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Find the *Aitech Defense Systems C901* at our website: ***Click HERE***

C901

PowerPC® MPC7448 3U CompactPCI® SBC



- Rugged 3U CompactPCI SBC
- PowerPC® 7448 @ 1.4 GHz, 1.0 GHz, or 600 MHz, with AltiVec™ Technology
- 166 MHz MPX Bus
- Marvell MV64460 Discovery™ III System Controller
- One Standard PMC Slot
- PICMG 2.0, Rev. 3.0 Compliant
- System Controller or Peripheral
- Up to 1 GB of DDR333 SDRAM (@ 166 MHz) with ECC Protection
- 64 MB Boot Flash Memory
- 128 MB User Flash Memory
- 128 kB Autostore NVSRAM
- Up to 16 GB Flash File (NAND Flash)
- Power Saving Modes
- Two 10/100/1000 Mbps Ethernet Ports
- Two USB 2.0 Ports
- Two High-Speed RS-232/422/485 Ports
- Eight Single Ended TTL or Four RS-422 Differential Discrete I/O Lines
- Four High Performance DMA Engines
- Four 32-Bit Timers
- Fixed, Programmable & Windowed (Avionics) Watchdog Timers
- Real Time Clock
- On-Board Temperature Sensors
- Conduction and Air Cooled Versions
- RTOS Support:
  - Wind River - VxWorks®
  - Green Hills® - INTEGRITY®

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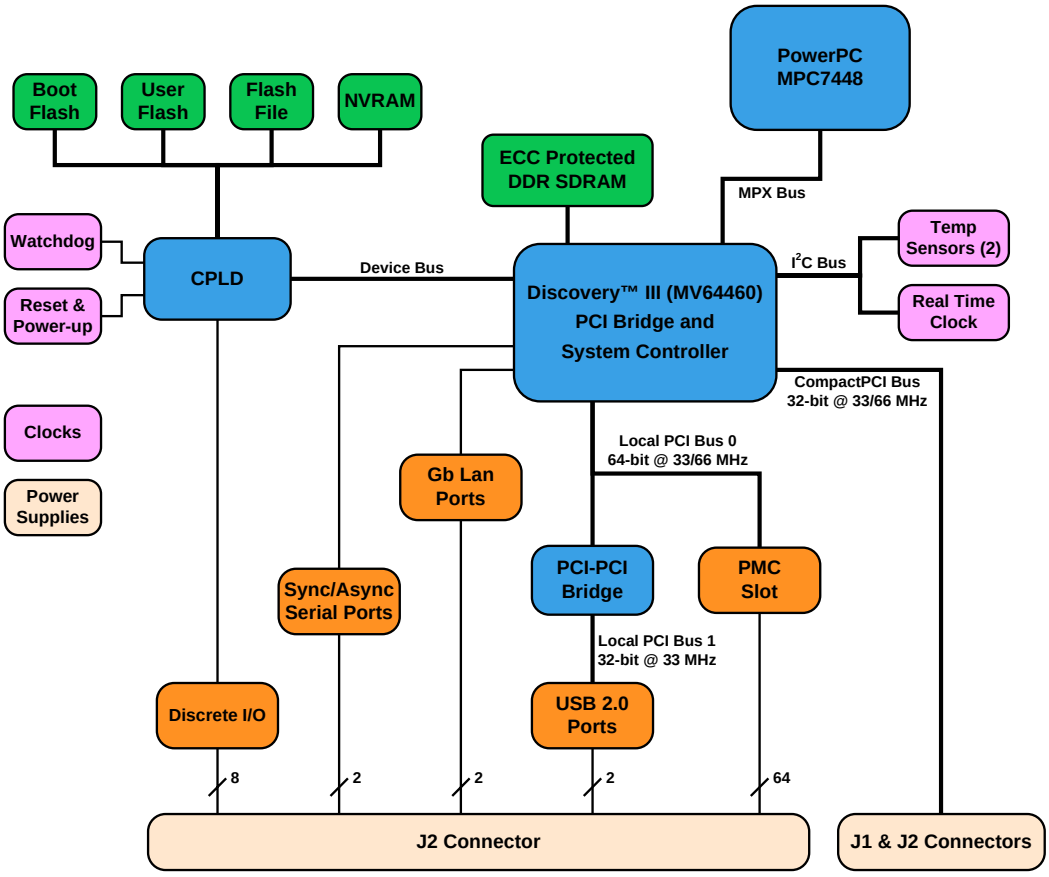
C901 Powerful Processing in Compact Form Factor

Aitech's C901 3U CompactPCI SBC represents an evolutionary development of the ground breaking C900. By upgrading the PowerPC processor to Freescale's new 7448, Aitech has increased processing performance while maintaining modest power requirements.

The next generation Freescale 7448 PowerPC processor has doubled the size of on-chip L2 cache to 1 MB compared to the 7447A, and raised the speed of the CPU and memory buses to 166 MHz. At the same time, core voltage has been reduced, and the Dynamic Frequency Switching mechanism has enhanced, to minimize power dissipation, and enable power saving when demands are low.

The C901 is available with three different versions of the MPC7448 processor operating at three different frequencies. The standard C901 operates at 1.4 GHz and offers the highest performance, while the ultra-low power C901U operates at 600 MHz and consumes just half the power.

As the C901 is a one to one drop in replacement for the C900, all systems currently using the C900 can benefit from a C901 upgrade without any modification whatsoever.



The C901 implements large on-board memory arrays to support the processor and user application needs. Memory resources include up to 1 GB fast DDR333 (Double Data Rate) SDRAM with ECC protection, 128 MB User Flash, 64 MB Boot Flash, up to 16 GB Flash File (NAND Flash) and 128 kB NVRAM for user/application specific parameter storage.

C901 onboard I/O capabilities include two Gigabit Ethernet ports, two high-speed serial communications ports, two USB 2.0 ports, and up to eight general-purpose discrete I/O channels. To further expand its

capabilities, the C901 is equipped with an industry standard PMC slot allowing for installation of additional modules and functionality.

The C901 may perform as either the CompactPCI system controller or as a peripheral board. When configured as system controller, the C901 can support up to six additional cards on the CompactPCI backplane, providing clock, arbitration and interrupt capabilities.

The highly integrated design of the C901 guarantees unmatched performance and versatility for a rugged conduction or air-cooled PowerPC 3U CompactPCI SBC.

Functional Description

Processor and Bus Architecture

The C901 is a powerful processing platform achieved by combining a high performance PowerPC processor and extensive supporting memory arrays. In addition the board's architecture was designed to utilize all bus interfaces to the maximum.

Processor

The C901 features Freescale's high performance MPC7448 PowerPC® processor. The MPC7448 is a 32-bit 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, 1.0 GHz, or 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.

The MPC7448 includes a Dynamic Frequency Switching (DFS) mechanism that can be used, under software control, to reduce processor speed on-the-fly by 50% or 75%, thereby lowering power consumption, when demands on the processor are low.

Bus Architecture

Supporting the processing unit's high performance and to provide a fast data highway for high throughput transfers, the C901 implements the advanced, highly integrated Discovery III system controller. The Discovery III performs as both the memory controller for the processor and as its bridge to the two PCI bus ports. Configured to support the high speed MPX bus protocols at 166 MHz, the Discovery III provides two separate and totally independent PCI-X bus interfaces. Both PCI buses support 64-bit operation at up to 133 MHz and fully comply with PCI Rev. 2.2 and PCI-X Rev. 1.0 specifications. The C901 utilizes standard PCI bus operation over these two PCI interfaces.

PCI bus 0 is 32 bit 33/66 MHz (per the CompactPCI specification) utilizing the CompactPCI interconnection over the backplane. PCI bus 1 is a 64-bit at 33/66 MHz bus used for on board interconnection to the PMC expansion slot and USB host controller.

To maintain support for 66 MHz operation over the local PCI bus (PCI bus 1) for high-speed PMC modules, the slower PCI USB controller (33 MHz) is attached to the PCI hierarchy through a PCI-PCI bridge. The primary PCI bus of this bridge operates at 66 MHz while its secondary bus - connecting to the USB controller - operates at 33 MHz.

Memory

The C901 is equipped with large memory arrays providing the user with extensive volatile and non-volatile memory resources, all of which are controlled through the Discovery III system controller. These arrays include up to 1 GB of fast DDR333 (Double Data Rate) SDRAM operating at 166 MHz, 64 MB Boot Flash, 128 MB User Flash, 128 kB NVRAM, and up to 2 GB Flash File (NAND Flash) for mass storage oriented applications. All memory resources reside on the SDRAM and device bus ports.

The DDR SDRAM bank is ECC protected providing high data integrity.

The 128 kB NVRAM (Non-Volatile RAM) is a fast Flash Shadow RAM with a hardware autostore capability that stores all NVRAM contents to its shadow Flash at the detection of a power failure, without the need for an external power supply.

Flash File, utilizing NAND Flash technology, is also provided on the C901. This block-oriented array provides a mass storage solution to applications requiring high data capacity devices for data storage/ retrieval.

The Boot Flash array is dedicated to firmware storage, freeing all the other arrays for user applications only.

CompactPCI

The C901 utilizes one of the Discovery III PCI bus ports for the CompactPCI backplane interconnection, implementing a standard 32-bit/66 MHz PCI interface, in accordance with the PCI specification.

In a CompactPCI subsystem, the C901 is capable of performing either as a system controller, or as a peripheral card. As system controller, the C901 supports up to six additional cards on the PCI backplane providing them with clock signals and arbitration support.

The C901 PCI interface is universal, supporting both 3.3 V and 5 V PCI signaling levels. The C901 drives 3.3 V signals and is 5 V tolerant.

I/O Interfaces

In addition to its superior processing power, the C901 provides many I/O capabilities (relative to its small form factor).

Ethernet

Two 10BaseT, 100BaseTX and 1000BaseT interfaces are provided on the C901.

The Gigabit Ethernet controllers (MAC) are integrated in the Discovery III system controller with internal FIFOs and DMA engines, allowing high bandwidth for data transfer through these interfaces. High performance physical layer devices complete this fast interface.

Serial I/O

The C901 provides two serial ports supporting RS-232/422/485 physical interfaces.

These ports are high-speed, multi-protocol synchronous/asynchronous ports supporting all common serial communications protocols (UART, USART, SDLC, HDLC, Transparent, etc.)

USB 2.0 Ports

The C901 includes a USB Rev. 2.0 host controller (backward compliant with Rev. 1.0 and Rev. 1.1) providing two EHCI/OHCI ports. The controller integrates the USB transceivers supporting high-speed, full-speed, and low-speed signaling. The C901 is capable of providing power to downstream devices. The controller is a PCI device capable of high data transfer rates using its internal FIFOs and DMA engine.

Discrete I/O

Up to eight single-ended or four differential general-purpose discrete I/O channels are provided on the C901. Each channel may be independently configured as input or output. Configured as input each of these channels may be programmed to generate an interrupt on any level shift event.

The eight discrete I/O signals are divided into two groups, each controlling four signals. Each group may be configured as four single-ended TTL channels or two differential RS-422 channels.

PMC Expansion

The C901 provides one IEEE 1386-2001 or ANSI/VITA 20-2001 compliant PMC expansion slot for extended flexibility and integration of additional I/O to the board.

The PMC slot resides on the fast 64-bit PCI bus port provided by the Discovery III system controller, and is capable of up to 66 MHz bus operation.

The universal PCI interface supports both 3.3 V and 5 V PCI signaling levels. The Discovery III drives 3.3 V signals and is 5 V tolerant.

I/O Routing

All I/O interface signals are available at the C901 J2 CompactPCI rear panel connectors. PMC I/O may also be routed to the J2 connector at the expense of on-board I/O connectivity.

The C901 is available in three basic I/O variants providing several combinations of on-board and PMC I/O at the J2 connector. Refer to the C901 ordering information for additional detail.

Timers

The C901 is equipped with four 32-bit timers/counters providing high-resolution timing functionality as well as chaining for long interval counting applications.

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

Three watchdog timers are available on the C901. The first is a standard 1.6 second hardware watchdog; if not serviced at least once every 1.6 seconds, this timer will reset the board. The second is a programmable watchdog integrated in the Discovery III system controller. This watchdog generates a timeout event if not serviced before the programmed time interval expires.

The third, and most versatile, is an avionics style programmable windowed watchdog timer, which must be serviced within a software programmable window defined by minimum and maximum times. If serviced too early, too late, or not at all, this watchdog timer will generate a timeout event. Each of the two programmable watchdog timers may be independently set to generate a non-maskable interrupt or reset the SBC.

Software

Test and Diagnostic Features

The C901 is supplied with an extensive firmware package, including startup firmware (boot software), AIMon monitor/debugger tool, AIDiag diagnostic tool, and BIT. BIT may be executed during power-up or at any time after the board has been booted.

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

Operating Systems

The C901 is available with complete Board Support Packages (BSP) for WindRiver VxWorks and Green Hills Integrity.

BSPs include drivers for all on-board resources, allowing the user to take full advantage of the C901's powerful features.

Mechanical Features

The C901 is available in both air-cooled and conduction-cooled mechanical formats. Both are single slot 3U modules.

A custom metal frame integral to the conduction-cooled version of the C901 provides excellent rigidity and shock resistance. The frame also provides an array of stiffeners to support rugged PMC boards.

Dimensions and Form Factor

- Air-cooled: per PICMG 2.0 R3.0
- Conduction cooled: per ANSI/VITA 30-1991

Weight

- Air-cooled: < 300 g (0.66 lbs)
- Conduction cooled: < 330 g (0.73 lbs)

Thermal Management

Careful mechanical design, including custom heatsink modules combined with a metal frame, allow for optimal heat dissipation and relief of the board. The C901 is also equipped with two temperature sensors, located at temperature-critical locations, to monitor board temperature and provide temperature data to user application software.

Power Requirements

The C901 receives power from the CompactPCI backplane and generates its specific power supplies on-board.

Power consumption for a fully populated C901 with 512 MB DRAM (no PMC installed):

Input Voltage	Processor		
	600 MHz	1.0 GHz	1.4 GHz
+3.3 V	1.6/1.75 A	1.7/1.95 A	1.7/1.95 A
+5.0 V	1.6/1.75 A	2.4/2.64 A	3.7/4.0 A
+12 V	0 A (no PMC/XMC mounted)		
–12 V	0 A (no PMC/XMC mounted)		
Power	13.3/14.5 W	17.6/19.6 W	24.1/26.5 A

* Values are Typical/Maximum

Environmental Features

Please Refer to the Aitech Ruggedization Datasheet.

Accessories

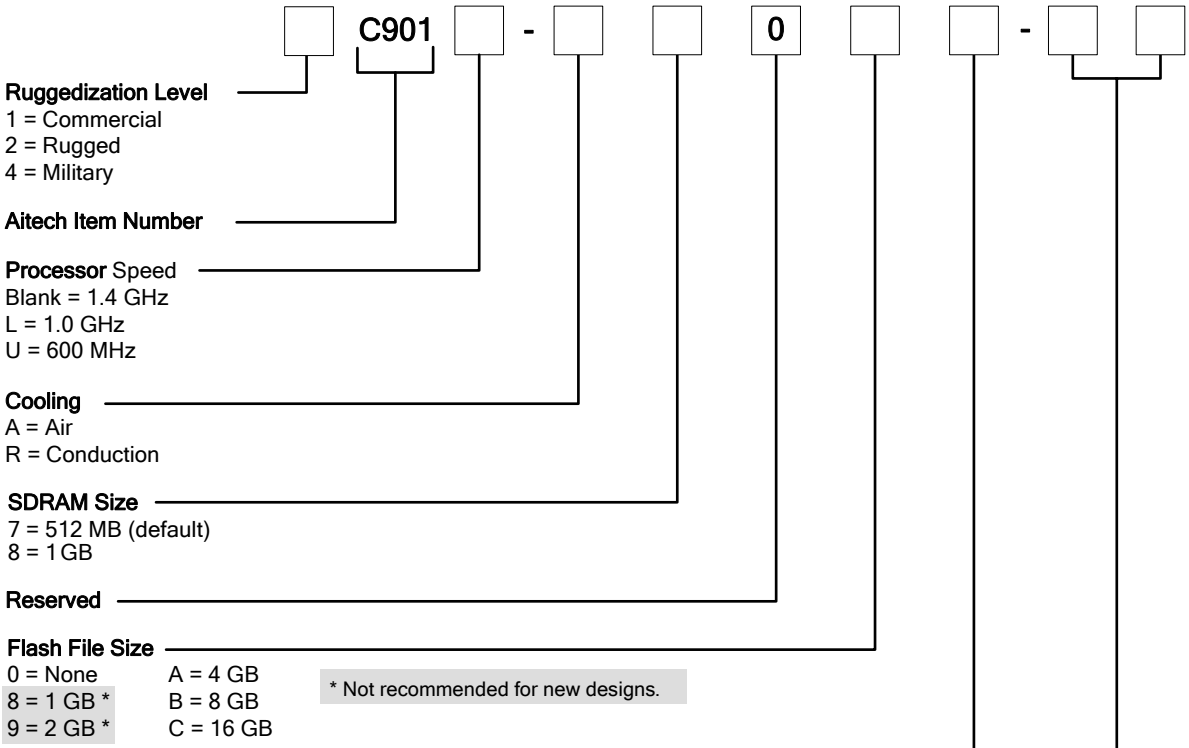
Optional accessories for the C90x family of SBCs include the TM900 Transition Module and the CM900 Carrier Expansion Module.

For system integration and other development purposes, the TM900 provides convenient access to all C90x I/O interfaces and all PMC I/O when an air-cooled or conduction-cooled C90x is mounted in a commercial air-cooled chassis.

The CM900 is a cPCI carrier board on which any industry standard PMC can be mounted. Using one or more CM900s, system functionality can be significantly expanded by enabling the C90x to control up to six additional PMCs on the cPCI the backplane.

Please refer to the TM900 and TM900 datasheets for additional information.

Ordering Information for the C901



Variant	1	2	3	4	5	6
System/Peripheral						
CompactPCI System Slot	x	x	x	-	-	-
CompactPCI Peripheral Slot	-	-	-	x	x	x
I/O Routed to J2						
GB Ethernet	2	1	0	2	1	0
Fast Ethernet	0	0	2	0	0	2
USB	2	2	2	2	2	2
High Speed Serial Ports	2	1	0	2	1	0
Standard UARTs	0	0	2	0	0	2
Discrete I/O Channels	8	4	4	8	4	4
PMC Pins	29	49	49	44	64	64

Configuration No.
To be assigned by Aitech

Example: 2C901L-R70B4-00

For more information about the C901 or any Aitech product, please contact Aitech Defense Systems sales department at (888) Aitech-8 (248-3248).

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