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Find the *Abaco Systems / Radstone PPC1A-603e-1237E* at our website: *Click HERE*

PowerPC™

PPC1A

RADSTONE VMEBUS SBC



- PowerPC 603 / 604 / 740 to 333MHz
- PReP Architecture
- 2 Air Cooled Build Levels & Conformal Coating
- Standard Features
  - 1Mbyte L2 Cache
  - 9Mbytes FLASH
  - 16 to 336Mbytes EDO DRAM with optional EDC
  - 10BaseT or 10Base5 Ethernet
  - Ultra SCSI
  - Mouse/Keyboard/Floppy/Parallel/2 x Serial Ports
  - 3 row VME with P0 Connector Option
  - 2 PMC Expansion Slots
  - PMC Carrier Cards with up to 9 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 PPC1A family of COTS 6U VME Single Board Computers offers market leading performance in 2 air cooled build levels, combined with the same rich feature set of the PowerPC Reference Platform (PReP) architecture Radstone introduced on PPC1 in 1995.

Choose PowerPC603, 604 or 740 processors at 266MHz and higher frequencies for state of the art performance, while maintaining backward compatibility with your existing Radstone system designs (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 reuse 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.

PPC1A 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.

RADSTONE TECHNOLOGY

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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.
2 Build Level Options	Maximum component reuse across multiple environmental ranges.
2 PMC expansion slots	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

PPC1A 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 PPC1 system designs (Table 1).

Memory

PPC1A supports 16, 64 or 80MBytes of DRAM on-board, with expansion to 336MBytes within a single VME slot total by adding the appropriate mezzanine cards (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 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 on-board slots supporting two single or one double width PMCs, PPC1A offers expansion with a family of standard PMC Carrier Cards (see table 3).

The PCI sub-system can support from 2 to 9 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 width or one double width PMCs which can be linked to the PPC1A host via the P0/J0 interface on each card.

PPC1A may also be combined with the PCC1 PMC carrier to form a 2 slot replacement unit offering 4 or 5 PMC slots total. This option does not require any special J0 signal routing on the backplane.

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

Table 1: CPU Selection

CPU	Frequency	SPECint95 *	SPECfp95 *	CPU Typical Power (Watts) Consumption *	SBC Typical Power (Watts) Consumption
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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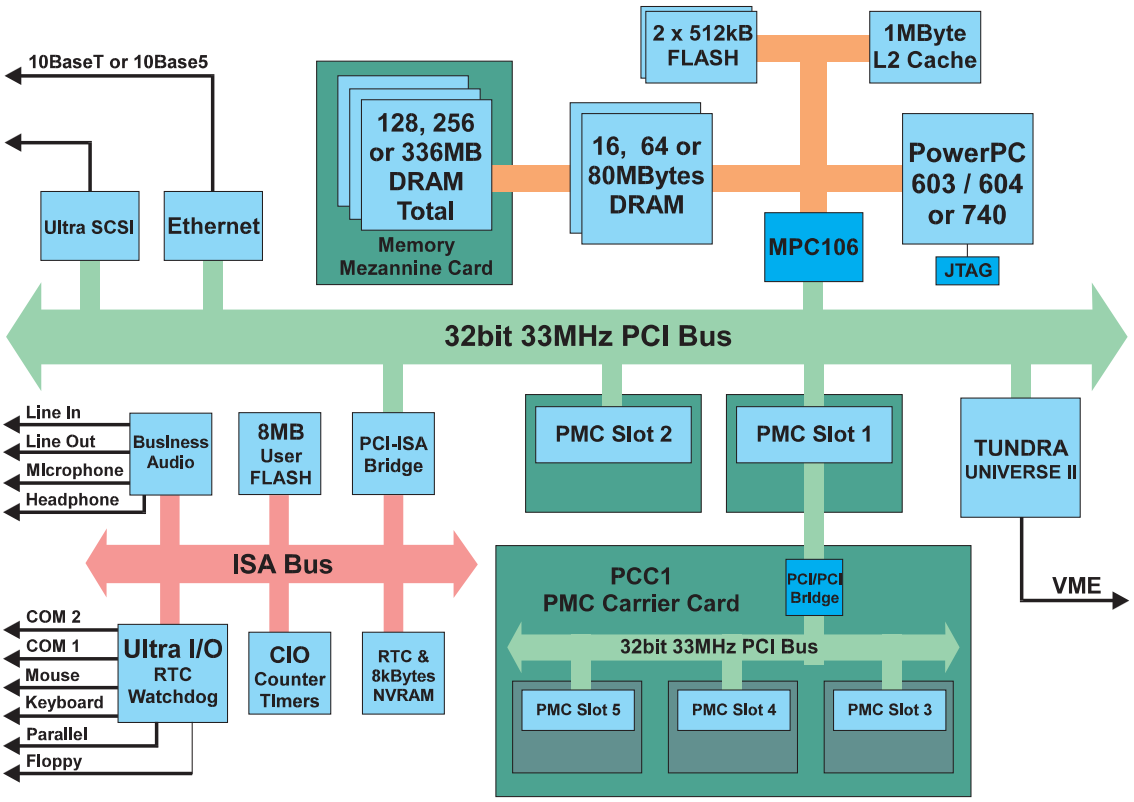


Figure 1 PPC1A Functional Block Diagram

Table 2: PPC1A Memory

DRAM	16, 64 or 80MBytes on-board	128, 256, 336MBytes with PPC1AMMC
System FLASH	2 X 512kBytes	Socketed (1 device is factory fitted)
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 PPC1A

Assembly	DRAM MBytes	PMC Slots	VME Slots
PPC1A	16, 64 or 80	2	1
PPC1A / PPC1AMMC	up to 336	1	1
PPC1A / PCC1	16, 64 or 80	4	2
PPC1A / PPC1AMMC / PCC1	up to 336	3	2
PPC1A/ PMCPCI / P0CC1	16, 64 or 80	3 to 9	2 to 5
PPC1A / PPC1AMMC/ PMCPCI / P0CC1	up to 336	2 to 8	2 to 5

Input / Output

PPC1A offers both front and rear I/O options. In addition to the front panel I/O options outlined in Figure 3, rear I/O (Figure 2) is supported by the P2X600 paddle card and our family of 3U transition modules and cables for fitment to stadard air cooled chassis.

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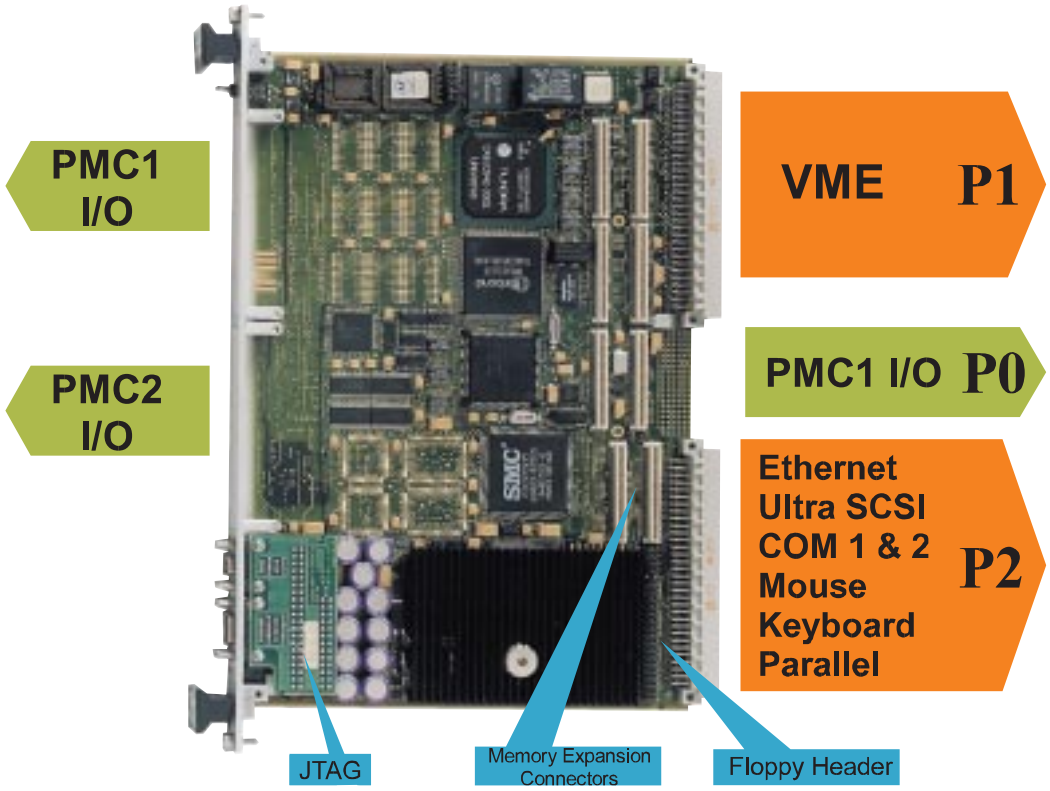


Figure 2 PPC1A Rear I/O Diagram

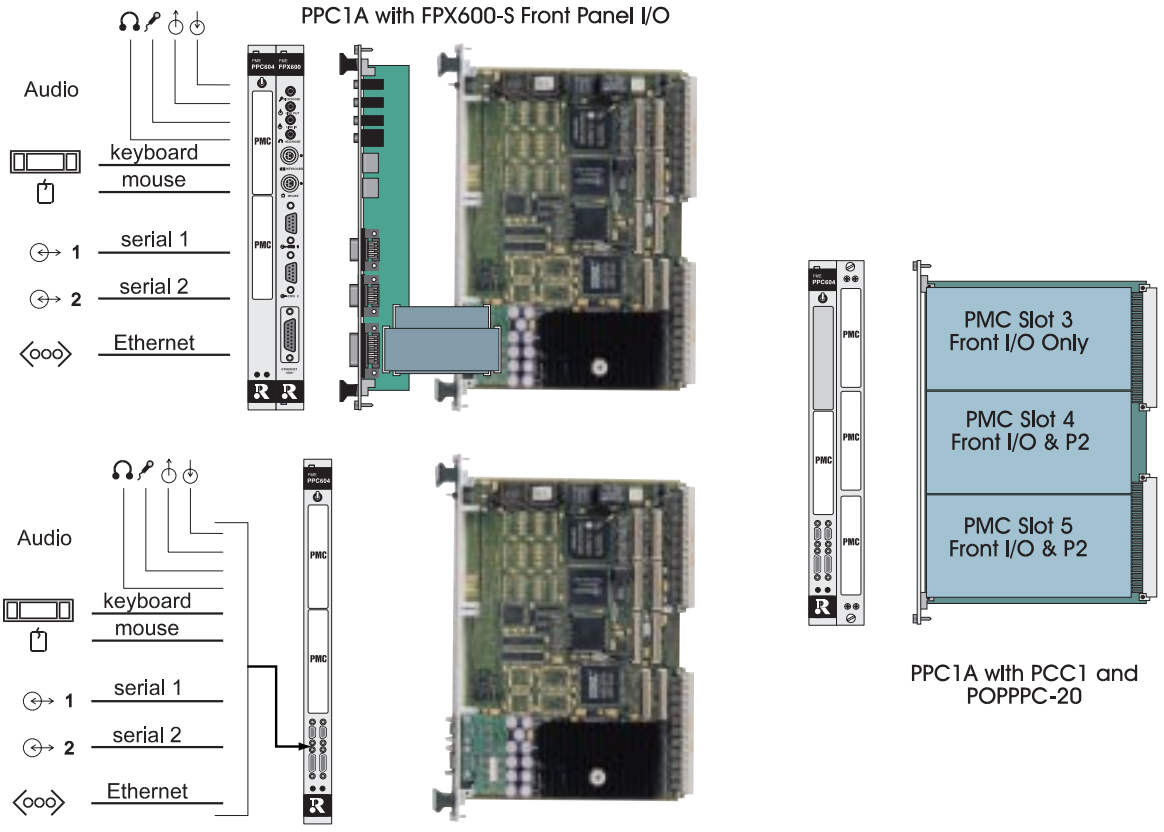


Figure 3 PPC1A Front I/O Diagram

Table 4: PPC1A Build Levels

Build Level	1	2
Cooling Method	Convection	Convection
Conformal Coat	Optional	Standard
Low Pressure Operational	15,000ft	15,000ft
Low Pressure Storage	50,000ft	50,000ft
High Temp Operational	55°C @ 300ft/min	65°C @ 300ft/min
Low Temp Operational	0°C	-20°C
High Temp Storage	85°C	85°C
Low Temp Storage	-40°C	-40°C
Temperature Shock	10°C/min over Ts	10°C/min over Ts
Humidity	95% non-condensing	95% 10cycles 240hrs
Vibration Sine	10-500Hz 2g	10-500Hz 2g
Vibration Random	0.002g²/Hz from 10-2000Hz	0.002g²/Hz from 10-2000Hz
Shock	20g Peak Sawtooth 11mSec Duration	20g Peak Sawtooth 11mSec Duration

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 industrial or extended temperature, ruggedised build levels.

We have invested more than 50 man-years of engineering talent 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.

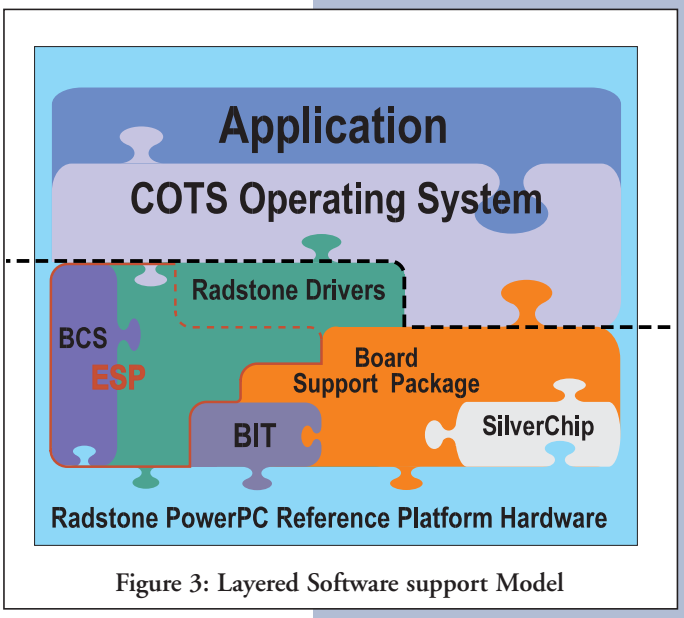


Figure 3: Layered Software support Model

OTS Software Products for PPC SBCs

The following software products are available for the entire PPCx family, including PPC1A, 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.

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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™

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™

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.

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.

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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.

PPC1A Hardware Technical Summary

Feature	Component	Comments
Processor	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	16 to 336MBytes
System	FLASH	FLASH 2 X 512kBytes socketed PROMs. One device is factory fitted.
Real Time Clock	M48T18	T.O.D., calendar,
NVRAM		8 kBytes SRAM battery backed or with back up from the 5V VMEBus +5VSTBY
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	Winbond 83C553	7 Channel DMA, Timer, Interrupt Controller & PCI bus arbiter.
Watch Dog Timer	Z85C36 CIO	1 second fixed interval Time Out
Timer Counters		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)	SMC 53C935	INS8250N-B, PC16550A & PC16450 compatible.
Parallel Port		Centronics style printer port.
Keyboard & Mouse		PS/2 compatible.
Floppy Disk Controller		Available via on-board header.
Business Audio	CS4231	16BIT CODEC, Stereo earphone, microphone, line-in, line-out.
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 420 grams	

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PPC1A Standard Ordering Information

Sales Code	300 MHz PowerPC 603r - 64MB DRAM
PPC1A-603-1436F	300 MHz PowerPC 603r 6U VME SBC, Level 1; 64MB DRAM, 1MB L2 Cache, 512kB System Flash, 8MB UserFlash; RTC, 10BaseT, ULTRA SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 ports, Business Audio, 2 PMC slots, 3 row P1 & P2 (no P0).
PPC1A-603-2436F	Air Cooled Level 2 As Above with Conformal Coating.
	266 MHz PowerPC 740 - 64MB DRAM
PPC1A-740-1B36F	266 MHz PowerPC 740 6U VME SBC, Level 1; 64MB DRAM, 1MB L2 Cache, 512kB System Flash, 8MB UserFlash; RTC, 10BaseT, ULTRA SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 ports, Business Audio, 2 PMC slots, 3 row P1 & P2 (no P0).
PPC1A-740-2B36F	Air Cooled Level 2 As Above with Conformal Coating.
	333 MHz PowerPC 604r - 64MB DRAM
PPC1A-604-1936F	333 MHz PowerPC 604r 6U VME SBC, Level 1; 64MB DRAM, 1MB L2 Cache, 512kB System Flash, 8MB UserFlash; RTC, 10BaseT, ULTRA SCSI, Mouse & Keyboard I/F, Floppy, Parallel, 2 x RS232 ports, Business Audio, 2 PMC slots, 3 row P1 & P2 (no P0).
PPC1A-604-2936F	Air Cooled Level 2 As Above with Conformal Coating.

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