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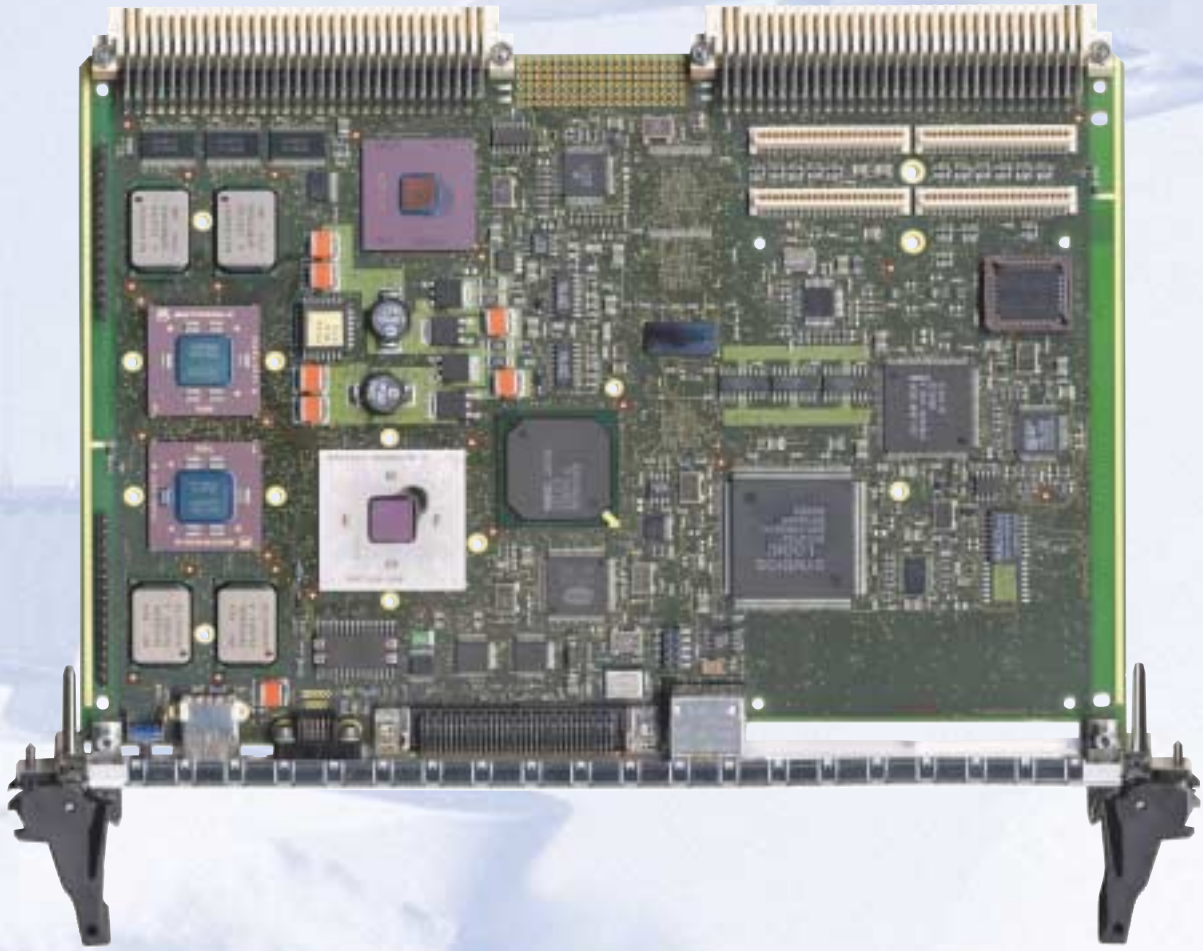
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THALES COMPUTERS | **Where COTS Meets Reality**



PowerEngine VMPC6c & VMPC6c-Dual

With the latest PowerPC 74XO (G4) processor and its AltiVec™ vector unit, the PowerEngine6 family of COTS SBCs provides an innovative solution 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, 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' technology 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.

To maintain an innovative edge, Thales Computers aligns itself with key organizations and industry leaders. Our close development partnership with IBM has resulted in jointly-designed ASICs for optimizing on-board resource access, and has given Thales Computers early access to the latest IBM chip designs.

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 cumulated experience of both partners since the beginning of the PowerPC and brings new features and performances adapted to the PowerPC 750 and 74XO (G4) versions: double-bank SDRAM memory with ECC, support of dual processor with 100 and 133 MHz PowerPC bus, 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. This chip is now part of the IBM offering (part number CPC710).

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

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

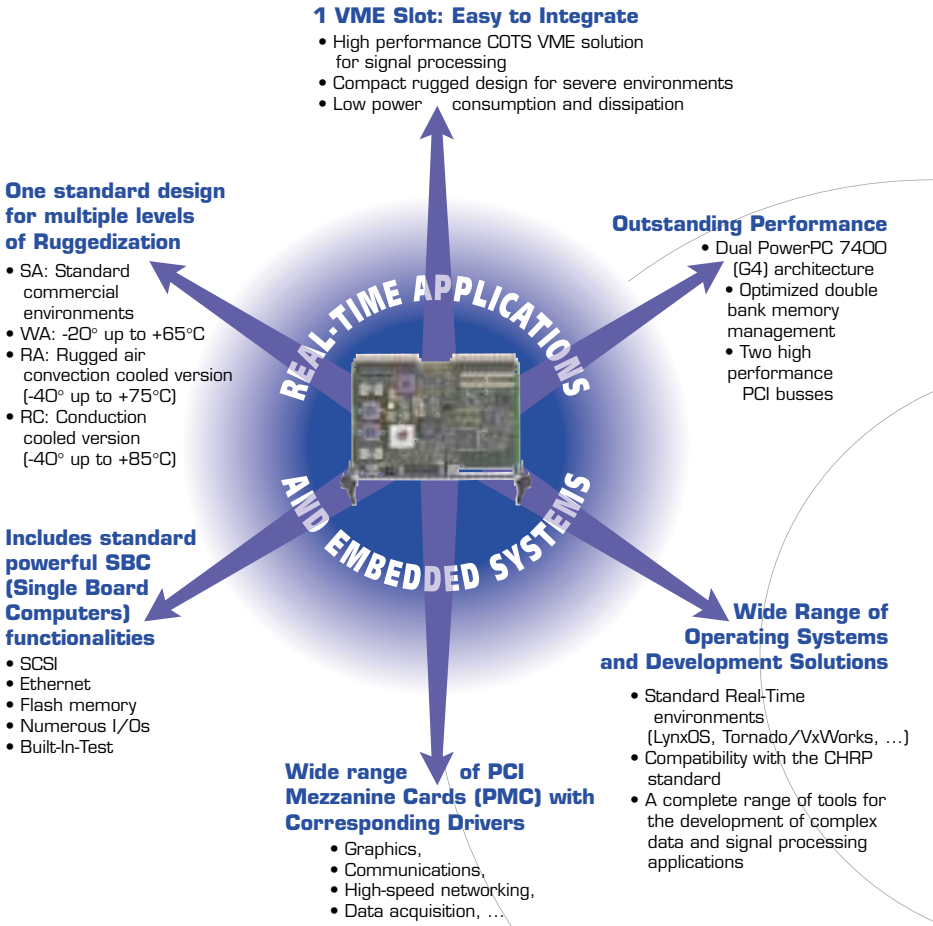
Designed for harsh environments

Thales Computers' SBC products respond to a diverse range of ruggedization requirements in embedded applications. Available in several different configurations representing multiple levels of ruggedization, the boards 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" (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.

The products: VMPC6c & VMPC6c-Dual

The PowerEngine 6c single board computer features one or two PowerPC 74XO microprocessors from Motorola. With its AltiVec™ vector processing unit, the PowerPC 74XO is ideally suited for signal processing functions and leading edge computing. With more than 1400 MIPS in a single VME slot, the VMPC6c delivers unprecedented computing power and enables real-time processing of the most demanding data streams. Combined with Thales Computers' software extensions to the base operating system which ease the development and deployment of applications on complex architectures, the VMPC6c and VMPC6c-Dual provide a new COTS approach for data and signal processing in military and aerospace equipment.



VMPC6c & VMPC6c-Dual

Thales Computers' VMPC6c SBCs are designed to support Motorola's latest PowerPC G4 technologies.

The VMPC6c and VMPC6c-Dual, as specified below, have an on-board single or dual PowerPC 74XO processor featuring 400 MHz+ speeds.

Technical Data

PowerPC Processor

- Either one or two superscalar PowerPC 74XO processors operating at 400 MHz+
- Mips: 730 at 400 MHz per processor
- L1: 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
- RISCWATCH functionality (S and W build levels)
- Low Power Implementation
- AltiVec™ extension

Ethernet Interface

- On-board PCnet-PCI Ethernet controller: 10/100 Base-T on front panel or P2 (build option on P2 for S, W and RA build levels products, 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, ...).

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

Serial Lines

- Two available RS-232 ports up to 115.2 Kb/s
- Handled by TL16C550C components
- INS8250N-B, PC16550A, PC16450 software compatible

ALMA64 VME Interface

- Managed by the ALMA 64/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 channels DMA controller

Keyboard / Mouse

- Keyboard and mouse interface

SDRAM Memory

- 64, 128, 256 or 512 MB of on-board 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

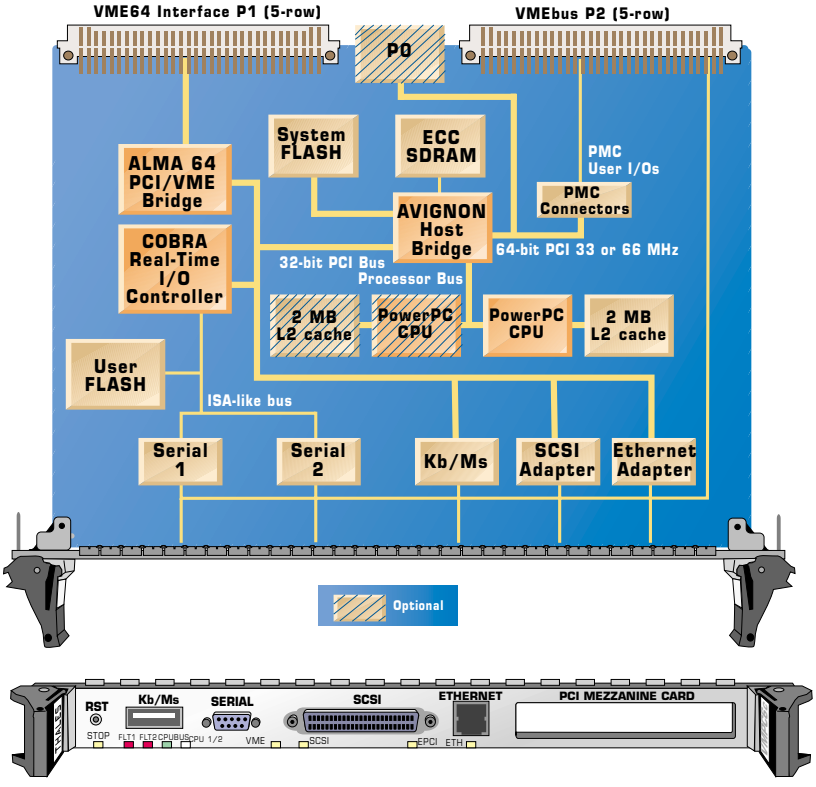
512 KB + 1 MB of system Flash EPROM memory are available for initialization and operating system boot routines.

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

NVRAM/RTC

An 8 KB NVRAM chip provides convenient non-volatile 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 class products and optional on RA and RC class products.



PCI Interface

Two PCI interfaces (master/slave with burst capability) are implemented on the PowerEngine6:

- The internal interface provides a high-speed backbone for local interconnect of on-board devices (Host Bridge, Ethernet, SCSI, keyboard and mouse, ...) and is fully compliant to PCI Specs- Rev.2.0 (32-bit)
- The external PCI interface is a user PCI interface designed for connecting PMC mezzanine modules (1553, Graphics, Ethernet, FDDI, ATM, ...), and provides a Rev. 2.0 standard 64-bit PCI interface that can operate at 33 or 66 MHz

Both the PowerEngine6 single and dual SBC can maintain concurrent bus operations on two PCI buses using a uniquely optimized host bridge. This allows applications using PCIs to operate efficiently in parallel, doubling available throughput.

PMC Carrier Card

For configurations requiring additional PCI connectivity, Thales Computers offers a PMC carrier card that provides two extra PMC slots. The PMC carrier card is fitted in an adjacent VMEbus slot. Applications requiring up to three PCI slots (such as redundant configurations) can therefore be easily implemented.

The following table summarizes the number of PMC slots available with/without the carrier board:

Configuration	Available PMC Slots	VME Slots
VMPC6c without Carrier Card	1	1
VMPC6c with Carrier Card	3	2

For the Rugged versions (RC and RA), the PMC slot can accept conduction cooled PMC according to CCPMC VITA 2.0 standard (draft 1.2).

Thales Computers 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. 2.0 (slave mode)
- ISA-like interface for serial ports, RTC, ...
- Large non-volatile memory interface (NVRAM, Flash, ...)
- 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 main DRAM of the board. These non-intrusive IBIT tests cover more than 95% of the boards's functional nodes. These test results can be read back by the board's operating system or can be collected by another VMPC board running the rack supervision software.

Software

Thales Computers provides the necessary real-time OS extensions on the VMPC6c and VMPC6c-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.

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 multi-board architectures.

** See www.vsipl.org for details*

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 its standard support services, Thales Computers offers customized help to system integrators on a consultancy basis.

Connectivity

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

Thales Computers' 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 Thales Computers' 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 (VMPC6a /RA) carries the ruggedizer but keeps the front panel I/O
- Conduction cooled version (VMPC6a /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.

VMPC6c Technical Features

CPU

Processor	One or two PowerPC 74XO (G4/Altivec)
Clock Frequency	400 MHz and higher
MIPS	730 at 400 Mhz per processor

MEMORY

Global Memory	64, 128, 256, 512 MB on board
ECC	Yes (standard)
Cache Memory	2 MB per processor (on processor dedicated bus)
ROM 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 / DO8 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

- On-board 10/100 Mbps Ethernet interface managed by the INTEL 21143 chip
- 10/100 BaseT connectivity
- 10 BaseT on all build levels
- ANSI 802.3 compliant

MISCELLANEOUS

- 2 asynchronous RS-232 serial lines - Max: 115.2 Kb/s
- Keyboard / Mouse interface

POWER REQUIREMENTS (maximum)

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

ENVIRONMENTAL SPECIFICATIONS

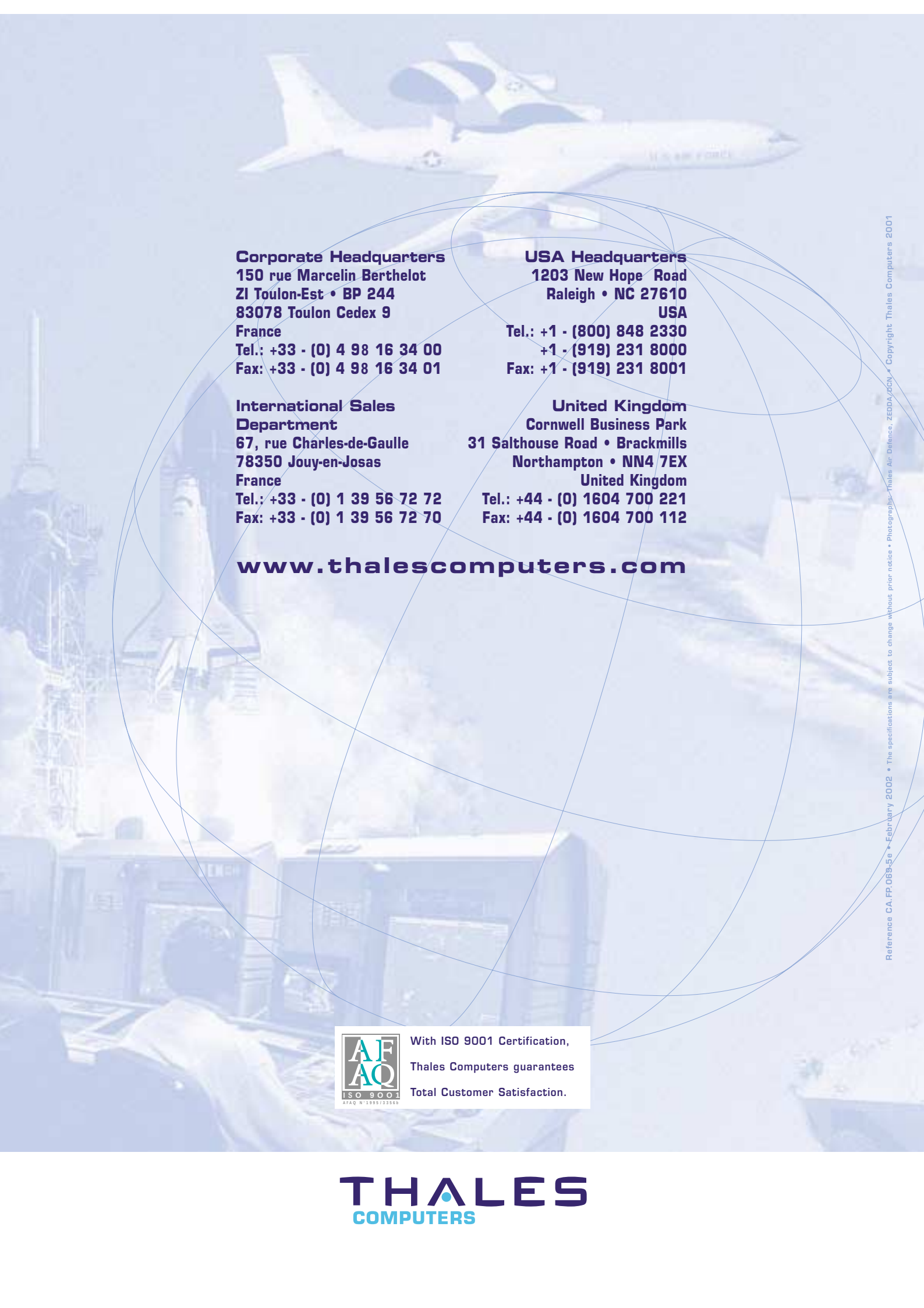
	SA / WA	RA	RC
Temperature range			
Operating	SA: 0 to +55°C WA: -20 to +65°C	-40 to +75°C	-40 to +85°C
Storage	-45 to +85°C	-45 to +100°C	-45 to +100°C
Conformal Coating	SA: Opt. / WA: Std	Standard	Standard
Relative Humidity	no condensation		
	90%	95 % 10 cycles 240 hours	
Mechanical			
Vibration Sine	5-200 Hz 2g Peak	5-2000 Hz 2.5g Peak	5-2000 Hz 5g Peak
Vibration Random	0.01 g^2/Hz 10-40 Hz 0.0007 g^2/Hz 100-200 Hz 0.00005 g^2/Hz 2000 Hz	0.04 g^2 Hz with a flat response to 1,000 Hz 6dB/Oct roll-off from 1Khz-2KHz	0.1 g^2 Hz
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 per direction	
Altitude	-1000 to 15000 ft		-1000 to 70000 ft

PowerEngine6 Order Code

		Standard (Air)	Extended Temperature (Air)	Rugged(Air) Convection Cooled	Rugged Conduction Cooled	Code
Processors	Dual	x	x	x	x	1
	Quad	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	400Mhz	x	x	x	x	1
SDRAM	128 MB	x	x	x	x	2
	256 MB	x	x	x	x	3
	512 MB	x	x	x	x	4
Flash	8 MB	x	x	x	x	0
	32 MB	x	x	x	x	2
Ethernet Link	Front panel Ethernet is default	x	x	x		0
	Ethernet routed to backplane	x	x	x	Default	1
PO connector	No PO connector is default	x	x	x	x	0
	PO connector fitted	x	x	x	x	1
PMC slot VIO key	5V is default	x	x	x	x	0
(PCI Signaling Voltage)	3.3V	x	x	x	x	1
Coating		x	Default	Default	Default	V

VMPC6c

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