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PPC7A

PowerXtreme
POWER PC PROCESSOR

PowerXtreme SBC with Certifiable BSP to DO-178B Level A

- Latest PowerPC processors
- High performance architecture
- Extensive Radstone software support
- Extended feature set
  - PowerPC 7410 or 7457
  - 64-bit 66 MHz PCI
  - 200 MHz L3 cache bus
  - 133 MHz main memory bus
  - 6 serial ports
  - 2 Ethernet ports
  - Graphics accelerator
  - 2 USB Ports (or keyboard/mouse)
  - Digital I/O (or parallel port)
  - SCSI interface



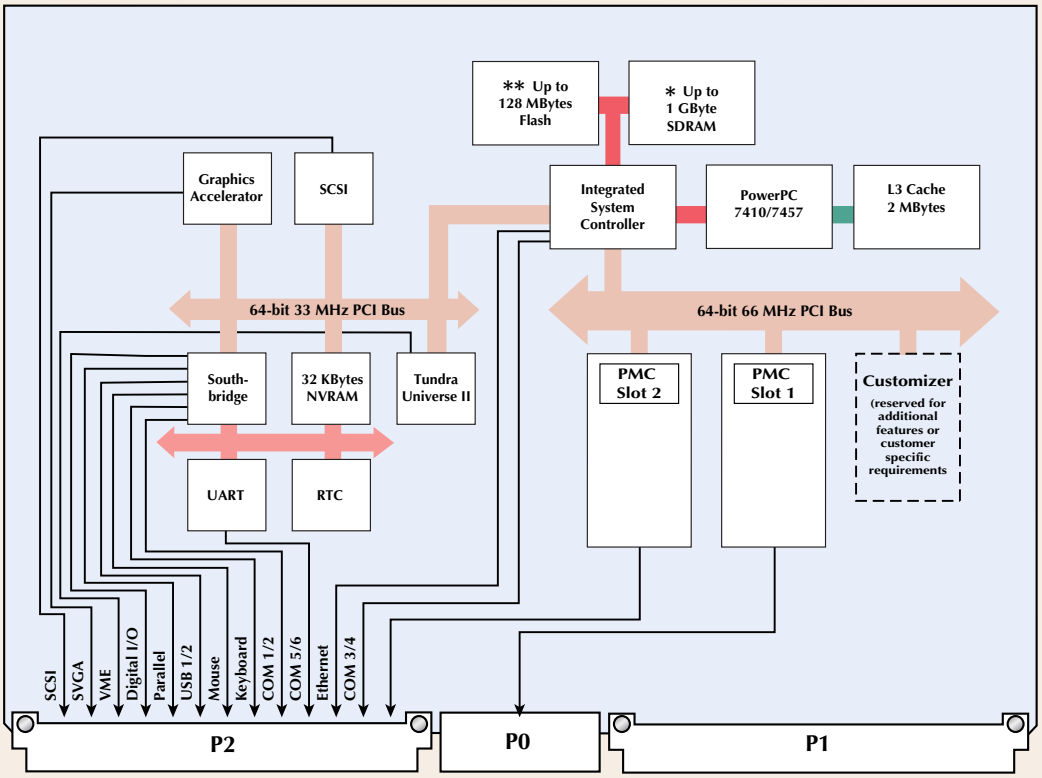
RADSTONE
DIGITAL PROCESSING

PPC7A is a cornerstone of Radstone's PowerXtreme family of single board computers (SBCs) offering a powerful combination of the latest technology plus full compatibility with the PowerXtreme feature set, first defined in 1995. PPC7A is fully supported by a comprehensive range of Radstone software products including our Deployed Test modules (BIT [built- in test] and BCS [background condition screening]), plus support for VxWorks and VxWorks6 from Wind River Systems, LynxOS from LynuxWorks, and INTEGRITY from Green Hills Software Inc.

PPC7A offers a choice of the latest PowerPC processors. Two PMC sites via 64-bit 66 MHz PCI provide access to further incremental system expansion if required. In addition to PowerXtreme standard interfaces (SCSI, parallel, keyboard and mouse) the number of serial ports has been expanded to six and the number of Ethernet ports to two. New features for PowerXtreme include on-board integrated graphics accelerator, two USB ports, 16-bit digital I/O and a reserved board area which can accommodate custom design features for large volume production programs.

In addition to support for the standard (non certifiable) COTS operating systems above, the PPC7A is supported by a BSP for the certifiable VxWorksAE653 operating system from Wind River Systems.

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*256 MBytes SDRAM fitted as standard with 7410 processor, 512 MBytes SDRAM fitted as standard with 7457 processor
**64 MBytes Flash fitted as standard with 7410 processor, 128 MBytes Flash fitted as standard with 7457 processor.

Figure 1: PPC7A Functional Block Diagram

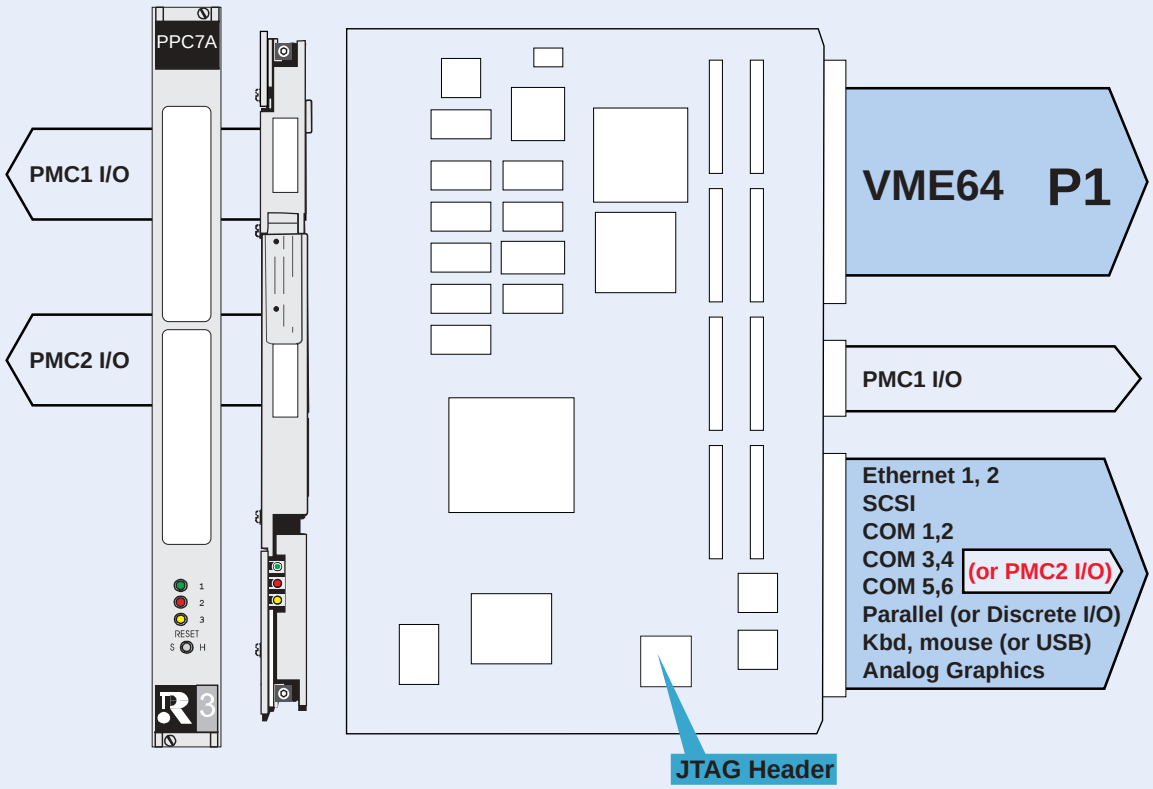


Figure 2: PPC7A Input/Output Options

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	Processor	Memory	Flash	Video
PPC7A10	7410	256 MBytes	64 MBytes	69000
PPC7A5x	7457	512 MBytes	128 MBytes	69030

Table1: Key Feature Summary of PPC7A10 and PPC7A5x

I/O Options	P2 PMC Rear I/O	E'net	COM 3/4	COM 5/6	
				RS232	RS422
1	✔	2	-	-	-
B	-	2	✔	✔	
C	-	2	✔	-	✔

Primary I/O options are selected by the 5th digit (X) in the order code i.e. PPC7Axx-xxxxXxx

Table2: Summary of Primary I/O Option

IO Options	USB	GPIO	Keyd Mouse	Parallel
0	✔	✔	-	-
1	-	✔	✔	-
2	✔	-	-	✔
3	-	-	✔	✔

Secondary I/O options are selected by the 4th digit (X) in the order code i.e. PPC7Axx-xxxXxxx

Table3: Summary of Secondary I/O Option

Ruggedization Levels

PPC7A is available in Radstone's five ruggedization levels for use in both convection- and conduction-cooled environments. See Radstone's Ruggedization data sheet (RT184) for further details.

Ruggedization Levels	1	2	3	4	5
Cooling Method	Convection	-	-	Conduction	
Conformal Coat	Optional	Standard	Standard	Standard	
High Temp Operational	55ºC @ 300ft/min	65ºC @ 300ft/min	75ºC @ 300ft/min	75ºC	85ºC
				At card edge	
Low Temp Operational	0ºC	-20ºC	-40ºC	-40ºC	

Table4: Ruggedization Levels Table

Operating System Support

A number of mission- critical, real-time operating systems are supported on the PPC7A:-

WIND RIVER

VxWorks is a highly scalable and deterministic run-time system, distributed backplane and networking support and with a large base of third-party support. The PowerX BSP & ESP from Radstone both run PPC1A/2A/4/4A/4B/6/7A from one object code.

VxWorks, the run-time component of the Tornado II embedded development platform, is the most widely adopted real-time operating system (RTOS) in the embedded industry. Tornado II also includes a comprehensive suite of core and optional cross-development tools and utilities, and a full range of communications options for the target connection to the host.

LYNUXWORKS

LynxOS is a hard real-time Unix with full memory management support. Conforming to full POSIX standards, LynuxOS features Linux binary compatibility at 4.0. The PowerX BSP & ESP from Radstone both run PPC1A/2A/4/4A/4B/6/7A from one object code.

Summary: LynuxOS offers hard real-time determinism; complete MMU-based protected address spaces for tasks; Linux application binary interface (ABI) personality; Linux binaries run unchanged on LynxOS v4.0; comprehensive POSIX API conformance 1003.1, .1b & .1c; LynxOS 4.0 also exhibits true linear scalability.

INTEGRITY; is a maximum reliability, royalty-free real-time operating system. Support for Radstone boards including

INTEGRITY

the PPC1A/2A/4/4A/4B/6/7A is available direct from our technology partner, Green Hills Software Inc.

The royalty-free INTEGRITY RTOS uses hardware memory protection to isolate and protect itself, and user tasks, from incorrect operation caused by accidental errors or malicious tampering.

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Deployed Test Software

PPC7A features the most effective deployed test strategy in the industry, highly adapted to the characteristics of modern COTS silicon and COTS operating systems. This strategy is implemented through our built-in test (BIT) and background condition screening (BCS) components.

To facilitate smooth technology insertion, the object code modules for BIT and BCS run on all PowerX board family members of any age and variant produced since the family's inception in 1995.

Built-In Test (BIT)

BIT provides an initialization test for all on-board functional areas of PPC7A. Highest possible coverage, 95%, is achieved by the use of intrusive testing, with BIT assuming exclusive use of device resources. BIT executes before any COTS OS, and passes control to the OS upon completion. Testing in conjunction with a COTS OS is accomplished by BCS: see top of page.

BIT is a highly configurable component, with options for individual tests and sub-tests. System-wide coverage to Radstone PMCs or other Radstone VME boards is handled. Custom tests for bespoke equipment can readily be added.

Test results are stored in Flash for later analysis by the application, in addition to visual indication. Radstone BIT features 'Fast Start', whereby if BIT detects a state change of a particular backplane pin, it skips all tests. The backplane pin is usually connected to an electro-mechanical 'brown-out' detector.

Coverage methodolgy and proofs for PowerX boards are available. Please request our brochure 'BIT Coverage – A Straightforward guide'.

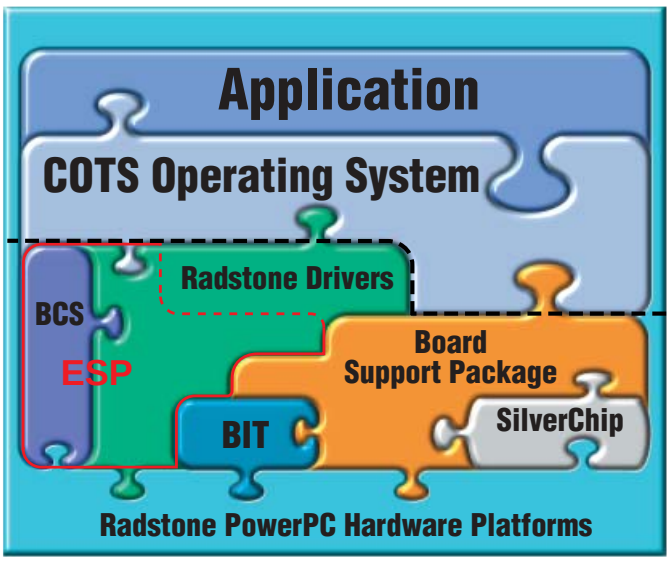


Figure 3: Software Support Model

Background Condition Screening (BCS)

BCS provides continuous, online health monitoring. It runs as a task thread, featuring non-intrusive tests that are specifically designed to be co-operative with the normal functioning of the COTS OS that is running the application. In addition to providing minimal impact on system latency, this method avoids a difficulty that arises when 'calling back' into a traditional, stand-alone test firmware, written in ignorance of the OS and probably assuming exclusive use of board resources. Such firmwares may not gaurantee the restoration of the entire and complex machine state as the OS left it. BCS works chiefly through OS mechanisms and does not compromise the machine state imposed by the OS.

Radstone's BCS for VxWorks is downloadable or can be linked to the VxWorks OS executable image. It can be launched from the VxWorks shell or from an application. Configuration can be static, via the Tornado Project Tool, or dynamic via an interactive menu.

Configurable parameters include the thread priority to run BCS at, plus various test options and other characteristics. An error log is stored in Flash, in addition to visual indication of a detected failure. An application interface is provided for immediate invocation of individual tests, in addition to the default running of tests in background mode.

BCS offers:

- Logging and scrubbing of single bit errors
- Comprehensive main memory test. By dedicating small segments per bank for exclusive BCS usage, and in conjunction with ECC circuitry, all failure modes throughout all the memory can be detected without destructive action outside of the BCS segments.
- System and user background Flash checksummin
- NVRAM checksum
- PCIbus error condition monitoring
- Preset PCI configuration verification
- Temperature monitoring (board and CPU)
- Temperature throttling
- Network connectivity
- SCSI connectivity
- Bus memory probing
- Real-time clock test
- Global hardware register verification
- Tests of 8250-compatible COM port devices
- AltiVec and FPU tests
- Custom tests can be integrated

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Standard Ordering Information

Sales Code	500 MHz PowerPC 7410 – 256 MB of SDRAM
PPC7A10-1C40B0X	500 MHz PowerPC 7410, 6U VME SBC, Level 1; 256 MBytes SDRAM, 2 MBytes L2 cache, 64 MBytes Flash, RTC, 2 x 10/100 Base-T, Ultra SCSI, 2 x USB, 17 bits GPIO, 4 x RS232 & 2 x RS422 ports, SVCA, 2 PMC slots, 5 Row P1 & P2 (no P0)
PPC7A10-2C40B0X	Air-cooled level 2 as above with conformal coating
PPC7A10-3C40B0X	Air-cooled level 3 as above with conformal coating
PPC7A10-4C40B0X	Conduction-cooled level 4 as above
PPC7A10-5C40B0X	Conduction-cooled level 5 as above
	1.1 GHz PowerPC 7457 – 512 MBytes of SDRAM
PPC7A5X-1D54B0X	1.1 GHz PowerPC 7457, 6U VME SBC, Level 1; 512 MBytes SDRAM, 2 MBytes L2 Cache, 128 MBytes Flash, RTC, 2 x 10/100 Base-T, Ultra SCSI, 2 x USB, 17 bits GPIO, 4 x RS232 & 2 x RS422 ports, SVCA, 2 PMC slots, 5 Row P1 & P2 (no P0)
PPC7A5X-2D54B0X	Air-cooled level 2 as above with conformal coating
PPC7A5X-3D54B0X	Air-cooled level 3 as above with conformal coating
PPC7A5X-4D54B0X	Conduction-cooled level 4 as above
PPC7A5X-5D54B0X	Conduction-cooled level 5 as above

PPC7A Accessories

PPC7-IOKIT1	I/O kit to support the PPC7 range of boards. Comprises of the following components:
	P25X606-11200: P2 transition module with 5 Row VME connector. Provides headers for 2 x Ethernet (RJ45 to ETHX600), Ultra SCSI, COM 1,2,3,4,5 & 6 serial, parallel, mouse & keyboard ports, floppy, GPIO, video and USB
	SIOX600-S: 3U Serial I/O panel with 2 x 9 way D type connectors and 0.5m internal ribbon cable. For use on COM 1 & 2 ports on all PPC paddle cards. Requires 3 to access all ports
	SIO2X600-S: 3U Serial I/O panel with 2 x 25 way D type connectors and 0.5m internal ribbon cable. For use on COM 1 & 2 ports (all PPCs) and on COM 3 & 4 (PowerXtreme boards) when RS323 is specified. Requires 3 to access all ports
	SIO3X600-S: 3U Serial I/O panel with 1 x 25 way D type connectors and 0.5m internal ribbon cable. Complies with RS530 pin out and signal set. May be used with COM 3 & 4 ports when RS422 is specified. Requires 2 to access all ports
	PMKX600-S: 3U Panel for parallel, mouse & keyboards ports with 0.5m internal ribbon cable. For use with all PPC paddle cards
	SCSIX600-S: 3U Honda SCSI panel with 0.5m internal ribbon cable. For use with all PPC paddle cards
	10BTX600-S:3U 10/100 Base-T Panel with 1 metre cable to provide RJ45 plug to RJ45 socket on 3U mounting plate for use with all PPC paddle cards. Requires 2 for both Ethernet ports
	USBX606-11: 3U panel for 4 USB ports

X = software option. Note: The standard ordering information (above) defines the standard build variant. Consult factory for availability of further build options.

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