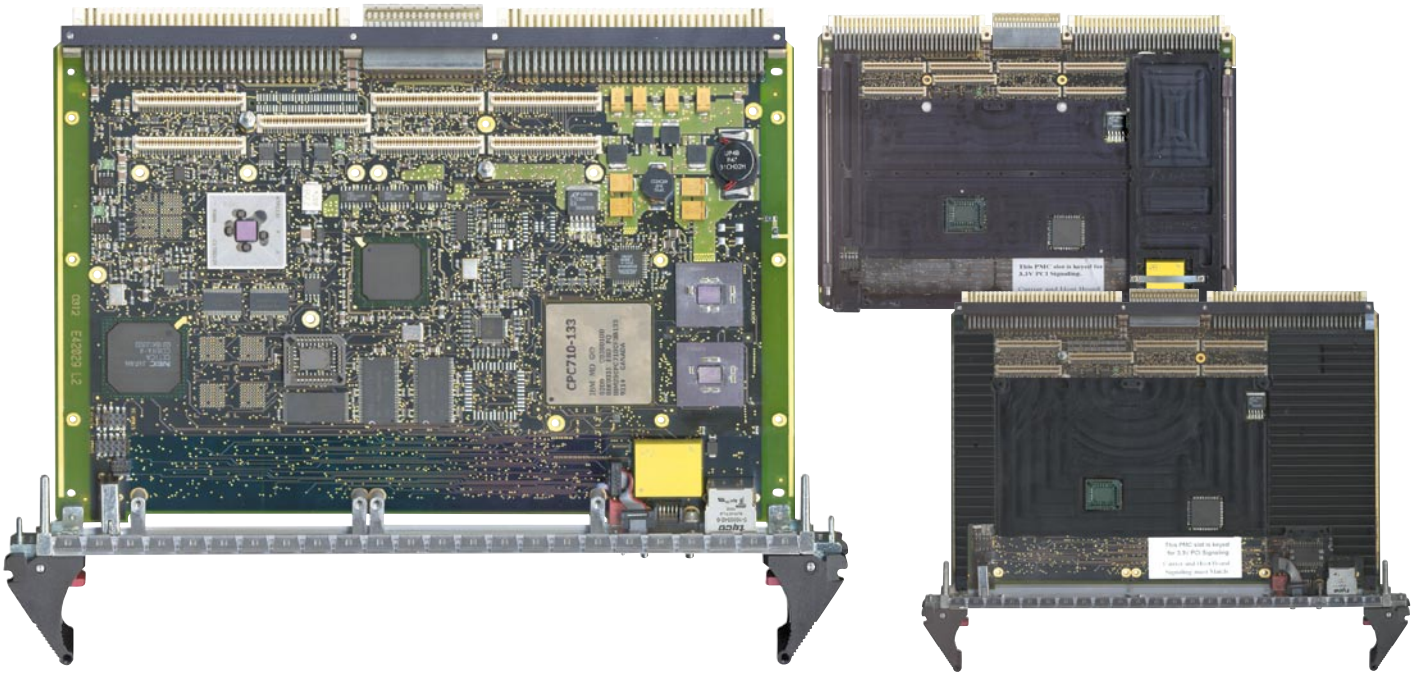
PowerEngine7

Single or Dual PowerPC 750FX/GX



Outstanding Computing Performance with Very Low Power Dissipation

- Single or Dual PowerPC 750FX/GX Operating at up to 1 GHz
- Two PCI Mezzanine Card Sites
- Low Power ALMA2e PCI/VME64 Bridge, Featuring 2eSST Capabilities
- Available in All 4 Environmental Ruggedization Levels
- Fast Track 2-Week Lead Time Version Available
- Supports VxWorks, LynxOS, Green Hills Integrity, Linux, and SYSGO ELinOS

Product Overview

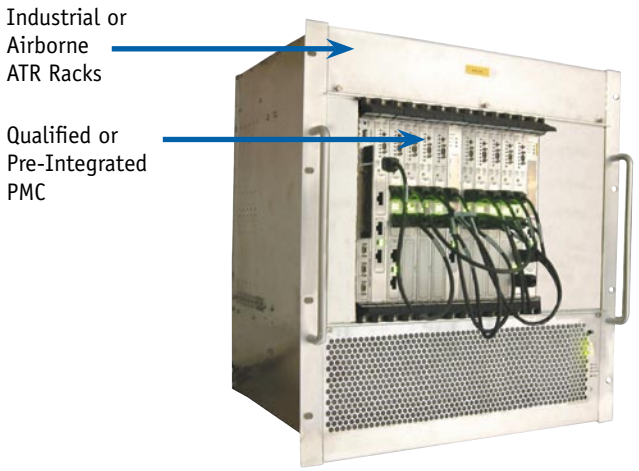
The PowerEngine7 is a major leap forward in Kontron´s technological excellence. The PowerEngine7 meets Kontron´s technology insertion policy which offers customers a clear performance upgrade path while protecting long-term investments in application software.

PowerPC 750FX/GX: Outstanding Performance PowerPC for Power-Conscious Applications

The PowerEngine7 features the latest PowerPC 750FX/GX microprocessor from IBM which delivers 700 MHz to 1 GHz performance for networking, storage, imaging, and other high-performance embedded applications. The PowerPC 750FX/GX fully complies with the PowerPC architecture. It is the first to combine IBM's most advanced process technologies onto one chip, reducing power consumption by up to 50 percent or increasing performance by up to 30 percent. Manufactured in IBM's advanced 0.13 micron process, the chip is the first to include copper interconnects, silicon-on-insulator (SOI) transistors, and low-k dielectric insulation technologies.

The PowerPC 750FX and 750GX have respectively an internal L2 cache capacity of 512 KB and 1 MB. The cache is two-way set associative; each way contains 4096 blocks and each block consists of two 32-byte sectors. Array read and write operations execute in one processor cycle. Moreover, the L1 data cache path to the 60x bus interface unit (BIU) and the L2 cache reload path to the L1 data cache are each 256 bits, a fourfold improvement compared with previous 7xx processors. Additional buffers between the L1 data cache, L2 cache, and the BIU enable the processor to improve both latency and bandwidth by allowing two cache miss transactions to be active simultaneously on the 60x bus. The memory management unit (MMU) has eight data and eight instruction block address translation (BAT) registers to provide flexibility in defining larger blocks of memory for simpler management. Up to 4 GB of memory can be configured, eliminating the need for pagelevel translation in some embedded applications.

Full Pre-Integrated System



Single and Dual Processing

The PowerEngine7 is available in both single- and dual-processor configurations for performance and design flexibility. A dual-processor SBC is a cost-effective, better-performing, and more-reliable alternative to using two single-processor boards. On a dual-processor board, computing tasks can be assigned to one processor, while the other processor handles device drivers and I/O, improving compute time and eliminating the frequent I/O interrupts encountered on a single-processor board. Moreover, the shared memory of a dual-processor board results in very efficient processor communication, removing the need for interboard communication protocol. Finally, a dual-processor SBC ensures a much higher MTBF value, as well as a lower price, than two single boards.

ASIC Innovation for Better Performance, Seamless Software Upgrade and Long-Term Support

To offer the best board-level solutions, Kontron teamed with IBM to develop the key chips of the PowerEngine architecture and to take advantage of IBM technology for low power consumption. AVIGNON, the host bridge, and ALMA2e, the low power VME bridge, benefit from the accumulated experience of both partners since the beginning of the PowerPC and VME.

Single-Source Customer Service

Leveraging more than 15 years of new product development and customer support in embedded and rugged computers, Kontron offers a wide range of integration and maintenance services, from product warranty and start-up assistance to the delivery of fully tested pre-integrated systems and one-stop-shop delivery of qualified racks and PMCs.

Product Warranty and Services

- All of Kontron's hardware products are covered by a two-year return-to-factory warranty.
- Several service programs are available, including update services, hotline access, product repair and exchange services, technical assistance, on-site or remote technical assistance.
- ISO 9001: Kontron's ISO 9001 certification is just another way for us to back our commitment to quality products and customer service.

Finally, in addition to its standard support services, Kontron offers customized consultation to system integrators.

PowerPC Processor

- PowerPC 750FX or 750GX processor
- Either one or two PowerPC operating at up to 1 GHz
- Dual issue superscalar control processor
- L1 cache: 32 KB, 32-byte line, 8-way set associative instruction cache and 32 KB, 32-byte line, 8-way set associative data cache
- Dual Integer Unit
- IEEE-754 Floating Point Unit, one madd per cycle
- Instruction and Data Memory Management Units (MMU)
- Internal 512 KB (750FX) or 1 MB (750GX) L2 cache with ECC: operates at processor frequency
- Very low power implementation

AVIGNON High-Performance Host Bridge

AVIGNON, the host bridge, benefits from the accumulated experience of both IBM and Kontron since the beginning of the PowerPC. It performs as a crossbar between the processors, the main memory, and two PCI busses. This crossbar function is the key to implementing a high-performance computing node. The PowerEngine7 is equipped with the latest release of this bridge, which features backward compatibility with previous releases in order to protect customers' long-term investment in application software. The features of the AVIGNON bridge include double-bank SDRAM memory with ECC, support of dual processors with 133 MHz bus (100 MHz for extended temperature versions), and management of two PCI busses: one 32-bit PCI bus and a second 64-bit PCI bus at up to 66 MHz.

SDRAM Memory

- 128, 256 or 512 MB of onboard SDRAM with ECC
- Double bank memory management handled by the AVIGNON host bridge
- The 1 GHz version of the PowerEngine7 is available only with 512 MB SDRAM.

FLASH Memory

- User Flash: Up to 128 MB of contiguous directlyaccessible, 32-bit wide Flash memory for OS and application code
- System Flash: 2 MB TSOP Flash device organized as Dual Boot Sites; A link selects which device is the boot device on power up

RT Board Controller ASIC

The COBRA chip brings a highly integrated single chip solution to control interrupts by providing up to 32 I/O device interrupt inputs and 4 interprocessor interrupts. Kontron´s COBRA technology is also optimized for real-time applications and offers:

- Connection to PCI bus Rev. 2 (slave mode)
- ISA-like interface for serial ports
- Large non-volatile memory interface (NVRAM, Flash, etc.)
- Optimized message passing with four high-density FIFOs
- General purpose I/Os (six on VME P2)
- Four highly programmable 32-bit global timers

COP/JTAG debug

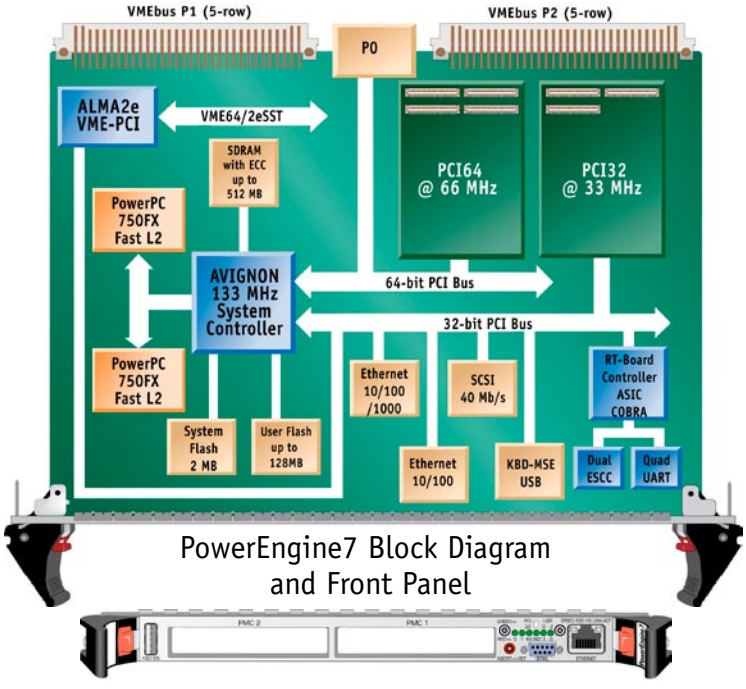
A powerful diagnostic and test interface of any of the PowerPC 750FX through Common-On-Chip processor and IEEE 1149.1 COP/JTAG interface is available onboard using a PMC-type connector. A specific PMC-shaped breakout board can be used in development for easy connection to standard cables.

PCI Interface

Two PCI interfaces (master/slave with burst capability) are implemented on the PowerEngine7 and can operate concurrently:

- The first PCI bus provides a high-speed backbone for local interconnect (local I/O, VME bridge, one PMC-32 slot) and is fully compliant to the PCI specification, Rev. 2 (32-bit).
  Depending on the ordering option, the PCI signaling level of this PCI bus is either 3.3V or 5V.
- The second PCI bus is dedicated for the connection of PMCs. It provides a Rev. 2 standard 64-bit PCI interface that can operate at either 33 or 66 MHz. It operates only at 33 MHz in extended temperature versions. The PCI signaling level of this PCI bus is 3.3V only. Depending on the manufacturing option, this 64-bit PCI bus is routed onto the VME P0 connector allowing the customer to bridgelessly expand the number of PMC slots using Kontron´s V2PMC PMC carrier.

The PowerEngine7 generates onboard stable 3.3V and ±12V power supplies for the PMC, allowing their use in VME racks with as little as 3 rows.



PowerEngine7 Block Diagram and Front Panel

PMC Expansion

For configurations requiring additional PCI connectivity, Kontron offers a PMC carrier card, the V2PMC, that provides two extra PMC slots. The PMC carrier card is fitted in an adjacent VMEbus slot. Applications requiring up to four PCI slots, such as redundant configurations, can therefore be easily implemented. The Carrier Card is connected to the PowerEngine7 with the PCI bus on P0 option, via a P0 overlay on the backplane for optimum flexibility and modularity. The following table summarizes the number of PMC slots available with/ without the carrier board:

Configuration	Bridgeless PMC Slots	VME Slots
PowerEngine7 without Carrier Card	2	1
PowerEngine7 with PCI on P0 option and Carrier Card	4	2
PowerEngine7 with PCI on P0 option and Dual Carrier Card	Contact Kontron	

ALMA2e VME Interface

- Managed by the ALMA PCI-to-VME bridge component, a highly integrated low-power, single-chip solution
- VME64 ANSI/VITA-1 1994 compliant
- VMEbus system controller
- VMEbus requester (Level 1-4)
- VMEbus interrupter and interrupt handler (IRQ1-7)
- VMEbus master/slave A32, A24, A16:D32, D16, D8, UAT
- VMEbus master/slave A32, A24: D32BLT, D64MBLT
- Programmable VME slave image base address and size (8 VME slave channels)
- PCI-to-VME access conversion through 8 MB granularity mapping table
- Transmit/Receive FIFOs
- Programmable posted write, prefetch read, coupled mode
- Programmable BB2BLT mode: mapping of multiple single PCI accesses to a VMEbus BLT/MBLT cycle
- Programmable 2eSST support:
  - A32/64 - D64 2eSST
  - A32/64 - D64 broadcast 2eSST modes. Please contact Kontron to learn how to optimize your system integration.
- Semaphore registers
- VME/PCI 2-channel DMA controller
- Hardware watchdog feature

Firm Plug System

Dedicated rigid bars enable a firm connection and increase reliability.

PBIT, IBIT

Automatically triggered at power up, PBIT executes several simple checks of main board functions before launching the debug monitor.

IBIT can then be executed, on demand, by using the "auto" firmware command. IBIT executes a comprehensive suite of functional tests and leaves results in the main DRAM of the board. These non-intrusive IBIT tests cover more than 95% of the board's functional nodes, and test results can be read back by the board's operating system or collected by the rack supervision board.

Local I/O

The PowerEngine7 is loaded with all the I/O you'd expect from a Single Board Computer. Due to the limited number of I/O pins available on the VME backplane, please consult the PowerEngine7 Users' Manual for a detailed description of the availability of all the I/O.

Port	Description	I/O Location
Quad UART (1) 16550 compliant	Software Configurable as either: ➤ One single channel full modem ➤ Two or Four channels Tx,Rx only	Front or Rear
Dual ESCC (1)	Synchronous/Asynchronous	Rear
Keyboard and Mouse	USB interface	Front or Rear
General Purpose I/O	Up to six TTL I/O	Rear
SCSI (2)	8/16 bits, 40MB/s	Rear
Ethernet 10/100 (2)	10/100BASE-T	Front or Rear
Ethernet 10/100/1000 (2)	10/100/1000BASE-T	Front or Rear

(1) Depending on the version, serial lines support either EIA-232 or software configurable EIA-232/422/485 >> Please contact Kontron for additional information.
(2) SCSI speed is reduced when used in extended temperature versions. Narrow or wide depending on the I/O routing option on VME-P2

Board Support Packages

The PowerEngine7 supports VxWorks release 6.2 with Workbench 3 and ARINC 653 from WindRiver, LynxOS 4.0 from LynuxWorks, Linux release 2.6 Fedora from Redhat, ELinOS from SYSGO, as well as INTEGRITY 4.09 from Green Hills.

Kontron provides real-time OS extensions for the PowerEngine7 that facilitate development of high-end realtime data and signal processing applications on multiprocessor clusters (see PowerLine data sheet).

Rear Transition Module

Kontron VITA36 compliant or compact size Rear Transition Module (RTM) provide a connection interface for the PowerEngine7 board's I/O ports and PMC sites I/O that are connected to P2 and/or P0 of the back panel.

Easy PowerPC System

The Easy System is an unique turnkey VME system offering:

- A PowerEngine7
- One SCSI disk
- Selectable pre-loaded VxWorks, LynxOS and Linux BSP
- One month hotline technical support access



Miscellaneous

- Board size: VME double Eurocard (6U: 233.3 mm x 160 mm)
- Single VME slot
- Convection-cooled version carries the Ruggedizer but keeps the front panel I/O.
- Conduction-cooled version is IEEE 1101.2-1992 compliant and is a single VME slot solution.
- Electromagnetic compatibility:
  - NF EN 55022 Class B
  - NF EN 50082-2
- All Kontron boards are EC-compliant.

Technical Information

CPU	
Processor	One or two PowerPC 750FX or 750GX
Clock Frequency	700 MHz to 1 GHz
MIPS	2300 DMips @ 1 GHz (Dhrystone 2.1 MIPS)
Memory	
Global Memory	128, 256, 512 MB onboard
ECC	Standard
L2 Cache Memory	Fast 512 KB internal

VME Interface

- ALMA2e V64 VME/PCI bridge with semaphore registers
- A32/A24/A16 master / slave
- D64 (MBLT) / D32 (BLT) / D16 / D08 master / slave
- 5-row connectors, 3-row compatible
- 2eSST enhancements: Contact Kontron

PCI Interface

- PCI revision 2 compliant
- PMC#1: PCI 32-bit/33 MHz, 3.3V and 5V signaling build option
- PMC#2: PCI 64-bit/33 or 66 MHz selectable, 3.3V signaling (33 MHz in extended temperature versions or with V2PMC carrier board)

Miscellaneous

- 4 async. serial lines selectable on either front or rear
- Optional 2 ESCC sync./async. serial lines on rear panel
- Ethernet 10/100 and optional Ethernet 10/100/1000 available on either front or rear panel
- 6 TTL level general purpose I/O

Typical Power Requirements

+5V (+5%, -2.5%)	Single	Dual
733 MHz	2.9A/14.4W	3.2A/17.0W
1 GHz	3.8A/18.4W	5.8A/29W

+12V (±2.5%) only when serial line 0 on P2 is used

Environmental Specifications				
	SA Standard Commercial	**WA** Extended Temperature	**RA** Rugged Air-Cooled	**RC** Rugged Conduction-Cooled
Conformal Coating	Optional	Standard	Standard	Standard
Airflow	1.2 m/s	1.5 m/s	1.8 m/s	NA
Temperature	VITA 47-Class AC1	VITA 47-Class AC2	VITA 47-Class AC3	VITA 47-Class CC4
Cooling Method	Convection	Convection	Convection	Conduction
Operating	0° to +55°C	-20° to +65°C	-40° to +75°C	-40° to +85°C
Storage	-45° to +85°C	-45° to +85°C	-45° to +100°C	-45° to +100°C
Vibration Sine (Operating)	20/500 Hz: 2g	20/500 Hz: 2g	20/2,000 Hz: 3g	20/2,000 Hz: 5g
Random	VITA 47-Class V1	VITA 47-Class V1	VITA 47-Class V2	VITA 47-Class V3
Shock (Operating)	20g/11 ms Half Sine	20g/11 ms Half Sine	40g/20 ms Half Sine	40g/20 ms Half Sine
Altitude (Operating)	-1,640 to 15,000 ft	-1,640 to 33,000 ft	-1,640 to 33,000 ft	-1,640 to 50,000 ft
Relative Humidity	90% without condensation	95% without condensation	95% without condensation	95% without condensation

Ordering Information

		VMPC7-														
		SA	WA	RA	RC											
Processors	Single	X	X	X	X	1										
	Dual	X	X	X	X	2										
Environment Class	Standard (Air)	X					SA									
	Extended Temperature (Air)		X				WA									
	Rugged Convection-Cooled (Air)			X			RA									
	Rugged Conduction-Cooled				X		RC									
Clock Speed	PPC 750FX 700 MHz/100 MHz	X	X	X	X			6								
	PPC 750FX 733 MHz/133 MHz	X						7								
	PPC 750GX 1 GHz/100 MHz	X	X	X	X			9								
	PPC 750GX 1 GHz/133 MHz	X						A								
SDRAM	128 MB (PowerPC 750FX)	X	X	X	X				2							
	256 MB (PowerPC 750FX)	X	X	X	X				3							
	512 MB (PowerPC 750FX and GX)	X	X	X	X				4							
Flash	No User Flash	X	X	X	X					N						
	64 MB	X	X	X	X					3						
	128 MB	X	X	X	X					4						
I/O routing on P0 & P2	VMPC6a like PCI 64 on P0, PMC64 on P2-46 dz	X	X	X	X						00					
	PMC-P4 on P0 & P2 VITA 31 Gigabit Ethernet	X	X	X	X						10					
Ethernet 10/100/1000	Single Ethernet 10/100 front panel	X	X	X								0				
	GBE front panel, Ethernet 10/100 rear P2	X	X	X								1				
	Single Ethernet 10/100 rear P2	X	X	X	Default							2				
	Dual Ethernet on rear	X	X	X	X							3				
Dual ESCC ports	Not equipped	X	X	X	X								0			
	Option available	X	X	X	X								1			
PMC32 slot VIO key	5V	Default												0		
(PCI Signaling Voltage)	3.3V	Option												1		
Other Options	P0 Connector	Default													0	
	No P0 connector	Contact Kontron													N	
Coating		X	Default													V

Add code V only when not default

Fast Track 2-Week Lead Time Version: VMPC7-1SAA43-001000

Corporate Offices

Europe, Middle East & Africa
Oskar-von-Miller-Str. 1
85386 Eching/Munich
Germany
Tel.: +49 (0)8165/ 77 777
Fax: +49 (0)8165/ 77 219
sales@kontron.com

North America
14118 Stowe Drive
Poway, CA 92064-7147
USA
Tel.: +1 888 294 4558
Fax: +1 858 677 0898
sales@us.kontron.com

Asia Pacific
17 Building,Block #1,ABP.
188 Southern West 4th Ring Road
Beijing 100070,P.R.China
Tel.: + 86 10 63751188
Fax: + 86 10 83682438
kcn@kontron.cn

Kontron Modular Computers S.A.
150, Rue Marcelin Berthelot
ZI Toulon Est - BP 244
83078 Toulon Cedex 9 - France
Tel: +33 (0) 4 98 16 34 00
Fax: +33 (0) 4 98 16 34 01
sales@kontron.com

#PowerEngine7#1405208PDL
Copyright© 2008 Kontron AG. All rights reserved. All data is for information purposes only and not guaranteed for legal purposes. Information has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Kontron and the Kontron logo and all other trademarks or registered trademarks are the property of their respective owners and are recognized. Specifications are subject to change without notice.