Embedded Solutions

D7 - 6U CompactPCI® Multi-Core Xeon® Blade Server

- **2 Intel® dual core Xeon® 1.66 GHz**
- **4HP CompactPCI® system slot (8HP for extended temperature range)**
- **PCI 64-bit/66-MHz**
- **Hot-swap, PICMG 2.16 support**
- **Up to 4 GB DDR2 ECC SDRAM**
- **Non-volatile SRAM, FRAM**
- **Hard disk slot**
- **2 SATA, 2 PATA interfaces**
- **Graphics up to 1280 x 1024 (optional)**
- **4 Gigabit Ethernet (PCIe®)**
- **3 USB 2.0, 2 COM**
- **Individual I/O in FPGA**
- **2 XMC/PMC slots (PCIe®)**
- **Board Management Control**

The D7 is equipped with two high-performance Intel® multi-core Xeon® processors, which consist of four CPU cores running at 1.66 GHz. The versatile 4 or 8HP/6U (single or double-slot, double-size Eurocard) CompactPCI® single-board computer is designed especially for embedded systems which require high computing performance. It comes with a tailored passive heat sink - forced air cooling is required inside the CompactPCI® system.

The D7 offers a 64-bit/66-MHz PCI up to PCI-X interface to the CompactPCI® bus. PCI Express® for high-speed communication is supported on board to connect the two Gigabit Ethernet controllers as well as one or two XMC modules.

A wide range of different memory is available on the D7, such as a maximum of 4GB DDR2 SDRAM with ECC as main memory. The non-volatile memory comprises up to 8MB buffered SRAM and 16KB FRAM. All memory components are soldered to guarantee reliable shock and vibration resistance. A hard disk slot is also implemented. Aside from parallel ATA support, two serial ATA lines are available in addition.

The standard I/O available at the front panel of the D7 includes two XMC or PMC modules, two Gigabit Ethernet and one USB 2.0. If only one XMC module is used, one VGA and one COM are available at the front panel.

Graphics is provided in the FPGA which can also be used to implement further application-specific I/O functions. An additional 32MB SDRAM is connected to the FPGA, e.g. for use as graphics memory.

The D7 is also prepared for rear I/O where for example two USB ports, two COMs, IDE, audio AC'97 or the rear I/O signals from the PMC modules can be connected.

A board management controller is implemented to supervise the CPUs, all voltages, processor and board temperature, and reset. The controller is completely independent of the CPUs and monitors all states of the CPUs.

The D7 operates in Windows® and Linux environments as well as under real-time operating systems which are able to support multi-core architecture. The Award BIOS was especially designed for embedded system applications.

Equipped with Intel® components that come exclusively from the Intel® Embedded Line, the D7 has a guaranteed minimum standard availability of 5 years.

The D7 is suited for a wide range of industrial communication applications, for example networked appliances (base stations, gateways, routers etc.), instrumentation and test or railway signalling equipment. Main target markets comprise telecoms, medical engineering and transportation.

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Technical Data

CPU
- Two Dual-Core Intel® Xeon® ULV processors
  - 1.66GHz processor core frequency
  - 667MHz front-side bus frequency
- Chipset
  - Northbridge: Intel® MCH E7520 server chip set
  - Southbridge: Intel® ICH 6300ESB
  - High-end memory controller
- Passive heat sink

Memory
- 2MB L2 cache integrated in Xeon®
- Up to 4GB SDRAM system memory
  - Soldered
  - DDR2 with ECC support
  - 400MHz memory bus frequency
  - Dual-channel, 2x64 bits
- Up to 32MB additional SDRAM, FPGA-controlled, e.g. for video data
- Up to 8MB boot Flash
- Up to 8MB non-volatile SRAM
  - Backed by GoldCap or external battery
- Up to 16KB non-volatile serial FRAM
- Serial EEPROM 3x2kbit for factory settings
- CompactFlash® card interface, optional, instead of XMC/PMC 0

Mass Storage
- Parallel IDE (PATA)
  - One port for local hard-disk/CD-ROM, or:
  - One port for local CompactFlash®
  - One port for rear I/O
- Serial ATA (SATA)
  - One port via onboard connector
  - One port for rear I/O
  - Transfer rates up to 150MB/s

Graphics
- FPGA-controlled
  - 2D graphics, frame-buffered
  - VGA up to SXGA
  - Maximum resolution: 1280 x 1024 pixels
  - Supports BIOS for set-up and control
  - Operating system support by means of dedicated drivers
- VGA/COM Adapter (see Accessories), instead of XMC/PMC
- Standard VGA graphics with integrated operating system support can be added as needed through an XMC/PMC

I/O
- USB
  - One USB 2.0 port at front via Series A connector
  - Two USB 2.0 ports via rear I/O
  - UHCI implementation
  - Data rates up to 480Mbits/s
- Ethernet
  - Two 10/100/1000Base-T Ethernet channels at front panel
  - Two 10/100/1000Base-T Ethernet channels at rear (2.16)
  - RJ45 connectors at front panel
  - Ethernet controllers are connected by four x4 PCIe® links
  - Two onboard LEDs per channel (front) to signal LAN Link, Activity status and connection speed
- Two UARTs (COM1..COM2)
  - Via onboard adapter or rear I/O
  - COM1: Physical RS232 interface at front panel using adapter PCB, or: via rear I/O
  - COM2: Via rear I/O, or: Physical interface at front panel using SA-Adapter™ via 10-pin ribbon cable on I/O connector, optional, instead of XMC/PMC 0, RS232..RS485, isolated or not
  - Data rates up to 115.2kbits/s
  - 16-byte transmit/receive buffer
  - Handshake lines: full support (rear I/O); CTS, DCD, DSR, DTR, RTS (COM1 at front); CTS, DTR, RTS (COM2 at front)
- 25 GPIO lines
  - Via rear I/O
- Further I/O depending on FPGA configuration

Front Connections
- One USB 2.0 (Series A)
- Two Ethernet (RJ45)
- COM1/VGA (optional, instead of XMC/PMC 0)
- COM2 (D-Sub, optional, instead of XMC/PMC 0 and COM1/VGA)
- XMC/PMC 0 and 1
- CompactFlash® (optional, instead of XMC/PMC 0 and COM1/VGA)

Rear I/O
- IDE (PATA), one port
- SATA, one port
- USB 2.0, two ports
- Ethernet 1000Base-T according to PICMG 2.16, two ports
- COM1/COM2
- 25 GPIO lines
- Mezzanine rear I/O: Two PMC

FPGA
- Standard factory FPGA configuration:
  - 16Z052_GIRQ - Interrupt controller
  - 16Z024_SRAM - SRAM controller
  - 16Z043_SDRAM - Additional SDRAM controller (up to 32MB)
  - 16Z044_DISP - Display controller (60Hz/75Hz, 6-bit RGB)
  - 16Z034_GPIO - GPIO controller (25 lines)
- The FPGA offers the possibility to add customized I/O functionality. See FPGA.

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Technical Data

Board Management
- Board Management Controller (BMC)
- CPU alarm and status monitoring
- Voltage and current supervision
- Reset control
- CPU and board temperature monitoring
- Prepared for BIOS update via BMC

Mezzanine Slots
- Two slots usable for PMC or XMC
- 2 XMC slots
  - Compliant with XMC standard VITA 42.3-200x
  - PCI Express® links: one x4 or two x4 or one x8
- 2 PMC slots
  - Compliant with PMC standard IEEE 1386.1
  - 32-bit/33-MHz, 3.3V V(I/O)
  - PMC I/O module (PIM) support

Miscellaneous
- Real-time clock with GoldCap backup
- Reset button
- Four status LEDs, one hot-swap LED (blue)

PCI Express®
- Four x4 links to connect local 1000Base-T Ethernet controllers (1GB/s in each direction)
- Two x4 links or one x8 link for XMC extension (1GB/s or 2GB/s in each direction)

CompactPCI® Bus
- Compliance with CompactPCI® Core Specification PICMG 2.0 R3.0
- System slot
- Up to 64-bit/66-MHz PCI-to-PCI bridge / PCI-X
- V(I/O): +3.3V
- CompactPCI® hot-swap support compliant with CompactPCI® Hot Swap Specification PICMG 2.1 R2.0
- Compliance with CompactPCI® Packet Switching Backplane PICMG 2.16 R1.0
- Prepared for compliance with CompactPCI® System Management PICMG 2.9 R1.0

Electrical Specifications
- Supply voltage/power consumption:
  - +5V (-3%/+5%), 10A typ. (2 processors 1.66GHz)
  - +3.3V (-3%/+5%), 3A typ.
  - ±12V (-5%/+5%), only used for XMCs/PMCs and hard-disk connector
- MTBF: 114,626h @ 40°C according to IEC/TR 62380 (RDF 2000)

Mechanical Specifications
- Dimensions: conforming to CompactPCI® specification for 6U boards
- Front panel: 4HP with ejector and heat sink
- Weight: 410g (without XMCs or PMCs)

Environmental Specifications
- Temperature range (operation):
  - 0..+40°C (4HP) with P601 mezzanines
  - 0..+45°C (4HP) w/o mezzanines
  - 0..+60°C (8HP with larger heat sink) with mezzanines
  - Airflow: min. 3.5m/s
- 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
- Conformal coating on request

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)

BIOS
- Award BIOS

Software Support
- Windows®
- Linux
- VxWorks® (on request)
- For more information on supported operating system versions and drivers see Software.

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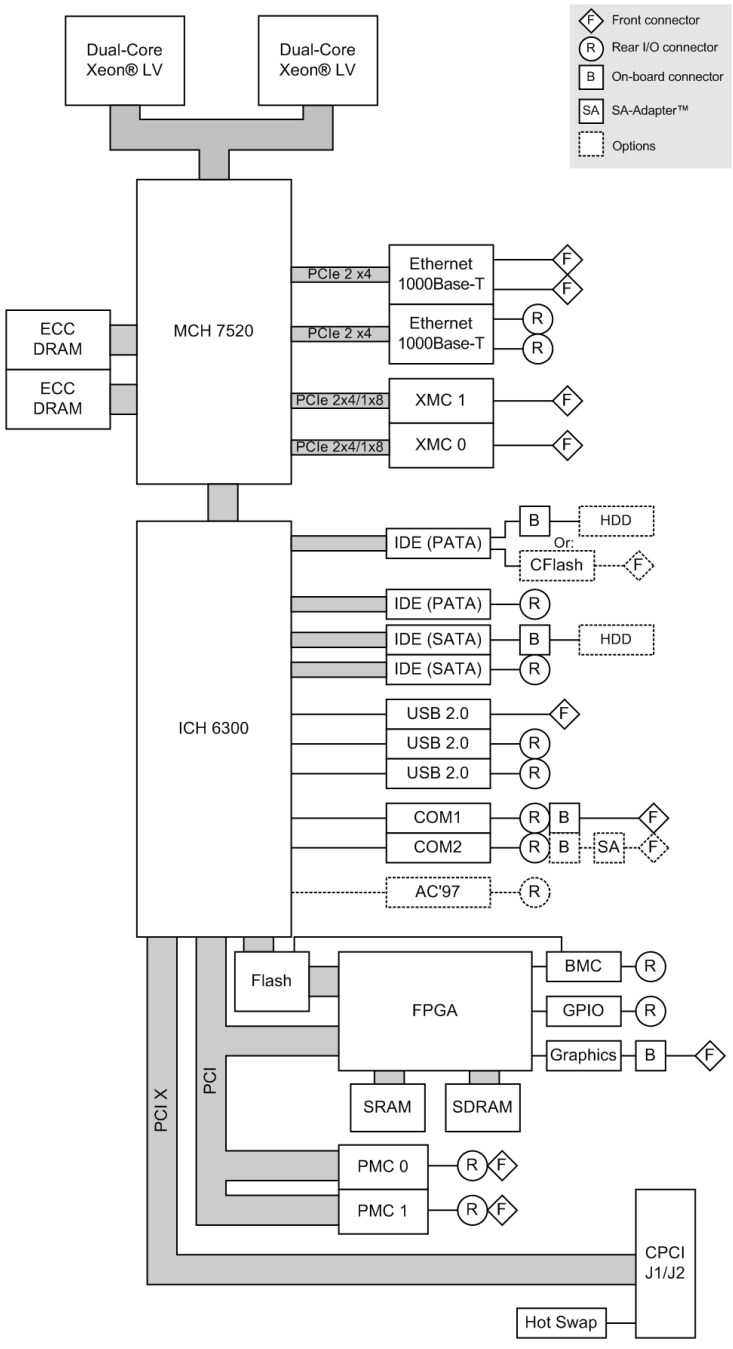
Diagram


Dual-Core Xeon® LV
Dual-Core Xeon® LV
Front connector
Rear I/O connector
On-board connector
SA-Adapter™
Options
MCH 7520
ECC DRAM
ECC DRAM
PCIe 2 x4
Ethernet 1000Base-T
PCIe 2 x4
Ethernet 1000Base-T
PCIe 2x4/1x8
XMC 1
PCIe 2x4/1x8
XMC 0
ICH 6300
IDE (PATA)
HDD
Or:
CFlash
IDE (PATA)
IDE (SATA)
HDD
IDE (SATA)
USB 2.0
USB 2.0
USB 2.0
COM1
COM2
SA
AC'97
Flash
FPGA
BMC
GPIO
Graphics
SRAM
SDRAM
PCI X
PCI
PMC 0
PMC 1
CPCI J1/J2
Hot Swap

Configuration & Options

Standard Configurations

Article No.	CPU Type	System RAM	Additional SDRAM	SRAM / FRAM	Boot Flash	XMC/PMC	Operation Temp.
02D007-00	2 Dual Core Xeon®, 1.66 GHz	2 GB DDR2 ECC	32 MB	8MB / 16KB	2MB	2 slots	0..+45°C

Options

Memory

- System RAM
  - 256 MB, 512 MB, 1 GB or 2 GB (4GB when components available)
- Additional SDRAM
  - 0 MB, 16 MB or 32 MB
- SRAM
  - 0 MB, 2 MB, 4 MB or 8 MB
- FRAM
  - 0 KB, 8 KB or 16 KB
- CompactFlash®
  - 0 MB up to maximum available
- Boot Flash
  - 2 MB, 4 MB or 8 MB

Mass Storage

- CompactFlash® card interface
  - Instead of XMC/PMC 0, instead of COM1/VGA
  - Via onboard IDE
  - Type I
  - True IDE
  - DMA support
- Hard disk on board
  - Instead of XMC/PMC 0, instead of COM1/VGA
  - Via PATA onboard connector
  - Still only one slot needed
  - Using adapter kit

I/O

- I/O alternative to XMC/PMC 0 or COM1/VGA
  - Onboard hard disk
  - CompactFlash® slot, or:
  - COM2 at front panel via SA-Adapter™
  - SA-Adapter™ for COM2 for RS232 or RS422/485, isolated or not
- XMC/PMC
  - 0, 1 or 2 slots

Rear I/O

- IDE (PATA), one port
- SATA, one port
- USB 2.0, two ports
- Ethernet 1000Base-T according to PICMG 2.16, two ports
- COM1/COM2
- 25 GPIO lines
  - Can be extended by 50 additional lines by reducing PMC rear I/O
- AC'97 audio
  - Reduces GPIO lines
- Mezzanine rear I/O: PMC 0 and 1

FPGA

- Pin count of rear I/O connectors:
  - 50 additional pins on J5
  - Usable for GPIO
  - Reduces PMC rear I/O

Mezzanine Slots

- 0, 1 or 2 XMC/PMC slots
  - Second slot (XMC/PMC 0) instead of COM1/VGA

Backplane

- PICMG 2.16 Only Operation

Operation Temperature

- 0..+45°C (4HP)
- 0..+60°C (8HP)

Please note that some of these options may only be available for large volumes. Please ask our sales staff for more information.

FPGA

Flexible Configuration

- This MEN board offers the possibility to add customized I/O functionality in FPGA.
- It depends on the board type, pin counts and number of logic elements which IP cores make sense and/or can be implemented. Please contact MEN for information on feasibility.
- You can find more information on our web page "User I/O in FPGA"

FPGA Capabilities

- FPGA Altera® Cyclone® EP2C20
  - 18,752 logic elements
  - 239,616 total RAM bits
- Connection
  - Available pin count of rear I/O connectors: 25 pins (J4, for free configuration)+ 50 pins (J5, limited to GPIO, optional)
  - Functions available through rear I/O

Ordering Information

Standard Hardware

02D007-00	2x Dual Core Xeon ULV 1.66GHz, 2GB DDR2 RAM (ECC), 8MB SRAM, 32MB SDRAM, 16KB FRAM, 2MB Boot Flash, 2 XMC/PMC slots, 0..+45°C

Related Hardware

08CT07-00	CompactPCI rear I/O transition module 6U/80mm, 2 Gb Ethernet, 2 USB 2.0, 2 COMs, 1 PIM slot, 1 CompactFlash slot, connecting to D6, D7, D9, 0..+60°C
15P517-00	Graphics accelerator, 16MB integrated SGRAM, 4 Mbit Flash BIOS, S-Video In/Out and Composite Video Output, 0..+60°C, no RoHS
15P601-00	4-port 1000Base-T Ethernet, 4x RJ45, 2 x4 PCIe links, 5V supply, 0..+55°C

Systems & Card Cages

0701-0030	CompactPCI 19" 3U/84HP rack-mount enclosure for 6U cards (horizontal), 6-slot backplane, system slot left, 250W ATX wide-range PSU, 2 fans, prepared for rear I/O

Miscellaneous

0710-0028	Industrial PATA hard disk, 2.5", 80GB, 24hours/7days, for on-board mounting (hard disk mounting kit may be required additionally), -30..+85°C qualified
08AD71-00	AD71, 2.5" hard disk adapter for A13, A14, A15, D6, D7
08AD93-00	VGA/COM adapter for D6 and D7 on front (occupies second XMC/PMC slot)

Software: OS independent

13Z017-06	MDIS5 low-level driver sources (MEN) for 16Z034_GPIO and 16Z037_GPIO

Software: Linux

13Z044-90	Linux native driver (MEN) for 16Z044_DISP (frame buffer)

Software: Windows

13T001-70	Windows network driver (Intel) for F14, F15, F17, F18, D9, D6, D7, D601, A19, A20 and P601, P602
13T003-70	Windows chipset driver (Intel) for F14, F15, F17, F18, F18E, F19P, D9, D6, D7, D601, A19 and A20
13Z044-70	Windows native driver (MEN) for 16Z044_DISP (frame buffer)

Documentation

20APPN004	Application Note: How to make a USB stick bootable
20D007-00	D7 User Manual
20D007-ER	D7 Errata

For the most up-to-date ordering information and direct links to other data sheets and downloads, see the D7 online data sheet under » www.men.de.

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