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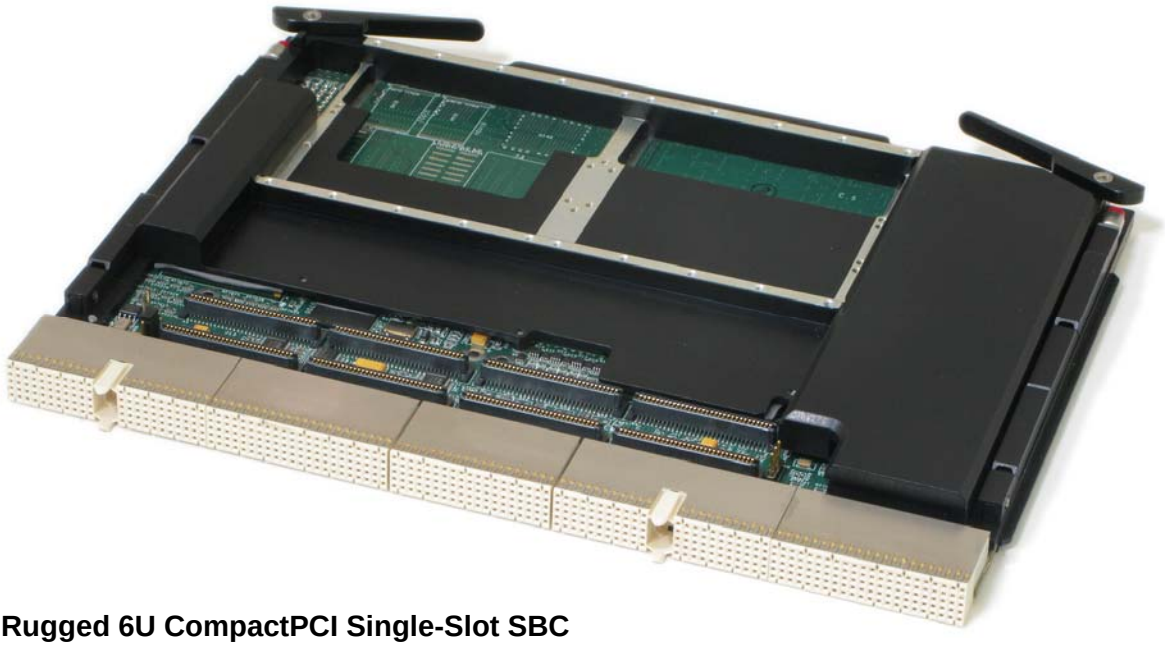
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Find the *Aitech Defense Systems C104* at our website: ***Click HERE***

C104

PowerPC® MPC7448 CompactPCI SBC



- Rugged 6U CompactPCI Single-Slot SBC
- PICMG 2.0 Rev 3.0 Compliant
- PowerPC® G4+ Processor
  - MPC7448 @ up to 1.4 GHz
  - AltiVec™ Technology
  - 32 kB L1 and 1 MB L2 Caches
- Up to 1 GB of SDRAM with ECC
- 32 MB Boot Flash Memory
- 128 MB User Flash Memory
- Up to 32 GB NAND Flash Memory
- 128 kB NVRAM
- 1 Gigabit Ethernet Port
- 2 Fast Ethernet Ports
- 2 USB 2.0 Ports
- 2 Dual-Redundant MIL-STD-1553B Ports
- CANbus 2.0B Interface
- 2 Standard Serial UART Ports - RS-232/422/485
- 6 Multi-Protocol High-Speed Serial Ports Supporting RS-232/422/485
- 16 Single-Ended TTL or 8 Differential RS-422 Discrete I/O Lines
- 2 PMC Slots
- Auto System/Peripheral Detection
- 64-bit @ 66Mhz CompactPCI Bus
- Power Saving Modes
- Eight 32-Bit Timers
- Standard and Windowed Watchdog Timers
- Electronic Elapsed Time Meter
- Real-time Clock
- 8 High Performance DMA Engines
- 3 On-board Temperature Sensors
- Conduction and Air-Cooled Versions
- RTOS Support
  - Wind River VxWorks®
  - Green Hills® INTEGRITY®

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C104 High Performance and Low Power Combined with Extensive I/O

The C104 designed for harsh environment applications that require high performance, low power, and multiple I/O capabilities.

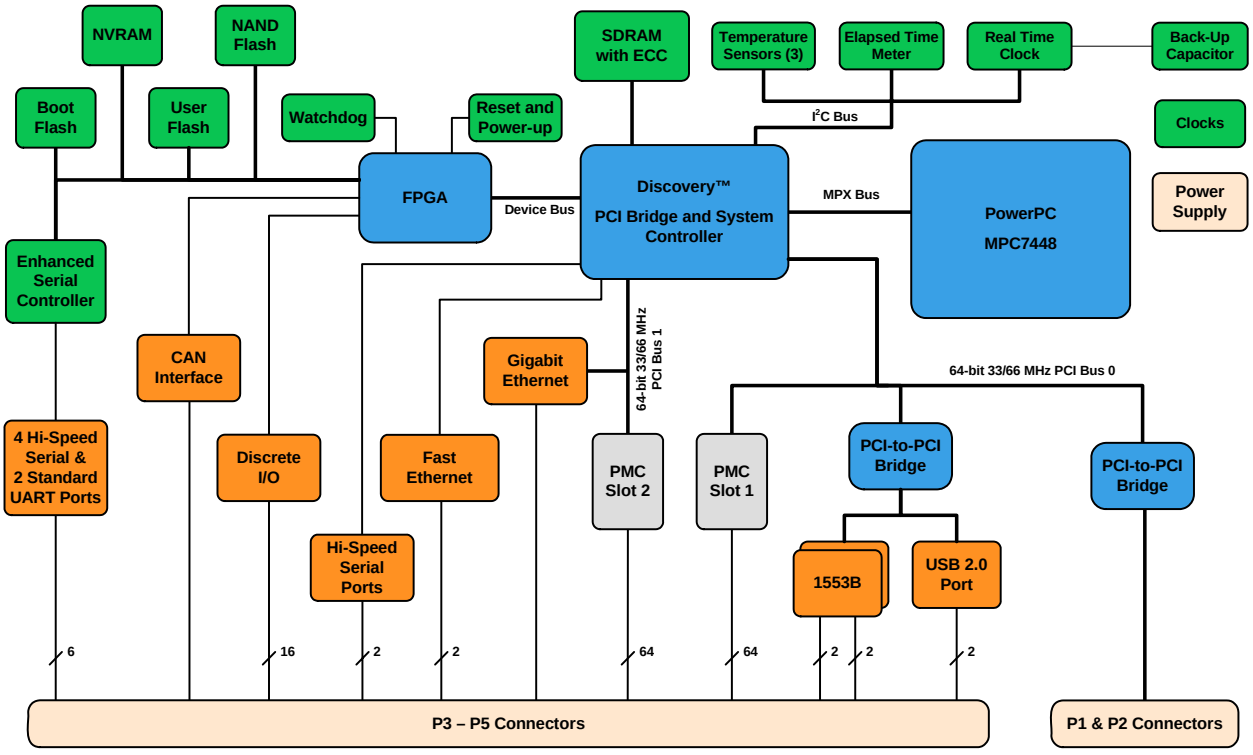
This single-board computer combines an enhanced processing engine with versatile and flexible I/O. Powered by Freescale's advanced PowerPC® MPC7448 microprocessor at 1.4 GHz with integrated on-chip L1 and L2 caches, the C104 provides excellent processing capability while consuming minimum power and generating a low level of heat. For even lower power consumption and heat generation the C104L and C104U configurations are also available, with processors operating at 1.066 GHz and 600 MHz respectively.

The large, fast SDRAM array is supplemented by additional memory arrays, such as Flash for user application storage, high-density NAND Flash for mass storage purposes, and NVRAM for user/application-specific parameter storage.

In addition to its high performance processor architecture, the C104 provides unparalleled I/O capabilities, all integrated on board. I/O interfaces include a Gigabit Ethernet port, two Fast Ethernet ports, two dual-redundant MIL-STD-1553B interfaces, CANbus 2.0B interface, two USB 2.0 ports, eight serial ports (six high-speed ports and two standard UART ports), and 16 single-ended or 8 differential discrete I/O channels. The C104 enables further enhancement of all this functionality by providing two PMC expansion slots.

The C104 internal architecture is based on two separate 64-bit wide PCI buses, operating at 66/33 MHz enabling separation of the slow PCI devices from the faster ones so that each PCI device can operate at its top speed. In order to achieve maximum bus utilization, multiple advanced programmable DMA engines are available for data transfer over the PCI buses.

The C104 implements a fast 64-bit 66 MHz CompactPCI interface.



C104 Block Diagram

Functional Description

Processor and Bus Architecture

The C104 is a powerful processing platform combining a high performance processor with extensive supporting memory arrays. The board's architecture maximizes utilization of all bus interfaces.

Processor

The C104 features the high performance 32-bit MPC7448 PowerPC® processor, integrating both L1 (32 kB instruction/data) and L2 (1 MB) caches on chip to support its powerful processing core.

The processor is available in 600 MHz, 1.066 Hz, and 1.4 GHz versions (with potentially higher frequency processors available in the future), and provides AltiVec support enabling the user to take advantage of the processor's real-time vector processing capabilities.

Dynamic Frequency Switching (DFS)

The DFS feature allows the processor core frequency to be divided by two or four via software to reduce power consumption. The MPC7448 and the C104 itself remain fully functional in DFS mode, but operate at a lower level of processing.

Bus Architecture

In order to support the processing unit's high level of performance and to provide a fast highway for data transfer, the C104 implements the advanced, highly-integrated Discovery™ device.

The Discovery system controller performs both as the memory controller for the processor, and as its bridge to the PCI bus, and interfaces with the processor through the MPX bus at 133 MHz.

To maximize PCI bus utilization, and enable various PCI bus configurations, the C104 architecture was designed with two separate and totally independent PCI Rev. 2.2 compliant PCI buses, both supporting 64-bit operation at 66 MHz.

Memory

The C104 is equipped with large memory arrays providing the user with extensive resources. These arrays include up to 1 GB of fast SDRAM operating at 133 MHz, 32 MB of linear Boot Flash, 128 MB of linear User Flash, and up to 32 GB of NAND Flash for solid-state mass storage applications.

All SDRAM banks are ECC protected, providing high data integrity.

In addition, the C104 provides 128 kB of NVRAM (Non-Volatile RAM). This array is a fast Flash shadow type of RAM that does not require an external power supply to maintain its contents during power down.

Another Flash array is dedicated to Firmware storage, freeing all other arrays for user applications only.

CompactPCI

The C104 implements a standard 64-bit/66 MHz PCI interface in accordance with the PCI specification.

In a CompactPCI subsystem, the C104 is capable of performing either as system controller or as a peripheral card. As system controller, the C104 supports up to seven additional cards on the CompactPCI backplane, providing them with clock signals and arbitration support.

I/O Interfaces

In addition to its superior processing power and the more traditional I/O capabilities such as the Ethernet ports and serial channels, the C104 also provides more advanced interfaces such as Gigabit Ethernet, CANbus, and USB 2.0 ports.

MIL-STD-1553B

Two dual-redundant MIL-STD-1553B ports, each of which is capable of BC, RT, and MT operation, are provided. These ports are implemented through two separate PCI controllers enabling 32-bit 33 MHz PCI bus operation.

The MIL-STD-1553B ports are routed to the backplane connectors via transformer coupling (default) or direct coupling (optional).

Ethernet

The C104 provides one Gigabit and two Fast Ethernet ports. The Gigabit Ethernet interface supports 10BaseT/100BaseTX/1000BaseT and the Fast Ethernet ports support 10BaseT/100BaseTx.

The Gigabit Ethernet controller supports 64-bit @ 66 MHz PCI operation and incorporates large FIFOs and a powerful DMA engine enabling high bandwidth for data transfer.

The fast Ethernet controllers are integrated in the Discovery device, enabling fast access to the local SDRAM without loading any of the PCI buses.

CANbus 2.0B Interface

The C104 includes a CANbus port, implemented through a Philips SJA1000 stand-alone Controller Area Network (CAN) controller.

Two different modes of operation are implemented:

- BasicCAN mode
- PeliCAN mode with extended features

The CAN controller supports the full CANbus 2.0B protocol specification.

Serial I/O

The C104 provides a total of eight serial ports, six high-speed multi-protocol synchronous/asynchronous ports supporting all common serial communications protocols (UART, SUART, SDLC, HDLC, etc.), and two standard UART ports.

USB

A USB Rev. 2.0 host controller (backward compliant with Rev. 1.0 and Rev. 1.1) provides EHCI/OHCI Root hubs. The controller integrates the USB transceivers supporting high-speed, full-speed, and low-speed signaling. The C104 is capable of providing power to down stream devices. The controller is a PCI device capable of high data transfer rates through the use of its internal FIFOs and DMA engine.

Two USB 2.0 ports are routed to the backplane connectors for user access.

Discrete I/O

The C104 provides standard discrete I/O channels that may be configured as either 16 single ended or 8 differential channels. Each channel may be independently configured as input or output.

When configured as input each of the discrete channels may be programmed to generate an interrupt on any level shift event.

PMC I/O Expansion

The C104 provides two IEEE 1386-2001 or ANSI/VITA 20-2001 compliant PMC expansion slots for extended flexibility and integration of additional I/O to the board.

Each of the PMC slots resides on a different PCI bus and are capable of 64-bit at 66 MHz bus operation.

Both PMC slots can host IEEE1386/ 1386.1-2001 compliant air-cooled and VITA 20-2001 compliant conduction-cooled PMC modules.

The PMC slots support 3.3 V PCI signaling levels and are 5.0 V tolerant allowing insertion of any PMC module. The keying for them is universal (no key).

I/O Routing

All I/O interface signals are available at the C104 J2 - J5 backplane connectors.

On air-cooled versions, some of the I/O interfaces are available at the front panel. Refer to the front panel section for more information.

Timers

The C104 is equipped with eight 32-bit timer/counters, providing high-resolution timing functionality. They can be cascaded for long interval counting applications.

The C104 includes a Real-Time Clock (RTC) for time and date storage. The RTC is backed up by a large super-capacitor for long-term parameter storage.

The C104 provides two user programmable watchdog timers. The first is a standard timer, which generates a timeout event when not serviced before the programmed time interval expires. The second is an avionics style windowed watchdog timer, which requires the timer toggling to be performed within a specific “window” of time; if the timer is serviced before or after the programmed time “window” it generates a timeout event. Each of the two timers may be independently set to generate a non-maskable interrupt or reset the SBC.

Front Panel Connectors and Switches

The air-cooled version of the board is provided with a front panel, which includes the following:

- D-Type connector delivering two UART ports
- RJ-45 connector delivering one Ethernet port
- Reset SWITCH

Temperature Sensors

Three digital temperature sensors for thermal management and protection have been integrated into the design of the C104. Two sensors are located at the two edges of the board, and the third is in the PowerPC processor.

These sensors are software accessible via an I^2C interface.

Software

Test and Diagnostic Features

The C104 is supplied with an extensive firmware package including startup firmware (boot software), Aitech's AIMon monitor/debugger tool, Aitech's AIDiag diagnostic tool, and Built-in Test software (BIT). BIT may be executed during power-up, or at any time after the board has been booted.

A COP/JTAG interface to the processor is provided for debugging and development purposes.

RTOS Support

Board Support Packages (BSP) for the C104 are available for several Real-Time Operating Systems (RTOS), including WindRiver VxWorks, and Green Hills INTEGRITY®.

Other RTOS BSPs may be available upon request.

The BSPs include drivers for all on-board resources, enabling the user to take full advantage of the board’s powerful features.

Mechanical Features

The C104 is available in two mechanical formats:

- Air-cooled: per PICMG 2.0 R3.0
- Conduction-cooled: per ANSI/VITA 30.1-2002

Both mechanical formats are single-slot 6U modules.

The C104's customized metal frame provides excellent rigidity and shock resistance, as well as an array of stiffeners to support rugged PMCs.

C104

PowerPC® MPC7448 CompactPCI SBC

Dimensions

- Air-cooled: per PICMG 2.0 R3.0
- Conduction-cooled: per ANSI/VITA 30.1-2002

Weight

- Air-cooled form factor: < 625 g (1.38 lbs)
- Conduction-cooled form factor: < 750 g (1.65 lbs)

Thermal Management

A careful mechanical design including custom heatsink elements combined with a customized metal frame provides for optimal heat dissipation and relief of the board.

The C104 provides both primary and secondary thermal interface support for conduction-cooled PMCs.

Power Requirements

The C104 receives all its power from the CompactPCI backplane's +5.0 V and +3.3 V power supplies as defined in the CompactPCI specification.

Total power consumption of the C104 depends on its configuration and assembly options.

Fully featured, typical power consumption of the C104 is as follows:

Input Voltage	Processor		
	600 MHz	1.066 GHz	1.4 GHz
+3.3 V	3.5 A		
+5.0 V	0.6/1.5 A	1.5/2.7 A	2.7/3.7 A
+12 V	0 A (no PMC/XMCs mounted)		
−12 V	0 A (no PMC/XMCs mounted)		
Power	14.5/19 W	19/25 W	25/30 A

* Values are Typical/Maximum

Environmental Features

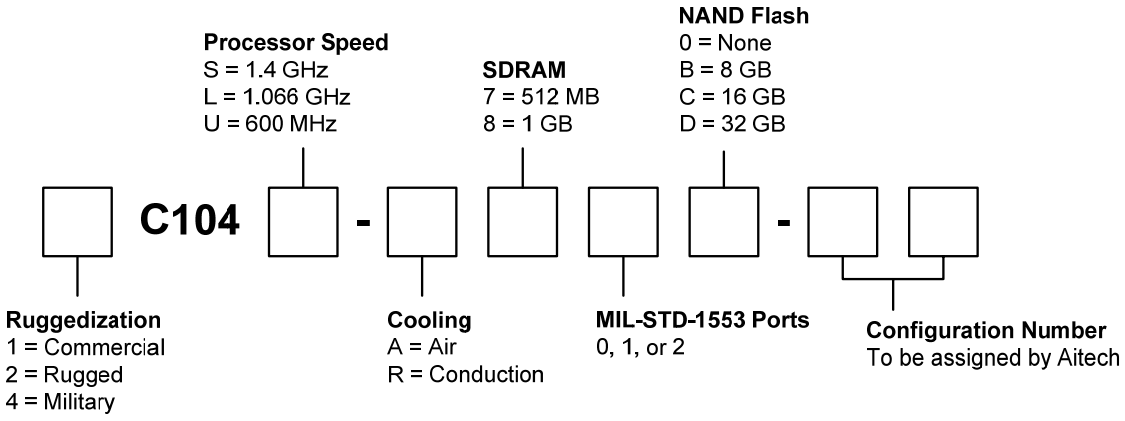
Please Refer to the Aitech Ruggedization Datasheet.

Accessories

For system integration and other development purposes, the TM104 Rear Transition Module (RTM) provides convenient access via standard connectors to all C104 I/O interfaces and all PMC I/O. The RTM supports both the air-cooled and conduction-cooled versions of the C104 when mounted in a commercial air-cooled chassis.

Please refer to the TM104 datasheet for additional information.

Ordering Information



Example: 4C104L-R72C-00

For more information about the C104 or any Aitech product, please contact Aitech Defense Systems sales department at (888) Aitech-8 (248-3248).

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