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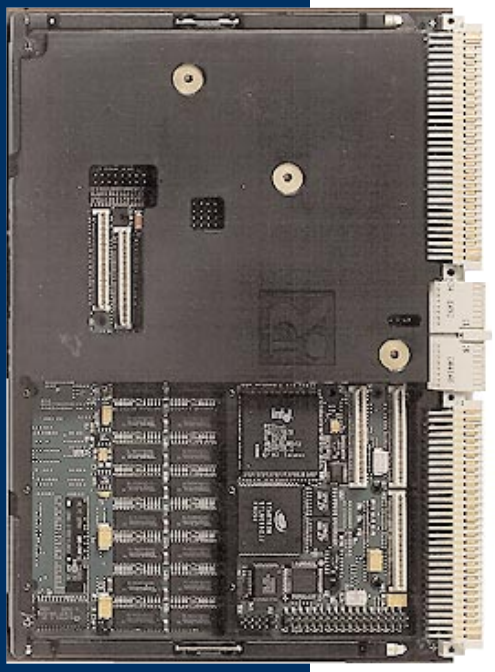
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Find the *Abaco Systems / Radstone PPC2-603e* at our website: ***Click HERE***

PowerPC™

PPC2A

RADSTONE VMEBUS SBC



- PowerPC 603 / 604 / 740 to 333MHz
- PReP Architecture
- 5 Air & Conduction Cooled Build Levels
- Standard Features:
  - 1Mbyte L2 Cache
  - 9Mbytes FLASH (1Mbyte system/8Mbyte user)
  - 32 to 256Mbytes EDO DRAM with optional EDC
  - 10BaseT or 10Base5 Ethernet
  - Ultra SCSI 2
  - Mouse/Keyboard/Floppy/Parallel/4 x Serial Ports
  - 5 row VME64 & Type A or B P0 Connectors
  - 1 PMC Expansion Slot
  - PMC Carrier Cards with up to 8 PMCs
- Radstone BIT & SilverChip Firmware
- BSPs & ESPs for VxWorks/Tornado, LynxOS, RTEMS, OS-9, SPECTRA
- SW Maintenance Support
- HW & SW Configuration Management

Product Overview

The PPC2A COTS 6U VME Single Board Computers offer market leading performance in both air cooled and conduction cooled form factor, combined with the same rich feature set of the PowerPC Reference Platform (PReP) architecture Radstone introduced on PPC1 in 1995.

We have extended the environmental specification to 5 Build Levels offering a clear choice for Systems Integrators and Defence OEMs serving the market for high performance Naval, Land Based and Airborne embedded computing platforms.

Choose the PowerPC CPU that's right for your performance and power budget while maintaining form, fit and function compatibility with the PPC2 SBCs you have already fielded. PPC2A supports 100MHz 603e as well as the latest third generation (G3) processors (Table 1).

Radstone protects your investment in application software by maintaining a standard functional envelope with a clear performance upgrade path enabling technology insertion and maximum hardware and software component re-use across multiple applications and programs.

Software support includes Radstone Built-In-Test (BIT) and SilverChip firmware as well as Board Support Packages (BSPs) and Enhanced Support Packages (ESPs) for VxWorks/Tornado from WindRiver Systems and LynxOS from Lynx Real Time Systems. Third party OS support is also available for RTEMS from OAR Corp., OS-9 from MicroWare and SPECTRA/VRTX from Microtech Research.

PPC2A is backed by Radstone's 35+ years of experience supplying rugged electronic systems and long term program management to the world's industrial and defence marketplace.

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Features	Benefits
PowerPC 603 / 604 / 740	Scalable processing power and backward compatibility with current systems
1 MByte Level 2 cache	Provides substantial boost in system performance
PReP based architecture	Support for the latest COTS Software and Third Party development environments
Single Slot 6U VME form factor	Reduced system cost and slot count
5 Build Level Options	Maximum hardware and software component reuse across multiple environmental ranges
PMC expansion slot	System expansion using IEEE P1386.1 standard PCI Mezzanine Cards
PMC Carrier Cards	Future proofs your system design by enabling PCI Sub-System expansion to add new, low cost interface capability as required
Radstone Software Support	COTS BIT, SilverChip Firmware and BSPs and ESPs for VxWorks & LynxOS
Radstone SW Maintenance	Automatic SW revision updates and technical support
Radstone Configuration Management	Unique part number requiring customer authorisation for changes in product revision status

Processor

PPC2A supports a wide range of G3 PowerPC processors within the standard PReP architecture. This means you can choose the CPU that fits your performance and power budget requirements while maintaining form, fit and function compatibility with previous PPC2 system designs. (Table 1)

Memory

PPC2A supports 32 or 64MBytes of EDO DRAM on-board, with expansion to 256MBytes total by adding the PMCC2 6U daughter board (Table 2).

The CPU to memory interface is supported by the MPC106 Grackle™ from Motorola Semiconductor. This device implements a 64bit, 66MHz data bus to DRAM with optional EDC or Parity and supports System FLASH and Level 2 Cache.

The Grackle also bridges the CPU to the internal 32bit, 33MHz PCI bus providing the main interface to both on-board and PCI sub-system resources.

PCI Sub-System

In addition to the single on-board slot supporting air or conduction cooled PMCs, PPC2A offers expansion with a family of standard PMC Carrier Cards (Table 3).

When memory expansion is required, the 6U PMCC2 memory expansion and carrier card may be fitted to the PPC2A SBC forming a two-slot replacement unit with up to 256MBytes of DRAM and 2 PMC slots.

The PCI sub-system can also support from 2 to 8 PMCs within a standard VME chassis (see P0CC1 datasheet for more detail). The P0CC1 6U PMC Carrier is a single slot replacement unit supporting two single or one double width PMCs which can be linked to the PPC2A host via the P0/J0 interface on each card (Figure 2).

Radstone PMCs for Graphics, MIL-1553, Serial, ATM, FLASH Memory, Fast Ethernet and FDDI support are available in various build standards.

Table 1: CPU Selection

CPU	Frequency	SPECint95 *	SPECfp95 *	CPU Typical Power (Watts) Consumption *	SBC Typical Power (Watts) Consumption
603e	100	3.1	2.4	3.2	17
603r	300	7.4	6.1	4.2	18
740a	266	11.5	6.9	5.6	18
604e	200	8.0	6.7	14	25
604r	333	14.6	8.9	8	20

* Estimates of CPU performance & dissipation provided by Motorola Semiconductor. These figures are presented as a guide to illustrate relative CPU performance only. Radstone SBC performance may vary from these figures.
Actual power consumption may vary depending on the application and resource usage of the configured system.

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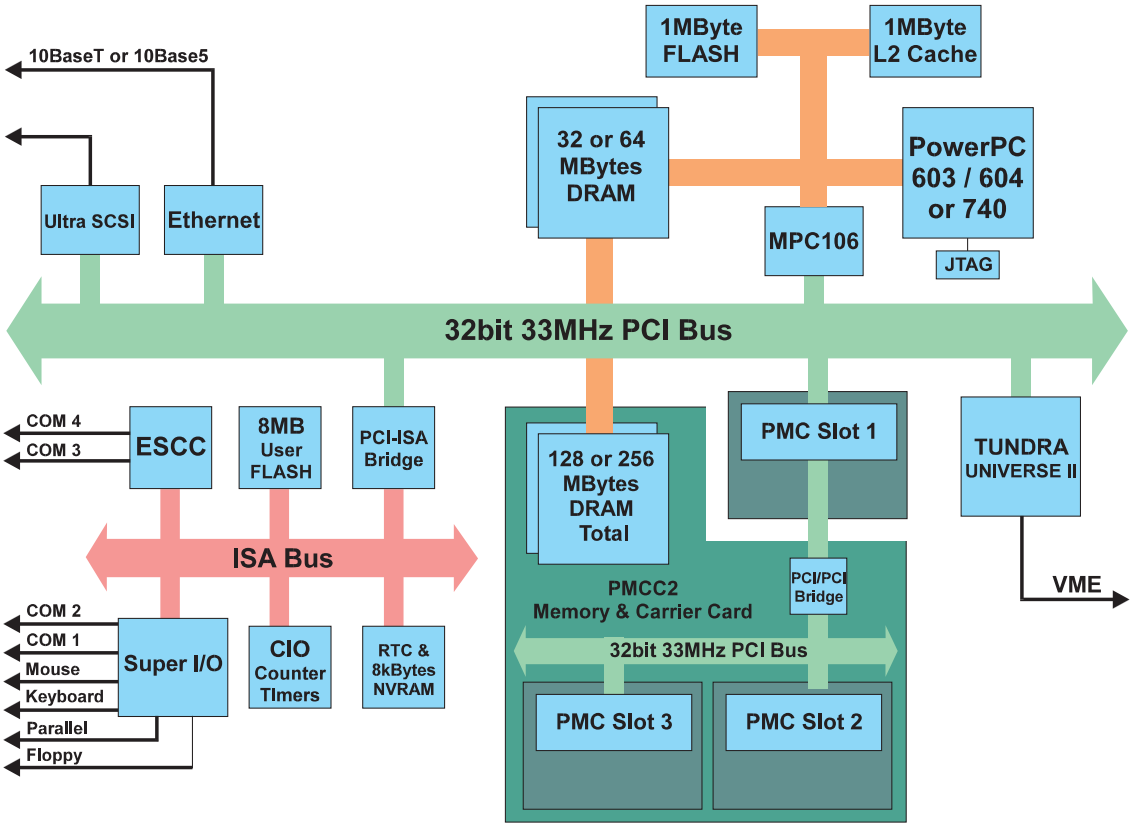


Figure 1: PPC2A Functional Block Diagram

Table 2: PPC2A Memory

DRAM with optional EDC	32 or 64 MBytes on-board	96, 128, 256 MBytes with PMCC2
System FLASH	1 MByte	Standard surface mount device (not socketed)
Level 2 Cache	1 MByte	Standard
Non-volatile RAM	8 kBytes SRAM with 8 kBytes shadow E2PROM	
User FLASH	8 MBytes Standard on the internal ISA bus	

Table 3: PMC and Memory Expansion on PPC2A

Assembly	DRAM MBytes	PMC Slots	VME Slots
PPC2A	32 or 64	1	1
PPC2A / PMCC2	32 to 256	2	2
PPC2A / PMCPCI / P0CC1	32 or 64	2 to 8	2 to 5

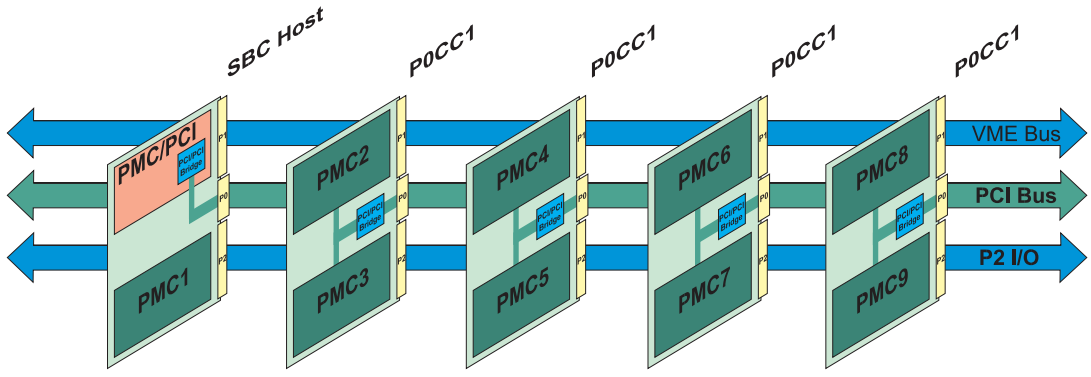


Figure 2: PCI Subsystem Expansion

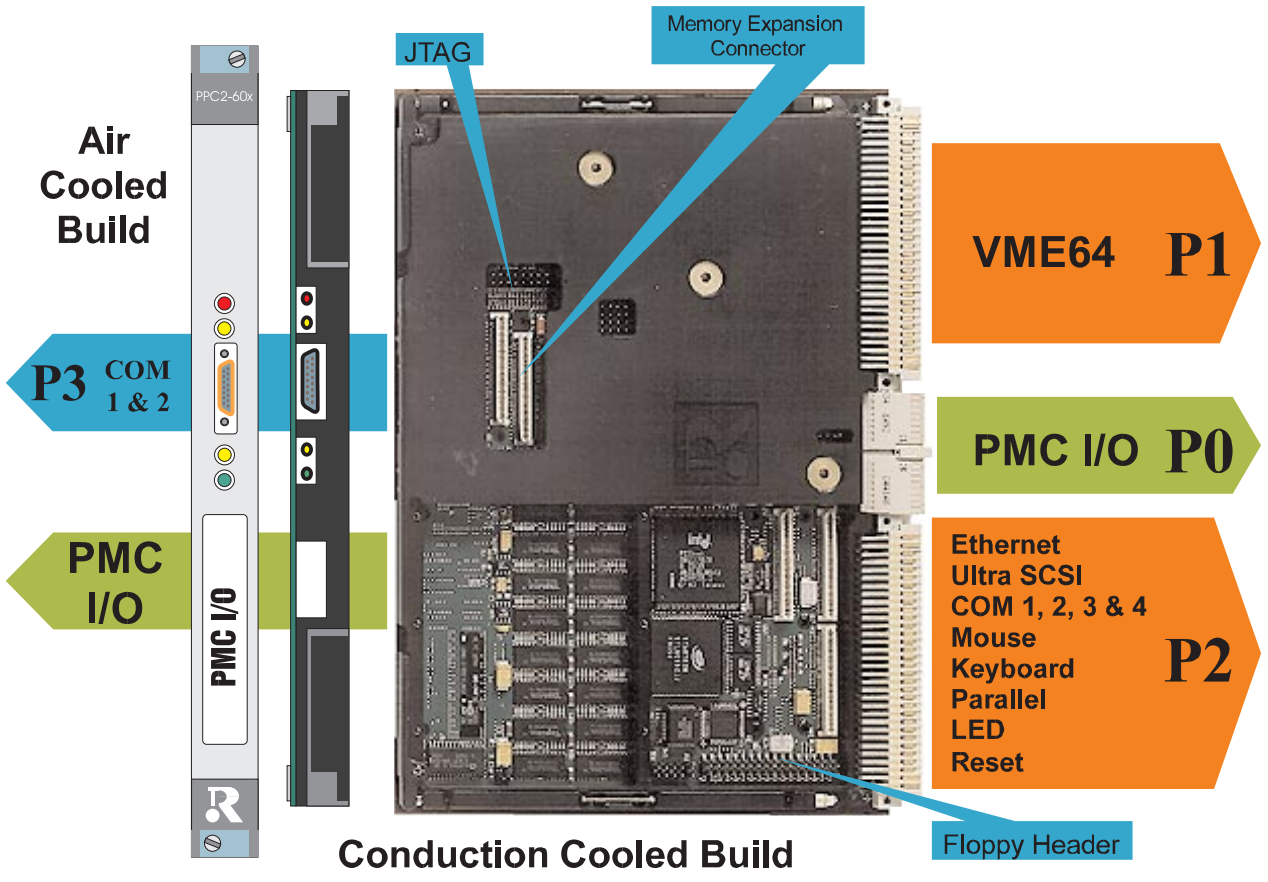


Figure 3: PPC2 I/O Diagram

Input / Output

PPC2A is designed to provide high-density rear I/O for systems requiring sealed box operation and simple card replacement routines for field maintenance. Front panel I/O is limited to the PMC slot and the P3 connector for COM 1 & 2 (Figure 3).

In order to maximise I/O density, PPC2A uses 5 row VME64 P1 and P2 connectors as well as a standard P0 connector for rear access to the on-board PMC slot. The Type A 80 way P0 connector with guide pin and keying, is fitted as standard to all level 4 and 5 conduction cooled builds.

Type B 95 way P0 connectors may be fitted by specifying the appropriate build option when placing your order. Please note that Type A and Type B connectors will not mate interchangeably with system backplanes of the opposite type.

PPC2A air-cooled builds are not fitted with P0 connectors as standard. Type A or B P0 connectors may be specified as required when you place your purchase order.

5 Build Levels

PPC2A is available in Radstone's 5 environmental build levels (Table 4). Air Cooled variants are designed to be used in standard industrial VME chassis. Conduction Cooled builds are for use in Radstone or third party ATR style enclosures. In addition to these COTS configurations, PPC2A may be supplied to meet the mechanical and thermal requirements of specific platforms with the addition of mission specific, to-type mechanics.

Radstone uses advanced thermal and mechanical design in the printed circuit board, metal work and assembly process, in order to build in the required levels of ruggedness. Build level 2 and higher circuit card assemblies include Conformal Coating as standard.

PPC2A has been successfully tested to shock and vibration levels far in excess of our COTS level 4 and 5 build standards, in order to meet the requirements of specific defense programs. These tests included 400g shock pulses and wing mounted Fast Jet Pod vibration environments with rugged PMCs fitted.

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Table 4: PPC2A Build Levels

Build Level	1	2	3	4	5
Cooling Method	Convection			Conduction	
Conformal Coat	Optional	Standard	Standard	Standard	
Low Pressure Operational	15,000ft	15,000ft	15,000ft	70,000ft	
Low Pressure Storage	50,000ft	50,000ft	50,000ft	70,000ft	
Rapid Decompression	N/A	N/A	0-50,000ft	0-70,000ft	
High Temp Operational	55°C @ 300ft/min	65°C @ 300ft/min	75°C @ 600ft/min	75°C At card edge	85°C
Low Temp Operational	0°C	-20°C	-40°C	-40°C	
High Temp Storage	85°C	85°C	100°C	100°C	
Low Temp Storage	-50°C	-50°C	-50°C	-50°C	
Temperature Shock	10°C/min over Ts	10°C/min over Ts	10°C/min over Ts	10°C/min over Ts	
Humidity	95% non-condensing	95% 10cycles 240hrs	95% 10cycles 240hrs	95% 10cycles 240hrs	
Salt Fog	N/A	N/A	5% Salt 48Hrs	5% Salt 48Hrs	
Acceleration	N/A	N/A	13.5g	13.5g	
Vibration Sine	10-500Hz 2g	10-500Hz 2g	5-2000Hz 5g	5-2000Hz 5g	
Vibration Random	$0.002g^2$/Hz from 10-2000Hz	$0.002g^2$/Hz from 10-2000Hz	$0.04g^2$/Hz with a flat response to 1000Hz. 6dB/Oct roll-off from 1000-2000Hz	$0.1g^2$/Hz with a flat response to 1000Hz. 6dB/Oct roll-off from 1000-2000Hz	
Shock	20g Peak Sawtooth 11mSec Duration	20g Peak Sawtooth 11mSec Duration	20g Peak Sawtooth 11mSec Duration Bench Handling	40g Peak Sawtooth 11mSec Duration Bench Handling	

Software Support

Radstone's software strategy for PowerPC is designed to allow fully integrated system level solutions to be realised easily and with confidence.

Our off-the-shelf layered software modules deliver the most from low-level hardware features, while exploiting the best high level debug and run-time functionality of the COTS Operating Systems.

The result is standard software support across the widest selection of PowerPC SBCs available in either industrial, or extended temperature, rugged build levels.

We have invested more than 50 man-years of engineering effort in the PowerPC architecture so that our customers can develop market-leading products using the O/S and development environment best suited to their long term program requirements.

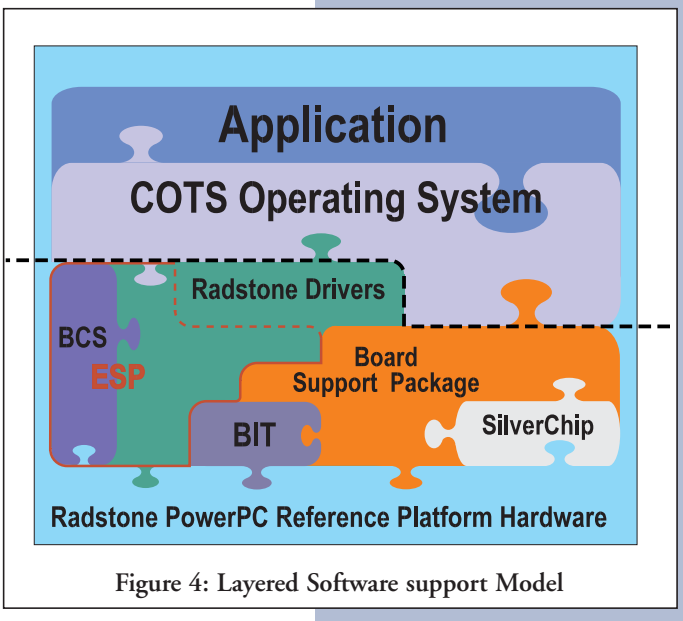


Figure 4: Layered Software support Model

COTS Software Products for PPC SBCs

The following software products are available for the entire PPCx family, including PPC2A, providing a common look, feel and interface for technology inserts:

Built-In-Test for PowerPC

PPC BIT probes from the lowest on-card hardware up to Line Replaceable Unit (LRU) level within a system, ensuring the highest degree of confidence in system integrity. BIT includes comprehensive configuration facilities, allowing automatic power-up tests to be defined, for the desired mix of system functionality and options. Further tests can be invoked interactively, also giving BIT a valuable role as a field service tool. Both Object and Source code products are available. For more details please ask for the "BIT for the Radstone PowerPC family" data sheet.

SilverChip firmware

RADSTONE SILVERCHIP

Developed as an integral part of COTS product strategy, SilverChip firmware provides a foundation layer to interface between the raw PowerPC board hardware, with it's highly programmable device set-ups and flexibility, and the supported Operating Systems (O/S's) which require a straight-forward booting and device interface model (Figure 4).

SilverChip includes: comprehensive configuration facilities, interactive or auto-boot sequencing from a range of device types, automatic PCI resource allocation at initialisation, PCI display/interrogation utilities plus other valuable features for system integrators.

Memory or other speed and feature enhancements are seamlessly absorbed by SilverChip giving the same look and feel to the O/S and the user application as the Radstone PowerPC hardware advances (PPC1, PPC1A, PPC2, PPC2A, PPC4, etc.). Where particular O/S's define the use of alternate boot methods (e.g. VxWorks bootroms) SilverChip technology is absorbed into such boot methodology. Please ask for the "Radstone SilverChip" data sheet for more details.

Board Support Packages

In-house porting expertise for PPCx boards is focused on key Operating Systems, including Wind River Systems' VxWorks/Tornado and Lynx Real Time-Systems' LynxOS. Other O/S ports, drivers for third party hardware, and layered products, including RTEMS from OAR, OS-9 and VRTX/Spectra™ support, are provided through strategic partnerships with dedicated third party vendors, who are able to offer high quality products and services complementary to the Radstone range. State-of-the-art development environments and debug tools, available with the above software products, are thus leveraged for use on Radstone's high performance hardware architecture.

VxWorks Tornado™

WindRiver SYSTEMS

TORNADO

VxWorks/Tornado Distributed Real-Time Operating System

- Fully integrated Workstation or PC Development Environment
- High performance, deterministic, highly scaleable run-time system
- FDDI, Ethernet and backplane networking
- Comprehensive debug/analysis tools

Tornado represents the latest generation of development and execution environments for embedded and real–time applications. The Tornado suite, which includes the VxWorks operating system, brings a superior development and deployment platform to the embedded developer, based on solid core technology yet adding an evolutionary development interface.

The VxWorks distributed real-time operating system features integrated networking facilities, a fast multi-tasking kernel with pre-emptive scheduling, inter-task communications, backplane multiprocessor support, symbolic and source level debugging, performance monitoring and an I/O file system.

The VxWorks/Tornado package extends the long-standing partnership of WindRiver's software components and Radstone's system solutions. BSPs have been passed using the WindRiver validation suite for the greatest confidence and ease of use. In addition, many of Radstone's I/O and graphics products are also supported by VxWorks libraries and drivers. Please see the "Radstone/VxWorks" data sheet for more details.

LynxOS™

Lynx REAL-TIME SYSTEMS, INC.

LynxOS Real-time UNIX Operating System

- Conforms to POSIX standards
- Self-hosted, SunOS, or AIX development environments
- Designed for hard real-time
- Full MMU support

LynxOS is a UNIX-compatible, POSIX-compliant, multi-process, and multi-threaded operating system designed for complex real-time applications that require fast, deterministic response. The LynxOS kernel was specifically designed for hard real-time applications. Since its first release in 1988, LynxOS has been fully pre-emptible, re-entrant, and compact.

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The modularity inherent in the LynxOS architecture makes the operating system highly scaleable and configurable. At its smallest, LynxOS can be configured with only the kernel and linked with an application to form a ROMable image for specialised embedded applications. At its fullest, LynxOS is a self-hosted development environment consisting of a wide array of software development tools, UNIX-compatible utilities, industry standard networking (TCP/IP, NFS), a graphical user interface (X11, Motif), and a UNIX-like hierarchical file system. The powerful PosixWorks environment complementing LynxOS provides high specification development tools including source debug, real-time analysis, code control, and other rich features. Support is available for Radstone's leading edge family of COTS PowerPC platforms spanning a wide environmental range with drivers/libraries for various compatible I/O products. Please see the "Radstone/Lynx" data sheet for more details.

RTEMS™

Free Operating System - RTEMS

Developed by OAR Corp., Huntsville, AL for the US Army Missile Command, RTEMS provides all the power and flexibility of real-time executives available on the commercial market today, but without the cost of source code and royalties. RTEMS is freely available from the Internet with no royalties attached. RTEMS is a high performance, object-oriented, multiprocessing executive that forms the cornerstone of re-usable software solutions for today's embedded systems development.

Layered Software Products

Background Condition Screening (BCS)

Available initially under VxWorks, BCS supplements the high test coverage obtained at initialisation by BIT (see above) with further health screening that is able to co-exist with a standard COTS Operating System. Whilst the intensity and coverage of a true traditional BIT style test makes it destructive to O/S's, the configurable BCS package allows functions such as periodic checksumming, memory scrubbing, and others to be tailored for operation alongside the application in on-line conditions. Results are stored in Flash in the same format as BIT results. Code is available for reading out BIT/BCS results under LynxOS and VxWorks.

ADA™

Several ADA vendors now offer comprehensive environments layered over standard O/S's such as VxWorks/Tornado and LynxOS. These environments run on any Radstone SBC for which the O/S is supported, without any alteration to the board's regular Board Support Package for the O/S.

Licensing, Maintenance and Support

Radstone supplies the BSPs and drivers necessary to support our hardware for the selected Operating Systems noted above, under license RT5088. Embedded firmwares such as BIT and SilverChip are supplied under license RT5087. Standard Maintenance Contracts are also available for these modules under our Agreement RT5090. Please contact your local sales channel for details.

PPC2A Hardware Technical Summary

Feature	Component	Comments
Processor	603e	100MHz
	603r	300MHz
	604e	200MHz
	604r	333MHz
	740a	266MHz
Memory Controller & PCI Bridge	MPC106 Grackle	64bit 66MHz Memory bus with EDC or Parity and 32bit 33MHz PCI bus support
DRAM	EDO	32 to 256MBytes
System FLASH	FLASH	1Mbyte surface mounted with SW & HW write enable/disable
NVRAM	Simtek 11C68	8 kBytes SRAM with 8 kBytes shadow E^2PROM
User FLASH	FLASH	8Mbytes surface mounted on ISA bus
Level 2 Cache	SRAM	1MByte
Ethernet	AMD 79C970 Pcnet-PCI	10BaseT or 10Base5 (10Base2 with 3U transceiver module)
Ultra SCSI	NCR 53C860	8 bit 20Mbytes/s
ISA Bridge	Intel 82378ZB	7 Channel DMA, Timer & Interrupt Controller
Real Time Clock	DS1285	T.O.D/Calendar, configurable 16 or 32-bit timers. Backed up by VME 5VSTDBY
Watch Dog Timer	Maxim 706	1.6 second interval
Timer Counters	Zilog 85C36 CIO	3 independent 16 bit timers with 333ns resolution. 2 of them may be linked to form a 32 bit counter/timer
COM 1 & 2 (RS232)	Startech-Exar ST16C552	INS8250N-B, PC16550A & PC16450 compatible
Parallel Port		Centronics style printer port.
COM 3 & 4	Zilog Z85230 ESCC	RS422/485 is standard. RS232 is available as a build option
Keyboard & Mouse	Intel 82C42	PS/2 compatible
Floppy Disk Controller	Intel 82078	Available via on-board header
VME64 to PCI Bridge	Tundra UNIVERSE II™	64-bit VME, 32-bit 33MHz PCI bus interface, Integral FIFOs, Programmable DMA controller, 70MBytes/s burst data transfer
VME Compliance:	Master / Slave	A16, A24, A32, ADO, ADOH A16:LCK, A24:LCK, A32:LCK D08(EO), D08(EO):RMW, D08(EO):BLT D16, D16:RMW, D16:BLT, D32, D32:RMW, D32:BLT, D64:MBLT, D32:UAT
	Interrupt Handler	D08(O), IH(1-7), I(1-7)
	Interrupter	SGL, RRS, PRI, BCLR* generation
	VMEBus Arbiter	ROR, RWD, early BSY* release, Bus capture & hold
	VMEBus Requester	IACK* daisy chain driver, SYSCLK driver
	Auto Slot ID	Slot 1 detector and Auto ID.
Power Requirements	+5V (+5%, -2.5%), ±12V for PMC feed, +12V for Ethernet feed only on P2	
Weight	Approximately 710 grams (level4)	

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PPC2A Standard Ordering Information

Sales Code	300 MHz PowerPC 603r - 64MB DRAM
PPC2A-603-1436A	300 MHz PowerPC603r 6U VME SBC, Level 1 64MB DRAM, 1MB L2 Cache, 1MB System Flash, 8MB User Flash RTC, 10Base5, Ultra SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 & 2 x RS422 ports, 1 PMC slot, 5 Row P1 & P2 (no P0)
PPC2A-603-2436A	Air cooled Level 2 as above with conformal coating
PPC2A-603-3436A	Air cooled Level 3 as above with conformal coating
PPC2A-603-4436A	Conduction cooled Level 4 as above but with Type A 80 way P0 connector fitted as standard
PPC2A-603-5436A	Conduction Cooled Level 5 as above but with Type A 80 way P0 Connector fitted as standard
	266 MHz PowerPC 740 - 64MB DRAM
PPC2A-740-1B36A	266 MHz PowerPC 740 6U VME SBC, Level 1 64MB DRAM, 1MB L2 Cache, 1MB System Flash, 8MB User Flash, RTC, 10Base5, Ultra SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 & 2 x RS422 ports, 1 PMC slot, 5 Row P1 & P2 (no P0)
PPC2A-740-2B36A	Air cooled Level 2 as above with conformal coating
PPC2A-740-3B36A	Air cooled Level 3 as above with conformal coating
PPC2A-740-4B36A	Conduction cooled Level 4 as above but with Type A 80 way P0 connector fitted as standard
	333 MHz PowerPC 604r - 64MB DRAM
PPC2A-604-1936A	333 MHz PowerPC 604r 6U VME SBC, Level 1 64MB DRAM, 1MB L2 Cache, 1MB System Flash, 8MB User Flash RTC, 10Base5, Ultra SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 & 2 x RS422 ports, 1 PMC slot, 5 Row P1 & P2 (no P0)
PPC2A-604-2936A	Air cooled Level 2 as above with conformal coating
PPC2A-604-3936A	Air cooled Level 3 as above with conformal coating
PPC2A-604-4936A	Conduction cooled Level 4 as above but with Type A 80 way P0 connector fitted as standard

PPC2A P0 Connector Options

POPPPC2A-35	**Type A 80 way P0** connector fitted to air cooled PPC2A Level 1, 2 or 3. This must be specified when PPC2A is ordered.
POPPPC2A-36	**Type B 95 way P0** connector fitted to air cooled PPC2A Level 1, 2 or 3 or conduction cooled Level 4 or 5 (Note :Type A P0 will be fitted on Level 4 or 5 unless this POP is specified). This must be specified when PPC2A is ordered.
POPPPC2A-65	**No P0 connector fitted to conduction cooled PPC2A** Level 4 or 5. This must be specified when the PPC2A is ordered.

UK
Radstone Technology PLC
Water Lane, Towcester,
Northants NN12 6JN
Telephone: +44 (0) 1327 359444
Fax: +44 (0) 1327 359662
E-mail: sales@radstone.co.uk

USA
Radstone Technology Corporation
50 Craig Road
Montvale, NJ 07645-1709
Telephone: +1 800 368-2738
Fax: +1 (201) 391-2899
E-mail: radstone@radstone.com

North Eastern Region: +1 (201) 391-2700
South Eastern Region: +1 (703) 383-3150
Western Region +1 (909) 974-1141

FRANCE
Radstone Technology SA
6 avenue des Andes
91952 COURTABOEUF Cedex
Telephone: +33 (01) 64.46.04.03
Fax: +33 (01) 69.28.03.40

AUSTRALIA
Radstone Technology Pty Ltd
PO Box 486
MORISSET
N.S.W. 2264
Telephone: +61 (02) 4973-4926
Fax: +61 (02) 4970-5953

TAIWAN
Radstone Technology
Fl 4 No 568
Chung Cheng Road
Hsintien
R.O.C.
Telephone: +886-2-2218-5819
Fax: +886-2-2218-6248

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