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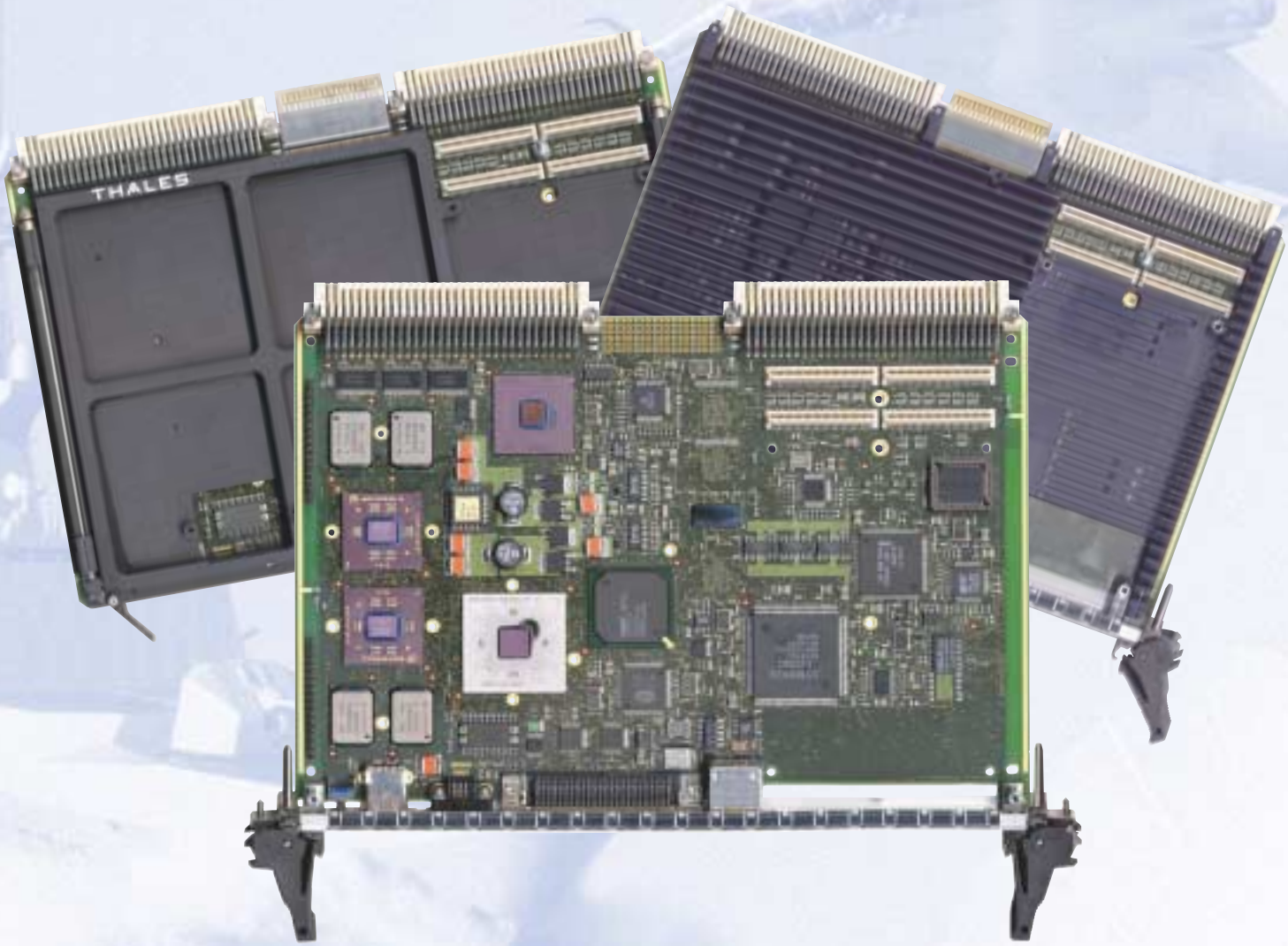
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THALES COMPUTERS | **Where COTS Meets Reality**



PowerEngine VMPC6d & VMPC6d-Dual

With the VMPC6d featuring the fastest combination of 500 MHz PowerPC 7410 (G4) processor and AVIGNON memory bridge, Thales Computers sets a new performance standard for the most demanding data and signal processing computers in military and aerospace applications.

General Overview

At Thales Computers, we have a whole-system philosophy when it comes to innovation. We actively pursue and develop techniques for improving our product performance, I/O capabilities, multiprocessor and cluster management and ruggedness to give our customers maximum design flexibility with cutting-edge technology. The PowerEngine6 series represents another step forward in Thales Computers' technological progress. As the PowerPC® experts, we continue to track the evolution of PowerPC technology and offer our customers extensive COTS design experience. Of course, the PowerEngine6 series is available with The Ruggedizer™, our patented convection- and conduction-cooled heatsink solution for harsh environments.

ASIC Innovation

To offer the best board-level solutions, Thales Computers teamed with IBM to develop the key chips of the PowerEngine6 architecture and to take advantage of IBM technology for low power consumption.

AVIGNON, the host bridge, benefits of the accumulated experience of both partners since the beginning of the PowerPC. The features and performances of the AVIGNON bridge are adapted to the PowerPC versions. Such features include double-bank SDRAM memory with ECC, support of dual processors with 100 and 133 MHz PowerPC bus, and management of two PCI busses: one 32-bit PCI bus for I/O management and a second 64-bit PCI bus at up to 66 MHz.

ALMA64 is the PCI/VMEbus bridge that interfaces the 32-bit PCI bus of AVIGNON with the VME64 bus. Due to its small die size, ALMA64 surpasses the competition for low power designs.

COBRA is dedicated to the control of interrupts and other real-time functions. The interrupt control features an OpenPIC compliant device including microprocessor support and support for all variations of edge/level high/low polarity on 32 interrupt sources. With numerous timers, control of NVRAM and Flash Memory, FIFOs for message passing, etc., COBRA eases the development of real-time application and the control of complex I/Os.

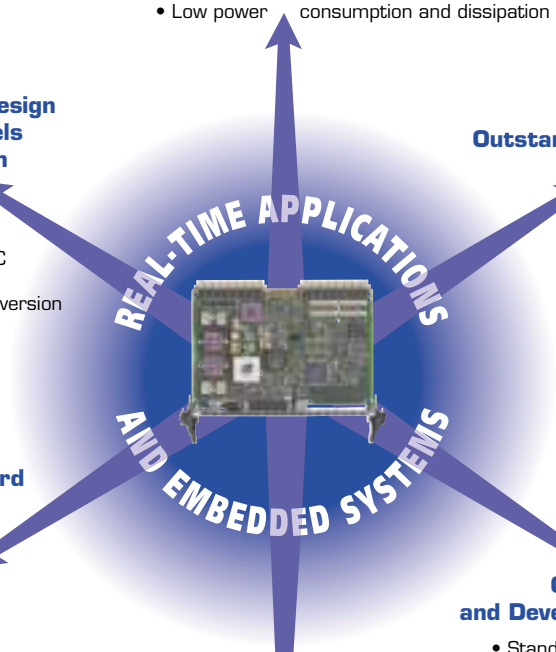
Designed for Harsh Environments

Available in several different configurations representing multiple levels of ruggedization, Thales Computers' SBCs can be tailored to any application's needs. Ruggedization occurs early in the SBC's design phase following Thales Computers' stringent selection of components, strict design and layout rules, intense simulation tests, and an established high-quality manufacturing process.

The PowerEngine6 SBC designed-in ruggedization is then augmented with The Ruggedizer™, a patented heat-drain technology from Thales. The PowerEngine6 family is available with four levels of ruggedization: "standard" (SA) for commercial applications, "extended temperature" (WA) for higher climatic and humidity constraints, and two Ruggedizer-equipped models: the rugged air-cooled version (RA) and the rugged convection- cooled version (RC) for harsh conditions such as shock, vibration, and humidity. After years of providing harsh environment solutions, Thales Computers' ruggedized PowerEngine6 family is uniquely positioned to provide a wide range of products for the industrial, military and aerospace environments.

1 VME Slot: Easy to Integrate
- High-performance COTS VME solution for signal processing
- Compact rugged design for severe environments
- Low power consumption and dissipation

One standard design for multiple levels of Ruggedization
- SA: Standard commercial environments
- WA: -20° to +65°C
- RA: Rugged air convection-cooled version (-40° to +75°C)
- RC: Conduction-cooled version (-40° to +85°C)



Outstanding Performance
- Dual PowerPC 7410 (G4) architecture
- Optimized double bank memory management
- Two high-performance PCI busses

Includes standard powerful SBC (Single Board Computers) functionalities
- SCSI
- Ethernet
- Flash memory
- Numerous I/Os
- Built-In-Test

Wide Range of Operating Systems and Development Solutions
- Standard Real-Time environments (LynxOS, Tornado/VxWorks, etc.)
- Compatibility with the CHRP standard
- A complete range of tools for the development of complex data and signal processing applications

Wide range of PCI Mezzanine Cards (PMC) with Corresponding Drivers
- Graphics,
- Communications,
- High-speed networking,
- Data acquisition, etc.

VMPC6d & VMPC6d-Dual

The VMPC6d SBC features one or two 500 MHz PowerPC 7410 microprocessors from Motorola. With its AltiVec™ vector processing unit, the PowerPC 7410 is ideally suited for signal processing functions and leading-edge computing. With more than 1700 MIPS in a single VME slot, the VMPC6d delivers unprecedented computing power and enables real-time processing of the most demanding data streams. Thales Computers' software extensions to the base operating system ease the development and deployment of applications on complex architectures, providing a new COTS approach for data and signal processing in military and aerospace equipment.

VMPC6d & VMPC6d-Dual

Thales Computers' VMPC6d SBCs are designed to support Motorola's latest PowerPC G4 technologies.

The VMPC6d and VMPC6d-Dual, as specified below, have an onboard single or dual 500 MHz PowerPC 7410 processor.

Technical Data

PowerPC Processor

- Either one or two superscalar PowerPC 7410 processors
- MIPS: 855 at 466 MHz per processor
- L1 cache: 32 KB instruction cache and 32 KB data cache
- Four instructions per clock cycle
- Dynamic branch prediction
- Multiple integer units
- Memory Management Unit (MMU)
- 64-bit data bus
- Fully JTAG-compliant
- Test functionality (SA and WA versions)
- Low power implementation
- AltiVec™ extension

Ethernet Interface

- Onboard PCnet-PCI Ethernet controller: 10/100BASE-T on front panel or P2 (option on P2 for SA, WA, and RA versions, standard on RC)
- ANSI 802.3-compliant
- Managed by INTEL's 21143 chip

SCSI Interface

This interface enables easy connection with industry-standard mass storage devices (i.e. hard disk, CD-ROM, streamer, etc.).

- Managed by the SYM53C875A PCI-SCSI I/O processor (SIOP)
- Wide Ultra SCSI bus transfers in single-ended mode (40 MB/s)

Serial Lines

- Two available EIA-232 ports
- Handled by TL16C550C components
- INS8250N-B, PC16550A, PC16450 software compatible

ALMA64 VME Interface

- Managed by the ALMA64/IBM 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
- Semaphore registers
- VME/PCI 2-channel DMA controller

Keyboard / Mouse

- Keyboard and mouse interface

SDRAM Memory

- 128, 256, or 512 MB of onboard SDRAM with ECC
- Double bank memory management handled by the AVIGNON CPC710 host bridge

Cache Memory

2 MB cache memory per processor is implemented (high performance transfers due to dedicated L2 Bus) running at high speed (clock ratio 1:2).

ROM Memory

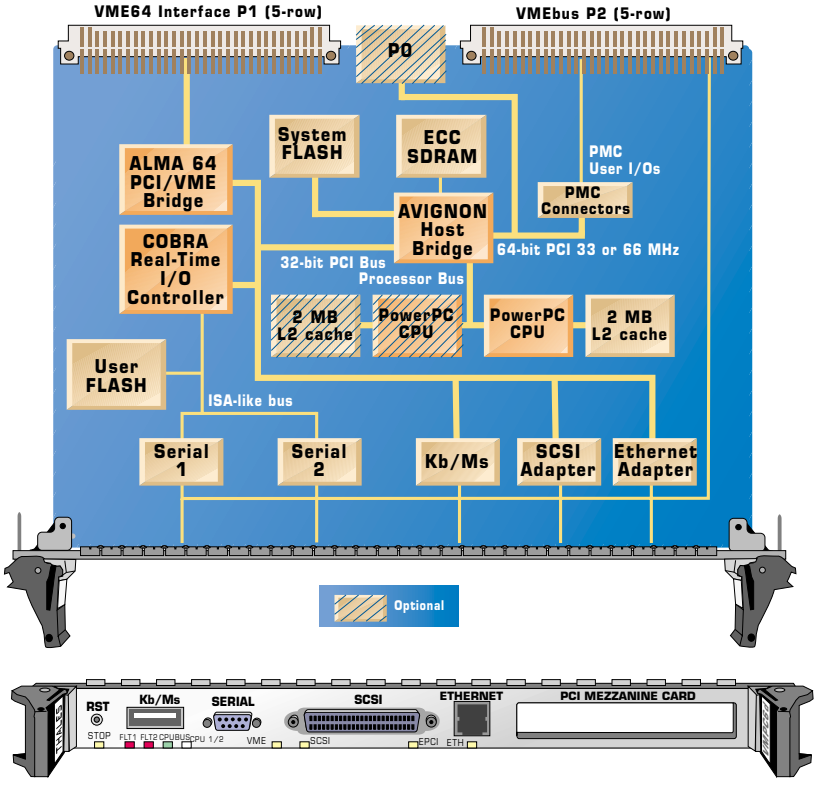
512 KB + 1 MB of system Flash EPROM are available for initialization and operating system boot routines.

Additional User Flash (up to 32 MB) is devoted to embedded system requirements.

NVRAM/RTC

An 8 KB NVRAM chip provides convenient nonvolatile storage for board parameters. MT48T18 (SA class) or MT48T59 (RA and RC classes) provide real-time clock and time of day with battery-backed storage.

This NVRAM/RTC feature is standard on SA and WA class products and optional on RA and RC class products.



PCI Interface

Two PCI interfaces (master/slave with burst capability) are implemented on the VMPC6d:

- The internal interface provides a high-speed backbone for local interconnect of onboard devices (host bridge, Ethernet, SCSI, keyboard and mouse, etc.) and is fully compliant to PCI Specification, Rev. 2 (32-bit).
- The external PCI interface is designed for connecting one PCI Mezzanine Card (PMC). It provides a Rev. 2 standard 64-bit PCI interface that can operate at 33 or 66 MHz. Connecting a PMC to a host increases performance and functionality at low cost.

The signaling level of the PCI bus can be either 5V or 3.3V. It is fixed at the manufacturing stage according to the order code. PCI signaling levels of all the interconnected devices, VMPC6d, PMC and PMC carrier should match. Both the PowerEngine6 single and dual SBC can maintain concurrent bus operations on two PCI busses using a uniquely optimized host bridge. This allows applications using PCI busses to operate efficiently in parallel, doubling available throughput.

PMC Carrier Card

Thales Computers offers 2 PMC carriers that expand the PCI bus to extra PMC slots:

- ***ICPMC6:*** brings 2 extra PCI 64 slots to the VMPC6d allowing the assembly VMPC6+ICPMC6 able to host 3 PMCs while occupying 2 VME slots. The ICPMC6 is not available in a rugged conduction-cooled version.
- ***V2PMC:*** available in all the environment classes, it expands the PCI bus of the VMPC6 to add two PMCs via the PO. The usable PCI bus is limited to PCI 32/33 MHz.

The following table summarizes the number of PMC slots available with and without the carrier board.

Configuration	PMC Slots	VME Slots	Availability
VMPC6d without Carrier Card	1	1	SA, WA, RA, RC
VMPC6d with ICPMC6	3	2	SA, WA
VMPC6d with V2PMC	3	2	SA, WA, RA, RC

For the Rugged conduction-cooled version (RC), the PMC slot can accept conduction-cooled PMCs according to the CCPMC VITA-20 standard.

Dedicated Real-Time I/O Controller: COBRA

The COBRA chip brings a highly-integrated single-chip solution to control interrupts by providing up to 32 I/O device interrupts inputs and 4 interprocessor interrupts.

Thales Computers' 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, RTC, etc.
- Large non-volatile memory interface (NVRAM, Flash, etc.)
- Optimized message passing with four high-density FIFOs
- General purpose I/Os
- Four highly programmable 32-bit global timers

PBIT, IBIT

Automatically triggered at power up, PBIT executes several simple checks of main board functions before launching the VMPCBug 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 nonintrusive IBIT tests cover more than 95% of the board's functional nodes. These test results can be read back by the board's operating system, or they can be collected by another VMPC board running the rack supervision software.

Software

Thales Computers provides the real-time OS extensions on the VMPC6d and VMPC6d-dual to facilitate development of high-end real-time data and signal processing applications on clusters of multiprocessor boards. These extensions are available for operating systems such as LynxOS or VxWorks. For example, a VSIPL* library optimized for the G4 boosts the performance of the AltiVec™ vector unit while simplifying the programming of portable signal processing code.

Linux is also available on the VMPC6d. In conjuction with LynxOS 4, Linux BlueCat from LynuxWorks provides both real time and Lynux benefits.

In addition, Thales Computers offers a specific software called DDLink that manages and optimizes data transfers between the processing units in large-scale signal processing applications implemented on multiple computing nodes. This API and associated protocol operating on processor busses implement a NO-COPY message passing system. DDLink is also used to seamlessly implement any system area network with various hardware communication fabrics technologies.

Thales Computers also provides the necessary tools to facilitate management and monitoring of complex multiboard architectures. These tools include machine supervision building blocks which insulate the end user from low-level hardware details as well as cross-compilers and multiprocessor debugger products that are compatible with the various CASE environments.

Finally, in addition to our standard support services, Thales Computers offers customized consultation to system integrators.

** See www.vsipl.org for details*

Connectivity

- All I/O on Thales Computers' PowerEngine6 SBCs are available either via the front panel or P2.
- For the conduction-cooled version (RC), all I/O are directed to P2 according to IEEE 1101.2-1992 standard.
- 6 general purpose I/O TTL-compatible signals are available via the VME P2 (connected to COBRA).

Product Warranty and Services

- All of Thales Computers' hardware products are covered by a twelve month 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: Thales Computers' ISO 9001 certification is just another way for us to back our commitment to quality products and customer service.

Miscellaneous

- Board size: VME double Eurocard (6U: 233.3 mm x 160 mm)
- Single VME slot
- Convection-cooled version (VMPC6d /RA) carries the ruggedizer but keeps the front panel I/O
- Conduction-cooled version (VMPC6d /RC) 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 Thales Computers SBCs are EC-compliant.

VMPC6d Technical Features

CPU

Processor	One or two PowerPC 7410 (G4/AltiVec)
MIPS	855 @ 466 MHz per processor

MEMORY

Global Memory	128, 256, 512 MB on board
ECC	Yes (standard)
Cache Memory	2 MB per processor (on processor dedicated bus)
ROM Flash Memory	512 KB + 1 MB System Flash Memory Up to 32 MB User Flash

VME INTERFACE

- ALMA V64 VME/PCI bridge with semaphore registers
- A32/A24/A16 master/slave
- D64 (MBLT)/D32 (BLT)/D16/D08 master/slave
- 5-row connectors compatible with 3-row backplanes

USER PCI INTERFACE

- PCI fully compliant (32/64-bit)
- 1 PMC slot (up to 3 with carrier card)
- 33 or 66 MHz selectable PCI frequency
- DMA engine: DRAM <-> PCI

INTERNAL PCI INTERFACE

On-board I/O devices

- PCI Rev. 2 fully compliant
- Fully dual ported with user PCI

SCSI INTERFACE

- Wide Ultra SCSI
  (RA and RC build levels support Fast Wide)

ETHERNET INTERFACE

- Onboard 10/100 Mb/s Ethernet interface managed by the INTEL 21143 chip
- 10/100BASE-T connectivity
- 10BASE-T on all build levels
- ANSI 802.3 compliant

MISCELLANEOUS

- 2 asynchronous EIA-232 serial lines
- Keyboard/Mouse interface

POWER REQUIREMENTS (maximum)

	Single	Dual
+5V (+5%, -2.5%)	6.1A	8.3A

ENVIRONMENTAL SPECIFICATIONS

	SA	WA	RA	RC
Temperature range				
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
Conformal Coating	Optional	Standard	Standard	Standard
Relative Humidity	no condensation 90%	95% 10 cycles 240 hours	95% 10 cycles 240 hours	95% 10 cycles 240 hours
Mechanical				
Vibration Sine	5-200 Hz - 2g Peak	5-200 Hz - 2g Peak	5-2,000 Hz - 2.5g Peak	5-2,000 Hz - 5g Peak
Vibration	0.01 g^2/Hz 10-40 Hz	0.01 g^2/Hz 10-40 Hz	0.04 g^2/Hz	0.1 g^2/Hz
Random	0.0007 g^2/Hz 100-200 Hz - 0.00005 g^2/Hz 2,000 Hz		with a flat response to 1,000 Hz 6 dB/Oct roll-off from 1 KHz-2 KHz	
Shock	10g Peak 16 ms Half Sine Pulse		40g Peak 20 ms Half Sine Pulse	
Bumps			40g Peak 6 ms, Half Sine Pulse 3 bumps/sec and 1,000 bumps/direction	
Altitude	-1,000 to 15,000 ft	-1,000 to 15,000 ft	-1,000 to 33,000 ft	-1,000 to 50,000 ft

PowerEngine6 Order Code

		SA	WA	RA	RC	Code
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/Memory Frequency	450 MHz / 100 MHz		x	x	x	2
	466 MHz / 133 MHz	x				3
SDRAM (*)	128 MB	x	x	x	x	2
	256 MB	x	x	x	x	3
	512 MB	x	x	x	x	4
Flash	No User Flash	x	x	x	x	N
	32 MB	x	x	x	x	2
Ethernet Link	Front panel	Default	Default	Default	Default	0
	Ethernet routed to backplane	Option	Option	Option	Default	1
PO Connector	No PO connector	Default	Default	Default	Default	0
	PO connector fitted	Option	Option	Option	Option	1
PMC (**) slot VIO Key (PCI signaling voltage)	5V	Default	Default	Default	Default	0
	3.3V	Option	Option	Option	Option	1
Coating		x	Default	Default	Default	V

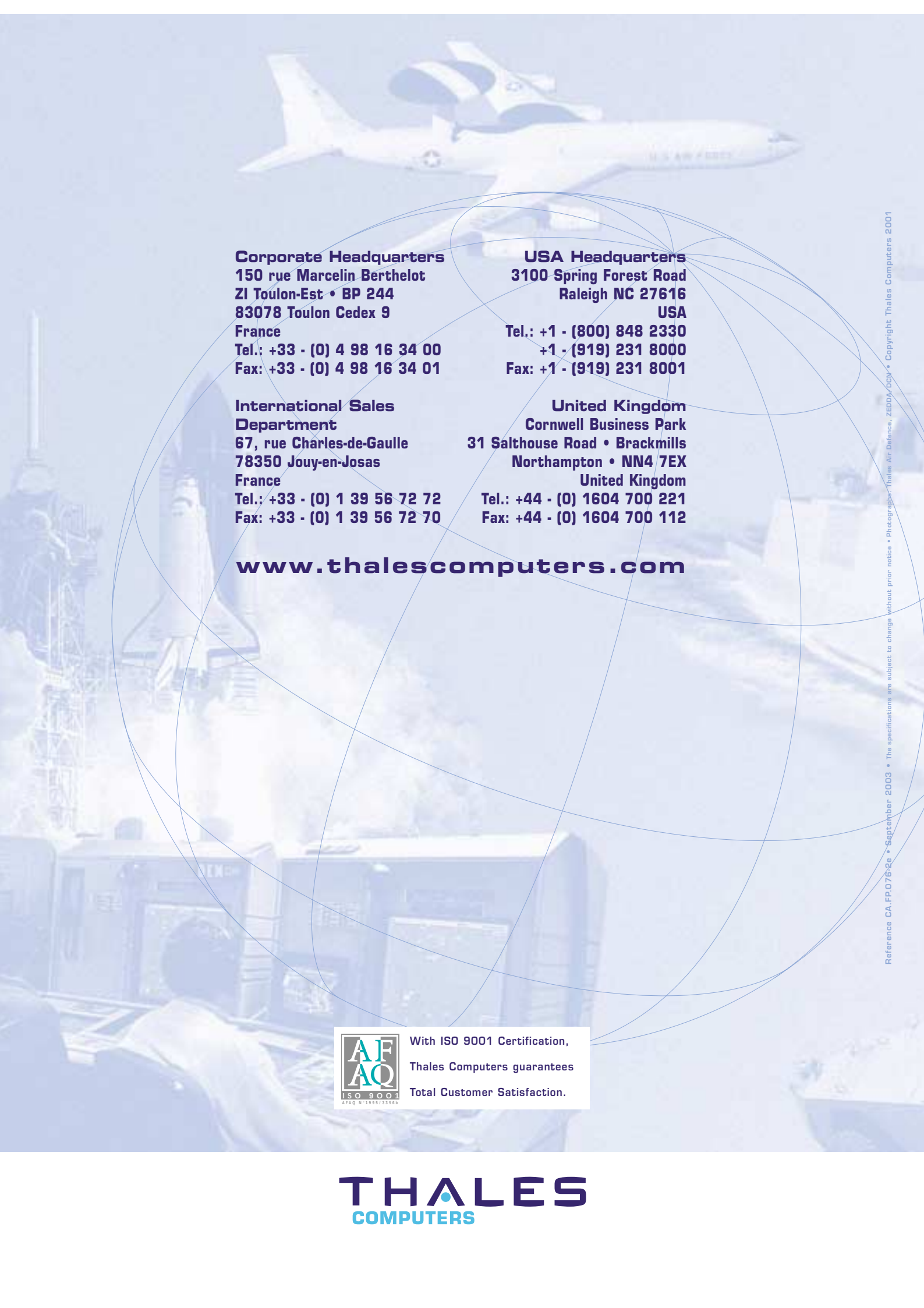
VMPC6d

Add code **V** only when not default

(*) Boards with large memory require specific O.S. application management - Please check O.S. type and release

(**) PCI signaling level on the VMPC6d and on the PMC devices should match

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