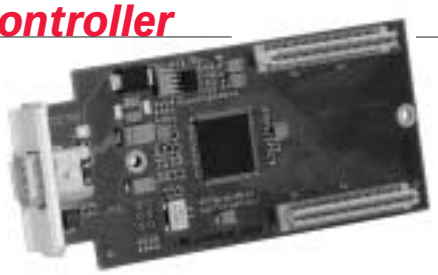
P16



P15

P14 – PC-MIP IEEE 1394 OHCI FireWire Controller

- 1-channel OHCI PHY/Link Layer Controller
- TI TSB43AA22 integrated 1394a-2000
- Up to 400Mbits/s



Controller
- TI TSB43AA22 Integrated 1394a-2000 OHCI PHY/Link Layer Controller

Data Transfer Rates
- 100, 200 and 400Mbits/s

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target and initiator

Peripheral Connections
- Via front panel on a shielded 6-pin Molex receptacle connector

Miscellaneous
- Cable Active LED for on-board diagnosis

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 100mA max.
  - +3.3V (3.0V..3.6V), 300mA max.
  - +12V (11.4V..12.6V), 100mA max. (without 1394 cable power charge)
- MTBF: tbd. @ 50°C

Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP specification
- Weight: 23g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Windows 98 and Windows 2000, no drivers necessary

P13 – PC-MIP 48-bit TTL I/O Interface

- 32 TTL inputs/outputs
- 48mA drivers
- Active terminators
- Same line interface as SCSI
- Fast 16-bit host access

Input/Output
- 48-bit TTL I/O
- 6 groups, alternatively input or output
- Active terminators can be activated for each group
- Output low current (VOL max. 0.55V): min. 64mA
- Output high current (VOH min. 2.0V): min. -15mA
- Input high current: max. 100µA
- Input low current: max. -100µA
- Input voltage: min. -0.5V, max. 6V

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification,Rev. 2.1
- Target

Peripheral Connections
- Via front panel on a shielded 36-pin half-pitch D-Sub receptacle connector
  - Only Type II models
  - 28-bit I/O, incl. trigger functionality
- Via J3/carrier board (rear I/O)
  - Type I and Type II models
  - Full 48-bit I/O functionality

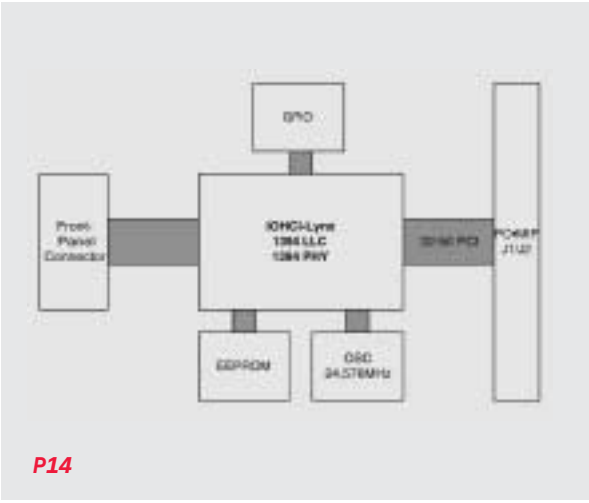
Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 1.1A
  - +3.3V (3.0V..3.6V), 68mA
- MTBF: 334,000h @ 50°C

Mechanical Specifications
- Dimensions: PC-MIP Type I/II conforming to PC-MIP specification
- Weight:
  - Type I module: 24g, type II module: 34g

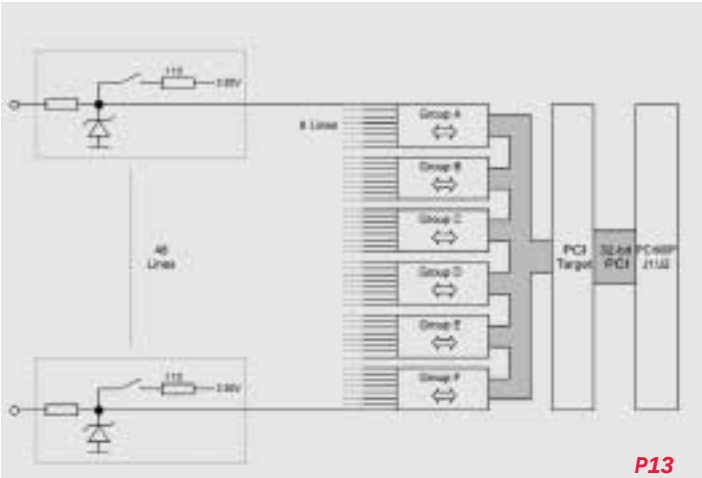
Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



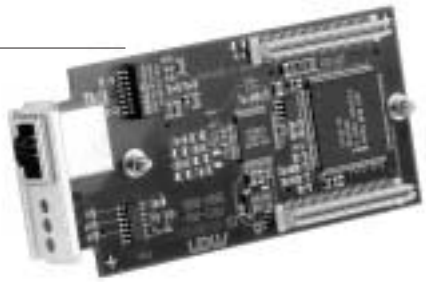
P14



P13

P12 – PC-MIP 10/100Base-T Ethernet

- 10/100Base-T Fast Ethernet
- Intel® 21143 Ethernet controller
- RJ45 connector
- Full duplex
- Electrical isolation



Ethernet Interface
- 10/100Base-T with three status LEDs at front
- Full duplex support
- Media Access Control (MAC) address stored in onboard serial EEPROM

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target and initiator

Peripheral Connections
- Via front panel on a standard 8-pin RJ45 receptacle connector

Electrical Specifications
- Isolation voltage: 1.5kV RMS (0..1000m above sea level)
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 120mA typ. (operation), 80mA typ. (stand-by)
  - +3.3V (3.15V..3.6V), 150mA typ. (operation), 30mA typ. (stand-by)
- MTBF: 316,000h @ 50°C

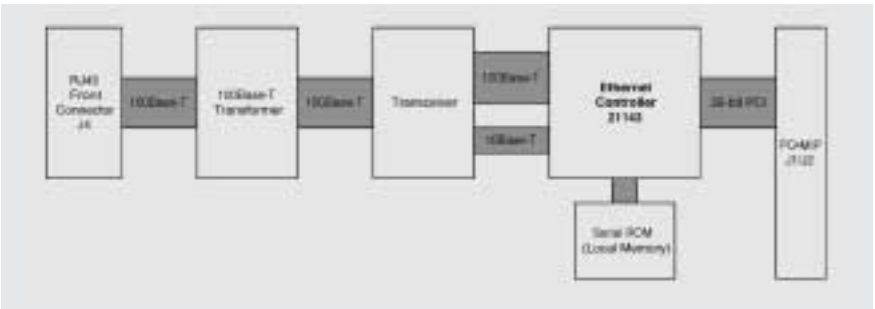
Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP specification
- Weight: 30g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- WindowsNT
- VxWorks
- Linux



P11 – PC-MIP Quad RS422/485 UART

- Four asynchronous channels
- Full-duplex
- 128 bytes FIFO per transmitter/receiver per channel

UART
- 4 16C950 high-performance UARTs
- Full software compatibility with 16C550 UARTs
- Configured with I/O or memory base address
- 8 128-byte FIFOs
- Data rates
- UART controller supports up to 15Mbps
- Physical interface supports up to 10Mbps
- Full duplex/half duplex interface

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- Target

Peripheral Connections
- Via front panel on a shielded 26-pin half-pitch D-Sub receptacle connector
- Via J3/carrier board

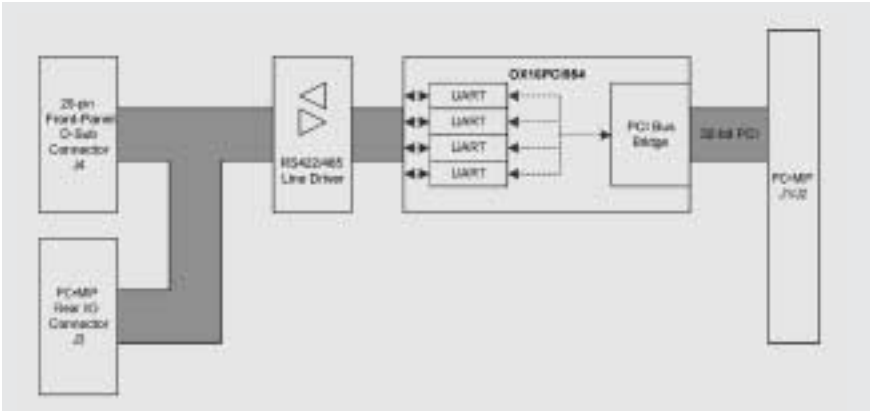
Electrical Specifications
- Supply voltages/power consumption:
  - +5V (4.85V..5.25V), 130mA
  - +3.3V (3.15V..3.6V), 40mA
- MTBF: 190,000h @ 50°C

Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP specification
- Weight: 28g

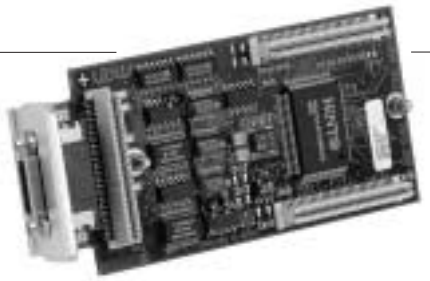
Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

Software Support
- WindowsNT
- VxWorks
- OS-9
- Linux (on request)



P10 – PC-MIP Quad RS232 UART



- Four asynchronous channels
- Full-duplex
- 128 bytes FIFO per transmitter/receiver per channel
- Alternatively TTL-level at rear (SA-Adapters)

UART
- 4 16C950 high-performance UARTs
  - Full software compatibility with 16C550 UARTs
  - Configured with I/O or memory base address
- 8 128-byte FIFOs
- Data rates
  - UART controller supports up to 15Mbps
  - Physical interface supports up to 120kbps

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- Target

Peripheral Connections
- Via front panel on a shielded 26-pin half-pitch D-Sub receptacle connector (RS232 level)
- Via J3/carrier board (TTL level)

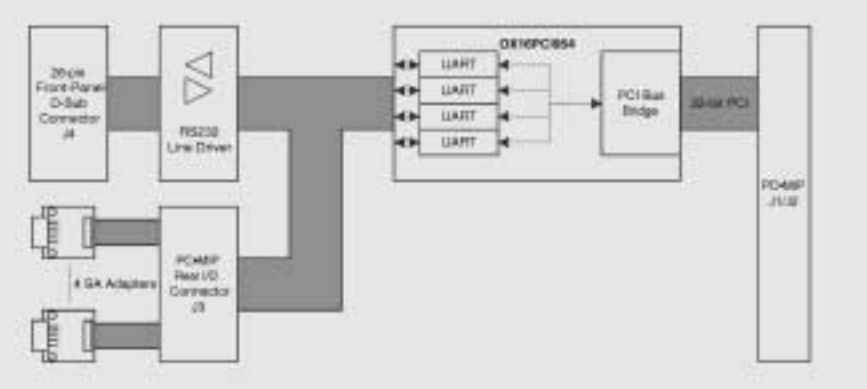
Electrical Specifications
- Supply voltages/power consumption:
  - +5V (4.85V..5.25V), 130mA
  - +3.3V (3.15V..3.6V), 40mA
- MTBF: 190,000h @ 50°C

Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP specification
- Weight: 34g

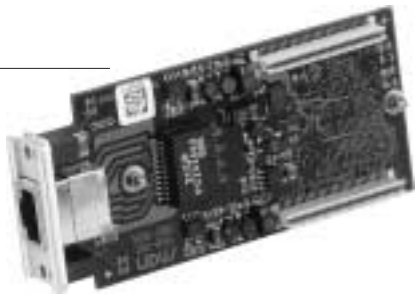
Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

Software Support
- WindowsNT
- VxWorks
- OS-9
- Linux (on request)



P9 – PC-MIP 10/100/1000Base-T Ethernet



- 1000/100/10Base-T
- Standard RJ45 connector
- Full duplex with 10/100Base-T
- Half duplex with 1000Base-T
- Electrical isolation

Ethernet
- 10Mbits/s 10Base-T
- 100Mbits/s 100Base-T
- 1000Mbits/s 1000Base-T
- 82544 controller
- 4 front-panel status LEDs
- Serial EEPROM for factory settings

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target and initiator

Peripheral Connections
- Via front panel on a standard RJ45 connector

Electrical Specifications
- Supply voltage/power consumption: +3.3V (3.15V..3.6V), 400mA typ.
- MTBF: 520,000h @ 50°C

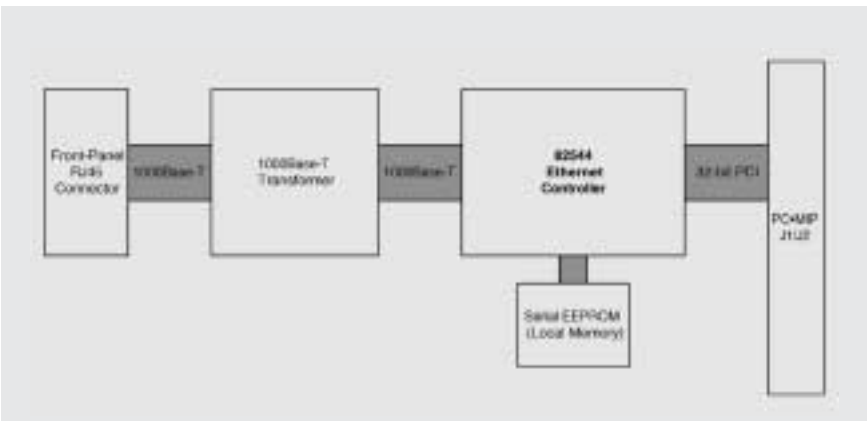
Mechanical Specifications
- Dimensions: PC-MIP Type II conforming to PC-MIP specification
- Weight: 30g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Drivers from Intel® for many operating systems, incl. Linux and Windows



P6 – PC-MIP Profibus DP Master

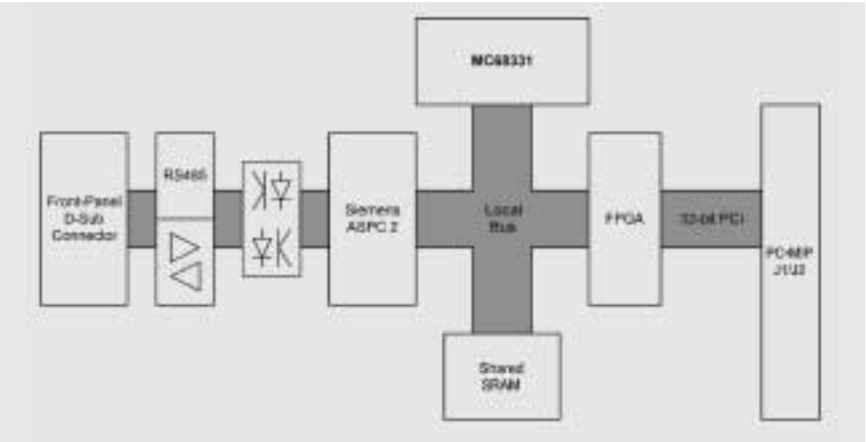
- Class 1/2 Profibus DP master (DIN19245)
- Isolated RS485, RS232 (debug) interface
- Local 32-bit CPU
- Up to 127 active or passive stations
- 12Mbits/s data transfer rate
- 1MB DRAM
- Complete Softing Profibus software on-board
- Compatible with PROFIBUS DP Configurator (Softing)

MC68331/16MHz CPU

- CPU32 performance
- Complete Profibus DP software on one PC-MIP
- Local interrupt controller
- Hardware watchdog

ASPC 2 Profibus Controller

- Up to 12Mbaud data rate
- 16-bit DMA interface (local)
- Complete bus access protocol
- Up to 127 active or passive stations



Miscellaneous

- 1MB shared memory for communication and program
- PCI interface with autoincrement address mode
- Status LEDs
- Isolated Profibus interface

Peripheral Connections

- Via front panel on a shielded 9-pin D-Sub receptacle connector

PCI Characteristics

- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- Target and initiator
- I2O Ready Messaging Unit

Software Support

- Softing protocol portation (ISO/OSI protocol layer 2/DP)
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

P5 – PC-MIP Intelligent CAN Interface

- Full CAN/Extended CAN
- Local 32-bit CPU
- ISO high-speed coupling
- 1Mbit/s data transfer rate
- Optical isolation
- CANopen master and slave software support (Vector Informatik)
- Intelligent CAN Layer 2 support

CAN Controller

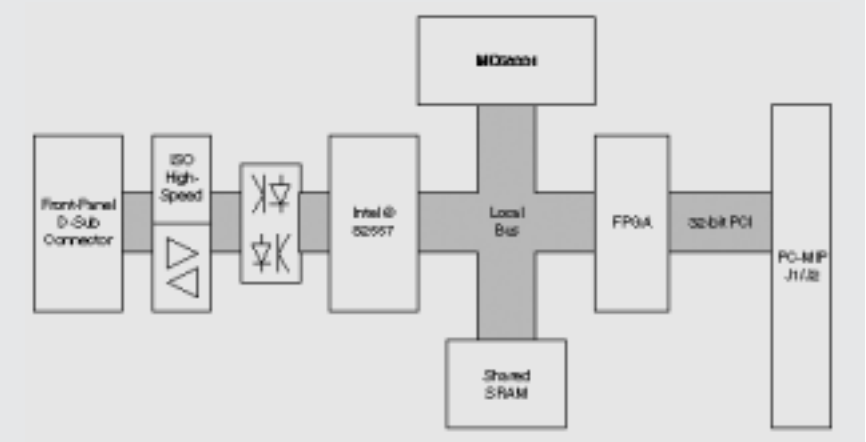
- I82527
- Standard and extended frames
- Up to 15 message objects
- Up to 1Mbit/s

I/O Processor

- MC68331
- 32-bit CPU32
- 24MHz

Physical Interface

- ISO high speed transceiver 82C251
- Optically isolated
- Automotive 24V compliant



Memory

- 1MB shared SRAM for communication and program

Peripheral Connections

- Via front panel 9-pin D-Sub plug connector

PCI Characteristics

- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.2
- Target and initiator
- I2O Ready Messaging Unit

Electrical Specifications

- Optical isolation: 180V DC GND-to-Shield
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), tbd.
- +3.3V (3.14V..3.47V), tbd.
- MTBF: 310,000h @ 50°C

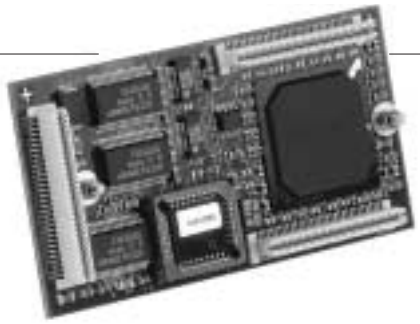
Mechanical Specifications

- Dimensions: PC-MIP Type II conforming to PC-MIP specification, 10H module
- Weight: 32g

Software Support

- CANopen firmware (Vector Informatik)
- ICANL2 firmware and toolbox (MEN)
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

P4 – PC-MIP Ultra2 SCSI Controller



- Ultra2 SCSI up to 40MB/s
- Single-ended and LVD
- SYM53C895 PCI-Ultra2 SCSI I/O processor
- Up to 47MB/s DMA rate
- Multi-threaded I/O algorithms
- SCSI SCRIPTS

SCSI Interface
- Support of Ultra2 SCSI, up to 40MB/s
- Backward compatible to Fast (Wide) SCSI and Ultra (Wide)

SCSI modes
- Support of single-ended (Fast SCSI, Ultra SCSI modes) and LVD (Ultra2 SCSI mode only) signaling environments

Miscellaneous
- Big/little endian support
- Support for option ROM

PCI Characteristics
- 32-bit PCI, complying with PCI Local Bus Specification, Rev. 2.1
- Target and initiator

Peripheral Connections
- Via J3/carrier board

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 80mA typ., 450mA max.
  - +3.3V (3.15V..3.6V), 100mA typ., 750mA max.
- MTBF: 567,000h @ 50°C

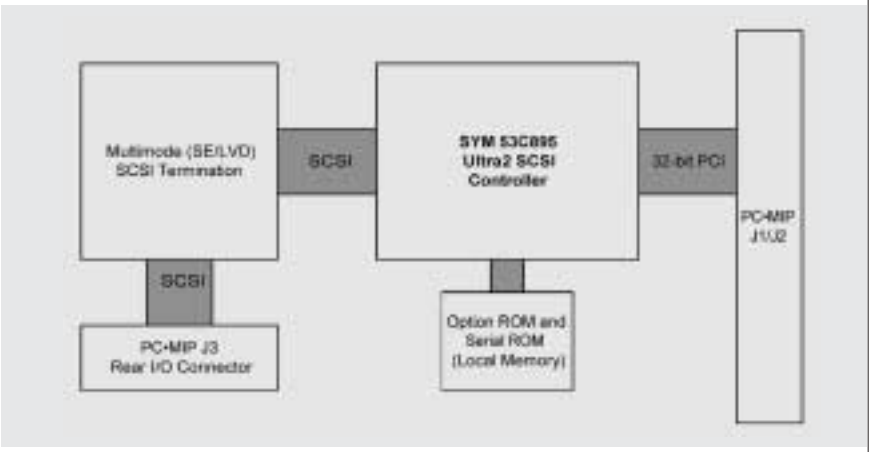
Mechanical Specifications
- Dimensions: Type II PC-MIP conforming to PC-MIP specification
- Weight: 28g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 byUL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- Windows NT



Overview – M-Module Mezzanine Cards

M-Modules, ANSI-standard since 1997, are a mezzanine standard perfectly suited for adding any kind of real-world I/O to the system in a flexible way. M-Modules are modular I/O extensions for all types of industrial computers, from embedded systems up to high-end workstations.

The M-Module interface – a fast asynchronous parallel interface – offers sophisticated functions like 32-bit data bus, burst transfers up to 100MB/s, DMA and trigger capabilities.

M-Modules offer direct front-panel connection rather than requiring a separate adapter panel with ribbon-cable connections. This provides a clean path for sensitive signals without loss of data or signal quality – using, for example, shielded D-Sub connectors and COAX cables.

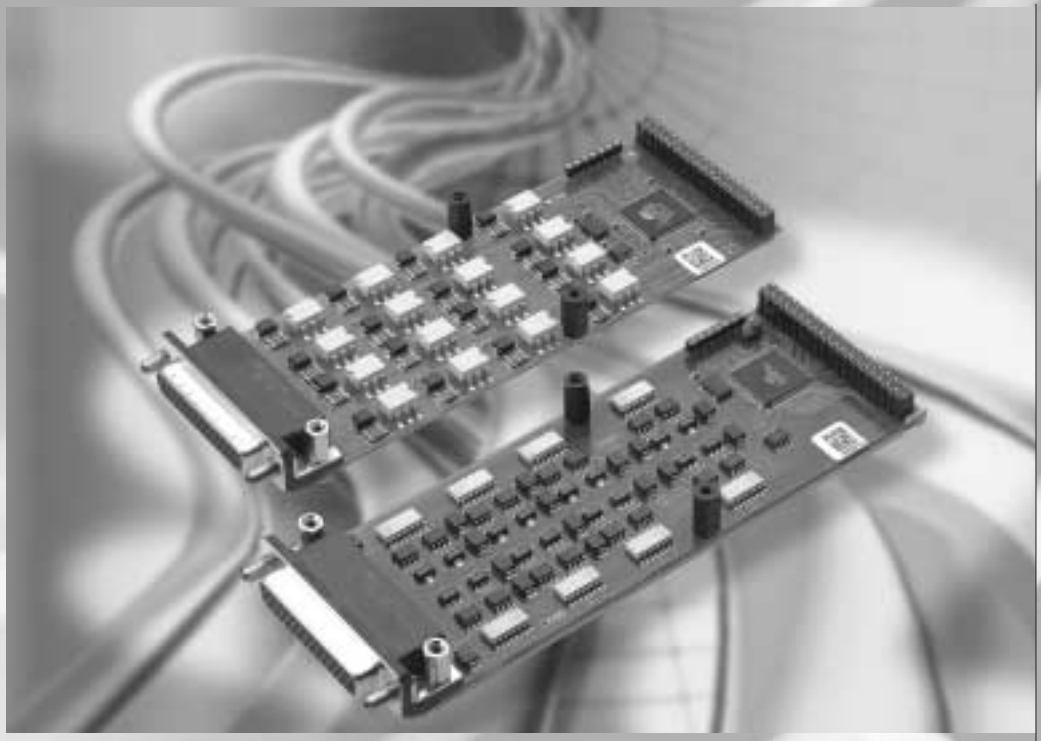
A carrier board in double Eurocard format, for instance, can accommodate up to four M-Modules.

Typical M-Module functionality comprises instrumentation, process I/O, motion, robotics, various general-purpose analog and binary I/O as well as all common fieldbus interfaces.

M-Modules have been developed to work also in rugged environments – shock, vibration, drop, resonance, humidity, chemicals, -40 to +85°C operating temperature.

M-Modules for Binary Process I/O

	I/O Lines	Load on...	Input Voltage Range	Output Voltage Range	Output Current per Channel	Front Connector	Optical Isol.	Consumption typ.	Software
M82 *p. 83*	16 inputs	---	0..40V	---	---	44-pin HD-Sub	Yes	220mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M81 *p. 83*	16 outputs	---	---	0..36V	500mA	44-pin HD-Sub	Yes	330mA (max.)	Windows, Linux, QNX, OS-9, VxWorks, RTX
M66 *p. 84*	32 inputs or outputs	Ground	0..32V	12..32V	Max. 1.9A	44-pin HD-Sub	Yes	200mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M58 *p. 85*	32-bit TTL I/O with line termination	---	---	---	---	44-pin HD-Sub	---	200mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M43 *p. 85*	8 relay outputs	---	---	Max. 100V	1A	25-pin D-Sub	Yes	700mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M32 *p. 86*	16 inputs	Supply voltage	0..180V	---	---	25-pin D-Sub	Yes	50mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M31 *p. 86*	16 inputs	Ground	0..180V	---	---	25-pin D-Sub	Yes	50mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M28 *p. 87*	16 outputs	Ground	---	8..36V	500mA	25-pin D-Sub	Yes	100mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M27 *p. 87*	16 outputs	Supply voltage	---	8..36V	500mA	25-pin D-Sub	Yes	100mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M24 *p. 88*	8/16 inputs	Ground or supply voltage	0..32V	---	---	25-pin D-Sub or screw terminal	Yes	120mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M22 *p. 88*	8 inputs or 8 outputs	Ground	0..32V	0..32V	2A	25-pin D-Sub or screw terminal	Yes	250mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M11 *p. 89*	18-bit TTL I/O	---	---	---	---	25-pin D-Sub	---	200mA	Windows, Linux, QNX, OS-9, VxWorks, RTX



Digital Input M-Modules M81 and M82

M-Modules for Analog Process I/O

	I/O Lines	Current / Voltage	Resolution	Acquisition/ Conversion Time	Miscellaneous	Front Connector	Optical Isolation	Consumption typ.	Software
M62 *p. 78*	16 outputs	Current or voltage	12 bits	15µs	---	25-pin D-Sub	Yes	110mA (no DC 560mA (with DC)	Windows, Linux, QNX, VxWorks, RTX, OS-9
M37 *p. 79*	4 outputs	Current or voltage	16 bits	8.5µs	Simultaneous update, external trigger	25-pin D-Sub	Yes	+5V: 850mA ±12V: 300mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M36 *p. 80*	8/16 inputs	Current or voltage	16 bits	10µs	Semi-intelligent with dual-ported RAM	25-pin D-Sub	Yes	110mA (no DC), 580mA (with DC)	Windows, Linux, QNX, VxWorks, RTX, OS-9
M35N *p. 81*	8/16 inputs	Current or voltage	14 bits	7.8µs	Improved version of M34/M35	25-pin D-Sub	Yes	190mA (no DC), 670mA (with DC)	Windows, Linux, QNX, VxWorks, RTX, OS-9
M33 *p. 82*	8 outputs	Current or voltage	12 bits	10µs	Simultaneous update	25-pin D-Sub	Yes	140mA (no DC), 950mA (with DC)	Windows, Linux, QNX, VxWorks, RTX, OS-9

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

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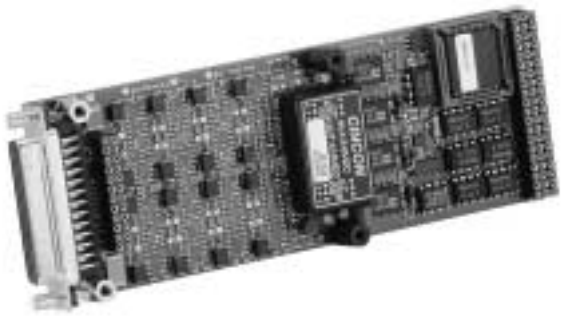
M62 – 16 Analog Outputs

- 16 current or voltage outputs (different versions)
- 12 bits resolution
- 15 µs acquisition/conversion time
- Optical isolation



D/A Conversion

- 16 channels
- 12 bits
- Conversion time 15µs
- ±2 LSB gain

Voltage Output

- Output current: 2mA max.
- Output linearity: ±1 LSB
- Accuracy: ±0.2%, ±1 LSB differential
- Voltage ranges: 0..10V; -10V..+10V

Current Output

- Accuracy: ± 0.5%
- Current range : 4..20mA (other ranges possible on request)
- Max. output voltage 6V
- Max. load resistance 300 Ohm

Possible Configurations

- 16 voltage outputs
- 16 current outputs
- 8 voltage outputs
- 8 current outputs

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, IDENT

Electrical Specifications

- Isolation voltage: 500V DC
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 110mA typ. (without DC/DC converter), 560mA (with DC/DC, voltage outputs without load)
  - External supply ±15V: 04M062-01 (voltage output): +90mA typ., -25mA without load; 04M062-02 (current output): +129mA typ., -48mA without load
- MTBF: 560,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 100g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

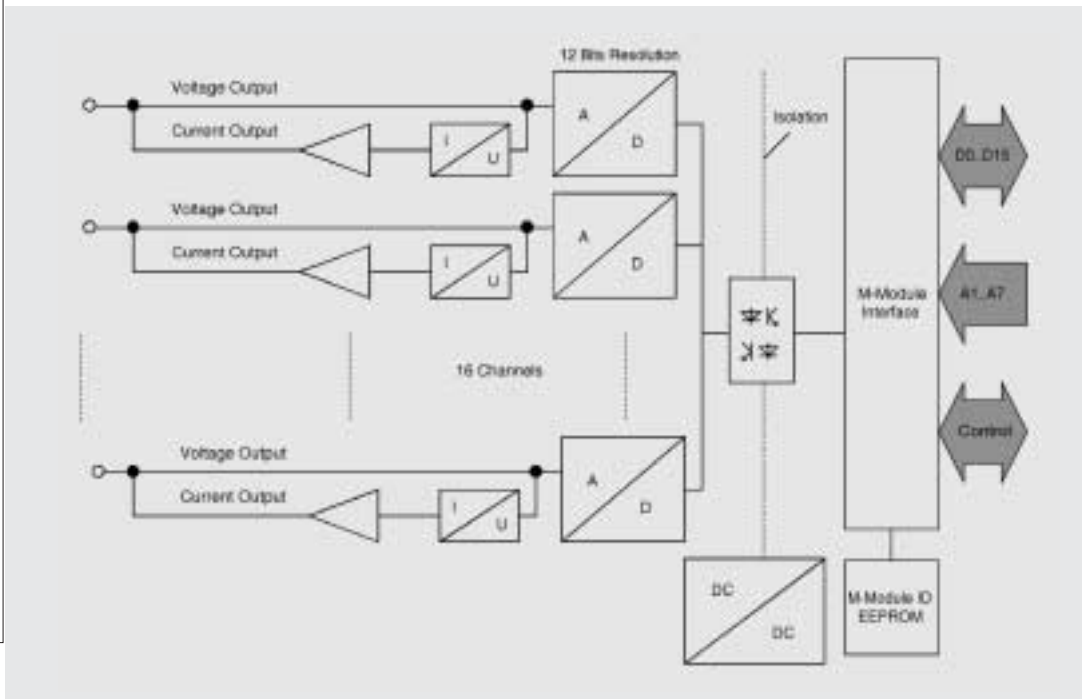
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M37 – 4 Analog Outputs

- 4 current or voltage outputs
- 16 bits high resolution
- 8.5 µs acquisition/conversion time
- Simultaneous channel update
- Synchronization with external trigger
- Optical isolation

D/A Conversion
- 4 channels
- 16 bits
- Conversion time: 8.5µs
- Output linearity: ±1LSB
- Simultaneous updating of all channels
- Synchronization with external trigger

Voltage Output
- Output current: ±5mA max.
- Accuracy: ±0.3%
- Voltage range: -10V..+10V

Current Output
- Accuracy: ±0.5%
- Current range: 0..20mA
- Max. load resistance: 500 Ohm

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, INTA, IDENT

Electrical Specifications
- Isolation voltage: 500V DC
- Supply voltage/power consumption:
  - With on-board DC/DC converter: +5V (4.85V..5.25V), 850mA typ., ±12V 300mA typ.
  - Without DC/DC converter: 100mA typ.
  - External supply ±15V: -100mA (no load connected), +110mA (no load connected)
- MTBF: tbd.

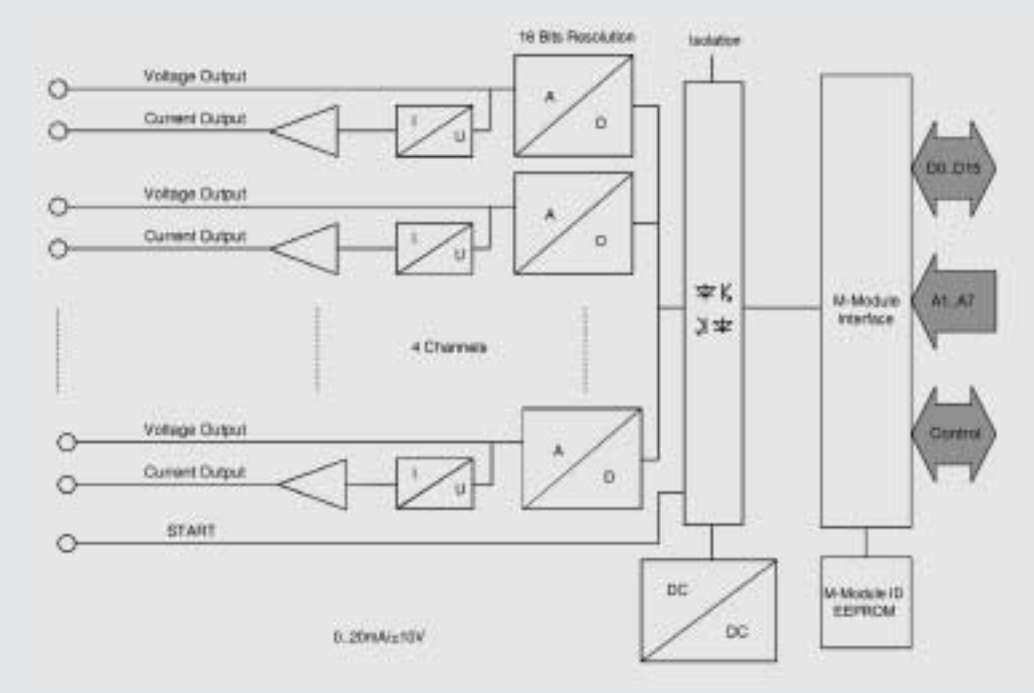
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 98g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M36 – 8/16 Analog Inputs

- 8/16 current or voltage inputs
- 16 bits resolution
- 10 µs acquisition/conversion time
- Unipolar/bipolar software-selectable
- Auto-sampling system
- Communication via dual-ported RAM
- External triggering
- Optical isolation
- On-board signal conditioning via separate adapter

A/D Conversion

- 16 bits @ 10µs
- Precision: ±2 LSB, ±0.1% typ.
- Noise: ±3 LSB of mean value, delta = 0.8
- Optically isolated (500V isolation)
- Programmable gain factor of 1, 2, 4 or 8 (factor 16 by hardware jumpering)
- Offset max. 4 LSB (25°C)
- Full-scale error max. 4 LSB (25°C)
- Software-selectable unipolar or bipolar operation
- Sample and hold
- Autoincrement of channel number

Input Signal Conditioning with AD01

- Voltage or Current Inputs
- 16 analog inputs, single-ended
- High input voltage tolerance
- Cross-talk less than 56db
- Low-pass filter 1kHz
- Voltage Measurement
- Precision: ±0.5%
- Voltage max.: ±15V
- Voltage full scale: ±10V
- Input resistance: 100 kOhm, ±10%
- Current Measurement
- Precision: ±1%
- Current max.: ±25mA
- Current full scale: ±20mA, UA = ±1.25V
- Load resistance: 62.5 Ohm, ±0.1%

Input Signal Conditioning with AD02

- Voltage or Current Inputs
- 8 analog inputs, differential
- High common mode range ±200V
- Cross-talk less than 60db
- Low-pass filter 3kHz
- Voltage Measurement
- Precision: ±0.5%
- Voltage max.: ±200V (common mode)
- Voltage full scale: ±10V
- Input resistance: 400 kOhm typ.
- Current Measurement
- Precision: ±1%
- Current max.: ±25mA
- Voltage max. to IGND: ±200V
- Input resistance: 62.5 Ohm, ±0.1%

Miscellaneous

- External trigger (isolated, rising-edge sensitive)
- External binary input

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, IDENT

Electrical Specifications

- Isolation voltage:
- 500V DC between isolated and digital side
- 180V DC between the channels
- Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltages/power consumption:
- +5V (4.85V..5.25V), 110mA typ. (without DC/DC converter), 580mA (with DC/DC), 990mA (with DC/DC and AD01)
- External supply voltages (without on-board DC/DC converter and adapter): +15V: 14.5V..15.5V, +60mA; -15V: 14.5V..15.5V, -32mA
- MTBF: 44,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight (incl. adapter): 102g

Environmental Specifications

- Temperature range (operation):
- 0..+60°C
- Industrial temperature range on request
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

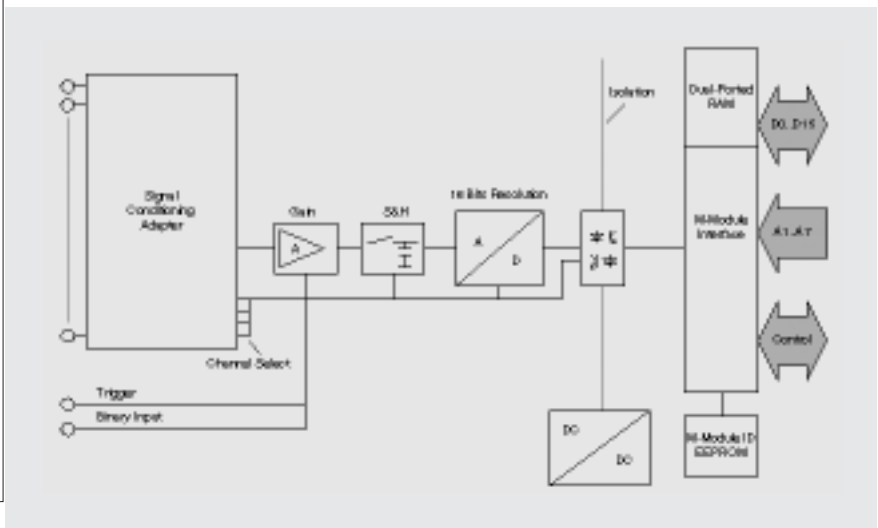
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

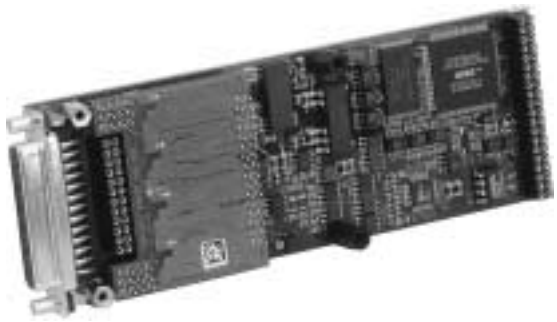
Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M35N – 8/16 Analog Inputs

- 8/16 current or voltage inputs
- 14 bits resolution
- 7.8µs acquisition/conversion time
- Precision better than 0.05%
- Unipolar/bipolar software-selectable
- Autoincrement of channel number
- External triggering
- Optical isolation (500V)



A/D Conversion

- 14 bits @ 7.8µs
- Precision: depends on M-Module settings; see user manual
- Noise: depends on M-Module settings; see user manual
- Programmable gain factor of 1, 2, 4 or 8 (factor 16 by hardware jumpering)
- Software-selectable unipolar or bipolar operation
- Sample and hold
- Autoincrement of channel number

Input Signal Conditioning: 16 inputs

- Voltage or Current Inputs
- 16 analog inputs, single-ended
- High input voltage tolerance
- Cross-talk less than 60db
- Low-pass filter 1kHz
- Voltage Measurement
- Voltage max.: ±15V
- Voltage full scale: ±10V
- Input resistance: 100 kOhm, ±10%
- Current Measurement
- Current max.: ±25mA
- Current full scale: ±20mA, UA = ±1.25V
- Load resistance: 62.5 Ohm, ±0.1%

Input Signal Conditioning: 8 inputs

- Voltage or Current Inputs
- 8 analog inputs, differential
- High common mode range ±200V
- Cross-talk less than 60db
- Low-pass filter 3kHz
- Voltage Measurement
- Voltage max.: ±200V (common mode)
- Voltage full scale: ±10V
- Input resistance: 400 kOhm typ.
- Current Measurement
- Current max.: ±25mA
- Voltage max. to IGND: ±200V
- Input resistance: 62.5 Ohm, ±0.1%

Miscellaneous

- Improved version of M34/M35
- External trigger (isolated, rising-edge sensitive)
- External binary input

Differences between M34, M35 and M35N

- Acquisition time
  - M34: 12 bits @ 8.5µs
  - M35: 14 bits @ 10µs
  - M35N: 14 bits @ 7.8µs
- Precision
  - M34/M35: ±1 LSB, ±0.2% typ.
  - M35N: better than 0.05%
- Noise
  - M34: ±1 LSB
  - M35: ±2 LSB
  - M35N: ±2 LSB

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, IDENT

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - 180V DC between the channels
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltages/power consumption:
  - +5V (4.85V..5.25V), 300mA
- MTBF: 99,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 84g (incl. adapter)

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -45..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

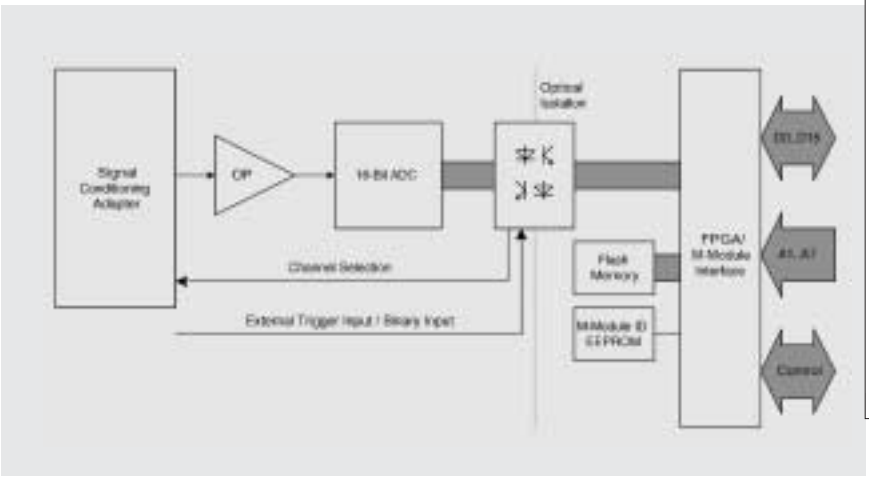
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

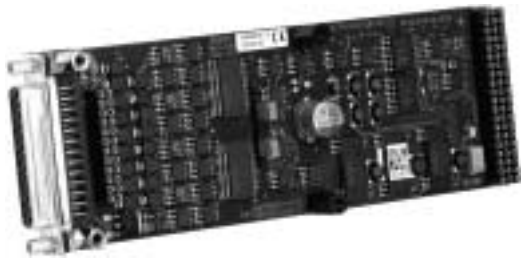
Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M33 – 8 Analog Outputs

- 8 current or voltage outputs
- 12 bits resolution
- 10 µs acquisition/conversion time
- Simultaneous channel update
- Optical isolation



D/A Conversion

- 8 channels
- 12 bits
- DAC conversion time 10µs
- ±5 LSB gain
- Simultaneous update of all channels possible

Voltage Output

- Output current: 5mA max.
- Output linearity: ±1 LSB
- Accuracy: ±0.2%, ±1 LSB differential
- Voltage ranges: 0..10V; -5V..+5V; -10V..+10V
- Voltage output stable up to 1µF capacitive load

Current Output

- Accuracy: ± 0.5%
- Current range: 0..20mA; 4..20mA
- Max. output voltage 10V
- Load resistance range: 0..500 Ohm

Slew Rates for Voltage Output

- 0V..+10V mode: switch from 0V to +10V; slew rate (SR) = 4V/µs
- -5V..+5V mode: switch from -5V to +5V; slew rate (SR) = 4V/µs
- -10V..+10V mode: switch from -10V to +10V; slew rate (SR) = 4V/µs

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, IDENT

Electrical Specifications

- Isolation voltage: 500V DC
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 480mA quiescent current, 600mA with 8 channels voltage output, 650mA with 4 channels current output
  - External supply voltage +24V: 15.6V..30V
- MTBF: 200,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 80g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

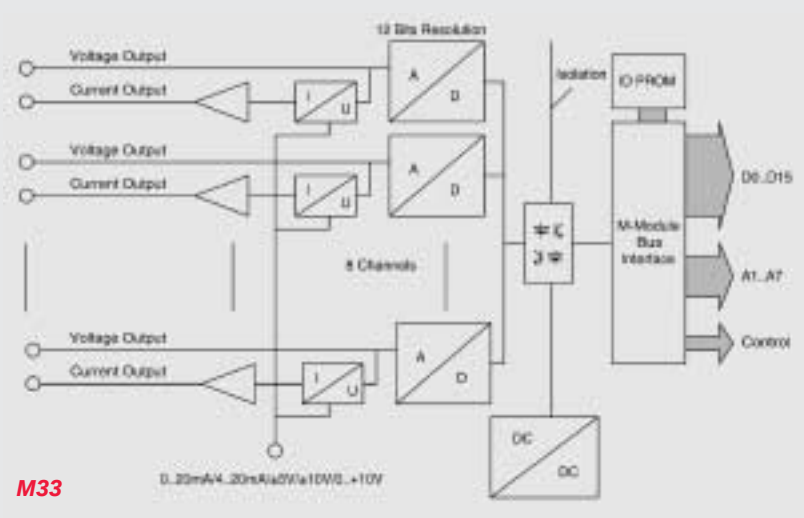
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

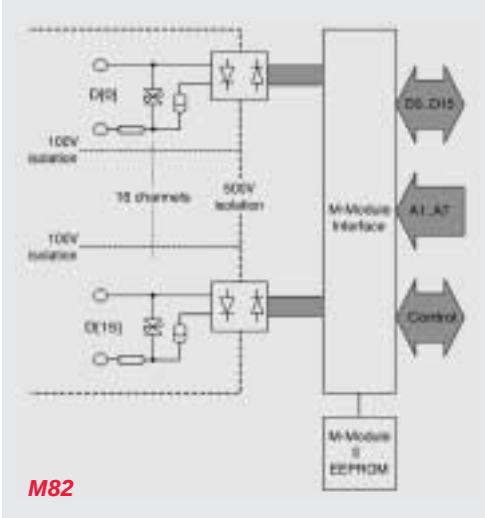
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



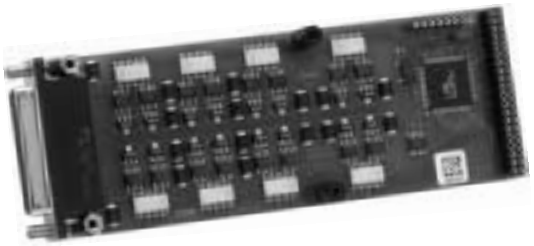
M33



M82

M82 – 16 Binary Inputs

- 16 fast 20kHz inputs
- 0..40V input voltage
- Constant current inputs
- Hysteresis function
- Interrupt generation
- Load on ground
- Optical isolation from the system (500VDC)
- Optical isolation between the channels (100VDC)



Binary Inputs
- Input load on ground
- FET constant current source inputs
- Input voltages and currents:
  - 0..40V max.
  - 5.5V, ±0.5V (switching voltage 0)
  - 9.5V, ±0.5V (switching voltage 1)
  - 15.2V, ±0.5V (switching voltage 2)
- Switching Times
  - Rise time: 4.2µs typ.
  - Fall time: 32µs typ.

Miscellaneous
- Hysteresis function
- Interrupt generation with maskable interrupt

Peripheral Connections
- Via front panel on a shielded 44-pin HD-Sub receptacle connector

M-Module Characteristics
- A08, D16, INTA, INTB, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - All channels are optically isolated (100V between the channels)
- Supply voltage/power consumption: +5V (4.85V..5.25V), tbd.
- MTBF: 185,000h @ 50°C

Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 72g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

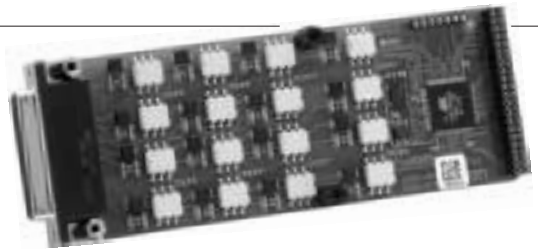
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M81 – 16 Binary Outputs

- 16 opto-relay outputs
- 0..36V output voltage per channel
- 500mA output current per channel
- Thermal and short-circuit protection
- Load on supply voltage
- Optical isolation from the system (500VDC)
- Optical isolation between the channels (100VDC)



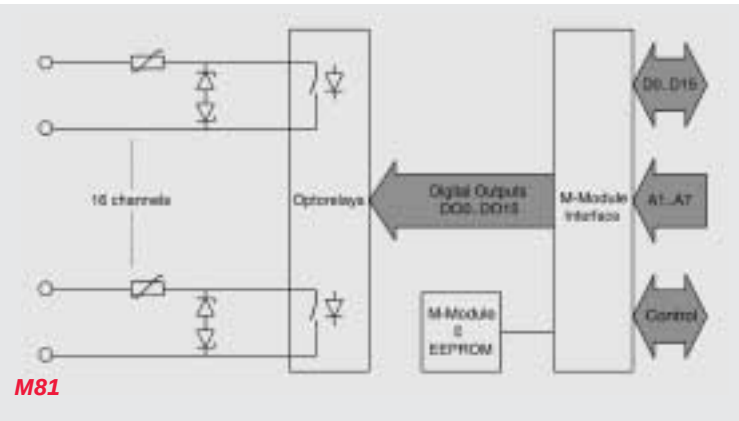
Binary Outputs
- Output Voltage: 0..36V
- Output Current
  - Max. 500mA per channel
  - No derating
- Switching Times
  - Turn-on time: 700µs typ.
  - Turn-off time: 40µs typ.

Miscellaneous
- Load on supply voltage
- Thermal and short circuit protection
- Outputs are designed for AC and DC operation

Peripheral Connection
- Via front panel on a shielded 44-pin HD-Sub receptacle connector

M-Module Characteristics
- A08, D16, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - All channels are optically isolated
- Supply voltage/power consumption: +5V (4.85V..5.25V), tbd.
- MTBF: 600,000h @ 50°C



M81

Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: tbd.

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

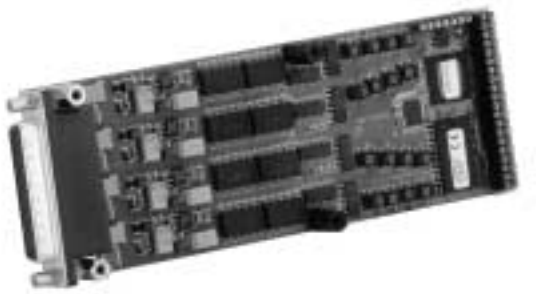
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 (radio disturbance), IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M66 – 32 Binary Inputs/Outputs

- 32 inputs 0..32V or
- 32 outputs 12..32V or
- Mixed I/O in groups of 4
- 1.9A output current per channel
- 16A switching power on one M66
- Load on ground
- Optical isolation



Binary I/Os

- 32 binary signals
- 4 optically isolated units
- 8 channels for each unit
- Individual use of each channel as input or output
- Individual edge-triggered interrupts
- Input/output load on ground
- High-side output switches
- High output current
- Max. 1.9A per channel
- Max. 4A per unit
- Over-current and over-temperature protection

Output Characteristics

- Output voltage range: 12V..32V
- Output current log. 0: max. 10mA
- Output current log. 1: max. 1.9A
- Switching time for output change: 200µs typ.
- Isolation voltage (optocoupler): 500V DC

Input Characteristics

- Input voltage min.: 0V
- Input voltage max. external supply voltage (12..32V)
- Voltage level log. 0: 0V..6V or open
- Voltage level log. 1: 12V..32V
- Input current log. 1: 2.03mA @ 24V
- Switching threshold: 9.2V @ 0.78mA typ.
- Switching time for input change: 33µs min., 44µs max.
- Excess voltage protection: + 47V

Peripheral Connections

- Via front panel on a shielded 44-pin HD-Sub receptacle connector

M-Module Characteristics

- A08, D08, INTA, IDENT

Electrical Specifications

- Isolation voltage:
- 500V DC between isolated and digital side
- 180V DC between the channels
- Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption:
- +5V (4.85V..5.25V), 200mA typ.
- +24V (external supply voltage 12..32V), 46mA typ.
- MTBF: 45,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 110g

Environmental Specifications

- Temperature range (operation):
- 0..+60°C or -40..+85°C
- Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% without condensation
- Relative humidity range (storage): max. 95% without condensation
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

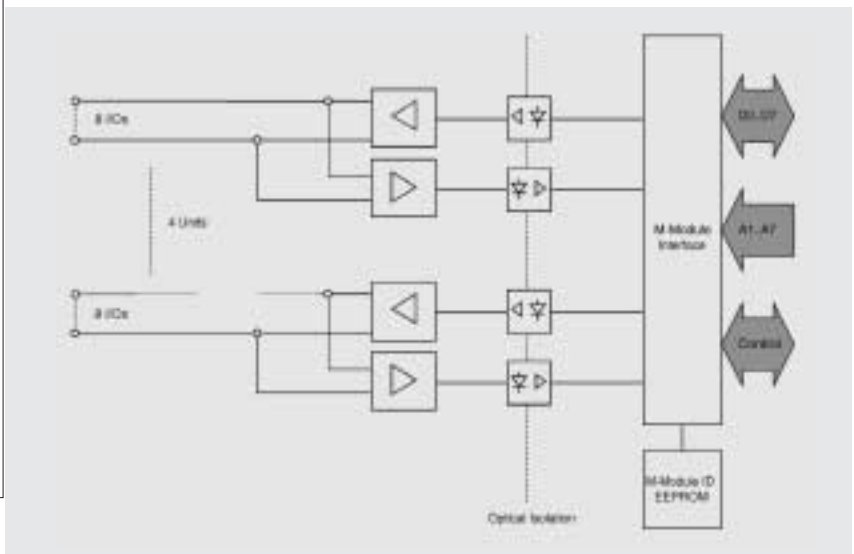
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

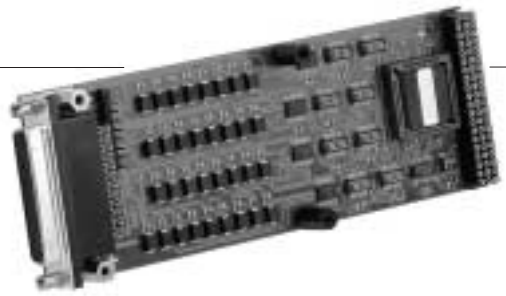
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



D302 – 6U CompactPCI Card with 128 Binary I/Os >> Page 23

A302 – 6U VMEbus Card with 128 Binary I/Os >> Page 42

M58 – 32-bit TTL I/O Interface



- 32 TTL inputs/outputs
- 48mA drivers
- Active terminators
- Same line interface as SCSI
- Fast 16-bit host access

Input/Output

- 32-bit TTL I/O
- 48mA driver performance per I/O bit
- 4 groups, alternatively input or output
- Active terminators can be activated for each group
- Output low current (VOL max. 0.55V): min. 64mA
- Output high current (VOH min. 2.0V): min. -15mA
- Input high current: max. 100µA
- Input low current: max. -100µA
- Input voltage: min. -0.5V, max. 6V

Miscellaneous

- Trigger line with interrupt capabilities

Peripheral Connections

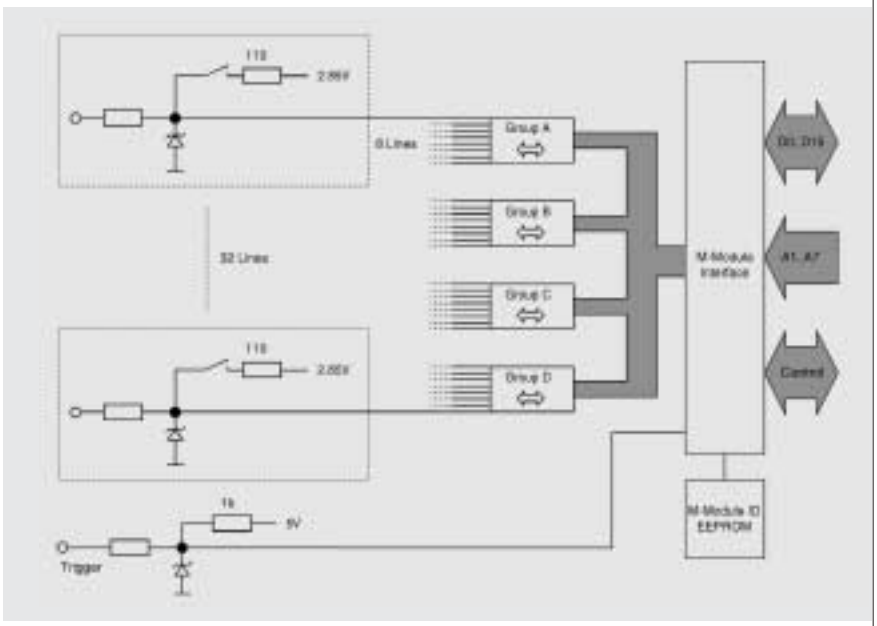
- Via front panel on a shielded 44-pin HD-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

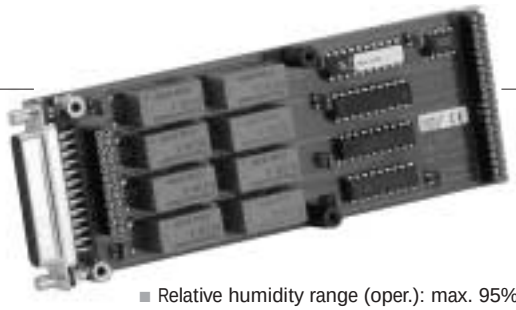
- A08, D16, INTA, IDENT

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M43 – 8 Relay Outputs



- 8 relay outputs
- 1A switching power per relay
- One throw-over contact per relay
- Output voltage range max. 100V
- No separate supply voltage

Relay Outputs

- 8 outputs as throw-over contacts
- NO (normally open), NC (normally closed) and common contacts

Ratings

- Maximum switching voltage: 48V
- Maximum switching current: 3A
- Maximum operation current: 1A
- Maximum switching power: 60W

Switching Time

- 2ms typ. for NO and NC

Miscellaneous

- Relay status can be read out – "read-modify-write" accesses possible
- Low heat development by use of CMOS components

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, IDENT

Electrical Specifications

- Supply voltage/power consumption: +5V (+10%/-0%), 700mA typ. (all relays active)
- MTBF: 1,000,000h @ 50°C

Mechanical Specifications

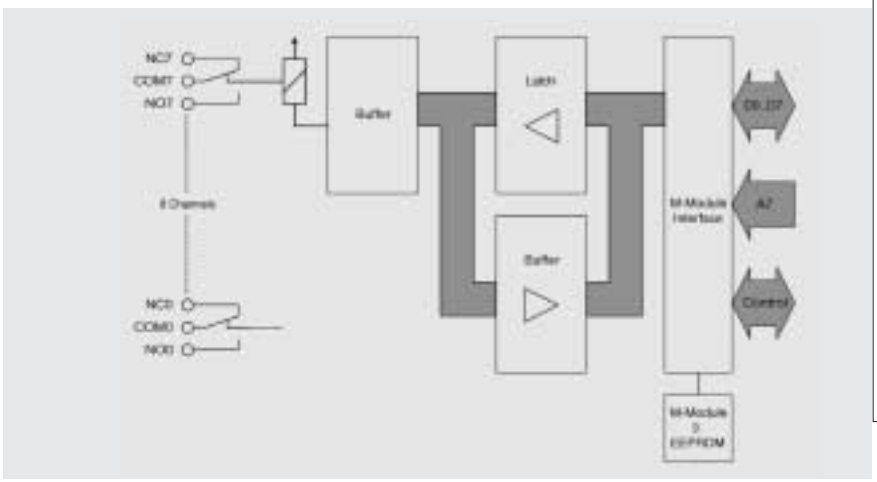
- Dimensions: conforming to M-Module Standard
- Weight: 98g

Environmental Specifications

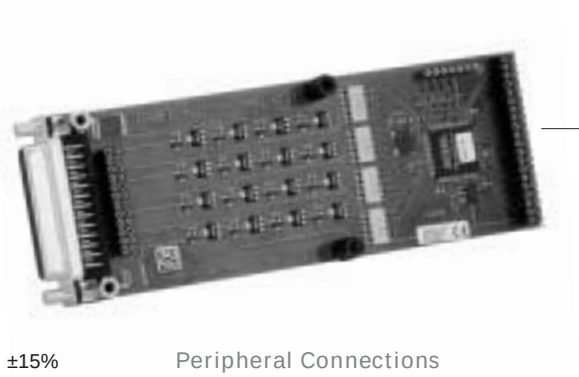
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M32 – 16 Binary Inputs

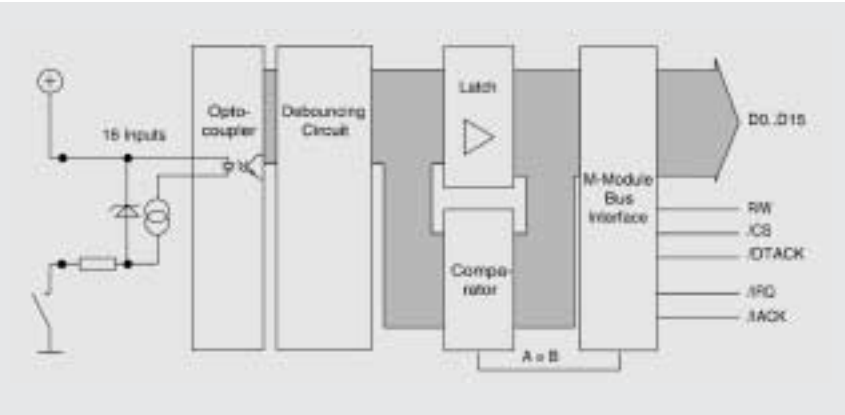


- 16 inputs 0..155V
- Constant current inputs
- Debouncing circuit
- Interrupt generation
- Load on supply voltage
- Optical isolation

Binary Inputs
- Input load on supply voltage
- FET constant current source inputs
- Input voltage ranges:
  - 5..40V; 2.5..3.5mA (high level)
  - 5..180V (M-Module version for extended temperature range)
  - 0..1V; 0..0.2mA (low level)
- Input clamping voltage: 39V, ±15%
- Switching time for input change: 3µs typ.

Debouncing Time
- 14ms (defined by PLD programming)

Miscellaneous
- Debouncing circuit
- Interrupt generation with maskable interrupt



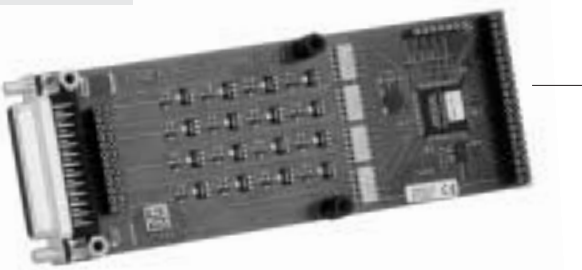
Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, INTA, INTB, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 50mA typ.
- MTBF: 300,000h @ 50°C

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M31 – 16 Binary Inputs



- 16 inputs 0..155V
- Constant current inputs
- Debouncing circuit
- Interrupt generation
- Load on ground
- Optical isolation

Binary Inputs
- Input load on ground
- FET constant current source inputs
- Input voltages and currents:
  - 5..40V; 2.5..3.5mA (high level)
  - 5..180V (M-Module version for extended temperature range)
  - 0..1V; 0..0.2mA (low level)
- Switching time for input change: 3µs typ.

Debouncing Time
- 14ms (defined by PLD programming)

Miscellaneous
- Debouncing circuit
- Interrupt generation with maskable interrupt

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

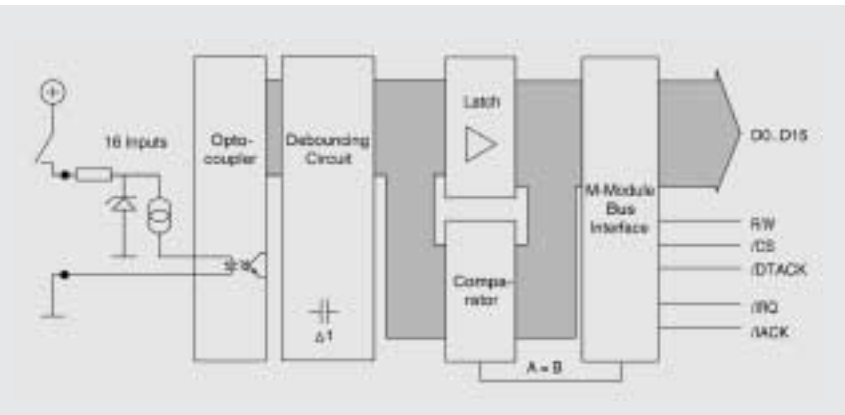
M-Module Characteristics
- A08, D16, INTA, INTB, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 50mA typ.
- MTBF: 300,000h @ 50°C

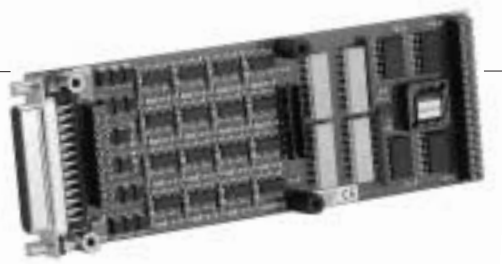
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 67.5g

Environmental Specifications
- Temperature range (operation):
  - o 0..+60°C or -40..+85°C
  - o Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M28 – 16 Binary Outputs



- 16 outputs 8..36V
- 500mA output current per channel
- Thermal and short-circuit protection
- Load on ground
- Optical isolation

Output Voltage
- 8..36V; 500mA (closed)
- 2V max.; 10µA max. (open)

Output Current
- Max. 500mA per channel
- No derating

Miscellaneous
- Load on ground
- Thermal and short circuit protection

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

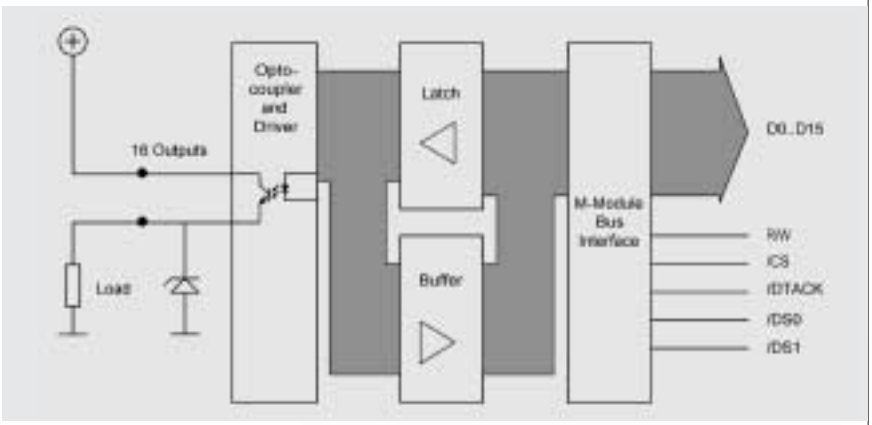
M-Module Characteristics
- A08, D16, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated nd digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V) 100mA typ.
- MTBF: 58,000h @ 50°C

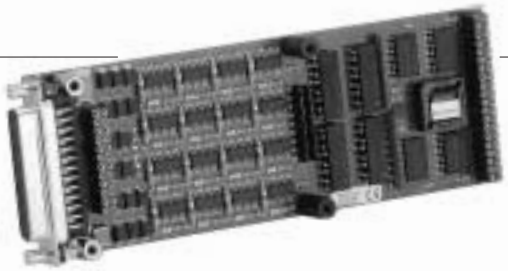
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 82g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (storage): max. 95%nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M27 – 16 Binary Outputs



- 16 outputs 8..36V
- 500mA output current per channel
- Thermal and short-circuit protection
- Load on supply voltage
- Optical isolation

Output Voltage
- 8..36V; 10µA max. (open)
- 2V max.; 500mA (closed)

Output Current
- Max. 500mA per channel
- No derating

Miscellaneous
- Load on supply voltage
- Thermal and short circuit protection

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 100mA typ.
- MTBF: 58,000h @ 50°C

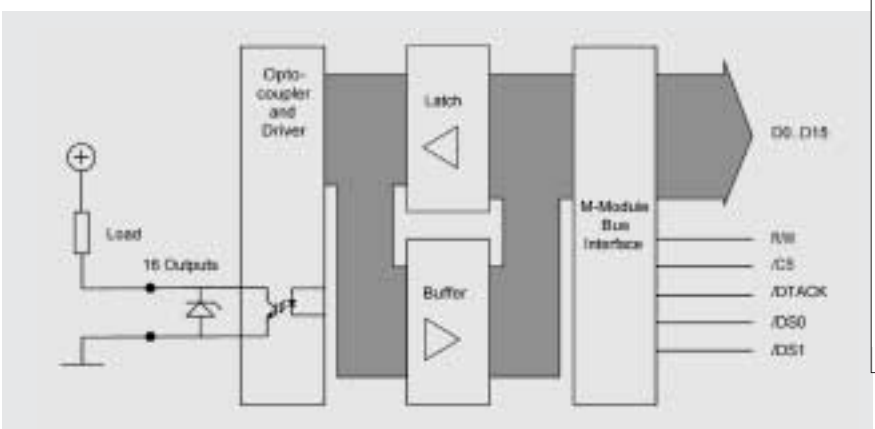
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 84g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M24 – 8/16 Binary Inputs

- 8/16 Schmitt trigger inputs 0..32V
- Debouncing circuit
- Individual interrupt generation
- Load on ground or supply voltage
- Screw terminal/LED version available
- Optical isolation

Binary Inputs

- 16 binary inputs with 25-pin D-Sub connector
- 8 binary inputs with screw terminal and LED display
- Input load on ground or supply voltage
- Schmitt trigger characteristics with 2V hysteresis
- Input current 5mA @ 24V typ.
- Input voltage range 12..32V

Input Control

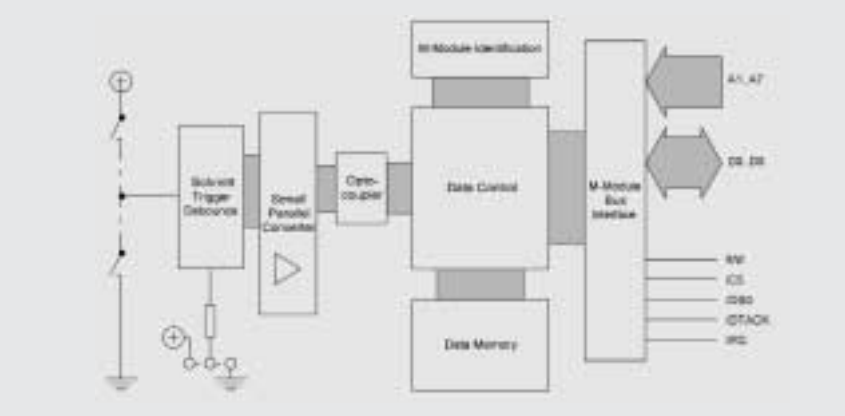
- BIOC (Binary Input/Output Controller)

Switching Voltage and Current

- U low = VBB / (2 - 0.5V)
- U high = VBB / (2 + 0.5V)
- I in = ±5mA (VBB = 24V)

Overload Protection

- Intelligent protection



Miscellaneous

- Debouncing circuit
- Interrupt generation for each channel on each signal edge

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub connector (16 inputs) or
- Via screw terminal and LED display (8 inputs)
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, INTA, IDENT

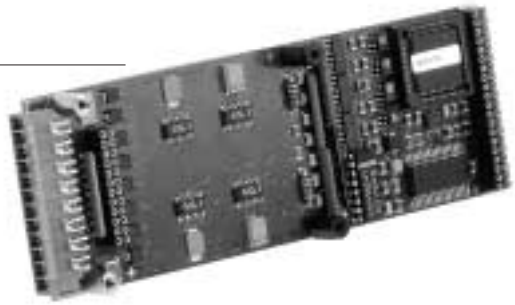
Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 120mA typ.
  - +24V (10V..32V), 50mA typ.
- MTBF: tbd.

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M22 – 8 Binary Inputs/Outputs



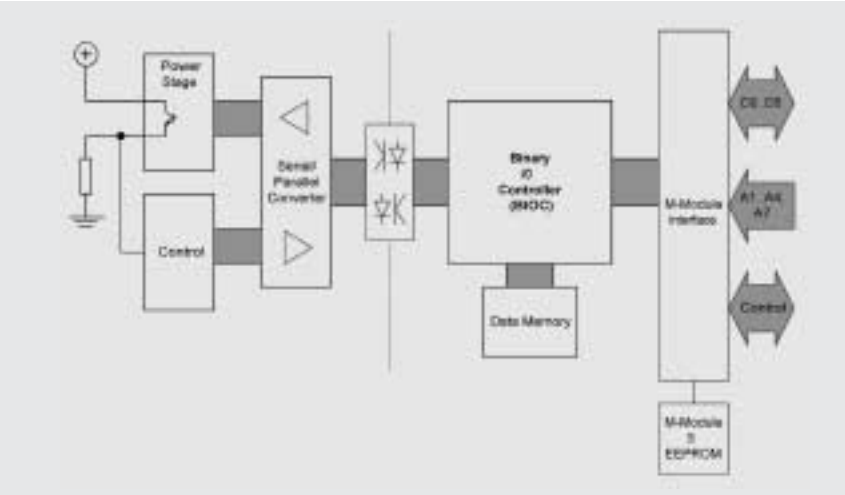
- 8 channels output 0..32V or
- 8 channels input 0..32V
- 2A load per channel
- Load on ground
- Overload and line-break detection
- Interrupt generation per channel
- Screw terminal/LED version available
- Optical isolation

Outputs

- Output voltage range 12V..32V
- Output current max. 2A per channel, no derating
- Switching time for output change: < 55µs

Inputs

- Switching voltage 5.5V typ.
- Input current 0.5mA (external switch to ground)
- Switching time for input change: < 80µs



Input/Output Control

- BIOC (Binary Input/Output Controller)

Miscellaneous

- Load on ground
- Overload protection using delay circuit
- Overheating and short-circuit protection
- Overvoltage protection with inductive loads
- Line-break detection
- Low heat production (0.2V typ. loss per switch at 2A current)
- Interrupt generation for each channel

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector or
- Via screw terminal and LED display
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, INTA, IDENT

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M11 – 16-bit TTL I/O Interface

- 18 TTL inputs/outputs
- 4 handshake lines
- Programmable timer
- 24 bits resolution

TTL I/O

- 18 TTL inputs/outputs
  68230 Parallel Interface Timer
- 68000 bus compatible
- Port modes include:
  - Bit I/O
  - Unidirectional 8-bit and 16-bit
  - Bidirectional 8-bit and 16-bit
- Programmable handshaking options
- 24-bit timer
- Five separate interrupt vectors
- Separate port and timer interrupt service requests

Input Voltages and Currents

- Input voltage "high" min. 2V, max. 4.75V
- Input voltage "low" min. -0.3V, max. 1.8V
- Input leakage current max. 10µA

Output Voltages and Currents

- Output current in "off-state" min. -0.1mA, max. -1mA
- Output voltage "high" min. 2.4V (load < -0.15mA)
- Output voltage "low" max. 0.5V (load < 2.4mA)

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, INTC, IDENT

Electrical Specifications

- Supply voltage/power consumption: +5V (4.85V..5.25V), 200mA typ.
- MTBF: 120,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 78g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (stor.): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

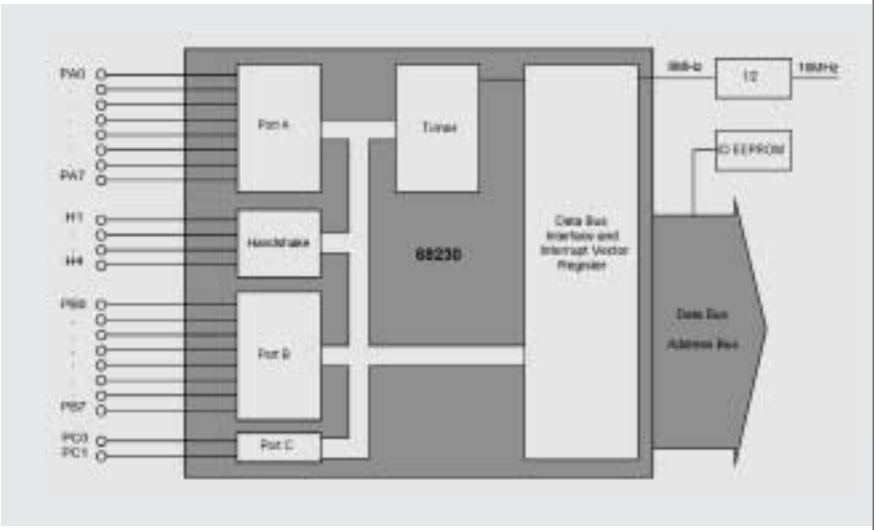
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radiodisturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



Overview – M-Modules for Instrumentation and Motion/Robotics

Instrumentation M-Modules always consist of a complete instrument on a single module, such as multi-meters, oscilloscopes, function and waveform generators, switches, data acquisition devices etc. Some of them are equipped with their own processors or DSPs for fast on-board data pre-processing. These virtual instruments – together with the appropriate carrier card – typically reside in a PC or in a more complex CompactPCI, PXI, VME or VXI main frame, with all front panel controls and displays simulated on the monitor.

M-Modules for robotics and motion include motor controllers, timer/counters, SSI or synchro/resolover functions.

M-Modules for Instrumentation

	Function	I/O Lines	Measuring Ranges	Resolution	Convers. Time	Trigger	Memory	Front Connector	Cons. typ.	Software
M97 *p. 92*	Universal Counter	2 inputs	0..100MHz, DC: 60V, AC: 42V	10ns @ ±1LSB	---	---	---	5-pin DBM 5W5S D-Sub	750mA (max.)	Windows, Linux, QNX, OS-9, VxWorks, RTX
M78 *p. 93*	4-Channel Digital Oscilloscope	4 voltage inputs	Variable	12 bits	Variable	TRIGA: sample TRIGB	16MB	4 "Lemosa" receptacles	Tbd.	Windows, Linux, QNX, OS-9, VxWorks, RTX
M76 *p. 94*	Digital Multimeter	1 input	DC: ±125mV..±60V; ±12.5mA.. ±2.5A; AC: 250mV RMS..42V RMS; 25mA RMS..2.5A RMS; Ohm: 0..25 M	22.5 bits @ 10Hz sampling	52µs	---	---	5-pin high-voltage D-Sub	700mA (max.)	Windows, Linux, QNX, OS-9, VxWorks, RTX
M70 *p. 95*	Universal Temperature Acquisition	16 voltage inputs	0.025..1V	16 bits	20ms typ.	---	80kB DSP	44-pin HD-Sub	500mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M68 *p. 96*	Quad Output Function & Waveform Generator	4 outputs	±10V	16 bits	7µs	TRIGA: sample TRIGB: gate	2x 80kB DSP	4 "Lemosa" receptacles	500mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M67 *p. 97*	1-Channel Digital Oscilloscope	1 voltage input	±1V DC	12 bits	25ns, 40MHz	TRIGA: trigger	4MB buffer	15-pin combined D-Sub	700mA (incl. adapter)	Windows, Linux, QNX, OS-9, VxWorks, RTX
M63 *p. 98*	32-/16-Bit Binary Data Acquisition/ Generation	32 inputs, 16 outputs, 24V signals	Out: 12..32V In: 0..32V	---	10µs	TRIGA: sample TRIGB: gate	2x 80kB DSP	44-pin HD-Sub	570mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M59 *p. 99*	Quad Input Analog Data Acquisition	4 differential, DC/AC voltage	±5V, ±10V	16 bits	10µs	TRIGA: sample TRIGB: gate	2x 80kB DSP	4 "Lemosa" receptacles	700mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M56 *p. 100*	16-Channel Analog Multiplexer	16 relay switches	1µA..50mA, max. 50V ±1.25V, ±2.5V,	---	---	---	---	50-pin HD-Sub	100mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M16 *p. 101*	Quad Input Analog Data Acquisition	4 differential, DC/AC voltage	±1.25V, ±2.5V, ±5V, ±10V, ±20V	12 bits	35µs	TRIGA: sample TRIGB: filter freq.	512-byte FIFO	25-pin D-Sub 25-pin D-Sub	550mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M15 *p. 102*	Frequency and PWM Generator	2 outputs	2MHz..0.0019Hz	125ns / 0.3mV	100ms typ.	---	---		550mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M8 *p. 103*	IEC Bus Controller	1 channel	---	---	---	---	---	25-pin D-Sub	290mA	Windows, Linux, QNX, OS-9, VxWorks, RTX

Digital Oscilloscope M-Module M78

M-Modules for Motion

	Function	I/O Lines	Resolution	Interface	Miscellaneous	Front Connector	Optical Isolation	Consumption typ.	Software
M72 *p. 104*	Motion Counter	4	32 bits	RS422 or TTL, 24V	Different counter modes	44-pin HD-Sub	Yes	550mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M54 *p. 105*	DC Motor Controller	1	---	RS422 or TTL, ±10V, 8 binary inputs, 2 binary outputs	LM628, additional binary I/O	25-pin D-Sub	Yes	1A	Windows, Linux, QNX, VxWorks, RTX, OS-9
M50 *p. 106*	Synchro/Resolver Converter	1	10..16 bits	Synchro/resolver interface	AD2S82A resolver-to-digital converter	25-pin D-Sub	Yes	550mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M47 *p. 107*	SSI Controller	4	32 bits	RS422	Absolute value data input	25-pin D-Sub	Yes	500mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M41 –	4-Channel Timer/Counter	4	24 bits	RS422 or TTL, 24V	Different counter modes	44-pin HD-Sub	Yes	700mA	OS-9

- For fast and convenient download of data sheets try our Product Quick Access
- Up-to-date Product Compare Charts under ***www.men.de/products/***

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

mikro elektronik gmbh · nürnberg

M97 – Universal Counter

- 1 channel with 2 input lines
- 100MHz counter technology
- 32 bits resolution (91/2 digits)
- 10ns @ ±1LSB
- Quartz oscillator better than 1ppM accuracy
- Variable conversion
- 6 measuring functions
- 0..100MHz, HV input: ±300V, LV input: ±10V
- Input voltages over 60V DC and 42V AC only with appropriate additional safety measures according to EN60950!
- 20mV sensitivity
- Programmable switching points and hysteresis
- Optical isolation

Basic Features
- 100-MHz counter technology
- 32 bits resolution (9 1/2 digits)
- 6 measuring functions
- Programmable switching points and hysteresis

Measurement Functions
- Frequency (line A)
- High time
- Low time
- Period
- Totalize (line A) during external gate (line B)
- Time difference (line A to B)

Input Characteristics (A to B input)
- 2 input lines
  - 2 high-voltage inputs for ±300V
  - 2 coax inputs for ±10V
- Input voltage range
  - ±10V peak-to-peak, input impedance 100 kOhm, frequency AC: 10Hz..100MHz, DC: 0..100MHz
  - ±300V peak-to-peak, input impedance 2 MOhm, frequency AC: 10Hz..100kHz, DC: 0..100kHz; fully usable only if requirements of EN60950 are fulfilled through additional safety measures (see user manual)
- Maximum input voltage if no further safety measures are taken:
  - 60V DC / 42V AC
- Sensitivity: programmable in steps of
  - 5.37mV @ ±10V
  - 164mV @ ±300V
- Minimum pulse duration: 10ns
- Input noise: < 100µV typ.
- Coupling: AC or DC (programmable)

Frequency A
- Resolution: measuring time 10ns @ ±1 LSB
- Measuring times: programmable in steps of 1ms

High time, Low time, Period
- Range: 42s
- Resolution: 10ns @ ±1LSB

Totalize
- Gate by line B
- Maximum pulse duration: 42s
- Resolution: 10ns @ ±1LSB
- Gate error ±10ns

Time Difference
- Maximum time difference: 42s
- Resolution: 10ns @ ±2LSB

Time Base
- Frequency: 1kHz, based on 100MHz system clock
- Time range: 1ms..32.767s
- Resolution: 1ms @ ±10ns

Peripheral Connections
- Via front panel on a 5-pin DBM 5W5S D-Sub connector with two high-voltage contacts and two coax contacts by FCT
- Via carrier board using 24-pin connector (rear I/O)

M-Module Characteristics
- A08, D16, INTA, IDENT

Electrical Specifications
- Isolation voltage (inputs): 500V DC
- Absolute maximum input voltages:
  - High-voltage contacts: 500V (only with additional safety measures according to EN60950)
  - Coax contacts: 20V
- Supply voltage/power consumption: +5V (4.85V..5.25V), 750mA
- MTBF: tbd. @ 50°C

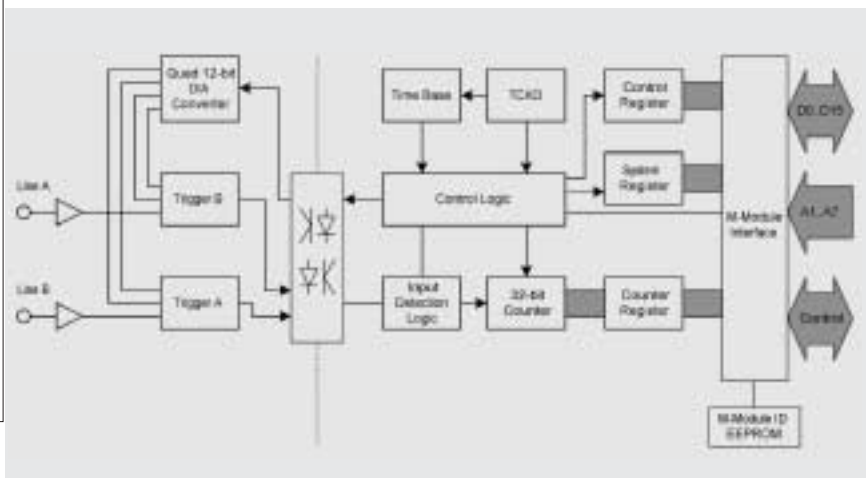
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 120g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- THE M97 DOES NOT COMPLY WITH THE REQUIREMENTS OF THE EN60950 STANDARD. THE MAXIMUM INPUT VOLTAGES ARE 60V DC AND 42V AC. HOWEVER, THE M97 WAS DESIGNED TO PROVIDE HIGH-VOLTAGE FUNCTIONALITY. IF YOU NEED TO APPLY VOLTAGES HIGHER THAN 60V DC AND 42V AC, TAKE APPROPRIATE MEASURES TO KEEP THE SAFETY REQUIREMENTS OF EN60950.
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M78 – 4-Channel Digital Oscilloscope

- 4 analog input channels 50MS/s for each channel simultaneously
- Full oscilloscope functionality
- 12 bits resolution
- 16MB local memory
- 64dB SNR at 3.58MHz
- Comprehensive trigger possibilities
- External trigger and clocking
- Flexible onboard signal conditioning

Analog Input
- 4 analog input channels
- Prepared for input conditioning adapter
- ±1V max. input range (without input conditioning adapter)

Analog Performance
- High SNR: >60dB @ max. sampling frequency (with external low jitter clock)
- Analog input bandwidth: >200MHz

General Purpose Inputs
- 2 digital GPIs per channel (GPI0..GPI7) (TTL/LVTTL)
- GPI0 is configurable as an external clock source (LVTTL recommended)
- GPI1 is configurable as an external trigger source (TTL/LVTTL)

Binary Outputs
- 4 outputs to control signal conditioning adapter or external hardware

Trigger
- Internal trigger, signal-sensitive with adjustable hysteresis function
- Free trigger positioning
- Rising or falling edge
- Programmable trigger delay
- External trigger
- Software trigger

Acquisition Clock
- External 10kHz..50MHz
- Internal low noise 48MHz
- Internally divided by FPGA (base: 48MHz)

System Clock
- FPGA Clock 100MHz
- SDRAM Clock 100MHz

Buffer
- 16MB memory
- Organized as a ring FIFO
- Width: 4 words
- 2 MSamples with four active channels
- 4 MSamples with two active channels
- 8 MSamples with one active channel
- Random access by the host

A/D Conversion
- 12 bits resolution, max. 50MS/s
- Track/hold
- Oversampling technology

Recording
- 12 ADC bits per channel
- Up to 8 external binary inputs

Peripheral Connections
- Via front panel on 4 shielded receptacle connectors
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, D32, INTA, IDENT, TRIGI

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), tbd.
- MTBF: tbd. @ 50°C

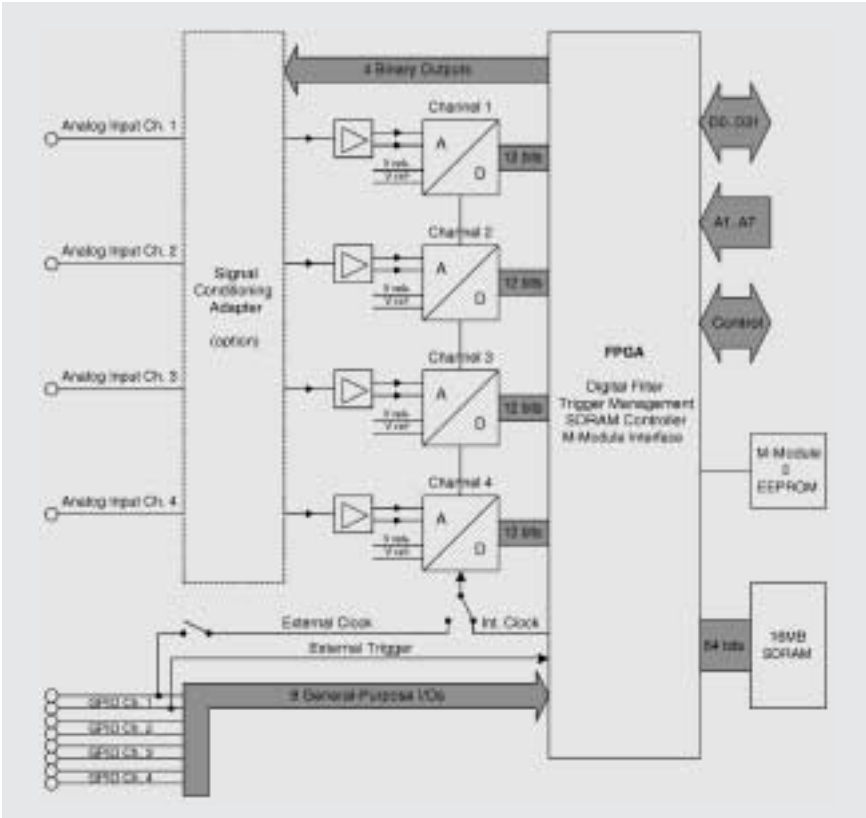
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 100g (incl. input adapter)

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% nc
- Relative humidity (storage): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

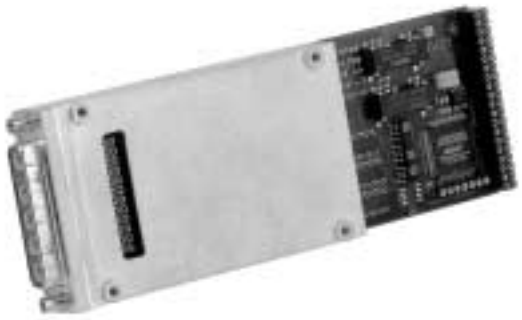
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to IEC1000-4-2 (ESD) and IEC1000-4-4 (burst) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M76 – Digital Multimeter



- Up to 22 bits resolution (6 1/2 digits)
- Max. resolution 50nV, 5nA, 50µOhm
- 52 µs acquisition/conversion time
- 0.01% DC accuracy
- 20 measuring ranges
- DC: ±125mV..±500V; ±12.5mA..±2.5A
- AC: 250mV RMS..250V RMS; 25mA RMS..2.5A RMS
- Input voltages over 60V DC and 42V AC only with appropriate additional safety measures according to EN60950!
- Resistance: 0..2.5 MOhm
- True RMS measurements
- Autocalibration
- Optical isolation

Resolution

- 22.5 bits @ 10Hz sampling
- 20 bits @ 50/60 Hz sampling
- 11 bits @ 1kHz sampling

DC Voltage Measurement

- Maximum input voltage if no further safety measures are taken:
  - 60V DC / 42V AC for all measuring ranges
- Maximum input voltage if requirements of EN60950 are fulfilled through additional safety measures (see user manual):
  - High-voltage input: 500V DC for 500V range
  - Normal input: 125V DC for 125mV, 1.25V, 12.5V and 125V range
- Measuring ranges:
  - -125mV..+125mV, -1.25V..+1.25V, -12.5V..+12.5V, -125V..+125V, -500V..+500V
- Measuring accuracy:
  - 24 hours, 23°C ±1°C: error < 0.025%
  - 90 days, 23°C ±5°C: error < 0.05%
  - Temp. coefficient 0°C..+55°C: error < 0.01%
- Input impedance:
  - 40 MOhm @ 500V input (HV)
  - 10 MOhm @ 125V and 12.5V range
  - > 1 GOhm @ 1.25V and 125mV range
- Input current: max. 10pA @ 23°C
- CMRR: 100dB @ 50/60Hz
- NMRR: 60dB @ 50/60Hz

AC Voltage Measurement

- Maximum input voltage if no further safety measures are taken: 60V DC / 42V AC for all measuring ranges
- Maximum input voltage if requirements of EN60950 are fulfilled through additional safety measures (see user manual):
  - High-voltage input: 250V AC
  - Normal input: 60V AC
- Measuring ranges:
  - 250mV RMS, sine 40Hz..100kHz, error < 5%
  - 2.5V RMS, sine 40Hz..100kHz, error < 1%
  - 25V RMS, sine 40Hz..100kHz, error < 1%
  - 250V RMS (high-voltage input), sine 40Hz..100Hz, error < 1%
- Crest factor: max. 4
- Measuring accuracy @ 50/60Hz:
  - 24 hours, 23°C ±1°C: error < 0.5%
  - 90 days, 23°C ±5°C: error < 1%
  - Range error < 1%
- Input impedance:
  - High-voltage input: 40 MOhm
  - Normal input: 1 MOhm
- Input current: max. 10pA @ 23°C
- CMRR: 100dB @ 50/60Hz

DC Current Measurement

- Maximum input voltage if no further safety measures are taken:
  - 60V DC for all measuring ranges
- Measuring ranges: -12.5mA..+12.5mA, -125mA..+125mA, -1.25A..+1.25A, -2.5A..+2.5A
- Measuring accuracy:
  - 24 hours, 23°C ±1°C: error < 0.025%
  - 90 days, 23°C ±5°C: error < 0.05%
  - Temp. coefficient 0°C..+55°C: error < 0.01%
- Shunt:
  - 1 Ohm @12.5mA, 125mA range
  - 0.1 Ohm @ 1.25A, 2.5A range

AC Current Measurement

- Maximum input voltage if no further safety measures are taken:
  - 42V AC for all measuring ranges
- Sine 40Hz..100Hz
- Measuring ranges:
  - 25mARMS, 250mARMS, 2.5ARMS
- Crest factor: max. 4
- Measuring accuracy:
  - 24 hours, 23°C ±1°C: error < 0.5%
  - 90 days, 23°C ±5°C: error < 1%
  - Range error < 1%
- Shunt:
  - 1 Ohm @ 25mA, 250mA range
  - 0.1 Ohm @ 2.5A range

Resistance Measurement

- Measuring ranges: 250 Ohm, 2.5 kOhm, 25 kOhm, 250 kOhm, 2.5 MOhm
- Measuring accuracy: 250 Ohm, 2.5 kOhm, 25 kOhm, 250 kOhm:
  - 24 hours, 23°C ±1°C: error < 0.1%
  - 90 days, 23°C ±5°C: error < 0.2%
  - Temp. coefficient 0°C..+55°C: error < 0.01%
- Measuring accuracy 2.5 MOhm:
  - 24 hours, 23°C ±1°C: error < 1%
  - 90 days, 23°C ±5°C: error < 2%
  - Temp. coefficient 0°C..+55°C: error < 0.1%
- Measuring modes: 2- and 4-wire
- Maximum measuring voltage: 2.5V

Peripheral Connections

- Via front panel on a 5-pin 5W5S D-Sub receptacle connector with high-voltage contacts (recommended)
- Via carrier-board connector (rear-panel I/O) (not recommended)

M-Module Characteristics

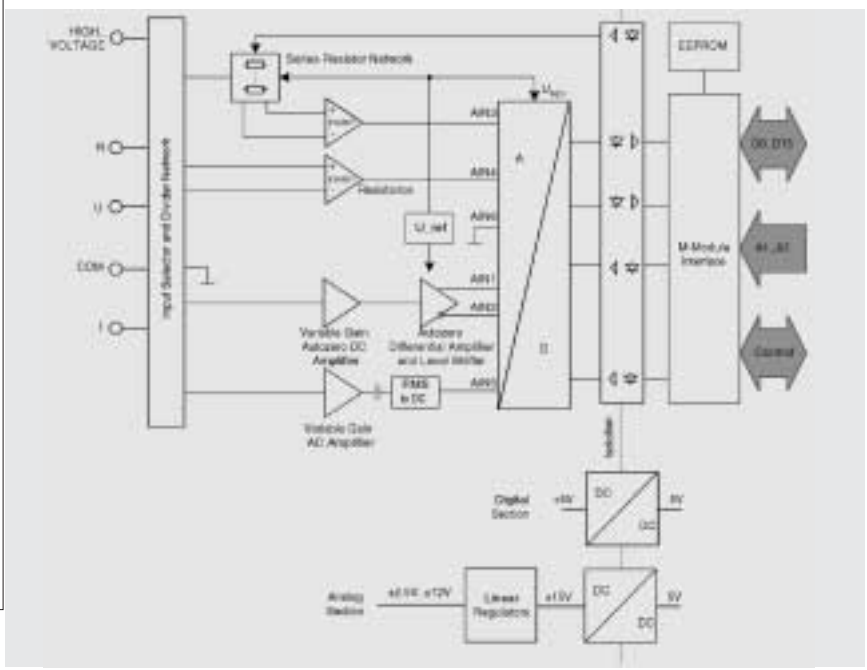
- A08, D16, INTA, IDENT

Safety

- THE M76 DOES NOT COMPLY WITH THE REQUIREMENTS OF THE EN60950 STANDARD. THE MAXIMUM INPUT VOLTAGES FOR ALL TYPES OF MEASUREMENTS ARE 60V DC AND 42V AC. HOWEVER, THE M76 WAS DESIGNED TO PROVIDE HIGH-VOLTAGE FUNCTIONALITY. IF YOU NEED TO APPLY VOLTAGES HIGHER THAN 60V DC AND 42V AC, TAKE APPROPRIATE MEASURES TO KEEP THE SAFETY REQUIREMENTS OF EN60950.
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

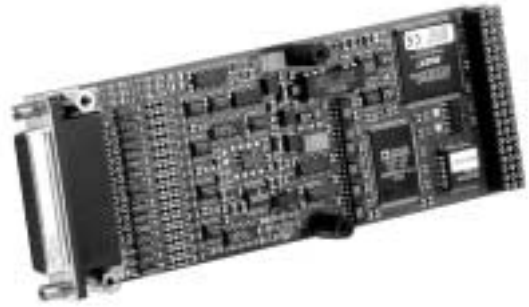
Software Support

- MEN Driver Interface System (MDIS for Windows, Linux,VxWorks, QNX, RTX, OS-9)



M70 – Universal Temperature Acquisition

- 4, 8 or 16 channels
- RTDs: PT100/PT1000
- 2-, 3- or 4-wire connection
- Thermocouples
- 16 bits resolution
- 20ms typ. conversion time
- 0.025..1V measuring range
- Input protection
- Line-break detection
- DSP 32MIPS
- 80KB memory
- Optical isolation



Digital Signal Processor
- 1 ADSP-2181 (Analog Devices)
- 16k x 16 bits data buffer
- 16k x 24 bits program memory
- 80KB total DSP memory
- 32 MHz clock frequency

A/D Conversion
- 20-bit Delta-Sigma A/D converter CS5526 (Crystal Semiconductor)
- Linearity error: 0.0015%FS
- Noise free resolution: 18 bits
- Bipolar/unipolar input ranges from 25mV to 5V
- Maximum sampling rate: 200Hz

Inputs
- 16 voltage inputs with 25mV..1V sensitivity
- Measuring current < 0.4mA (power in the sensor < 0.3mW)

Sensors
- Resistance temperature detectors (RTD): PT100 or PT1000
  - Supported temperature range: -200..+850°C
- Thermocouples of type K or type T, option: configuration for other types
  - Supported temperature range type K: -200..+1372°C
  - Supported temperature range type T: -200..+400°C
- Line break detection

Measuring Accuracy
- RTD 2-wire: ±0.7%, ±0.5°C
- RTD 3-wire: ±0.3%, ±0.5°C
- RTD 4-wire: ±0.1%, ±0.5°C
- Thermocouple: ±0.5%, ±0.5°C
- All values refer to the final measuring value of the thermo sensor at an ambient temperature of 0..+60°C. Error tolerance of sensor must be added.

Miscellaneous
- On-board digital temperature sensor
- EEPROM for calibration values
- M-Module identification EEPROM
- On-board DC/DC converter for supply of A/D converter

Peripheral Connections
- Via front panel on a shielded 44-pin HD-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, INTA, DMA, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 500mA typ.
- MTBF: tbd.

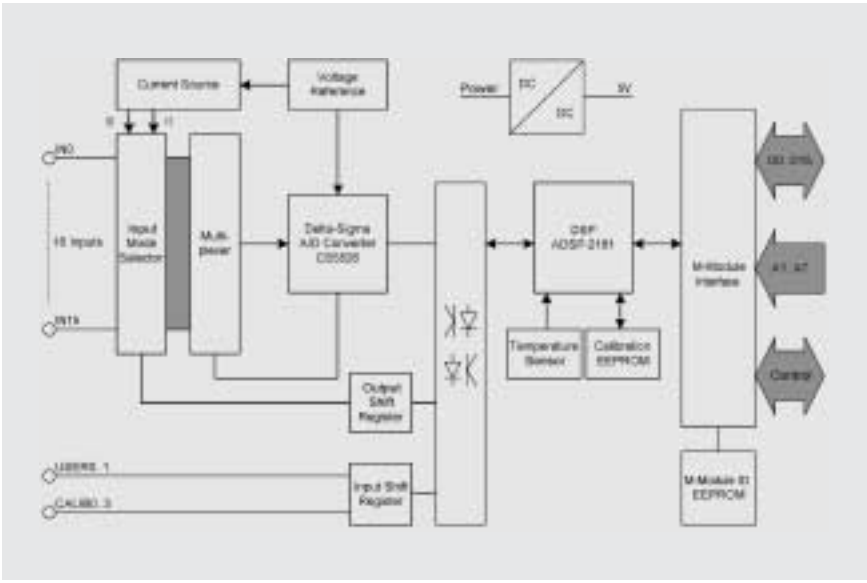
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 82g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

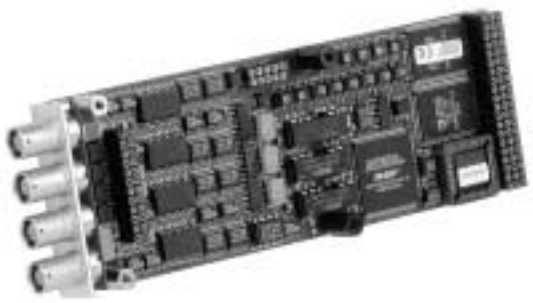
EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- Host toolbox (C library)
- Firmware



M68 – Quad Output Function & Waveform Generator

- 4 16-bit D/A converters
- Individual offset and output voltage range
- 100kHz update rate per channel
- 7µs acquisition/conversion time
- ±10V measuring range
- 2 DSPs, 32 MIPS each
- 160kB memory
- Optical isolation



D/A Conversion

- Resolution: 16 bits
- Conversion time: 7µs
- Absolute accuracy: ±0.5%
- Differential accuracy: ±0.05%, no missing codes

Outputs

- 4 analog outputs
- Current range: ±1mA
- Voltage range: ±10V
- Output accuracy depends on load resistance
- Output impedance: 0 Ohm

Miscellaneous

- Adjustable peak via 12-bit DAC
- Self-calibration (firmware)
- 6th-order output lowpass filter 15kHz
- 100kHz maximum output rate

Digital Signal Processing

- 2 processors ADSP 2181 (Analog Devices)
- Data reduction by interpolation
- 16k x 16 bits data buffer
- 16k x 24 bits program memory
- Programming via host interface
- External or internal trigger (software-programmable)

Peripheral Connections

- Via front panel on 4 shielded receptacle connectors
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, IDENT, TRIGI

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 500mA
- MTBF: 151,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 98g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

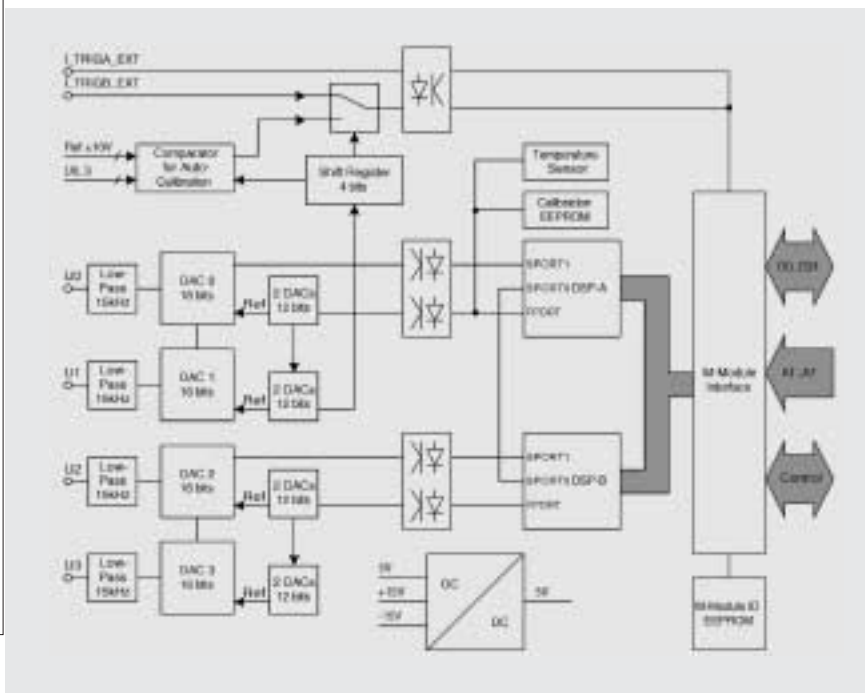
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- Standard firmware
- Host Toolbox (C library)



M67 – 1-Channel Digital Oscilloscope

- 1 analog voltage input 40MS/s
- 12 bits resolution
- 25ns acquisition/conversion time
- ±1V DC measuring range
- 4MB SDRAM
- Complex trigger logic
- Oversampling technology
- Flexible onboard signal conditioning
- Optical isolation

Analog Input
- ±1V max. input range, 75 Ohm
- Input conditioning via adapter PCB

Trigger
- Trigger at signal level, external signal or via software
- Rising or falling edge
- Trigger at start, middle, end

Clock
- Internal or external clock, max. 40MHz
- Divider 2n

Buffer
- 4MB
- Random access by the host possible

A/D Conversion
- 12 bits, 40MSPS
- 64dB SNR at 3.58MHz
- Track/hold
- Oversampling technology

Recording
- 12 ADC bits and 4 external binary inputs

Binary Inputs/Outputs
- 4 inputs
- 6 outputs

Peripheral Connections
- Via front panel on a shielded combined 15-pin D-Sub receptacle connector

M-Module Characteristics
- A08, D16, D32, INTA, DMA, IDENT, TRIGI

Electrical Specifications
- Isolation voltage: 500V DC
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 700mA typ. (with sample adapter)
  - +12V (±5%), +50mA
  - -12V (±5%), -40mA
- MTBF: tbd.

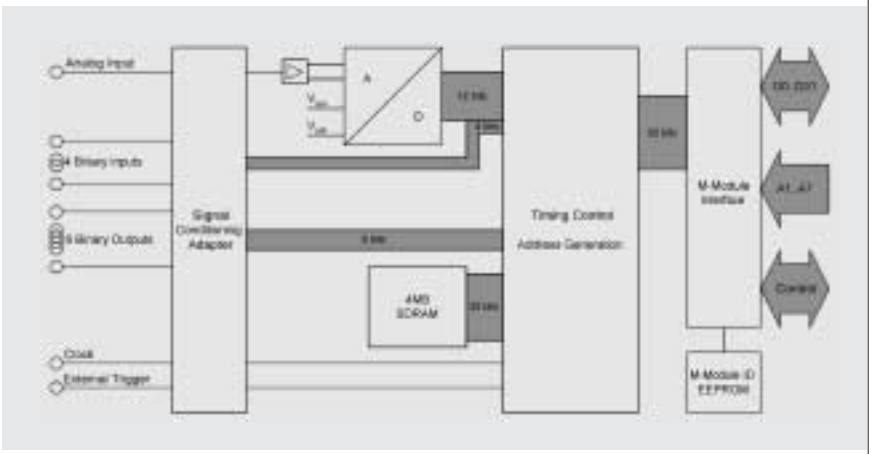
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 112g (incl. adapter)

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M63 – 32-/16-Bit Binary Data Acquisition/Generation

- 32 inputs 0..32V
- 16 output channels, 12..32V, 500mA each
- 24V signals
- Simultaneous sampling
- 100kHz sampling rate per channel
- 10µs acquisition/conversion time
- 2 DSPs, 32 MIPS each
- 160kB memory
- Optical isolation

I/O

- 16 outputs (high-side driver)
  - Output voltage range: 12V..32V
  - Output current log. 0: max. -200µA
  - Output current log. 1: max. 500mA
  - Switching time for output change: < 5µs
  - Isolation voltage (optocoupler): 500V DC
- 32 inputs
  - Input voltage range: 0V..32V
  - Switching threshold log. 1: 10V..32V
  - Switching threshold log. 0: 0V..5V or open
  - Input current log. 1: < 1mA
  - Switching time for input change: < 50µs
  - Excess voltage protection: ± 50V
  - 16 inputs offer the possibility to be set to TTL level (inputs at DSP-B)
- Division into two groups, each group being controlled by one DSP

Digital Signal Processing

- 2 processors ADSP 2181 (Analog Devices)
- 16k x 16 bits data memory
- 16k x 24 bits program memory
- Programming via host interface
- External or internal trigger (programmable)
- DMA host interface

Peripheral Connections

- Via front panel on a shielded 44-pin HD-Sub receptacle connector
- Via carrier board (rear I/O)
- Intermodule Port

M-Module Characteristics

- A08, D16, INTA, IDENT, IMP, TRIGI

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - 180V DC between the channels
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 570mA typ.
- MTBF: 189,500h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 96g
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

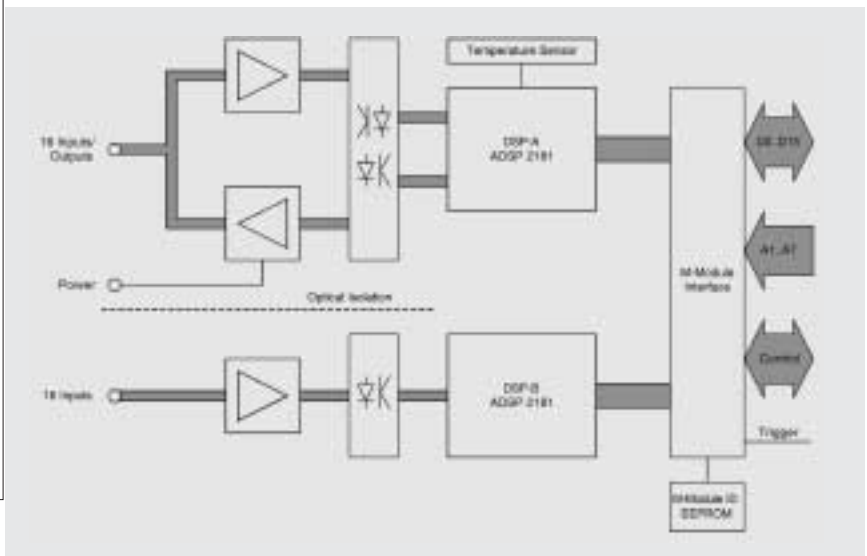
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- Standard firmware
- Host Toolbox (C library)



M59 – Quad Input Analog Data Acquisition

- 4 16-bit A/D converters
- 4 differential DC/AC inputs
- Simultaneous sampling
- 100kHz sampling rate per channel
- 10µs acquisition/conversion time
- ±1.25V, ±2.5V, ±5V, ±10V measuring ranges
- On-board signal conditioning
- 2 DSPs, 32 MIPS each
- 160kB memory
- Optical isolation

A/D Conversion

- Resolution: 16 bits
- Conversion time: max. 8µs
- Integral linearity error: ±3LSB
- Full-scale error: ±0.5%
- Simultaneous sampling of all four channels
- Variable sampling rate, 100kHz maximum for each channel

Inputs

- 4 differential analog inputs
- DC and AC coupling
  - 0.5Hz highpass with AC coupling
- Measuring ranges:
  - ±1.25V, ±2.5V, ±5V, ±10V
  - Individually configurable
- Optical isolation using optocouplers
- 4 voltage references for software calibration
- Small signal:
  - Max. 5Vss
  - Fg = 20kHz (-3dB)
- Large signal:
  - Max. 20Vss
  - Fg = 10kHz (-3dB)
  - Fg = 5kHz (0dB) (no attenuation)
- Accuracy after software adjustment: ±1mV
- Temperature drift (0..+60°C): ±0.1%
- Noise (0..+60°C):
  - X1: ±8LSB; delta = 1.7
  - X2: ±10LSB; delta = 2.0
  - X4: ±12LSB; delta = 2.2
  - X8: ±18LSB; delta = 3.4
  - Overall: ±0.03%

Anti-Aliasing

- 8th-order Bessel lowpass filter, cutoff frequency fg = 20kHz

Digital Signal Processing

- 2 processors ADSP 2181 (Analog Devices)
- Data reduction by interpolation
- 16k x 16 bits data buffer
- 16k x 24 bits program memory
- Programming via host interface
- External or internal trigger (programmable)

Peripheral Connections

- Via front panel on 4 shielded receptacle connectors
- Via carrier board (rear I/O)
- Intermodule Port

M-Module Characteristics

- A08, D16, INTA, IDENT, TRIGI

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 700mA typ.
- MTBF: 143,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 90g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

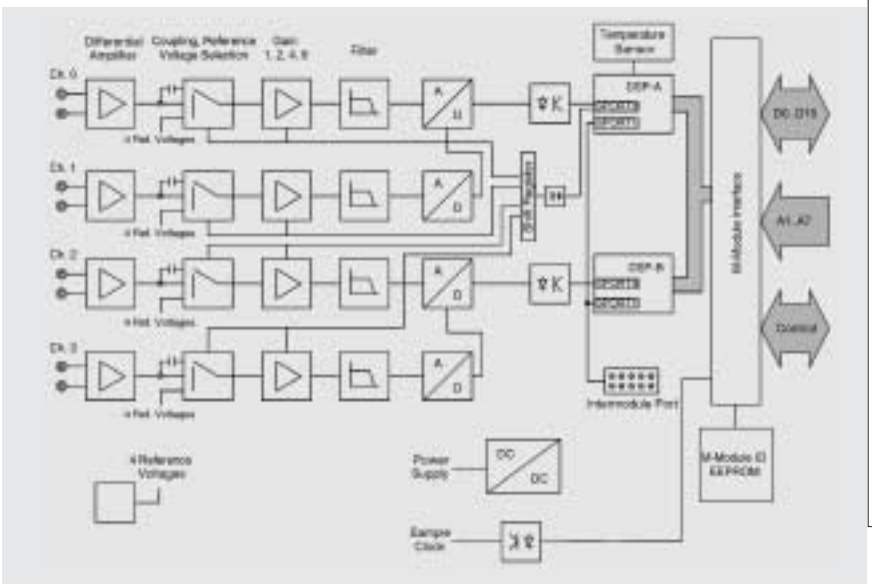
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)
- Standard firmware
- Host Toolbox (C library)



M56 – 16-Channel Analog Multiplexer

- 16 powerless-switching relays
- 1µA..50mA (max. 50V), ±1.25V, ±2.5V,
- One throw-over contact each
- No separate supply voltage
- Low heat development
- Optical isolation

Relay Outputs

- 16 outputs as throw-over contacts
- Switching voltages and currents
  - Switching voltage: max. 50V
  - Switching current: max. 100mA
  - Switching power: max. 5W
- Cross-talk
  - Cross-talk damping between individual inputs: > 60dB
  - Cross-talk damping between input and output: > 60dB
  - Maximum frequency without cross-talk: 100MHz
- Load current
  - Min. 1µA
  - Max. 50mA
- Initial contact resistance: max. 50 mOhm

Miscellaneous

- Relay position can be read back
- Low heat development by use of CMOS components and bistable/monostable relays

Peripheral Connections

- Via front panel on a shielded 50-pin D-Sub receptacle connector

M-Module Characteristics

- A08, D08, IDENT

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and digital ground is limited to 180V using a varistor; AC coupling between connector shield and digital ground through 47nF capacitor
  - 150V DC between relay switching contacts
  - 250V DC between the channels
- Supply voltage/power consumption: +5V (5V..5.5V), 150mA typ. with load, 125mA typ. w/o load
- MTBF: 47,000h @ 50°C
- Maximum switching quantity: 100,000,000 for any relay

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 75g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety

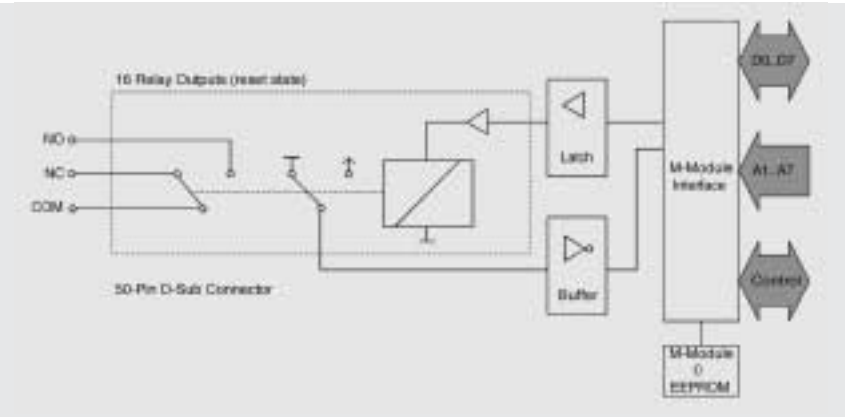
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

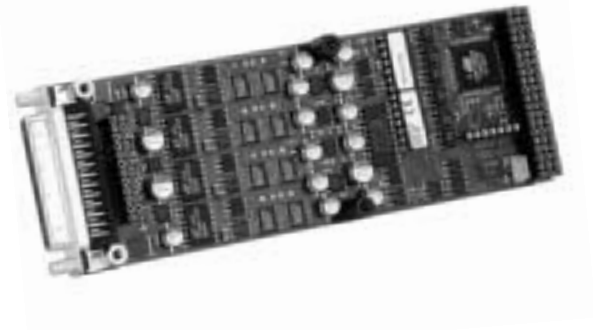
Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M16 – Quad Input Analog Data Acquisition

- 4 differential DC/AC voltage input channels
- 12 bits resolution
- 35µs acquisition
- ±1.25V, ±2.5V, ±5V, ±10V, ±20V measuring ranges
- Simultaneous sampling of all channels
- External measurement trigger
- FIFO for data buffering
- Optical isolation



A/D Conversion
- 12 bits/35µs
- Simultaneous sampling of four channels
- Precision:
  - Offset < 5mV
  - Gain < 0.2%
- Sampling frequency: max. 28kHz

Input Conditioning
- Precision: ±0.1%
- Input resistance > 100 kOhm

Voltage Input
- 4 analog inputs, differential
  - ±1.25V, ±2.5V, ±5V, ±10V, ±20V
  - Common mode rejection: 55dB

Programmable Low-Pass Filter
- Operation range: 5Hz..10,000Hz
- Filter transconductance: 48dB/octave

FIFO
- 512 bytes, 64 samples (4 words each)

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D16, INTA, DMA, IDENT, TRIGI

Electrical Specifications
- Isolation voltage
  - 500V DC between M-Module interface and analog input connector
  - Voltage between the connector shield and analog input connector is limited to 180V using a varistor; AC coupling between connector shield and analog input connector through 47nF capacitor
- Supply voltage/power consumption:
  - Digital part: +5V (4.85V..5.25V), 220mA max.
  - Analog part: ±15V (±5%), +200mA, -100mA typ.
- MTBF: 228,000h @ 50°C

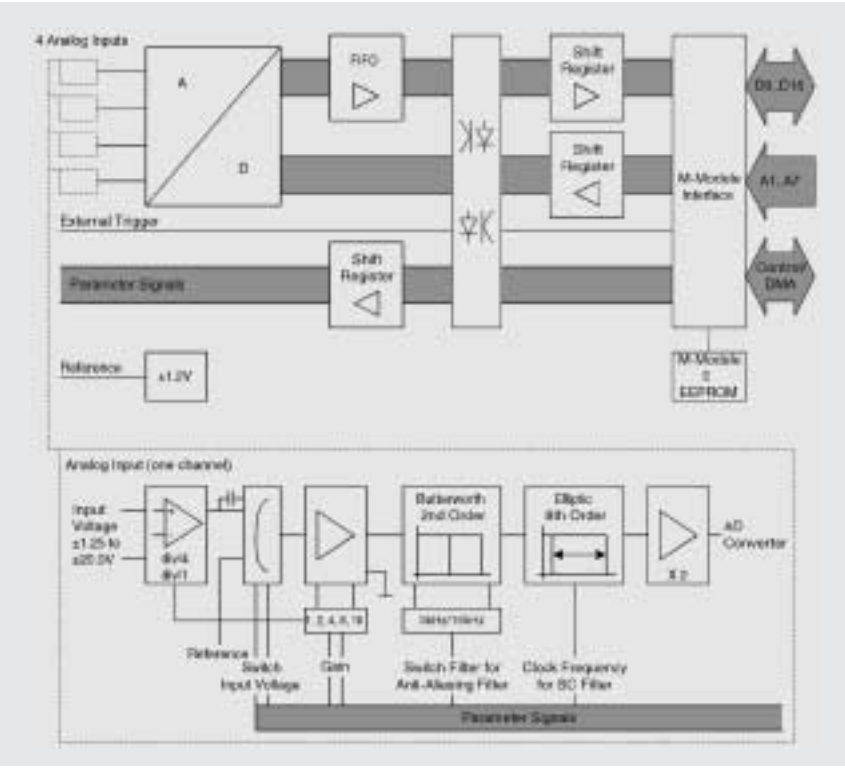
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 75g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% without condensation
- Relative humidity range (storage): max. 95% without condensation
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M15 – Frequency and PWM Generator

- 2 independent binary frequency outputs
- Programmable output voltages
- Programmable frequency/pulse width
- 100ms typ. acquisition time
- 125ns, 0.3mV resolution
- 2MHz..0.0019Hz measuring ranges
- Optical isolation from the system and between the channels

Frequency Output

- 2 TTL outputs
- Frequency range: 2MHz..0.0019Hz
- Pulse width modulation: max. 16 bits precision (depending on frequency)
- Output voltage:
  - "Low" and "high" levels can be programmed independently using D/A converters
  - Voltage range: -10V..+10V
- Output current: 5mA max.

A/D Converter

- 4 channels (2 per frequency channel)
- Resolution: 16 bits
- Absolute accuracy: 2%
- Differential accuracy: ±4LSB
- Conversion time: 100ms typ.

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, IDENT

Electrical Specifications

- Isolation voltage: 50V AC/DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 550mA typ.
- MTBF: tbd.

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 90g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

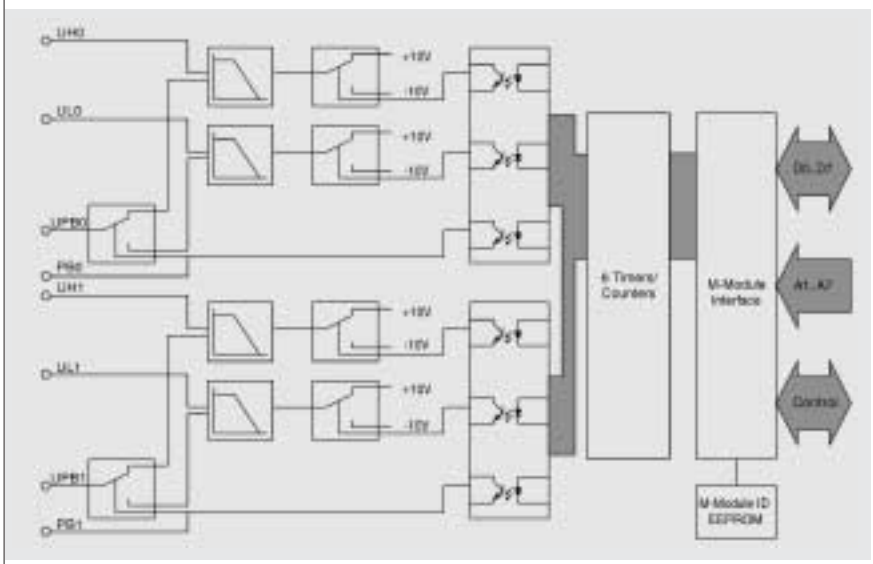
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M8 – IEC Bus Controller

- GPIB controller, talker and listener
- IEC625/IEEE488
- Automatic handshake (source and acceptor)

Controller
- NAT9914

GPIB Functions
- Support of controller, talker and listener
- Completely according to IEC625 (IEEE488)

Miscellaneous
- Automatic handshake (source and acceptor)
- Interrupt level

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub plug connector
- Via carrier board connector (rear I/O) M-Module Characteristics
- A08, D08, INTA

Electrical Specifications
- Supply voltage/power consumption: +5V (4.85V..5.25V), 290mA typ.
- MTBF: 120,000h @ 50°C

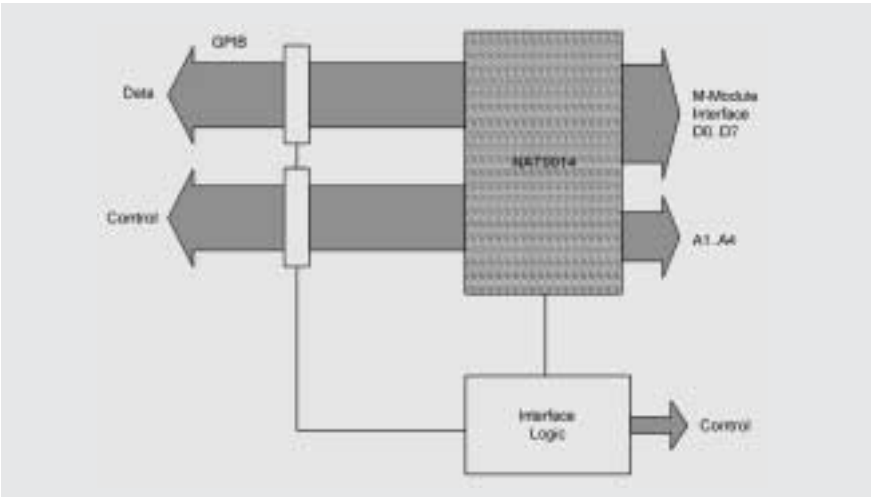
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 68g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M72 – Motion Counter

- 4 independent cascadable 32-bit counters
- 2 comparators per counter
- Quadrature incremental encoder interface
- Pulse width/frequency measurement
- Multimode event generation
- RS422 or TTL or 24V
- Optical isolation
- Customized counter modes via FPGA

Four Independent Counters

- 32-bit up/down counter
- Two 32-bit comparators
- One 32-bit preload register
- Clock frequency 40MHz

Counter Modes

- Single count
- 1x quadrature, 2x quadrature, 4x quadrature
- Frequency measurement
- Pulse width "high", pulse width "low"
- Period measurement, timer

Input

- 3 inputs for each counter
- RS422, TTL or 24V input
- Timing characteristics for the different modes:
  - Single count: t high > 200ns; t low > 200ns
  - Quadrature: time between two active edges (t edges > 400ns)
  - Frequency measurement: gating time 10ms, < 2.5MHz
  - Pulse width: t high or t low > 15µs
  - Period: t high or t low > 15µs, internal frequency 2.5MHz
  - Synchronization of input signals with on-board clock (40MHz)
- Input debouncing time: 100ns
- RS422 input:
  - In accordance with the standards: EIA Standard RS-422-A or CCITT V.11/X.27 or DIN 66 259, part 3
- TTL input:
  - Uin < 0.5V = "low"
  - Uin > 2.2V = "high"
  - Uin max. = 12V
  - Max. input current: ±5mA
- 24V input:
  - Uin < 1V = "low"
  - Uin > 10V = "high"
  - Uin max. = 30V
  - Max. input current: ±10mA
  - Max. frequency measurement: 500kHz

Output

- 4 TTL outputs (optically isolated)
- Output current:
  - High current: 10mA
  - Low current: 15mA

Peripheral Connections

- Via front panel on a shielded 44-pin HD-Sub receptacle connector

M-Module Characteristics

- A08, D16, INTA, IDENT

Electrical Specifications

- Isolation voltage: 500V DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 550mA
- MTBF: 70,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 100g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

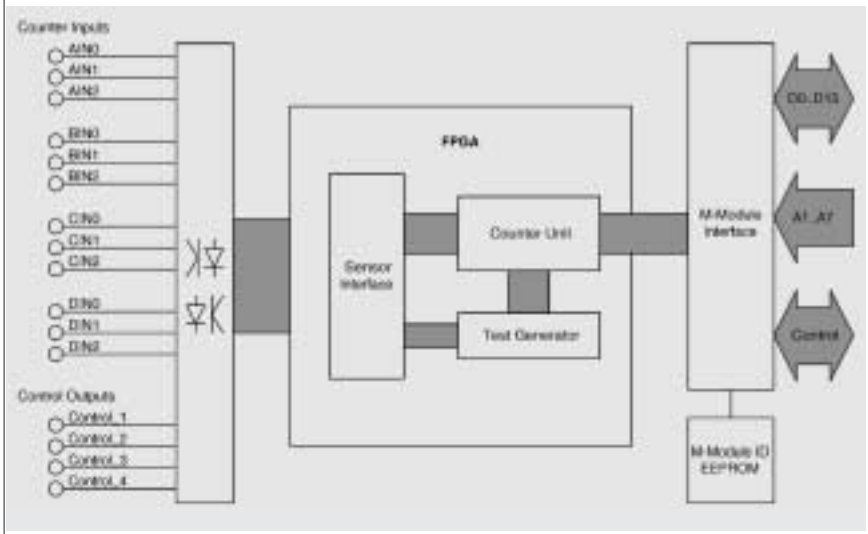
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M54 – DC Motor Controller

- 1 LM628 supported channel
- Suited for every motor type with ±10V control input
- Position and velocity operation
- Quadrature incremental encoder interface
- PID values programmable
- RS422 or TTL, ±10V, 1 relay output
- Additional binary I/O
- Optical isolation

LM628 Motor Controller
- LM628 precision motor controller
- 32-bit position, velocity and acceleration registers
- 256µs control-loop update time
- Programmable digital PID filter with 16-bit coefficients
- Operating modes: position and velocity
- Position feedback interface
  - Incremental encoder
  - Quadrature signals with optional index
  - RS422 or TLL signal level

Motor Interface
- Optically isolated from all other parts
- ±10V analog output
- Resolution: 12 bits, ±2 LSB

Quadrature Incremental Encoder Interface
- Index pulse
- RS422 or TTL signal level
- Line break monitor
- Plausibility check for glitch detection

Binary I/O
- I/O controller Zilog Z8536
- Optically isolated from all other parts
- Supply: 12..36V, 50mA typ.
- Binary inputs:
  - 8 inputs connected to port A of Z8536 (6 inputs digitally debounced)
  - Switching voltage: 1.2V nominal
  - Input frequency: I0/I1 max. 125Hz, I2..I7 max. 50Hz
  - Input resistance: 12 kOhm, ±10%
- Binary outputs:
  - 2 outputs connected to port B of the Z8536
  - Protected highside outputs (BTS412)
  - Switching current: Imax = -1A
  - Overload protection: Imax = -10A typ.

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D08, INTA, IDENT

Electrical Specifications
- Isolation voltage:
  - 500V DC from M-Module interface
  - 100V DC from binary I/O
  - 100V DC from motor interface
- Supply voltage/power consumption: +5V (4.85V..5.25V), 1A typ.
- MTBF: tbd.

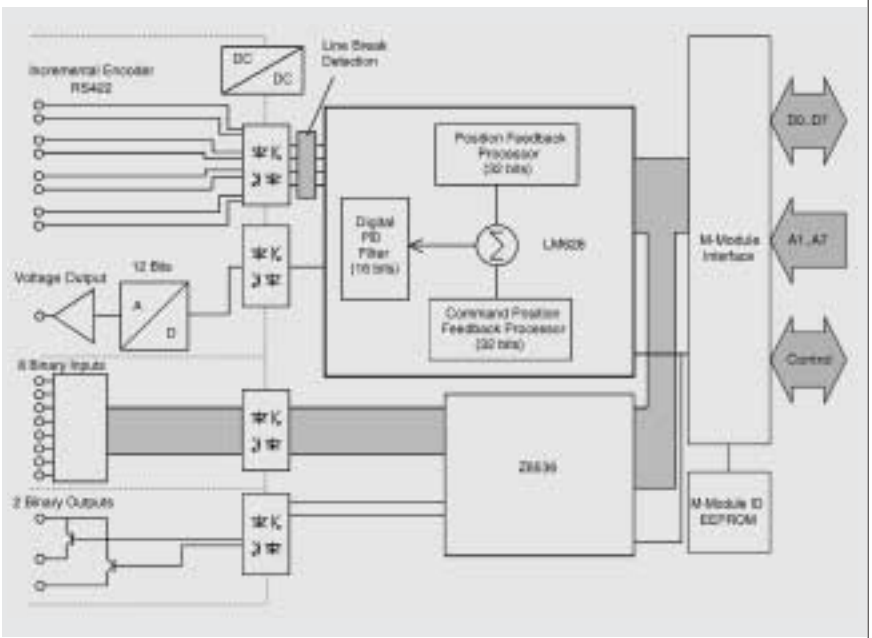
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 108g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M50 – Synchro/Resolver Converter

- Resolver/synchro-to-digital converter
- Up to 16 bits resolution
- On-board reference frequency generation
- On-board signal conditioning
- 2 arc minutes accuracy
- Analog velocity output
- Optical isolation

AD2S82A Resolver-to-Digital Converter

- Resolution: 10/12/14/16 bits
- Reference input voltage: variable, 2V RMS..90V RMS/115V RMS

- Reference output voltage: max. 21V RMS, 1.5W
- Reference frequency range: 50..20,000Hz
- Accuracy:
  - ±2/±4/±8/±22 arc min, ±1LSB (resolver input)
  - Accuracy: ±9/±13/±15/±29 arc min, ±1LSB (synchro input)
- Tracking rate: depends on frequency and resolution (max. 1040 rps)
- Small/large step settling time: depends on frequency and resolution

Miscellaneous

- Input signals: 10% max. harmonic distortion
- Velocity output: ±8V

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, IDENT

Electrical Specifications

- Isolation voltage: 500V DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 550mA typ.
- MTBF: 34,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 102g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

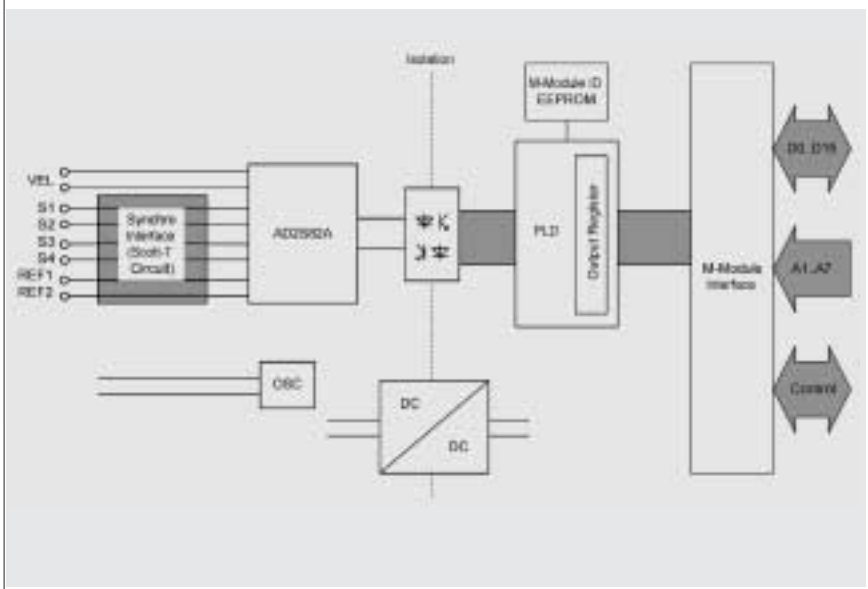
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

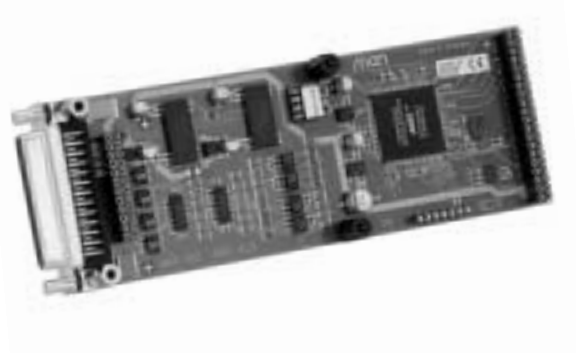
Software Support

- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M47 – SSI Controller

- 4-channel 32-bit Serial Synchronous Interface (SSI)
- RS422A interface
- Automatic communication
- RAM-like double buffer user interface
- Gray/binary decoding for each channel
- Line-break detection
- Absolute value data input
- Optical isolation for each channel
- External Baud rate possible



SSI Interface
- 4-channel Serial Synchronous Interface (SSI)
- Optical isolation
- RS422A interface

Data Transmission
- Baud rate
  - 62.5 kbaud, 125 kbaud, 250 kbaud, 500 kbaud
  - Programmable for each channel
- Word length
  - 1..32 bits
  - Programmable for each channel

Memory
- 16-byte RAM-like double buffer user interface

Interfaces
- 4 RS422 ports, optically isolated
- Supply voltage for external sensors etc.: 5V (±10%), 400mA max. all channels summed up

Miscellaneous
- Automatic communication
- Gray and binary decoding, programmable for each channel
- Sensor connection detection
- Interrupt triggering on a new data transmission

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D08, INTA, IDENT

Electrical Specifications
- Isolation voltage
  - 500V DC between M-Module interface and external sensor interface
  - Voltage between the connector shield and sensor interface is limited to 180V using a varistor; AC coupling between connector shield and sensor interface through 10nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 150mA without external sensors connected, max. 850mA with 4 sensors connected
- MTBF: 33,000h @ 50°C

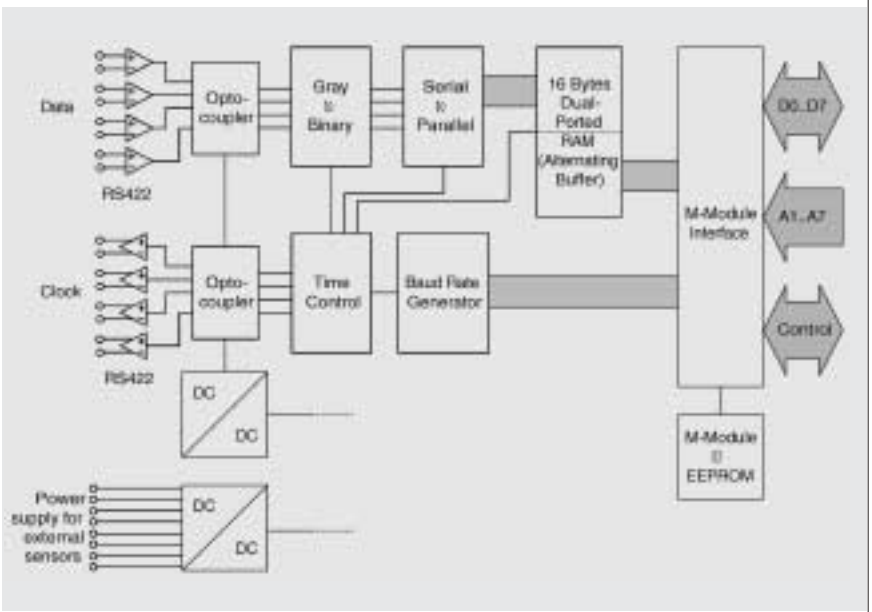
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 60g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



Overview – M-Modules for Fieldbus Interfacing and Legacy I/O

Out of the large variety of fieldbus standards dedicated to distributed I/O solutions, MEN offers the most popular ones: CANopen (Vector protocol stack and tools) and PROFIBUS DP (Softing protocol stack and tools) – with master and slave functionality. The corresponding driver software is based on MDIS, which makes the M-Modules ready for use under Windows, Linux and the most popular real-time operating systems. MEN's know-how with fieldbus solutions implemented on different platforms includes also DeviceNet, Bitbus, MVB and WTB.

M-Modules are also available with legacy I/O functions for many different communication standards for data exchange with any type of development or target computer system as well as for periphery such as modems, scanners, CD-ROMs, printers or disk drives.

M-Modules for Fieldbus Connection

	Function	I/O Lines	Interface	Memory	Miscellaneous	Front Connector	Optical Isol.	Firmware	Consumption typ.	Driver Software
M79 *p. 110*	Profibus DP Slave Interface	1	DIN19245: RS485	1MB shared memory	---	9-pin D-Sub	Yes	Softing protocol portation (ISO/OSI layer 2)	287mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M74 –	Double Fault-Tolerant CAN Interface	2	ISO high-speed	---	CAN 2.0B, Extended CAN	25-pin D-Sub	Yes	CAN layer 2	250mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M65 *p. 110*	Intelligent Dual CAN Interface	2	ISO high-speed	2x 1MB sync. DRAM, 2x 512KB Flash	Full CAN, Extended CAN	25-pin D-Sub	Yes	CAN layer 2, CANopen (Vector)	470mA (max.) (2 channels) 280mA (1 chan.)	Windows, Linux, QNX, VxWorks, RTX, OS-9
M57 *p. 111*	Profibus DP Master Interface	1	DIN19245: RS485, RS232 (debug)	1MB DRAM	---	9-pin D-Sub	Yes	ISO/OSI protocol layer 2/DP (Softing), PROFIBUS DP Configurator tool	800mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M51 *p. 111*	Quadruple CAN Interface	4	ISO high-speed	---	CAN 2.0B, Extended CAN	25-pin D-Sub	Yes	CAN layer 2	900mA	Windows, Linux, QNX, VxWorks, RTX, OS-9
M40 –	Profibus FMS Multimaster Interface	1	DIN19245: RS485, RS232 (debug)	512KB DRAM 0.5MB EPROM	---	9-pin D-Sub	Yes	ISO/OSI protocol layer 7 (Softing)	700mA	OS-9
M39 –	InterBus-S Slave Interface	1	RS485, RS232 (debug)	2KB dual-ported RAM	---	9-pin D-Sub	Yes	---	210mA	OS-9

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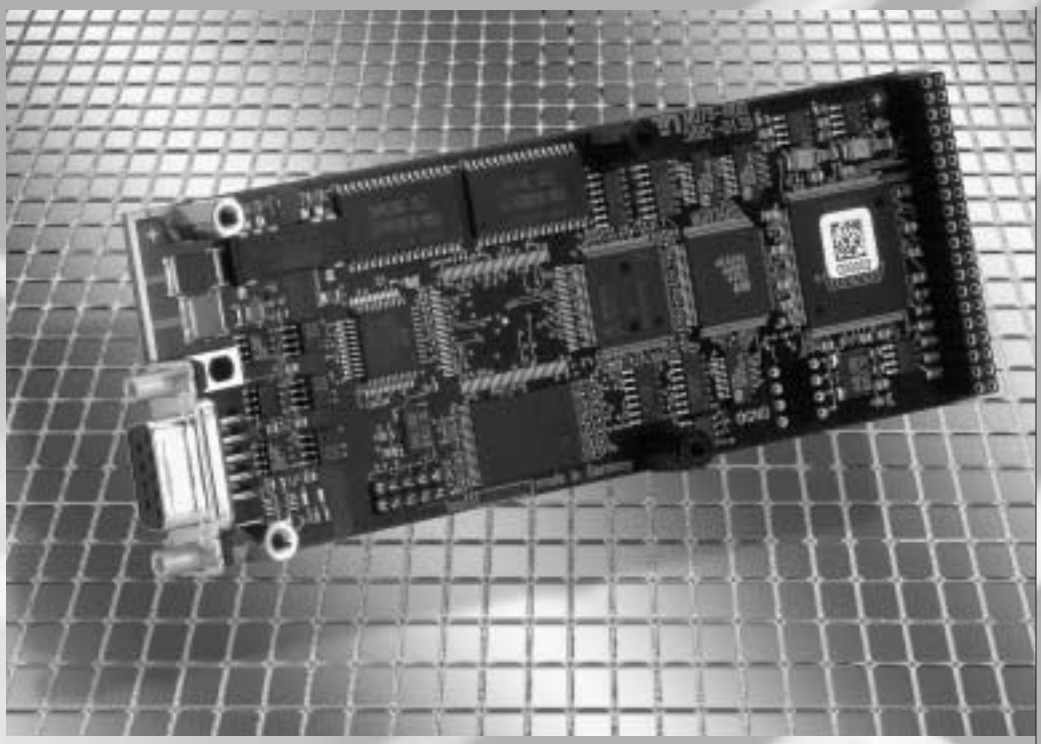


Profibus Slave Interface M-Module M79

M-Modules for Communication

	Function	I/O Lines	Intellig.	Memory	Miscellaneous	Front Connector	Optical Isolation	Consumption typ.	Driver Software
M77 *p. 112*	Quad RS232/423 to RS422/485 UART	4	14950	256 bytes FIFO for all transmitters/ receivers	Physical interface selectable by software	25-pin D-Sub	Yes	200mA	Windows, VxWorks
M75 *p. 113*	HDLC/SDLC Controller	2	85C30-compatible via FPGA	Quadruple asynchronous FIFO memory	2 RS422 full-duplex or 2 RS485 half-duplex; synchronous/ asynchronous	2x 15-pin micro D-Sub	Yes	600mA	Windows, Linux, QNX, OS-9, VxWorks, RTX
M73 –	10Base-T Ethernet Controller	1	---	64KB SRAM, 48 bytes FIFO	IEEE802.3: 10Base-T	RJ45	Yes	250mA	OS-9
M69 *p. 114*	Quadruple RS232 Interface	4	CD1400	12 bytes FIFO for all transmitters/ receivers	---	25-pin D-Sub	Yes	700mA	Windows, VxWorks, OS-9
M45 *p. 114*	Octal RS232 Interface	8	2x CD1400	12 bytes FIFO for all transmitters/ receivers	---	44-pin HD-Sub	No	+5V: 100mA +12V: 80mA -12V: 70mA	Windows, VxWorks, OS-9
M17 *p. 115*	Triple Communication Controller	3	MC68302/ 16MHz	256KB DRAM, 0.5MB EPROM, 4KB FIFO	DMA, RS232, RS422, RS485 via adapter, 1x X.21bis via adapter	25-pin D-Sub	Prepared for 500V DC isolation; depends on adapter type	250mA (w/o adapters)	Windows, OS-9
M6 –	RS232 or RS422/485 or TTY Interface	1	---	---	---	25-pin D-Sub	Yes	700mA	OS-9

Designed for: -40 to +85°C operation temperature, shock, drop, bump, vibration, humidity, chemical resistance

M79 – Profibus DP Slave Interface

- DIN19245
- Isolated RS485
- Local 16-bit CPU
- 12Mbits/s data transfer rate
- Complete Softing Profibus software on board
- Compatible with Softing tools

C165 CPU
- 16-bit data bus, 20-bit address bus
- Complete Profibus DP software on one M-Module
- Local interrupt controller
- Hardware watchdog

Slave: SPC 3 Profibus Controller
- Up to 12Mbaud data rate
- 8-bit interface (local)
- Complete DP slave protocol

Master: ASPC 2 Profibus Controller
- Optional, for M79 as Profibus Master
- Up to 12Mbaud data rate
- 16-bit DMA interface (local)
- Complete bus access protocol
- Up to 127 active or passive stations

Miscellaneous
- 1MB shared memory for communication and program
- Isolated RS485 Profibus interface

Peripheral Connections
- Via front panel on a shielded 9-pin D-Sub receptacle connector

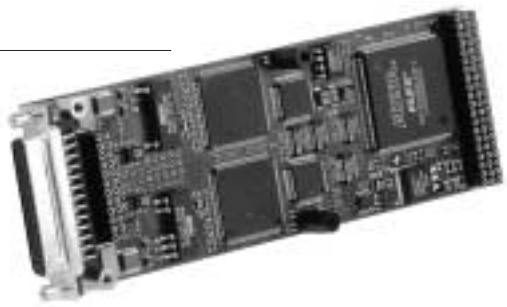
M-Module Characteristics
- A08, D16, INTA, IDENT

Electrical Specifications
- Electrical isolation: 500V DC
  - 500V DC between isolated and digital side
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 287mA
- MTBF: 430,000h @ 50°C

Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 53g

Software Support
- Softing protocol portation (ISO/OSI protocol layer 2/DP)
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M65 – Intelligent Dual CAN Interface



- Full CAN/Extended CAN
- Two independent channels
- Two local 32-bit CPUs
- ISO high-speed coupling
- 1Mbit/s data transfer rate
- Optical isolation
- CANopen master and slave software support (Vector Informatik)
- Intelligent CAN Layer 2 support

CAN Controllers
- I82527
- Standard and extended frames
- Up to 15 message objects
- Up to 1Mbit/s
- ISO 11898 high speed up to 1Mbit/s, both channels optically isolated using DC/DC converters

I/O Processors
- MC68331, 32-bit CPU32, 24MHz

Memory
- 1MB shared SRAM for communication and program per channel

Physical Interface
- ISO high speed coupling (optically isolated)

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

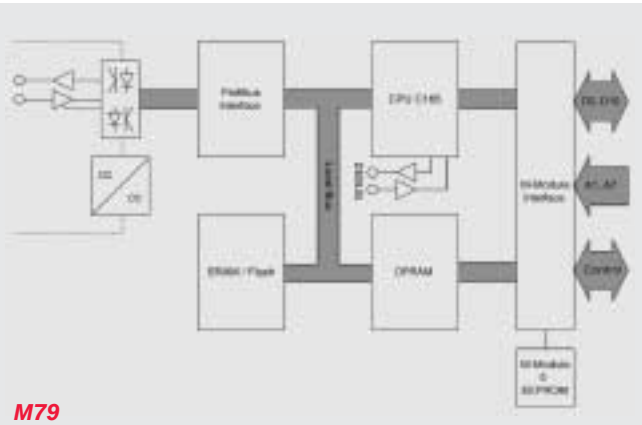
M-Module Characteristics
- A08, D16, INTA, IDENT

Electrical Specifications
- Isolation voltage: 500V DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 470mA max. (2 channels), 280mA (1 channel)
- MTBF: 40,000h @ 50°C

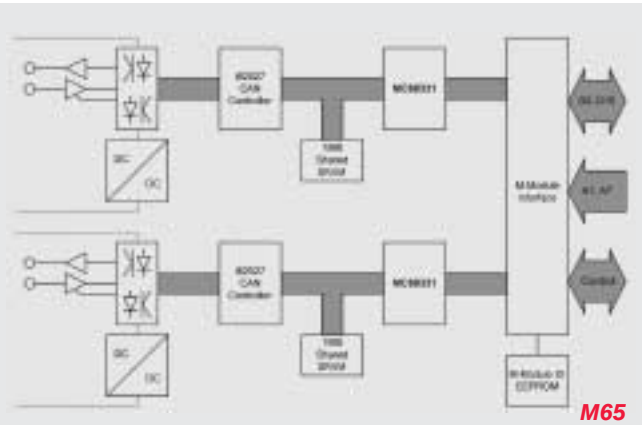
Mechanical Specifications
- Dimens.: conforming to M-Module Standard
- Weight: 84g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (stor.): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support
- CANopen firmware (Vector Informatik)
- ICANL2 firmware and toolbox (MEN)
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

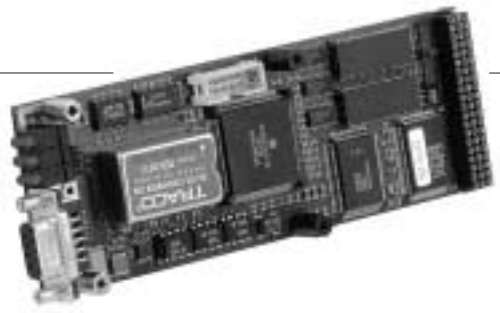


M79



M65

M57 – Profibus DP Master Interface



- Class 1/2 Profibus DP master (DIN19245)
- Isolated RS485, RS232 (debug) interface
- Local 32-bit CPU
- Up to 127 active or passive stations
- 12Mbit/s data transfer rate
- 1MB DRAM
- Complete Softing Profibus software on board
- Compatible with PROFIBUS DP Configurator (Softing)

MC68331/16MHz CPU
- CPU32 performance
- Complete Profibus DP software on one M-Module
- Local interrupt controller
- Hardware watchdog

ASPC 2 Profibus Controller
- Up to 12Mbaud data rate
- 16-bit DMA interface (local)
- Complete bus access protocol
- Up to 127 active or passive stations

Miscellaneous
- 1MB shared memory for communication and program
- Fast M-Module interface with autoincrement address mode
- Status LEDs
- Isolated Profibus interface

Peripheral Connections
- Via front panel on a shielded 9-pin D-Sub receptacle connector

M-Module Characteristics
- A08, A24, D16, INTA, IDENT

Electrical Specifications
- Isolation voltage: 500V DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 800mA typ.
- MTBF: 45,000h @ 50°C

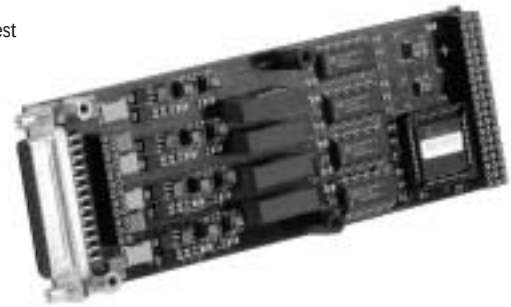
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 92g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (stor.): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

Software Support
- Softing protocol portation (ISO/OSI protocol layer 2/DP)
- MEN Driver Interface System 4 (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)

M51 – Quadruple CAN Interface



- 4 SJA1000 CAN controllers
- 2.0B Basic CAN/Extended CAN
- ISO high-speed coupling
- Optical isolation
- CANopen support

Four SJA1000 CAN Controllersn
- CAN 2.0B functionality, Extended CAN
- Serial multi-master network with unlimited number of nodes
- Bus access priorities
- 29-bit message identifier
- Powerful error handling capabilities
- Programmable transfer rates up to 1Mbit/s
- Bus length up to 40m at 1Mbit/s (ISO high speed)
- Guaranteed latency for highest-priority objects
- 0..8 bytes data block length

Physical Interface
- ISO high speed coupling (optically isolated)

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

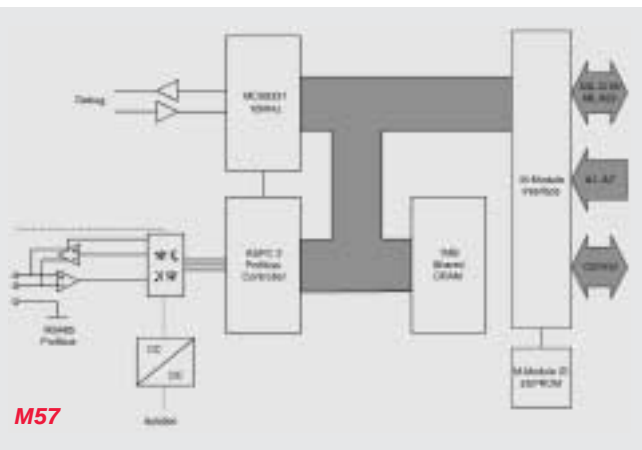
M-Module Characteristics
- A08, D08, INTA, IDENT

Electrical Specifications
- Isolation voltage: 500V DC
- Supply voltage/power consumption: +5V (4.85V..5.25V), 900mA typ. (with four CAN controllers)
- MTBF: 45,000h @ 50°C

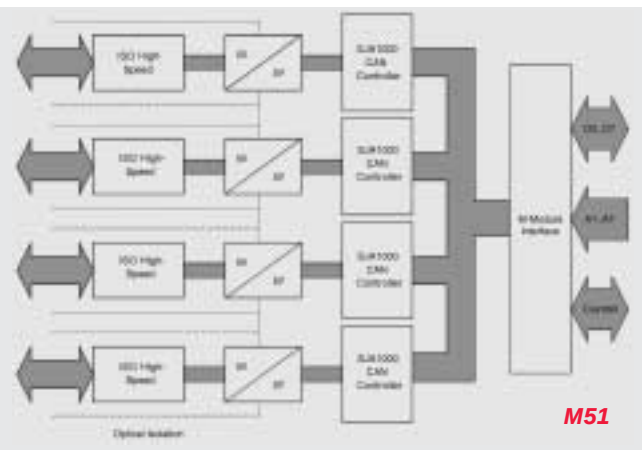
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 90g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (stor.): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Software Support
- CAN Layer 2 (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



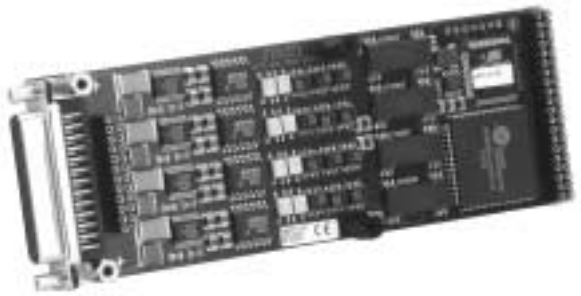
M57



M51

M77 – Quad RS232/423 to RS422/485 UART

- 4x 16C954 high-performance UARTs
- Serial data rates up to 1.152 Mbits/s
- Software programmable
- Full and half duplex on 4 channels
- Optically isolated from the system and from each other



Quad RS232/423/485/422 Interface

- All 4 channels with 4 lines (no handshake lines)
- All 4 channels optically isolated from the system and from each other

OX16C954 Communication Engine

- Software-programmable serial data rates up to 1.152 Mbaud full duplex/half duplex on 4 channels
- 128 bytes of FIFO for each transmitter/receiver
- Detection of bad data in receiver FIFO
- Selectable arbitrary trigger levels for receiver and transmitter FIFO interrupts
- Improved automatic flow control using selectable arbitrary thresholds
- Automated flow control using DSR#/DTR#
- Independent software reset of each channel
- Readable FIFO filling levels
- Optional generation of RS485 buffer enable signal
- Transmitter and Receiver can be disabled
- 5..8 bits per character plus parity
- Parity mode: odd, even, no or forced
- Stop bits: 1, 1.5 or 2

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, INTA, IDENT

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - 180V DC between the channels
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 200mA typ.
- MTBF: 280,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 67g

Environmental Specifications

- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

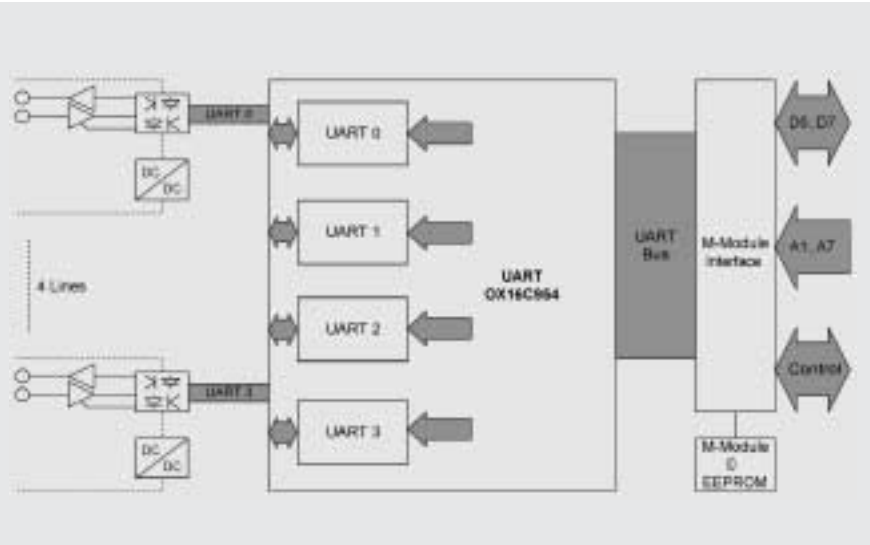
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- Linux driver
- Windows NT driver
- VxWorks driver
- OS-9 SPF driver



M75 – Dual HDLC/SDLC Communication Controller

- 2 full-duplex RS422 channels or
- 2 half-duplex RS485 channels
- 2 Mbits/s synchronous/asynchronous per channel
- Industry-standard 85C30
- Optically isolated

Serial Communication Controller
- 85C30-compatible via FPGA
- Two channels with data transfer rates up to 2Mbits/s full duplex per channel
- 10 x 19-bit status FIFO
- 14-bit byte counter
- HDLC/SDLC protocol
- Vector interrupt

Quadruple Asynchronous FIFO Memory IDT7203
- 2kB depth each direction
- Asynchronous and simultaneous read and write

Physical Interface
- Front panel connectors:
  - RS422
  - Optically isolated
- Rear I/O connector:
  - TTL
  - Not isolated

Peripheral Connections
- Via front panel on two shielded 15-pin micro D-Sub plug connectors
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D08, INTA, INTC, IDENT

Electrical Specifications
- Isolation voltage:
  - 180V DC between channel A and B connectors
  - 500V DC to the system
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between connector shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 600mA typ.
- MTBF: 285,000h @ 50°C

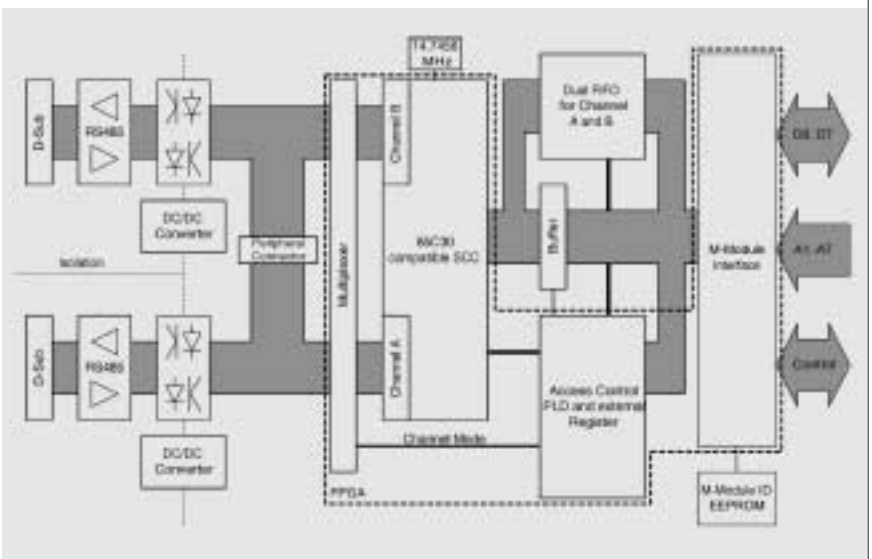
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 82g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/11ms
- Bump: 10g/16ms
- Vibration (sinusoidal): 2g/10..150Hz

Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

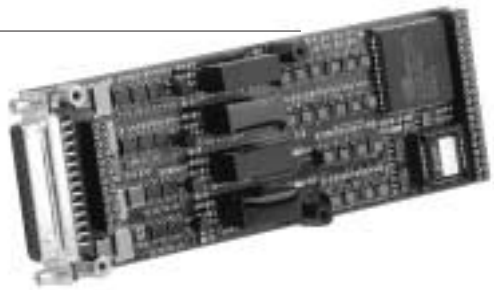
EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- MEN Driver Interface System (MDIS for Windows, Linux, VxWorks, QNX, RTX, OS-9)



M69 – Quadruple RS232 Interface

- 4 RS232 interfaces
- Intelligent asynchronous receivers/transmitters
- Modem control lines
- Receiver and transmitter FIFOs
- CL-CD1400 Communications Engine
- Optical isolation

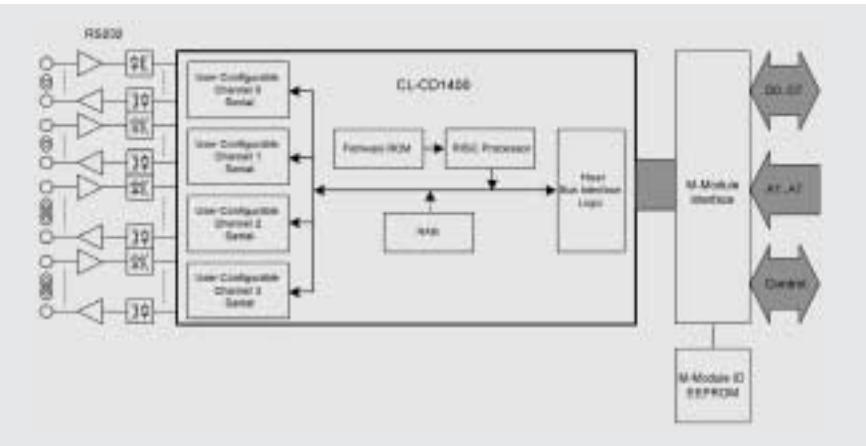


4 RS232 Interfaces

- 2 with 4 lines (2 modem control lines)
- 2 with 6 lines (4 modem control lines)
- All 4 channels optically isolated from the system and from each other

CL-CD1400 Communication Engine

- Software programmable serial data rates up to 135kbits/s full duplex on 4 channels
- 12 bytes of FIFO for each transmitter/receiver
- GOOD DATA interrupts eliminate the need for character status check
- Independent bit rate selections for transmit and receive on each channel
- Autom. flow control modes for serial channels:
  - XON/XOFF, RTS/CTS, DTR/DSR
- Special character processing, optionally handled by CL-CD1400
- Line break detection (start and end) and generation
- Insertion of transmit delays in data stream
- One timer per channel for receiver data timeout interrupt
- 5..8 bits per character plus parity
- Parity mode: odd, even, no or forced
- Stop bits: 1, 1.5 or 2



Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D08, INTA, IDENT

Electrical Specifications

- Isolation voltage:
  - 500V DC between isolated and digital side
  - 180V DC between the channels
  - Voltage between the connector shield and isolated ground is limited to 180V using a varistor; AC coupling between conn. shield and isolated ground through 47nF capacitor
- Supply voltage/power consumption: +5V (4.85V..5.25V), 700mA typ.
- MTBF: 215,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 92g

Software Support

- Windows NT driver
- VxWorks driver
- OS-9 SPF driver

M45 – Octal RS232 Interface

- 8 RS232 interfaces
- Intelligent asynchronous receivers/transmitters
- Modem control lines
- Receiver and transmitter FIFOs
- 2 CL-CD1400 Communications Engines

8 RS232 Interfaces

- 6 with 4 lines (2 modem control lines)
- 2 with 6 lines (4 modem control lines)

2 CL-CD1400 Communication Engines

- Software programmable serial data rates up to 135kbits/s full duplex on 4 channels
- 12 bytes of FIFO for each transmitter/receiver
- GOOD DATA interrupts eliminate the need for character status check
- Independent bit rate selections for transmit and receive on each channel
- Automatic flow control modes for serial channels:
  - XON/XOFF, RTS/CTS, DTR/DSR
- Special character processing, optionally handled by CL-CD1400
- Line break detection (start and end) and generation
- Insertion of transmit delays in data stream
- One timer per channel for receiver data timeout interrupt
- 5..8 bits per character plus parity
- Parity mode: odd, even, no or forced
- Stop bits: 1, 1.5 or 2

Peripheral Connections

- Via front panel on a shielded 44-pin HD-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, IDENT

Electrical Specifications

- Supply voltage/power consumption:
  - +5V (4.85V..5.25V), 100mA typ.
  - +12V (+11.5V..+15V), 80mA typ.
  - -12V (-11.5V..-15V), 70mA typ.
- MTBF: 70,000h @ 50°C

Mechanical Specifications

- Dimensions: conforming to M-Module Standard
- Weight: 98g

Environmental Specifications

- Temperature range (operation): 0..+60°C
  - Industrial temperature range on request
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (oper.): max. 95% nc
- Relative humidity range (stor.): max. 95% nc
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC

- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support

- Windows NT driver
- VxWorks driver
- OS-9 SPF driver

M17 – Triple Communication Controller

- 3 independent intelligent communication channels
- RS232 or RS422 or RS485 (via separate adapter)
- 1 intelligent X.21bis interface (special version of the M17)
- Local 32-bit CPU
- RISC and DMA controller

CPU
- MC68302/16MHz CPU

Interfaces
- RS232 or RS422 or RS485 or X.21bis

Miscellaneous
- 4KB bidirectional FIFO for interprocessor communication
- Up to 0.5MB EPROM/Flash (32-pin JEDEC socket, 128KB standard)
- EPROM with write protection for boot software
- Up to 1MB DRAM (256KB standard)
- Local 6-channel DMA controller
- Local interrupt controller
- Hardware watchdog
- RISC CPU for interfaces
- Three independent full-duplex serial interface controllers

Peripheral Connections
- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics
- A08, D08, INTA, IDENT

Electrical Specifications
- Isolation voltage: prepared for 500V DC isolation; depends on adapter type
- Supply voltage: +5V (4.85V..5.25V)
- Power consumption:
  - M17 without adapter: 5V, 250mA
  - AD03 without M17: +5V, 15mA; ±12V, ±30mA
  - AD04 without M17: +5V, 260mA
  - AD18 without M17: +5V, 5mA; ±12V, ±110µA
  - AD28 without M17: 5V, 250mA
- Max. current output ±200mA, ±12V (only M17 with AD03)
- MTBF: 545,000h @ 50°C

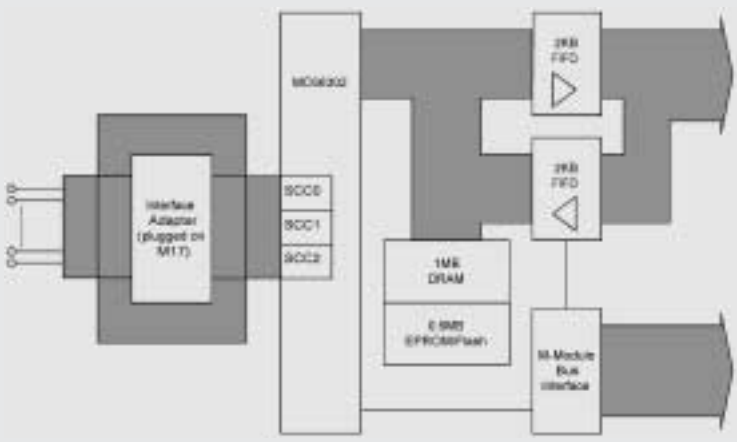
Mechanical Specifications
- Dimensions: conforming to M-Module Standard
- Weight: 100g (without adapter); adapter: approx. 15g

Environmental Specifications
- Temperature range (operation):
  - 0..+60°C or -40..+85°C
  - Airflow: min. 10m³/h
- Temperature range (storage): -40..+85°C
- Relative humidity range (operation): max. 95% non-condensing
- Relative humidity range (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: 15g/0.33ms, 6g/6ms
- Vibration: 1g/5..2,000Hz

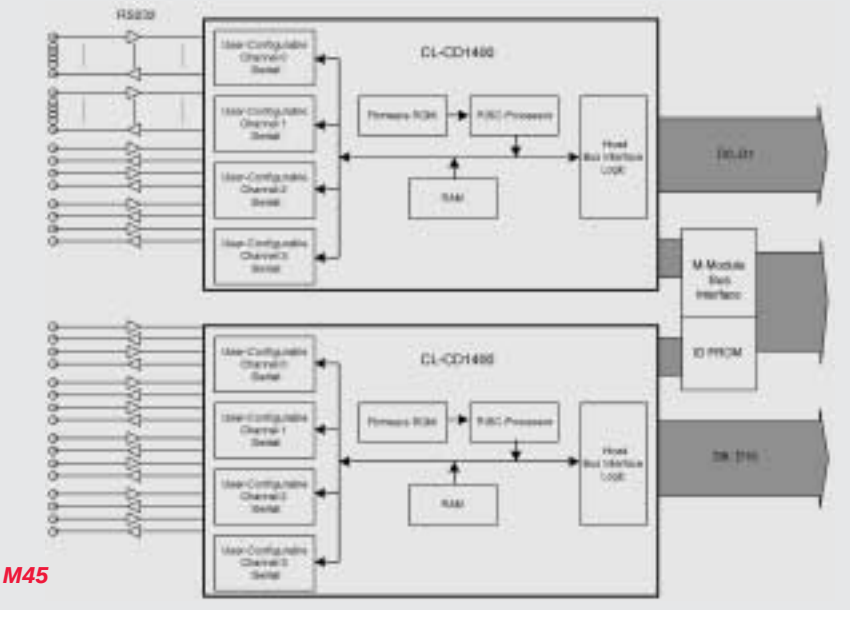
Safety
- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC
- Tested according to EN 55022 / 1999-05 (radio disturbance) and EN 55024 / 1999-05 (immunity) with regard to CE conformity

Software Support
- For hardware 04M017-00 and interface adapter AD03 or AD04, RS422 operation:
  - OS-9 FASTSCC driver
  - WindowsNT V.4.0 kernel mode driver for FASTUART
- For hardware 04M017-00 and interface adapter AD04 (RS485 operation) or AD28:
  - OS-9 FASTSCC driver
- For hardware 04M017-05:
  - X.25 protocol license with TCP/IP integration (only OS-9 driver available)
- For all hardware versions and interface adapters:
  - Linux SyncPPP/UART driver

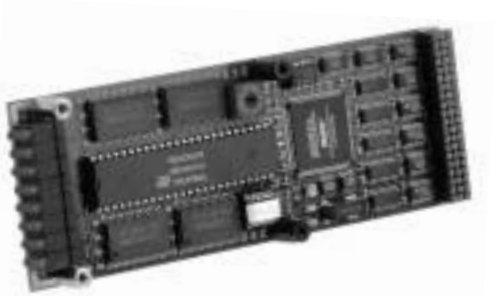


M17



M45

M99 – Carrier Board Test M-Module



- Compliance testing of carrier boards
- All address and data bus sizes
- DMA, interrupts

68230 Parallel Interface Timer

- 68000 bus compatible
- Port modes include:
  - Bit I/O
  - Unidirectional 8-bit and 16-bit
  - Bidirectional 8-bit and 16-bit
- Programmable handshaking options
- 24-bit timer
- Five separate interrupt vectors
- Separate port and timer interrupt s ervice requests

Miscellaneous

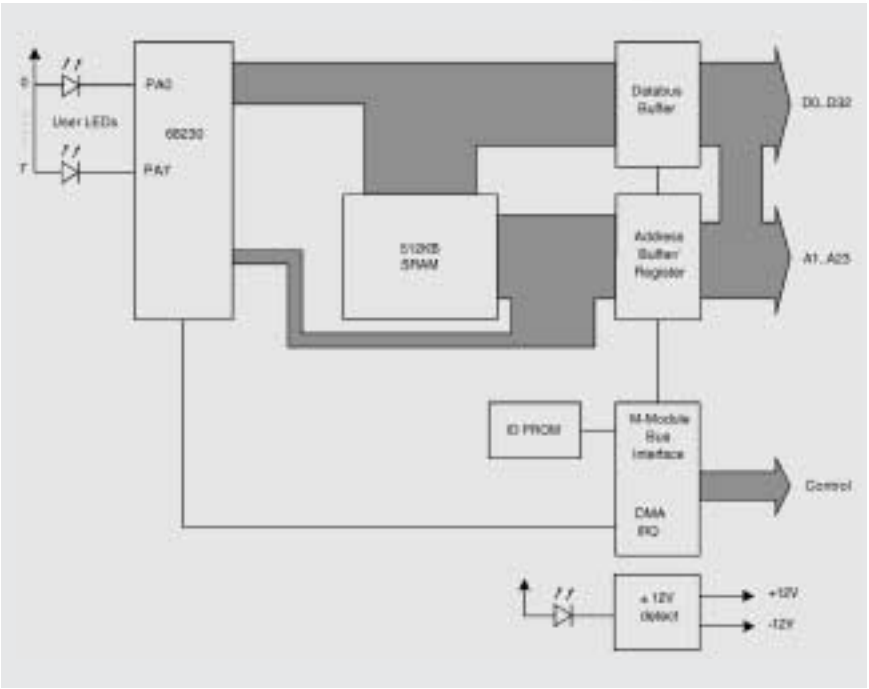
- MA-Module
- 8 status LEDs
- 8 user-programmable LEDs
- DMA capability
- QSPI interface
- Up to 512KB SRAM
- Compatible with A4/A4N (QSPI, TPU lines, A16)
- ±12V failure detection

M-Module Characteristics

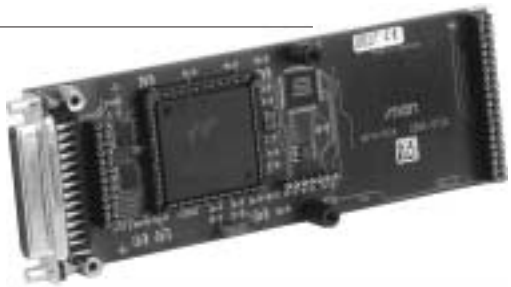
- A08, A24, D08, D16, D32, INTA, INTB, INTC, DMA16, DMA32, TRIGI, TRIGO, IDENT
- Burst access D16, D32

Software Support

- MEN Driver Interface System (MDIS3 for OS-9)



M14 – SCSI-2 Interface



- 8-bit SCSI-2 standard
- DMA capability
- Peak data rate up to 6MB/s

SCSI Interface

- FAS216U controller
- SCSI-1 (ANSI X3.131-1986) and SCSI-2 (ANSI X3.131-198X) standards
- Termination configurable via jumper
- DMA burst transfer rate: max. 20MB/s
- Asynchronous data transfer rate: max. 5MB/s
- Synchronous data transfer rate: max. 6MB/s
- Clock frequency: 25MHz
- HCMOS technology

Peripheral Connections

- Via front panel on a shielded 25-pin D-Sub receptacle connector
- Via carrier board (rear I/O)

M-Module Characteristics

- A08, D16, INTA, DMA, IDENT

Software Support

- OS-9 file manager

M9 – Ethernet Controller

- Am79C90 Local Area Network Controller
- Ethernet interface
- 10Base-5 or 10Base-2 connection
- 64KB dual-ported SRAM

AM7990

- 48-byte FIFO
- DMA controller
- Data rate up to 10Mbits/s
- OSI/ISO layer 1 and 2
- Network diagnosis: CRC, loop back, collision detection

Memory

- 64KB SRAM, pointer addressable
- Autoincrement possible
- Memory control according to ring buffer principle

Peripheral Connections

- Via front panel on a shielded combined 15-pin D-Sub receptacle conn. with adapter:
  - 15-pin AUI D-Sub connector (10Base-5) or
  - BNC connectors (10Base-2)

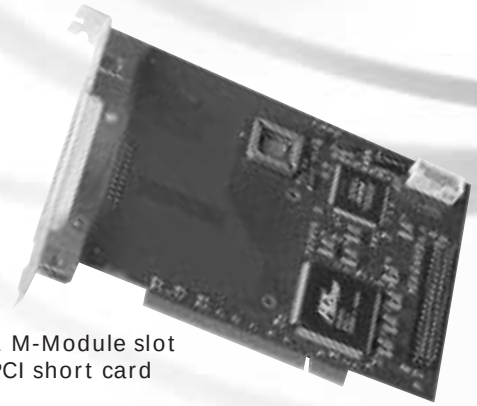
M-Module Characteristics

- A08, D16, INTA, IDENT

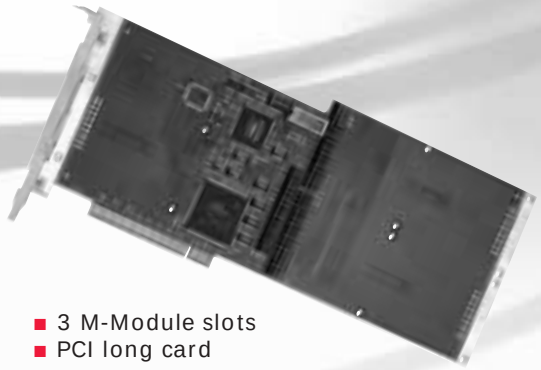
Software Support

- VxWorks driver
- OS-9 driver

C204 – Short-Card PCI Carrier Board for M-Modules



- 1 M-Module slot
- PCI short card



- 3 M-Module slots
- PCI long card

PCI Bus
- Slots required on the PCI bus:
  - C203: one long-card slot
  - C204: one short-card slot
- PCI 9050 controller
  - Target on PCI bus
  - Max. clock frequency 33MHz
  - Power supply 5V
- Compliance with PCI Specification 2.1
- 32-bit PCI data bus

M-Modules
- Number of M-Modules on one board:
  - C203: up to three M-Modules
  - C204: one M-Module
- One pass-thru window per M-Module
- Characteristics: D08, D16, D32, A08, A24, INTA, TRIGI, TRIGO

PXI
- Five trigger lines compliant with PXI Specification rev. 1.0
  - Via 10-pin plug connector
- Routing of PXI trigger lines to M-Module interface TRIGA, TRIGB

Peripheral Connections
- Via PC slot
- Via additional PC slot connection cables (C203)

Software Support
- M-Module drivers for Windows, VxWorks, Linux, OS-9, RTX as supported

C203 – Long-Card

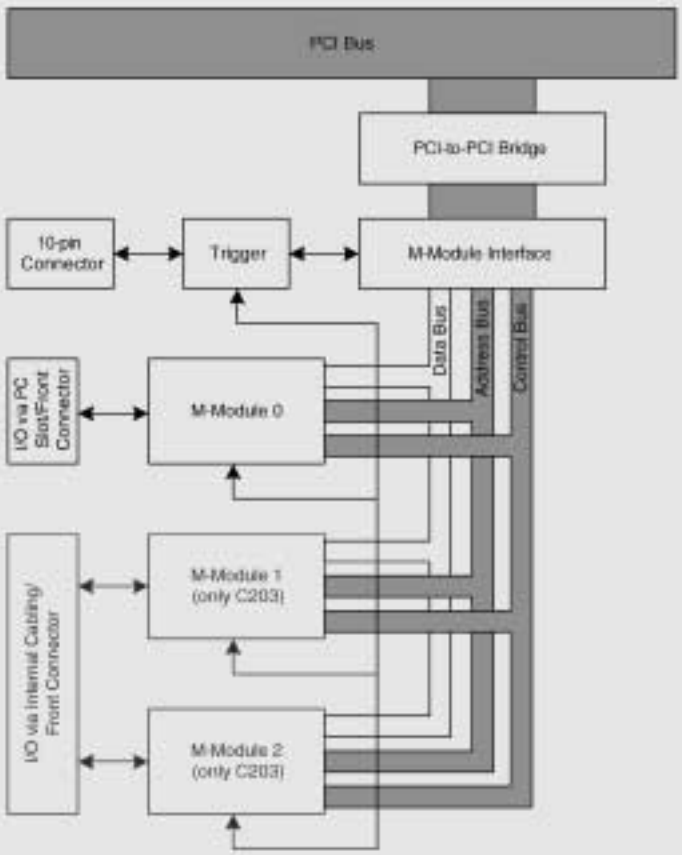
PCI Bus
- Slots required on the PCI bus:
  - C203: one long-card slot
  - C204: one short-card slot
- PCI 9050 controller
  - Target on PCI bus
  - Max. clock frequency 33MHz
  - Power supply 5V
- Compliance with PCI Specification 2.1
- 32-bit PCI data bus

M-Modules
- Number of M-Modules on one board:
  - C203: up to three M-Modules
  - C204: one M-Module
- One pass-thru window per M-Module
- Characteristics: D08, D16, D32, A08, A24, INTA, TRIGI, TRIGO

PXI
- Five trigger lines compliant with PXI Specification rev. 1.0
  - Via 10-pin plug connector
- Routing of PXI trigger lines to M-Module interface TRIGA, TRIGB

Peripheral Connections
- Via PC slot
- Via additional PC slot connection cables (C203)

Software Support
- M-Module drivers for Windows, VxWorks, Linux, OS-9, RTX as supported



Operating System Support

ELinOS – Embedded Linux

ELinOS is a development environment for embedded Linux devices. It provides a seamless toolchain covering everything from the configuration of the Linux system software up to application development. ELinOS includes all tools like cross-compiler, linker and debugger, comes with the adequate boot strategies, and is handled easily thanks to its graphical tools. With the CoTools CODEO for application development and COGNITO for system analysis ELinOS is now a complete IDE for embedded Linux development. All MEN PowerPC boards are integrated into ELinOS and can be selected easily.
ELinOS is a product of SYSGO and comes along with SYSGO's comprehensive support and consulting program. Due to broad experience with safety-critical software and certification needs (i.e. DO-178B) SYSGO has the knowledge to provide Linux solutions even in this area.

SYSGO
REAL-TIME SOLUTIONS

MontaVista™ – Embedded Linux

MontaVista Linux is supported on some MEN PowerPC platforms targeted for telecom applications. MontaVista Linux is a comprehensive embedded operating system and cross development environment providing a common source and binary platform across a broad range of processor architectures. The Professional Edition includes a modern OS featuring real-time functionality, multi-process and multi-threaded with extensive bundled software components including rich networking.

montavista
PARTNER

Microsoft® Windows®

Microsoft Windows (NT, 2000, XP, Embedded) is supported on most of MEN's x86 platforms.

Microsoft® Windows

VxWorks® – Real-time operating system

VxWorks by WindRiver is supported on all MEN PowerPC and x86 platforms.VxWorks is a widespread operating system supporting open standards, such as POSIX. It comes with elaborate features like an MMU-based memory protection and an enhanced error management, among others.

WIND RIVER

QNX® Neutrino® – Real-time operating system

QNX Neutrino by QNX is supported on a wide range of MEN PowerPC and x86 platforms.
QNX Neutrino is a reliable, fault tolerant, scalable and true microkernel operating system. Under QNX Neutrino, every driver, application, protocol stack, and file system runs outside the kernel, in the safety of memory-protected user space. As a result, virtually any component can fail – and be automatically restarted – without affecting other components or the kernel.

QNX
QNX SOFTWARE SYSTEMS

OS-9 – Real-time operating system

Microware OS-9 by Radisys® is supported on some of MEN's PowerPC and the remaining 68k platforms.
OS-9 includes development tools, software components, the OS kernel, networking, graphics, power management and more.

MENMON –"BIOS" for PowerPC Boards

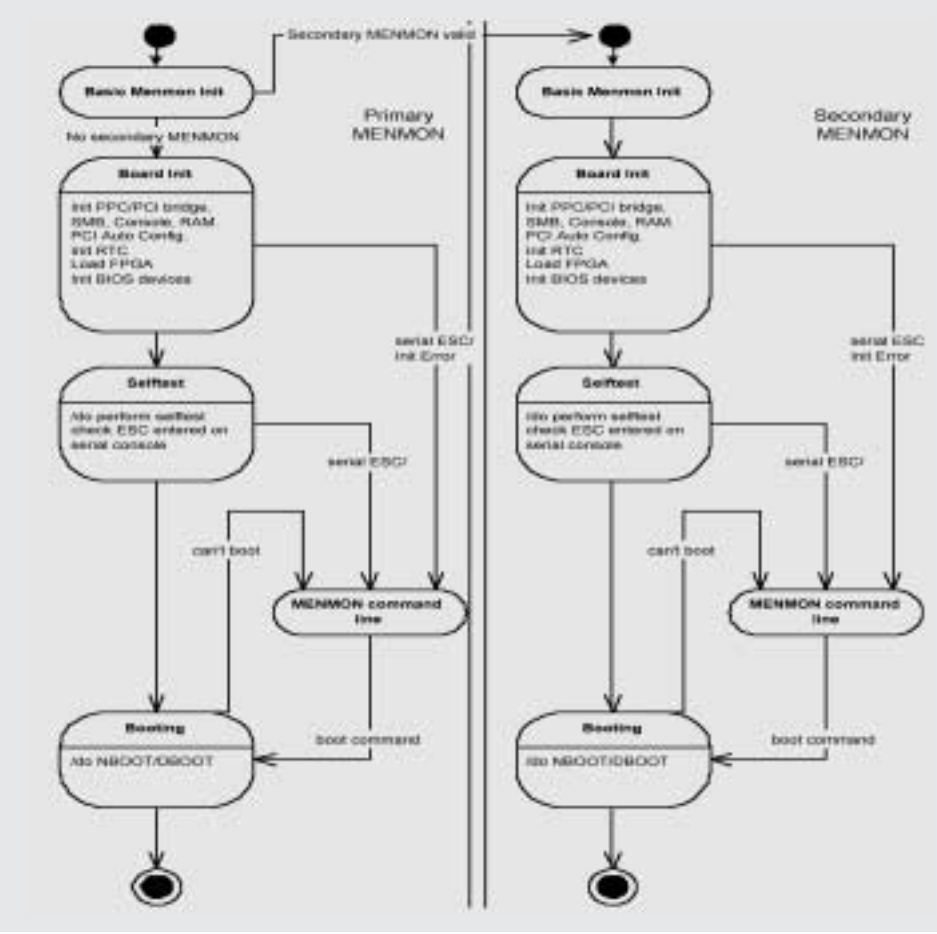
MENMON is a sort of BIOS for all MEN boards based on PowerPC processors. It can be used for bootstrapping operating systems, for hardware testing, or for debugging applications without running any operating system.

- ***CPU/board setup: Initialize the CPU and its peripherals***
- ***Load the FPGA code***
- ***PCI auto configuration***
- ***Perform selftest***
- ***Provide debug/diagnostic features on MENMON command line (serial console)***
- ***Diagnostics: POST, enhanced diagnostics for user and final production test***
- ***Boot operating system (from disk, Flash or network)***

MENMON needs only a small amount of memory, nevertheless it provides a number of interesting features:

- Fallback during startup with two MENMON copies in Flash (primary MENMON for fallback, secondary MENMON active – total code size max. 1MB)
- Runs when no external RAM is available (using on chip RAM or cache)
- Network stack with telnet and HTTP server (MENMON console over network, Flash update over network, setup/control via browser)
- Graphics consoles with VGA/framebuffer devices (optional touch/virtual keyboard) and boot logo while booting (BMP file from onboard medium, f.e. CompactFlash)
- Console features with PC style setup menue, multiple console support (user selectable and simultaneously active) and a Command Line Editor
- Web access
- Disk support with loading file from disk, disk update
- Single stepping, break points
- Change/examine memory
- Line-by-line assembler/disassembler
- Memory testing
- Exception reporting

MENMON is somewhat similar to a BIOS as known from x86 systems. Major differences to a BIOS structure are that MENMON is no longer active when the operating system has started and that it provides a limited number of system calls (PPCbug compatible).



Typical Startup Sequence

MDIS4 – MEN Driver Interface System

MDIS, the MEN Driver Interface System, is a framework to develop device drivers for almost any kind of I/O hardware. MDIS is independent of the architecture, platform and bus system. The driver source code is interchangable between operating systems. A properly written driver runs on all operating systems supported by MDIS. Operating systems currently supported are Linux and RTAI, Windows (NT, 2000, XP, Embedded), QNX, RTX, VxWorks and OS-9.
MDIS4 is the fourth major revision of MDIS and is the first revision that offers full platform independence.

Typical I/O hardware supported by MDIS device drivers:
- Binary and analog I/O
- Instrumentation modules
- Motion controllers
- Fieldbus controllers (CAN, Profibus etc.)
- Other specialized hardware like watchdogs, hardware monitors, etc.

And this hardware is typically located on:
- M-Module mezzanines
- PC-MIP and PMC mezzanines
- Other PCI hardware
- Components on CPU boards
- FPGAs on CPU and I/O boards

MDIS drivers can be used for all the types of hardware listed above, because in these cases the driver function can be presented to the application using the MDIS standard API. There are some device types, like network and disk I/O, where the MDIS API cannot be used because the operating system already supports this kind of device. For these devices, you still need to develop a specific driver for each operating system.

MDIS-API – the Application Programming Interface

The MDIS-API is a function interface for the user defining the function calls to access an MDIS driver. The API is the same on all operating systems, being a simple interface written in ANSI C. Under Windows it is accessible via DLL callable from C/C++, Delphi and Visual Basic. The API consists of eight basic functions that originate from UNIX and OS_9 calls to control a device (open, close):

- M_open — open path to device
- M_read — read a single value from current channel
- M_write — write a single value to current channel
- M_getblock — read multiple values (data block) from device
- M_setblock — write multiple values (data block) to device
- M_getstat — get parameter from device
- M_setstat — set parameter of device
- M_close — close path to device

These status calls are provided for starting specific actions and setting or querying parameters, making it possible to access functions specific to a device driver as well as the standardized MDIS functions.

MDIS driver module structure

The MDIS concept is based on three functional parts:
- The low-level driver for handling the device hardware
- The board handler for handling the base board hardware
- The MDIS/BBIS Kernels, which generally manage the device/board initialization and deinitialization sequences and route the API calls to the appropriate low-level driver and board handler calls.

The MDIS4 distribution concept

The MDIS4 System Package.

To run and/or compile MDIS4 drivers, you need the MDIS4 system package for your operating system.

Each MDIS4 system package contains:
- MDIS4 libraries required by the low-level drivers, including documentation
- MDIS4 libraries required by applications
- All BBIS handlers supported by this operating system
- The MDIS4 user guide
- A low-level driver installation tool, if necessary
- One or more example BBIS handlers in source code
- Tools to access the MDIS-API and to view debug messages (if necessary)

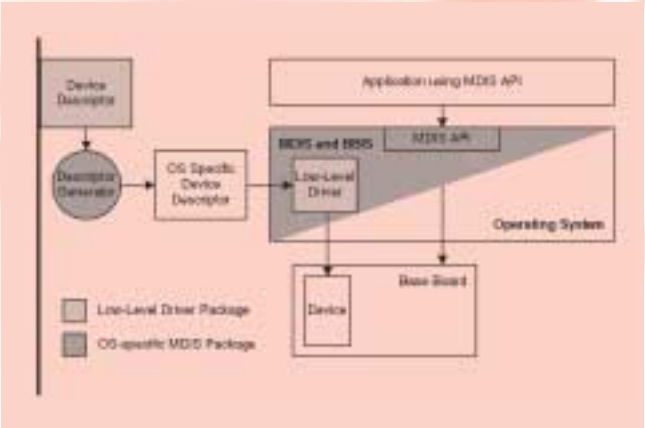
The MDIS4 Low-Level Driver Package.

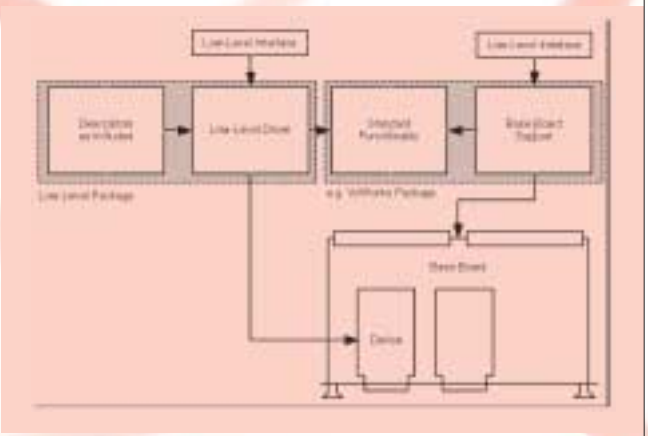
A low-level driver package exists for each hardware supported by MDIS4.

This package contains:
- The low-level driver source code including a generic makefile
- Example descriptors
- Example programs and tools
- HTML and ASCII-text documentation
- Some packages also include an API library to access the driver more easily.

Licensing

MDIS System Packages: Linux and VxWorks system packages are distributed in source code under the GNU General Public License. Windows, RTX and OS-9 system packages are delivered in object code only. They can be used for free, but are subject to MEN's general licensing conditions. All MDIS system packages are free of charge.





MDIS Low-Level Driver Packages: Most low-level drivers are distributed under the GNU General Public License. They are normally provided as source code. Most MDIS low-level driver packages are free of charge.

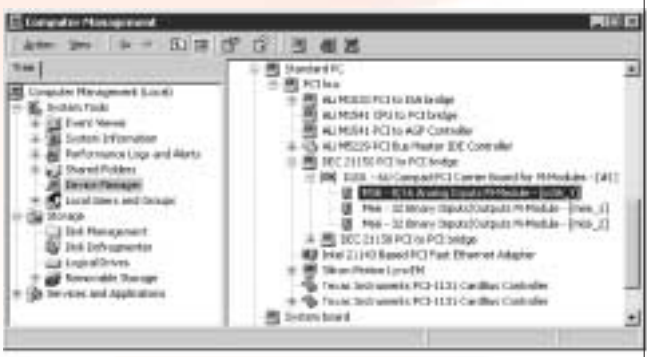
Note on MEN MDIS drivers: The copyright of the GNU GPL does not cover user programs that use the MDIS driver by standard MDIS API calls—this is merely considered normal use of the driver, and does not fall under the heading of "derived work".

Configuration Tool for Linux and VxWorks

The MDIS wizzard is a device manager for configuration of MEN boards (under MDIS) and the corresponding parameters in a Linux or Windows environment. It has a user-friendly "Windows-like" GUI that allows for a fast and easy system configuration independent of the platform (e.g. VMEbus or CompactPCI, PowerPC or Pentium...). The MDIS wizzard can also be used for hardware settings (e.g. to select resolution, amplification, signal conditioning mode etc. of an M-Module with analog I/O channels). That way it is possible to generate executable MDIS projects which can be loaded in the application under Linux or VxWorks.

Plug&Play Tools for Windows 2000 / XP

Plug&Play Tool for Windows: If MEN boards are installed in a Windows system (under MDIS), this new MDIS tool allows automatic installation of the corresponding Windows drivers (Plug&Play). Optionally, these drivers can also be installed manually. After that the board parameters can be set in the Windows device manager.



CompactPCI Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
F11 – 3U cPCI/PXI Pentium® III SBC	●	●	●				
F10 – 3U cPCI/PXI Pentium® M SBC	●	●	●				
F9 – 3U cPCI/PXI Pentium® M SBC	●	●	●				
F8 – 3U cPCI Infotainment SBC	●	●					
F7N – 3U/6U cPCI/PXI Pentium® III SBC	●	●	●	●	●		
F7 – 3U/6U cPCI/PXIPentium® III SBC	●	●	●	●	●		
F6 – 3U cPCI/PXI PowerPC SBC	●		●				
F1N – 3U cPCI PowerPC SBC	●		●	●		●	
F301 – 3U cPCI 9-Port Ethernet Switch							Driver software not necessary
F207 – 3U cPCI Carrier Board for PCI-104							PCI-104 module driver software
F206 – 3U cPCI 8 UARTs for SA-Adapters	●	●	●				
F206I – 3U cPCI Carrier Board for PC/104							PC/104 module driver software
F206N – 3U cPCI Intelligent NIOS Slave							NIOS sample designs,Flash update tools (FPGA)
F205 – 3U cPCI/PXI M-Module Carrier							M-Module driver software
F204 – 3U cPCI/PXI M-Module Carrier							M-Module driver software
F203 – 3U cPCI/PXI PC-MIP Carrier							PC-MIP driver software
D6 – 6U cPCI/PXI Pentium® M SBC	●	●	●				
D5 – 6U cPCI PowerPC SBC	●		●	●			
D4 – 6U cPCI/PXI Pentium® 4 SBC	●	●	●	●	●		
D3 – 6U cPCI PowerPC SBC	●		●	●		●	
D2 – 6U cPCI Pentium® SBC	●	●	●	●	●		
D302 – 6U cPCI Card – 128 Binary I/Os	●	●	●	●	●	●	
D203 – 6U cPCI M-Module Carrier							M-Module driver software
D202 – 6U cPCI PC-MIP Carrier							PC-MIP driver software

VMEbus Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
B12 – 3U VMEbus PowerPC SBC			●			●	
B11 – 3U VMEbus PowerPC SBC	●		●	●		●	
B6 – 3U VMEbus 68k Communication Controller						●	
B5 – 3U VMEbus 68k Communication Controller						●	
B202S – 3U VMEbus Carrier Board for M-Modules							M-Module driver software
B201S – 3U VMEbus Carrier Board for M-Modules							M-Module driver software
A15 – 6U VME64 PowerPC SBC with Mezzanines	●		●	●		●	
A14 – 6U VME64 PowerPC SBC with PMC/PC-MIP	●		●	●			
A13 – 6U VME64 Pentium® III SBC with Mezzanines	●	●	●	●		●	
A12 – 6U VMEbus PowerPC SBC with Mezzanines	●		●	●		●	
A11 – 6U VMEbus PowerPC Workstation			●	●		●	
A10 – 6U VMEbus Single-Board Computer			●			●	
A9 – 6U VMEbus Single-Board Computer			●			●	
A4N – 6U VMEbus Intelligent I/O Controller			●			●	
A302 – 6U VMEbus Card with 128 Binary I/Os	●	●	●	●	●	●	
A201S – 6U VMEbus Carrier Board for M-Modules							M-Module driver software

ESM Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	
EM08 - ESM with PowerPC MPC 8540	●		●				
EM07 – ESM with Pentium® III / Celeron®	●	●	●	●	●	●	
EM05 – ESM with Transmeta TM5900	●	●	●				
EM04/N – ESM with PowerPC MPC 8245	●		●			●	
EM03/A – ESM with MPC8560 (PowerQUICC III)	●		●				
EM02 – ESM with Pentium® III	●	●	●	●	●		
EM01 – ESM with PowerPC MPC 5200	●	●	●	●	●		

PCI-104 Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	
PP05 – PCI-104 Module with WTB interface	●	●	●	●	●	●	
PP04 – PCI-104 Module with MVB interface	●	●	●	●	●	●	
PP01 – PCI-104 Module with PowerPC MPC 5200	●		●				

PC-MIP & PMC Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
P518 – PMC Frame Buffer Interface	●	●					
P517 – PMC Graphics Accelerator		●				●	– OS-9: C library for P17 and P517 for simple portations of various graphics packages based on a frame buffer interface – OS-9: Shared library module XiGfx.dll. for P17, P517 for XiBase9 – Windows®2000: Graphics driver for P17, P517 (SMI, object code) – Windows®XP2000: Graphics driv. for P17, P517(SMI, object code)
P501 – PMC CRT/LCD Graphics Accelerator	●	●	●				– VxWorks®: Graphics driv. for P1 (MEN, source code for 68k, x86, PPC) – Windows® NT: Graphics driver for P1 (SMI, object code)
P18 – PC-MIP Frame Buffer Interface	●	●				●	
P17 – PC-MIP Display Controller		●				●	– OS-9: C library for P17 and P517 for simple portations of various graphics packages based on a frame buffer interface – OS-9: Shared library module XiGfx.dll. for P17, P517 for XiBase9 – Windows®2000: Graphics driver for P17, P517 (SMI, object code) – Windows®XP2000: Graphics driv. for P17, P517 (SMI, object code)
P16 – PC-MIP Dual 100Base-T Ethernet	●		●	●		●	
P15 – PC-MIP Non-volatile SRAM	●		●			●	
P13 – PC-MIP 48-bit TTL I/O Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for P13 – MDIS4/2004 Windows®NT4/W2K driver for P13
P12 – PC-MIP 10/100Base-T Ethernet	●	●	●				
P11 – PC-MIP Quad RS422/485 UART	●	●	●				– SCF driver for P10/P11 M-Module, OS-9(PPC), PowerPC object code – VxWorks® driver for P10/P11 – Windows®NT: UART driver for P10/P11/AD45
P10 – PC-MIP Quad RS232 UART	●	●	●			●	– SCF driver for P10/P11 M-Module, OS-9(PPC), PowerPC object code – VxWorks® driver for P10/P11 – Windows®NT: UART driver for P10/P11/AD45
P9 – PC-MIP 10/100/1000Base-T Ethernet	●	●					
P6 – PC-MIP Profibus DP Master	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M57/P6 – MDIS4/2004 Windows®NT4/W2K driver for M57/P6
P5 – PC-MIP Intelligent CAN Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driv. sources for M65/P5 (CANopen firmware) – MDIS4/2004 low-level driv. sources for M65/P5 (CAN layer 2 firmw.) – MDIS4/2004 Windows®NT4/W2K driv. for M65/P5(CANopen firmw.)
P4 – PC-MIP Ultra2 SCSI Controller		●					– Windows®NT: SCSI driver for P4
P1 – PC-MIP CRT/LCD Graphics Accelerator	●	●	●	●			– VxWorks®: graphics driv. for P1 (MEN, source code for 68k, x86, PPC) – Windows® NT: Graphics driver for P1 (SMI, object code) – Windows®2000: Graphics driver for P1 (SMI, object code)

Software

M-Module Driver Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
M99 – Carrier Board Test M-Module						●	– MDIS4/2004 low-level driver sources for M99 – MDIS4/2004 Windows®NT4/W2K driver for M99
M97 – Universal Counter	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M97 – MDIS4/2004 Windows®NT4/W2K driver for M97
M82 – 16 Binary Inputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M31/M32/M82 – MDIS4/2004 Windows®NT4/W2K driver for M31/M32/M82
M81 – 16 Binary Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M27/M28/M81 – MDIS4/2004 Windows®NT4/W2K driver for M27/M28/M81
M79 – Profibus DP Slave Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M79 – MDIS4/2004 Windows®NT4/W2K driver for M79
M78 – 4-Channel Digital Oscilloscope	●	●	●	●	●	●	
M77 – Quad RS232/423 to RS422/485 UART	●	●	●			●	– M77 SCF compatible driver for OS-9/68k (not OS-9/PPC) – VxWorks® driver for M77 (Tornado 2.0.x), source code – Native Windows®NT4/W2K driver for M77 – Linux TTY driver for M77, source code
M76 – Digital Multimeter	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M76 – IVI driv. (National Instruments LabWindows®/CVI) for M76 (object code) – MDIS4/2004 Windows®NT4/W2K driver for M76
M75 – Dual HDLC/ SDLC Communication Controller	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M75 – MDIS4/2004 Windows®NT4/W2K driver for M75
M74 – Double Fault-Tolerant CAN Interface	●	●	●	●	●	●	– OS-9/68k V.3.0: driver software M74 (floppy disk) – MDIS4/2004 low-level driver sources for SJA1000, CAN Layer 2 – MDIS4/2004 Windows®NT4/W2K driver for SJA1000, CAN Layer 2
M73 – 10Base-T Ethernet Controller			●			●	– OS-9/68k V.3.0: Ethernet driver for OS-9 ISP and OS-9/NET for M9/M73 (object code, floppy disk) – VxWorks® V.5.3: Ethernet driver for M9/M73 (MEN, object code, floppy disk)
M72 – Motion Counter	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M72 – MDIS4/2004 Windows®NT4/W2K driver for M72
M70 – Universal Temperat. Acquisition	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M70 – MDIS4/2004 Windows®NT4/W2K driver for M70
M69 – Quadruple RS232 Interface		●	●			●	– Driver for M45/M69/CD1400, OS9(000) PowerPC – Driver for M45/M69/CD1400, VxWorks®, source code – OS-9/68k V.3.0: driver software M69 (floppy disk) – OS-9/68k V.3.0: driver software M69, SPF driv. sources (floppy disk) – Windows®NT V.4.0: driver software M69 (object code)
M68 – Quad Output Function & Waveform Generator	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M68 – IVI driv. (National Instruments LabWindows®/CVI) for M68 (obj. code) – MDIS4/2004 low-level driver sources for M68
M67 – 1-Channel Digital Oscilloscope	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M67 – MDIS4/2004 Windows®NT4/W2K driver for M67

M-Module Driver Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
M66 – 32 Binary Inputs/Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M66/A302/D302 – MDIS4/2004 Windows®NT4/W2K driver for M66/A302/D302
M65 – Intelligent Dual CAN Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driv. sources for M65/P5 (CANopen firmware) – MDIS4/2004 low-level driv. sources for M65/P5 (CAN layer 2 firmw.) – MDIS4/2004 Windows®NT4/W2K driv. for M65/P5 (CANopen firmw.) – MDIS4/2004 Windows®NT4/W2K driv. for M65/P5 (CAN layer 2 firm.)
M63 – 32-/16-Bit Binary Data Acquisition/Generation	●	●	●	●	●	●	– DSP firmware source and toolbox for M63 – MDIS4/2004 low-level driver sources/toolbox for M63 – MDIS4/2004 Windows®NT4/W2K driver for M63
M62 – 16 Analog Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M62 – MDIS4/2004 Windows®NT4/W2K driver for M62
M59 – Quad Input Analog Data Acquisi.	●	●	●	●	●	●	– DSP firmware source/toolbox for M59 – MDIS4/2004 low-level driver sources/toolbox for M59 – MDIS4/2004 Windows®NT4/W2K driver for M59
M58 – 32-bit TTL I/O Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M58 – MDIS4/2004 Windows®NT4/W2K driver for M58
M57 – Profibus DP Master Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M57/P6 – MDIS4/2004 Windows®NT4/W2K driver for M57/P6
M56 – 16-Channel Analog Multiplexer	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M56 – M56 IVI driver for use with National Instruments LabWindows®/CVI – MDIS4/2004 Windows®NT4/W2K driver for M56
M54 – DC Motor Controller	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M54 – MDIS4/2004 Windows®NT4/W2K driver for M54
M51 – Quadruple CAN Interface	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for SJA1000, CAN Layer 2 – MDIS4/2004 Windows®NT4/W2K driver for SJA1000, CAN Layer 2
M50 – Synchro/ Resolver Converter	●	●	●	●	●	●	– 2S80-series calculation software by Analog Devices, for M50 (DOS tool, manual) – MDIS4/2004 low-level driver sources for M50 – MDIS4/2004 Windows®NT4/W2K driver for M50
M47 – SSI Controller	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M47 – MDIS4/2004 Windows®NT4/W2K driver for M47
M45 – Octal RS232 Interface	●	●	●			●	– OS-9/68k V.3.0: driver software M45 – Driver for M45/M69/CD1400, OS9(000) PowerPC – Driver for M45/M69/CD1400, VxWorks®, source code – Windows®NT driver for M45, object code – Linux driv. for M-Mod. M45 (Linux 2.4, on 6U VME carrier A201 only)
M43 – 8 Relay Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M43 – MDIS4/2004 Windows®NT4/W2K driver for M43
M41 – 4-Channel Timer/Counter						●	– OS-9/68k V.3.0: MDIS3 driver M41
M40 – Profibus FMS Multimaster Interface						●	– OS-9/68k V.3.0: Profibus FMS driver software M40 (floppy disk)
M39 - InterBus-S Slave Interface	●	●	●	●	●	●	– OS-9/68k V.3.0: MDIS driver M39 (floppy disk)

Software

M-Module Driver Software Compare Chart

	Linux	Windows	VxWorks	QNX	RTX	OS-9	Comments
M39 – InterBus-S Slave Interface	●	●	●	●	●	●	– OS-9/68k V.3.0: MDIS driver M39 (floppy disk)
M37 – 4 Analog Outputs M36 – 8/16 Analog Inputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M37 – MDIS4/2004 Windows®NT4/W2K driver for M37 – MDIS4/2004 low-level driver sources for M36 – MDIS4/2004 Windows®NT4/W2K driver for M36
M35N – 8/16 Analog Inputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M34/M35 – MDIS4/2004 Windows®NT4/W2K driver for M34/M35
M33 – 8 Analog Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M33 – MDIS4/2004 Windows®NT4/W2K driver for M33
M32 – 16 Binary Inputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M31/M32/M82 – MDIS4/2004 Windows®NT4/W2K driver for M31/M32/M82
M31 – 16 Binary Inputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M31/M32/M82 – MDIS4/2004 Windows®NT4/W2K driver for M31/M32/M82
M28 – 16 Binary Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M27/M28/M81 – MDIS4/2004 Windows®NT4/W2K driver for M27/M28/M81
M27 – 16 Binary Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M27/M28/M81 – MDIS4/2004 Windows®NT4/W2K driver for M27/M28/M81
M24 – 8/16 Binary Inputs 4	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M22/M2 – MDIS4/2004 Windows®NT4/W2K driver for M22/M24
M22 – 8 Binary Inputs/Outputs	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M22/M24 – MDIS4/2004 Windows®NT4/W2K driver for M22/M24
M17 – Triple Communication Controller	●	●				●	– OS-9/68k V.3.0: FASTSCC, driver softw. for M17; incl. HDLC support – Windows®NT V.4.0: FASTUART driver for M17 (object code) – Linux SyncPPP/UART driver for M17, source code
M16 – Quad Input Analog Data Acquisi.	●	●	●	●	●	●	– OS-9 V.3.0: MDIS driv. M16 (obj.code, floppy disk; for M16 up to rev.04) – MDIS4/2004 low-level driv. source for M16 (M16 rev. 06 & higher) – MDIS4/2004 Windows®NT4/W2K driv. for M16 (M16 rev. 06 & higher only)
M15 – Frequency and PWM Generator	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M15 – MDIS4/2004 Windows®NT4/W2K driver for M15
M14 – SCSI-2 Interface						●	– OS-9 V.3.0: driver software for M14 and A501 (object code)
M11 – 16-bit TTL I/O Interface 1	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M1 – MDIS4/2004 Windows®NT4/W2K driver for M11
M8 – IEC Bus Controller	●	●	●	●	●	●	– MDIS4/2004 low-level driver sources for M8 – MDIS4/2004 Windows®NT4/W2K driver for M8
M6 – RS232 or RS422/485 or TTY Interface						●	- OS-9/68k V.3.0: driver software M6 (object code, floppy disks)

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