



A191 RediBuilt™

GPGPU Based Rugged HPEC



- GPGPU Based High Performance Embedded Computer (HPEC)
- Rugged Computer for Military and other Harsh Environment Applications
- Combination of High Performance Multi-core CPU and GPU
 - CPU
 - 4th Generation Intel® Core™ i7 CPU, Quad Core @ 2.4 GHz
 - Choice of GPU
 - NVIDIA® GeForce® GTX 770M
 - AMD Radeon™ HD 7970M
- Fully Integrated and Tested – Ready to Use
- Front Panel I/O Module with D38999 Connectors
- 3U VPX Architecture
- Compact and Lightweight
- Internally Conduction-Cooled
- Two External Cooling Configurations
 - Convection and Radiation Cooling by Fins
 - Cold Plate-Cooling
- Fully Sealed Faraday Cage and Complete EMI/RFI Filtering
- Environmentally Sealed
- Embedded Frame Grabber
- Up to 1 TB Flash Storage
- Video Outputs
 - 2 x DVI/HDMI
 - 2 x RGBHV
- Video Inputs
 - 2 x SD-SDI
 - 4 x Composite
- Communications I/O
 - 2 x Serial Ports
 - 2 x USB Ports
 - 2 x Gigabit Ethernet Ports
- Windows™ Support

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RediBuilt™ Powered by GPGPU

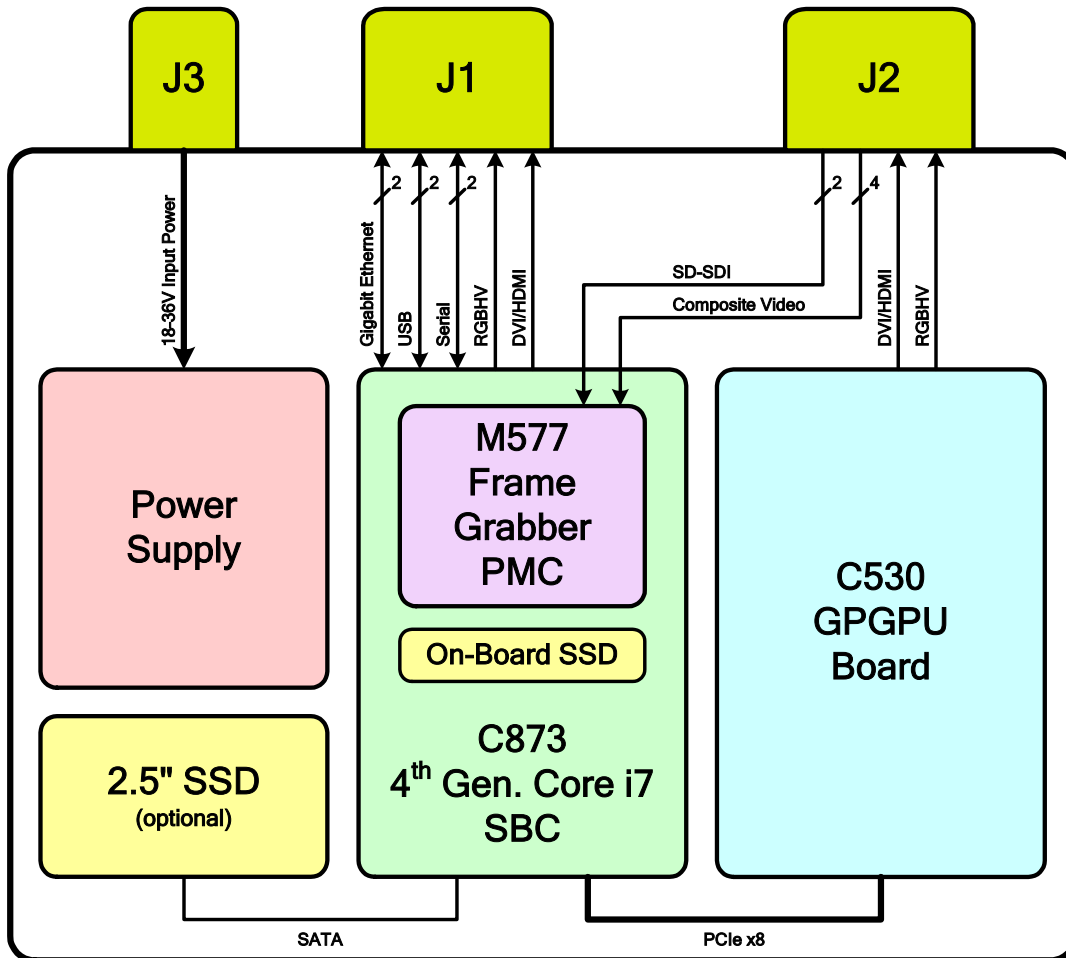
The latest generation of supercomputers achieves unprecedented performance by harnessing the parallel processing capabilities of today's multi-core Graphics Processing Units (GPU) and combining them with high performance multi-core CPUs. Aitech's COTS A191 High Performance Embedded Computer (HPEC) RediBuilt™ system works in exactly the same way, by combining a conventional CPU with a GPU – the CPU provides overhead functions while the GPU does the heavy lifting. Following this design philosophy, Aitech's engineers have achieved unprecedented processing capabilities in the A191 that are greater than the sum of the two individual processors. Performance is nearly an order of magnitude greater than can be accomplished with CPUs alone, and at roughly the same level of power consumption.

In Aitech's A191, the CPU is a 4th Generation Intel Core i7 processor on our latest generation C873 SBC, and the GPU is your choice of NVIDIA GeForce or AMD/ATI Radeon on our C530 General Purpose GPU (GPGPU) board. Rounding out the complement of boards is an Aitech M577 Frame Grabber PMC, providing video input capture.

The A191 provides extensive I/O, including various video formats, Ethernet, serial, and USB ports. The system includes on-board Flash mass storage, eliminating the need for external storage or mechanical/rotating media drives.

With its small footprint, moderate power consumption, and exceptional processing capabilities, potential applications for the A191 are wide ranging and include: Intelligence, Surveillance and Reconnaissance, including wide-area surveillance and automatic target recognition (ATR), multispectral sensor fusion, IED detection and countermeasures, synthetic aperture radar processing, and more.

The A191 includes a 2-slot 3U VPX backplane and an Aitech proprietary front panel I/O board, which together provide all system interconnections and filtering circuitry. The high-efficiency modular power supply ensures reliable operation over a wide range of input voltages.





Designed using proven technology, RediBuilt products are fully integrated, requiring no NRE or any additional development. To assist in rapid application software development and deployment, the A191 RediBuilt is code compatible with desktop PC environments including (but not limited to) OpenCL, NVIDIA's CUDA, and MATLAB, allowing porting of algorithms and application software onto the deployable hardware platform.

Optional accessories and readily available cable sets provide industry standard connector interfaces to all system I/O, ensuring a fully operational system right out of the box, ready for your application and/or OFP software.

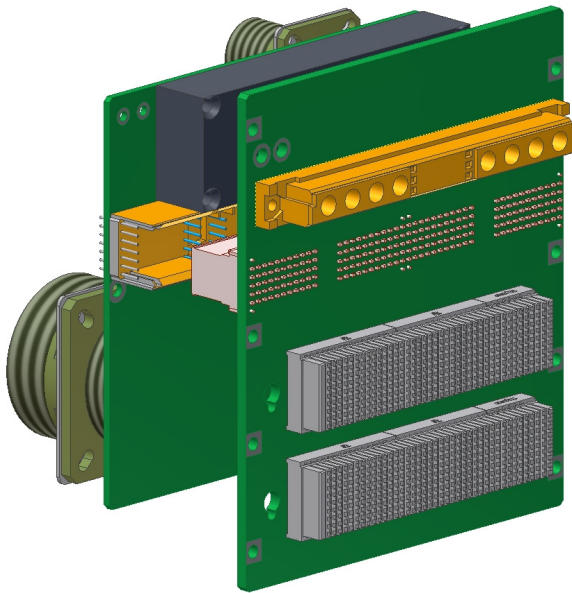
The Power of GPGPU

The parallel processing capabilities of today's multi-core Graphics Processing Units (GPU), in combination with high performance CPUs, make them ideal for many computationally intensive non-graphics applications. Aitech's C530 General Purpose GPU (GPGPU) board enables incorporation of these capabilities in a rugged configuration.

Designed to carry standard MXM 3.0/3.1 Type B modules, the 3U VPX C530 is currently available with NVIDIA GeForce GTX 770M and AMD Radeon HD 7970M based modules. These modules utilize the latest state-of-the-art GPUs, which would otherwise be unavailable for incorporation in rugged boards.

Rugged and Reliable

The A191 is based on a rugged Aitech enclosure constructed from aircraft grade anodized aluminum. Fasteners are stainless steel and often-used threads have self-locking stainless steel helicoils to withstand severe vibration and shock. All connectors are located on the enclosure front panel for easy access.



Internal I/O is routed from the backplane to the front panel connectors by means of a solid-state I/O transition module. This design philosophy, which was pioneered by Aitech, provides higher reliability and better signal integrity than harnessing, and is lower in cost.

Designed with a built-in handle for convenient handling, the A191 is equipped with brackets and captive screws for convenient hard mounting.

Cooling Configurations

The A191 is available in both natural convection air-cooled and cold plate conduction-cooled configurations. Both configurations are internally conduction-cooled, with the heat generated by the boards being conducted through the enclosure sidewalls for dissipation to the surrounding air or to the cold plate.

Sidewalls of the air-cooled configuration are externally finned for natural convection and radiation cooling without sacrificing ruggedness.

The cold plate-cooled A191 includes sidewalls that are specifically designed to efficiently conduct heat to the enclosure base. The high quality surface finish of the thermal surfaces at the bottom of the enclosure provides excellent thermal contact with the cooling base plate to ensure maximum heat transfer and cooling. The cold plate cooling is supplemented with convective cooling by means of the sidewall fins.

Versatile

Aitech has been designing custom embedded real-time rugged computing systems for nearly 30 years. In that time we have listened and learned. Our experience, together with the increasing functionality and decreasing size and power consumption of today's components, led us to develop the RediBuilt family of off-the-shelf computers that pack unprecedented processing power and functionality in small, lightweight, low power packages.

The A191 RediBuilt is currently available with a 4th Generation Intel Core i7 CPU, and two GPGPU options (NVIDIA GeForce GTX 770M or AMD Radeon HD 7970M), to meet a wide variety of mission requirements.

Ready to Use

The A191 RediBuilt is ready-to-use right out of the box, with features and functionality suitable for many defense and aerospace applications.

The system is fully integrated, available with the operating system and all drivers pre-installed. Just connect power and I/O harnessing, load your application, and you're ready to go.



Video Interfaces

The following A191 video interfaces are provided by the C873 SBC, the M577 Frame Grabber PMC, and the C530 GPGPU board, and are available at the J1 and J2 front panel connectors, as shown in the block diagram.

- 2 x RGBHV Outputs
- 2 x DVI/HDMI Single-Link Outputs
- 4 x Composite Video Inputs supporting RS-170A (NTSC)/PAL
- 2 x SD-SDI Inputs

A maximum of any two input channels can be active simultaneously.

Communications Interfaces

The following communications interfaces, provided by the C873 SBC, are available at the A191 front panel J1 connector, as shown in the block diagram.

- 2 x Gigabit Ethernet Ports
- 2 x USB 2.0 Ports
- 2 x Serial Ports, software configurable as RS-232, RS-422, or RS-485

Mass Storage

The A191 offers up to 1 TB of internal Flash storage with the following SSD options:

- Up to 512 GB from the C873 SBC on-board SSD
- Up to 512 GB from an optional standalone 2.5" SSD mounted inside the A191 enclosure, connected to the C873 via a SATA II interface

A191 SSDs use SLC (Single-Level Cell) or MLC (Multi-Level Cell) memory as specified in *Ordering Information* below.

High Performance Power Supply

The integral modular power supply accepts input voltage over the wide range of 18 – 36Vdc and has a 4 ms holdup time (50 ms with optional capacitor bank). The high efficiency of the power supply ensures reliable operation of the A191 RediBuilt, with minimum heat dissipated by the power supply itself.

Numerous protection mechanisms in the power supply protect the A191 RediBuilt from power line interference, reverse polarity, and overheating.

Output overvoltage and short circuit protection prevent damage to the power supply in the event of malfunctions in the system.

A small battery is also included to backup the system RTC. The battery is soldered in place by default, with a removable option available per customer request (contact an Aitech representative for information).

Connectability

Aitech's RediBuilt computer systems feature D38999 front panel power and I/O connectors for reliable operation in adverse environments.

Software

The A191 RediBuilt is available with the Windows operating system.

Environmental Specification

• Operating Temperature

Minimum: -40 °C

Maximum operating temperature is dependent on system configuration and power dissipation

• Non-operating Temperature

-50 to +100 °C

• Humidity

5% to 95% relative humidity with condensation

• Vibration

Sine Cycling of 5 g (max) at 5 to 500 Hz

Random 10 g_{rms} at 20 to 2000 Hz

Transportation Loose cargo vibration

• Shock

Single half-sine shocks: 40 g_{peak}/11 ms

• Transit Drop (packaged)

4 ft. drop on concrete

• Bench Handling

4-in unpackaged drop at a 45° angle to simulate conditions during servicing

• Salt Fog 5% salt spray

• Fine Dust Wind and fine dust particles

General Specifications

• Dimensions

Maximum external dimensions with fins and handle:

Convection-Cooled Enclosure:

181.0 x 260.7 x 126.0 mm (W x D x H)

7.13 x 10.26 x 4.96 in (W x D x H)

Cold Plate-Cooled Enclosure:

155.5 x 260.7 x 126.0 mm (W x D x H)

6.12 x 10.26 x 4.96 in (W x D x H)

• Weight

Less than 6.8 kg (15 lbs)

Power Consumption

Power consumption is dependent on configuration options. Maximum consumption is 140 W.



Configuration Variants

	Variant	
	13	22
Card Set	C873 M577 C530 (NVIDIA)	C873 M577 C530 (AMD)
GPGPU	NVIDIA GeForce GTX 770M	AMD Radeon HD 7970M
C873 I/O		
Bus Architecture	PCIe x8	
Gigabit Ethernet Ports	2	
Serial Ports ⁽¹⁾	2	
USB Ports	2	
Video Outputs (from C873 and C530)		
DVI/HDMI Single-Link Output	2 ⁽²⁾	
RGBHV Output	2 ⁽²⁾	
Video Inputs (from M577) ⁽³⁾		
SD-SDI Input ⁽⁴⁾	2	
Composite Input ⁽⁵⁾	4	

(1) Software configurable as RS-232, RS-422, or RS-485

(2) One channel from C873, one channel from C530

(3) A maximum of any two input channels can be active simultaneously

(4) Factory configured for 75 Ω single-ended SDI operation mode (standard default configuration)
100 Ω differential configurations are available per customer request

(5) Supports RS-170A (NTSC)/PAL

