EMBEDDED COMPUTING SOLUTIONS

MADE IN USA

RELIABILITY

FLEXIBILITY

FAST DELIVERY

ENGINEERING SUPPORT

ONE STOP SOLUTIONS

EMBEDDED COMPUTING & I/O SOLUTIONS
Experience counts – especially when engineering the right embedded solution. And with more than 60 years experience, Acromag can help you reduce your costs and increase your productivity.

Acromag: The I/O Leader
Acromag is focused on developing embedded computing solutions that provide the best long term value in the industry. Compare and you will find that Acromag offers an unmatched balance of price, performance, and features.

60+ Years of I/O Experience
With over 60 years of industrial I/O design experience, Acromag stands alone in the high-performance bus-board market. Developing VMEbus I/O boards since 1984, we combine our process control expertise with extensive experience in embedded computing. This background gives us unrivaled insight to many unique concerns when interfacing computer systems to various sensors and controllers in a wide range of applications.

Acromag processor, FPGA, and I/O products are commonly used in these industries:

- military/defense
- transportation
- semiconductors
- communication
- aerospace
- manufacturing
- scientific
- research labs

Quality You Can Count On
We take every measure to guarantee dependable operation with ISO9001 and AS9100 certified quality management. State-of-the-art manufacturing with industrial-grade components adds extra ruggedness. Advanced inspection and testing further ensure that Acromag I/O performs at or beyond their rated specs.

Technical Support
Drawing on a wealth of embedded I/O experience, our sales engineers are well qualified to support you in the use of our products in your end-applications. We take pride in our highly experienced staff that excels at after-sale technical support.

Global Representation
Great care has been put into building a team of highly skilled representatives and distributors. They are located around the world to service your needs.

Online Ordering
Find full documentation and pricing information online. You can get quotes and even order directly on our website.

Become a fan: www.facebook.com/acromaginc
Follow us: www.twitter.com/acromag
Connect with us: www.linkedin.com/company/acromag
Subscribe to our channel: www.youtube.com/acromagio

Experience
good, bad or otherwise. The best approach is the one that works best for you. And with more than 60 years of experience, Acromag can help you reduce your costs and increase your productivity.
Embedded Processing Solutions

VME Single Board Computers
VME multi-core 6U single board computers provide high-performance embedded computing with a range of CPU, I/O, and memory configurations.

- Intel® Core™ i7 or i5, 4th generation CPU
- Intel Core 2 Duo CPU
- Air-cooled or conduction-cooled

Embedded SFF Computers
The ARCX is the complete rugged embedded computing solution, coming equipped with CPU, carrier, power supply and optional power filter.

- Cableless and fanless design for rugged applications
- I/O expansion is available via XMC/PMC/Mini PCIe/mSATA modules
- Modify I/O with custom front panel designs

XMC 10GbE Interface Modules
10-Gigabit Ethernet interface modules deliver reliable, high-speed communication for data-intensive real-time embedded computing.

- Quad SFP+ copper/fibre or dual XAUI ports
- ASIC provides TCP/IP, FCoE, RDMA and stateless offload engine
- PCIe 2.0 x8 host interface

VPX Single Board Computer
AcroExpress™ 3U VPX carrier card with Skylake Xeon® CPU provides superior support of modern high-speed signals.

- PCIe switch
- 45W thermal design power
- Air-cooled or conduction-cooled

VPX Carriers
Acromag offers a full line of rugged OpenVPX™ carrier cards to deliver high-speed performance for data-intensive, high bandwidth applications.

- 3U and 6U form factors
- Interfaces up to two PMC or XMC modules
- PCIe x8 Gen 2 interface

Rear Transition Modules
VME and VPX Rear transition modules add a variety of new connectors to a single board computer.

Software Support
Windows® 7 32-bit driver package for VME and VPX single board computers. Includes individual drivers for Intel chipset, Ethernet, video, audio, serial, and Intel ME.

For more embedded computing, please see: www.Acromag.com/Boards

Telephone: 877-295-7092 or 248-295-0310 ■ Fax: 248-624-9234 ■ solutions@acromag.com ■ www.acromag.com
FPGA Computing Solutions

PMC FPGA Modules with AXM Support
PMC FPGA modules feature a high-speed I/O interface, user-customizable FPGA, and plenty of memory for efficient data handling.

- Up to 155K optimized logic cells
- -40 to 85°C and conduction-cooled models
- Plug-in I/O extension modules available (AXM)

High-Speed Serial I/O Modules
Advanced XMC FPGA modules feature multiple high-throughput serial interfaces supporting PCIe, SRIO, 10GbE, or Aurora implementation.

- Dual SFP+ ports for Fibre Channel or 10GbE
- Up to 410k optimized logic cells
- High-speed interface for PCIe Gen 1/2

XMC FPGA Modules with AXM Support
XMC FPGA modules add high-speed, multi-lane serial interconnects to a high-bandwidth PCI Express interface ensuring fast data throughput.

- Up to 410k optimized logic cells
- Up to 8-lane PCIe bus Gen 1/2 interface
- Plug-in I/O extension modules available (AXM)

AXM I/O Extension Modules
AXM multi-function extension modules add I/O to Acromag FPGAs. They plug right into the front mezzanine on the FPGA modules.

- Analog I/O, digital I/O and custom functions

Software Library Support
For easier development, Acromag function libraries greatly simplify the interface between our I/O boards and your application program.

VxWorks®, Win64, DLL, Linux

FPGA Engineering Design Kits
These kits provide utilities to communicate with the FPGA. They help load VHDL code and establish DMA transfers to the CPU.

For more FPGA modules, please see: www.Acromag.com/FPGAs

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COM Express Solutions

COM Express Carriers Type 6 Double Width
COM Express double width carrier boards feature a rugged design and save valuable space with a variety of expansion options.

- Interfaces: Type 6 COM Express modules, dual Mini PCIe/mSATA modules, and dual PMC/XMC modules
- -40 to 85°C operating temperature
- High-density Samtec SEARAY connectors provide all field connections

COM Express CPU Modules
COM Express modules feature a CPU and secure removable memory for use with a carrier card to provide custom and compact I/O.

- Type 6 interconnects
- Intel Core i7 or i5 CPU, 4th Gen (Haswell)
- Exclusive SODIMM hold-down mechanism secures up to 16GB of removable memory

Engineering Design Kit and Development System
For easier development and testing, the breakout board routes all I/O signals from the carrier’s high-density connector to standard peripheral connectors.

Get just the breakout board or have it mounted on a panel with cooling fans.

COM Express Carriers Type 6 Single Width
COM Express single wide carrier cards are built for rugged conditions and offer a variety of expansion options.

- Interfaces: Type 6 COM Express modules, dual Mini PCIe modules, and one PMC/XMC module
- -40 to 85°C operating temperature
- High-density Samtec SEARAY connectors provide all field connections

Production Front Panels
Front panels are available for the single and double-width carrier cards, featuring MIL-DTL-38999 cylindrical connectors to help prepare for field deployment.

Accessories
MIL-DTL-38999 CPU peripheral I/O breakout cable, power cable, and cable connectors to complete field wiring the production front panels.

COM Express Carriers Type 2/3
COM Express carrier boards provide a variety of additional I/O for the Type 2 or 3 COM Express module it holds.

- Mini PCIe site, Compact Flash site with ejector
- ATX power connector

For more COM Express, please see: www.Acromag.com/COMexpress
Embedded I/O Solutions

PMC I/O Modules
PMC I/O modules are available in a variety of analog and digital I/O functions for a balance of performance, features, and price.

- Analog I/O, digital I/O, multi-function I/O, counter/timer, serial communication
- Rugged design with long product lifecycles
- -40 to 85°C extended temperature option

PCI I/O Boards
PCI boards provide time-tested reliability with high-performance parts to withstand more demanding environments.

- Analog I/O, digital I/O, multi-function I/O, counter/timer
- Rugged design with long product lifecycles
- Available termination panels, cables, and adapters simplify system integration

IndustryPack I/O Modules
IndustryPack plug-in I/O modules deliver mix-and-match flexibility and high channel density for custom space-saving combinations.

- Analog I/O, digital I/O, counter/timer, serial
- Available termination panels, cables, and adapters simplify system integration
- -40 to 85°C extended temperature option

CompactPCI I/O Boards
CompactPCI I/O boards implement high-performance components into reliable design, which is ideal for defense and industrial systems.

- Analog I/O, digital I/O, multi-function I/O, counter/timer
- Rugged design with long product lifecycles
- Available termination panels, cables, and adapters simplify system integration

Software Development Tools
For easier development, Acromag function libraries for Windows, Linux, VxWorks and other operating systems quickly integrate with your application.

- Easy-to-use C function routines (with source code)
- Demonstration programs exercise the software and I/O board before attaching your application

For more embedded I/O, please see: www.Acromag.com/EmbeddedIO

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Embedded I/O Solutions

**AcroPack® I/O Modules**

**Analog I/O**
These modules perform high-speed and high-resolution A/D and D/A conversion.
- Mix and Match endless I/O combinations in a single slot
- PCIe Bus Interface
- -40 to 85°C standard operating temperature

**Digital I/O**
These modules interface TTL, on/off, hi/lo logic levels to an embedded computer system.
- High voltage, isolated input or isolated output
- PCIe Bus Interface
- -40 to 85°C standard operating temperature

**Serial Communication**
These modules provide an asynchronous serial communication interface for your system.
- RS232 or RS422/485 serial ports
- PCIe Bus Interface
- -40 to 85°C standard operating temperature

**Reconfigurable FPGA**
These reconfigurable Xilinx FPGA modules allow for custom user defined digital I/O designs.
- Mix and Match endless I/O combinations in a single slot
- PCIe Bus Interface
- -40 to 85°C standard operating temperature

**Counter/Timers**
These modules perform event counting, timing and frequency measurement functions.
- TTL or RS422/485 or TTL & RS422/485 combo
- PCIe Bus Interface
- -40 to 85°C standard operating temperature

**Software Support**
For easier development, Acromag function libraries greatly simplify the interface between our I/O boards and your application program.

For more AcroPack I/O, please see: www.Acromag.com/AcroPacks

**AcroPack Carrier Cards**
PCI Express and VPX Bus carrier cards for AcroPack® modules. The AcroPack product line updates our popular Industry Pack I/O modules with a PCIe interface format.
- Two or three AcroPack or mini-PCIe mezzanine module slots
- Non-Intelligent carrier cards
- PCIe x4 interface

**VxWorks™**

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### Embedded Computing Solutions

#### FPGA Modules

<table>
<thead>
<tr>
<th>Module Type / XMC Module</th>
<th>Logic Cells</th>
<th>DSP</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xilinx® Kintex®-7 FPGA (High-Speed Serial I/O)</td>
<td>Up to 410k logic cells</td>
<td>Up to 1540 DSP48E1 slices</td>
<td>8 high-speed serial lanes; dual SFP+ ports</td>
</tr>
<tr>
<td>Xilinx® Kintex-7 FPGA (AXM I/O)</td>
<td>Up to 410k logic cells</td>
<td>Up to 1540 DSP48E1 slices</td>
<td>8 high-speed serial bus lanes; plug-in extension I/O</td>
</tr>
<tr>
<td>Xilinx® Virtex®-6 FPGA</td>
<td>Up to 365k logic cells</td>
<td>Up to 768 DSP48E1 slices</td>
<td>8 high-speed serial lanes; dual SFP+ ports</td>
</tr>
<tr>
<td>Xilinx® Spartan®-6 FPGA</td>
<td>Up to 150k logic cells</td>
<td>Up to 830 DSP48A1 slices</td>
<td>32 LVDS; plug-in extension I/O</td>
</tr>
<tr>
<td>Xilinx® Virtex-5 FPGA</td>
<td>Up to 155k logic cells</td>
<td>Up to 640 DSP48E1 slices</td>
<td>32 LVDS; plug-in extension I/O</td>
</tr>
<tr>
<td>Xilinx® Virtex-4 FPGA</td>
<td>Up to 60k logic cells</td>
<td>Up to 192 XtremeDSP slices</td>
<td>32 LVDS; plug-in extension I/O</td>
</tr>
</tbody>
</table>

#### SBCs

<table>
<thead>
<tr>
<th>SBC Type</th>
<th>CPUs</th>
<th>Memory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPX Single Board Computers</td>
<td>Intel® Core™ i7 6200E (1.60GHz), 6200LE (2.0GHz), or 610E (2.53GHz)</td>
<td>4GB DDR3 ECC soldered RAM; 8GB Flash</td>
<td>Profile A/B, extended temperature options</td>
</tr>
<tr>
<td>VME Single Board Computers</td>
<td>Intel Core i7 (2.4GHz) or Core i5 (1.6GHz)</td>
<td>Up to 16GB of DDR3L ECC RAM with SODIMM lock-down mechanism</td>
<td>Extended temperature options</td>
</tr>
</tbody>
</table>

#### 10GbE Networking

<table>
<thead>
<tr>
<th>Ethernet Interface</th>
<th>Memory</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMC 10GbE Interface Modules</td>
<td></td>
<td>-40 to 85°C operation</td>
</tr>
</tbody>
</table>

#### Mass Storage

<table>
<thead>
<tr>
<th>Type/Format</th>
<th>Features</th>
<th>Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPX Storage Solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID controller module</td>
<td>Supports up to 8 SATA / SAS drives; Double fat-pipe (x8) PCIe interface</td>
<td>VXPM-6300 MOD3-PAY-ID-16.2.6-2</td>
</tr>
<tr>
<td>Bootable SATA / SAS drive module</td>
<td>Supports dual slim SATA drives or single 2.5” drive (rotating or solid-state)</td>
<td>VXPM-6300 MOD3-PER-1U-16.3.3-1 (PCle) MOD3-STO-1U-16.5.1-2 (SATA)</td>
</tr>
<tr>
<td>VME Storage Solutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBC expansion module</td>
<td>Accepts 1.8” SATA drive; USB; Ethernet; Serial</td>
<td>XVME-6300</td>
</tr>
<tr>
<td>6U rear transition module</td>
<td>Allows for custom set of new connectors</td>
<td>XVME-6300</td>
</tr>
<tr>
<td>On-board carrier for Type I or II Compact Flash</td>
<td>Processor board can boot from Compact Flash</td>
<td>XVME-6200</td>
</tr>
<tr>
<td>On-board carrier for 1.8” solid-state drive</td>
<td>Processor board can boot from drive</td>
<td>XVME-6200</td>
</tr>
<tr>
<td>6U rear transition module</td>
<td>Adds additional connectors, with or without PO</td>
<td>XVME-6200</td>
</tr>
</tbody>
</table>

### (continues on next page)
### Embedded Computing Solutions

#### I/O Boards

<table>
<thead>
<tr>
<th>IndustryPack I/O Modules</th>
<th>Inputs</th>
<th>Outputs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP200 Series</td>
<td>– –</td>
<td>Analog output; up to 16 channels</td>
<td>12 or 16-bit D/A; up to 100kHz</td>
</tr>
<tr>
<td>IP300 Series</td>
<td>Analog input; up to 20D/40SE channels</td>
<td>– –</td>
<td>12, 14 or 16-bit A/D; up to 1MHz</td>
</tr>
<tr>
<td>IP400 Series</td>
<td>Digital input; up to 48 channels</td>
<td>Digital output; up to 48 channels</td>
<td>TTL, CMOS, ±60V DC, or differential</td>
</tr>
<tr>
<td>IP480 Series</td>
<td>Counter/timers, TTL or RS-232; up to 10 channels</td>
<td>– –</td>
<td>16/32-bit; measure/generate; quadrature</td>
</tr>
<tr>
<td>IP500 Series</td>
<td>Serial communication; EIA/TIA-232/422/485, MIL-STD-1553, or CAN bus; dual/quad/octal</td>
<td>– –</td>
<td>64-byte FIFOs; optional isolation</td>
</tr>
</tbody>
</table>

#### PMC I/O Modules

| PMC200 Series | Analog output; 8 channels | 16-bit D/A; up to 100kHz |
| PMC300 Series | Analog input; up to 16D/32SE channels | – – | 14 or 16-bit A/D; up to 125kHz |
| PMC400 Series | Digital input; up to 64 channels | Digital output; up to 64 channels | TTL, 0-60V DC, bi-directional |
| PMC480 Series | Counter/timers, TTL or RS-232; up to 10 channels | – – | 16/32-bit; measure/generate; quadrature |
| PMC500 Series | Serial communication; octal 232/422/485 | – – | 64-byte FIFOs; full-duplex; |
| PMC700 Series | Analog in (16D/32SE); Digital input (16) | Analog output (8), Digital output (16) | 16-bit A/D & D/A; TTL I/O; 32-bit counter |

#### PCI and CompactPCI I/O Boards

| APC300 Series | Analog input; up to 16D/32SE channels | – – | 14 or 16-bit A/D; up to 125kHz |
| APC400 Series | Digital input; up to 64 channels | Digital output; up to 64 channels | TTL, 0-60V DC, bi-directional |
| APC480 Series | Counter/timers; TTL or RS-232; up to 10 channels | – – | 16/32-bit; measure/generate; quadrature |
| APC700 Series | Analog in (16D/32SE); Digital input (16) | Analog output (8), Digital output (16) | 16-bit A/D & D/A; TTL I/O; 32-bit counter |

### Bus Carrier Cards

#### Carrier Cards for IP Modules

<table>
<thead>
<tr>
<th>Carrier Cards for VME Modules</th>
<th>Size</th>
<th># of Slots</th>
<th>Field Connectors</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>VME carrier cards</td>
<td>3U/6U VME</td>
<td>2 or 4 IP slots</td>
<td>Front or rear I/O; 50-pin or SCSI-2 connectors</td>
<td>VME64 support; -40 to 85°C operation</td>
</tr>
<tr>
<td>PCI carrier cards</td>
<td>Full/half-length PCI</td>
<td>3 or 5 IP slots</td>
<td>50-pin headers</td>
<td>-40 to 85°C operation</td>
</tr>
<tr>
<td>PCI Express carrier cards</td>
<td>Full-length PCIe</td>
<td>4 IP slots</td>
<td>50-pin headers</td>
<td>-40 to 85°C operation</td>
</tr>
<tr>
<td>CompactPCI carrier cards</td>
<td>3U/6U PCI</td>
<td>2 or 4 IP slots</td>
<td>Front or rear I/O; 50-pin high-density connectors</td>
<td>-40 to 85°C operation</td>
</tr>
</tbody>
</table>

#### Carrier Cards for PMC / XMC Modules

<table>
<thead>
<tr>
<th>Carrier Cards for PMC / XMC Modules</th>
<th>Size</th>
<th># of Slots</th>
<th>Field Connectors</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI carrier cards</td>
<td>Half-length PCI</td>
<td>1 PMC slot</td>
<td>Front or rear I/O</td>
<td>-40 to 85°C operation</td>
</tr>
<tr>
<td>PCI Express carrier cards</td>
<td>Full-length PCIe</td>
<td>1 PMC/XMC slot</td>
<td>Front or rear I/O; x4/x8 PCIe interface</td>
<td>Air-cooled</td>
</tr>
<tr>
<td>CompactPCI carrier cards</td>
<td>3U/6U PCI</td>
<td>1 or 2 PMC slots</td>
<td>Front or rear I/O</td>
<td>-40 to 85°C or conduction-cooled</td>
</tr>
<tr>
<td>VPX carrier cards</td>
<td>3U/6U VPX</td>
<td>1 or 2 PMC/XMC slots</td>
<td>Front or rear I/O; x8 PCIe interface</td>
<td>Air-cooled, conduction-cooled, or REDI</td>
</tr>
</tbody>
</table>

### COM Express® Carrier Cards

#### Carrier Cards for COM Express Modules

<table>
<thead>
<tr>
<th>Carrier Cards for COM Express Modules</th>
<th>Size</th>
<th># of Slots</th>
<th>Field Connectors</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2/3 carrier card</td>
<td>Basic: 95x125mm</td>
<td>1 PMC slot</td>
<td>Front or rear I/O</td>
<td>-40 to 85°C operation</td>
</tr>
<tr>
<td>Type 6 carrier cards</td>
<td>Double: 200x165mm or Single: 125x165mm</td>
<td>2 Mini PCIe slots or 1 or 2 PMC/XMC slots</td>
<td>I/O via high-density Samtec SEARAY connectors</td>
<td>-40 to 85°C operation, Conduction cooling options</td>
</tr>
<tr>
<td>Type 6 carrier card front panel</td>
<td>Double or single width</td>
<td>– –</td>
<td>MIL-DTL-38999 cylindrical connectors</td>
<td></td>
</tr>
<tr>
<td>Type 6 carrier card engineering design kit</td>
<td>– –</td>
<td>– –</td>
<td>Delivers all signals from the carrier’s Samtec SEARAY connector through the EDK connectors</td>
<td></td>
</tr>
<tr>
<td>Type 6 carrier card development system</td>
<td>– –</td>
<td>– –</td>
<td>EDK break-out board mounted to panel with fans</td>
<td></td>
</tr>
</tbody>
</table>

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VPX AcroExpress™ Processor Board

VPX6600 3U VPX Air or Conduction-Cooled Processor Board

Description
The VPX6600 is a high performance 3U OpenVPX™ single board computer based on the 6th Generation Skylake Intel® Xeon® processor and PCH. Designed for COTS applications this SBC utilizes the Intel C230 series PCH chipset for extensive I/O support. Heat is managed with a fully integrated heat sink for advanced cooling management. The VPX6600 doesn’t consume I/O space and offers specialized I/O on P2.

Intel 6th Generation
Whether you’re looking for a tech refresh to update your legacy systems or starting a new application, Intel processors deliver significant performance advancements such as: enhanced microarchitecture, integrated graphics, and expanded memory performance with up to 32GB of high-speed DDR4 memory and ECC memory controllers. This board is designed and manufactured to meet VITA 46.0 and has at least a 7-year life expectancy.

Cutting-edge technology features programmable power limits, allowing the user to “dial-down” the maximum power consumption of the CPU in systems where power is a concern.

The VPX6600 also takes advantage of Intel Advanced Vector Extensions 2.0 for enhanced performance on floating point-intensive applications and Hyper-Threading Technology that enables each core to use two software threads for more efficient use of the CPU.

Memory
Supports either one or two DDR4 ECC SODIMMs, for a total of up to 32GB removable memory. The SODIMMs are firmly attached to the module with screws for easy replacement and surrounded by heat sink material to provide a mechanically and thermally robust mechanism. These processors feature a M.2 flash storage site perfect for solid-state storage application.

System Integrity
Acromag Built-In Test (BIT) software provides exceptional test coverage through Power-On BIT (POBIT).

Operating System Software
The VPX6600 is supported for use with Microsoft Windows® 7/8, VxWorks™ and Linux.

Extensive Support
With over 60-years’ experience, more than 40 of those years working with defense and military contracts, we are focused on providing embedded computing solutions for the best long term value in the industry.

Designed and manufactured in the USA, with a 2-year standard warranty.

Key Features & Benefits
- 6th Generation Intel Xeon:
  - Quad Core Xeon E3-1505M V5 (47W)
- Up to -40 to 85°C extended operating range
- Programmable CPU power for heat sensitive applications
- Intel C230 series CM236 PCH chipset
- Up to 32GB of high-speed DDR4 memory with SODIMM lock-down mechanism
- Power-on self-test (POST) code LCD display

Memory
- Supports either one or two DDR4 ECC SODIMMs, for a total of up to 32GB removable memory. The SODIMMs are firmly attached to the module with screws for easy replacement and surrounded by heat sink material to provide a mechanically and thermally robust mechanism. These processors feature a M.2 flash storage site perfect for solid-state storage application.

System Integrity
- Acromag Built-In Test (BIT) software provides exceptional test coverage through Power-On BIT (POBIT).

Operating System Software
- The VPX6600 is supported for use with Microsoft Windows® 7/8, VxWorks™ and Linux.

Extensive Support
- With over 60-years’ experience, more than 40 of those years working with defense and military contracts, we are focused on providing embedded computing solutions for the best long term value in the industry.
- Designed and manufactured in the USA, with a 2-year standard warranty.
**VPX6600 3U VPX Air or Conduction-Cooled Processor Board**

### Performance Specifications

**AcroExpress Processor & Memory**

Processor
- Intel Xeon processor.
- (6th generation, codename Skylake). The CPU allows programming a lower power limit in the BIOS setup allowing use in applications where less power is available or heat removal is an issue.
- E3-1505M V5: 2.8GHz, quad core, 8Mb cache, 47W.

Chipset
- Intel C230 series CM236 PCH chipset.

Memory
- 32GB of 2133 DDR4 ECC memory.

Flash Storage
- M.2 site available for onboard Flash.

**Software Support**

Acromag offers a board support package that contains the supporting drivers, documentation, as well as example code for the VXWorks® 7 Real Time Operating Systems.

Drivers for Microsoft® Windows® 7/8 and Linux™ are available for download from www.acromag.com.

**Fabric Port**

The VPX6600 provides 3 ports of x4 Gen 3 PCIe where 1-x4 port is used on the Data Plane and 2-x4 ports are used on the Expansion Plane. All ports fully comply with the PCIe specifications as defined by PCI-SIG and are routed to the P1 backplane connector as defined by VITA 46.4. The Data Plane and Expansion Plane interfaces can be used to interconnect multiple VPX6600s or to provide PMC/XMC support using the VPX4810 or VPX4814.

**Bus Compliance**

VITA 65 module profile
- MOD3-PAY-1F2F2U-16.2.2-4.
- VITA 46.0 / 46.4 / 46.6.

**Form Factor**

3U VPX 1” pitch (VITA 48.1).

**Environmental**

Operating temperature
- Air-cooled: 0 to 70°C *.
- Conduction-cooled: -40 to 85°C.

* w/ 300 lfm airflow, depends on application - see manual for details

Storage temperature
- -40 to 85°C.

Relative humidity
- 5% to 95% at 60°C non-condensing.

Shock
- 50g peak-to-peak, 11ms duration, MIL-STD-202G Method 213B.

Vibration
- 11.96 grms, 50-20,000 Hz, each axis, MIL-STD-202G Method 214A.

Power Inputs from backplane:
- 5V: 10.4A typical, 14.4A maximum.
- 3.3V: 1.3A typical.

### Ordering Information

**VPX6600-LF**
- Xeon CPU, 32GB DDR4, air-cooled.

**VPX6600-CC-LF**
- Same as VPX6600-LF plus conduction-cooled.

**Accessories**

**VPX6600-RTM-LF**
- 3U VPX rear transition module for air-cooled boards.

**Software Development Tools**

**VPX6600-BSP-VXW**
- Board support package includes driver and integration directions.
- Drivers for Microsoft® Windows® 7/8 are available for download from www.acromag.com.

**Related Products**

**VPX4810-LF**
- VPX carrier card, 3U, one PMC/XMC site.
- PCIe bus 8-lane Gen 1 or 2 interface backplane connection.

**VPX4810-CC-LF**
- Conduction-cooled version of VPX-4810.

**VPX4810-REDI-LF**
- Ruggedized enhanced design implementation (REDI VITA 48) version of VPX-4810-LF.

**VPX4814-LF**
- VPX carrier card, 3U, one XMC site.
- PCIe bus 16-lane Gen 1 or 2 interface backplane connection.

**VPX4814-CC-LF**
- Conduction-cooled version of VPX4814.

**VPX4814-REDI-LF**
- Ruggedized enhanced design implementation (REDI VITA 48) version of VPX4814.

For more information, see www.acromag.com.
**Single Board Computers**

**XVME-6700 6U VME Intel® Celeron® 2002E Air-Cooled Processor Board**

**Description**
If you’re one of the thousands who depends on the continued use of your VMEbus systems you can feel confident that Acromag is there for you. This single board computer updates your legacy systems with an Intel processor that will deliver an enhanced microarchitecture, integrated graphics, and expanded memory performance with 8 GB of high-bandwidth DDR3L memory and ECC memory controllers.

The XVME-6700 will add 7 to 10 years of life to your system with modern technology. This high-performance SBC features a FPGA-based VME to PCIe bridge that solves the end of life issue with the TSI148 VME interface chip.

Ruggedized SODIMM removable memory is surrounded by heat sink material to provide a robust hold-down mechanism. The SODIMM is secured with four screws so it is easy to replace faulty memory.

**Operating System Software**
Linux, VxWorks and Windows 7+

Advanced Vector Extensions 2.0 for enhanced performance on floating point-intensive applications and Hyper-Threading Technology that enables each core to use two software threads for more efficient use of the CPU.

**Expansion Capabilities**
In addition to a comprehensive range of front panel and backplane I/O features, the XVME-6700 offers increased expansion capabilities through two PMC/XMC sites on the board. In lieu of one PMC/XMC module, the optional XBRD-9060 expansion I/O carrier module may be installed. The XBRD-9060 allows for two SSD mSATA drives, as well as another Gigabit Ethernet port, RS-232 port, and two USB 2.0 ports.

The XVME-9640 rear transition module is also available for storage, networking, and easy access to the P2 connector I/O.

**Extensive Support**
With over 50 years’ experience, more than 35 of those years working with defense and military contracts, we are committed to providing embedded solutions for the best long term value in the industry. Designed and manufactured in the USA, this product comes with a 2-year warranty.

**Key Features & Benefits**
- Celeron-based board for cost-sensitive applications
- FPGA-based VME to PCIe bridge
- Intel 8-Series QM87 PCH chipset
- 8GB of high-speed DDR3L memory with SODIMM lock-down mechanism standard (16GB optional)
- Front panel I/O includes:
  - dual USB 2.0 ports
  - VGA (switched w/ rear)
  - dual Gb Ethernet ports thru RJ Point 5 connector
  - RS-232 port
- Backplane I/O includes:
  - dual Gigabit Ethernet (on optional P0)
  - dual SATA ports & dual USB ports
  - DVI-D
  - RS-232/422/485
  - VGA (switched with front)
- XBRD-9060 expansion module adds:
  - dual USB 2.0 ports
  - Gigabit Ethernet port (switched with one of the rear ports)
  - RS-232 port
  - dual mSATA drives
- Power-on self-test (POST) code LCD display

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/etc/telecom/8400-870b
Performance Specifications

- **Processor and Memory**
  - Processor: Intel® Celeron® Processor 2002E (2M Cache, 1.50 GHz)
  - Chipset: Intel 8-Series QM87 PCH chipset
  - Memory: 8GB of 1600 DDR3L ECC memory
  - Flash Memory: 8GB standard

- **Software Support**
  - VxWorks, Linux and Windows 7+

- **Bus Compliance**
  - VMEbus Interface
    - P1 and P2 connectors are compatible with VME64x VME Master/Slave using FPGA-based VME to PCIe bridge
    - A32/A24/A16/D32/D16/D8, MBLT64, 2eVME/2eSST
  - Dual PMC/XMC Sites
    - 32/64-bit, 33/66/133MHz sites (IEEE P1386/P1386.1)
    - Front panel I/O bezel and P4 module user I/O on optional P0 rear connector and P2 connector
    - (XMC module P16 connector I/O optionally available on P0 connector, please consult the factory)
    - XMCs are PCIe x8
    - Option to replace PMC/XMC #2 with the XBRD-9060

- **System Integrity**
  - A two-digit LED display is available for power-on self test (POST) codes for problems during the boot operation. It can then be used for application software user codes to aid in software debugging.

- **Form Factor**
  - 6U VMEbus 9.2" (233mm) x 6.3" (160mm)

Optional Expansion

XBRD-9060

- Allows more I/O to the front panel, as well as mSATA SSD modules to be added for storage. Front panel I/O available are Gb Ethernet, RS-232 serial port, and two USB ports.
- The XBRD-9060 also contains two mSATA sockets that allow two SSD drives to be added while still remaining within a single VME slot. Using the software RAID functionality of the QM87 PCH, these drives can even be setup as a RAID 0/1 array if redundancy or extra speed is desired.

XVME-9640

- Installed onto the rear slot directly behind the XVME-6700 to easily access all of the available I/O on the P2, and optionally P0 connectors, as well as allow mSATA SSD modules to be added for storage. Front panel I/O available are two Gb Ethernet ports, one VGA port, one DVI-D port, and two USB ports. Internal connectors are also available. Please see the user manual for more information.

Environmental

- Operating temperature
  - Standard temperature models: 0 to 70°C*
  - Extended temperature models: -40 to 75°C*
  - Application dependent - see manual for details
- Storage temperature
  - -55 to 85°C
- Relative humidity
  - 5% to 95% at 60°C non-condensing
- Shock
  - 50g peak-to-peak, 11ms duration, MIL-STD-202G Method 213B.
- Vibration
  - 11.96 g rms, 50-20,000 Hz, each axis, MIL-STD-202G Method 214A.
- Power Inputs from backplane:
  - Dual Core Celeron
    - 5V (5V only backplane): 53W typical to 53W maximum, 37.5W typical
    - 5V (5V +3.3V backplane): 50W typical to 50.5W maximum, 35W typical
    - 3.3V (optional): 3W
    - +/-12V: Used only for PMC/XMC

Ordering Information

- XVME-6700-7080-LF
  - 6U VME SBC, PO
- XVME-6700-7080E-LF
  - 6U VME SBC, PO, extended operating temperature
- XVME-6700-7081-LF
  - 6U VME SBC, no PO
- XVME-6700-7081E-LF
  - 6U VME SBC no PO, extended operating temperature

Note: Please contact the factory regarding conduction-cooled models.

- Accessories
  - For more information, see www.acromag.com.
  - XBRD-9060-LF
    - Expansion I/O Carrier Module
  - XVME-9640-1-LF
    - 6U VMEbus Rear Transition Module with P0 connector
  - XVME-9640-2-LF
    - 6U VMEbus Rear Transition Module without P0 connector

- Cable Set
  - 5028-558
    - Cable adapter: RJ Point 5 Male to RJ45 Female, 6 in
  - 5028-572
    - Cable adapter: 26-pin to 2 USB, VGA, Serial, 18 in

- Software Development Tools
  - Board support package includes driver and integration directions.
  - XVME-6500/6700-BSP-LNX
    - Linux board support package
  - XVME-6500/6700-BSP-VXW
    - VxWorks board support package
  - XVME-6500/6700-BSP-WIN
    - Windows BSP for XVME-6500 and XVME-6700
  - IPSW-A7VME-LNX
    - Linux example libraries for models XVME-6510 & XVME-6700 and VME carriers.

- Related Products
  - XMC FPGA modules
  - PMC FPGA modules

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XVME-6700 6U VME Intel® Celeron® 2002E Air-Cooled Processor Board

ISO9001
AS9100

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Intel® i7 CPU ◆ Up to 16GB DDR3L ECC RAM ◆ BIOS Selectable Byte Swapping

Expansion Capabilities
In addition to a comprehensive range of front panel and backplane I/O features, the XVME-6510 offers increased expansion capabilities through two PMC/XMC sites on the board. In lieu of one PMC/XMC module, the optional XBRD-9060 expansion I/O carrier module may be installed. The XBRD-9060 allows for two SSD mSATA drives, as well as another Gigabit Ethernet port, RS-232 port, and two USB 2.0 ports. The XVME-9640 rear transition module is also available for further storage, networking, and easy access to the P2 connector I/O.

Operating System Software
VxWorks and Linux.

Extensive Support
With over 50 years experience, more than 35 of those years working with defense and military contracts, we are focused on providing embedded computing solutions for the best long term value in the industry. Designed and manufactured in the USA, with a 2-year standard warranty.

Key Features & Benefits
- 4th Generation Intel Core:
  - Quad Core i7 CPU for high performance (47W)
- Programmable CPU power for heat sensitive applications
- FPGA-based VME to PCIe bridge
- Intel 8-Series QM87 PCH chipset
- Up to 16GB of high-speed DDR3L memory with SODIMM lock-down mechanism
- Front panel I/O includes:
  - dual USB 2.0 ports
  - VGA (switched w/rear)
  - dual Gb Ethernet ports thru RJ Point 5 connector
  - RS-232 port
- Backplane I/O includes:
  - dual Gigabit Ethernet (on optional P0)
  - dual SATA ports & dual USB ports
  - DVI-D
  - RS-232/422/485
  - VGA (switched with front)
- XBRD-9060 expansion module adds:
  - dual USB 2.0 ports
  - Gigabit Ethernet port (switched with one of the rear ports)
  - RS-232 port
  - dual mSATA drives
- Power-on self test (POST) code LCD display

The XVME-6510 will add 7 to 10 years of life to your system with modern technology. This high-performance SBC features a FPGA-based VME to PCIe-bridge that solved the end of life issue with the TSI148 VME interface chip.

Cutting-edge technology features programmable power limits allowing the user to “dial-down” the maximum power consumption of the CPU in heat sensitive applications.

Ruggedized SODIMM 16GB removable memory is surrounded by heat sink material to provide a mechanically and thermally robust mechanism. The SODIMM is secured with four screws so it is easy to replace faulty memory.

The XVME-6510 also takes advantage of Intel Advanced Vector Extensions 2.0 for enhanced performance on floating point-intensive applications and Hyper-Threading Technology that enables each core to use two software threads for more efficient use of the CPU.

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**XVME-6510** 6U VME Intel® Core™ i7 Air Cooled Processor Board

### Performance Specifications

**Processor and Memory**

**Processor**
Intel Core™ i7 processor. (4th generation, codename Haswell). The CPU allows programming a lower power limit in the BIOS setup allowing use in applications where less power is available or heat removal is an issue.

**i7-4700EQ:** 2.4GHz, quad core, 6Mb cache, 47W.

**Chipset**
Intel 8-Series QM87 PCH chipset.

**Memory**
16GB of 1600 DDR3L ECC memory.

### Optional Expansion

**VMEbus Interface**

P1 and P2 connectors are compatible with VME64x VME Master/Slave using FPGA-based VME to PCIe bridge

A32/A24/A16/D32/D16/D8, MBLT64, 2eVME/2eSST

**Dual PMC/XMC Sites**
32/64-bit, 33/66/133MHz sites (IEEE P1386/P1386.1)

Front panel I/O bezel and P4 module user I/O on optional P0 rear connector and P2 connector. (XMC module P16 connector I/O optionally available on P0 connector, please consult the factory).

XMCs are PCIe x8

Option to replace PMC/XMC #2 with the XBRD-9060

**System Integrity**

A two-digit LED display is available for power-on self test (POST) codes for problems during the boot operation. It can then be used for application software user codes to aid in software debugging.

**Environmental**

Operating temperature
Standard temperature models: 0 to 70°C*
Extended temperature models: -40 to 75°C*

* w/ 300 lfm airflow; depends on application - see manual for details

Storage temperature
-55 to 85°C

Relative humidity
5% to 95% at 60°C non-condensing

Shock
50g peak-to-peak, 11ms duration, MIL-STD-202G Method 213B

Vibration
11.96 g rms, 50-20,000 Hz, each axis, MIL-STD-202G Method 214A

Power Inputs from backplane:

Quad Core i7
5V (5V only backplane): 89W maximum, 53W typical
5V (5V +3.3V backplane): 86W maximum, 50W typical
3.3V (optional): 3W
+/-12V: Used only for PMC/XMC

### Ordering Information

**XVME-6510-1160-LF**
6U VME SBC, PO

**XVME-6510-1160E-LF**
6U VME SBC, PO, extended operating temperature

**XVME-6510-1161-LF**
6U VME SBC, no PO

**XVME-6510-1161E-LF**
6U VME SBC no PO, extended operating temperature

**Note:** Please contact the factory for conduction-cooled models.

**Accessories**

For more information, see www.acromag.com.

**XBRD-9060-LF**
Expansion I/O Carrier Module for XVME-6510

**XVME-9640-1-LF**
6U VMEbus Rear Transition Module with P0 connector

**XVME-9640-2-LF**
6U VMEbus Rear Transition Module without P0 connector

**Software Development Tools**

Board support package includes driver and integration directions.

**XVME-6500/6700-BSP-LNX**
Linux board support package

**XVME-6500/6700-BSP-VWX**
VxWorks board support package

**XVME-6500/6700-BSP-WIN**
Windows BSP for XVME-6500 and XVME-6700

**IPSW-A7VME-LNX**
Linux example libraries for models XVME-6510 & XVME-6700 and VME carriers.

**Related Products**

**XMC FPGA modules**

**PMC FPGA modules**

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XVME-9640

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**ISO9001**
**AS9100**

Tel 248-295-0310  ■  Fax 248-624-9234  ■  solutions@acromag.com  ■  www.acromag.com  ■  30765 Wixom Rd, Wixom, MI 48393 USA
XVME-6410  6U VME Intel® Core™ i7/i5 Air Cooled Processor Board

**Description**

The XVME-6410 is a high performance 6U VME single board computer based on the 4th Generation Intel® Core™ i7 or i5 processor and utilizes the Intel 8-Series PCH chipset for extensive I/O support.

**Intel 4th Generation**

Whether you’re looking for a tech refresh to update your legacy systems or starting a new application, Intel processors deliver significant performance advancements such as: enhanced microarchitecture, integrated graphics, and expanded memory performance with up to 16GB of high-bandwidth DDR3L memory and ECC memory controllers.

Cutting-edge technology features programmable power limits, allowing the user to “dial-down” the maximum power consumption of the CPU in systems where power is a concern.

The XVME-6410 also takes advantage of Intel Advanced Vector Extensions 2.0 for enhanced performance on floating point-intensive applications and Hyper-Threading Technology that enables each core to use two software threads for more efficient use of the CPU.

**Expansion Capabilities**

In addition to a comprehensive range of front panel and backplane I/O features, the XVME-6410 also offers increased expansion capabilities through two PMC/XMC sites available on the board.

In lieu of one PMC/XMC module, the optional XBRD-9060 expansion I/O carrier module may be installed. The XBRD-9060 allows for two SSD mSATA drives, as well as another Gigabit Ethernet port, RS-232 port, and two USB 2.0 ports.

The XVME-9640 rear transition module is also available for further storage, networking, and easy access to the P2 connector I/O.

**Memory**

Supports either one or two DDR3L ECC SODIMMs, for a total of up to 16GB removable memory. 8GB flash memory standard. The SODIMMs are firmly attached to the module with screws and surrounded by heat sink material to provide a mechanically and thermally robust mechanism.

**System Integrity**

Acromag Built-In Test (BIT) software provides exceptional test coverage through Power-On BIT (PBIT).

**Operating System Software**

The XVME-6410 is supported for use with Microsoft Windows® 7, Windows® 8, and Linux.

**Exteensive Support**

With over 50 years experience, more than 35 of those years working with defense and military contracts, we are focused on providing embedded computing solutions for the best long term value in the industry.

Designed and manufactured in the USA, with a 2-year standard warranty.

**Key Features & Benefits**

- 4th Generation Intel Core:
  - Quad Core i7 CPU for high performance (47W) or
  - Dual Core i5 CPU for low power (25W)

- Programmable CPU power for heat sensitive applications

- Intel 8-Series QM87 PCH chipset

- Up to 16GB of high-speed DDR3L memory with SODIMM lock-down mechanism (permits user removal or upgrades)

- Front panel I/O includes:
  - dual USB 2.0 ports
  - VGA (switched with front)
  - RS-232 port

- Backplane I/O includes:
  - dual Gigabit Ethernet (on optional P0)
  - dual SATA ports & dual USB ports
  - DVI-D
  - RS-232/422/485
  - VGA (switched with front)

- XBRD-9060 expansion module adds:
  - dual USB 2.0 ports
  - Gigabit Ethernet port (switched with one of the rear ports)
  - RS-232 port
  - dual mSATA drives

- Power-on self test (POST) code LCD display

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Bulletin #8400-814g
XVME-6410 6U VME Intel® Core™ i7/i5 Air Cooled Processor Board

### Performance Specifications

#### Processor and Memory

**Processor**
- Intel Core™ i7 or i5 processor (4th generation, codename Haswell). The CPU allows programming a lower power limit in the BIOS setup allowing use in applications where less power is available or heat removal is an issue.
- i7-4700EQ: 2.4GHz, quad core, 6Mb cache, 47W.
- i5-4402E: 1.6GHz, dual core, 3Mb cache, 25W.

**Chipset**
- Intel B-Series QM87 PCH chipset.
- Intel DH82QM87 Platform Controller Hub.

**Memory**
- Up to 8-16GB of 1600 DDR3L ECC memory.

**Flash Memory**
- 8GB standard with up to 32-GB available. Contact factory for more information.

**Software Support**
- Microsoft Windows® 7, 8, and Linux

#### Bus Compliance

**VMEbus Interface**
- P1 and P2 connectors are compatible with VME64x
- VME Master/Slave using IDT/Tundra TSi 148 device
- A32/A24/A16/D64/D32/D16/D8, 2eVME/2eSST
- VMEbus specification VME-2gSST, 64X, 320X

**Dual PMC/XMC Sites**
- 32/64-bit, 33/66/133MHz sites (IEEE P1386/P1386.1)
- Front panel I/O bezel and P4 module user I/O on optional P0 rear connector and P2 connector.
- (XMC module P16 connector I/O optionally available on P0 connector, please consult the factory).
- XMCs are PCIe x8
- Option to replace PMC/XMC #2 with the XBRD-9060

#### Form Factor
- 6U VMEbus 9.2" (233mm) x 6.3" (160mm)

### Environmental

**Operating temperature**
- Standard temperature models: 0 to 70°C*
- * w/ 300 lfm airflow; depends on application - see manual for details

**Storage temperature**
- -40 to 85°C

**Relative humidity**
- 5% to 95% at 60°C non-condensing

**Shock**
- 50g peak-to-peak, 11ms duration, MIL-STD-202G Method 213B.

**Vibration**
- 11.96 g rms, 50-20,000 Hz, each axis, MIL-STD-202G Method 214A.

**Power Inputs from backplane:**
- Quad Core i7: 5V (5V only backplane): 89W maximum, 53W typical
- 5V (5V +3.3V backplane): 86W maximum, 50W typical
- 3.3V (optional): 3W
- +/-12V: Used only for PMC/XMC

- Dual Core i5: 5V (5V only backplane): 61W maximum, 38W typical
- 5V (5V +3.3V backplane): 58W maximum, 35W typical
- 3.3V (optional): 3W
- +/-12V: Used only for PMC/XMC

### Ordering Information

- **XVME-6410-1080-LF** 6U VME SBC i7, 8GB Memory, 2.4GHz processor, PO
- **XVME-6410-1081-LF** 6U VME SBC i7, 8GB Memory, 2.4GHz processor, no PO
- **XVME-6410-1160-LF** 6U VME SBC i7, 16GB Memory, 2.4GHz processor, PO
- **XVME-6410-1161-LF** 6U VME SBC i7, 16GB Memory, 2.4GHz processor, no PO
- **XVME-6410-3080-LF** 6U VME SBC i5, 8GB Memory, 1.6GHz processor, PO
- **XVME-6410-3081-LF** 6U VME SBC i5, 8GB Memory, 1.6GHz processor, no PO
- **XVME-6410-3160-LF** 6U VME SBC i5, 16GB Memory, 1.6GHz processor, PO
- **XVME-6410-3161-LF** 6U VME SBC i5, 16GB Memory, 1.6GHz processor, no PO

#### Accessories

- For more information, see www.acromag.com.
- **XBRD-9060-LF** Expansion I/O Carrier Module for XVME-4610
- **XVME-9640-1-LF** 6U VMEbus Rear Transition Module with P0 connector
- **XVME-9640-2-LF** 6U VMEbus Rear Transition Module without P0 connector

#### Software Development Tools

- Board support package includes driver and integration directions:
  - **IPSW-VME-LNX** Linux™ support (website download only)
  - **IPSW-VME-WIN**

#### Related Products

- XMC FPGA modules
- PMC FPGA modules
Single Board Computers

XVME-6300-AC  6U VME Intel® i7 Core™ Air Cooled Processor Board

Description
The XVME-6300 is a high performance 6U VME processor board based on the Intel® i7 Core™. This module offers a wide range of front and rear I/O options, designed for new and legacy systems.

Key Features & Benefits
- Additional ports on the front panel including:
  - quad USB ports*
  - VGA (switched with rear)
  - dual Gigabit Ethernet*
  - dual RS-232 ports*
- Backplane I/O includes:
  - dual Gigabit Ethernet (on optional P0)
  - dual SATA ports
  - 8 GPIO
  - dual USB ports
  - DVI-D
  - dual RS-232/422/485
  - VGA (switched with front)
- Built-in self-test at power-on

*For one of the Gigabit Ethernet ports, one RS-232 port, and two of the USB ports, the XBRD-9050 expansion module is necessary.

Ordering Information
- XVME-6300-ABCD-X
  A = CPU
  2 - i7-620UE (1.06GHz)
  3 - i7-620LE (2.0GHz)
  4 - i7-610E (2.53GHz)
  B = P0
  1 - with P0
  2 - no P0
  C = Memory
  4 - 4GB
  8 - 8GB
  D = Extended Temperature
  Blank - Standard temperature
  E - Extended temperature
  X = Solder
  L - Lead solder
  LF - Lead-free solder
Contact factory for conformal coating options.

Accessories
For more information, see www.acromag.com
XBRD-9050
Expansion I/O Carrier Module for Micro SATA
XVME-9630
6U VMEbus Rear Transition Module

Intel® i7 CPU (up to 2.53GHz)  ◆  Up to 8GB DDR3 ECC RAM  ◆  8GB Flash  ◆  Dual PMC/XMC Sites

Tel 248-295-0885  xembeddedsales@acromag.com  www.acromag.com/xembedded  30765 Wixom Rd, Wixom, MI 48393  USA

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Performance Specifications

■ General
Processor
Intel® i7 Core™, 1.066GHz FSB
- 620UE at 1.06GHz
- 620LE at 2.0GHz
- 610E at 2.53GHz
Memory
4GB or 8GB DDR3 ECC 1066MHz (800MHz for 620UE) of soldered on memory
Flash Memory
8GB of bootable flash memory with write-protection options
Software Support
Microsoft Windows® 7, Linux

■ Bus Compliance
VMEbus Interface
- P1 and P2 connectors are compatible with VME64x
- VME Master/Slave using IDT/Tundra Ts148 device
- A32/A24/A16/D64/D32/D16/D8, MBLT64, 2eVME/2eSST (Hardware byte-swapping with D16 or D32)
- VMEbus specification VME-2gSST, 64X, 320X
Dual PMC/XMC Sites
- 32/64-bit, 33/66/133MHz sites (IEEE P1386/P1386.1)
- Front panel I/O bezel and user I/O on optional P0 rear connector
- XMCs are PCIe x8
- Option to replace PMC/XMC #2 with the XBRD-9050

■ Form Factor
6U VMEbus 9.2" (233mm) x 6.3" (160mm)

■ Environmental
Operating temperature
Standard models:
620UE: 0 to 70°C*
620LE: 0 to 65°C*
610E: 0 to 55°C*
Extended models:
620UE: -20 to 75°C*
620LE: -20 to 70°C*
610E: -20 to 60°C*
* w/ 200 lfm airflow
Storage temperature
-40 to 85°C
Relative humidity
20 to 80% non-condensing

Shock
Operating: 30g peak acceleration, 11ms duration
Non-operating: 50g peak acceleration, 11ms duration
Vibration (5Hz-2kHz)
Operating:
0.015" (380µm) peak-to-peak displacement
2.5 g max acceleration
Non-operating:
0.030" (760µm) peak-to-peak displacement
5.0 g max acceleration
The XVME-6300 is a high performance 6U VME processor board based on the Intel® i7 Core™. This module offers a wide range of front and rear I/O options, designed for new and legacy systems.

**Key Features & Benefits**
- Backplane I/O includes:
  - dual Gigabit Ethernet (on optional P0)
  - dual SATA ports
  - 8 GPIO
  - dual USB ports
  - DVI-D
  - dual RS-232/422/485
- VLA
- Built-in self-test at power-on

**Performance Specifications**

**Bus Compliance**
- **VMEbus Interface**
  - P1 and P2 connectors are compatible with VME64x
  - VME Master/Slave using IDT/Tundra Tsi 148 device
  - A32/A24/A16/D64/D32/D16/D8, MBLT64, 2eVME/2eSST (Hardware byte-swapping with D16 or D32)
- **VMEbus specification VME-2gSST, 64X, 320X**

**Dual PMC/XMC Sites**
- 32/64-bit, 33/66/133MHz sites (IEEE P1386/P1386.1)
- Front panel I/O bezel and user I/O on optional P0 rear connector
- XMCs are PCIe x8

**Form Factor**
- 6U VMEbus 9.2" (233mm) x 6.3" (160mm)

**Environmental**
- Operating temperature: -40 to 85°C**
  - **must operate in a fully installed conduction cooled rack**
- Storage temperature: -55 to 105°C
- Relative humidity: 20 to 80% non-condensing
- **Shock**
  - Operating: 30g peak acceleration, 11ms duration
  - Non-operating: 50g peak acceleration, 11ms duration
- **Vibration (5Hz-2kHz)**
  - Operating: 0.015" (380µm) peak-to-peak displacement
  - 2.5g max acceleration
  - Non-operating: 0.030" (760µm) peak-to-peak displacement
  - 5.0g max acceleration

**Ordering Information**

- **XVME-6300-ABCD-X**
  - A = CPU
    - 2 - i7-620UE (1.06GHz)
    - 3 - i7-620LE (2.0GHz)
    - 4 - i7-610E (2.53GHz)
  - B = P0
    - 5 - with P0
    - 6 - no P0
  - C = Memory
    - 4 - 4GB
    - 8 - 8GB
  - D = Extended Temperature
    - Blank - Standard temperature
    - E - Extended temperature
  - E = Solder
    - L - Lead solder
    - LF - Lead-free solder
- Front panel and conformal coating options available, please consult factory.

- **XVME-6300-CC**
  - 2-4GB DDR3
  - 2-4GB DDR3 CH. A
  - INTEL QM57 PCH (IBEXPEAK-M)
  - 2-4GB DDR3 CH. B
  - (SOLDERED DOWN)
  - SPI
  - VGA
  - SINGLE-LINK DVI
  - SATA-BASED NAND FLASH
  - 8GB
  - 2-4GB DDR3 CH. A
  - PCIe X1
  - PCIe X2
  - PCIe X8
  - PCIe-PCIX
  - PCIe X4
  - PCIIX
  - PCIX
  - PCIX
  - (1) 3GB/s SATA
  - (2) USB 2.0
  - 2-4GB DDR3 CH. B

- **Accessories**
  - For more information, see www.acromag.com

- **XVME-9630**
  - 6U VMEbus Rear Transition Module

Tel 248-295-0885  x embeddedsales@acromag.com  www.acromag.com/xembedded  30765 Wixom Rd, Wixom, MI 48393  USA

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**Description**
The XVME-6200 is a powerful VMEbus PC-compatible processor module that allows users to take advantage of the multiprocessing capability while using standard off-the-shelf PC software, operating systems and VMEbus I/O modules.

**Key Features & Benefits**
- E7520 and 6300ESB chipset
- Enhanced Intel® SpeedStep®
- Headless operation using serial console mode including BIOS setup
- Parallel printer port (ECP, EPP, and IEEE1284)
- Keyboard and mouse port via shared PS/2 on front panel
- Long duration Watchdog timer
- Front panel I/O includes:
  - Reset switch and status LEDs
  - COM1: RS-232 / 422 / 485 port
  - Dual USB 2.0 ports
  - Dual 10/100/1000 ports via front panel or optional P0 rear connector
  - VGA, resolutions up to 1280 x 1024 (optional rear support)
- Backplane I/O includes:
  - COM2 and COM3: Two RS-232 ports via P2
  - Dual USB 2.0 ports via P2
  - Line level stereo input and output via P2

**Ordering Information**
- **XVME-6200-ABCD-X**
  - A = CPU
    - 8 - 1.50 GHz Core™ 2 Duo
    - 9 - 2.16 GHz Core™ 2 Duo
  - B = P0
    - 1 - No P0
    - 3 - With P0
  - C = Memory
    - 4 - 4GB
  - D = Extended Temperature
    - Blank - Standard temperature
    - E - Extended temperature
  - X = Solder
    - L - Lead solder
    - LF - Lead-free solder
  - Contact factory for conformal coating options.

**Accessories**
For more information, see [www.acromag.com](http://www.acromag.com)
- XVME-912
  - On-board Compact Flash Carrier
- XVME-913S
  - On-board SSD Kit
- XVME-990
  - Rear Transition Module
- XVME-9076
  - Dual PMC Carrier Module

Tel 248-295-0885  xembeddedsales@acromag.com  www.acromag.com/xembedded  30765 Wixom Rd, Wixom, MI 48393  USA

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### Performance Specifications

**General**

**Processor**
- Intel® Core™ 2 Duo
  - L7400 1.50GHz
  - T7400 2.16GHz

**Memory**
- 4GB DDR2 ECC 400MHz SODIMM

**Mass Storage**
- Dual SATA channels via P2
- Floppy drive interface via P2
- EIDE Ultra-DMA 100 interface supports up to three devices:
  - Two channels via P2 for use with mass storage or rear transition modules
  - One channel on-board for optional 1.8" SSD EIDE or Compact Flash carrier

**Software Support**
- Microsoft Windows® 7, Windows® XP, RTX®, Linux®, and MS-DOS®

**Bus Compliance**

**VMEbus Interface**
- VME-64 support with Tundra Universe IID A32/A24/A16/D64/D32/D16/D8 (Hardware byte-swapping with D16 or D32), MBLT64
- The optional P0 connector is used to implement Vita 31.1 and PMC rear I/O functions

**PMC/XMC (PCIe x4) Site**
- 32/64-bit, 33/66MHz site (IEEE P1386/P1386.1)
- Front panel I/O bezel and user I/O on optional P0 rear connector

**Form Factor**
- 6U VMEbus 9.2" (233mm) x 6.3" (160mm)

**Environmental**

**Operating temperature**
- Standard models: 0 to 55°C *
- Extended models: -20 to 65°C *
  * w/ 200 lfm airflow

**Storage temperature**
- -40 to 85°C

**Relative humidity**
- 20 to 80% non-condensing

**Shock**
- Operating: 30g peak acceleration, 11ms duration
- Non-operating: 50g peak acceleration, 11ms duration

**Vibration (5Hz-2kHz)**
- Operating: 0.015" (380µm) peak-to-peak displacement
- 2.5 g max acceleration
- Non-operating: 0.030" (760µm) peak-to-peak displacement
- 5.0g max acceleration

**NOTE:** If the user backplane is only a 96-pin J1/J2 VMEbus, the I/O functions on the outer rows of the P1/P2 160-pin VMEbus connector are not available. All functions on the P2 and P0 connectors are supported via connectors on the optional XVME-990 rear transition module.

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**XVME-6200 6U VME Intel® Core™2 Duo Processor Board**

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**ISO9001**

**AS9100**

**MADe IN USA**

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**Acromag**

**THE LEADER IN INDUSTRIAL I/O**

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Bulletin #B400-687b

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XMC-6260-CC 10-Gigabit Ethernet Interface Module with Dual XAUI Ports

Description
Acromag's XMC-6260-CC provides a 10-gigabit Ethernet (10GbE) interface solution for data-intensive real-time embedded computing systems. Ultra-high performance is achieved using an ASIC-based TCP/IP offload engine (TOE).

Typical applications include high-speed data storage, image collection/transfer, distributed control networks, and board-to-board interfaces.

Fully Integrated Network Interface Card
With the adoption of 10GbE interfaces and rapidly increasing volumes of data, even the most powerful embedded processors can no longer manage data flow without a significant reduction in performance. To solve this problem, Acromag's XMC-6260-CC pairs a high-performance Chelsio T4 purpose-built multi-protocol processor with two channels of 10GbE connectivity. This combination maintains maximum 10GbE performance to meet the needs of data-intensive real-time applications.

High Performance Protocol Offload Engine
A PCI Express v2.0 x8 host interface provides a high-speed connection to the system processor. With support for 5Gbps data rates, the PCIe interface delivers up to 32Gbps of bandwidth to the server. This connection accommodates stateless offloads, packet filtering (firewall offload), and traffic shaping (media streaming).

Complete and Flexible TCP Offload
The XMC-6260-CC's TOE ASIC has hundreds of programmable registers for protocol configuration and offload control. As a result, the XMC-6260-CC can offload TCP processing per connection, per server, per interface. It can also globally and simultaneously tunnel traffic from non-offloaded connections to the host processor for the native TCP/IP stack to process. Additionally, the XMC-6260-CC provides a flexible zero-copy capability for regular TCP connections, requiring no changes to the sender, to deliver line rate performance with minimal CPU usage.

Packet Switching and Routing
The XMC-6260-CC integrates a high-performance packet switch, which allows switching of traffic from any of the input ports to any of the output ports (wire-to-wire), and from any of the output ports to any of the input ports (host-to-host).

Compatibility
Acromag's XMC-6260-CC provides guaranteed interoperability and compatibility with the full Ethernet standard.

Extensive Software Support
The XMC-6260-CC offers a full suite of protocol software and drivers. Linux software tools support all offload (TOE) and network interface (NIC) operations. Windows software supports NIC operations.
XMC Modules

XMC-6260-CC  10-Gigabit Ethernet Interface Module with Dual XAUI Ports

Performance Specifications

■ Communication
Ethernet interface
Dual XAUI ports.
Throughput
2500MB/second, per port, full-duplex.
Latency
2µs end-to-end.
PCI Express
PCIe 8-lane (x8) Gen 2.0 interface.
Determinism
±1µs.

■ XMC Compliance
Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
Complies with ANSI/VITA 42.6 specification for XMC modules with XAUI interface.
Electrical/Mechanical Interface: Single-Width Module.

■ TCP/IP Offload Engine (TOE)
TOE processor
The ASIC incorporates two XGMAC (10GbE) interfaces. These interfaces are labeled MAC0 and MAC1. The ports support 10GBASE-KX4 and XAUI standards. They contain four lanes (four differential TX pairs and four differential RX pairs) of high speed SERDES. KX4 and XAUI operations will use all four lanes of MAC0 and MAC1. For MAC0 and MAC1, all 10GBE serial communication takes place on Lane 0 only.

■ Software Support
Linux operating systems
Drivers available with support for all TOE and NIC functions. Please contact factory for details.
Windows operating systems
Drivers available with support for NIC functions. Please contact factory for details.

■ Electrical
XMC PCIe bus interface (P15 and P16)
One 114-pin male connector
(Samtec ASP-103614-05 or equivalent).
P15 primary XMC connector
8 differential TX pairs (PCIe) and
8 differential RX pairs (PCIe).
Optional JTAG: 6 JTAG signals
(TDI, TDO, TMS, TCK, 3.3V, and ground).
JTAG interface follows IEEE Standard 1149.1, which defines a test access port (TAP) and boundary-scan architecture.
System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
3.3V power: 4 pins at 1A/pin.
3.3V auxiliary power: 1 pin for system management.
Variable power (5V or 12V): 8 pins at 1A per pin.
P16 XMC connector
2 ports each with 4 differential TX pairs and 4 differential RX pairs (XAUI/KX4 operations).
1 global clock differential pair.

■ Environmental
Operating temperature
-40 to 85°C.
Storage temperature
-55 to 125°C.
Relative humidity
5 to 95% non-condensing.
Power requirements
3.3V (±5%): Consult factory.
5V (±5%): Consult factory.
12V (±5%): Consult factory.
MTBF
Contact the factory.

Comparison of TCP/IP Offload Engines (TOE): ASIC vs. Software Stack

<table>
<thead>
<tr>
<th></th>
<th>Acromag ASIC TOE 10GbE Interface</th>
<th>Software Stack TOE 10GbE Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput per Port, Full-Duplex</td>
<td>2500MB/ps (full-duplex)</td>
<td>40MB/ps (limited by CPU)</td>
</tr>
<tr>
<td>Host Overhead</td>
<td>very low</td>
<td>very high</td>
</tr>
<tr>
<td>User-to-User Latency</td>
<td>2µs</td>
<td>250µs</td>
</tr>
<tr>
<td>Determinism</td>
<td>±1µs</td>
<td>±200µs</td>
</tr>
<tr>
<td>Reliability Under Load</td>
<td>Excellent (any load condition)</td>
<td>Variable (dependent on load)</td>
</tr>
</tbody>
</table>

Ordering Information

■ XMC Modules
XMC-6260-CC-LF
10-gigabit Ethernet interface module, lead-free

■ Accessories
For more information, see www.acromag.com.
**XMC Modules**

**XMC-6280** 10-Gigabit Ethernet Interface Module with Quad SFP+ Ports

**Description**

Acromag’s XMC-6280 provides a 10-gigabit Ethernet (10GbE) interface solution for data-intensive real-time embedded computing systems. Ultra-high performance is achieved using an ASIC-based TCP/IP offload engine (TOE).

Typical applications include high-speed data storage, image collection/transfer, distributed control networks, and board-to-board interfaces.

**Fully Integrated Network Interface Card**

With the adoption of 10GbE interfaces and rapidly increasing volumes of data, even the most powerful embedded processors can no longer manage data flow without a significant reduction in performance. To solve this problem, Acromag’s XMC-6280 pairs a high-performance Chelsio T4 purpose-built multi-protocol processor with four channels of 10GbE connectivity. This combination maintains maximum 10GbE performance to meet the needs of data-intensive real-time applications.

**High Performance Protocol Offload Engine**

A PCI Express v2.0 x8 host interface provides a high-speed connection to the system processor. With support for 5Gbps data rates, the PCIe interface delivers up to 32Gbps of bandwidth to the server. This connection accommodates stateless offloads, packet filtering (firewall offload), and traffic shaping (media streaming).

**Complete and Flexible TCP Offload**

The XMC-6280’s TOE ASIC has hundreds of programmable registers for protocol configuration and offload control. As a result, the XMC-6280 can offload TCP processing per connection, per server, per interface. It can also globally and simultaneously tunnel traffic from non-offloaded connections to the host processor for the native TCP/IP stack to process. Additionally, the XMC-6280 provides a flexible zero-copy capability for regular TCP connections, requiring no changes to the sender, to deliver line rate performance with minimal CPU usage.

**Packet Switching and Routing**

The XMC-6280 integrates a high-performance packet switch, which allows switching of traffic from any of the input ports to any of the output ports (wire-to-wire), and from any of the output ports to any of the input ports (host-to-host).

**Compatibility**

Acromag’s XMC-6280 provides guaranteed interoperability and compatibility with the full Ethernet standard.

**Extensive Software Support**

The XMC-6280 offers a full suite of protocol software and drivers. Linux software tools support all offload (TOE) and network interface (NIC) operations. Windows software supports NIC operations.

**Key Features & Benefits**

- Quad port 10 GbE via SFP+
- XMC PCI Express Gen2 x8
- Supports up to 1M connections
- Full offload support for:
  - TCP
  - UDP
  - iSCSI
  - FCoE (Fibre Channel over Ethernet)
- Low processor overhead
- Very low Ethernet latency
- High-level determinism
- Zero-copy direct data placement
- Traffic filtering and management
- 5Gb DDR3 memory to enhance the number of virtual connections

**XMC module with TCP/IP offload engine ASIC ◆ Quad SFP+ fibre/copper ports ◆ PCIe x8 Gen2**
**XMC Modules**

---

#### XMC-6280 10-Gigabit Ethernet Interface Module with Front SFP+ Ports

**Performance Specifications**

- **Communication**
  - Ethernet interface
  - Quad SFP+ ports.
  - Throughput: 2500Mbytes per second, per port, full-duplex.
  - Latency: 2µs end-to-end.
  - PCI Express: PCIe 8-lane (x8) Gen 2.0 interface.
  - Determinism: ±1µs.

- **XMC Compliance**
  - Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
  - Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
  - Electrical/Mechanical Interface: Single-Width Module.

- **TCP/IP Offload Engine (TOE)**
  - TOE processor: The ASIC incorporates four XGMAC (10GbE) interfaces. These interfaces are labeled MAC0, MAC1, MAC2 and MAC3. These ports will support the 10GbE standard’s SFP+ limited mode. They contain one lane (one differential TX pair and one differential RX pair) of high speed SERDES.
  - Throughput: 2500MBps (full-duplex) 40MBps (limited by CPU).
  - Host Overhead: very low, very high.
  - User-to-User Latency: 2µs, 250µs.
  - Determinism: ±1µs, ±200µs.
  - Reliability Under Load: Excellent (any load condition), Variable (dependent on load).

- **Electrical**
  - XMC PCIe bus interface (P15)
    - One 114-pin male connector (Samtec ASP-103614-05 or equivalent).
    - P15 primary XMC connector: 8 differential TX pairs (PCle) and 8 differential RX pairs (PCle).
    - Optional JTAG: 6 JTAG signals (TDI, TDO, TMS, TCK, 3.3V, and ground).
    - JTAG interface follows IEEE Standard 1149.1, which defines a test access port (TAP) and boundary-scan architecture. System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
    - 3.3V power: 4 pins at 1A/pin.
    - 3.3V auxiliary power: 1 pin for system management.
    - Variable power (5V or 12V): 8 pins at 1A per pin.
    - SFP+ connectors: Four SFP+ module front I/O ports. SFP+ transceiver signals routed directly to the TOE device are capable of a maximum data rate of 10 Gb/sec.
    - 20 signals (transmit pair, receive pair, TX_Fault, TX_enable, MOD_DEF(0), MOD_DEF(1), MOD_DEF(2), rate select, LOS, 3.3 Vdc, and ground).

- **Software Support**
  - Linux operating systems: Drivers available with support for all TOE and NIC functions. Please contact factory for details.
  - Windows operating systems: Drivers available with support for NIC functions. Please contact factory for details.

- **Ordering Information**
  - **XMC Modules**
    - XMC-6280-LF 10-Gigabit Ethernet interface module, lead-free
  - **Accessories**
    - For more information, see www.acromag.com.
    - 5028-449 SFP cable, SFP-to-SFP (male-male) connectors, 1 meter
    - TAPCABLE1M SFP+ cable, SFP+-to-SFP+ (male-male) connectors, 1 meter
    - 5028-452 Optical module SFP transceiver, MSA, 1000Base-SX, Fiber
    - 5028-455 Optical module SFP transceiver, MSA, 1000Base-T RJ45 copper
    - SM10G-LR 10-Gigabit long reach single-mode optical module
    - SM10G-SR 10-Gigabit short reach multi-mode optical module

---

Model XMC-6280 shown as it ships with pre-installed heat sink.
**Description**
Acromag's XVME-9060 expansion module installs in the upper PMC site of the XVME-6410 and allows for additional front I/O expansion, as well as optional storage space.

**Key Features & Benefits**
- Standard I/O connectors on the front panel:
  - USB (2)
  - Ethernet
  - RS-232 Serial*
- Also accepts 2 mSATA modules for onboard storage.
  *by use of included conversion cable

**Ordering Information**
XBRD-9060-LF
Expansion module for the XVME-6400, no mSATA drives included.
VME Storage

XBRD-9050 Expansion Module for the XVME-6300

**Description**

Acromag's XVME-9050 expansion module installs in PMC site 2 of the XVME-6300 and allows for additional front I/O expansion, as well as optional storage space.

**Key Features & Benefits**

- Standard I/O connectors on the front panel:
  - USB (2)
  - Ethernet
  - RS-232 Serial*
- Also accepts 1.8" SSD SATA drive (5mm maximum thickness)

*by use of included conversion cable

**Ordering Information**

XBRD-9050-000
Expansion module for the XVME-6300, no drive included
Add ‘-LF’ to the end of the part number for lead free solder.
Add ‘-L’ to the end of the part number for lead solder.

Seamless integration with XVME-6300   ♦ Provides additional front I/O   ♦ Accepts SSD SATA drives

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**VME Storage**

**XVME-912 / XVME-913S** On-board Storage Modules for the XVME-689 / 690 / 6200

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**Description**

Acromag's XVME-912 is an on-board Compact Flash carrier module. The socket on this carrier module will support Type I or Type II Compact Flash cards. The Compact Flash resides as a master on the secondary EIDE port and requires no unique drivers. The processor can be booted from the Compact Flash drive if configured in the BIOS Boot menu.

Acromag's XVME-913S is an on-board solid state hard drive module. The drive resides as a master on the secondary EIDE port and requires no unique drivers. The processor module can be booted from the on-board solid state drive if configured in the BIOS Boot menu.

The XVME-689, 690, and 6200 processors all accept on-board storage modules. However, when either storage module is installed on the XVME-6200, the on-board PMC site is no longer available.

NOTE: Processor modules can accept either an on-board 1.8” solid state drive (XVME-913S) or a Compact Flash carrier (XVME-912), but not both.

---

**Key Features & Benefits**

- Includes cable and mounting hardware required to place modules on the processor board
- Compact Flash socket on carrier module supports Type I and Type II cards
- The storage card/drive resides as a master on the secondary EIDE port
- No unique drivers required
- Processor can boot from the Compact Flash or solid state drive if configured in the BIOS Boot menu

---

**Ordering Information**

<table>
<thead>
<tr>
<th>XVME-912-001</th>
<th>On-board Compact Flash Carrier Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>XVME-913S-064</td>
<td>On-board 64GB 1.8” Solid State Drive Module</td>
</tr>
</tbody>
</table>

---

**XEMBEDDED™**

**No unique drivers ◆ Integration with XVME-689, 690, and 6200 ◆ Includes cable and mounting hardware**

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Tel 248-295-0885  xembeddedsales@acromag.com  www.acromag.com/xembedded  30765 Wixom Rd, Wixom, MI 48393  USA

Bulletin #8400-707

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VPX Controller Modules

**XVPX-9400** 3U VPX RAID Controller Module

**Description**
Acromag's XVPX-9400 is a controller module capable of supporting up to eight external or backplane-mounted SAS/SATA hard drives. It accommodates on-board storage of user-defined parameters, BIOS and mirroring data.

The XVPX-9400 includes a PMC/XMC site using PCIe, as well as status indicator lights for each supported drive located on the front panel for easy recognition.

**Key Features & Benefits**
- Double Fat Pipe (x8) PCIe interface
- Up to 8 SATA/SAS drives supported
- Up to 3GB/s per drive transfer
- Utilizes the LSI 1068e RAID controller and MegaRAID software utility
- Supports RAID 0, 1, and 1E in hardware
- SMBus FRU available for user data and module status
- PMC PCIx 133MHz, 32/64 bit, XMC with PCIe x8, Gen 2

**Performance Specifications**
- **RAID Levels**
  - RAID 0
  - RAID 1
  - RAID 1E

**Ordering Information**
- **XVPX-9400-A00-X**
  - A = Thermal
  - 1 - Air cooled
  - 2 - Conduction cooled
  - 3 - REDI
  - X = Solder
  - L - Lead solder
  - LF - Lead-free solder

---

**RAID Levels**
- RAID 0
  - Uses striping to provide high data throughput, especially for large files in an environment that does not require fault tolerance. Requires at least two drives.
- RAID 1
  - Uses mirroring so that data written to one disk drive is simultaneously written to another disk drive. Good for small databases or other applications that require small capacity, but complete data redundancy. Requires at least two drives.
- RAID 1E
  - Writes mirrored stripes to adjacent disks, providing high read throughput and complete data redundancy. Requires at least three drives.

**Bus Compliance**
- Designed to meet CE Emissions Specification EN 55022, EN 50082-2 and FCC 47 CFR, Part 15, Class A when tested in a shielded enclosure.
- IEEE 1396.1 (CMC Standard)
- VITA 46.0, 46.4, 46.9, and 65
- MIL Spec 217-F @ 105,000 Hrs

**Form Factor**
- 3U VPXbus 3.94" (100.01mm) x 6.5" (165.1mm)

**Environmental**
- Operating temperature
  - Air cooled: 0 to 70°C*
  - Conduction cooled: -40 to 85°C**
  - REDI cover, conduction cooled: -40 to 85°C***
- Storage temperature
  - Air cooled models: -40 to 85°C
  - Conduction cooled and REDI models: -40 to 105°C
- Relative humidity
  - 20 to 80% non-condensing
- Shock
  - Operating: 30g peak acceleration, 11ms duration
  - Non-operating: 50g peak acceleration, 11ms duration
- Vibration (5Hz-2kHz)
  - Operating: 0.015" (380µm) peak-to-peak displacement
  - 2.5g max acceleration
  - Non-operating: 0.030" (760µm) peak-to-peak displacement
  - 5.0g max acceleration

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XVPX-9756  3U VPX Bootable SATA/SAS Drive Module

Description
The XVPX-9756 is a bootable SATA/SAS storage module which supports dual slim SATA drives (SSD) or a single 2.5” drive, either rotating or solid state. The module connects directly to the CPU via SATA signals or by means of PCI Express signals through an on-board controller. Given its connectivity options, the XVPX-9756 is an unequaled VPX bootable storage solution.

Key Features & Benefits
- Bootable over PCIe or SATA/SAS
- Supports SATA, SAS, and PCIe interfaces
- Suits customized or standard backplanes
- RAID 0/1 configurable with dual slim SATA drives
- Can support one or two CPU boards via SATA interfaces
- Drive activity LED
- SMBus FRU available for user data and module status

Performance Specifications
- **Bus Compliance**
  - VITA 46.0, 46.4, 46.9, 48, 65
  - MIL Spec 217-F @105.000 Hrs
- **Form Factor**
  - 3U VPXbus 3.94” (100.01mm) x 6.3” (160mm)
- **Environmental**
  - Operating temperature
    - Air cooled: 0 to 70°C*
    - Conduction cooled: -40 to 85°C**
    - REDI cover, conduction cooled: -40 to 85°C***
  - Storage temperature
    - Air cooled models: -40 to 85°C
    - Conduction cooled and REDI models: -40 to 105°C
  - Shock
    - Operating: 30g peak acceleration, 11ms duration
    - Non-operating: 50g peak acceleration, 11ms duration
  - Relative humidity
    - 20 to 80% non-condensing
  - Vibration (5Hz-2kHz)
    - Operating: 0.015” (380µm) peak-to-peak displacement
    - Non-operating: 0.030” (760µm) peak-to-peak displacement
    - 2.5g max acceleration
    - 5.0g max acceleration

Ordering Information
- **XVPX-9756-A80-X**
  - A = Thermal
    - 1 - Air cooled
    - 2 - Conduction cooled
    - 3 - REDI
  - B = Drive connector type
    - 0 - HD/SDD (SATA)
    - 1 - Dual slim SATA
  - X = Solder
    - L - Lead solder
    - LF - Lead-free solder

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**XVME-9076** Dual PMC Carrier Module for the XVME-6200

### Description

Acromag's XVME-9076 carrier provides PMC support for two PMC expansion modules for the XVME-6200 Core™ 2 Duo VMEbus processor. Each PMC card uses its own bus resource. This carrier connects to the XVME-6200 via four lanes of PCI Express enable high-speed connection with 1GB/s bandwidth in each direction.

The XVME-9076, in combination with the XVME-6200, provides up to three PMC modules, or two PMC/XMC modules and one XMC module. The expansion site allow functions such as: FPGA, Ethernet, SCSI, serial port, digital I/O, analog I/O and special-function PMC modules.

The PMC sites are IEEE P1386 compliant and will provide the power needed by most PMC modules.

### Key Features & Benefits

- Single-slot dual PMC carrier module for use with the XVME-6200
- Two 32/64-bit, 33/66/133MHz 3.3V PMC sites with front panel I/O cutout
- High-speed connection using four lanes PCI Express
- 3.3V tolerant signaling using 64-bit PCI-X
- Capable of 1GB per second bandwidth in each direction
- Support for PMC cards at speeds up to 133MHz
- Fits into any standard 6U VMEbus card cage
- All PMC sites are capable of providing 14 watts of power to each PMC module
- Only draws power from VMEbus
- Rear access for PMC I/O via P2 and P0

### Ordering Information

**XVME-9076-3A9-X**

- **A** = P0
- **0** = No P0
- **Z** = With P0
- **X** = Solder
- **L** = Lead solder
- **LF** = Lead-free solder

**Note:** P0 is used to bring the second PMC's I/O out of the rear of the VMEbus chassis.
**XVME-9076** Dual PMC Carrier Module for the XVME-6200

### Performance Specifications

#### General
- **PMC Expansion Sites**
  Intel 41210 Serial to Parallel PCIe-to-PCI-X Bridge
  PCI Express x4 interface
  32/64-bit, 33/66/133MHz PCI-X operation
  Two 64-bit sites, one with rear I/O out P2 of the carrier and the other with rear I/O out the optional P0
- **NOTE:** The XVME-9076 carrier draws power and ground from the VMEbus backplane.

#### Environmental
- **Operating temperature**
  -25 to 70°C
- **Storage temperature**
  -40 to 85°C
- **Relative humidity**
  20 to 90% non-condensing
- **Shock**
  - Operating: 30g peak acceleration, 11ms duration
  - Non-operating: 50g peak acceleration, 11ms duration
- **Vibration (5Hz-2kHz)**
  - Operating: 0.015" (380µm) peak-to-peak displacement
    2.5g max acceleration
  - Non-operating: 0.030" (760µm) peak-to-peak displacement
    5.0g max acceleration

#### VME Compliance
- Compatible with PMC 2.0 Specifications for IEEE P1386 modules
- BGXIN* tied to BGXOUT* on this module

#### Form Factor
- 6U VMEbus 9.2"(233mm) x 6.3"(160mm)
XVME-976 Dual PMC Carrier Module for the XVME-689 / XVME-690

Description
Acromag’s XVME-976 carrier provides an effortless method of deploying PMC modules in the VMEbus rack using the XVME-689 or XVME-690 processor modules.

Using two stacked XVME-976 modules allows expansions of the processor to include up to five PMC modules. One PMC is located on the processor and two on each of the XVME-976 modules. The expansions allow for functions such as: FPGA, Ethernet, SCSI, serial port, digital I/O, analog I/O and special function PMC modules.

The PMC sites on the XVME-976 are IEEE P1386 compliant and will provide the power needed by most PMC modules.

Key Features & Benefits
■ Fits into any standard 6U VMEbus card cage adjacent to the XVME-689 or XVME-690 processor module
■ Each carrier only occupies one VMEbus slot. Get up to 5 PMC modules using only three VMEbus slots
■ One PMC site with I/O out the rear P2, both sites support front I/O
■ All PMC sites are capable of providing 14 watts of power to each PMC module
■ Draws power and ground from the VMEbus backplane

Performance Specifications
■ General
PMC Expansion Sites
Two 32-bit sites, one with rear I/O out P2 of the carrier
NOTE: The XVME-976 carrier draws power and ground from the VMEbus backplane.

■ Environmental
Operating temperature
-25 to 70°C
Storage temperature
-40 to 60°C
Relative humidity
20 to 80% non-condensing
Shock
Operating:
30g peak acceleration, 11ms duration
Non-operating:
50g peak acceleration, 11ms duration
Vibration (5Hz-2kHz)
Operating:
0.015” (380µm) peak-to-peak displacement
2.5g max acceleration
Non-operating:
0.030” (760µm) peak-to-peak displacement
5.0g max acceleration

■ VME Compliance
Compatible with PMC 2.0 Specifications for IEEE P1386 modules
BGXIN* tied to BGXOUT* on this module

■ Form Factor
6U VMEbus 9.2”(233mm) x 6.3”(160mm)

Ordering Information
■ XVME-976-209-X
X = Solder
L = Lead solder
LF = Lead-free solder
VME Rear Transition Modules

**XVME-9640** Rear Transition Module for the XVME-6400

Variety of additional connectors to access I/O from P2 and optionally P0

**Description**
Acromag's XVME-9640 rear transition module adds a variety of I/O connectors to the XVME-6400.

**Key Features & Benefits**
- I/O available on the board via standard connectors:
  - VGA
  - USB (2)
  - DVI-D
  - PMC I/O from P2
- Available via headers:
  - Audio
  - RS-232/422/485 Serial (1)
- Additionally available*:
  - Ethernet (2) thru RJ Point 5 connector*
  - PMC I/O from P0*

**Ordering Information**
- XVME-9640-1-LF
  Rear Transition Module with P0
- XVME-9640-2-LF
  Rear Transition Module without P0

*requires P0 connector
VME Rear Transition Modules

XVME-9630 Rear Transition Module for the XVME-6300

Description
Acromag’s XVME-9630 rear transition module adds a variety of new connectors to the XVME-6300.

Multiple versions are available allowing for a mix of what interface connectors you would prefer to utilize.

Key Features & Benefits
- I/O available on the board via standard connectors:
  - VGA
  - USB (2)
  - SATA (2)
- Available via headers:
  - Audio
  - GPI (4)
  - GPO (4)
  - RS-232/422/485 Serial (2)
- Additionally available*:
  - Ethernet (2)
  - DVI
- VITA-36 compliant module site for I/O from XVME-6300 PMC 1 site
- Proprietary module site for I/O from XVME-6300 PMC 2 site (only I/O pins 1-28)
*not all simultaneously - see options and ordering information

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XVME-9630-100</td>
<td>Rear Transition Module with P0, VGA, (2) USB, (2) SATA, audio, (2) Serial, (4) GPI, and (4) GPO</td>
</tr>
<tr>
<td>XVME-9630-102</td>
<td>Same as XVME-9630-100 plus Dual Ethernet</td>
</tr>
<tr>
<td>XVME-9630-103</td>
<td>Same as XVME-9630-100 plus DVI</td>
</tr>
<tr>
<td>XVME-9630-200</td>
<td>Rear Transition Module without P0- includes VGA, (2) USB, (2) SATA, audio, (2) Serial, (4) GPI, and (4) GPO</td>
</tr>
<tr>
<td>XVME-9630-203</td>
<td>Same as XVME-9630-200 plus DVI</td>
</tr>
</tbody>
</table>

Variety of additional connectors ◆ VITA-36 compliant module site ◆ Multiple configurations

Tel 248-295-0885 ■ xembeddedsales@acromag.com ■ www.acromag.com/xembedded ■ 30765 Wixom Rd, Wixom, MI 48393 USA

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**VME Rear Transition Modules**

**XVME-990** Rear Transition Module for the XVME-689 / 690 / 6200

Acromag's XVME-990 rear transition module adds a variety of new connectors to the XVME-689, 690 and 6200. Two configurations are available, with or without P0 and User I/O connector.

The XVME-990 is used to connect an external DVD, CD-ROM or hard drive and a floppy drive or use the SATA interface with your XVME-689/690/6200 processor module. In addition, the rear USB ports, video, sound I/O, Ethernet, and user I/O from the on-board PMC site (if configured with the VMEbus P0).

### Description

Available with and without P0

Connects to external storage units

### Key Features & Benefits

- **I/O available on the board via standard connectors:**
  - SATA (2)
  - Floppy
  - 26-pin parallel
  - COM3, COM4
- **Available via front panel:**
  - USB (2)
  - COM2
  - Line-in, line-out
- **Available via socket connectors:**
  - Ethernet
  - VGA
  - COM3

**Ordering Information**

**XVME-990-00A-X**

- A = P0
  - 1 - With P0
  - 2 - No P0
- X = Solder
  - L - Lead solder
  - LF - Lead-free solder

---

** Variety of additional connectors **

- SATA (2)
- Floppy
- 26-pin parallel
- COM3, COM4
- USB (2)
- COM2
- Line-in, line-out
- Ethernet
- VGA
- COM3
VPX Rear Transition Modules

XVPX-9630 Rear Transition Module for the XVPX-6300

Variety of I/O via board and headers
◆ Multiple configurations
◆ CMOS/RTC battery socket

Description
Acromag’s XVPX-9630 rear transition module adds a variety of new connectors to the XVPX-6300.

Multiple versions are available allowing for a mix of what interface connectors you would prefer to utilize.

Key Features & Benefits
■ I/O available on the board via standard connectors:
  - VGA*
  - USB* (2)
  - SATA (2)
  - RS-232/422/485 Serial*

■ Available via headers:
  - Audio
  - SMBUS

■ Additionally available**:
  - Ethernet (2)
  - USB
  - DVI
  - SATA (2)
  - RS-232 Serial

■ Socket for CMOS/RTC battery
*by use of included conversion cable
**not all simultaneously - see options and ordering information

Ordering Information
XVPX-9630-100
Rear Transition Module with VGA, (2) USB, (2) SATA, Serial, audio, and SMBUS

XVPX-9630-101
Same as XVPX-9630-100 plus Ethernet, (2) SATA, and 3-pin RS-232

XVPX-9630-102
Same as XVPX-9630-100 plus Dual Ethernet and 3-pin RS-232

XVPX-9630-103
Same as XVPX-9630-100 plus DVI and 3-pin RS-232
**Description**

Acromag's XMC-7A modules feature a high-performance user-configurable Xilinx® Artix®-7 FPGA enhanced with high-speed memory and a high-throughput serial bus interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Both front and rear I/O is supported. Front I/O processing is supported with plug-in AXM mezzanine cards. A variety of AXM I/O cards are available to add the flexibility of a wide range of analog and digital I/O to your design.

The rear I/O provides an 8-lane high-speed serial interface on the P16 XMC port for customer-installed soft cores. P16 also supports 34 SelectIO channels. The P4 port adds another 60 SelectIO and global clock lines. SelectIO signals are Artix-7 FPGA I/O pins that support single-ended I/O (LVCMOS, HSTL, SSTL) and differential I/O standards (LVDS, HT, LVPECL, BLVDS, HSTL, SSTL).

With Acromag’s Artix-7 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up CPU cycles by offloading algorithmic-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze™ soft processors.

Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with Vivado® or ISE® Design Suite. And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces.

**Key Features & Benefits**

- Reconfigurable Xilinx Artix-7 FPGA with 200k logic cells
- 128M x 64-bit DDR3 SDRAM
- 32M x 16-bit parallel flash memory for MicroBlaze FPGA program code storage
- 4-lane high-speed serial interface on rear P15 connector for PCIe Gen 1/2 (standard), Serial RapidIO, 10Gb Ethernet, Xilinx Aurora
- 8-lane high-speed interfaces on rear P16 connector for customer-installed soft cores
- 60 SelectIO or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectIO or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface
## XMC-7A200 User-Configurable Artix-7 FPGA Modules w Plug-In I/O

### Performance Specifications

**FPGA**
- FPGA device: Xilinx® Artix®-7 FPGA.
- Model XC7A200T FPGA with 215,360 logic cells and 740 DSP48E1 slices.

**FPGA configuration**
- Download via JTAG or flash memory.

**Example FPGA program**
- IP integrator block diagram provided for bus interface, front & rear I/O control, and SDRAM memory interface controller. See EDK kit.

### I/O Processing

**Acromag AXM I/O Modules**
- AXM modules plug into the XMC module’s front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.

**Rear high-speed I/O**
- 12 high-speed serial lanes.
- x8 lanes via P15 and x8 lanes via P16.

**Rear user I/O**
- P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
- P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

### Engineering Design Kit

- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-7A module (see www.acromag.com for more information).

### XMC Compliance

- Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
- Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
- Electrical/Mechanical Interface: Single-Width Module.

### Electrical

**XMC PCIe bus interface (P15 and P16)**
- One 114-pin male connector (Samtec ASP-103614-05 or equivalent).

**P15 primary XMC connector**
- 8 differential pairs (PCIe x4 standard, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora). JTAG.
- 3 global clock pins.
- Vcco pins are powered by 2.5V and support the 2.5V I/O standards.

**P16 XMC connector**
- 8 differential pairs (PCIe, Serial RapidIO, or Xilinx Aurora).
- 17 LVDS pairs or 34 SelectI/O signals (differential pairs grouped per VITA 46.0 X38s).
- 2 global clock pairs.
- Vcco pins powered by 2.5V and support the 2.5V I/O standards.

### Environmental

**Operating temperature**
- XMC-7A200-LF: -40 to 55°C.

**Storage temperature**
- -55 to 125°C.

**Relative humidity**
- 5 to 95% non-condensing.

### Ordering Information

**Power**
- 3.3V (±5%): TBD W typical.
- 12V (±5%): TBD W typical.
- 3.3V AUX (±5%): 57µW

**MTBF**
- Contact the factory.

**NOTE:** XMC-7KA-EDK is required to configure FPGA.

### XMC Modules

**XMC-7A200-LF**
- User-configurable Artix-7 FPGA, 200k logic cells with AXM support

### Accessories

**AXM-A75**
- 16 analog inputs, 8 analog outputs, and 16 digital I/O

**AXM-A30**
- 2 analog input 100MHz 16-bit A/D channels.

**AXM-D02**
- 30 RS485 differential I/O channels.

**AXM-D03**
- 16 CMOS and 22 RS485 differential I/O channels.

**AXM-D04**
- 30 LVDS I/O channels.

**AXM-??**
- Custom I/O configurations available, call factory

### Software

For more information, see www.acromag.com.

**XMC-7KA-EDK**
- Engineering Design Kit (one kit required)

**PMCSW-API-VXW**
- VxWorks® 32-bit software support package

**PCISW-API-WIN**
- Windows® DLL software support package

**PCISW-API-LNX**
- Linux™ support (website download only)
XMC-7A200CC User-Configurable Conduction-Cooled Artix®-7 FPGA Modules

Description

Acromag’s XMC-7A200CC modules feature a high-performance user-configurable Xilinx® Artix®-7 FPGA enhanced with high-speed memory and a high-throughput serial bus interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

The rear I/O provides an 8-lane high-speed serial interface on the P16 XMC port for customer-installed soft cores. P16 also supports 34 SelectIO channels. The P4 port adds another 60 SelectIO and global clock lines. SelectIO signals are Artix-7 FPGA I/O pins that support single-ended I/O (LVCMOS, HSTL, SSTL) and differential I/O standards (LVDS, HT, LVPECL, BLVDS, HSTL, SSTL)

With Acromag’s Artix-7 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up CPU cycles by offloading algorithmic-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze™ soft processors.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with Vivado® or ISE® Design Suite.

And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces

Key Features & Benefits

- Reconfigurable Xilinx Artix-7 FPGA with 215K logic cells
- 128M x 64-bit DDR3 SDRAM
- 32M x 16-bit parallel flash memory for MicroBlaze FPGA program code storage
- 4-lane high-speed serial interface on rear P15 connector for PCIe Gen 1/2 (standard), Serial RapidIO, 10Gb Ethernet, Xilinx Aurora
- 8-lane high-speed interfaces on rear P16 connector for customer-installed soft cores
- 60 SelectIO or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectIO or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface
- Extended temperature conduction-cooled
XMC Modules

XMC-7A200 CC  User-Configurable Conduction-Cooled Artix-7 FPGA Modules

Performance Specifications

■ FPGA
FPGA device
Xilinx Artix-7 FPGA.
Model XC7A200T FPGA with 215,360 logic cells and 740 DSP48E1 slices.
FPGA configuration
Download via JTAG or flash memory.
Example FPGA program
IP integrator block diagram provided for bus interface, front & rear I/O control, and SDRAM memory interface controller. See EDK kit.

■ I/O Processing
Rear high-speed I/O
12 high-speed serial lanes.
  x4 lanes via P15 and x8 lanes via P16.
Rear user I/O
P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

■ Engineering Design Kit
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-7 series module (see www.acromag.com for more information).

■ XMC Compliance
Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
Electrical/Mechanical Interface: Single-Width Module.

■ Electrical
XMC PCIe bus interface (P15 and P16)
  One 114-pin male connector
  (Samtec ASP-103614-05 or equivalent).
P15 primary XMC connector
  4 differential pairs (PCIe standard, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora). JTAG.
  System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
  3.3V power: 4 pins at 1A/pin.
  3.3V auxiliary power: 1 pin, powers volatile memory to store the bitstream encryption key.
  Variable power (5V or 12V): 8 pins at 1A per pin.
P16 XMC connector
  8 differential pairs (PCIe, Serial RapidIO, or Xilinx Aurora).
  17 LVDS pairs or 34 SelectI/O signals (differential pairs grouped per VITA 46.0 X38s).
  2 global clock pairs.
Vcco pins are powered by 2.5V and support the 2.5V I/O standards.
P4 PMC rear I/O connector
  64-pin female receptacle header
  (AMP 120527-1 or equivalent).
  64 I/O connections (30 LVDS pairs plus two global clocks).
Vcco pins powered by 2.5V and support the 2.5V I/O standards.

■ Environmental
Operating temperature
XMC-7A200CC-LF: Conduction-cooled, -40 to 75°C.
Storage temperature
-55 to 125°C.
Relative humidity
5 to 95% non-condensing.
Power
  3.3V (±5%): 7W typical.
  12V (±5%): 2W typical.
  3.3V AUX (±5%): 57µW
MTBF
Contact the factory.

Ordering Information
NOTE: XMC-7KA-EDK is required to configure FPGA.

■ XMC Modules
XMC-7A200CC-LF
User-configurable Artix-7 FPGA, 215k logic cells, conduction-cooled

■ Software
For more information, see www.acromag.com.
XMC-7KA-EDK
Engineering Design Kit (one kit required)
PMCSW-API-VXW
VxWorks® 32-bit software support package
PCISW-API-WIN
Windows® DLL software support package
PCISW-API-LNX
Linux™ support (website download only)
XMC-7A200CC User-Configurable Conduction-Cooled Artix®-7 FPGA Modules with Plug-In I/O
XMC Modules

XMC-7K AX User-Configurable Kintex-7 FPGA Modules with Plug-In I/O

Description

Acromag's XMC-7K modules feature a high-performance user-configurable Xilinx® Kintex®-7 FPGA enhanced with high-speed memory and a high-throughput serial bus interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Both front and rear I/O is supported. Front I/O processing is supported with plug-in AXM mezzanine cards. A variety of AXM I/O cards are available to add the flexibility of a wide range of analog and digital I/O to your design.

The rear I/O provides an 8-lane high-speed serial interface on the P16 XMC port for customer-installed soft cores. P16 also supports 34 SelectIO channels. The P4 port adds another 60 SelectIO and global clock lines.

Key Features & Benefits

- Reconfigurable Xilinx Kintex-7 FPGA with 325k or 410k logic cells
- 128M x 64-bit DDR3 SDRAM
- 32M x 16-bit parallel flash memory for MicroBlaze FPGA program code storage
- 8-lane high-speed serial interface on rear P15 connector for PCIe Gen 1/2 (standard), Serial RapidI/O, 10Gb Ethernet, Xilinx Aurora
- 8-lane high-speed interfaces on rear P16 connector for customer-installed soft cores
- 60 SelectI/O or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectI/O or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface

With Acromag’s Kintex-7 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up CPU cycles by offloading algorithmic-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze® soft processors.

Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with Vivado® or ISE® Design Suite. And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces.
# XMC Modules

## XMC-7K AX User-Configurable Kintex-7 FPGA Modules w Plug-In I/O

### Performance Specifications

- **FPGA**
  - FPGA device
  - Xilinx Kintex-7 FPGA.
  - Model XC7K325T FPGA with 326,080 logic cells and 840 DSP48E1 slices or Model XC7K410T with 406,720 logic cells and 1540 DSP48E1 slices.
- **FPGA configuration**
  - Download via JTAG or flash memory.
- **Example FPGA program**
  - IP integrator block diagram provided for bus interface, front & rear I/O control, and SDRAM memory interface controller. See EDK kit.

### I/O Processing

- **Acromag AXM I/O Modules**
  - AXM modules plug into the XMC module's front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
  - **Rear high-speed I/O**
    - 12 high-speed serial lanes.
    - x8 lanes via P15 and x4 lanes via P16.
  - **Rear user I/O**
    - P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
    - P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

### Engineering Design Kit

- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-7K module (see www.acromag.com for more information).

### XMC Compliance

- Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
- Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interfaces.
- Electrical/Mechanical Interface: Single-Width Module.

### Electrical

- **XMC PCIe bus interface (P15 and P16)**
  - One 114-pin male connector (Samtec ASP-103614-05 or equivalent).
- **P15 primary XMC connector**
  - 8 differential pairs (PCIe standard, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora), JTAG.
  - System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
  - 3.3V power: 4 pins at 1A/pin.
  - 3.3V auxiliary power: 1 pin, powers volatile memory to store the bitstream encryption key.
  - Variable power (5V or 12V): 8 pins at 1A per pin.
- **P16 XMC connector**
  - 4 differential pairs (PCIe, Serial RapidIO, or Xilinx Aurora).
  - 17 LVDS pairs or 34 SelectIO signals (differential pairs grouped per VITA 46.0 X38s).
  - 2 global clock pairs.
  - Vcc0 pins are powered by 2.5V and support the 2.5V I/O standards.
  - P4 PMC rear I/O connector
    - 64-pin female receptacle header (AMP 120527-1 or equivalent).
    - 64 I/O connections (30 LVDS pairs plus two global clocks).
    - Vcco pins powered by 2.5V and support the 2.5V I/O standards.
- **Environmental**
  - **Operating temperature**
    - XMC-7K325AX-LF: -40 to 50°C.
    - XMC-7K410AX-LF: -40 to 40°C.
  - **Storage temperature**
    - -55 to 125°C.
  - **Relative humidity**
    - 5 to 95% non-condensing.
  - **Power**
    - 3.3V (±5%): 7.8W typical.
    - 12V (±5%): 2.7W typical.
    - 3.3V AUX (±5%): 57µW.
  - **MTBF**
    - Contact the factory.

### Ordering Information

- **NOTE:** XMC-7K-EDK is required to configure FPGA.

#### XMC Modules

- **XMC-7K325AX-LF**
  - User-configurable Kintex-7 FPGA, 325k logic cells with AXM support.
- **XMC-7K410AX-LF**
  - User-configurable Kintex-7 FPGA, 410k logic cells with AXM support.

#### Accessories

- **AXM-A75**
  - 16 analog inputs, 8 analog outputs, and 16 digital I/O
- **AXM-A30**
  - 2 analog input 100MHz 16-bit A/D channels.
- **AXM-D02**
  - 30 RS485 differential I/O channels.
- **AXM-D03**
  - 16 CMOS and 22 RS485 differential I/O channels.
- **AXM-D04**
  - 30 LVDS I/O channels.
- **AXM-??**
  - Custom I/O configurations available, call factory.

#### Software

- **XMC-7KA-EDK**
  - Engineering Design Kit (one kit required)
- **PMCSW-API-VXW**
  - VxWorks® 32-bit software support package
- **PCISW-API-WIN**
  - Windows® DLL software support package
- **PCISW-API-LNX**
  - Linux™ support (website download only)

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XMC-7K325AX-LF shown with optional AXM-A75
XMC-7K AX Block Diagram

**XMC-7K AX** User-Configurable Kintex-7 FPGA Modules with Plug-In I/O

- **Front Panel Mezzanine Bus**
- **AXM I/O Module**

- **KINTEX**
  - XC7K325 or XC7K410

- **Quad DDR3 SDRAM**
  - 2Gb (128M x 16)

- **Parallel Flash**
  - 512Mb (32M x 16)

- **16 x 4 LVDS Pairs, 2 Global Clock Pairs**

- **30 LVDS Pairs, 2 Global Clock Pairs**

- **97 I/O**
- **JTAG**
**description**

Acromag's XMC-7K modules feature a high-performance user-configurable Xilinx® Kintex®-7 FPGA enhanced with high-speed memory and a high-throughput serial bus interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

The rear I/O provides an 8-lane high-speed serial interface on the P16 XMC port for customer-installed soft cores. P16 also supports 34 SelectIO channels. The P4 port adds another 60 SelectIO and global clock lines. SelectIO signals are Kintex-7 FPGA I/O pins that support single-ended I/O (LVCMOS, HSTL, SSTL) and differential I/O standards (LVDS, HT, LVPECL, BLVDS, HSTL, SSTL).

Two versions of the Kintex-7 are available, offering a choice of an FPGA device with 325k or 410k logic cells.

With Acromag's Kintex-7 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up CPU cycles by offloading algorithm-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze™ soft processors.

Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with Vivado® or ISE® Design Suite. And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces.

**Key Features & Benefits**

- Reconfigurable Xilinx Kintex-7 FPGA with 325k or 410k logic cells
- 128M x 64-bit DDR3 SDRAM
- 32M x 16-bit parallel flash memory for MicroBlaze FPGA program code storage
- 8-lane high-speed serial interface on rear P15 connector for PCIe Gen 1/2 (standard), Serial RapidIO, 10Gb Ethernet, Xilinx Aurora
- 8-lane high-speed interfaces on rear P16 connector for customer-installed soft cores
- 60 SelectIO or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectIO or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface
- Extended temperature conduction-cooled
XMC Modules

XMC-7K CC  User-Configurable Conduction-Cooled Kintex-7 FPGA Modules

Performance Specifications

■ FPGA
FPGA device
Xilinx Kintex-7 FPGA.
Model XC7K325T FPGA with 326,080 logic cells and 840 DSP48E1 slices or Model XC7K410T with 406,720 logic cells and 1540 DSP48E1 slices.
FPGA configuration
Download via JTAG or flash memory.
Example FPGA program
IP integrator block diagram provided for bus interface, front & rear I/O control, and SDRAM memory interface controller. See EDK kit.

■ I/O Processing
Rear high-speed I/O
16 high-speed serial lanes.
x8 lanes via P15 and x8 lanes via P16.
Rear user I/O
P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

■ Engineering Design Kit
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-7K module (see www.acromag.com for more information).

■ XMC Compliance
Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
Electrical/Mechanical Interface: Single-Width Module.

■ Electrical
XMC PCIe bus interface (P15 and P16)
One 114-pin male connector
(Samtec ASP-103614-05 or equivalent).
P15 primary XMC connector
8 differential pairs (PCIe standard, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora). JTAG.
System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
3.3V power: 4 pins at 1A/pin.
3.3V auxiliary power: 1 pin, powers volatile memory to store the bitstream encryption key.
Variable power (5V or 12V): 8 pins at 1A per pin.
P16 XMC connector
4 differential pairs (PCIe, Serial RapidIO, or Xilinx Aurora).
17 LVDS pairs or 34 SelectI/O signals (differential pairs grouped per VITA 46.0 X38s).
2 global clock pairs.
Vcco pins are powered by 2.5V and support the 2.5V I/O standards.
P4 PMC rear I/O connector
64-pin female receptacle header
(AMP 120527-1 or equivalent).
64 I/O connections (30 LVDS pairs plus two global clocks).
Vcco pins powered by 2.5V and support the 2.5V I/O standards.

■ Environmental
Operating temperature
XMC-7K325AX-LF: Conduction-cooled, -40 to 70°C.
XMC-7K410AX-LF: Conduction-cooled, -40 to 70°C
Storage temperature
-55 to 125°C.
Relative humidity
5 to 95% non-condensing.
Power
3.3V (±5%): 7.8W typical.
12V (±5%): 2.7W typical.
3.3V AUX (±5%): 57µW
MTBF
Contact the factory.

Ordering Information
NOTE: XMC-7K-EDK is required to configure FPGA.

■ XMC Modules
XMC-7K325CC-LF
User-configurable Kintex-7 FPGA, 325k logic cells, conduction-cooled
XMC-7K410CC-LF
User-configurable Kintex-7 FPGA, 410k logic cells, conduction-cooled

■ Software
XMC-7KA-EDK
Engineering Design Kit (one kit required)
PMCSW-API-VXW
VxWorks® 32-bit software support package
PCISW-API-WIN
Windows® DLL software support package
PCISW-API-LNX
Linux™ support (website download only)

XMC-7K325CC-LF shown with heatsink
XMC-7K CC Block Diagram

XMC-7K CC  User-Configurable Conduction-Cooled Kintex-7 FPGA Modules

Quad DDR3 SDRAM 2Gb (128M x 16)

Parallel Flash 512Mb (32M x 16)

JTAG

16 x 4

X4 / X8

17 LVDS Pairs, 2 Global Clock Pairs

30 LVDS Pairs, 2 Global Clock Pairs

X4

X4

P16

P15

P4

XC7K325

or

XC7K410

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**Description**

Acromag’s XMC-7K modules feature a high-performance user-configurable Xilinx® Kintex®-7 FPGA enhanced with high-speed memory and a high-throughput serial interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Two versions of this module are available, offering a choice of an FPGA device with 325k or 410k logic cells.

Front I/O adds dual SFP+ ports and a VHDCR connector. The two SFP+ ports each provide a copper or fibre interface of up to 10.3125Gbps. They also support a Gigabit Ethernet interface. The VHDCR connector interfaces JTAG, USB, and 22 SelectIO.

The rear I/O provides an 4-lane high-speed serial interface on the P16 XMC port for customer-installed soft cores. P16 also supports 34 SelectIO channels. The P4 port adds another 60 SelectIO and global clock lines. SelectIO signals are Kintex-7 FPGA I/O pins that support single-ended I/O (LVCMOS, HSTL, SSTL) and differential I/O standards (LVDS, HT, LVPECL, BLVDS, HSTL, SSTL).

With Acromag's Kintex-7 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up CPU cycles by offloading algorithmic-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze™ soft processors.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with Vivado® or ISE® Design Suite. And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces.

**Key Features & Benefits**

- Reconfigurable Xilinx Kintex-7 FPGA with 325k or 410k logic cells
- 128M x 64-bit DDR3 SDRAM
- 32M x 16-bit parallel flash memory for MicroBlaze FPGA program code storage
- 8-lane high-speed serial interface on rear P15 connector for PCIe Gen 1/2 (standard), Serial RapidI/O, 10Gb Ethernet, Xilinx Aurora
- 4-lane high-speed interfaces on rear P16 connector for customer-installed soft cores
- Dual SFP+ ports for Fibre Channel or 10GbE
- 60 SelectIO or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectIO or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- 22 SelectIO, 2 global clock pairs, JTAG, USB, and ground signals via front 36-pin connector
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface
XMC Modules

**XMC-7K F** User-Configurable Kintex-7 FPGA Modules w/ Dual SFP+ Ports

### Performance Specifications

- **FPGA**
  - FPGA device
  - Xilinx Kintex-7 FPGA.
  - Model XC7K325T FPGA with 326,080 logic cells and 840 DSP48E1 slices or Model XC7K410T with 406,720 logic cells and 1540 DSP48E1 slices.
- **FPGA configuration**
  - Download via JTAG or flash memory.
  - Example FPGA program
    - IP integrator block diagram provided for bus interface, front & rear I/O control, and SDRAM memory interface controller. See EDK kit.

### I/O Processing

- **Front high-speed I/O**
  - Two x1 lanes via SFP+ connectors for Gigabit Ethernet and Fibre Channel interface
- **Front user I/O**
  - 36-pin connector provides JTAG connection, USB signals, 2 global differential clock pairs, 11 LVDS signal pairs, and 2 ground signals.
- **Rear high-speed I/O**
  - 12 high-speed serial lanes.
  - x8 lanes via P15 and x4 lanes via P16.
- **Rear user I/O**
  - P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
  - P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

### Engineering Design Kit

- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-7K module (see [www.acromag.com](http://www.acromag.com) for more information).

### XMC Compliance

- Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
  - Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
  - Electrical/Mechanical Interface: Single-Width Module.

### Electrical

- **XMC PCIe bus interface (P15 and P16)**
  - One 114-pin male connector (Samtec ASP-103614-05 or equivalent).
  - P15 primary XMC connector
    - 8 differential pairs (PCIe standard, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora), JTAG.
  - System Management (XMC provides hardware definition information read by an external controller using IPMI commands and I2C serial bus transactions.)
    - 3.3V power: 4 pins at 1A/pin.
    - 3.3V auxiliary power: 1 pin for system management. Variable power (5V or 12V): 8 pins at 1A per pin.
- **P16 XMC connector**
  - 4 differential pairs (PCIe, Serial RapidIO, or Xilinx Aurora).
  - 17 LVDS pairs or 34 SelectI/O signals (differential pairs grouped per VITA 46.0 X38s).
  - 2 global clock pairs.
  - Vcco pins are powered by 2.5V and support the 2.5V I/O standards.
- **P4 PMC rear I/O connector**
  - 64-pin female receptacle header (AMP 120527-1 or equivalent).
  - 64 I/O connections (30 LVDS pairs plus two global clocks).
  - Vcco pins powered by 2.5V and support the 2.5V I/O standards.
- **VHDCR connector**
  - 36-position connector (Samtec VHDCR-36-01-M-RA) mates with industry-standard VHDCI cable assemblies.
- **SFP+ host connector**
  - SFP transceiver signals route directly to Kintex-7 FPGA. 10.3125Gb/S maximum data rate.
  - SFP+ copper (Gigabit Ethernet) or fibre optic modules available from Acromag.

### Environmental

- **Operating temperature**
  - XMC-7K325F-LF: -40 to 50°C.
  - XMC-7K410F-LF: -40 to 40°C.
- **Storage temperature**
  - -55 to 125°C
- **Relative humidity**
  - 5 to 95% non-condensing.
- **Power**
  - 3.3V (±5%): 7.8W typical.
  - 12V (±5%): 2.7W typical.
  - 3.3V AUX (±5%): 57µW typical.
- **MTBF**
  - Contact the factory.

### Ordering Information

- **XMC-7K325F-LF**
  - User-configurable Kintex-7 FPGA, 325k logic cells plus SFP front I/O
  - **Accessories**
    - 5025-921
      - Cable, VHDCI 36-pin to SCSI-2, 6 feet long.
    - 5028-449
      - Cable, copper twin-ax, SFP to SFP, 1 meter long.
    - 5028-455
      - Transceiver, 10/100/1000BASE-T copper SFP, up to 1.25Gb/s bi-directional data links.
    - 5028-452
      - Transceiver, short-wavelength SFP, up to 2.125Gb/s bi-directional data links.
- **Software**
  - **XMC-7KA-EDK**
    - Engineering Design Kit (one kit required)
  - **PMCSW-API-VXW**
    - VxWorks® 32-bit software support package
  - **PCISW-API-WIN**
    - Windows® DLL software support package
  - **PCISW-API-LNX**
    - Linux™ support (website download only)

**XMC-7K325F-LF shown with heatsink**
XMC Modules

XMC-6VLX  User-Configurable Virtex-6 FPGA Modules

Description
Acromag's XMC-6VLX modules feature a high-performance user-configurable Xilinx® Virtex®-6 FPGA enhanced with high-speed memory and a high-throughput serial interface. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Two Versions: Rear I/O or Front + Rear
Two versions of this module are available, each offering a choice of an FPGA device with 240k or 365k logic cells. One version provides only rear I/O for use in air or conduction-cooled systems. The other version adds two SFP ports and a 36-pin connector on the front but only supports air-cooled systems.

On all versions, the rear I/O provides an 8-lane high-speed serial interfaces on both the P15 and P16 XMC ports for PCIe Gen 1/2, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora implementation. P16 also supports 34 SelectIO channels. The P4 port adds another 30 SelectIO and global clock lines. SelectIO signals are Virtex-6 FPGA I/O pins that support single-ended I/O (LVCMOS, HSTL, SSTL) and differential I/O standards (LVDS, HT, LVPECL, BLVDS, HSTL, SSTL).

Models with front I/O add dual SFP ports and a VHDCR connector. The two SFP ports each provide a copper or fibre interface of up to 2.5Gbps. They also support a Gigabit Ethernet interface. The VHDCR connector interfaces JTAG, USB, and 22 SelectIO.

With Acromag's Virtex-6 FPGA modules, you can greatly increase DSP algorithm performance for faster throughput using multiple channels and parallel hardware architectures. Free up DSP processor CPU cycles by offloading algorithm-intensive tasks to the FPGA co-processor.

These modules are ideal for high-performance customized embedded systems. Optimize your system performance by integrating high-speed programmable logic with the flexibility of software running on MicroBlaze™ soft processors.

Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL debugging. Additional Xilinx tools help finish your system faster. Maximize FPGA performance with ISE® Design Suite. And with ChipScope™ Pro tools, you can rapidly debug logic and serial interfaces.

Key Features & Benefits
- Reconfigurable Xilinx Virtex-6 FPGA with 240k or 365k logic cells
- 2M x 72-bit QDRII SRAM, 128M x 64-bit DDR3 SDRAM
- 16M x 16-bit parallel flash memory for MicroBlaze program code storage
- 128Mb flash memory to store power-up configuration bit file for Virtex-6 FPGA
- Dual 8-lane high-speed serial interfaces on rear P15 and P16 connectors for PCIe Gen 1/2, Serial RapidIO, 10Gb Ethernet, Xilinx Aurora
- Dual SFP ports for Fibre Channel or GbE
- 60 SelectIO or 30 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P4 port
- 34 SelectIO or 17 LVDS pairs plus 2 global clock pairs direct to FPGA via rear P16 port
- 22 SelectIO, 2 global clock pairs, JTAG, USB, and ground signals via front 36-pin connector
- DMA support provides data transfer between system memory and the on-board memory
- Support for Xilinx ChipScope™ Pro interface
- Designed for conduction-cooled host card

Tel 248-295-0310  Fax 248-624-9234  solutions@acromag.com  www.acromag.com  30765 Wixom Rd, Wixom, MI 48393  USA
## XMC-6VLX  User-Configurable Virtex-6 FPGA Modules

### Performance Specifications

- **FPGA**
  - FPGA device
  - Xilinx Virtex-6 FPGA.
  - Model XC6VLX240T FPGA with 241,152 logic cells and 768 DSP48E1 slices or Model XC6VLX365T with 364,032 logic cells and 576 DSP48E1 slices.
  - FPGA configuration
  - Download via JTAG or flash memory.
  - Example FPGA program
  - VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

- **I/O Processing**
  - Front high-speed I/O
    - Two x1 lanes via SFP connectors for Gigabit Ethernet and Fibre Channel interface
  - Front user I/O
    - 36-pin connector provides JTAG connection, USB signals, 2 global differential clock pairs, 11 LVDS signal pairs, and 2 ground signals.
  - Rear high-speed I/O
    - 16 high-speed serial lanes.
    - x8 lanes via P15 and x8 lanes via P16.
  - Rear user I/O
    - P16: 17 LVDS pairs (34 LVCMOS), 2 global clock pairs.
    - P4: 30 LVDS pairs (60 LVCMOS), 2 global clock pairs.

- **Engineering Design Kit**
  - Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-6VLX module (see www.acromag.com for more information).

- **XMC Compliance**
  - Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
  - Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
  - Electrical/Mechanical Interface: Single-Width Module.

### Electrical

- **FPGA**
  - XMC PCIe bus interface (P15 and P16)
    - One 114-pin male connector (Samtec ASP-103614-05 or equivalent).
  - P15 primary XMC connector
    - 8 differential pairs (Serial RapidIO, PCIe, 10-Gigabit Ethernet, or Xilinx Aurora). JTAG.
  - P16 XMC connector
    - 8 differential pairs (Serial RapidIO, PCIe, 10-Gigabit Ethernet, or Xilinx Aurora).
    - 17 LVDS pairs or 34 SelectI/O signals (differential pairs grouped per VITA 46.0 X38s).
  - 2 global clock pairs.
  - Vcco pins are powered by 2.5V and support the 2.5V I/O standards.
  - P4 PMC rear I/O connector
    - 64-pin female receptacle header (AMP 120527-1 or equivalent).
    - 64 I/O connections (30 LVDS pairs plus two global clocks).
  - Vcco pins powered by 2.5V and support the 2.5V I/O standards.
  - VHDCR connector
    - 36-position connector (Samtec VHDCR-36-01-M-RA) mates with industry-standard VHDCI cable assemblies.
  - SFP host connector (optional)
    - SFP transceiver signals route directly to Virtex-6 FPGA.
    - 2.5Gs maximum data rate.
    - SFP copper (Gigabit Ethernet) or fibre optic modules available from Acromag.
  - Operating temperature
    - Standard models: 0 to 70°C.
  - Storage temperature
    - -55 to 125°C.
  - Relative humidity
    - 5 to 95% non-condensing.
  - Power
    - 3.3V (±5%): Application dependent.
    - 12V (±5%): Application dependent.
  - MTBF
    - Contact the factory.

### Ordering Information

- **XMC Modules**
  - XMC-6VLX240
    - User-configurable Virtex-6 FPGA, 240k logic cells, no front I/O
  - XMC-6VLX240F
    - Same as XMC-6VLX240 plus SFP front I/O
  - XMC-6VLX365
    - User-configurable Virtex-6 FPGA, 365k logic cells, no front I/O
  - XMC-6VLX365F
    - Same as XMC-6VLX365 plus SFP front I/O

- **Accessories**
  - 5025-921
    - Cable, VHDCI 36-pin to SCSI-2, 6 feet long. Use with XMC-6VLX240F and XMC-6VLX365F.
  - 5028-449
    - Cable, copper twin-ax, SFP to SFP, 1 meter long.
  - 5028-452
    - Transceiver, 10/100/1000BASE-T copper SFP, up to 1.25Gb/s bi-directional data links.
  - 5028-452
    - Transceiver, short-wavelength SFP, up to 2.125Gb/s bi-directional data links.

- **Software**
  - For more information, see www.acromag.com.
  - XMC-6VLX-EDK
    - Engineering Design Kit (one kit required)
  - PMCSW-API-VXW
    - VxWorks® software support package
  - PCISW-API-WIN
    - Windows® DLL software support package
  - PCISW-API-LNX
    - Linux™ support (website download only)
VPX Boards

VPX-SLX  VPX module with User-Configurable Spartan-6 FPGA

Description

Acromag’s cost-effective VPX-SLX boards feature a user-configurable Xilinx® Spartan®-6 FPGA enhanced with high-speed memory and a high-throughput PCIe interface. The result is a powerful and flexible logic processor module that is capable of executing your custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Large, high-speed memory banks enable efficient data handling. The dual-port SRAM facilitates high-speed DMA transfers between the FPGA and the rest of the system. A high-bandwidth PCIe interface ensures fast data throughput.

64 I/O lines are accessible through the rear (P2) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external AXM I/O cards are available to interface your analog and digital I/O signals.

Take advantage of the conduction-cooled version for use in hostile environments. Conduction efficiently dissipates heat if there is inadequate cooling air flow.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL debugging.

Key Features & Benefits

- Reconfigurable Xilinx Spartan-6 FPGA with 147,433k logic cells
- PCIe bus 4-lane Gen 1 interface
- 1M x 64-bit dual-ported SRAM provides direct links from the PCIe bus and to the FPGA
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (P2) connector
- Plug-in I/O extension modules are available for the front mezzanine
- FPGA code loads from the PCIe bus or from on-board flash memory
- Supports dual DMA channel data transfer from/to the rest of the system
- Support for Xilinx ChipScope™ Pro interface
- Air-cooled (0 to 70°C) and conduction-cooled (-40 to 85°C) models

Conduction-cooled version

Plug in an AXM analog or digital I/O module for additional I/O signal processing capabilities.

Tel 248-295-0310  ■  Fax 248-624-9234  ■  solutions@acromag.com  ■  www.acromag.com  ■  30765 Wixom Rd, Wixom, MI 48393  USA

Bulletin #8400-628c
VPX Boards

VPX-SLX  VPX module with User-Configurable Spartan-6 FPGA

Performance Specifications

■ General

Form Factor
3U VPX bus 6.299” (160mm) x 3.937” (100.0mm).

Pitch
VPX-SLX150 (air-cooled): 0.80” pitch.
VPX-SLX150-CC (conduction-cooled): 0.85” pitch.

Chassis Compatibility
Compatible VITA 65 module / slot profiles:
MOD3-PER-2F-16.3.1 / SLT3-PER-2F-14.3.1
MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2
MOD3-PAY-1D-16.2.6-11 / SLT3-PAY-1D-14.2.6
MOD3-PAY-2F-16.2.7-11 / SLT3-PAY-2F-14.2.7
Note 1: Board is compatible with payload profiles but
has no hosting capabilities.

FRU EEPROM with temperature monitor.

■ FPGA

FPGA Device
Xilinx Spartan-6 FPGA.
Model XC6SLX150-3FG676 FPGA with 147,433 logic
cells and 180 DSP48A1 slices.

FPGA configuration
Download via PCIe bus or flash memory.

Example FPGA program
VHDL provided for bus interface, front & rear I/O
control, SRAM read/write interface logic, and SRDRAM
memory interface controller. See EDK kit.

■ I/O Processing

Acromag AXM I/O modules:
AXM modules plug into the FPGA board’s front
mezzanine for additional I/O lines. Analog and digital
I/O AXM modules are sold separately.

Rear I/O
64 I/O (32 LVDS) lines supported with a direct
connection between the FPGA and the rear I/O
connector (P2).

■ Engineering Design Kit

Provides user with basic information required to
develop a custom FPGA program. Kit must be ordered
with the first purchase of a VPX-SLX board
(see www.acromag.com for more information).

■ Environmental

Air-Cooled Operating Temperature
0 to 70°C (air flow requirement as measured to be
greater than 200 LFM).

Conduction-Cooled Operating Temperature Range
-40 to 85°C (board must operate in a fully-installed
conduction-cooled rack).

Storage Temperature Range
-55 to 100°C.

Relative Humidity
5 to 95% non-condensing.

Vibration
0.05g RMS (20 - 2000Hz) random,
operating 6g RMS per Hz spectrum.

Shock
30g each axis, 11ms.

MTBF
Consult factory.

■ Power Requirements

Carrier-Only Power Requirements
+3.3V DC: 0.9A typical plus any additional power
consumed by PMC/XMC (4A max).
+5V DC: 0.9A typical plus any additional power
consumed by PMC/XMC (4A max).
+12V DC and –12V DC provided to PMC site from
VPX backplane.

Ordering Information

NOTE: XMC-SLX-EDK is required to configure FPGA.

■ VPX Boards

VPX-SLX150
3U VPX card with user-configurable Spartan-6 FPGA,
air-cooled
VPX-SLX150-CC
3U VPX card with user-configurable Spartan-6 FPGA,
conduction-cooled

■ AXM Plug-In I/O Extension Modules

For more information, see www.acromag.com.
AXM-A30
2 analog input 100MHz 16-bit A/D channels
AXM-D02
30 RS485 differential I/O channels
AXM-D03
16 CMOS and 22 RS485 differential I/O channels
AXM-D04
30 LVDS I/O channels
AXM-??
Custom I/O configurations available, call factory.

■ Software

For more information, see www.acromag.com.
XMC-SLX-EDK
Engineering Design Kit (one kit required)
PMCSW-API-VXW
VxWorks® software support package
PCISW-API-WIN
Windows® DLL software support package
PCISW-API-LNX
Linux™ support (website download only)
PMC Modules

**PMC-SLX** User-Configurable Spartan-6 FPGA Modules with Plug-In I/O

**Description**

Acromag's cost-effective PMC-SLX modules feature a user-configurable Xilinx® Spartan®-6 FPGA enhanced with high-speed memory and a high-throughput PCI-X interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Large, high-speed memory banks enable efficient data handling. The dual-port SRAM facilitates high-speed DMA transfers to the bus or CPU. A high-bandwidth PCI-X interface ensures fast data throughput.

64 I/O lines are accessible through the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external AXM I/O cards are available to interface your analog and digital I/O signals.

Take advantage of the conduction-cooled design for use in hostile environments. Conduction efficiently dissipates heat if there is inadequate cooling air flow. Optional extended temperature models operate reliably from -40 to 85°C.

Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL debugging.

**Key Features & Benefits**

- Reconfigurable Xilinx Spartan-6 FPGA with 147,433 logic cells
- PCI-X bus 100MHz 64-bit interface
- 256k x 64-bit dual-ported SRAM provides direct links from the PCI bus and to the FPGA (optional 1M x 64-bit)
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4) connector
- Plug-in I/O extension modules are available for the front mezzanine
- FPGA code loads from the PCI-X bus or from flash memory
- Other memory options available (call factory)
- Supports dual DMA channel data transfer to the CPU/bus
- Support for Xilinx ChipScope™ Pro interface
- Designed for conduction-cooled host card or -40 to 85°C operation in air-cooled systems
PMC Modules

PMC-SLX  User-Configurable Spartan-6 FPGA Modules with Plug-In I/O

Performance Specifications

- **FPGA**
  - FPGA Device
  - Xilinx Spartan-6 FPGA.
  - Model XC6SLX150-3FG676 FPGA with 147,433 logic cells and 180 DSP48A1 slices.
  - FPGA configuration
    - Download via PCI-X bus or flash memory.
  - Example FPGA program
    - VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

- **I/O Processing**
  - Acromag AXM I/O modules:
    - AXM modules plug into the PMC module's front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
  - Rear I/O
    - 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

  - **Engineering Design Kit**
    - Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-SLX module (see www.acromag.com for more information).

  - **PMC Compliance**
    - Conforms to PCI Local Bus Specification, Revision 3.0 and CMC/PMC Specification, P1386.1.
    - Electrical/Mechanical Interface: Single-Width Module.
    - PCI Bus Modes: Supports PCI-X at 100MHz, 66MHz and Standard PCI at 66MHz and 33MHz
    - PCI-X Master/Target: 32-bit or 64-bit interface
    - Signaling: 3.3V compliant.
    - Interrupts (INTA#): Interrupt A is used to request an interrupt.

  - **Environmental**
    - Operating temperature
      - -0 to 70°C or -40 to 85°C (E versions).
    - Storage temperature
      - -55 to 125°C.
    - Relative humidity
      - 5 to 95% non-condensing.
    - Power
      - 3.3V (±5%): 700mA typical, 840mA maximum.
      - 5V (±5%): 1600mA typical, 2160mA maximum.
    - MTBF
      - Contact the factory.

  - **Ordering Information**
    - NOTE: PMC-SLX-EDK is required to configure FPGA.

  - **PMC Modules**
    - **PMC-SLX150**
      - User-configurable Spartan-6 FPGA, 150k logic cells, 256 x 64-bit dual-port SRAM
    - **PMC-SLX150E**
      - Same as PMC-SLX150 with extended temp. range
    - **PMC-SLX150-1M**
      - User-configurable Spartan-6 FPGA, 150k logic cells, 1M x 64-bit dual-port SRAM
    - **PMC-SLX150E-1M**
      - Same as PMC-SLX150-1M with extended temp. range

  - **AXM Plug-In I/O Extension Modules**
    - For more information, see www.acromag.com.
    - **AXM-A30**
      - 2 analog input 100MHz 16-bit A/D channels
    - **AXM-D02**
      - 30 RS485 differential I/O channels
    - **AXM-D03**
      - 16 CMOS and 22 RS485 differential I/O channels
    - **AXM-D04**
      - 30 LVDS I/O channels
    - **AXM-??**
      - Custom I/O configurations available, call factory.

  - **Software**
    - For more information, see www.acromag.com.
    - **PMC-SLX-EDK**
      - Engineering Design Kit (one kit required)
    - **PMC-SW-API-VXW**
      - VxWorks® software support package
    - **PCISW-API-WIN32**
      - 32-bit Windows® driver (DLL) software package
    - **PCISW-API-WIN64**
      - 64-bit Windows® driver (DLL) software package
    - **PCISW-API-LNX**
      - Linux™ support (website download only)
XMC Modules

XMC-SLX  User-Configurable Spartan-6 FPGA Modules with Plug-In I/O

Description
Acromag’s cost-effective XMC-SLX modules feature a user-configurable Xilinx® Spartan®-6 FPGA enhanced with high-speed memory and a high-throughput PCIe interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing custom instruction sets and algorithms.

The logic-optimized FPGA is well-suited for a broad range of applications. Typical uses include hardware simulation, communications, in-circuit diagnostics, military servers, signal intelligence, and image processing.

Large, high-speed memory banks enable efficient data handling. The dual-port SRAM facilitates high-speed DMA transfers to the bus or CPU. A high-bandwidth PCIe interface ensures fast data throughput.

64 I/O lines are accessible through the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external AXM I/O cards are available to interface your analog and digital I/O signals.

Key Features & Benefits
- Reconfigurable Xilinx Spartan-6 FPGA with 147,433 logic cells
- PCIe bus 4-lane Gen 1 interface
- 256k x 64-bit dual-ported SRAM provides direct links from the PCIe bus and to the FPGA (optional 1M x 64-bit)
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4) connector
- Plug-in I/O extension modules are available for the front mezzanine
- FPGA code loads from the PCIe bus or from flash memory
- Other memory options available (call factory)
- Supports dual DMA channel data transfer to the CPU/bus
- Support for Xilinx ChipScope™ Pro interface
- Designed for conduction-cooled host card or -40 to 85°C operation in air-cooled systems

Rear 64 I/O Points
1.0V Power Supply
1.8V Power Supply
2.5V Power Supply
Flash Memory 16MB
Dual Port SRAM 1M x 32
Dual Port SRAM 1M x 32
Front Panel Mezzanine Bus
AXM I/O Module
Flash Memory 16MB
1.0V Power Supply
1.8V Power Supply
2.5V Power Supply
XMC module with PCIe interface  Logic-optimized Spartan-6 FPGA  I/O extension mezzanine modules

Take advantage of the conduction-cooled design for use in hostile environments. Conduction efficiently dissipates heat if there is inadequate cooling air flow. Optional extended temperature models operate reliably from -40 to 85°C.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL debugging.

Plug in an AXM analog or digital I/O module for additional I/O signal processing capabilities.

VPX air-cooled and REDI versions are available
XMC Modules

Performance Specifications

- **FPGA**
  - FPGA Device
  - Xilinx Spartan-6 FPGA.
  - Model XC6SLX150-3FG676 FPGA with 147,433 logic cells and 180 DSP48A1 slices.
  - FPGA configuration
  - Download via PCIe bus or flash memory.
  - Example FPGA program
  - VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

- **I/O Processing**
  - Acromag AXM I/O modules: AXM modules plug into the XMC module's front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
  - Rear I/O
    - 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

- **Engineering Design Kit**
  - Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-SLX module (see www.acromag.com for more information).

- **XMC Compliance**
  - Conforms to PCI Express 1.1a electrical and protocol standards. 2.5Gbps data rate per lane per direction.
  - Complies with ANSI/VITA 42.0 specification for XMC module mechanicals and connectors.
  - Complies with ANSI/VITA 42.3 specification for XMC modules with PCI Express interface.
  - Electrical/Mechanical Interface: Single-Width Module.

- **Environmental**
  - Operating temperature
    - -0 to 70°C or -40 to 85°C (E versions).
  - Storage temperature
    - -55 to 125°C.
  - Relative humidity
    - 5 to 95% non-condensing.
  - Power
    - 3.3V (±5%): 700mA typical, 840mA maximum.
    - 12V (±5%): 640mA typical, 804mA maximum.
  - MTBF
    - Contact the factory.

Ordering Information

- **NOTE**: XMC-SLX-EDK is required to configure FPGA.

- **XMC Modules**
  - XMC-SLX150
    - User-configurable Spartan-6 FPGA, 150k logic cells, 256 x 64-bit dual-port SRAM
  - XMC-SLX150E
    - Same as XMC-SLX150 with extended temp. range
  - XMC-SLX150-1M
    - User-configurable Spartan-6 FPGA, 150k logic cells, 1M x 64-bit dual-port SRAM
  - XMC-SLX150E-1M
    - Same as XMC-SLX150-1M with extended temp. range

- **VPX Boards**
  - For more information, see www.acromag.com.

- **AXM Plug-In I/O Extension Modules**
  - For more information, see www.acromag.com.

- **Software**
  - For more information, see www.acromag.com.

For more information, see www.acromag.com.

AXM-SLX-EDK
- Engineering Design Kit (one kit required)
- PMCSW-API-VXW
  - VxWorks® software support package
- PCISW-API-WIN
  - Windows® DLL software support package
- PCISW-API-LNX
  - Linux™ support (website download only)
Description

Models
XMC-VLX85: 85k logic cells
XMC-VLX110: 110k logic cells
XMC-VLX155: 155k logic cells

Acromag’s XMC-VLX mezzanine modules feature a configurable Xilinx® Virtex™-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCIe interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing your custom instruction sets and algorithms.

Three models provide a choice of logic-optimized FPGAs to match your performance requirements. Although there is no limit to the uses for these boards, several applications are ideal. Typical uses include hardware simulation, military servers, communications, in-circuit diagnostics, signal intelligence, and image processing.

64 I/O lines are accessible through the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards are available to interface for your analog and digital I/O signals.

Large, high-speed memory banks provide efficient data handling. Generous DDR2 SDRAM buffers store captured data prior to FPGA processing. Afterward, data is moved to dual-port SRAM for high-speed DMA transfer to the bus or CPU. Our high-bandwidth PCIe interface ensures fast data throughput.

Take advantage of the conduction-cooled design for use in hostile environments. Conduction efficiently dissipates heat if there is inadequate cooling air flow. Optional extended temperature models operate reliably from -40 to 85°C.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL debugging.

Key Features & Benefits

- Reconfigurable Xilinx Virtex-5 FPGA
- PCIe bus 4-lane Gen 1 interface
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4) connector
- Plug-in I/O extension modules are available for the front mezzanine
- FPGA code loads from the PCIe bus or from flash memory
- 1M x 64-bit dual-ported SRAM provides direct links from the PCIe bus and to the FPGA
- 32M x 32-bit DDR2 SDRAM is directly accessed through the FPGA
- Other memory options available (call factory)
- Supports dual DMA channel data transfer to the CPU/bus
- Support for Xilinx ChipScope™ Pro interface
- Designed for conduction-cooled host card or -40 to 85°C operation in air-cooled systems

Plug in an AXM analog or digital I/O module for additional I/O signal processing capabilities.
XMC Modules

XMC-VLX  User-Configurable Virtex-5 FPGA Modules with Plug-In I/O

### Performance Specifications
- **FPGA**
  - FPGA Device
  - Xilinx Virtex-5 FPGA.
  - Model XMC-VLX85: XC5VLX85T-1FF1136 FPGA with 82,944 logic cells and 48 DSP48E slices.
  - Model XMC-LX110: XC5VLX110T-1FF1136 FPGA with 110,592 logic cells and 64 DSP48E slices.

- **FPGA configuration**
  - Download via PCIe bus or flash memory.

- **Example FPGA program**
  - VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

- **I/O Processing**
  - Acromag AXM I/O modules: AXM modules plug into the XMC module’s front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
  - **Rear I/O**
    - 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

### Engineering Design Kit
- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a XMC-VLX module (see www.acromag.com for more information).

### Ordering Information
- **XMC Modules**
  - XMC-VLX85
    - User-configurable Virtex-5 FPGA, 85k logic cells
  - XMC-VLX85E
    - Same as XMC-VLX85 with extended temp. range
  - XMC-VLX110
    - User-configurable Virtex-5 FPGA, 110k logic cells
  - XMC-VLX110E
    - Same as XMC-VLX110 with extended temp. range
  - XMC-VLX155
    - User-configurable Virtex-5 FPGA, 155k logic cells
  - XMC-VLX155E
    - Same as XMC-VLX155 with extended temp. range
  - XMC-VLX-EDK
    - Engineering Design Kit (one kit required)

- **AXM Plug-In I/O Extension Modules**
  - For more information, see www.acromag.com.
  - AXM-A30
    - 2 analog input 100MHz 16-bit A/D channels
  - AXM-D02
    - 30 RS485 differential I/O channels
  - AXM-D03
    - 16 CMOS and 22 RS485 differential I/O channels
  - AXM-D04
    - 30 LVDS I/O channels
  - AXM-??
    - Custom I/O configurations available, call factory.

- **Software**
  - For more information, see www.acromag.com.
  - PMCSW-API-VXW
    - VxWorks® software support package
  - PCISW-API-WIN
    - Windows® DLL software support package
  - PCISW-API-LNX
    - Linux™ support (website download only)

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**ISO9001**

**AS9100**

**Made in USA**

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**VPX Boards**

**VPX-VLX**  VPX Board with User-Configurable Virtex-5 FPGA

**Description**

- **VPX-VLX85**: 85k logic cells
- **VPX-VLX110**: 110k logic cells
- **VPX-VLX155**: 155k logic cells

Acromag's VPX-VLX 3U VPX boards feature a configurable Xilinx® Virtex®-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCIe interface. The result is a powerful and flexible logic processor module that is capable of executing your custom instruction sets and algorithms.

Three models provide a choice of logic-optimized FPGAs to match your performance requirements. Although there is no limit to the uses for these boards, several applications are ideal. Typical uses include hardware simulation, military servers, communications, in-circuit diagnostics, signal intelligence, and image processing.

Large, high-speed memory banks provide efficient data handling. Generous DDR2 SDRAM buffers store captured data prior to FPGA processing. Afterward, data is moved to dual-port SRAM for high-speed DMA transfer to/from the rest of the system. A high-bandwidth PCIe interface ensures fast data throughput.

64 I/O lines are accessible through the rear (P2) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external AXM I/O cards are available to interface your analog and digital I/O signals.

**Key Features & Benefits**

- Reconfigurable Xilinx Virtex-5 FPGA
- PCIe bus 4-lane Gen 1 interface
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (P2) connector
- Plug-in I/O extension modules are available for the front mezzanine
- FPGA code loads from the PCIe bus or from on-board flash memory
- 1M x 64-bit dual-ported SRAM provides direct links from the PCIe bus and to the FPGA
- 32M x 32-bit DDR2 SDRAM is directly accessed through the FPGA
- Supports dual DMA channel data transfer to/from the rest of the system
- Support for Xilinx ChipScope™ Pro interface
- Designed for conduction-cooled host card or -40 to 85°C operation in air-cooled systems

**Conduction-cooled version**

- Plug in an AXM analog or digital I/O module for additional I/O signal processing capabilities.

**Acromag**

The Leader in Industrial I/O

Tel 248-295-0310  ■  Fax 248-624-9234  ■  solutions@acromag.com  ■  www.acromag.com  ■  30765 Wixom Rd, Wixom, MI 48393  USA

Bulletin #8400-627b
VPX Boards

**VPX-VLX**  VPX Board with User-Configurable Virtex-5 FPGA

### Performance Specifications

- **General**
  - **Form Factor**
    - 3U VPX bus 6.299" (160mm) x 3.937" (100.0mm).
  - **Pitch**
    - VPX-VLXxxx (air-cooled): 0.80" pitch.
    - VPX-VLXxxx-CC (conduction-cooled): 0.85" pitch.
  - **Chassis Compatibility**
    - Compatible VITA 65 module / slot profiles:
      - MOD3-PAY-2F-16.2.7-11 / SLT3-PAY-2F-14.2.7
      - MOD3-PAY-1D-16.2.6-11 / SLT3-PAY-1D-14.2.6
      - MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2
      - MOD3-PER-2F-16.3.1-3 / SLT3-PER-2F-14.2.7
    - Note 1: Board is compatible with payload profiles but has no hosting capabilities.

- **PCI Express Interface**
  - VITA 46.4 fat pipe (x4) PCIe Gen 1 interface.

- **Environmental**
  - **Operating Temperature**
    - VPX-VLX155: 0 to 70°C (air flow requirement as measured to be greater than 200 LFM).
    - VPX-VLX85-CC: -40 to 85°C (board must operate in a fully-installed conduction-cooled rack).
    - VPX-VLX110-CC: 0 to 70°C (air flow requirement as measured to be greater than 200 LFM).
  - **Relative Humidity**
    - 5 to 95% non-condensing.
  - **Shock**
    - 30g each axis, 11ms.
  - **Vibration**
    - 0.05g (20 - 2000Hz) random, RMS
      - For more information, see www.acromag.com.

- **I/O Processing**
  - Acromag AXM I/O modules:
    - AXM modules plug into the FPGA board's front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
  - **Rear I/O**
    - 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (P2).

- **Engineering Design Kit**
  - Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a VPX-VLX module (see www.acromag.com for more information).

- **Power Requirements**
  - Carrier-Only Power Requirements:
    - +3.3V DC: 0.9A typical plus any additional power consumed by PMC/XMC (4A max).
    - +5V DC: 0.9A typical plus any additional power consumed by PMC/XMC (4A max).
    - +12V DC and −12V DC provided to PMC site from VPX backplane.

### Ordering Information

**NOTE:** XMC-VLX-EDK is required to configure FPGA.

- **VPX Boards**
  - VPX-VLX85: 3U VPX, Virtex-5 FPGA, 85k logic cells, air-cooled
  - VPX-VLX110-CC: Same as VPX-VLX85 except conduction-cooled
  - VPX-VLX110: 3U VPX, Virtex-5 FPGA, 110k logic cells, air-cooled
  - VPX-VLX155-CC: Same as VPX-VLX110 except conduction-cooled
  - VPX-VLX155: 3U VPX, Virtex-5 FPGA, 155k logic cells, air-cooled

- **AXM Plug-In I/O Extension Modules**
  - For more information, see www.acromag.com.
  - **AXM-A30**
    - 2 analog input 100MHz 16-bit A/D channels
  - **AXM-D02**
    - 30 RS485 differential I/O channels
  - **AXM-D03**
    - 16 CMOS and 22 RS485 differential I/O channels
  - **AXM-D04**
    - 30 LVDS I/O channels
  - **AXM-??**
    - Custom I/O configurations available, call factory.

- **Software**
  - For more information, see www.acromag.com.
  - **XMC-VLX-EDK**
    - Engineering Design Kit (one kit required)
  - **PMCSW-API-VXW**
    - VxWorks® software support package
  - **PMCSW-API-WIN**
    - Windows® DLL software support package
  - **PMCSW-API-LNX**
    - Linux™ support (website download only)

---

**FPGA**

**Example FPGA program**

VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

**Performance Specifications**

**General**

- **Form Factor**
  - 3U VPX bus 6.299" (160mm) x 3.937" (100.0mm).
- **Pitch**
  - VPX-VLXxxx (air-cooled): 0.80" pitch.
  - VPX-VLXxxx-CC (conduction-cooled): 0.85" pitch.

**Chassis Compatibility**

Compatible VITA 65 module / slot profiles:

- MOD3-PAY-2F-16.2.7-11 / SLT3-PAY-2F-14.2.7
- MOD3-PAY-1D-16.2.6-11 / SLT3-PAY-1D-14.2.6
- MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2
- MOD3-PER-2F-16.3.1-3 / SLT3-PER-2F-14.2.7

**Note 1:** Board is compatible with payload profiles but has no hosting capabilities.

**FRU EEPROM with temperature monitor.**

**PCI Express Interface**

VITA 46.4 fat pipe (x4) PCIe Gen 1 interface.

**FPGA configuration**

Download via PCIe bus or flash memory.

**Example FPGA program**

VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

**VPX Model**

- **Virtex-5 FPGA Device**
  - **Logic Cells**
  - **DSP48E Slices**

<table>
<thead>
<tr>
<th>VPX Model</th>
<th>Virtex-5 FPGA Device</th>
<th>Logic Cells</th>
<th>DSP48E Slices</th>
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<tr>
<td>VPX-VLXB5</td>
<td>XC5VLX85T</td>
<td>82,944</td>
<td>48</td>
</tr>
<tr>
<td>VPX-VLX110</td>
<td>XC5VLX110T</td>
<td>110,592</td>
<td>64</td>
</tr>
<tr>
<td>VPX-VLX155</td>
<td>XC5VLX155T</td>
<td>155,648</td>
<td>128</td>
</tr>
</tbody>
</table>

**FPGA**

**Example FPGA program**

VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

**Performance Specifications**

**General**

- **Form Factor**
  - 3U VPX bus 6.299" (160mm) x 3.937" (100.0mm).
- **Pitch**
  - VPX-VLXxxx (air-cooled): 0.80" pitch.
  - VPX-VLXxxx-CC (conduction-cooled): 0.85" pitch.

**Chassis Compatibility**

Compatible VITA 65 module / slot profiles:

- MOD3-PAY-2F-16.2.7-11 / SLT3-PAY-2F-14.2.7
- MOD3-PAY-1D-16.2.6-11 / SLT3-PAY-1D-14.2.6
- MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2
- MOD3-PER-2F-16.3.1-3 / SLT3-PER-2F-14.2.7

**Note 1:** Board is compatible with payload profiles but has no hosting capabilities.

**FRU EEPROM with temperature monitor.**

**PCI Express Interface**

VITA 46.4 fat pipe (x4) PCIe Gen 1 interface.

**FPGA configuration**

Download via PCIe bus or flash memory.

**Example FPGA program**

VHDL provided for bus interface, front & rear I/O control, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.
PMC-VLX85/110/155
User-Configurable
Virtex-5 FPGA Modules
with Plug-In I/O

- PMC-VLX85: 82,944 logic cells (XC5VLX85T)
- PMC-VLX110: 110,592 logic cells (XC5VLX110T)
- PMC-VLX155: 155,648 logic cells (XC5VLX155T)

Description
Acromag’s PMC-VLX boards feature a reconfigurable Xilinx® Virtex™-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCI-X interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing your custom instruction sets and algorithms.

Three models provide a choice of logic-optimized FPGAs to match your performance requirements. Although there is no limit to the uses for these boards, several applications are ideal. Typical uses include hardware simulation, communications, military servers, in-circuit diagnostics, signal intelligence, and image processing.

64 I/O lines are provided via the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card data sheet for more details.

Large, high-speed memory banks provide efficient data handling. Generous DDR2 SDRAM buffers store captured data prior to FPGA processing. Afterward, data is moved to dual-port SRAM for high-speed DMA transfer to the bus or CPU. Our high-bandwidth PCI-X interface ensures fast data throughput.

Take advantage of conduction cooling for use in hostile environments. Conduction efficiently dissipates heat in environments with inadequate cooling air flow. Optional extended temperature models operate from -40 to 85°C.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL simulation. A JTAG interface enables on-board VHDL simulation.

Features
- Reconfigurable Xilinx Virtex-5 FPGA
- PCI-X bus 100MHz 64-bit interface
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4)
- Plug-in I/O modules are available for front mezzanine
- FPGA code loads from PCI bus or flash memory
- Two banks of 256Kb x 32-bit dual-ported SRAM
- Two banks of 32Mb x 16-bit DDR2 SDRAM
- Other memory options available (contact factory)
- Supports dual DMA channel data transfer to CPU/bus
- Supports 3.3V signalling
- Support for Xilinx ChipScope™ Pro interface
- Conduction-cooled or -40 to 85°C operating range

Specifications
FPGA
- FPGA: Xilinx Virtex-5 FPGA
  - PMC-VLX85: XC5VLX85T FPGA with 82,944 logic cells and 48 DSP48E slices
  - PMC-LX110: XC5VLX110T FPGA with 110,592 logic cells and 48 DSP48E slices
  - PMC-LX155: XC5VLX155T FPGA with 155,648 logic cells and 128 DSP48E slices
- FPGA configuration: Download via PCI bus or flash memory.
- Example FPGA program: VHDL provided for local bus interface, control of front & rear I/O, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

I/O Processing
Acromag AXM I/O modules: for front mezzanine: AXM modules attach to the board for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
- Rear I/O:
  - 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

Engineering Design Kit
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-VLX module.

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 3.0 and CMC/PMC Specification, P1386.1.
Electrical/Mechanical Interface: Single-Width Module.
- PCI Bus Modes: Supports PCI-X at 100MHz, 66MHz and Standard PCI at 66MHz and 33MHz.
- PCI-X Master/Target: 32-bit or 64-bit interface
- Signaling: 3.3V compliant
- Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental
- Operating temperature: 0 to 70°C or -40 to 85°C (E versions)
- Storage temperature: -55 to 105°C
- Relative humidity: 5 to 95% non-condensing
- Power: Consult factory. Operates from 3.3V supply.
- MTBF: Hours at 25°C, MIL-HDBK-217F, Notice 2
  - VLX-85: 633,360
  - VLX-10: 624,625
  - VLX-155: call factory.

All trademarks are the property of their respective owners.
PMC Modules

Ordering Information

PMC Modules

PMC-VLX85
User-configurable Virtex-5 FPGA with 82,944 logic cells

PMC-VLX85E
Same as PMC-VLX85 with extended temperature range

PMC-VLX110
User-configurable Virtex-5 FPGA with 110,592 logic cells

PMC-VLX110E
Same as PMC-VLX110 with extended temperature range

PMC-VLX155
User-configurable Virtex-5 FPGA with 155,648 logic cells

PMC-VLX155-1M
Same as PMC-VLX155 plus 1MB x 64 dual port SRAM

PMC-VLX155E
Same as PMC-VLX155 with extended temperature range

PMC-VLX-EDK
Engineering Design Kit (one kit required)

AXM Plug-In I/O Extension Modules
For more information, see AXM data sheet.

AXM-A30
2 analog input 100MHz 16-bit A/D channels

AXM-D02
30 RS485 differential I/O channels

AXM-D03
16 CMOS and 22 RS485 differential I/O channels

AXM-D04
30 LVDS I/O channels

AXM-??
Custom I/O configurations available, call factory.

Software
(see software documentation for details)

PMCSW-API-VXW
VxWorks® software support package

PCISW-API-WIN32
32-bit Windows driver software package with DLLs and demonstration programs for PMC, XMC, PCI, and cPCI products. Supplied on CD-ROM. Windows® DLL software support.

PCISW-API-WIN64
64-bit Windows driver software package with DLLs and demonstration programs for PMC, XMC, PCI, and cPCI products. Supplied on CD-ROM. Windows® DLL software support.

PCISW-API-LNX
Linux® support (website download only)
PMC-VSX95
User-Configurable Virtex-5 FPGA Modules
with Plug-In I/O

- PMC-VSX95: 94,208 logic cells and 640 DSP48E slices (XC5VSX95T)

Description

Acromag’s PMC-VSX boards feature a reconfigurable Xilinx® Virtex™-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCI-X interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing your custom instruction sets and algorithms.

The on-board FPGA is a DSP-optimized version of the Virtex-5 FPGA. Although there is no limit to the uses for these boards, several applications are ideal. Typical uses include hardware simulation, communications, military servers, in-circuit diagnostics, signal intelligence, and image processing.

64 I/O lines are provided via the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card data sheet (Bulletin 8400-458) for more details.

Large, high-speed memory banks provide efficient data handling. Generous DDR2 SDRAM buffers store captured data prior to FPGA processing. Afterward, data is moved to dual-port SRAM for high-speed DMA transfer to the bus or CPU. Our high-bandwidth PCI-X interface ensures fast data throughput.

Take advantage of conduction cooling for use in hostile environments. Conduction efficiently dissipates heat in environments with inadequate cooling air flow. Optional extended temperature models operate from -40 to 85°C.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL simulation.

Download your own programs into the reconfigurable FPGA to quickly create custom I/O module. Optional I/O modules plug into the front mezzanine.

Features
- Reconfigurable Xilinx Virtex-5 FPGA (VSX95T)
- PCI-X bus 100MHz 64-bit interface
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4)
- Plug-in I/O modules are available for front mezzanine
- FPGA code loads from PCI bus or flash memory
- Two banks of 256Kb x 32-bit dual-ported SRAM
- Two banks of 32Mb x 16-bit DDR2 SDRAM
- Other memory options available (contact factory)
- Supports dual DMA channel data transfer to CPU/bus
- Supports 3.3V signalling
- Support for Xilinx ChipScope® Pro interface
- Conduction-cooled or -40 to 85°C operating range

Specifications

FPGA
- FPGA: Xilinx Virtex-5 FPGA
- PMC-VSX95: XC5VSX95T FPGA with 94,208 logic cells and 640 DSP48E slices
- FPGA configuration: Download via PCI bus or flash memory.
- Example FPGA program: VHDL provided implements local bus interface, control of front and rear I/O, SRAM read/write interface logic, and SDRAM memory interface controller. Program requires user proficiency with Xilinx software tools. See Engineering Design Kit.

I/O Processing
- Acromag AXM I/O modules: for front mezzanine.
- AXM modules attach to the board for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
- Rear I/O: 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

Engineering Design Kit
- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-VSX module.

PMC Compliance
- Conforms to PCI Local Bus Specification, Revision 3.0 and CMC/PMC Specification, P1386.1.
- Electrical/Mechanical Interface: Single-Width Module.
- PCI Bus Modes: Supports PCI-X at 100MHz, 66MHz and Standard PCI at 66MHz and 33MHz
- PCI-X Master/Target: 32-bit or 64-bit interface
- Signaling: 3.3V compliant
- Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental
- Operating temperature: 0 to 70°C or -40 to 85°C (E versions)
- Storage temperature: -55 to 105°C
- Relative humidity: 5 to 95% non-condensing
- Power: Consult factory. Operates from 3.3V supply.
- MTBF: 630,959 hours at 25°C, MIL-HDBK-217F, Notice 2
PMC Modules

Ordering Information

PMC Modules
PMC-VSX95
User-configurable Virtex-5 FPGA with 94,208 logic cells

PMC-VSX95E
Same as PMC-VSX95 with extended temperature range

PMC-VSX-EDK
Engineering Design Kit (one kit required)

AXM Plug-In I/O Extension Modules
For more information, see AXM data sheet

AXM-A30
2 analog input 100MHz 16-bit A/D channels

AXM-D02
30 RS485 differential I/O channels

AXM-D03
16 CMOS and 22 RS485 differential I/O channels

AXM-D04
30 LVDS I/O channels

AXM-??
Custom I/O configurations available, call factory.

AXM Plug-In I/O Extension Modules

Software
(see software documentation for details)

PMCSW-API-VXW
VxWorks® software support package

PCISW-API-WIN
Windows® DLL software support

PCISW-API-LNX
Linux™ support (website download only)

Acromag, Inc. • PO Box 437, Wixom, MI 48393 • Phone: 248-295-0310 • Fax: 248-624-9234 • solutions@acromag.com • www.acromag.com
PMC-VFX70
User-Configurable Virtex-5 FPGA Modules with Plug-In I/O

- XC5VFX70T FPGA: 71,680 logic cells and embedded PowerPC 440 processor 32-bit RISC core

Description
Acromag’s PMC-VFX boards feature a reconfigurable Xilinx® Virtex™-5 FPGA enhanced with multiple high-speed memory buffers and a high-throughput PCI-X interface. Field I/O interfaces to the FPGA via the rear J4/P4 connector and/or with optional front mezzanine plug-in I/O modules. The result is a powerful and flexible I/O processor module that is capable of executing your custom instruction sets and algorithms.

The on-board FPGA has a hard core PowerPC 440 block to handle the most complex and memory-intensive computing applications. Offload your CPU-intensive operations such as video and 3D data processing or fixed-point math for superior system performance. The PowerPC core also enables system-on-chip functionality with real-time processing capabilities.

64 I/O lines are provided via the rear (J4) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card data sheet (Bulletin 8400-458) for more details.

Large, high-speed memory banks provide efficient data handling. Generous DDR2 SDRAM buffers store captured data prior to FPGA processing. Afterward, data is moved to dual-port SRAM for high-speed DMA transfer to the system. Our high-bandwidth PCI-X interface ensures fast data throughput.

Take advantage of the module’s support of conduction cooling for efficient dissipation of heat in environments with inadequate cooling air flow. Optional extended temperature models operate from -40 to 85°C.

Acromag’s Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL simulation.

Features
- Reconfigurable Xilinx Virtex-5 FPGA
- PCI-X bus 100MHz 64-bit interface
- Supports both front and rear I/O connections
- 64 I/O or 32 LVDS lines direct to FPGA via rear (J4)
- Plug-in I/O modules available for front mezzanine
- FPGA code loads from PCI bus or 32MB flash memory
- Two banks of 256K x 32-bit dual-ported SRAM
- Two banks of 64M x 16-bit DDR2 SDRAM
- Other memory options available (contact factory)
- Supports dual DMA channel data transfer to CPU/bus
- Supports 3.3V signalling
- Support for Xilinx ChipScope™ Pro interface
- Conduction-cooled or -40 to 85°C operating range

Specifications
FPGA
- FPGA: Xilinx Virtex-5 FPGA XC5VFX70T FPGA with 71,680 logic cells and PowerPC processor block
- FPGA configuration: Download via PCI bus or flash memory.
- Example FPGA program: VHDL provided for local bus interface, control of front & rear I/O, SRAM read/write interface logic, and SDRAM memory interface controller. See EDK kit.

I/O Processing
- Acromag AXM I/O modules: for front mezzanine: AXM modules attach to the board for additional I/O lines. Analog and digital I/O AXM modules are sold separately.
- Rear I/O: 64 I/O (32 LVDS) lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

Engineering Design Kit
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-VFX module.

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 3.0 and CMC/PMC Specification, P1386.1.

Electrical/Mechanical Interface
- Single-Width Module.
- PCI Bus Modes: Supports PCI-X at 100MHz, 66MHz and Standard PCI at 66MHz and 33MHz
- PCI-X Master/Target: 32-bit or 64-bit interface
- Signaling: 3.3V compliant.
- Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental
- Operating temperature: 0 to 70°C or -40 to 85°C (E versions)
- Storage temperature: -55 to 105°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: Consult factory. Operates from 3.3V supply.
- MTBF: Consult factory.

Plug-in AXM I/O or use base board for conduction-cooled applications.

All trademarks are the property of their respective owners.
PMC Modules

Ordering Information

PMC Modules

PMC-VFX70
User-configurable Virtex-5 FPGA with 71,680 logic cells and PowerPC processor block

PMC-VFX70E
Same as PMC-VFX70 with extended temperature range

PMC-VFX-EDK
Engineering Design Kit (one kit required)

AXM Plug-In I/O Extension Modules
For more information, see AXM data sheet.

AXM-A30
2 analog input 105MHz 16-bit A/D channels

AXM-D02
30 RS485 differential I/O channels

AXM-D03
16 CMOS and 22 RS485 differential I/O channels

AXM-D04
30 LVDS I/O channels

AXM-??
Custom I/O configurations available, call factory.

Software
(see software documentation for details)

PMCSW-API-VXW
VxWorks® software support package

PCISW-API-WIN
Windows® DLL software support

PCISW-API-LNX
Linux® support (website download only)
PMC Modules

PMC-LX40/LX60
User-configurable Virtex-4 FPGA Modules
with plug-in I/O

- PMC-LX40: 41,472 logic cells (XC4VLX40)
- PMC-LX60: 59,904 logic cells (XC4VLX60)

Description
Acromag’s PMC-LX boards use a high-performance Xilinx® Virtex-4™ FPGA, but maintain a relatively low price point. They are optimized for high-performance logic, featuring a high logic-to-feature ratio and a high I/O-to-feature ratio. Two modules let you select an FPGA to match your logic requirements.

Although there is no limit to the uses for Acromag’s FPGA boards, several applications are ideal for this new technology. Typical uses include hardware simulation, communication processing, in-circuit diagnostics, military servers, and telecommunication.

I/O processing is handled on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card for more details. Additionally, 64 I/O lines are supported via the rear (J4) connector.

Plenty of DRAM memory is available for receipt and transfer of high-speed data from the I/O data ports on the front and rear of the board. Dual Ported SRAM memory is supplied for storage of data to be passed, via DMA transfer, to the PCI bus. One of the dual ports is attached to the FPGA and the other to the local bus.

The PCI bus interface is handled by a PLX® PCI 9656 device which provides 64-bit 66MHz bus mastering with dual-channel DMA support.

Take advantage of the optional conduction cooling for use in hostile environments. Conduction cooling provides efficient heat dissipation in environments where there is inadequate cooling air flow.

Acromag provides software utilities and examples to simplify your programming and get you started quickly. A JTAG interface enables on-board VHDL simulation.

Features
- Customizable FPGA (Xilinx Virtex-4 XC4VLX40/60) with up to 60K logic cells and 64 XtremeDSP™ slices
- Supports both front and rear I/O
- Plug-in I/O modules are available for front mezzanine
- 64 I/O lines supported with direct connection to FPGA via rear (J4) connector
- FPGA code loads from PCI bus or flash memory
- 256K x 36-bit dual-ported SRAM
- 32Mb x 32-bit DDR DRAM
- Supports dual DMA channel data transfer to CPU
- Supports both 5V and 3.3V signalling
- Conduction cooled or 0 to 70°C operating range

Specifications

FPGA
- FPGA: Xilinx Virtex-4 FPGA
- PMC-LX40: XC4VLX40 FPGA with 41,472 logic cells and 64 DSP slices
- PMC-LX60: XC4VLX60 FPGA with 59,904 logic cells and 64 DSP slices
- FPGA configuration: Downloadable via PCI bus or from flash memory.

Example FPGA program: VHDL provided implements interface to PCI bus IC, interface to dual port SRAM, PLL control, ADC, and DAC control. Program requires user proficiency with Xilinx software tools. See Engineering Design Kit.

I/O Processing
AXM modules: for front mezzanine:
Acromag AXM modules attach to the board to provide I/O. A variety of modules are available and are sold separately.

Rear I/O:
32 LVDS I/O lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

Engineering Design Kit
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-LX module. (See Design Kit for details)

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.

Electrical/Mechanical Interface: Single-Width Module.

PCI bus clock frequency: 66MHz.

64-bit PCI Master. Implemented by PLX PCI 9656 device. Signalling: 5V and 3.3V compliant.

Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental
Operating temperature: 0 to 70°C

Storage temperature: -55 to 105°C.

Relative humidity: 5 to 95% non-condensing.

Power: Consult factory. Operates from 3.3V supply.

MTBF: Hours at 25°C MIL-HDBK-217F, Notice 2

PMC-LX40 773,246; PMC-LX60 870,489

All trademarks are the property of their respective owners.
Ordering Information

**PMC Modules**
- **PMC-LX40**
  - User-configurable Virtex-4 FPGA with 41,472 logic cells
- **PMC-LX60**
  - User-configurable Virtex-4 FPGA with 59,904 logic cells
- **PMC-LX-EDK**
  - Engineering Design Kit (one kit required)

**AXM Plug-In I/O Modules**
For more information, see AXM data sheet.
- **AXM-A30**
  - 2 16-bit 100MHz A/D channels
- **AXM-D02**
  - 30 RS485 differential I/O channels
- **AXM-D03**
  - 16 CMOS and 22 RS485 differential I/O channels
- **AXM-D04**
  - 30 LVDS I/O channels
- **AXM-??**
  - Custom I/O configurations available, call factory.

**Software** (see software documentation for details)
- **PMCSW-API-VXW**
  - VxWorks® software support package
- **PCISW-API-WIN**
  - Windows® DLL software support
- **PCISW-API-LNX**
  - Linux™ support (website download only)

**Hardware**
- **DDR DRAM**
  - 32Mb x 16
- **SRAM**
  - 256Kb x 32
- **XC4VLX40**
- **XC4VLX60**
- **XC4VSX35**
- **Power Management Circuit**
- **PCI Bus Interface**
  - 64-bit 66MHz
- **Front Panel Mezzanine Bus**
- **AXM I/O Extension Module**
- **Local Bus**
- **JN1 - JN8**
- **System Monitor**
- **Flash Memory**
- **Dual Port SRAM**
  - 256Kb x 32
- **64 I/O or 32 LVDS**
- **Chipscope / JTAG**
- **Control Lines**
- **64 I/O**
- **JN4 - Rear I/O**
- **64 I/O or 32 LVDS**
PMC Modules

PMC-SX35
User-configurable Virtex-4 FPGA Modules with plug-in I/O

Description

Acromag’s PMC-SX boards use a high-performance Xilinx® Virtex-4™ FPGA, but maintain a relatively low price point. They are optimized for high-performance digital signal processing to help you build custom pre/post/co-processing hardware or high-performance filters. You can create more than 40 different functions (MACs, multipliers, adders, and muxes).

Although there is no limit to the uses for Acromag’s FPGA boards, typical applications include sonar and radar processing.

I/O processing is handled on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card for more details. Additionally, 64 I/O lines are supported via the rear (J4) connector.

Plenty of DRAM memory is available for receipt and transfer of high-speed data from the I/O data ports on the front and rear of the board. Dual Ported SRAM memory is supplied for storage of data to be passed, via DMA transfer, to the PCI bus. One of the dual ports is attached to the FPGA and the other to the local bus.

The PCI bus interface is handled by a PLX® PCI 9656 device which provides 64-bit 66MHz bus mastering with dual-channel DMA support.

Take advantage of the optional conduction cooling for use in hostile environments. Conduction cooling provides efficient heat dissipation in environments where there is inadequate cooling air flow.

Acromag provides software utilities and examples to simplify your programming and get you started quickly. A JTAG interface enables on-board VHDL simulation.

Features

- Customizable FPGA (Xilinx Virtex-4 XC4VSX35) with up to 34K logic cells and 192 XtremeDSP™ slices
- Supports both front and rear I/O
- Plug-in I/O modules are available for front mezzanine
- 64 I/O lines supported with direct connection to FPGA via rear (J4) connector
- FPGA code loads from PCI bus or flash memory
- 256K x 36-bit dual-ported SRAM
- 32Mb x 32-bit DDR DRAM
- Supports dual DMA channel data transfer to CPU
- Supports both 5V and 3.3V signalling
- Conduction cooled or 0 to 70°C operating range

Specifications

FPGA

- FPGA: Xilinx Virtex-4 FPGA XC4VSX35 with 34,560 logic cells and 192 DSP slices.
- FPGA configuration: Downloadable via PCI bus or from flash memory.
- Example FPGA program: VHDL provided implements interface to PCI bus IC, interface to dual port SRAM, PLL control, ADC, and DAC control. Program requires user proficiency with Xilinx software tools. See Engineering Design Kit.

I/O Processing

AXM modules: for front mezzanine:
- Acromag AXM modules attach to the board to provide I/O. A variety of modules are available and are sold separately.

Rear I/O:
- 32 LVDS I/O lines supported with a direct connection between the FPGA and the rear I/O connector (J4).

Engineering Design Kit

Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-SX module. (see Design Kit for details)

PMC Compliance

Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.

Electrical/Mechanical Interface: Single-Width Module.

PCI bus clock frequency: 66MHz.

32-bit PCI Master: Implemented by PLX PCI 9056 device.

Signaling: 5V and 3.3V compliant.

Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental

Operating temperature: 0 to 70°C

Storage temperature: -55 to 105°C

Relative humidity: 5 to 95% non-condensing

Power: Consult factory. Operates from 3.3V supply.


Download your own logic programs into the user-configured FPGA to quickly create a custom I/O module. Shown with optional plug-in I/O module.

All trademarks are the property of their respective owners.
### Ordering Information

**PMC Modules**
- **PMC-SX35**
  - User-configurable Virtex-4 FPGA with 34,560 logic cells
- **PMC-SX-EDK**
  - Engineering Design Kit (one kit required)

**AXM Plug-In I/O Modules**
- **AXM-A30**
  - 2 16-bit 100MHz A/D channels
- **AXM-D02**
  - 30 RS485 differential I/O channels
- **AXM-D03**
  - 16 CMOS and 22 RS485 differential I/O channels
- **AXM-D04**
  - 30 LVDS I/O channels
- **AXM-??**
  - Custom I/O configurations available, call factory.

**Software** (see [software documentation](#) for details)
- **PMCSW-API-VXW**
  - VxWorks® software support package
- **PCISW-API-WIN**
  - Windows® DLL software support
- **PCISW-API-LNX**
  - Linux® support (website download only)
Industry Pack Modules

IP-EP200
JTAG-Reconfigurable Cyclone™ II FPGA
Digital I/O Modules

This series of plug-in mezzanine modules provides a user-customizable Altera® Cyclone II FPGA on an Industry Pack (IP) module. The module allows users to develop and store their own instruction set in the FPGA for adaptive computing applications. Typical uses include specialized communication systems over RS422/485 networks, test fixture simulation of signals using specialized mathematical formulas such as those developed with MathWorks’s MatLab® software.

The FPGA on Acromag’s IP-EP200 modules can control up to 48 TTL or 24 RS485 I/O signals or a mix of both types. Another model interfaces 24 LVDS I/O channels. User application programs are downloaded through the JTAG port or via the IP bus directly into the FPGA. A pre-programmed internal CPLD facilitates initialization by acting as the bus controller during power-up and while the program is downloading. This bus controller is limited to functions necessary for power-up and downloading. After the program downloads, the FPGA takes control of the IP bus and the CPLD disables.

Features
- Altera Cyclone II EP2C20 FPGA
- Four models available:
  - IP-EP201: 48 TTL I/O lines
  - IP-EP203: 24 TTL and 12 RS485 I/O lines
  - IP-EP204: 24 LVDS I/O lines
- FPGA programmable via JTAG port or IP bus
- Local static RAM (64K x 16) under FPGA control
- LVTTL external clock connected directly to the FPGA
- Supports 8MHz and 32MHz IP bus
- Programmable PLL-based clock synthesizer
- Example FPGA design code provided as VHDL
  - 8MHz IP bus interface
  - Digital I/O control register
  - others
- Hardware support for DMA and memory space

These modules support adaptive computing applications with an FPGA running custom programs to control system communication.

Specifications

**FPGA**
- FPGA configuration: Downloadable via JTAG port or IP bus.
- Clock: Cypress CY22150 (or equivalent).
- Generates frequencies from 250kHz to 100MHz
- Input/output signals:
  - IP-EP201: 48 TTL lines
  - IP-EP202: 24 differential RS485 lines
  - IP-EP203: 24 TTL lines and 12 RS485 lines
  - IP-EP204: 24 LVDS lines
- All models: LVTTL external clock input
- IP bus clock frequency: Supports 8 and 32MHz clocks.
- ID space: 8-bit data.
- I/O space: 8 or 16-bit data.
- Memory space: Wired to FPGA but not supported with example FPGA design firmware.
- Interrupt support: Two IP request levels.
- DMA support: Wired to FPGA but not supported with example FPGA design firmware.
- IP logic interface: CPLD maintains ID space and two locations in IO space for FPGA configuration. Remaining IO space and INT space are defined by the configured FPGA.

**Example FPGA program:** VHDL provided implements IP bus interface to IO, ID, and INT space. Requires user proficiency with VHDL and Altera Quartus® II software tools. See Engineering Design Kit.

**IP Compliance (ANSI/VITA 4)**

- Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported: Input/output (I/OSelect), ID read (IDSelect), Interrupt select (INTSelect).
- Access times (8MHz or 32MHz clock):
  - ID space read: 1 wait state (375ns cycle @ 8MHz).
  - Interrupt read/write: 1 wait state (375ns cycle @ 8MHz).

**Environmental**

- Operating temperature: 0 to 70°C or -40 to 85°C (E models).
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- MTBF: Consult factory.

**Engineering Design Kit**

Engineering Design Kit: Provides user with basic information required to develop a custom FPGA program for download to the Altera FPGA. This kit must be ordered with the first purchase of an IP-EP200 module. Kit on CD-ROM includes:

- Schematics (.pdf)
- Parts list and part location drawing (.pdf)
- Example VHDL source file (.vhd)
- Example assignments file (.qsf)
- Example configuration file (.hex)
- Programming guide (.pdf)

Only one Design Kit purchase is required. User should be fluent in use of Altera Quartus design tools. Additionally, user should also purchase either the IPSW-API-VXW (VxWorks source code library) or the IPSW-API-WIN (Windows DLL driver package). These packages include important driver support programs to assist in transferring developer code between user’s processor and EPC20 FPGA.

**Ordering Information**

**Industry Pack Modules**

- IP-EP201: 48 TTL I/O lines
- IP-EP201E: Same as above w/extended temperature range
- IP-EP202E: Same as above w/extended temperature range
- IP-EP203: 24 TTL and 12 RS485 I/O lines
- IP-EP203E: Same as above w/extended temperature range
- IP-EP204: 24 LVDS I/O lines
- IP-EP204E: Same as above w/extended temperature range
- IP-EP2-EDK: Engineering Design Kit (one kit required)

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software Development Tools**

See www.acromag.com for more information.

**Accessories**

See www.acromag.com for more information.
Engineering Design Kit

This kit provides you with the basic information required to develop a custom FPGA program for download to the Xilinx FPGA. Utilities help you load VHDL into the FPGA, and to establish DMA transfers between the FPGA and the CPU. It is also recommended that users should be familiar with Xilinx development tools.

Acromag’s Engineering Design Kit includes:

- Parts list and location
- Schematics
- Compiled FPGA file
- Example VHDL code provided as selectable blocks of code
  - Local Bus — example interface between PLX PCI9056 and FPGA
  - SRAM — example code for read and write transfers to SRAM
  - Interrupts — examples of change-of-state monitoring and interrupts to the PCI bus
  - Field I/O — examples of direction control and I/O read/write capability
  - Pin definitions — configuration file containing definition of all user I/O pins communicating with the FPGA
AXM Series Analog I/O Extension Modules for PMC FPGA Boards

Description

AXM Series extension modules offer numerous I/O options for Acromag’s PMC modules with configurable FPGAs. These extension modules plug into the front mezzanine on Acromag’s PMC-LX/SX (Virtex®-4 FPGA), and PMC-VLX/VSX/VFX (Virtex-5 FPGA) modules.

AXM-A30 Analog Input

This module features two 105MHz 16-bit A/D channels. An external clock and trigger can be used to control sampling.

An internal precision clock conditioner provides the functions of jitter cleaning/reconditioning, multiplication, and distribution of a reference clock.

Each clock distribution block includes a programmable divider, a phase synchronization circuit, and a programmable delay. This allows multiple integer-related and phase-adjusted copies of the reference to be distributed to multiple system components.

Specifications

AXM-A30 Analog Input

- Input configuration: Two differential channels using two Analog Devices AD9460 A/D converters.
- A/D resolution: 16 bits.
- Input range: 3.4V peak-to-peak, centered at 0V, into a 50 ohm load.
- External clock input: 3.3V peak-to-peak.
- Input clock range: 1-105MHz.
- Maximum throughput rate: 1 channel (max.): 9.5nS (105MHz).
- 2 channels (max.): 9.5nS (105MHz).
- Input clock controller: Precision clock conditioner combines the functions of jitter cleaning/reconditioning, multiplication, and distribution of a reference clock.
- Signal-to-noise ratio: 69dB (25°C) typical.
- Signal-to-noise and distortion: 67dB (25°C) typical.
- General purpose I/O: Low voltage TTL.

Physical Dimensions

- Size: 11.5 mm high x 31.0 mm deep x 74.0 mm wide (0.453 inches x 1.220 inches x 2.913 inches)
- Stacking height: 5.0 mm (0.197 inches).
- Complies with PMC Specification P1386.1 for a single-width PMC module when installed on a supported PMC module.

Connectors

- Front field I/O: Four SMA PCB jack female receptacle connectors.

Environmental

- Operating temperature: 0 to 70°C
- Storage temperature: -55 to 105°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: 4.5 Watts typical

Ordering Information

AXM Plug-In I/O Modules

- AXM-A30
  2 analog input channels
- AXM-??
  Custom I/O configurations available, call factory.

PMC Modules

For more information, see individual data sheets
PMC-LX, PMC-SX, PMC-VLX, PMC-VSX, PMC-VFX

Software (see software documentation for details)

Accessories (see accessories documentation for details)

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**AXM Series** Digital I/O Extension Modules

**Extension I/O Modules**

**Description**

AXM Series extension modules offer numerous I/O options for Acromag’s PMC and XMC modules with configurable FPGAs. These extension modules plug into the front mezzanine on Acromag’s I/O compatible FPGAs.

**AXM-D01 LVTTL I/O**

This module provides 64 LVTTL I/O channels for straight through I/O. Custom modules are available for optional pull-ups, pull-downs, JTAG, and fusted power for front I/O use.

**AXM-D02 RS-485 Differential I/O**

This module provides 30 differential I/O channels. Data direction, either input or output, on each channel is independently controlled. Eight of the channels support programmable change-of-state interrupts.

**AXM-D03 CMOS and RS-485 Differential I/O**

This module provides 16 CMOS and 22 RS-485 differential I/O channels. Data direction, either input or output, on each channel is independently controlled. Eight of the channels support programmable change-of-state interrupts.

**AXM-DX03 CMOS and RS-485 Differential I/O**

Same as AXM-D03 above except 16 CMOS and 24 RS-485 differential I/O channels. Provides a replacement for legacy PMC-DX503/2003 FPGA modules when used with PMC/XMC-SLX.

**AXM-D04 LVDS**

This module provides 30 channels of low voltage differential signaling with independently configured direction. Interrupts are programmable on eight of the channels for any bit change of state or level. JTAG option

**Key Features & Benefits**

- Various modules allow users to select the Front I/O required for their application.
- Differential RS485/RS422 can be configured for input or output with independent direction control.
- Interface with 5V compliant input/output CMOS channels which can be configured as input or output with independent direction control.
- Low voltage differential signaling can be configured for input or output with independent direction control.
- The EDK board provides the standard Xilinx JTAG interface to allow direct programming of the FPGA and an interface with ChipScope®.
- Example code provides interrupts that are software programmable for any bit Change-Of-State or level on 8 channels.
- Example Design – The example VHDL design, provided in the base board EDK, includes control of all I/O, and eight Change-Of-State interrupts.

**Plug-In I/O Modules**

- Choose from four I/O Options
- JTAG Support Option

**ACM Series Digital I/O Extension Modules**

AXM modules attach to PMC Modules with user-configurable FPGAs.

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Bulletin #B400-458j


**AXM Series** Digital I/O Extension Modules

### Performance Specifications

**AXM-D01**  
Channel configuration: 64 channel bi-directional LVTTL signals are independently direction controlled. LVTTL I/O characteristics: all I/O characteristics are determined by the FPGA.

**AXM-D02**  
Channel configuration: 30 bi-directional differential signals with independently configured direction. Channels to the FPGA are buffered using EIA RS485/RS422 line transceivers. Optional JTAG access via front connector.  
Differential driver output voltage: 1.5V minimum, 3.3V maximum with 54 ohm load.

**ACR5364**  
Channel configuration: 16 channels of low voltage differential signaling with independently configured I/O direction and 14 bi-directional differential signals with independently configured direction.  
RS485 channels: Same as AXM-D02  
LVDS channels: Same as AXM0-D04

**AXM-D03**  
Channel configuration: 16 bi-directional CMOS transceivers (input/output direction controlled as pairs of channels) and 22 bi-directional differential signals with independently configured direction.  
Differential channels: Same as AXM-D02.  
CMOS I/O electrical characteristics:  
\[ V_{OH} = 3.8V \text{ minimum} \quad V_{OL} = 0.55V \text{ maximum} \]  
\[ I_{OH} = -32.0mA \quad I_{OL} = 32.0mA \]  
\[ V_{IH} = 3.5V \text{ minimum} \quad V_{IL} = 1.5V \text{ maximum} \]

**AXM-DX03**  
Same as AXM-D03 above except 16 CMOS and 24 RS-485 differential I/O channels. Provides a replacement for legacy PMC-DX503/2003 FPGA modules when used with PMC/XMC-SLX.

**AXM-D04**  
Channel configuration: 30 channels of low voltage differential signaling with independently configured I/O direction. Optional JTAG access via front connector.  
LVDS I/O electrical characteristics:  
LVDS driver output voltage: 247mV min., 454mV max.  
Common mode output voltage: 1.37 V max.  
LVDS Input Threshold Voltage: -50mV min.,50mV max.

### Physical Dimensions

- **Size**: 11.5 mm high x 31.0 mm deep x 74.0 mm wide (0.453 inches x 1.220 inches x 2.913 inches)
- **Stacking height**: 8.0 mm (0.315 inches).
- **PMC Compliance**: Complies with PMC Specification P1386.1 for a single-width PMC module when attached to the PMC front mezzanine.
- **Connectors**: Front field I/O: 68-pin, SCSI-3, female receptacle header (AMP 5787394-7 or equivalent).

### Environmental

- **Operating temperature**: -40 to 85°C
- **Storage temperature**: -55 to 150°C
- **Relative humidity**: 5 to 95% non-condensing
- **Power**: 1.5W typical (AXM-D02, AXM-D03)  
0.6W typical (AXM-D04)
- **MTBF**: Hours are at 25°C, MIL-HDBK-217F, Notice 2  
AXM-D01: TBD  
AXM-D02: 3,559,276 hours  
AXM-D03: 3,921,522 hours  
AXM-DX03: TBD  
AXM-D04: 6,534,197 hours

### Ordering Information

#### AXM Plug-In I/O Modules

- **AXM-D01**: 64 bi-directional LVTTL I/O channels
- **AXM-D02**: 30 RS-485 Differential I/O channels  
ACR5364  
Same as AXM-D02 except 16 LVDS and 14 RS485 I/O channels
- **AXM-D02-JTAG**: Same as AXM-D02 plus JTAG support
- **AXM-D03**: 16 CMOS and 22 RS485 differential I/O channels
- **AXM-DX03**: 16 CMOS and 24 RS485 differential I/O channels
- **AXM-D04**: 30 LVDS I/O channels
- **AXM-D04-JTAG**: Same as AXM-D04 plus JTAG support
- **AXM-??**: Custom I/O configurations available, call factory.

#### Accessories

- **5025-288**: Termination Panel for 68-pin SCSI-3 cable to connect field I/O Signals to the board.
- **5028-432**: Round shielded cable, 34 twisted pairs, SCSI-3 male connector at both ends. Connects model 5025-288 termination panel to the board. 2 meters long.

### Accessories

- **XMC FPGA Modules**
- **PMC FPGA Modules**
**AXM-A30 Analog I/O Extension Modules for PMC FPGA Boards**

**Description**

AXM Series extension modules offer numerous I/O options for Acromag’s PMC modules with configurable FPGAs. These extension modules plug into the front mezzanine on Acromag’s PMC-LVXS (Virtex®-4 FPGA), and PMC-VLXSV/ VFX (Virtex-5 FPGA) modules.

**AXM-A30 Analog Input**

This module features two 105MHz 16-bit A/D channels. An external clock and trigger can be used to control sampling.

An internal precision clock conditioner provides the functions of jitter cleaning/reconditioning, multiplication, and distribution of a reference clock.

Each clock distribution block includes a programmable divider, a phase synchronization circuit, and a programmable delay. This allows multiple integer-related and phase-adjusted copies of the reference to be distributed to multiple system components.

**Key Features & Benefits**

- **Analog Input**
  - Input configuration: Two differential channels using two Analog Devices AD9460 A/D converter
  - A/D resolution: 16 bits
  - Input range: 3.4V peak-to-peak, centered at 0V, into a 50 ohm load
  - External clock input: 3.3V peak-to-peak
  - Input clock range: 1-105MHz

- **Maximum throughput rate:**
  - 1 channel (max.): 9.5nS (105MHz)
  - 2 channels (max.): 9.5nS (105MHz)

- **A/D trigger:** External source, FPGA controlled

- **Input clock controller:** Precision clock conditioner combines the functions of jitter cleaning/reconditioning, multiplication, and distribution of a reference clock

- **Signal-to-noise ratio:** 69dB (25°C) typical

- **Signal-to noise and distortion:** 67dB (25°C) typical

- **General purpose I/O:** Low voltage TTL
AXM-A30  Analog I/O Extension Modules for PMC FPGA Boards

Performance Specifications

- AXM-A30 Analog Input
  Input configuration
  Two differential channels using two Analog Devices AD9460 A/D converter.
  A/D resolution
  16 bits.
  Input range
  3.4V peak-to-peak, centered at 0V, into a 50 ohm load.
  External clock input:
  3.3V peak-to-peak.
  Input clock range:
  1-105MHz.
  Maximum throughput rate
  1 channel (max.): 9.5ns (105MHz).
  2 channels (max.): 9.5ns (105MHz).
  A/D trigger
  External source, FPGA controlled.
  Input clock controller:
  Precision clock conditioner combines the functions of jitter cleaning/reconditioning, multiplication, and distribution of a reference clock.
  Signal-to-noise ratio
  69dB (25°C) typical.
  Signal-to-noise and distortion
  67dB (25°C) typical.
  General purpose I/O: Low voltage TTL.

- Physical
  Acromag's AXM Series extension modules offer numerous I/O options for Acromag's PMC modules with configurable FPGA. These extension modules plug into the front mezzanine on Acromag's PMC-LV/SX (Virtex®-4 FPGA), and PMC-VLVSX0FX (Virtex-5 FPGA) modules. Analog and digital I/O AXM modules are sold separately.
  Size
  11.5 mm high x 31.0 mm deep x 74.0 mm wide
  (0.453 inches x 1.220 inches x 2.913 inches).
  Stacking height
  5.0 mm (0.197 inches).
  Weight
  41.3 g (1.46 oz).
  Connectors
  Front field I/O: Four SMA PCB jack female receptacle connectors.
  Complies with PMC Specification P1386.1 for a single-width PMC module when installed on a supported PMC module.

Environmental
- Operating temperature
  -0 to 70°C.
- Storage temperature
  -55 to 105°C.
- Relative humidity
  5 to 95% non-condensing.
- Power
  4.5 Watts typical.
- MTBF

Ordering Information

- AXM Plug-In I/O Modules
  For more information, see www.acromag.com.
  AXM-A30
  2 analog input channels
  AXM-??
  Custom I/O configurations available, call factory.
  Note: XMC-7A and XMC-7K Series are not supported

- Accessories
  For more information, see www.acromag.com.
  XMC FPGA Modules
  PMC FPGA Modules
Extension I/O Modules

**AXM-A75** Multi-function I/O extension module for Acromag FPGA cards

16 analog inputs, simultaneous A/D  ❚  8 analog outputs, simultaneous D/A  ❚  16 digital I/O channels

**Description**
The AXM-75 is a multi-function I/O module that adds A/D, D/A, and digital I/O signal processing functions to an FPGA board. These extension I/O modules plug directly onto many Acromag reconfigurable FPGA cards equipped with an AXM mezzanine connector.

**Analog Input**
There are sixteen differential analog input channels on the AXM-A75. Each input has its own high-speed 16-bit A/D converter offering the ability to simultaneously sample all channels.

At the beginning of the analog signal chain is a low-pass filter to remove any unwanted EMI. A programmable gain instrumentation amplifier scales the input and provides giga-ohm input impedance. Serial FLASH memory is included to store factory calibration constants.

**Analog Output**
Two quad serial input DAC devices drive eight analog output channels. Each channel has its own high-speed 16-bit D/A converter allowing simultaneous updates to all outputs.

**Digital I/O**
Sixteen bi-directional digital I/O channels provide the ability to monitor and control discrete devices. Each I/O channel is individually configurable as an input or output for great flexibility to match your requirements.

**Key Features & Benefits**
- 16 channels of analog input capable of simultaneous sampling
- 16-bit 500kHz A/D converter on each channel
- Analog input range of ±10.24 volts
- Programmable gain of 1x, 2x, 4x, or 8x
- 8 channels of analog output capable of simultaneous updates
- Each A/D channel includes a 2K sample FIFO
- FIFO status interrupts configurable for half-full or overflow conditions
- Dual quad 16-bit serial input D/A converters with 10µS settling time
- Analog output range of ±10 volts
- 16 channels of general-purpose digital I/O
- Front panel 68-pin VHDCI receptacle for field I/O connections
- Example VHDL code provided in the base board's Engineering Design Kit to control sample rate and gain selection
Extension I/O Modules

**AXM-A75**  Multi-function I/O extension module for Acromag FPGA cards

### Performance Specifications

- **Analog Input**
  - Input configuration: 16 differential channels with a separate A/D converter on each channel.
  - A/D resolution: 16 bits.
  - Input range: ±10.24 volts.
  - Programmable gain: 1x, 2x, 4x, or 8x.
  - Input impedance: 1 giga-ohm.
  - Maximum throughput rate: 2µS A/D (500kHz).
  - A/D trigger: FPGA controlled.
  - Signal-to-noise ratio: 69dB (25°C) typical.
  - Signal-to-noise and distortion: 67dB (25°C) typical.

- **Analog Output**
  - Output configuration: 8 channels with a separate D/A converter for each channel provided by two quad serial input DACs. Double buffering allows the simultaneous updating of all channels.
  - D/A resolution: 16 bits.
  - Output range: ±10 volts.
  - Settling time: 10µS (100kHz).

- **Digital I/O**
  - I/O configuration: 16 bi-directional I/O channels, individually configured.
  - I/O range: 5V TTL.
  - Output type: Open collector type with open drain outputs.
  - Pull-up resistor: Digital I/O lines are pulled high via a 4.75k ohm resistor to +5 volts.

### Physical

Acromag AXM I/O modules plug into a PMC or XMC FPGA module's front mezzanine for additional I/O lines. Analog and digital I/O AXM modules are sold separately.

- **Size**: 12.7 mm high x 42.1 mm deep x 74.0 mm wide (0.500 inches x 1.659 inches x 2.913 inches).
- **Weight**: 41.3 g (1.46 oz).
- **Connectors**
  - I/O: 68-pin VHDCI receptacle.
  - Mezzanine: High-speed 150-pin header.

### Environmental

- **Operating temperature**: -40 to 85°C.
- **Storage temperature**: -55 to 125°C.
- **Relative humidity**: 5 to 95% non-condensing.
- **Power**
  - +3.3V: 39mA typical, 50mA maximum.
  - +5V: 54mA typical, 65mA maximum.
  - +12V: 103mA typical, 115mA maximum.
  - –12V: 92mA typical, 115mA maximum.
- **MTBF**: Contact the factory.

### Ordering Information

- **AXM Plug-In I/O Extension Modules**
  For more information, see www.acromag.com.
  - **AXM-A75**: 16 analog inputs, 8 analog outputs, and 16 digital I/O
  - **AXM-??**: Custom I/O configurations available, call factory.

- **Accessories**
  For more information, see www.acromag.com.
  - **5028-420**: Cable, VHDCI 68-Pin to SCSI-3 MD68, 2 meters
  - **5028-288**: Termination panel
Description
The AXM-EDK board provides the standard Xilinx JTAG header as well as direct connections to the Xilinx FPGA. These general purpose LVTTL (Low Voltage TTL) I/O points allow the user to emulate AXM-D0x modules while using Xilinx’s ChipScope® software tools.

The AXM-EDK extension I/O module attaches to the PMC base board with a high-speed 150-pin header. The connector provides power to the extension board and multiple logic connections to the base board.

The AXM-EDK has a total of 46 LVTTL channels (30 general-purpose and 16 auxiliary). These I/O provide a direct connection through the mezzanine connector to the adjoining FPGA.

The I/O are mapped to simulate the various types of I/O on the AXM-D0x series modules. Therefore, the same registers can be used to simulate the field I/O on the AXM-EDK. The 30 general-purpose I/O map to the differential I/O on the AXM-D02, AXM-D03, and AXM-D04. The 16 auxiliary I/O map to the 16 CMOS on the AXM-D03. Regardless of which module is being emulated, the AXM-EDK I/O are all 3.3V LVTTL.

The front field I/O Xilinx JTAG header readily connects to any compatible Xilinx programming system such as the MULTIPro Tool® or parallel cable programming system. In general, the JTAG interface pins connect only to the Xilinx FPGA. The JTAG interface is powered by 3.3V.

Key Features & Benefits
- JTAG header can be used to directly program the FPGA or to interface with the FPGA debug software ChipScope
- 30 general-purpose front I/O pin connections can emulate differential channels using LVTTL signaling
- 16 auxiliary pins routed to two 8-pin SIP patterns allow for full end-user customization
- 8 channels can be configured to generate interrupts for change-of-state (COS) and input level (polarity) match conditions

Performance Specifications
- I/O Processing
  46 channels of bi-directional LVTTL signals are independently direction controlled.
- Physical
  Size
  11.5 mm (0.453 in) x 74.0 mm (2.913 in) x 31.0 mm (1.220 in). Stacking height 8.0 mm (0.315 in).
  Connectors
  JTAG: 14-pin, 2mm double row male header.
  I/O: 34-pin, 0.1” double row header.
  PMC board extension mezzanine: 150-pin header.
- Environmental
  Temperature Range
  Operation: -40 to 85°C.
  Storage: -55 to 150°C.
  Relative humidity
  5 to 95% non-condensing.
  Power
  Does not draw power (pass-through board).
  MTBF
  Not applicable (no active components).

Ordering Information
- AXM Module
  AXM-EDK
  FPGA engineering design kit extension module
### AXM-EDK  FPGA Interface Board Extension Module

#### 34-Pin Double Row 0.1” I/O Header

<table>
<thead>
<tr>
<th>Pin Description</th>
<th>Pin</th>
<th>Pin Description</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON</td>
<td>1</td>
<td>COMMON</td>
<td>2</td>
</tr>
<tr>
<td>LVTTL Channel 0</td>
<td>3</td>
<td>LVTTL Channel 1</td>
<td>4</td>
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<tr>
<td>LVTTL Channel 2</td>
<td>5</td>
<td>LVTTL Channel 3</td>
<td>6</td>
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<tr>
<td>LVTTL Channel 4</td>
<td>7</td>
<td>LVTTL Channel 5</td>
<td>8</td>
</tr>
<tr>
<td>LVTTL Channel 6</td>
<td>9</td>
<td>LVTTL Channel 7</td>
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</tr>
<tr>
<td>LVTTL Channel 8</td>
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<td>LVTTL Channel 9</td>
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<tr>
<td>LVTTL Channel 10</td>
<td>13</td>
<td>LVTTL Channel 11</td>
<td>14</td>
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<tr>
<td>LVTTL Channel 12</td>
<td>15</td>
<td>LVTTL Channel 13</td>
<td>16</td>
</tr>
<tr>
<td>LVTTL Channel 14</td>
<td>17</td>
<td>LVTTL Channel 15</td>
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<tr>
<td>LVTTL Channel 16</td>
<td>19</td>
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<td>LVTTL Channel 18</td>
<td>21</td>
<td>LVTTL Channel 19</td>
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<tr>
<td>LVTTL Channel 20</td>
<td>23</td>
<td>LVTTL Channel 21</td>
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<tr>
<td>LVTTL Channel 22</td>
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<td>LVTTL Channel 23</td>
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<td>LVTTL Channel 24</td>
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<td>LVTTL Channel 25</td>
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<td>LVTTL Channel 26</td>
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<td>LVTTL Channel 27</td>
<td>30</td>
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<tr>
<td>LVTTL Channel 28</td>
<td>31</td>
<td>LVTTL Channel 29</td>
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<tr>
<td>COMMON</td>
<td>33</td>
<td>COMMON</td>
<td>34</td>
</tr>
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</table>

#### 14-Pin 2mm Double Row JTAG Header

<table>
<thead>
<tr>
<th>Pin Description</th>
<th>Pin</th>
<th>Pin Description</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON</td>
<td>1</td>
<td>+3.3V</td>
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</tr>
<tr>
<td>COMMON</td>
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<td>TMS</td>
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<tr>
<td>COMMON</td>
<td>5</td>
<td>TCK</td>
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<td>COMMON</td>
<td>7</td>
<td>TDO</td>
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<td>COMMON</td>
<td>9</td>
<td>TDI</td>
<td>10</td>
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<td>COMMON</td>
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<tr>
<td>COMMON</td>
<td>13</td>
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<td>14</td>
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</tbody>
</table>

#### Auxiliary (LVTTL) I/O Pin Connections (SIP)

<table>
<thead>
<tr>
<th>SIP 1 (S1)</th>
<th>SIP 2 (S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin Description</td>
<td>Pin</td>
</tr>
<tr>
<td>AUX Channel 0</td>
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</tr>
<tr>
<td>AUX Channel 1</td>
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<tr>
<td>AUX Channel 2</td>
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<td>AUX Channel 3</td>
<td>4</td>
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<td>AUX Channel 4</td>
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<td>AUX Channel 5</td>
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<tr>
<td>AUX Channel 6</td>
<td>7</td>
</tr>
<tr>
<td>AUX Channel 7</td>
<td>8</td>
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</tbody>
</table>
Acromag Redefines SWaP-C With Our New AcroPack® I/O Platform

The AcroPack® product line updates our popular Industry Pack I/O modules by using the mPCIe interface format. We added 19mm and a 100 pin connector to provide up to 50 isolated rear I/O signals, giving you a tremendous amount of capability on an **Extremely Small Footprint - Without Cabling!**

Designed for COTS applications, these general purpose I/O modules deliver high-speed and high-resolution A/D and D/A, digital I/O, serial communication, counter/timers, and re-configurable FPGA functions. Whether it’s server-based lab activities, flight or ship-based test systems, if you are looking for that ever-shrinking form factor of I/O that allows you to get one step ahead, contact Acromag to discuss how Acro Packs can help you with tomorrow’s applications, today.

**Key Features Include:**
- A/D, D/A, serial, digital I/O, counter/timers, and FPGA
- Low-power consumption
- Solid-state electronics
- -40 to 85°C standard operating temperature
- Conduction cooled models available
- Mix and match endless I/O combinations in a single slot by using our VPX or PCIe-based carriers

**Size =** 70mm x 30mm  
**Weight =** .05 oz. avg  
**Power =** <5 watts per module  
**Cost =** Starting at $395

Visit Acromag.com/AcroPacks TO LEARN MORE
# Product Series Selection Guide

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Inputs</th>
<th>Outputs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
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<td><strong>Analog Modules</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP220-16E-LF</td>
<td>Analog output; 16 channels</td>
<td>12-bit DAC; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP231-16E-LF</td>
<td>Analog output; 16 channels</td>
<td>16-bit DAC; -40 to +85°C operation</td>
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<tr>
<td>AP225-16E-LF</td>
<td>Analog output; 16 channels</td>
<td>12-bit DAC with waveform memory; -40 to +85°C operation</td>
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<tr>
<td>AP235-16E-LF</td>
<td>Analog output; 16 channels</td>
<td>16-bit DAC with waveform memory; -40 to +85°C operation</td>
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</tr>
<tr>
<td>AP323E-LF</td>
<td>Analog high-density input; 20 differential or 40 single-ended channels</td>
<td>16-bit ADC; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP341E-LF</td>
<td>Analog Input; 8 simultaneous sample and hold channels</td>
<td>14-bit ADC; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td><strong>Digital Modules</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP408E-LF</td>
<td>Digital input; 32 bidirectional high voltage channels</td>
<td>Digital output; 32 bidirectional high voltage channels</td>
<td>TTL; 0 to 60V DC; -40 to +85°C operation</td>
</tr>
<tr>
<td>AP440-1E-LF</td>
<td>Digital ±4 to ±18V input range; 32 isolated channels</td>
<td>-40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP440-2E-LF</td>
<td>Digital ±16 to ±40V input range; 32 isolated channels</td>
<td>-40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP440-3E-LF</td>
<td>Digital ±38 to ±60V input range; 32 isolated channels</td>
<td>-40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP445E-LF</td>
<td>Digital output; 32 isolated bipolar solid-state relays</td>
<td>0 to ±60V DC or AC voltage input; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP470E-LF</td>
<td>Digital input; 48 bidirectional channels</td>
<td>Digital output; 48 bidirectional channels</td>
<td>0 to 5V DC; -40 to +85°C operation</td>
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<tr>
<td><strong>Counters/Timer Modules</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP482E-LF</td>
<td>Counter/timers; 10 TTL channels</td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP483E-LF</td>
<td>Counter/timers; 5 TTL and 3 RS422 channels</td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
<td></td>
</tr>
<tr>
<td>AP484E-LF</td>
<td>Counter/timers; 6 RS422 channels</td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
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<tr>
<td><strong>Serial Communication Modules</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP500E-LF</td>
<td>Serial communication; 4 RS232 serial ports</td>
<td></td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
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<tr>
<td>AP520-64E-LF</td>
<td>Serial communication; 8 RS232 serial ports</td>
<td></td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
</tr>
<tr>
<td>AP521-64E-LF</td>
<td>Serial communication; 8 RS232/485 serial ports</td>
<td></td>
<td>256-byte FIFOs; -40 to +85°C operation</td>
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<tr>
<td><strong>Reconfigurable FPGA Modules</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APA7-201E-LF</td>
<td>Reconfigurable Xilinx® Artix-7 FPGA; 48 TTL channels</td>
<td>33,280 logic cells; standard &amp; conduction-cooled options</td>
<td></td>
</tr>
<tr>
<td>APA7-202E-LF</td>
<td>Reconfigurable Xilinx® Artix-7 FPGA; 24 RS-485 channels</td>
<td>33,280 logic cells; standard &amp; conduction-cooled options</td>
<td></td>
</tr>
<tr>
<td>APA7-203E-LF</td>
<td>Reconfigurable Xilinx® Artix-7 FPGA; 24 TTL and 12 EIA-485/422 I/O channels</td>
<td>33,280 logic cells; standard &amp; conduction-cooled options</td>
<td></td>
</tr>
<tr>
<td>APA7-204E-LF</td>
<td>Reconfigurable Xilinx® Artix-7 FPGA; 24 LVDS channels</td>
<td>33,280 logic cells; standard &amp; conduction-cooled options</td>
<td></td>
</tr>
<tr>
<td><strong>AcroPack Carrier Cards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APCe7010E-LF</td>
<td>PCIe AcroPack carrier; holds 1 AcroPack board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APCe7020E-LF</td>
<td>PCIe AcroPack carrier; holds 2 AcroPack boards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APCe7040E-LF</td>
<td>PCIe AcroPack carrier; holds 4 AcroPack boards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VPX4500E-LF</td>
<td>3U VPX air-cooled AcroPack carrier; holds 3 AcroPack boards</td>
<td>2-slots out front and 1-slot out the rear</td>
<td></td>
</tr>
<tr>
<td>VPX4500-CC-LF</td>
<td>3U VPX conduction-cooled AcroPack carrier; holds 1 AcroPack board</td>
<td>1-slot out the rear</td>
<td></td>
</tr>
<tr>
<td><strong>Software Support</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APSW-API-VXW</td>
<td>VxWorks® software support package</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APSW-API-WIN</td>
<td>Windows® DDL driver software support package</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APSW-API-LNX</td>
<td>Linux® support (website download only)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Models

AP220-16E-LF: 16 voltage outputs

Description

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This COTS tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules in a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

The AP220 outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds two AcroPack AP modules, up to 32 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 12-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

Designed for COTS applications these analog output modules deliver high-density, high-reliability, and high-performance at a low cost.

AcroPack modules are ROHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP220 modules are 70mm long, 19.05mm longer than the full length mini PCIe card. The board’s width is the same as mPCIe board and use the same mPCIe standard board standoff and screw keep out areas.

A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals.

The AP220 supports 6 independent software selectable output ranges plus capabilities to monitor the status of each output.

Key Features & Benefits

- PCI Express Generation 1 interface
- Independent 12-bit D/A converters per channel
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- Double-buffered DACs
- Built-in calibration coefficients
- Independent selectable output ranges
- Outputs reset to 0 volts
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.
- Alarm function
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
Performance Specifications

Analog Output
- Output configuration: 16 non-isolated bipolar/unipolar.
- D/A Resolution: 12 bits.
- Output ranges:
  - Unipolar: 0V to 5V, 0V to 10V.
  - Bipolar: -2.5V to 7.5V, ±3V, ±5V, ±10V.
- Settling time:
  - 9μS - 20V step to 1 LSB at 16-bit resolution.
  - 7.5μS - 10V step to 1 LSB at 16-bit resolution.
- Maximum throughput rate:
  - Outputs can be updated simultaneously or individually.
  - One channel: 7.5μS/conversion.
  - Sixteen channels simultaneously: 17μS/16 channels.
- Calibrated system accuracy:
  - Linearity error: ±0.5 LSB.
  - Offset error: ±0.0625 LSB.
  - Gain error: ±0.0625 LSB.
  - Total error: ±0.625 LSB (±0.0152% FSR) maximum.
- Data format (left-justified):
  - Straight Binary or Two’s Complement.
- Output at reset: 0 volts.
- Output current: 10mA (maximum). This corresponds to a minimum load resistance of 1K ohms with a 10V output.
- Short circuit protection: Indefinite at 25°C.
- Alarm function: Software readable for brownout, short-circuit and temperature exceeding 150 degrees C conditions.

PCI Express Base Specification
- Conforms to PCIe base specification Revision 2.1.
- Lanes: 1 lane in each direction.
- Bus Speed: 2.5 Gbps (Generation 1).
- Memory: 4k space required.
- 1 base address register.

Environmental
- Operating temperature: -40 to 85°C.
- Storage temperature: -55 to 150°C.
- Relative humidity: 5 to 95% non-condensing.
- Power:
  - +3.3 VDC ±5% 400mA Typical, 480mA Maximum.
  - +12 VDC ±5% 85mA Typical, 275mA Maximum.
  - -12 VDC ±5% 50mA Typical, 200mA Maximum.

Physical
- Length: 70mm.
- Width: 30mm.

Ordering Information

AcroPack® Modules
- AP220-16E-LF
  - Sixteen voltage outputs.
  - (Note: Acropack modules are compatible only with the carriers listed below)

Accessories
- AP-CC-01
  - Conduction-cool kit

Carrier Cards
- APCe7010E-LF
  - PCIe AcroPack carrier, holds 1 AP board
- APCe7020E-LF
  - PCIe AcroPack carrier, holds 2 AP boards
- APCe7040E-LF
  - PCIe AcroPack carrier, holds 4 AP boards
- VPX4500E-LF
  - 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
- VPX4500-CC-LF
  - 3U VPX conduction-cooled AcroPack carrier, holds 1 board

Software
- APSW-API-VXW
  - VxWorks® software support package
- APSW-API-WIN
  - Windows® DLL driver software support package
- APSW-API-LNX
  - Linux™ support (website download only)

(see Acromag’s website for more information)
**Description**

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This COTS tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules in a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

The AP231 outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds two AcroPack AP modules, up to 32 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 16-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- Independent 16-bit D/A converters per channel
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- Double-buffered DACs
- Built-in calibration coefficients
- Independent selectable output ranges
- Outputs reset to 0 volts
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.
- Alarm function
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
AP231 Analog Voltage Output

Performance Specifications

- **Analog Output**
  - Output configuration: 16 non-isolated bipolar/unipolar.
  - D/A Resolution: 16 bits.
  - Output ranges:
    - Unipolar: 0V to 5V, 0V to 10V.
    - Bipolar: -2.5V to 7.5V, ±3V, ±5V, ±10V.
  - Settling time:
    - 9μS - 20V step to 1 LSB at 16-bit resolution.
    - 7.5μS - 10V step to 1 LSB at 16-bit resolution.
  - Maximum throughput rate:
    - Outputs can be updated simultaneously or individually.
    - One channel: 7.5μS/conversion.
    - Sixteen channels simultaneously: 17μS/16 channels.
- **Environmental**
  - Calibrated system accuracy:
    - Linearity error: ±2 LSB.
    - Offset error: ±0.0625 LSB.
    - Gain error: ±0.0625 LSB.
    - Total error: ±2.125 LSB (±0.0032% FSR) maximum.
  - Data format (left-justified):
    - Straight Binary or Two's Complement.
  - Output at reset:
    - 0 volts.
  - Output current:
    - 10mA (maximum). This corresponds to a minimum load resistance of 1K ohms with a 10V output.
  - Short circuit protection:
    - Indefinite at 25°C.
  - Alarm function:
    - Software readable for brownout, short-circuit and temperature exceeding 150 degrees C conditions.

PCI Express Base Specification
- Conforms to PCIe base specification Revision 2.1.
- Lanes: 1 lane in each direction.
- Bus Speed: 2.5 Gbps (Generation 1).
- Memory:
  - 4k space required.
  - 1 base address register.

Ordering Information

- **AcroPack® Modules**
  - AP231-16E
    - Sixteen voltage outputs.
    - (Note: Acropack modules are compatible only with the carriers listed below)
- **Accessories**
  - AP-CC-01
    - Conduction-cool kit
- **Carrier Cards**
  - APCe7010E-LF
    - PCIe AcroPack carrier, holds 1 AP board
  - APCe7020E-LF
    - PCIe AcroPack carrier, holds 2 AP boards
  - APCe7040E-LF
    - PCIe AcroPack carrier, holds 4 AP boards
  - VPX4500E-LF
    - 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  - VPX4500-CC-LF
    - 3U VPX conduction-cooled AcroPack carrier, holds 1 board
- **Software**
  - APSW-API-VXW
    - VxWorks® software support package
  - APSW-API-WIN
    - Windows® DLL driver software support package
  - APSW-API-LNX
    - Linux™ support (website download only)

(see Acromag’s website for more information)
**Description**

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules and a rugged form factor.

The AP408 monitors or controls the on/off (high/low) status of up to 32 devices. Each channel can be used as an input or output.

All 32 input channels can be configured with interrupts for a change of state or level detection of any bit. The TTL input threshold includes hysteresis for increasing noise immunity.

In order to ensure safe, reliable control under all conditions, output operation is “fail-safe.” That is, the outputs are always off upon power-up and are automatically cleared following a software reset.

Loopback monitoring of critical control signals is easy since the input and output circuitry are connected in tandem to each channel.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- 32 digital input/output channels
- 0 to 60V DC input range, 60V DC low-side switch outputs
- Outputs sink up to 1A per channel
- TTL-compatible input threshold with hysteresis
- Change-of-state/level interrupts (up to 32)
- Buffered inputs include hysteresis to increase noise immunity.
- Interrupts are software-programmable for a change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open output switches or shorts.
- High impedance inputs prevent loading of the input source and minimize current.
- Individual outputs sink up to 1A DC continuous. No deration of output current required at elevated temperatures.
### Performance Specifications

#### Digital Inputs
- Input channel configuration: 32 noninverting buffered inputs with a common connection
- Input signal voltage range: 0 to 60V DC, maximum
- Input signal threshold: TTL compatible. Limited to TTL levels of 0.8V DC (max. low level) and 2.0V DC (minimum high level)
- Interrupts: Change-of-state and level on channels 0-31

#### Digital Outputs
- Channel configuration: 32 open-drain MOSFETs with common source connection
- Output ON current range: 0 to 1A DC, continuous per channel (5A total for all channels combined). No deration required at elevated ambients
- Output Rds ON Resistance: 0.1 Ω maximum

#### PCI Express Base Specification
- Conforms to revision 2.1
- Lanes: 1 lane in each direction
- Bus Speed: 2.5 Gbps (Generation 1)
- Memory: 4k space required
- 1 base address register

#### Environmental
- Operating temperature: -40 to 85°C
- Storage temperature: -40 to 125°C
- Relative humidity: 5 to 95% non-condensing
- Power:
  - +3.3V (±5%) — 400mA typical 600mA maximum
  - +5V (±5%) — 20mA typical 50mA maximum

#### Physical
- Length: 70mm
- Width: 30mm

### Ordering Information

#### AcroPack® Modules
- AP408E-LF: 32 bidirectional input/output channels
  (Note: AcroPack modules are compatible only with the carriers listed below)

#### Accessories
- AP-CC-01: Conduction-cool kit

#### Carrier Cards
- APCe7010E-LF: PCIe AcroPack carrier, holds 1 AP board
- APCe7020E-LF: PCIe AcroPack carrier, holds 2 AP boards
- APCe7040E-LF: PCIe AcroPack carrier, holds 4 AP boards
- VPX4500E-LF: 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
- VPX4500-CC-LF: 3U VPX conduction-cooled AcroPack carrier, holds 1 board

#### Software
- APSW-API-VXW: VxWorks® software support package
- APSW-API-WIN: Windows® DLL driver software support package
- APSW-API-LNX: Linux™ support (website download only)

[see Acromag’s website for more information]
**Description**

**Models**
- AP440-1E-LF: ±4 to ±18V DC or AC peak input
- AP440-2E-LF: ±16 to ±40V or AC peak input
- AP440-3E-LF: ±38 to ±60 or AC peak input

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor.

AP440-XE-LF modules provide 32 optically isolated inputs to safely monitor a wide range of digital input voltage levels.

Isolation protects your computer system from noise, transient signals, and field wiring faults. The inputs are grouped into four 8-channel ports. Ports are isolated from the logic and each other.

Change-of-state interrupts are supported using paired channels. Debounce eliminates spurious interrupts from noise and switching transients for error-free edge detection.

Closed-loop monitoring of critical control signals is easily accomplished using the AP440-XE-LF in conjunction with Acromag's AP445E-LF digital output module.

The AP440 series modules are 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas. A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals. Pin spacing and signal assignments will allow for 100V of port to port isolation. Logic and field lines are isolated from each other for voltages up to 250V AC or DC on a continuous basis. The AP440 series maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- 2.5 Gbps bus speed with one lane in each direction
- 32 port-isolated input channels
- Interrupt support for each channel
- Programmable polarity of event interrupts (low-to-high or high-to-low transitions)
- Programmable debounce
- Input hysteresis
- Reverse polarity protection
- Software configuration (no jumpers or switches)
- Software configuration allows "on-the-fly" changes without removing modules.
- Pins are compatible with AP445E-LF output module for loopback monitoring
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.
- Extended temperature range
Performance Specifications

- **Digital Inputs**
  - Input channel configuration: 32 optically isolated inputs
  - Isolation: Logic and field connections are optically isolated. Individual ports are also isolated from each other. Input lines of individual ports share a common connection and are not isolated from each other. Logic and field lines are isolated from each other for voltages up to 250V AC rms 250V DC on a continuous basis (unit will withstand a 1250V AC dielectric strength test for one minute without breakdown).

- **Bipolar input voltage range**
  - AP440-1E-LF: ±4 to ±18V DC or AC peak
  - AP440-2E-LF: ±16 to ±40V DC or AC peak
  - AP440-3E-LF: ±38 to ±60V DC or AC peak

- **Input low-to-high threshold**
  - AP440-1E-LF: ±4V maximum
  - AP440-2E-LF: ±16V maximum
  - AP440-3E-LF: ±38V maximum

- **Input response time**
  - On to off: 15μS typical
  - Off to on: 35μS typical

- **Interrupts**: 32 channels configurable as below
  - High-to-low transitions
  - Low-to-high transitions
  - Change-of-state (two inputs required)

- **Debounce**: Selectable for 4μS, 64μS, 1mS, or 8mS

- **PCI Express Base Specification**
  - Conforms to revision 2.1
  - Lanes: 1 lane in each direction
  - Bus Speed: 2.5 Gbps (Generation 1)
  - Memory: 4k space required
  - 1 base address register

- **Environmental**
  - Operating temperature: -40 to 85°C
  - a conduction cooled application with an AcroPack requires heatsink model AP-CC-0
  - Storage temperature: -55 to 150°C
  - Relative humidity: 5 to 95% non-condensing
  - MTBF: Contact the factory
  - Power:
    - +1.5 VDC (±5%) not used
    - +3.3 VDC (±5%) 1.8 A Typical, 2.1 A maximum
    - +5 VDC (±5%) 15 A Typical, 0.2 A maximum
    - +12 VDC (±5%) not used
    - -12 VDC (±5%) not used

- **Physical**
  - Length: 70mm
  - Width: 30mm

Ordering Information

- **AcroPack® Modules**
  - AP440-1E-LF: Digital input, ±4 to ±18V
  - AP440-2E-LF: Digital input, ±16 to ±40V input range
  - AP440-3E-LF: Digital input, ±38 to ±60V input range

- **Accessories**
  - AP-CC-01: Conduction-cool kit

- **Carrier Cards**
  - APCE7010E-LF: PCIe AcroPack carrier, holds 1 AP board
  - APCE7020E-LF: PCIe AcroPack carrier, holds 2 AP boards
  - APCE7040E-LF: PCIe AcroPack carrier, holds 4 AP boards
  - VPX4500E-LF: 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  - VPX4500-CC-LF: 3U VPX conduction-cooled AcroPack carrier, holds 1 board

- **Software**
  - APSW-API-VXW: VxWorks® software support package
  - APSW-API-WIN: Windows® DLL driver software support package
  - APSW-API-LNX: Linux™ support (website download only)

(see Acromag’s website for more information)
**Description**

**Models**

AP445-LF: 0 to ±60V DC or AC peak input

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor.

AP445 modules provide 32 isolated solid-state relay outputs to safely control discrete devices.

A major AP445 advantage is its flexibility. The module supports wide range bipolar (AC or DC) voltage switching. Each port can be configured for high or low-side switches. The outputs are TTL-compatible when configured as low-side switches and populating on board pull up resistors or using external pull-ups.

Isolation protects your computer system from noise, transient signals, and field wiring faults. Outputs are grouped into four 8-channel ports. Ports are isolated via solid-state relays from the logic and from each other.

Readback buffers simplify output status monitoring. And for easy closed-loop monitoring of critical control signals, use the AP445 with an AP440 input module.

The AP445 series modules are 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas. A down facing 100 pin Samtec connector will mate with the carrier card.

Fifty of these signals are available as field I/O signals. Pin spacing and signal assignments will allow for 100V of port to port isolation. Logic and field lines are isolated from each other for voltages up to 250V AC or DC on a continuous basis. The AP445 series maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Key Features & Benefits**

- 32 bipolar solid state relays
- High/low-side switch configuration
- Port-isolated output channels
- ±60V AC/DC voltage range
- High speed processing
- TTL-compatible
- Failsafe power-up and system reset
- Output readback function
- On board pull-up resistors can be populated for low-side switching applications
- Unique ground reference points for each port permits AC and DC switching on one module.
- Pins are compatible with AP440 input module for loopback monitoring.
**Performance Specifications**

- **Digital Outputs**
  Output channel configuration
  32 isolated solid-state relays support AC or DC (high/low-side switching) operation.
  
  Isolation
  Logic and field connections are optically isolated by solid-state relays. Individual ports are also isolated from each other. Output lines of an individual port share a common connection and are not isolated from each other. IP Logic and field lines are isolated from each other for voltages up to 250V AC or 354V DC on a continuous basis (unit will withstand a 1450V AC dielectric strength test for one minute without breakdown).
  
  Voltage range
  0 to ±60V DC or peak AC
  
  Output ON current range
  150mA maximum continuous (up to 1A total per port)
  
  Turn on time
  1ms typical, 2ms maximum
  
  Turn off time
  0.2ms typical, 1ms maximum
  
  Output pull-up resistors
  Not populated, consult factory

- **Environmental**
  Operating temperature
  -40 to 85°C
  
  Storage temperature
  -40 to 125°C
  
  Relative humidity
  5 to 95% non-condensing
  
  Power
  +3.3V (±5%) all outputs off: 495mA typical
  +3.3V (±5%) all outputs on: 675mA typical

- **Physical**
  Length
  70mm
  
  Width
  30mm

**Ordering Information**

- **AcroPack® Modules**
  AP445E-LF
  Isolated digital output module
  (Note: AcroPack modules are compatible only with the carriers listed below)

- **Accessories**
  AP-CC-01
  Conduction-cool kit

- **Carrier Cards**
  APCe7010E-LF
  PCIe AcroPack carrier, holds 1 AP board
  
  APCe7020E-LF
  PCIe AcroPack carrier, holds 2 AP boards
  
  APCe7040E-LF
  PCIe AcroPack carrier, holds 4 AP boards
  
  VPX4500E-LF
  3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  
  VPX4500-CC-LF
  3U VPX conduction-cooled AcroPack carrier, holds 1 board

- **Software** (see software documentation for details)
  APSW-API-VXW
  VxWorks® software support package
  
  APSW-API-WIN
  Windows® DLL driver software support package
  
  APSW-API-LNX
  Linux™ support (website download only)

  (see Acromag’s website for more information)
Description
The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

AP470 AcroPack I/O (AP) modules provide 48 general-purpose, bidirectional I/O points to economically monitor and control a large quantity of digital devices.

Each channel has interrupt capability for detecting low-to-high or high-to-low transitions. Change-of-state interrupts are supported using paired channels. Debounce eliminates interrupts from noise and switching transients for error-free edge detection.

AP470 outputs are full-featured. They provide closed-loop readback status monitoring, TTL level thresholds and 15mA sink capability allowing a direct interface to standard relay racks. For safety, outputs go to a failsafe state upon power-up/reset without any instantaneous toggling to prevent false alarms.

Designed for COTS applications these TTL level digital I/O modules deliver high-density, high-reliability, and high-performance at a low cost.

AcroPack modules are ROHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP470 module is 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe standard board hold down standoff and screw keep out areas.

48 bidirectional input/output channels ◆ Digital I/O ◆ Wide Temperature Range ◆ PCIe Bus Interface

Key Features & Benefits
- PCI Express Generation 1 interface
- 48 bidirectional input/output channels
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- TTL-compatible inputs
- CMOS-compatible open-drain outputs
- Interrupt support for each channel
- Input debounce
- Electronic overvoltage protection on individual channels
- Open drain outputs
- Output readback registers - Output readback capability eliminates the need for additional input channels to verify the output channel state
- Output channels do not “glitch” after a power-up/reset to eliminate false alarms
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
Performance Specifications

- **Digital Inputs**
  - Input channel configuration: 48 buffered inputs.
  - Input voltage range: 0 to 5V DC.
  - Input signal threshold: 1.5V typical.

- **Digital Outputs**
  - Output channel configuration: 48 open-drain CMOS outputs.
  - Voltage range: 0 to 5V DC.
  - Output ON current range: 0 to 15mA DC.
  - Output pull-ups: 4.7k Ω internal pull-ups installed on board.

- **PCI Express Base Specification**
  - Conforms to revision 2.1
  - Lanes: 1 lane in each direction.
  - Bus Speed: 2.5 Gbps (Generation 1).
  - Memory: 4k space required.
  - 1 base address register.

- **Environmental**
  - Operating temperature: -40 to 85°C.
  - Storage temperature: -55 to 150°C.
  - Relative humidity: 5 to 95% non-condensing.
  - Power:
    - +3.3V (±5%): 400mA typical 600mA max.
    - +5V (±5%): 60mA all outputs ON w/4.7K Ω pull-ups
      0.5mA all outputs OFF.

- **Physical**
  - Length: 70mm.
  - Width: 30mm.

Ordering Information

- **AcroPack® Modules**
  - AP470E-LF
    - 48-channel digital I/O module
    - (Note: AcroPack modules are compatible only with the carriers listed below)

- **Accessories**
  - AP-CC-01
    - Conduction-cool kit

- **Carrier Cards**
  - APCe7010E-LF
    - PCIe AcroPack carrier, holds 1 AP board
  - APCe7020E-LF
    - PCIe AcroPack carrier, holds 2 AP boards
  - APCe7040E-LF
    - PCIe AcroPack carrier, holds 4 AP boards
  - VPX4500E-LF
    - 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  - VPX4500-CC-LF
    - 3U VPX conduction-cooled AcroPack carrier, holds 1 board

- **Software**
  - APSW-API-VXW
    - VxWorks® software support package
  - APSW-API-WIN
    - Windows® DLL driver software support package
  - APSW-API-LNX
    - Linux™ support (website download only)

(see Acromag's website for more information)
**AP482 TTL Counter/Timers**

**Description**

**Models**

**AP482E-LF:** Ten 32-bit counters - TTL

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

Support for internal or external triggering simplifies the synchronization of operations to specific events.

Designed for COTS applications these general purpose I/O modules deliver high-speed and high resolution TTL communication.

AcroPack modules are ROHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP482 module is 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals.

The AP482 maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- Ten 32-bit counter/timers
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- 62.5MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - Pulse width generation
- Most configuration is handled by a single register which minimizes programming.
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
Performance Specifications

Counter/timers
Counter/timer configuration:
AP482: Ten 32-bit counters – TTL
Clock frequency
Selectable internal clock frequencies: 1.95MHz, 3.9MHz, 7.81MHz, 15.62MHz, or 62.5MHz.
Minimum input event
32nS.
Minimum pulse measurement
32nS.
Minimum period measurement
64nS.
Minimum gate/trigger pulse
32nS.
Interrupts
Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).
Triggering/gate
Programmable via register write or external trigger. Minimum pulse width 32nS. Line may be used for gating of counter.
Counter trigger
Interface for triggering counter functions. Input level is TTL digital.
Counter input
Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL digital.
TTL compatibility
VIH = 2.0V and VIL = 0.8V. Inputs are buffered and include 4.7K pull-ups to +3.3V.
Counter output
Level is TTL digital.

PCI Express Base Specification
Conforms to revision 2.1
Lanes
1 lane in each direction
Bus Speed
2.5 Gbps (Generation 1)
Memory
4k space required
1 base address register

Environmental
Operating temperature
-40 to 85°C
Storage temperature
-55 to 150°C
Relative humidity
5 to 95% non-condensing
Power
Consult factory

Physical
Length
70mm
Width
30mm

Ordering Information

AcroPack® Modules
AP482E-LF
Ten 32-bit TTL counters
(Note: Acropack modules are compatible only with the carriers listed below)

Accessories
AP-CC-01
Conduction-cool kit

Carrier Cards
APCe7010E-LF
PCIe AcroPack carrier, holds 1 AP board
APCe7020E-LF
PCIe AcroPack carrier, holds 2 AP boards
APCe7040E-LF
PCIe AcroPack carrier, holds 4 AP boards
VPX4500E-LF
3U VPX air-cooled AcroPack carrier, holds 3 AP boards
VPX4500-CC-LF
3U VPX conduction-cooled AcroPack carrier, holds 1 board

Software (see software documentation for details)
APSW-API-VXW
VxWorks® software support package
APSW-API-WIN
Windows® DLL driver software support package
APSW-API-LNX
Linux™ support (website download only)

(see Acromag’s website for more information)
AcroPack® Modules

AP483 TTL and RS422 Counter/Timers

Description

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

Support for internal or external triggering simplifies the synchronization of operations to specific events.

Designed for COTS applications these general purpose I/O modules deliver high-speed communication.

AcroPack modules are RoHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP483 module is 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals.

The AP483 maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

Key Features & Benefits

- PCI Express Generation 1 interface
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- Available with both TTL and RS422 driver interface
- 62.5MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - Pulse width generation
- Most configuration is handled by a single register which minimizes programming.
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
## Performance Specifications

### Counter/timers

Counter/timer configuration:
- AP483: Five 32-bit counters – TTL
- Three 32-bit counters – RS422

Clock frequency
- Selectable internal clock frequencies: 1.95MHz, 3.9MHz, 7.81MHz, 15.62MHz, or 62.5MHz.
- Minimum input event: 32nS.
- Minimum pulse measurement: 32nS.
- Minimum period measurement: 64nS.
- Minimum gate/trigger pulse: 32nS.

Interrupts
- Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).

Triggering/gate
- Programmable via register write or external trigger.
- Minimum pulse width: 32nS. Line may be used for gating of counter.

Counter trigger
- Interface for triggering counter functions. Input level is TTL and RS422 differential digital.

Counter input
- Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL and RS422 differential digital.

TTL compatibility
- VIH = 2.0V and VIL = 0.8V. inputs are buffered and include 4.7K pull-ups to +3.3V.

Counter output
- Level is TTL and RS422 differential digital.

### PCI Express Base Specification

- Conforms to revision 2.1
- Lanes: 1 lane in each direction
- Bus Speed: 2.5 Gbps (Generation 1)
- Memory: 4k space required
- 1 base address register

### Environmental

- Operating temperature: -40 to 85°C
- Storage temperature: -55 to 150°C
- Relative humidity: 5 to 95% non-condensing
- Power: Consult factory

### Physical

- Length: 70mm
- Width: 30mm

## Ordering Information

### AcroPack® Modules

- **AP483E-LF**: Five 32-bit TTL and three 32-bit RS422 counters
  (Note: AcroPack modules are compatible only with the carriers listed below)

### Accessories

- **AP-CC-01**: Conduction-cool kit

### Carrier Cards

- **APCe7010E-LF**: PCIe AcroPack carrier, holds 1 AP board
- **APCe7020E-LF**: PCIe AcroPack carrier, holds 2 AP boards
- **APCe7040E-LF**: PCIe AcroPack carrier, holds 4 AP boards
- **VPX4500E-LF**: 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
- **VPX4500-CC-LF**: 3U VPX conduction-cooled AcroPack carrier, holds 1 board

### Software

- **APSW-API-VXW**: VxWorks® software support package
- **APSW-API-WIN**: Windows® DLL driver software support package
- **APSW-API-LNX**: Linux™ support (website download only)

(see Acromag’s website for more information)
### Description

#### Models

**AP484E-LF:** Six 32-bit counters - RS422

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing IP modules and a rugged form factor. Combine different AcroPack modules on one carrier for a simplified modular approach to system assembly.

Support for internal or external triggering simplifies the synchronization of operations to specific events.

Designed for COTS applications these RS422 counter/timers deliver high-speed and high-performance.

AcroPack modules are ROHS compliant and ideal for military, defense, automation, aerospace, scientific, and development labs industries.

The AP484 module is 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals.

The AP484 maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

### Key Features & Benefits

- PCI Express Generation 1 interface
- Mix and match countless I/O combinations in a single slot.
- Sample software and diagnostics
- 62.5MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - Pulse width generation
- Most configuration is handled by a single register which minimizes programming
- Solid-down connector I/O interface
- Wide temperature range
- VPX and PCIe carriers
- Linux®, Windows®, and VxWorks® support
Performance Specifications

Counter/timers
Counter/timer configuration:
AP484: Six 32-bit counters – RS422
Clock frequency
Selectable internal clock frequencies: 1.95MHz, 3.9MHz, 7.81MHz, 15.62MHz, or 62.5MHz.
Minimum input event
32nS.
Minimum pulse measurement
32nS.
Minimum period measurement
64nS.
Minimum gate/trigger pulse
32nS.
Interrupts
Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).
Triggering/gate
Programmable via register write or external trigger.
Minimum pulse width 32nS. Line may be used for gating of counter.
Counter trigger
Interface for triggering counter functions. Input level is RS422 differential digital.
Counter input
Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is RS422 differential digital.
Counter output
Level is RS422 differential digital.

PCI Express Base Specification
Conforms to revision 2.1
Lanes
1 lane in each direction
Bus Speed
2.5 Gbps (Generation 1)
Memory
4k space required
1 base address register

Environmental
Operating temperature
-40 to 85°C
Storage temperature
-55 to 150°C
Relative humidity
5 to 95% non-condensing
Power
Consult factory

Physical
Length
70mm
Width
30mm

Ordering Information

AcroPack® Modules
AP484E-LF
Six 32-bit RS422 counters
(Note: AcroPack modules are compatible only with the carriers listed below)

Accessories
AP-CC-01
Conduction-cool kit

Carrier Cards
APCe7010E-LF
PCIe AcroPack carrier, holds 1 AP board
APCe7020E-LF
PCIe AcroPack carrier, holds 2 AP boards
APCe7040E-LF
PCIe AcroPack carrier, holds 4 AP boards
VPX4500E-LF
3U VPX air-cooled AcroPack carrier, holds 3 AP boards
VPX4500-CC-LF
3U VPX conduction-cooled AcroPack carrier, holds 1 board

Software
(see software documentation for details)
APSW-API-VXW
VxWorks® software support package
APSW-API-WIN
Windows® DLL driver software support package
APSW-API-LNX
Linux™ support (website download only)

(see Acromag’s website for more information)
**ACROPACK® Modules**

**AP500 Serial 232 Communication**

**Description**

The ACROPACK® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules and a rugged form factor.

The AP500 modules provide four asynchronous serial communication interfaces for your system. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity. Full signal support for modem control is also included.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, and data set interrupts. All interrupts can be read from a single register.

**Key Features & Benefits**

- PCI Express Generation 1 interface
- Four RS232E serial ports
- 256-byte FIFO buffers
- Programmable baud rate (up to 500Kbps)
- Individual modem control signals on each channel
- Handshake lines (RTS, CTS, DTR, DSR, DCD, RI)
- Line-break and false start-bit detection
- 16550 compatible register set
- 256-byte FIFO buffers minimize CPU interaction for improved system performance.
- Each serial channel provides full handshake support to simplify interfacing with modems.
- Extended temperature range

**Four RS232 Serial Ports ◆ Extended Temperature ◆ PCIe Bus Interface**

- Extended Temperature
- PCIe Bus Interface
### Performance Specifications

- **RS232E Serial Ports**
  - **Configuration**
    Independent, non-isolated serial ports with a common single return connection and configured as a DTE device.
  - **Data Rate**
    Programmable up to 500K bits/second using internal baud rate generator.
  - **Max. Cable Length**
    15 meters (50 feet) typical, limited to a cable capacitive load of 2500pF
  - **Character size**
    5 to 8 bits, software-programmable
  - **Parity**
    Odd, even, or no parity; software-programmable.
  - **Stop bits**
    1, 1-1/2, or 2 bits; software-programmable
  - **Data register buffers**
    256-byte receive FIFO buffer and 256-byte transmit FIFO buffer.
  - **Interrupts**
    Receiver line status (overrun, parity, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter holding register empty; or modem status (CTS, DSR, RI, or DCD).

- **PCI Express Base Specification**
  - Conforms to revision 2.0
  - **Lanes**
    1 lane in each direction
  - **Bus Speed**
    2.5 Gbps (Generation 1)
  - **Memory**
    8k space required
  - **Length**
    70mm
  - **Width**
    30mm

### Environmental
- **Operating temperature**
  - -40 to 85°C
  - a conduction cooled application with an AcroPack requires heatsink model AP-CC-01
- **Storage temperature**
  - -55 to 125°C
- **Relative humidity**
  - 5 to 95% non-condensing
- **Power**
  - +3.3V (±5%) 100mA typical

### Physical
- **Length**
  - 70mm
- **Width**
  - 30mm

### Ordering Information
- **AcroPack® Modules**
  - AP500E-LF
    Four RS232E serial ports
  - (Note: AcroPack modules are compatible only with the carriers listed below)
- **Accessories**
  - AP-CC-01
    Conduction-cool kit
- **Carrier Cards**
  - APCe7010E-LF
    PCIe AcroPack carrier, holds 1 AP board
  - APCe7020E-LF
    PCIe AcroPack carrier, holds 2 AP boards
  - APCe7040E-LF
    PCIe AcroPack carrier, holds 4 AP boards
  - VPX4500E-LF
    3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  - VPX4500-CC-LF
    3U VPX conduction-cooled AcroPack carrier, holds 1 board
- **Software**
  - (see software documentation for details)
    - APSW-API-VXW
      VxWorks® software support package
    - APSW-API-WIN
      Windows® DLL driver software support package
    - APSW-API-LNX
      Linux™ support (website download only)

(see Acromag’s website for more information)
The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules and a rugged form factor. These modules provide four asynchronous serial communication ports from a single AP carrier slot for a high-density solution. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines. The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. All interrupts can be read from a single register.

The AP512 series modules are 70mm long. This is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector mates with the carrier card. Fifty of these pins are available for field I/O signals. Pin spacing and signal assignments will allow for 100V of port to port isolation.

The AP512 series maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Key Features & Benefits**

- Four asynchronous, full duplex RS4228 serial ports (supports RS485)
- Ports are isolated to 250V from digital and 100V from each other
- 256-byte transmit FIFO buffers
- 256-byte receive FIFO buffers
- Programmable baud rate (up to 16Mbps)
- Line-break and false start-bit detection
- Failsafe receivers
- 16550 compatible register set
- High-density design lowers per-port costs and saves IP carrier card slots for other functions.
- 256-byte FIFO buffers minimize CPU interaction for improved system performance.
- Extended temperatures deliver dependable operation in extreme conditions.
Performance Specifications

- **Serial Ports**
  - Configuration: Independent, isolated serial ports.
  - Data Rate: 16M bits/second, maximum
  - Max. Cable Length: 1200 meters (4000 feet) typical
  - Character size: 5 to 8 bits, software-programmable
  - Parity: Odd, even, or no parity; software-programmable.
  - Stop bits: 1, 1-1/2, or 2 bits; software-programmable
  - Data register buffers: 256-byte FIFO buffer
  - Interrupts: Receiver line status (overrun, parity, framing error, or break interrupt); receive/transmit FIFO level reached or character time-out; Xon/Xoff or special character detected.

- **Environmental**
  - Operating temperature: -40 to 85°C
  - Storage temperature: -55 to 125°C
  - Relative humidity: 5 to 95% non-condensing
  - Power: +3.3V (±5%) 450mA typical

- **Physical**
  - Length: 70mm
  - Width: 30mm

Ordering Information

- **AcroPack® Modules**
  - **AP512-LF**: Four RS422/485 serial ports
    - (Note: AcroPack modules are compatible only with the carriers listed below)

- **Accessories**
  - **AP-CC-01**: Conduction-cool kit

- **Carrier Cards**
  - **APCe7010E-LF**: PCIe AcroPack carrier, holds 1 AP board
  - **APCe7020E-LF**: PCIe AcroPack carrier, holds 2 AP boards
  - **APCe7040E-LF**: PCIe AcroPack carrier, holds 4 AP boards
  - **VPX4500E-LF**: 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
  - **VPX4500-CC-LF**: 3U VPX conduction-cooled AcroPack carrier, holds 1 board

- **Software** (see software documentation for details)
  - **APSW-API-VXW**: VxWorks® software support package
  - **APSW-API-WIN**: Windows® DLL driver software support package
  - **APSW-API-LNX**: Linux™ support (website download only)

(see Acromag's website for more information)
**AcroPack® Modules**

**AP520** Octal Serial RS232 Communication

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules and a rugged form factor.

The AP520 modules provide eight asynchronous serial communication ports from a single AP carrier slot for a high-density solution. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity. Signal support for RTS/CTS handshaking is also included.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, and data set interrupts. All interrupts can be read from a single register.

The AP520 series modules are 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe standard board hold down standoff and screw keep out areas. A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals. Pin spacing and signal assignments will allow for 100V of signal to signal isolation. The AP520 series maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Eight RS232 serial ports ◆ Extended Temperature ◆ PCIe Bus Interface**

**Key Features & Benefits**
- PCI Express Generation 1 interface
- Eight RS232E serial ports
- 256-byte transmit FIFO buffers
- 256-byte receive FIFO buffers
- Programmable baud rate (up to 500Kbps)
- Individual handshake lines (RTS, CTS) on each channel
- Line-break and false start-bit detection
- 16550 compatible register set
- High-density design lowers per-port costs and saves IP carrier card slots for other functions
- 256-byte FIFO buffers minimize CPU interaction for improved system performance.
- Each serial channel provides handshake support to simplify interfacing with modems.
- Extended temperature range

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Acromag®
THE LEADER IN INDUSTRIAL I/O

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Bulletin #8400-881c
Performance Specifications

RS232E Serial Ports
Configurations
Independent, non-isolated serial ports with a common single return connection and configured as a DTE device.

Data Rate
Programmable up to 500K bits/second using internal baud rate generator. Consult factory for custom baud rates up to 512K baud.

Max. Cable Length
15 meters (50 feet) typical, limited to a cable capacitive load of 2500pF.

Character size
5 to 8 bits, software-programmable.

Parity
Odd, even, or no parity; software-programmable.

Stop bits
1, 1-1/2, or 2 bits; software-programmable.

Data register buffers
256-byte FIFO buffer.

Interrupts
Receiver line status (overrun, parity, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter (FIFO level reached); or modem status (CTS).

PCI Express Base Specification
Conforms to revision 2.0.

Lanes
1 lane in each direction.

Bus Speed
2.5 Gbps (Generation 1).

Memory
8k space required.

Ordering Information

Environmental
Operating temperature
-40 to 85°C

aggiunto a conduction cooled application with an AcroPack requires heatsink model AP-CC-01.

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing.

Power
+3.3V (±5%) 110mA typical.

Physical

Length
70mm

Width
30mm

AcroPack Modules

AP520-84E-LF
Eight RS232E serial ports.

(Note: AcroPack modules are compatible only with the carriers listed below.)

Accessories

AP-CC-01
Conduction-cool kit.

Carrier Cards

APCe7010E-LF
PCIe AcroPack carrier, holds 1 AP board.

APCe7020E-LF
PCIe AcroPack carrier, holds 2 AP boards.

APCe7040E-LF
PCIe AcroPack carrier, holds 4 AP boards.

VPX4500E-LF
3U VPX air-cooled AcroPack carrier, holds 3 AP boards.

VPX4500CC-LF
3U VPX conduction-cooled AcroPack carrier, holds 1 board.

Software

See software documentation for details.

APSW-API-VXW
VxWorks® software support package.

APSW-API-WIN
Windows® DLL driver software support package.

APSW-API-LNX
Linux™ support (website download only).

(See Acromag’s website for more information.)
**Description**

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules and a rugged form factor.

These modules provide eight asynchronous serial communication ports from a single AP carrier slot for a high-density solution. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. All interrupts can be read from a single register.

The AP521 series modules are 70mm long, this is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas. A down facing 100 pin Samtec connector will mate with the carrier card. Fifty of these signals are available as field I/O signals. Pin spacing and signal assignments will allow for 100V of signal to signal isolation. The AP521 series maintains the same functionality and memory map of the existing Industry Pack modules providing a smooth transition to the AcroPack I/O modules.

**Key Features & Benefits**

- Eight asynchronous, full duplex RS422B serial ports (supports RS485)
- 256-byte transmit FIFO buffers
- 256-byte receive FIFO buffers
- Programmable baud rate (up to 20Mbps)
- Individual handshake lines (RTS, CTS) on each channel
- Line-break and false start-bit detection
- Failsafe receivers
- Built-in termination and bias resistors
  Consult factory for no termination
- 16550 compatible register set
- High-density design lowers per-port costs and saves IP carrier card slots for other functions.
- 256-byte FIFO buffers minimize CPU interaction for improved system performance.
- Extended temperatures deliver dependable operation in extreme conditions.
AcroPack® Modules

AP521 Octal Serial RS422/485 Communication

Performance Specifications

■ Serial Ports
  Configuration
  Independent, non-isolated serial ports with a common single return connection.
  Data Rate
  20M bits/second, maximum
  Max. Cable Length
  1200 meters (4000 feet) typical
  Character size
  5 to 8 bits, software-programmable
  Parity
  Odd, even, or no parity, software-programmable.
  Stop bits
  1, 1-1/2, or 2 bits; software-programmable
  Data register buffers
  256-byte FIFO buffer
  Interrupts
  Receiver line status (overrun, parity, framing error, or break interrupt); receive/transmit FIFO level reached or character time-out; Xon/Xoff or special character detected.

■ PCI Express Base Specification
  Conforms to revision 2.0
  Lanes
  1 lane in each direction
  Bus Speed
  2.5 Gbps (Generation 1)
  Memory
  8k space required
  1 base address register

■ Environmental
  Operating temperature
  -40 to 85°C
  a conduction cooled application with an AcroPack requires heatsink model AP-CC-01
  Storage temperature
  -55 to 125°C
  Relative humidity
  5 to 95% non-condensing
  Power
  +3.3V (±5%) 150mA typical
  +5V (±5%) 40mA typical

■ Physical
  Length
  70mm
  Width
  30mm

Ordering Information

AcroPack® Modules
AP521-64E-LF
Eight RS422/485 serial ports
(Note: AcroPack modules are compatible only with the carriers listed below)

Accessories
AP-CC-01
Conduction-cool kit

Carrier Cards
APC7010E-LF
PCIe AcroPack carrier, holds 1 AP board
APC7020E-LF
PCIe AcroPack carrier, holds 2 AP boards
APC7040E-LF
PCIe AcroPack carrier, holds 4 AP boards
VPX4500E-LF
3U VPX air-cooled AcroPack carrier, holds 3 AP boards
VPX4500-CC-LF
3U VPX conduction-cooled AcroPack carrier, holds 1 board

Software (see software documentation for details)
APSW-API-VXW
VxWorks® software support package
APSW-API-WIN
Windows® DLL driver software support package
APSW-API-LNX
Linux™ support (website download only)

(see Acromag’s website for more information)
**Description**

**Models**
- APA7-201E-LF: 48 TTL channels
- APA7-202E-LF: 24 EIA-485/422 channels
- APA7-203E-LF: 24 TTL and 12 EIA-485/422 channels
- APA7-204E-LF: 24 LVDS channels

The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality as the existing Industry Pack modules and a rugged form factor.

The APA7-200 series provides a FPGA based user-configurable bridge between a host processor and a custom digital interface via PCI Express. These boards feature a best in class Artix®-7 interface to deliver the industry’s lowest power and high performance.

The APA7-200 series modules are 70mm long. This is 19.05mm longer than the full length mini PCIe card at 50.95mm. The boards width is the same as mPCIe board of 30mm and they use the same mPCIe standard board hold down standoff and screw keep out areas.

A down facing 100 pin Samtec connector mates with the carrier card. Fifty of these pins are available for field I/O signals.

The Engineering Design Kit provides users with basic information required to develop custom FPGA firmware for download to the Xilinx FPGA. Example FPGA design code is provided as a Vivado IP Integrator project for functions such as a one-lane PCI Express interface, DMA, digital I/O control register, and more. Users should be fluent in the use of Xilinx Vivado design tools.

**Key Features & Benefits**
- PCI Express Generation 1 interface
- Reconfigurable Xilinx® FPGA
- High channel count digital interface: RS485, LVDS and TTL interface options.
- 32Mb quad serial Flash memory
- 33,280 logic cells
- 41,600 Flip flops
- 1,800 kb block RAM
- 90 DSP slices
- External LV/TTL clock input
- Long distance data transmission
- Example design
- Power up and systemd reset is failsafe
- Conduction-cooled options
### Performance Specifications

**FPGA**
- FPGA device: Xilinx Artix-7 FPGA Model XC7A35T
- FPGA configuration: Download via flash memory
- Example FPGA program: IP integrator block diagram provided for PCIe bus 1 lane Gen 1 interface, DMA controller, on chip block RAM, flash memory and control of field I/O. See EDK kit.

**I/O Processing**
- Field I/O Interface: PCIe bus 1 lane Gen 1 interface
- I/O Connector: 100 pin field I/O connector

**Engineering Design Kit**
- Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a APA7-200 series module (see www.acromag.com for more information).

**PCI Express Base Specification**
- Conforms to revision 2.0
- Lanes: 1 lane in each direction
- Bus Speed: 2.5 Gbps (Generation 1)
- Memory: 128k space required
- 1 base address register

**Environmental**
- Operating temperature: Air Cooled with heat sink -40 to 80°C
- Air Cooled without heat sink -40 to 70°C
- Conduction Cooled -40 to 85°C
- A conduction cooled application with an AcroPack requires heatsink model AP-CC-01
- Storage temperature: -55 to 125°C
- Relative humidity: 5 to 95% non-condensing
- Power: +3.3V (±5%) 500mA typical

**Physical**
- Length: 70mm
- Width: 30mm

### Ordering Information

**AcroPack® Modules**
- APA7-201E-LF: 48 TTL channels
- APA7-202E-LF: 24 EIA-485/422 channels
- APA7-203E-LF: 24 TTL & 12 EIA-485/422 channels
- APA7-204E-LF: 24 LVDS channels
  (Note: AcroPack modules are compatible only with the carriers listed below)

**Accessories**
- AP-CC-01: Conduction-cool kit

**Carrier Cards**
- APCC7010E-LF: PCIe AcroPack carrier, holds 1 AP board
- APCC7020E-LF: PCIe AcroPack carrier, holds 2 AP boards
- APCC7040E-LF: PCIe AcroPack carrier, holds 4 AP boards
- VPX4500E-LF: 3U VPX air-cooled AcroPack carrier, holds 3 AP boards
- VPX4500-CC-LF: 3U VPX conduction-cooled AcroPack carrier, holds 1 board

**Software**
- (see software documentation for details)
  - APSW-API-VXW: VxWorks® software support package
  - APSW-API-WIN: Windows® DLL driver software support package
  - APSW-API-LNX: Linux™ support (website download only)

(see Acromag’s website for more information)
PMC230A-8
16-Bit D/A
Analog Output

PMC230A modules have eight 16-bit D/A converters (DACs) to provide highly-accurate analog voltage outputs. A unique two-piece board design brings the proven reliability of Acromag’s Industry Pack (IP) A/D modules to a PMC format. An IP230A module is embedded on a PMC interface card that maintains maximum performance and transparent communication to the host.

Jumper-selectable output ranges give you the choice of unipolar or bipolar voltage output. And for greater flexibility, the PMC230 module accepts conversion start triggers from software commands, or from external sources for synchronization to specific events.

Features
- 8 analog voltage output channels
- Individual 16-bit D/A converters per channel
- 10µS settling time (100KHz throughput)
- Three output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable)
- Two trigger modes (software or external trigger)
- External trigger output
- High load capability (5mA output current)

Benefits
- High channel density saves card cage slots.
- Internally stored calibration coefficients ensure accuracy.
- Flexible output control allows single cycle updating of individual channels or all channels simultaneously.
- Hardware jumpers allow output range selection on an individual channel basis.

Specifications

**Analog Outputs**

Output configuration: 8 voltage output channels.
D/A Resolution: 16 bits.
Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).
Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 100KHz (10µS/conversion)
Eight channels: 100KHz (10µS/8 ch).
DAC programming: Immediate (transparently programmed to DAC output); simultaneous (input latches of DACs are loaded before simultaneously updating outputs).
System accuracy: 0.006% of 20V span max. corrected error (i.e. calibrated) at 25°C with output unloaded.
Output at reset: 0V for bipolar output, 5V for unipolar.
Output current: ±5 to +5mA (maximum).
Short circuit protection: Indefinite at 25°C.

**PMC Compliance**

Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1 (mechanical height exception, see Page 102).
Electrical/Mechanical Interface: Single-Width Module.
32-bit PCI Target: Implemented by Altera FPGA.
4K Memory Space Required: One Base Address Register.
Signaling: 5V Compliant, 3.3V Tolerant.
PMG Module Write Cycle: 1000ns typical measured from falling edge of FRAME# to module write complete.
PMG Module Read Cycle: 1000ns typical measured from falling edge of FRAME# to failing edge of TRDY# providing valid data.
Access Times: 1000ns for all registers.

Environmental

Operating temperature: 0 to 70°C (PMC230A-8) or -40 to 85°C (PMC230A-8E model)
Storage temperature: -55 to 100°C (all models).
Relative humidity: 5 to 95% non-condensing.
Power: 100mA at +5V, 140mA at +12V, 225mA at -12V.

Ordering Information

PMC Modules
PMC230A-8
Eight high-resolution voltage outputs
PMC230A-8E
Same as PMC230A-8 plus extended temperature range

Software
(see software documentation for details)
PMCSW-API-VXW
VxWorks® software support package
PCISW-API-WIN
Windows® DLL Driver software package
PCISW-API-LNX
Linux™ support (website download only)

Accessories
(see accessories documentation for details)
5028-378
Termination panel, SCSI-2 connector, 50 screw terminals
5028-438
Cable, shielded, SCSI-2 connector at both ends
PMC330 16-Bit A/D Analog Input

PMC330 mezzanine modules provide fast, high resolution A/D conversion.

The PMC330 has many features to improve your overall system throughput rate. You can scan all channels or define a subset for more frequent sampling. Burst mode scans selected channels at the maximum conversion rate. Uniform mode performs conversions at user-defined intervals. Both modes can scan continuously, or execute a single cycle upon receiving a trigger.

“Mail box” memory allows the CPU to read the latest data in 32 storage buffer registers without interrupting the A/D converter.

Features
- 16-bit A/D converter (ADC)
- 8µS conversion time (125KHz)
- 16 differential or 32 single-ended inputs (±5V, ±10V, 0-5V, and 0-10V input ranges)
- Individual channel mailbox with one or two storage buffer registers per channel
- Programmable scan control
- Four scanning modes
- User-programmable interval timer
- External trigger input and output
- Programmable gain for individual channels
- Post-conversion interrupts

Benefits
- “Mailbox” memory eliminates scanning interruptions for optimum throughput.
- Data register indicates new and missed (overwritten) data values in the mail box.
- Programmable interrupts simplify data acquisition by providing greater control.

Specifications

Analog Inputs
Input configuration: 16 differential or 32 single-ended.
A/D resolution: 16 bits.
Input ranges: ±5V, ±10V*, 0-5V, and 0-10V*.  
* Requires ±15V external supplies.
Data sample memory: Individual channel mailbox with one or two storage buffer registers per channel.
Maximum throughput rate:
Only one channel can be updated at a time.
One channel: 125KHz (8µS/conversion)  
[66KHz (15µS/conversion) recommended]
16 channels (differential): 4.2kHz (240µS/16 ch)  
32 channels (single-ended): 2.1KHz (480µS/32 ch).
Programmable gains: 1x, 2x, 4x, 8x.
A/D triggers: External and software.
System accuracy: ±1LSB (0.005%) typical (SW calib., gain=1, 25°C).
Data format: Straight binary or two’s complement.
Input overvoltage protection: Viss = -20V to Vdd 40V with power on, -35V to 55V power off.
Common mode rejection ratio (60Hz): 96dB typical.
Channel-to-channel rejection ratio (60Hz): 96dB typical.

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.
Electrical/Mechanical Interface: Single-Width Module.
32-bit PCI Target: Implemented by Altera FPGA.
4K Memory Space Required: One Base Address Register.
Signaling: 5V Compliant, 3.3V Tolerant.
Interrupts (INTA#): Interrupt A is used to request an interrupt.
Access Times: 8 PCI Clock Cycles for all registers.
To avoid Mail Box RAM read and write contention, a Mail Box read may be issued a retry termination.

Environmental
Operating temperature: 0 to 70°C (PMC330) or -40 to 85°C (PMC330E model)
Storage temperature: -55 to 100°C (all models).
Relative humidity: 5 to 95% non-condensing.
Power: 71mA at +5V, 14mA at +12V, 10mA at -12V.
MTBF: 1,745,521 hrs. at 25°C, MIL-HDBK-217F, notice 2

Ordering Information

PMC Modules
PMC330
32 single-ended or 16 differential inputs.
PMC330E
Same as PMC330 plus extended temperature range

Software (see software documentation for details)
PMCSW-API-VXW
VxWorks® software support package
PCISW-API-WIN
Windows® DLL Driver software package
PCISW-API-LNX
Linux™ support (website download only)

Accessories (see accessories documentation for details)
5028-378
Termination panel, SCSI-2 connector, 50 screw terminals
5028-438
Cable, shielded, SCSI-2 connector at both ends

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PMC341 Simultaneous A/D Conversion Analog Input

PMC341 modules provide fast, high resolution, simultaneous A/D conversion of eight channels. These modules have sixteen analog inputs which are sampled as two eight-channel banks. Eight A/D converters (ADCs) permit simultaneous conversion of all eight channels in a bank. All 16 channels share two generous 512-sample memory buffers. Conversion of each bank requires only 8µS, and all 16 channels can be sampled in just 16µs.

Flexible configuration options give you extensive control over the conversion process. The channels or bank to be converted, timing, scan mode, and other parameters are user-programmable. Interrupt support adds further control to interrupt upon a programmable threshold when the memory is full.

Features
- 16 differential inputs (±10V DC input range)
- Eight 14-bit A/D converters with simultaneous multi-channel conversion
- 8µS conversion time (125KHz) for 8-channel bank
- Two 512-sample memory buffers
- Data tagging for channel identification
- Programmable conversion timer
- Programmable channel conversion control
- External trigger input and output
- Continuous and single-cycle conversion modes
- Interrupt generation for memory full threshold conditions
- Precision calibration voltages stored on-board

Benefits
- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.

The PMC341 is ideal for high-speed data acquisition. Large memory buffer reduces CPU interactions for increased overall performance.

Specifications

Analog Inputs
- Input configuration: 16 differential
- A/D resolution: 14 bits.
- Input range: ±10V.
- Data sample memory: 512 sample FIFO buffer.
- Max. throughput rate: Eight channels can be simultaneously acquired.
  - One channel: 125KHz (8µS/conversion)
  - 8 channels (same bank): 1MHz (8µS/8 channels)
  - 16 channels (high & low banks): 1MHz (16µS/16 ch. at maximum 2.2K ohm source resistance).
- A/D triggers: Internal timer, external, and software.
- System accuracy: 2.4 LSB (0.014%).
- Data format: Binary two’s compliment.
- Input overvoltage protection: ±25V (power on), ±40V (power off).
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

PMC Compliance
- Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.
- 32-bit PCI Target: Implemented by Altera FPGA.
- 4K Memory Space Required: One Base Address Register.
- Signaling: 5V Compliant, 3.3V Tolerant.
- Interrupts (INTA#): Interrupt A is used to request an interrupt.
- Burst Read of Memory Buffer: 3 PCI Clock Cycles per sample read.
- Register Access Times: 8 PCI clock cycles, typical.

Environmental
- Operating temperature: 0 to 70°C (PMC341) or -40 to 85°C (PMC341E model)
- Storage temperature: -55 to 100°C (all models).
- Relative humidity: 5 to 95% non-condensing.
- Power: 100mA at +5V. 15mA at +12V. -10mA at -12V.
- MTBF: 2,943,878 hrs. at 25°C, MIL-HDBK-217F, notice 2

Ordering Information

PMC Modules
- PMC341: 14-bit A/D
- PMC341E: Same as PMC341 plus extended temperature range
- PMC341R: Same as PMC341, except with rear I/O connector
- PMC341RE: Same as PMC341R plus extended temperature range

Software (see software documentation for details)
- PCISW-API-\textregistered-\textregistered VXW®: VxWorks® software support package
- PCISW-API-WIN: Windows® DLL Driver software package
- PCISW-API-LNX: Linux™ support (website download only)

Accessories (see accessories documentation for details)
- 5028-378: Termination panel, SCSI-2 connector, 50 screw terminals
- 5028-438: Cable, shielded, SCSI-2 connector at both ends

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**PMC408**

**High Voltage Digital Input/Output**

The PMC408 monitors or controls on/off (high/low) status for up to 32 devices. Each channel can be used as an input or output. A unique two-piece board design brings the proven reliability of Acromag’s Industry Pack (IP) modules to a PMC format. An IP408 module is embedded on a PMC interface card that maintains maximum performance and transparent communication to the host.

Input channels can be configured with interrupts for a change of state or level detection of any bit on up to eight channels. The TTL input threshold includes hysteresis for increased noise immunity.

In order to ensure safe, reliable control under all conditions, output operation is “fail-safe.” That is, the outputs are always off upon power-up and are automatically cleared following a software reset.

Loopback monitoring of critical control signals is easy since the input and output circuitry are connected in tandem to each channel.

**Features**
- 32 digital input and/or output channels
- 0 to 60V DC input range, 60V DC low-side switch outputs
- Outputs sink up to 1A per channel
- TTL-compatible input threshold with hysteresis
- Change-of-state/level interrupts (up to 8)

**Benefits**
- Buffered inputs include hysteresis to increase noise immunity.
- Interrupts are software-programmable for a change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.
- High impedance inputs prevent loading of the input source and minimize current.

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**Specifications**

**Digital Inputs**
- Input channel configuration: 32 non-inverting buffered inputs with a common connection.
- Input voltage: 0 to 60V DC, maximum.
- Input signal threshold: TTL compatible. 1.5V DC with 200mV of hysteresis, typ. Limited to TTL levels of 0.8V DC (max. low level) and 2.0V DC (min. high level).
- Input response time: 250ns minimum to 375ns maximum.
- Interrupt: Change-of-state and level on channels 0-7.

**Digital Outputs**
- Voltage range: 0 to 60V DC, maximum.
- Output ON current range: 0 to 1A DC, continuous per channel (10A total for all channels combined).
- Turn on time: varies with load (320ns typical).
- Turn off time: varies with load (500ns typical).

**PMC Compliance**
- Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1 (mechanical height exception, see Page 102).
- Electrical/Mechanical Interface: Single-Width Module.
- Two-piece board design (see Page 102).
- 32-bit PCI Target: Implemented by Altera FPGA.
- 4K Memory Space Required: One Base Address Register
- Signaling: 5V Compliant, 3.3V Tolerant
- Interrupts (INTA#): Interrupt A is used to request an interrupt.
- PMC Module Write Cycle: 1000ns typical measured from falling edge of FRAME# to module write complete.
- PMC Module Read Cycle: 1000ns typical measured from falling edge of FRAME# to falling edge of TRDY# providing valid data.

**Environmental**
- Operating temp.: 0 to 70°C or -40 to 85°C (E version)
- Storage temperature: -55 to 100°C
- Relative humidity: 5 to 95% non-condensing
- Power: 70mA at +5V, 10mA at +12V, -12V (not used).

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**Ordering Information**

**PMC Modules**
- PMC408
  - 32 bidirectional input/output channels.
- PMC408E
  - Same as PMC408 plus extended temperature range

**Software**
- See software documentation for details
- PMCSW-API-VXW
  - VxWorks® software support package
- PCISW-API-WIN
  - Windows® DLL Driver software package
- PCISW-API-LNX
  - Linux™ support (website download only)

**Accessories**
- See accessories documentation for details
- 5028-378
  - Termination panel, SCSI-2 connector, 50 screw terminals
- 5028-438
  - Cable, shielded, SCSI-2 connector at both ends

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The PMC424 digital I/O module provides 24 differential input/outputs, 16 TTL input/output channels, and four 16-bit multi-function counter/timers.

The 16 TTL input/output channels can be programmed as an input or an output on a channel basis. The 24 differential input/output channels are programmed as inputs or outputs on a 4-channel port basis. All input channels can be enabled for change of state, low, or high level transition interrupts.

Four 16-bit multifunction counters/timers can be configured for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers. A conduction-cooled version is also available.

Features

Digital I/O
- 40 digital input/output channels:
  - 24 differential input/outputs
  - 16 TTL input/output channels (15 ch. for 434R)
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

Counter/Timer
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TTL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset is failsafe

Specifications

Differential Digital I/O
I/O channel configuration: 24 bidirectional non-isolated RS485/422A differential signals. Direction is controlled as a 4-channel group.

Differential driver output voltage with 50 ohm load:
- 2V minimum, 5V maximum.

Common mode output voltage:
- 3V maximum.

Minimum input resistance:
- 12K ohms.

Termination resistors:
- 120 ohm termination resistor networks are installed in sockets.

TTL Digital I/O
I/O channel configuration: 16 bidirectional TTL (15 for 424R) transceivers with direction controlled independently (shared as counter/timer control signals).

Reset/power-up condition:
- All channels default to input.

Digital Input
Input voltage range: 0 to 5V DC.
Input signal threshold, high to low: 3.5V typical.
Input signal threshold, low to high: 1.5V typical.
Input response time: 10 nanoseconds, typical.

Digital Output
Output voltage range: 0 to 5V DC.
Output ON current range: -3 to 32mA.
Output pullups: 4.7K ohm socketed resistors.

Input Interrupts
40 channels of interrupts are available for high-to-low, low-to-high, or any change-of-state event type.
Debounce: Selectable for each channel. User-selectable (5.6µS, 50.4µS, 408.8µS, or 3.276mS).

Counter/Timers
Counter/timer configuration: Four 16-bit counters can be configured into two 32-bit counters.
Counter input:
- Each counter has an INA, INB, and INC port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.
- Counter output: Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6µS pulse upon counter function completion.
Programmable as active high or low.

Clock frequencies:
- Selectable for 20MHz, 10MHz, 5MHz, 2.5MHz, 1.25MHz or external up to 8MHz.
- Minimum I/P event: 100nS (debounce disabled).
- Minimum pulse measurement: 100nS (debounce disabled).
- Minimum period measurement: 200nS (debounce disabled).
- Minimum gate/trigger pulse: 100nS (debounce disabled).

Board crystal oscillator: 20MHz.

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.

4K Memory Space Required: One Base Address Register.
Signaling: 5V Compliant, 3.3V Tolerant.

Environmental
Operating temperature:
- 0 to 70°C (PMC424 / R) or
- -40 to 85°C (PMC424F / CC)

Storage temperature:
- -55 to 105°C.

Relative humidity:
- 5 to 95% non-condensing.

MTBF:

Power:
- 216mA at +5V, typical.

Continued on the next page.
PMC Modules

Block Diagram

Ordering Information

PMC424: Digital I/O and counter/timer module
PMC424E: Same as PMC424 plus extended temp. range
PMC424R: Digital I/O and counter/timer module with rear I/O connector.
PMC424CC: Digital I/O and counter/timer module, plus extended temperature range and conduction-cooled with rear I/O connector.

Software (see software documentation for details)
PMCSW-API-VXW: VxWorks’ software support package
PCISW-API-WIN: Windows’ DLL software support
PCISW-API-LNX: Linux’ support (website download only)

Accessories (see accessories documentation for details)
5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
5028-432: Cable, shielded, SCSI-3 connector both ends

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PMC464
Digital I/O and Counter/Timers

The PMC464 module provides 64 digital input/output channels and four 16-bit multifunction counter/timers. Sixteen digital I/O channels can be programmed as an input or an output on an individual channel basis. The other 48 digital input/output channels are programmed as inputs or outputs on an 8-bit port basis. All inputs support change of state and high/low level transition interrupts.

Four 16-bit multifunction counters/timers can be configured for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers. A conduction-cooled version is also available.

Features

Digital I/O
- 64 digital input/output channels:
  - 16 individually programmable channels (15 channels for 464R)
  - 48 channels configured on an 8-bit port basis
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

Counter/Timer
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TTL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset is failsafe

Specifications

Digital I/O

I/O channel configuration:
- 64 bidirectional TTL transceivers.
  - Channels 0-47: Direction controlled on a port basis.
  - Channels 48-63: Direction controlled independently (shared as counter/timer control signals). (48-62 for 464R)
- Reset/power-up condition: All channels default to input.

Counter/Timer

Counter/timer configuration: Four 16-bit counters can be configured into two 32-bit counters.

Functions:
- Pulse width modulation, watchdog timer, event counting, frequency measurement, period measurement, pulse width measurement, and one-shot/repetitive.
- Counter input: Each counter has an INA, INB, and INC input port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.
- Counter output: Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6µS pulse upon counter function completion. Programmable as active high or low.
- Clock frequencies: Selectable for 20MHz, 10MHz, 5MHz, 2.5MHz, or external up to 8MHz.
- Minimum I/P event: 100nS (debounce disabled).
- Minimum pulse measurement: 100nS (debounce disabled).
- Minimum period measurement: 200nS (debounce disabled).
- Minimum gate/trigger pulse: 100nS (debounce disabled).
- Board crystal oscillator: 20MHz.

PMC Compliance

Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.

4K Memory Space Required: One Base Address Register.

Signaling: 5V Compliant, 3.3V Tolerant.

Environmental

Operating temperature: 0 to 70°C (PMC464 / R) or -40 to 85°C (PMC464E / CC)

Storage temperature: -55 to 105°C.

Relative humidity: 5 to 95% non-condensing.


Power: 160mA at +5V, typical.

This module saves money and PMC slots by combining digital I/O, and counter/timer functions on a single card.

PMC464CC for conduction cooling

Counter/timer configuration: Four 16-bit counters can be configured into two 32-bit counters.

Functions:
- Pulse width modulation, watchdog timer, event counting, frequency measurement, period measurement, pulse width measurement, and one-shot/repetitive.

Counter input: Each counter has an INA, INB, and INC input port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.

Counter output: Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6µS pulse upon counter function completion. Programmable as active high or low.

Clock frequencies: Selectable for 20MHz, 10MHz, 5MHz, 2.5MHz, or external up to 8MHz.

Minimum I/P event: 100nS (debounce disabled).

Minimum pulse measurement: 100nS (debounce disabled).

Minimum period measurement: 200nS (debounce disabled).

Minimum gate/trigger pulse: 100nS (debounce disabled).

Board crystal oscillator: 20MHz.

PMC464CC for conduction cooling

Specifications

Digital I/O

I/O channel configuration:
- 64 bidirectional TTL transceivers.
  - Channels 0-47: Direction controlled on a port basis.
  - Channels 48-63: Direction controlled independently (shared as counter/timer control signals). (48-62 for 464R)

Reset/power-up condition: All channels default to input.

Digital Input

Input voltage range: 0 to 5V DC.

Input signal threshold (channels 0-47):
- Low to high: 2.0V typical.
- High to low: 0.8V typical.

Input signal threshold (channels 48-63):
- Low to high: 3.5V typical.
- High to low: 1.5V typical.

Input response time: 10 nanoseconds, typical.

Interrupts: 64 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.

Debounce: Selectable for each channel. User-selectable (5.6µS, 50.4µS, 408.8µS, or 3.276mS).

Digital Output

Output voltage range: 0 to 5V DC.

Output ON current range (channels 0-47): -15 to 64mA.

Output ON current range (channels 48-63): -32 to 32mA.

Output pullups: 4.7k ohm socketed resistors.

Turn on time: 10ns.

Turn off time: 10ns.

Continued on the next page.
PMC Modules

Block Diagram

Ordering Information

PMC464: Digital I/O and counter/timer module
PMC464E: Same as PMC464 plus extended temp. range
PMC464R: Digital I/O and counter/timer module with rear I/O connector
PMC464CC: Digital I/O and counter/timer module, extended temperature range and conduction cooled with rear I/O connector

Software (see software documentation for details)
PMCSW-API-VXW: VxWorks® software support package
PCISW-API-WIN: Windows® DLL software support
PCISW-API-LNX: Linux™ support (website download only)

Accessories (see accessories documentation for details)
5025-288: Termination panel, SCSI-3 connector,
68 screw terminals
5028-432: Cable, shielded, SCSI-3 connector both ends

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PMC48x Counter/Timer with Quadrature

- PMC482: Ten 16-bit counters – TTL
- PMC483: Four 16-bit counters – TTL, and Four 32-bit counters – RS422
- PMC484: Six 32-bit counters – RS422

Several models with a variety of configurations provide up to ten counter/timer channels for counting events, generating waveform control signals, measuring pulse-widths or periodic rates, measuring quadrature position, and monitoring operations.

Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

Features
- Ten 16-bit counter/timers (PMC482 only) or six 32-bit counter/timers (PMC484 only)
- Two 16-bit counters can be combined to create one 32-bit counter
- Available with both TTL and RS422 driver interface (PMC483 only)
- 16 bi-directional digital I/O
- 20MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - 32-bit counter/timer
  - Pulse width generation
- Extended temperature option (-40 to 85°C)

Benefits
- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.

These modules are very flexible and available in several varieties to accommodate a broad range of counter/timer applications.

Specifications

Counter/Timers
Counter/timer configuration:
- PMC482: Ten 16-bit TTL counters
- PMC483: Four 16-bit TTL counters, four 32-bit RS422 counters
- PMC484: Six 32-bit RS422 counters
- Other I/O mixes can be made available as specials.

Mode accuracy (with external clocking):
- Waveform generation: Period is ±62ns.
- Watchdog: Timeout occurs within ±1 clock cycle.
- Field I/O: Front panel SCI-3 connector.

Environmental
- Operating temp.: 0 to 70°C or -40 to 85°C (E versions)
- Storage temperature: -55 to 105°C
- Relative humidity: 5 to 95% non-condensing

Power
- Consult factory

Mechanical
- Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.

Software
- Available for VxWorks, Windows, Linux, and Linux support (website download only)

Ordering Information

PMC482: Ten 16-bit TTL counters
- PMC482E: Same as PMC482 with rear I/O connector
- PMC482R: Same as PMC482 plus extended temp. range

PMC483: Four 16-bit TTL counters, Four 32-bit RS422 counters
- PMC483E: Same as PMC483 plus extended temp. range
- PMC483R: Same as PMC483 with rear I/O connector
- PMC483RE: Same as PMC483E with rear I/O connector
- PMC483R: Same as PMC483 with extended temp. range
- PMC483RE: Same as PMC483E with extended temp. range

PMC484: Six 32-bit RS422 counters
- PMC484E: Same as PMC484 with extended temp. range
- PMC484R: Same as PMC484 with rear I/O connector
- PMC484RE: Same as PMC484E with rear I/O connector

Accessories
- VxWorks® software support package
- Windows® DIL software support
- Linux® support (website download only)

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 PMC Modules

PMC520
Octal Serial 232
Communication

These modules provide eight asynchronous serial communication ports from a single PMC carrier slot. Software configuration helps you quickly set baud rates, character-size, stop bits, and parity. Signal support for RTS/CTS handshaking is also included.

For more efficient data processing, each serial port is equipped with 64-character FIFO buffers on the transmit and receive lines.

The data ports individually controlled transmit, receive, line status, and data set interrupts. A global interrupt source register provides interrupt status indication for all eight channels to speed up interrupt parsing.

Features
- Eight RS232E ports
- 64-byte transmit FIFO buffers
- 64-byte receive FIFO buffers
- Programmable baud rate (up to 120Kbps)
- Individual handshake lines (RTS, CTS) on each channel
- Line-break and false start-bit detection
- Industry-standard software-compatible 16C550 configuration registers

Benefits
- High-density design lowers per-port costs and saves PMC carrier card slots for other functions.
- 64-byte FIFO buffers minimize CPU interaction for improved system performance.
- Each serial channel provides handshake support to simplify interfacing with modems.

Specifications

RS232E Serial Ports
- Configuration: Independent, non-isolated serial ports with a common single return connection and configured as a DTE device.
- Data rate: Programmable up to 120K bits/second using internal baud rate generator.
- Max. cable length: 15 meters (50 feet) typical, limited to a cable capacitive load of 2500pF.
- Character size: 5 to 8 bits, software-programmable.
- Parity: Odd, even, or no parity, software-programmable.
- Stop bits: 1, 1-1/2, or 2 bits, software-programmable.
- Data register buffers: Double buffered or 64-byte FIFO buffered, mode-selectable.
- Interrupts: Receiver line status (overrun, parity, framing error, or break interrupt), received data available (FIFO level reached) or character time-out, transmitter (FIFO level reached); or modem status (CTS).

Environmental
- Operating temperature: 0 to 70°C (PMC520-64) or -40 to 85°C (PMC520-64E).
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: ±5V (±5%), consult factory for current specifications.

PMCE Compliance
- Conforms to PCI Local Bus Specification, Revision 2.3 and CMC/PMC Specification, P1386.1.
- 4K Memory Space Required: One Base Address Register.
- Signaling: 3.3V and 5V compliant.

Ordering Information

PMC520
Eight RS232E serial ports, front I/O connector

PMC520E
Same as PMC520 plus extended temperature range.

PMC520R
Same as PMC520 except with rear I/O connector

PMC520RE
Same as PMC520R plus extended temperature range

Customized PMC Modules
- 5085-x
  Modified PMC520 with user-specified crystal/baud rate.
- Specify x = crystal frequency when ordering.
- Minimum quantity per order is two units.

Software
- PMCware-Serial API-VXW
  VxWorks® software support package
- PCISW-API-WIN
  Windows® DLL software support
- PCISW-API-LNX
  Linux® support (website download only)

Accessories
- 5028-432
  Cable, shielded, SCSI-3 connector both ends

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PMC Modules

PMC521
Octal Serial 422/485 Communication

These modules provide eight asynchronous serial communication ports from a single PMC carrier slot. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 64-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. A global interrupt source register provides interrupt status indication for all eight channels to speed up interrupt parsing.

Features
- Eight asynchronous, full duplex RS422B serial ports (supports RS485)
- 64-byte transmit FIFO buffers
- 64-byte receive FIFO buffers
- Programmable baud rate (up to 1.8432Mbps)
- Line-break and false start-bit detection
- Failsafe receivers
- Socketed termination and bias resistors
- Industry-standard software-compatible 16C550 configuration registers

Benefits
- High-density design lowers per-port costs and saves PMC carrier card slots for other functions.
- 64-byte FIFO buffers minimize CPU interaction for improved system performance.
- Extended temperature ranges deliver dependable operation in extreme conditions.

Specifications
RS422B Serial Ports
Configuration: Independent, non-isolated serial ports with a common single return connection.
Data rate: 20MB/h second, maximum.
Standard crystal limits data rate to 1.8432Mbps.
Max. cable length: 1200 meters (4000 feet), typical.
Character size: 5 to 8 bits, software-programmable.
Parity: Odd, even, or no parity; software-programmable.
Stop bits: 1, 1-1/2, or 2 bits; software-programmable.
Data register buffers: Double buffered or 64-byte FIFO buffered, mode selectable.
Interrupts: Receiver line status (overrun, parity, framing error, or break interrupt); receive/transmit FIFO level reached or character time-out; Xon/Xoff or special character detected.

Environmental
Operating temperature: 0 to 70°C (PMC521-64) or -40 to 85°C (PMC521-64E).
Storage temperature: -55 to 125°C.
Relative humidity: 5 to 95% non-condensing.
Power: +5V (±5%), consult factory for current specifications.

PMC Compliance
Conforms to PCI Local Bus Specification, Revision 2.3 and CMC/PMC Specification, P1386.1.
4K Memory Space Required: One Base Address Register.
Signaling: 3.3V and 5V compliant.

Ordering Information
PMC Modules
PMCS21
Eight RS422B serial ports, front I/O connector
PMCS21E
Same as PMCS21 plus extended temperature range.
PMCS21R
Same as PMCS21 except with rear I/O connector
PMCS21RE
Same as PMCS21R plus extended temperature range

Customized PMC Modules
† 5086-x
Modified PMC521 with user-specified crystal/baud rate.
† Specify x = crystal frequency when ordering.
Minimum quantity per order is two units.

Software (see software documentation for details)
PMCSW-API-VXW
VxWorks’ software support package
PCISW-API-WIN
Windows’ DLL software support
PCISW-API-LNX
Linux’ support (website download only)

Accessories (see accessories software for details)
5025-288
Termination panel, SCSI-3 connector, 68 screw terminals
5028-432
Cable, shielded, SCSI-3 connector both ends

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PMC730 Multi-function I/O

- Analog Input
- Analog Output
- Digital I/O
- Counter/Timer

PMC730 mezzanine modules provide a variety of I/O functions on a single plug-in card. These new high-density modules perform both high-speed and high-resolution A/D and D/A conversion and also handle digital I/O and counter/timer functions.

Now you can conserve your precious PMC slots and still get all the I/O functionality you need. The PMC730 is designed for extreme versatility with many deluxe features to meet most applications. However, the PMC730 is still very budget-friendly. A conduction-cooled version is also available.

Features

Analog Inputs
- 16 differential or 32 single-ended inputs
  (-3.3V, ±5V, ±10V, 0-5V, and 0-10V ranges)
- 16-bit ADC with 512 sample RAM
- 10µS conversion time (100KHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable interval timer

Analog Outputs
- Eight analog output channels (+10V range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- 12.375µS settling time (80.8KHz throughput)
- Interrupt on user-programmable FIFO threshold

Digital I/O
- 16 TTL bidirectional input/outputs

Counter/Timer
- One 32-bit counter/timer

Specifications

Analog Input
- Input configuration: 16 differential or 32 single-ended channels multiplexed to a single A/D converter.
- A/D resolution: 16 bits.
- Input ranges: ±3.3V, ±5V, ±10V, 0-5V, and 0-10V.
- Maximum throughput rate:
  - One channel updated at a time: 10µS
  - 16 channels: 160µS
  - 32 channels: 320µS
- Data sample memory: 512 samples shared by all channels.
- A/D trigger: Internal timer, external source, software.
- On-board timer: One user-programmable timer for analog input acquisition control.
- System accuracy: ±3 LSB typ. (SW calib., gain=1, 25°C).
- Data format: Straight binary or binary two’s compliment.
- Input overvoltage protection: -40 to 55V power off.
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

Analog Output
- Output configuration: 8 single-ended channels, each controlled by its own independent D/A converter.
- D/A resolution: 16 bits.
- Output range: ±10V.
- Maximum throughput rate:
  - Outputs updated simultaneously: 12.375µS
  - 8 different channels: 12.375µS

Digital I/O
- I/O channel configuration: 16 TTL transceivers, input/output direction selectable on an 8-channel basis.

Digital Input
- Input voltage range: 0 to 5V DC.
- Input signal threshold:
  - Low to high: 2.0V typical.
  - High to low: 0.8V typical.
- Input response time: 250 nanoseconds.
- Interrupts: 16 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.
- Debounce: Individual debounce selectable on each channel. User-selectable (4µS, 64µS, 1mS, or 8mS).

Digital Output
- Output voltage range: 0 to 5V DC.
- Output ON current range: -15 to 64mA.
- Output pullups: 4.7K ohm socketed resistors.

Counter/Timers
- Counter/timer configuration: one 32-bit counter (requires use of channels 2 through 5 of digital I/O section).
- Functions:
  - Watchdog timer, event counting, pulse measurement, period measurement, output waveform generation (pulse width modulation, continuous pulse, single pulse, continuous waveform).

DAC programming: Via independent channel registers or through shared FIFO.
Data sample memory: 1024 sample FIFO shared by all channels.
D/A trigger: Internal timer, external source, software.
On-board timer: One user-programmable timer for analog output control.
System accuracy: 0.0076% of 20V span max. error corrected (i.e. calibrated) at 25°C with output unloaded.
Data format: Straight binary.
Output at reset: 0V.
Output current: -10 to 10mA (maximum).
Short circuit protection: Indefinite at 25°C.

Continued on the next page.
Specifications (continued)

**Counter/Timers**
Continued from the previous page.

- Internal clock: Programmable 1, 4, 8MHz.
- External clock: 3.4MHz.
- Input voltage range: 0 to 5V DC.
- Output voltage range: 0 to 5V with 4.7 ohm pull-up.
- Maximum of 0 to 35V with external supply.

**PMC Compliance**
Conforms to PCI Local Bus Specification, Revision 2.2 and CMC/PMC Specification, P1386.1.
4K Memory Space Required: One Base Address Register.
Signaling: 5V Compliant, 3.3V Tolerant.
Interrupts (INTA#): Interrupt A is used to request an interrupt.

**Environmental**
- Operating temperature: 0 to 70°C (PMC730 / R) or -40 to 85°C (PMC730E / CC)
- Storage temperature: -55 to 100°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: 120mA at +5V, 95mA at +12V, 70mA at -12V.

**Ordering Information**

**PMC Modules**
- **PMC730**
  Multi-function I/O module with front I/O connector
- **PMC730E**
  Same as PMC730 plus extended temperature range
- **PMC730R**
  Multi-function I/O module with rear I/O connector
- **PMC730CC**
  Multi-function I/O module, plus extended temperature range and onduction-cooled with rear I/O connector

**Software** (see software documentation for details)
- **PMCSW-API-VXW**
  VxWorks® software support package
- **PCISW-API-WIN**
  Windows® DLL Driver software package
- **PCISW-API-LNX**
  Linux™ support (website download only)

**Accessories** (see accessories documentation for details)
- **5025-288**
  Termination panel, SCSI-3 connector, 68 screw terminals
- **5028-432**
  Cable, shielded, SCSI-3 connector both ends
Industry Pack Carriers

Industry Pack Carrier Cards and Modules

I/O solutions for VME, CompactPCI®, and PCI systems.

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<tr>
<th>Model #</th>
<th>Description</th>
<th>Page</th>
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<tbody>
<tr>
<td>I/O Solutions for VME, CompactPCI®, and PCI systems.</td>
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<td></td>
</tr>
</tbody>
</table>

Industry Pack Carrier Cards

Acromag non-intelligent carrier cards offer high performance at an attractive price. They hold up to five IP modules for very high channel density and great flexibility. Optional extended temperature ranges are ideal for use in military and aerospace applications.

A full complement of mounting accessories such as transition modules and termination panels simplifies your installation. Software support tools are also available to help you quickly develop your application programs.

Benefits

- Variety of bus formats and sizes to handle many applications
- Carriers interface up to five plug-in IP modules to host computer
- Mix and match different IP modules to create custom I/O boards
- Extended temperature range option (-40 to 85°C) for harsh environments
- Analog I/O modules have high-speed and high-resolution A/D and D/A converters
- Digital output loopback monitoring function verifies status to detect faults
- Serial I/O modules have large memory buffers for superior performance

Industry Pack Modules

Acromag’s I/O modules deliver the market’s best value. They offer an unsurpassed combination of features, performance, and price. Choose from a wide selection for data acquisition, measurement and control, and high-speed serial data transfer.

Benefits

- Modular format lets you mix or match multiple I/O functions on a single carrier card.
- More channels per module reduce costs and conserve card slots
- Mix and match different functions to create custom I/O boards
- Extended temperature range option (-40 to 85°C) for harsh environments
- Analog I/O modules have high-speed and high-resolution A/D and D/A converters
- Digital output loopback monitoring function verifies status to detect faults
- Serial I/O modules have large memory buffers for superior performance

Accessories

Support for VxWorks, Win, Linux
Termination panels, cables, adapters
The IP220A outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds four IP modules, up to 64 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 12-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

**Features**
- 8 or 16 analog voltage output channels
- Independent 12-bit D/A converters per channel with an 11.0µS settling time
- Bipolar voltage (non-isolated) outputs: -10 to +10 volts
- Double-buffered DACs
- High load capability (5mA output current)
- Built-in calibration coefficients

**Benefits**
- Outputs reset to 0 volts.
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.

### Specifications

**Analog Outputs**
- Output configuration: 8 or 16 single-ended.
- D/A Resolution: 12 bits.
- Output range: Bipolar, -10 to +10V
- Settling time: 11µS
- Maximum throughput rate:
  - Outputs can be updated simultaneously or individually. One channel: 11µS/conversion.
  - Sixteen channels simultaneously: 17µS/16 channels.
- System accuracy: 0.025% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.
- Data format (left-justified): Bipolar Offset Binary.
- Output at reset: 0 volts.
- Output current: -5 to +5 mA (maximum).
- Short circuit protection: Indefinite at 25°C.

**IP Compliance (ANSI/VITA 4)**
Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported:
  - Input/output (IOSel*): DAC data, control registers, DAC offset and gain calibration coefficients.
  - ID read (IDSel*): 32 x 8 ID PROM.
- Access Times (8MHz clock):
  - ID EEPROM read: 0 wait states (250nS cycle).
  - DAC channel data write: 1 wait states (375nS cycle).
  - DAC offset/gain coeff read: 1 wait states (375nS cycle).
- Control register access: 1 wait states (375nS cycle).

**Environmental**
- Operating temperature: 0 to 70°C (IP220A-8/16) or -40 to 85°C (IP220A-8E/16E models).
- Storage temperature: -55 to 100°C (all models).
- Relative humidity: 5 to 95% non-condensing.
- Power: +5V: 33mA typical, 45mA Maximum
  - +12V from P1: 150mA typical, 200mA maximum.
  - -12V from P1: 133mA typical, 180mA maximum.

### Ordering Information

**Industry Pack Modules**
- IP220A-8: Eight voltage outputs
- IP220A-8E: Same as IP220A-8 plus extended temperature range.
- 5089-8: Same as IP220A-8 except requires the use of external ±15V supply
- 5089-8E: Same as IP220A-8E except requires the use of external ±15V supply.
- IP220A-16: Sixteen voltage outputs
- IP220A-16E: Same as IP220A-16 plus extended temperature range.
- 5089-16: Same as IP220A-16 except requires the use of external ±15V supply.
- 5089-16E: Same as IP220A-16E except requires the use of external ±15V supply.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- IPSW-API-VXW: VxWorks® software support package
- IPSW-API-QNX: QNX® software support package
- IPSW-API-WIN: Windows® DLL driver software support package
- IPSW-LNX-API: Linux® support (website download only)

See accessories documentation for additional information.

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IP230A-x
16-Bit D/A, Analog Output

IP230A modules have a 16-bit D/A converter (DAC) to provide highly-accurate analog voltage outputs. Jumper-selectable output ranges give you the choice of unipolar or bipolar voltage output. And for greater flexibility, the IP230A module accepts conversion start triggers from software commands, or from external sources for synchronization to specific events.

Features
- IP230A-4: 4 analog voltage output channels
- IP230A-8: 8 analog voltage output channels
- Individual 16-bit D/A converters per channel
- 10µS settling time (100KHz throughput)
- Three output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable)
- Two trigger modes (software or external trigger)
- External trigger output
- Extended temperature option (-40 to 85°C)

Benefits
- High channel density saves card cage slots.
- Internally stored calibration coefficients ensure accuracy.
- Flexible output control allows single cycle updating of individual channels or all channels simultaneously.
- Hardware jumpers allow output range selection on an individual channel basis.

Specifications

Analog Outputs
- Output configuration: 4 (IP230A-4/4E) or 8 (-8/8E).
- D/A Resolution: 16 bits.
- Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).
- Maximum throughput rate:
  - Outputs can be updated simultaneously or individually.
  - One channel: 1000Hz (10µS/conversion)
  - Four channels (IP235A-4): 1000Hz (10µS/4 ch)
  - Eight channels (IP235A-8): 1000Hz (10µS/8 ch).
- DAC programming: Immediate (transparently programmed to DAC output), simultaneous (input latches of multiple DACs are loaded with new data before simultaneously updating outputs).
- System accuracy: 0.0061% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.
- Output at reset: 0V for bipolar output, 5V for unipolar.
- Output current: -5 to +5mA (maximum).
- Short circuit protection: Indefinite at 25°C.

IP Compliance (ANSI/VITA 4)
- IP data transfer cycle types supported: Input/output (IOSel*), ID read (IDSel*).
- Access Times (8MHz clock):
  - All functions: 1 wait state (375nS cycle).

Environmental
- Operating temperature: 0 to 70°C (IP230A-4/8) or -40 to 85°C (IP230A-4E/8E models).
- Storage temperature: -55 to 125°C (all models).
- Relative humidity: 5 to 95% non-condensing
- Power: +5V (±5%), 200mA maximum.
  - ±12V (±5%) from P1: 150mA maximum.

Ordering Information

Industry Pack Modules
- IP230A-4
  - Four high-resolution voltage outputs
- IP230A-4E
  - Same as IP230A-4 plus extended temp. range
- IP230A-8
  - Eight high-resolution voltage outputs
- IP230A-8E
  - Same as IP230A-8 plus extended temp. range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-WIN32
  - 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64
  - 64-bit Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

Accessories
- See www.acromag.com for more information

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IP231-x
16-Bit D/A,
Analog Output

The IP231 outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds four IP modules, up to 64 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 16-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

Features
- 8 or 16 analog voltage output channels
- Independent 16-bit D/A converters per channel with an 13µS settling time
- Bipolar voltage (non-isolated) outputs: -10 to +10 volts
- Double-buffered DACs
- High load capability (5mA output current)
- Built-in calibration coefficients

Benefits
- Outputs reset to 0 volts.
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.

Specifications

Analog Outputs
- Output configuration: 8 or 16 single-ended.
- D/A Resolution: 16 bits.
- Output range: Bipolar, -10 to +10V
- Settling time: 13µS.
- Maximum throughput rate:
  - One channel: 13µS/conversion
  - Sixteen channels simultaneously: 13µS/16 channels.
- System accuracy: 0.0305% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.
- Linearity error: ±2.5LSB (maximum).
- Data format: Bipolar Offset Binary.
- Output at reset: 0 volts.
- Output current: -5 to 5mA (maximum). This corresponds to a minimum load resistance of 5K ohms with a 10V output.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
- Input/output (IOSel*): DAC data, control registers, DAC offset and gain calibration coefficients.
- ID read (IDSel*).

Access Times (8MHz clock):
- ID EEPROM read: 0 wait states (250nS cycle).
- DAC channel data write: 2 wait states (500nS cycle).
- DAC offset/gain coeff read: 1 wait state (375nS cycle).
- Control register access: 1 wait state (375nS cycle).

Environmental

Operating temperature: 0 to 70°C (IP231-8/16) or -40 to 85°C (IP231-8E/16E models).
- Storage temperature: -55 to 100°C (all models).
- Relative humidity: 5 to 95% non-condensing.
- Power:
  - +5V: 45mA
  - +12V: 200mA
  - -12V: 180mA

Ordering Information

Industry Pack Modules
- IP231-8
  - Eight voltage outputs
- IP231-8E
  - Same as IP231-8 plus extended temperature range.
- IP231-16
  - Sixteen voltage outputs
- IP231-16E
  - Same as IP231-16 plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software (see software documentation for details)
- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-QNX
  - QNX® software support package
- IPSW-API-WIN
  - Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

See accessories documentation for additional information.
IP235A-8
16-Bit D/A Analog Output with RAM Buffer

IP235A-8 modules have a 16-bit D/A converter (DAC) to provide highly-accurate analog voltage outputs. An internal RAM buffer enhances control over the transfer of data to the DAC.

Each channel has a dedicated 2K sample RAM buffer. All channels share a global clock. A start trigger transfers digital values from the buffer to the DAC. Four modes offer several choices for the data transfer. Continuous mode simultaneously updates all the channels by cycling through the buffer until a software halt command is received. Single-cycle mode simultaneously updates all channels but only cycles through the buffer once for each start trigger.

Features
- 8 analog voltage outputs
- Individual 16-bit D/A converters per channel
- Waveform memory (2K samples/channel)
- Global timer for all channels supporting clock rates of up to 100kHz
- Software, external, or internal timer triggers
- Interrupt capability
- External trigger output
- User-programmable interval timer
- Extended temperature option (-40 to 85°C)

Benefits
- RAM buffer provides many options and generates waveform signals.
- Internally-stored calibration coefficients ensure accuracy.
- Flexible output control allows single cycle or continuous updating of individual channels or all channels simultaneously.

Specifications

**Ancalog Outputs**
- Output configuration: 8
- D/A Resolution: 16 bits.
- Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).
- Data sample memory: 2K sample RAM buffer on each channel.
- Maximum throughput rate:
  - One channel: 100kHz (10µS/conversion)
  - Eight channels: 100kHz (10µS/8 ch).
- DAC programming: Immediate (transparently programmed to DAC output); simultaneous (input latches of multiple DACs are loaded with new data before simultaneously updating outputs).
- System accuracy: 0.0061% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.
- Output at reset: 0V for bipolar output, 5V for unipolar.
- Output current: -5 to +5mA (maximum).
- Short circuit protection: Indefinite at 25°C.

**IP Compliance (ANSI/VITA 4)**
- Meets IP specifications per ANSI/VITA 4-1995.
- IP235-8A:
  - Eight voltage outputs with memory.
- IP235-8E:
  - Same as IP235-8A plus extended temperature range.

**Ordering Information**

**IndustrY Pack Modules**

**IP235-8**
- Eight voltage outputs with memory.

**IP235-8E**
- Same as IP235-8A plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**

- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-WIN32
  - 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64
  - 64-bit Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

**Accessories**
[See www.acromag.com for more information](http://www.acromag.com)

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IP236A-8
16-bit D/A Analog Output with FIFO Buffers

IP236A-8 modules have 16-bit D/A converters (DAC) to provide highly-accurate analog voltage outputs. FIFO buffers enhance control over the transfer of data to the DAC and improve efficiency.

Each channel has a dedicated 128 sample FIFO buffer and its own clock. A start trigger transfers digital values from the buffer to the DAC. Three modes offer several choices for the data transfer on each channel. Continuous mode cycles data through the buffer for a given channel and is ideal for waveform generation. As new data loads into the FIFO, the output signal instantly updates without stopping the waveform. Single mode moves one value from the buffer to the converter for each trigger. External trigger mode synchronizes channel conversions to an event or other IP236A-8 modules.

Features
- 8 analog voltage outputs
- Individual 16-bit D/A converter on each channel
- Individual clock on each channel supporting rates of up to 100KHz
- FIFO memory buffers (128 samples/channel)
- Software, external, or internal timer triggers
- Interrupt capability
- External trigger output
- Extended temperature option (-40 to 85°C)

Benefits
- FIFO buffers enable “on-the-fly” changes to the output waveform as new data is received.
- Internally-stored calibration coefficients ensure accuracy.
- Independent control of each channel enables individual updates and unique conversion rates.

Specifications

Analog Outputs
- Output configuration: 8.
- D/A Resolution: 16 bits.
- Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).
- Data sample memory: 128 sample FIFO buffer on each channel.
- Maximum throughput rate: Outputs can be updated simultaneously or individually.
- One channel: 100kHz (10µS/conversion)
- Eight channels: 100kHz (10µS/8 ch).
- DAC programming: Independent. Input registers and FIFOs are directly loaded.
- System accuracy: 0.0061% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.
- Output at reset: 0V for bipolar output, 5V for unipolar.
- Output current: -5 to +5mA (maximum).
- Short circuit protection: Indefinite at 25°C.

IP Compliance (ANSI/VITA 4)
- Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported:
  - Input/output (IODSel*), ID read (IODSel*), Interrupt select (INFSel*).
- Access Times (8MHz clock):
  - All functions: 0 wait states (250ns cycle) except FIFO buffer write: 2 wait state (500ns cycle), Interrupt read/write: 2 wait states (250ns cycle).

Environmental
- Operating temperature: 0 to 70°C (IP236A-8) or -40 to 85°C (IP236-8E models).
- Storage temperature: -55 to 125°C (all models).
- Relative humidity: 5 to 95% non-condensing
- Power:
  - +5V (±5%): 250mA maximum.
  - ±12V (±5%) from P1: 210mA maximum.
- MTBF: Consult factory.

Ordering Information

Industry Pack Modules
- IP236A-8
  - Eight voltage output channels.
- IP236A-8E
  - Same as IP236A-8 plus extended temperature range.
  - Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-WIN32
  - 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64
  - 64-bit Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

Accessories
- See www.acromag.com for more information

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The IP320A monitors 20 differential or 40 single-ended input channels. When used with a carrier that holds four IP modules, up to 160 inputs can be obtained from a single card cage slot.

A jumper offers a choice of three input voltage ranges. Using the software programmable gain, you can easily customize the input voltage on an individual channel basis. The control register provides further flexibility with the option of single-ended or differential inputs and controlled channel selection. Software or external triggers enable synchronization of data acquisition to external events.

### Features
- 20 differential or 40 single-ended inputs
- 12-bit, successive approximation A/D converter (ADC) with an 4.5µS conversion time
- 200K samples per second maximum system throughput rate
- Three dip switch-selectable input ranges: -5 to 5V, -10 to 10V, and 0 to 10V
- Programmable gains of 1, 2, 4, and 8
- Built-in calibration references

### Benefits
- Software or external hardware inputs can trigger A/D conversions for synchronization to external events.
- On-board, precision voltage references enable accurate software calibration of the module without external instruments.
- The module supports both “wait” states (generated by the IP module) and “hold” states (generated by the carrier board).

### Specifications
**Analog Inputs**
- Input configuration: 40 single-ended or 20 differential.
- A/D resolution: 12 bits.
- Input ranges (dip switch-selectable):
  - Bipolar -5 to +5V, -10 to +10V (See Note 1), or
  - Unipolar 0 to +10V (See Note 1).
  Note 1: Range requires ±15V external power supply. Clipping occurs with ±12V supplies, typically to ±9V.
- Maximum throughput rate: 200kHz (5µS/conversion).
- Only one channel updates at a time.
- Programmable gains: x1, x2, x4, x8.
- A/D triggers: External and software.
- Maximum overall calibrated error at 25°C: See below.

<table>
<thead>
<tr>
<th>Input Range (volts)</th>
<th>PGA Gain</th>
<th>ADC Range (volts)</th>
<th>Max.Error (±LSB/±Span)</th>
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</thead>
<tbody>
<tr>
<td>0 to 10</td>
<td>0 to 10</td>
<td>3.2 (0.078)</td>
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<tr>
<td>-5 to +5</td>
<td>-5 to +5</td>
<td>1.8 (0.044)</td>
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</tr>
<tr>
<td>-10 to +10</td>
<td>-10 to +10</td>
<td>2.8 (0.069)</td>
<td></td>
</tr>
</tbody>
</table>

- Data format (left-justified): Straight Binary.
- Input overvoltage protection: ±32V powered, -35 to ±55 unpowered.
- Common mode rejection ratio (60Hz): 71dB.
- Channel-to-channel rejection ratio (60Hz): 71dB.

**IP Compliance (ANSI/VITA 4)**
Meets IP specifications per ANSI/VITA 4-1995.

**Environmental**
- Operating temperature: 0 to 70°C (IP320A) or -40 to 85°C (IP320AE model).
- Storage temperature: -40 to 125°C (IP320A) or -55 to 105°C (IP320AE model).
- Relative humidity: 5 to 95% non-condensing.
- Power: +5V: 210mA maximum.
  +12V from P1 or +15V from P2: 25mA maximum.
  -12V from P1 or -15V from P2: 25mA maximum.

### Ordering Information
**Industry Pack Modules**
- **IP320A**: 40 single-ended or 20 differential inputs.
- **IP320AE**: Same as IP320A plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- **IPSW-API-VXW**: VxWorks® software support package
- **IPSW-API-WIN32**: 32-bit Windows® DLL driver software support package
- **IPSW-API-WIN64**: 64-bit Windows® DLL driver software support package
- **IPSW-LINUX**: Linux™ support (website download only)

**Accessories**
See [www.acromag.com for more information](http://www.acromag.com)
IP330A Industry Pack (IP) modules provide fast, high resolution A/D conversion.

The IP330A has many features to improve your overall system throughput rate. You can scan all channels or define a subset for more frequent sampling. Burst mode scans selected channels at the maximum conversion rate. Uniform mode performs conversions at user-defined intervals. Both modes can scan continuously, or execute a single cycle upon receiving a trigger.

“Mailbox” memory allows the CPU to read the latest data in 32 storage buffer registers without interrupting the A/D converter.

Features
- 16-bit A/D converter (ADC)
- 5µS conversion time (200kHz)
- 16 differential or 32 single-ended inputs (±5V, ±10V, 0-5V, and 0-10V input ranges)
- Individual channel mailbox with one or two storage buffer registers per channel
- Programmable scan control
- Four scanning modes
- User-programmable interval timer
- External trigger input and output
- Programmable gain for individual channels
- Post-conversion interrupts

Benefits
- “Mailbox” memory eliminates scanning interruptions for optimum throughput.
- Data register indicates new and missed (overwritten) data values in the mailbox.
- Programmable interrupts simplify data acquisition by providing greater control.

Specifications

Analog Inputs
- Input configuration: 16 differential or 32 single-ended.
- A/D resolution: 16 bits.
- Input ranges: ±5V, ±10V*, 0-5V, and 0-10V*.
  * Requires ±15V external supplies.
- Data sample memory: Individual channel mailbox with one or two storage buffer registers per channel.
- Maximum throughput rate:
  - Only one channel can be updated at a time.
  - One channel: 200kHz maximum (5µS/conversion)
  - 16 channels (differential): 4.2kHz (240µS/16 ch)
  - 32 channels (single-ended): 2.1kHz (480µS/32 ch).
- Programmable gains: 1x, 2x, 4x, 8x.
- A/D triggers: External and software.
- System accuracy: ±2LSB (0.0030%) typical
  (SW calib., gain=1, 25°C).
- Data format: Straight binary or two’s compliment.
- Input overvoltage protection: Vss -20V to Vdd 40V with power on, -35V to 55V power off.
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

Environmental
- Operating temperature: 0 to 70°C (IP330A) or -40 to 85°C (IP330AE model).
- Storage temperature: -55 to 100°C.
- Relative humidity: 5 to 95% non-condensing.
- MTBF: Consult factory.
- Power:
  - +5V: 65mA typical, 200mA maximum
  - +12V: 14mA typical, 20mA maximum
  - -12V/-15V: 11mA typical, 15mA maximum.

Ordering Information

Industry Pack Modules
- IP330A: 32 single-ended or 16 differential inputs.
- IP330AE: Same as IP330A plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW: VxWorks® software support package
- IPSW-API-WIN32: 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64: 64-bit Windows® DLL driver software support package
- IPSW-LINUX: Linux™ support (website download only)

Accessories
- See www.acromag.com for more information

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IP340 and IP341 Simultaneous A/D Conversion Analog Input

IP340/341 Industry Pack (IP) modules provide fast, high resolution, simultaneous A/D conversion of up to eight channels.

These modules have sixteen analog inputs which are sampled as two eight-channel banks. Eight A/D converters (ADCs) permit simultaneous conversion of all eight channels in a bank. A FIFO buffer holds the first bank’s data while the second bank is converted. Conversion of each bank requires only 8µS, and all 16 channels can be sampled in just 16µs.

Flexible configuration options give you extensive control over the conversion process. The channels or bank to be converted, timing, scan mode, and other parameters are user-programmable. Interrupt support adds further control to flag a FIFO that is full or filled to a user-defined threshold level.

**Features**
- 16 differential inputs (±10V DC input range)
- Eight 12 or 14-bit A/D converters (IP340/341) with simultaneous multi-channel conversion
- 8µS conversion time (125KHz) for 8-channel bank
- FIFO buffer with 512 sample memory
- Programmable conversion timer
- Programmable channel conversion control
- External trigger input and output
- Continuous and single-cycle conversion modes
- Interrupt generation for FIFO threshold conditions
- Precision calibration voltages stored on-board

**Benefits**
- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.
- Programmable interrupts simplify data acquisition by providing greater control.

The IP340 is ideal for high-speed data acquisition. A large FIFO buffer reduces CPU interactions for increased overall performance.

**Specifications**

**Analog Inputs**
- Input configuration: 16 differential
- A/D resolution: 12 bits (IP340), 14 bits (IP341)
- Input range: ±10V
- Data sample memory: 512 sample FIFO buffer
- Max. throughput rate:
  - Eight channels can be simultaneously acquired.
  - One channel: 125KHz (8µS/conversion)
  - 8 channels (same bank): 1MHz (8µS/8 channels)
  - 16 channels (high & low banks): 1MHz (16µS/16 ch. at minimum 2.2K ohm source resistance).
- Data sample memory: 512-sample FIFO memory buffer
- A/D triggers: Internal timer, external, and software
- System accuracy:
  - IP340: 1.6 LSB (0.039%), IP341: 2.4 LSB (0.014%)
- Data format: Binary two’s compliment
- Input overvoltage protection: ±25V with power on, ±40V with power off.
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

**IP Compliance (ANSI/VITA 4)**
- Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported. Input/output (IOSel*), ID read (IDSel*), Interrupt select (INTSel*).
- Access times (8MHz clock):
  - ID space read: 0 wait states (250ns cycle).
  - FIFO buffer read: 2 wait states maximum (500ns), 1 wait state typical (375ns).
  - Registers read/write: 0 wait states (250ns cycle).
  - Interrupt read/write: 0 wait states (250ns cycle).

**Environmental**
- Operating temperature: 0 to 70°C (IP340/341) or -40 to 85°C (IP340E/341E models).
- Storage temperature: -40 to 125°C (all models).
- Relative humidity: 5 to 95% non-condensing.
- Power:
  - +12V from P1: 7mA.
  - -12V from P1: -6mA.

**Ordering Information**

Industry Pack Modules
- IP340
  - 12-bit A/D
- IP340E
  - Same as IP340 plus extended temp. range.
- IP341
  - 14-bit A/D
- IP341E
  - Same as IP341 plus extended temp. range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-WIN32
  - 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64
  - 64-bit Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

**Accessories**
- See [www.acromag.com](http://www.acromag.com) for more information
IP400
High Voltage Digital Input

The IP400 can monitor the on/off (high/low) status of up to 40 devices.

Loopback monitoring of critical control signals is easily accomplished with the IP400 by reading the output states of Acromag’s IP405 Output Module. The two modules share the same field interface pinouts for direct loopback compatibility.

Configuration is easy with software commands that eliminate confusing jumper settings and switches. You can configure interrupts for a change of state or level detection of any bit on up to 12 channels.

**Features**
- 40 digital inputs
- 0 to 60V DC input range
- TTL input threshold with hysteresis
- Change-of-state/level interrupts (up to 12 channels)
- Loopback monitoring of output states (with IP405)

**Benefits**
- Buffered inputs include hysteresis for increased noise immunity.
- Interrupts can be generated for change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.
- High impedance inputs minimize loading of the input source and input current.
- Faster data processing is achieved because only one “wait” state is required for a read or a write operation.

**Specifications**

**Digital Inputs**
Input channel configuration: 40 noninverting buffered inputs with a common connection. For DC voltage applications only, observe proper polarity.

Input voltage: 0 to 60V DC, maximum.

Input signal threshold: TTL compatible. 1.5V DC with 200mV of hysteresis, typical. Thus, Low-to-High threshold is 1.6V DC High-to-Low is 1.4V DC, typical. Limited to TTL levels of 0.8V DC (maximum Low level) and 2.0V DC (minimum High level).

Input resistance time: 100K ohms, typical.

Interrupts: Change-of-state and level on channels 0-11.

**IP Compliance (ANSI/VITA 4)**
Meets IP specifications per ANSI/VITA 4-1995.

**Environmental**
Operating temperature: 0 to 70°C (IP400) or -40 to 85°C (IP400E model).

Storage temperature: -55 to 125°C.

Relative Humidity: 5 to 95% non-condensing.


Power:
+5V (±5%): 30mA maximum
+12V (±5%) from P1: 8.5mA maximum
-12V (±5%) from P1: 0mA (not used).

**Ordering Information**

**Industry Pack Modules**
- **IP400**: 40 input channels.
- **IP400E**: Same as IP400 plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- **IPSW-API-VXW**: VxWorks® software support package
- **IPSW-API-WIN32**: 32-bit Windows® DLL driver software support package
- **IPSW-API-WIN64**: 64-bit Windows® DLL driver software support package
- **IPSW-LINUX**: Linux™ support (website download only)

**Accessories**
See www.acromag.com for more information

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IP405
High Voltage Digital Output

The IP405 controls up to 40 low-side switches (open-drain MOSFETs).

Operation of this module is very simple. Writing a “0” bit to a channel data register opens the switch to turn off a field device. Similarly, writing a “1” bit closes the switch to turn on the device. Each register can be read back to verify the value.

Loopback monitoring of critical control signals is easily accomplished by reading back output states using Acromag’s IP400 Digital Input Module.

To ensure safe, reliable control under all conditions, the output operation is “fail-safe.” That is, outputs are always off on power-up and are automatically cleared following a system software reset.

**Features**
- 40 digital low-side switch outputs
- 0 to 60V DC output range
- High output current (up to 1A per channel)
- True logic operation
- Low drain-to-source ON resistance
- Faultless power-up and system reset (open outputs)
- Output state readback capability (built-in)

**Benefits**
- Latched buffers enable the user to read back the output channel registers for verification purposes.
- Loopback monitoring (with IP400) enables self-test and diagnostics to detect system faults.
- Low drain-to-source ON resistance ensures TTL logic-low compatibility at high currents and reduces power dissipation.
- Individual channels sink up to 1A DC continuous. No deration of output current required at high ambient temperatures.

**Specifications**

**Digital Outputs**
- Output channel configuration: 40 open-drain DMOS MOSFETs with common source connection.
- Voltage range: 0 to 60V DC, maximum.
- Output ON current range: 0 to 1A DC, continuous (up to 10A total for all channels combined), 250mA DC, continuous (all channels on). No deration required at elevated ambient conditions.
- Turn on time: 320ns typical (varies with load).
- Turn off time: 500ns typical (varies with load).

**IP Compliance (ANSI/VITA 4)**
- Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported:
  - Input/output (IOSel*), ID read (IDSel*).
- Access Times (8MHz clock):
  - All functions: 0 wait states (250ns cycle), except Channel register write: 1 wait state (375ns cycle).
- Updates: Requires two 16-bit and one 8-bit writes to update all channels.

**Environmental**
- Operating temperature: 0 to 70°C (IP405) or -40 to 85°C (IP405E model).
- Storage temperature: -55 to 125°C (all models).
- Relative Humidity: 5 to 95% non-condensing.
- Power:
  - +5V (±5%): 350mA maximum.
  - +12V (±5%): from P1: 8.5mA maximum.
  - -12V (±5%): from P1: 0mA (not used).

**Ordering Information**

**Industry Pack Modules**
- IP405: 40 output channels.
- IP405E: Same as IP405 plus extended temperature range.
- Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- IPSW-API-VXW: VxWorks® software support package
- IPSW-API-WIN32: 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64: 64-bit Windows® DLL driver software support package
- IPSW-LINUX: Linux™ support (website download only)

**Accessories**
- See www.acromag.com for more information
**IP408**

**High Voltage Digital Input/Output**

The IP408 monitors or controls the on/off (high/low) status of up to 32 devices. Each channel can be used as an input or output.

Input channels can be configured with interrupts for a change of state or level detection of any bit on up to 8 channels. The TTL input threshold includes hysteresis for increasing noise immunity.

In order to ensure safe, reliable control under all conditions, output operation is “fail-safe.” That is, the outputs are always off upon power-up and are automatically cleared following a software reset.

Loopback monitoring of critical control signals is easy since the input and output circuitry are connected in tandem to each channel.

**Features**

- 32 digital input and/or output channels
- 0 to 60V DC input range, 60V DC low-side switch outputs
- Outputs sink up to 1A per channel
- TTL-compatible input threshold with hysteresis
- Change-of-state/level interrupts (up to 8)

**Benefits**

- Buffered inputs include hysteresis to increase noise immunity.
- Interrupts are software-programmable for a change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open output switches or shorts.
- High impedance inputs prevent loading of the input source and minimize current.
- Individual outputs sink up to 1A DC continuous. No deration of output current required at elevated temperatures.

---

## Specifications

### Digital Inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input channel configuration</td>
<td>32 noninverting buffered inputs with a common source connection. Input signal voltage range: 0 to 60V DC, maximum.</td>
</tr>
<tr>
<td>Input signal threshold</td>
<td>TTL compatible. 1.5V DC with 200mV of hysteresis, typ. Limited to TTL levels of 0.8V DC (max. low level) and 2.0V DC (minimum high level).</td>
</tr>
<tr>
<td>Input response time</td>
<td>250ns minimum to 375ns max.</td>
</tr>
<tr>
<td>Interrupts</td>
<td>Change-of-state and level on channels 0-7.</td>
</tr>
</tbody>
</table>

### Digital Outputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel configuration</td>
<td>32 open-drain DMOS MOSFETs with common source connection. Output ON current range: 0 to 1A DC, continuous per channel (10A total for all channels combined). No deration required at elevated ambient.</td>
</tr>
<tr>
<td>Turn on time</td>
<td>320ns typical (varies with load).</td>
</tr>
<tr>
<td>Turn off time</td>
<td>500ns typical (varies with load).</td>
</tr>
</tbody>
</table>

### IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

- IP data transfer cycle types supported: Input/output (IOSel*), ID read (IDSel*).
- Access Times (8MHz clock): 1 wait state (375ns cycle).
- Interrupt handling format: An 8-bit vector is provided during interrupt acknowledge cycles on D0 - D7.
- Updates: Two 16-bit read/writes to update all channels.

### Environmental

- Operating temperature: 0 to 70°C (IP408) or -40 to 85°C (IP408E).
- Storage: -55 to 125°C (all models).
- Relative Humidity: 5 to 95% non-condensing.
- Power: +5V (±5%): 50mA max. +12V (±5%) from P1: 8.5mA max. -12V (±5%) from P1: 0mA (not used).

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## Ordering Information

### Industry Pack Modules

- **IP408**: 32 bidirectional input/output channels
- **IP408E**: Same as IP408 plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

### Software

- **IPSW-API-VXW**: VxWorks® software support package
- **IPSW-API-WIN32**: 32-bit Windows® DLL driver software support package
- **IPSW-API-WIN64**: 64-bit Windows® DLL driver software support package
- **IPSW-LINUX**: Linux™ support (website download only)

### Accessories

See [www.acromag.com](http://www.acromag.com) for more information.
**IP409 Differential Digital Input/Output**

The IP409 provides 24 differential I/O channels with interrupts. Each channel is programmable as an input or an output on a bit basis, in any combination. All channels can generate change-of-state (COS), low, or high level transition interrupts.

Each channel uses a robust RS485/422A transceiver that supports bi-directional data transfer in one direction at a time (half-duplex). Differential data transmission enables reliable, high speed communication across distances of up to 4000 feet, even through noisy environments. Differential transmission nullifies the effects of ground shifts and noise signals which appear as common-mode voltages on the line.

**Features**
- 24 digital input and/or output channels
- Output channels support readback monitoring
- Socketed termination resistors
- Ruggedized RS422A/485 transceivers
- Interrupt support on all channels - change-of-state - high or low level transition
- Positive and negative current limiting
- Parallel I/O for up to 24 bits

**Benefits**
- All channels programmable as inputs or outputs.
- Differential data transmission is ideal for high-speed, long distance communication in noisy environments.

**Specifications**

**RS485 Transceivers**
- Bus common mode range: -7 to 12V.
- Channel configuration: 24 independent, non-isolated RS485/422A serial ports with a common signal return connection.
- Data rate: 250K bits/second, maximum.
- Cable length: 4000 feet, maximum. Use of a signal repeater can extend transmission distances.
- Termination resistors: 120 ohm resistors installed in board sockets at network endpoints only.
- Differential output voltage: 5V, maximum. 1.5V minimum (with 27 ohm load).
- Common mode output voltage: 3V, maximum.
- Output short circuit current: 250mA, maximum.
- Rise/fall time: 250ns, minimum. 800ns, typical. 2000ns, maximum.
- Receiver input impedance: 12K ohms.

**IP Compliance (ANSI/VITA 4)**
- Meets IP specifications per ANSI/VITA 4-1995.
- IP data transfer cycle types supported: Input/output (IDSel*), ID read (IOSel*).
- Access Time (8MHz clock): 0 wait states (250ns cycle).
- Interrupt handling format: An 8-bit vector is provided during interrupt acknowledge cycles on D0 - D7.

**Environmental**
- Operating temperature: 0 to 70°C (IP409) or -40 to 85°C (IP409E).
- Storage temperature: -55 to 125°C (all models).
- Relative Humidity: 5 to 95% non-condensing
- Power: +5V (±5%): 50mA maximum. ±12V (±5%) from P1. Not used.

**Ordering Information**

**Industry Pack Modules**
- **IP409**
  - Differential digital I/O module
- **IP409E**
  - Same as IP409 plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- **IPSW-API-VXW**
  - VxWorks® software support package
- **IPSW-API-WIN32**
  - 32-bit Windows® DLL driver software support package
- **IPSW-API-WIN64**
  - 64-bit Windows® DLL driver software support package
- **IPSW-LINUX**
  - Linux® support (website download only)

**Accessories**
- See [www.acromag.com](http://www.acromag.com) for more information

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IP440A-x
Isolated Digital Input

IP440A Industrial I/O Pack (IP) modules provide 32 optically isolated inputs to safely monitor a wide range of digital input voltage levels. Isolation protects your computer system from noise, transient signals, and field wiring faults. The inputs are grouped into four 8-channel ports. Ports are isolated from the logic and each other.

Change-of-state interrupts are supported using paired channels. Debounce eliminates spurious interrupts from noise and switching transients for error-free edge detection. Closed-loop monitoring of critical control signals is easily accomplished using the IP440A in conjunction with Acromag’s IP445 digital output module.

Features

- 32 port-isolated input channels
- Three input ranges (different models):
  - IP440A-1: ±4 to ±18V DC or AC peak
  - IP440A-2: ±16 to ±40V DC or AC peak
  - IP440A-3: ±38 to ±60V DC or AC peak
- Interrupt support for each channel
- High speed processing (0 wait states)
- Programmable polarity of event interrupts (low-to-high or high-to-low transitions)
- Programmable debounce
- Input hysteresis
- Reverse polarity protection
- Software configuration (no jumpers or switches)

Benefits

- Software configuration allows “on-the-fly” changes without removing modules.
- Pins are compatible with IP445 output module for loopback monitoring
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.

Specifications

Digital Inputs

Input channel configuration: 32 optically isolated inputs.
Isolation: Logic and field connections are optically isolated. Individual ports are also isolated from each other. Input lines of individual ports share a common connection and are not isolated from each other. Logic and field lines are isolated from each other for voltages up to 250V AC rms 250V DC on a continuous basis (unit will withstand a 1500V AC dielectric strength test for one minute without breakdown).

Bipolar input voltage range:
- IP440A-1: ±4 to ±18V DC or AC peak
- IP440A-2: ±16 to ±40V DC or AC peak
- IP440A-3: ±38 to ±60V DC or AC peak

Input low-to-high threshold:
- IP440A-1: ±2V typical
- IP440A-2: ±6.8V typical
- IP440A-3: ±13.75V typical

Input response time:
- On to off: 15µS typical
- Off to on: 10µS typical

Interrupts: 32 channels configurable as below.
- High-to-low transitions
- Low-to-high transitions
- Change-of-state (two inputs required)

Debounce: Selectable for 4µS, 64µS, 1mS, or 8mS.

IP Compliance (ANSI/VITA 4)
Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
- Input/output (IOTx*), ID read (IOTx*), Interrupt select (INTx*).
- Access times (8MHz clock): 0 wait states (250ns cycle).
- Updates: Requires four 8-bit reads to update all channels.

Environmental

Operating temperature: 0 to 70°C (IP440A-1/2/3) or -40 to 85°C (IP440A-1E/2E/3E models).
Storage temperature: -55 to 150°C (all models).
Relative humidity: 5 to 95% non-condensing.
MTBF: Contact the factory.
Power:
- +5V (±5%): 150mA maximum, 65mA typical
- ±12V (±5%): 0mA (not used)

Ordering Information

Industry Pack Modules
- IP440A-1: Digital input, ±4 to ±18V input range
- IP440A-1E: Same as IP440A-1 plus extended temperature range
- IP440A-2: Digital input, ±16 to ±40V input range
- IP440A-2E: Same as IP440A-2 plus extended temperature range
- IP440A-3: Digital input, ±38 to ±60V input range
- IP440A-3E: Same as IP440A-3 plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW: VxWorks® software support package
- IPSW-API-WIN32: 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64: 64-bit Windows® DLL driver software support package
- IPSW-LINUX: Linux™ support (website download only)

Accessories
See www.acromag.com for more information

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**IP445A Isolated Digital Output**

IP445A modules provide 32 isolated solid-state relay outputs to safely control discrete devices.

A major IP445A advantage is its flexibility. The module supports wide range bipolar (AC or DC) voltage switching. Each port can be configured for high or low-side switches. The outputs are TTL-compatible when configured as low-side switches using on-board socketed pull-up resistors.

Isolation protects your computer system from noise, transient signals, and field wiring faults. Outputs are grouped into four 8-channel ports. Ports are isolated via solid-state relays from the logic and from each other. Readback buffers simplify output status monitoring. And for easy closed-loop monitoring of critical control signals, use the IP445A with an IP440A input module.

### Features

- 32 bipolar solid state relays
- High/low-side switch configuration
- Port-isolated output channels
- ±60V AC/DC voltage range
- High speed processing (0 wait states)
- TTL-compatible
- Failsafe power-up and system reset
- Output readback function
- Socketed pull-up resistors for low-side switching applications
- Current-limited solid-state relays

### Benefits

- Unique ground reference points for each port permits AC and DC switching on one module.
- Pin are compatible with IP440A input module for loopback monitoring.

### Specifications

**Digital Outputs**

- Output channel configuration: 32 isolated solid-state relays support AC or DC (high/low-side switching) operation.
- Isolation: Logic and field connections are optically isolated by solid-state relays. Individual ports are also isolated from each other. Output lines of an individual port share a common connection and are not isolated from each other. IP Logic and field lines are isolated from each other for voltages up to 250V AC or 354V DC on a continuous basis (unit will withstand a 1000V AC dielectric strength test for one minute without breakdown).
- Voltage range: 0 to ±60V DC or peak AC.
- Output ON current range: 140mA maximum continuous (up to 1A total per port).
- Turn on time: IP445A 1mS typical, 2mS maximum.
- Turn off time: IP445A 1mS typical, 2.5mS maximum.
- IP445AE 1mS typical, 2.5mS maximum.

*maximum values are measured at 85°C*

Output pull-up resistors: 4.7K ohms, socketed.

**IP Compliance (ANSI/VITA 4)**

Meets IP specifications per ANSI/VITA 4-1995.

- IP data transfer cycle types supported:
  - Input/output (IOSel*), ID read (IDSel*).
- Access times (8MHz clock): 0 wait states (250ns cycle).
- Updates: Requires four 8-bit writes to update all channels.

### Environmental

- Operating temperature: 0 to 70°C (IP445A) or -40 to 85°C (IP445AE model).
- Storage temperature: -40 to 150°C (all models).
- Relative humidity: 5 to 95% non-condensing.
- Power:
  - +5V (±5%) all outputs on: 200mA maximum.
  - ±5V (±5%) all outputs off: 8mA maximum.

### Ordering Information

**Industry Pack Modules**

- IP445A
  - Digital output module.
- IP445AE
  - Same as IP445A plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software** (see software documentation for details)

- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-QNX
  - QNX® software support package
- IPSW-API-WIN
  - Windows® DLL driver software support package
- IPSW-LINUX
  - Linux™ support (website download only)

See accessories documentation for additional information.
IP470A TTL Level Digital I/O

IP470A Industrial I/O Pack (IP) modules provide 48 general-purpose, bidirectional I/O points to economically monitor and control a large quantity of digital devices.

Each channel has interrupt capability for detecting low-to-high or high-to-low transitions. Change-of-state interrupts are supported using paired channels. Debounce eliminates interrupts from noise and switching transients for error-free edge detection.

IP470A outputs are full-featured. They have socketed pull-ups and provide closed-loop readback status monitoring. TTL level thresholds and 15mA sink capability allow a direct interface to standard relay racks. And for safety, outputs go to a failsafe state upon power-up/reset without any instantaneous toggling to prevent false alarms.

Features

- 48 bidirectional input/output channels
- TTL-compatible inputs
- CMOS-compatible open-drain outputs
- Interrupt support for each channel
- Input debounce
- Electronic overvoltage protection on individual channels
- Open drain outputs with socketed pull-ups
- Output readback registers

Benefits

- Output readback capability eliminates the need for additional input channels to verify the output channel state.
- Pinouts are compatible with industry-standard isolated I/O racks.
- Output channels do not “glitch” after a power-up/reset to eliminate false alarms.

Specifications

Digital Inputs

Input channel configuration: 48 buffered inputs.
Input voltage range: 0 to 5V DC.
Input signal threshold: 1.5V typical.
Input response time: 135ns.

Digital Outputs

Output channel configuration: 48 open-drain CMOS outputs.
Output voltage range: 0 to 5V DC.
Output “ON” current range: 0 to 15mA DC.
Output pull-ups: 4.7K ohms pull-ups installed in board sockets. With pull-ups removed, integrated 47.5K ohms nominal pull-ups are present.
Turn on time: 125ns, typical.
Turn off time: 3µS, typical.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.
IP data transfer cycle types supported:
Input/output (IDSel*), ID read (IDSel*), Interrupt select (INTSel*).
Access times (8MHz clock): 0 wait states (250ns cycle).
Updates: Requires six 8-bit read/writes to update all 48 channels.

Environmental

Operating temperature: 0 to 70°C (IP470)
or -40 to 85°C (IP470E model).
Storage temperature: -55 to 150°C (all models).
Relative humidity: 5 to 95% non-condensing.
MTBF: Contact the factory.
Power:
+5V (±5%): 160mA maximum.
±12V (±5%) from P1: 0mA maximum (not used).

Ordering Information

Industry Pack Modules
IP470A
48-channel digital I/O module.
IP470AE
Same as IP470A plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software

IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DLL driver software support package
IPSW-API-WIN64
64-bit Windows® DLL driver software support package
IPSW-LINUX
Linux™ support (website download only)

Accessories
See www.acromag.com for more information

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IP482/483/484 Counter/Timers

- IP482: Ten 16-bit counters – TTL
- IP483: Five 16-bit counters – TTL, and Two 16-bit counters – RS422
- IP484: Five 16-bit counters – RS422

Several models with a variety of configurations provide up to ten counter/timer channels for counting events, generating waveform control signals, measuring pulse-widths or periodic rates, and monitoring operations.

Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

Features
- Up to ten 16-bit counter/timers (IP482)
- Available with both TTL and RS422 driver interface (IP483 only)
- 8 or 32MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - Pulse width generation
- Extended temperature option (-40 to 85°C)

Benefits
- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.

Specifications

Counter/Timers
- Counter/timer configuration:
  - IP482: Ten 16-bit counters – TTL
  - IP483: Five 16-bit counters – TTL, and Two 16-bit counters – RS422
  - IP484: Five 16-bit counters – RS422
- Clock frequency: 8 or 32MHz depending on IP bus speed.
- Field I/O: Front panel SCSI-3 connector.

8MHz carrier operation:
- Selectable internal clock frequency: 0.5, 1, 2, 4, or 8 MHz.
- Minimum input event: 125ns.
- Minimum pulse measurement: 125ns.
- Minimum period measurement: 300ns.
- Minimum gate/trigger pulse: 125ns.

32MHz carrier operation:
- Selectable internal clock frequency: 2, 4, 8, 16, or 32 MHz.
- Minimum input event: 31.25ns.
- Minimum pulse measurement: 31.25ns.
- Minimum period measurement: 150ns.
- Minimum gate/trigger pulse: 31.25ns.

Mode accuracy (with external clocking):
- Waveform generation: Period is ±62nS.
- Pulse/period measurement: ±1 clock cycle.

Interrupts: Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).

Triggering/gate: Programmable via register write or external trigger. Minimum pulse width 125ns. Line may be used for gating of counter.

Counter trigger: Interface for triggering counter functions. Input level is TTL or RS422 differential digital.

Counter input: Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL or RS422 differential digital.

TTL compatibility: V_{HH} = 2.0V and V_{LL} = 0.8V. inputs are buffered and include 4.7K pull-up to +5V.

Counter output: Level is TTL or RS422 differential digital.

Environmental
- Operating temp.: 0 to 70°C or -40 to 85°C (E versions)
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: Consult factory.

MTBF: Hours at 25°C, MIL-HDBK-217F, Notice 2
- IP482: 2,043,105; IP483: 3,289,625; IP484: 7,065,540

Ordering Information

Industry Pack Modules

- IP482: Ten 16-bit counters – TTL
- IP482E: Same as IP482 plus extended temperature range
- IP483: Five 16-bit counters – TTL, and Two 16-bit counters – RS422
- IP483E: Same as IP483 plus extended temperature range
- IP484: Five 16-bit counters – RS422
- IP484E: Same as IP484 plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW: VxWorks® software support package
- IPSW-API-WIN32: 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64: 64-bit Windows® DLL driver software support package
- IPSW-LINUX: Linux™ support (website download only)

Accessories
See www.acromag.com for more information

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IP500A
Serial 232
Communication

These modules provide asynchronous serial and parallel communication interfaces for your system. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity. Full signal support for modern control is also included.

For more efficient data processing, each serial port is equipped with 16-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, and data set interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts from one port from blocking interrupts from another.

Features
- Four RS232E serial ports
- 16-byte FIFO buffers
- Interrupts with unique vectors for each port
- Programmable baud rate (up to 128Kbps)
  (Consult factory for custom rates up to 512Kbps)
- Individual modem control signals on each channel
- Handshake lines (RTS, CTS, DTR, DSR, DCD, RI)
- Line-break and false start-bit detection
- Industry-standard 16C550 family UART includes software-compatible 16C450 mode

Benefits
- 16-byte FIFO buffers minimize CPU interaction for improved system performance.
- Each serial channel provides full handshake support to simplify interfacing with modems.

Specifications

RS232E Serial Ports
Configuration: Independent, non-isolated serial ports with a common single return connection and configured as a DTE device.

Data rate: Programmable up to 128K bits/second using internal baud rate generator. Consult factory for custom baud rates up to 512K baud.

Max. cable length: 15 meters (50 feet) typical, limited to a total cable capacitive load of 2500pF.

Character size: 5 to 8 bits, software-programmable.

Parity: Odd, even, or no parity; software-programmable.

Stop bits: 1, 1-1/2, or 2 bits; software-programmable.

Data register buffers: 16-byte receive FIFO buffer and 16-byte transmit FIFO buffer.

Interrupts: Receiver line status (overrun, parity, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter holding register empty; or modem status (CTS, DSR, RI, or DCD).

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
- Input/output (IDSel*), ID read (IDSel*), Interrupt select (INTSel*).

Access times (8MHz clock):
- ID PROM read: 0 wait states (255ns cycle).
- Channel register read/write: 1 wait state (375ns cycle).

Interrupt select cycle: 2 wait states.

Environmental

Operating temperature: 0 to 70°C.

Storage temperature: -55 to 125°C.

Relative humidity: 5 to 95% non-condensing.

Power:
- +5V (±5%): 300mA maximum.
- ±12V (±5%) from P1: 75mA maximum.


Ordering Information

Industry Pack Modules
IP500A
- Four RS232E serial ports.
- Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DLL driver software support package
IPSW-API-WIN64
64-bit Windows® DLL driver software support package

Accessories
See www.acromag.com for more information
IP501-x
Serial 422/485 Communication

These modules provide an asynchronous serial communication interface for your system. They have four asynchronous, full-duplex RS422B serial ports. Since the transceivers are compatible with the RS485 standard, you can also use a full-duplex RS485 interface for multiple driver support. However, for true half-duplex RS485 operation, use the IP502.

Software-configuration quickly sets the baud rate, character-size, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 16, 64 or 128-character FIFO buffers on the transmit and receive lines.

Features
- Four asynchronous, full-duplex RS422B serial ports (full-duplex RS485 )
- 16, 64, or 128-byte FIFO buffers
- Programmable baud rate (up to 512Kbps) (Consult factory for custom rates up to 1Mbps)
- Individually controlled interrupts (unique vectors for each port)
- Handshake control signals (RTS, CTS) for each channel
- Extended temperature option (-40 to 85°C)
- Industry-standard 16C550 family UART includes software-compatible 16C450 mode

Benefits
- Failsafe receivers guarantee a high output state when the inputs are left open or floating.
- Internal diagnostics help detect faults.
- FIFO buffers minimize CPU interaction for improved system performance.

Specifications

RS422B Serial Ports
Configuration: Four independent, non-isolated RS422B serial ports with a common single return connection.
Data rate: Programmable up to 512K bits/second using internal baud rate generator. Consult factory for custom baud rates up to 1M baud.
Interface: Asynchronous serial only.
Character size: 5 to 8 bits, software-programmable.
Parity: Odd, even, or no parity, software-programmable.
Stop bits: 1, 1-1/2, or 2 bits, software-programmable.
Interrupts: Receiver line status (overrun error, parity error, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter holding register empty; or modem status (CTS). Multiple ports share the InReq0 line according to a shifting priority scheme based on the last interrupting port serviced.

UART
IP501-16: Texas Inst. TL16C554FN or equivalent.
IP501-64: Startech ST16C654CJ68.
IP501-128: Exar/StarTech XR16C854

IP Compliance (ANSI/VITA 4)
Meets IP specifications per ANSI/VITA 4-1995.
IP data transfer cycle types supported:
- Input/output (IDSel*), ID read (IDSel*)
- Access times (8MHz clock):
  - ID PROM read: 1 wait state (375nS cycle).
  - Channel register read/write: 2 wait states (500nS cycle).
  - Interrupt select read: 2 wait states.

Environmental
Operating temperature: 0 to 70°C (IP501-16/64/128) or -40 to 85°C (IP501-16EX/128EX/5024-xE).
Storage temperature: -40 to 125°C (all models).
Relative humidity: 5 to 95% non-condensing.
Power: +5V (±5%): 650mA maximum.
±12V (±5%) from P1: 0mA (not used).

Ordering Information

Industry Pack Modules
- IP501-16: Four serial ports with 16-byte FIFOs.
- IP501-16E: Same as IP501-16 plus extended temp. range
- IP501-64: Four serial ports with 64-byte FIFOs
- IP501-128: Four serial ports with 128-byte FIFOs
- IP501-128E: Same as IP501-128 plus extended temp. range

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
- IPSW-API-VXW "VxWorks" software support package
- IPSW-API-WIN32 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64 64-bit Windows® DLL driver software support package

Accessories
See www.acromag.com for more information
IP502
Serial 485
Communication

These modules provide an asynchronous serial communication interface for your system. The IP502 has four asynchronous, half-duplex RS485 serial ports. It provides a cost-efficient interface to RS485 multi-driver networks which support up to 32 nodes. However, for full handshaking support, use the full-duplex IP501.

Software-configuration quickly sets the baud rate, character-size, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 16-character FIFO buffers on the transmit and receive lines.

Features
- Four asynchronous, half-duplex RS485 serial ports
- 16-byte FIFO buffers
- Programmable baud rate (up to 512Kbps) (consult factory for custom rates up to 1M bps)
- Individually controlled interrupts (unique vectors for each port)
- Line-break and false start-bit detection
- Industry-standard 16C550 family UART includes software-compatible 16C450 mode

Benefits
- Fail-safe receivers guarantee a high output state when the inputs are left open or floating.
- Internal diagnostics help detect communication faults.
- 16-byte FIFO buffers minimize CPU interaction for improved system performance.

Specifications

RS485 Serial Ports
Configuration: Four independent, non-isolated RS485 serial ports with a common single return connection.
Data rate: Programmable up to 512Kbps using internal baud rate-generator and carrier 8MHz clock. Consult factory for custom baud rates up to 1M baud.
Interface: Asynchronous serial only.
Max. cable length: 1200 meters (4000 feet) typical. A signal repeater can extend this limit.
Character size: 5 to 8 bits, software-programmable.
Parity: Odd, even, or no parity; software-programmable.
Stop bits: 1, 1-1/2, or 2 bits; software-programmable.
Data register buffers: 16-byte receive FIFO buffers and 16-byte transmit FIFO buffers.
Interrupts: Receiver line status (overrun error, parity error, framing error, or break interrupt), received data available (FIFO level reached) or character time-out; transmitter holding register empty. Multiple ports share the IntReq0 line according to a shifting priority scheme based on the last interrupting port serviced.

UART
UART: Texas Instruments TL16C554FN.

IP Compliance (ANSI/VITA 4)
Meets IP specifications per ANSI/VITA 4-1995.
IP data transfer cycle types supported:
- Input/output (IOSe*), ID read (IDSe*).
Access times (8MHz clock):
- ID PROM read: 1 wait state (375ns cycle).
- Channel register read/write: 2 wait states (500ns cycle).
- Interrupt select read: 2 wait states.

Environmental
Operating temperature: 0 to 70°C.
Storage temperature: -40 to 125°C.
Relative humidity: 5 to 95% non-condensing.
Power:
- +5V (±5%): 300mA maximum.
- ±12V (±5%) from P1: 0mA (not used)

Ordering Information

Industry Pack Modules
IP502
Four RS485 serial ports.
Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DLL driver software support package
IPSW-API-WIN64
64-bit Windows® DLL driver software support package

Accessories
See www.acromag.com for more information
IP511-x
Isolated Serial 422 Communication

IP511 Industry Pack (IP) modules provide an isolated, asynchronous serial communication interface for your computer system.

Large FIFO buffers on the transmit and receive lines of each serial port enable more efficient data processing. When the buffer is full, an interrupt is sent to the CPU to read the data. To match your budget and performance requirements, you can order 16 or 64-byte (IP511-16/64) buffers.

Features

- Four asynchronous RS422B ports
- Isolated serial ports
- 16 or 64-byte FIFO buffers
- Programmable baud rate (up to 512Kbps)
- (Consult factory for custom rates up to 1Mbaud)
- Individually controlled interrupts (unique vectors for each port)
- Line break generation and detection
- False start bit detection
- Industry-standard 16C550 UART including software compatible 16C450 mode

Benefits

- Isolation protects computer system from ground loops and transient signals.
- FIFO buffers minimize CPU interaction for more efficient data processing.
- Internal diagnostics help detect communication faults.
- Priority shifting scheme prevents continuous interrupts from blocking other ports.

Large, 64-byte FIFO buffers reduce the processing burden on the CPU to increase the overall system performance.

Specifications

Serial Ports
Configuration: 4 independent, isolated, full-duplex, RS422B ports.
Interface: Asynchronous serial only.
Data rate: Programmable to 512K bits/second. Consult factory for custom baud rates up to 1M baud.
Character size: Programmable 5-8 bits.
Parity: Programmable odd, even, or no parity.
Stop bits: Programmable 1, 1-1/2, or 2 bits.
Data register buffers: Double-buffered (16C450 mode) or 16/64-byte FIFO buffered.
Interrupts: Receiver Line Status, Received Data Available or Character Timeout, Transmitter Holding Register Empty. IP511-64 includes interrupts for received XOFF signal/special character.
Receiver input resistance: 12K ohms minimum.
Differential input threshold: ±0.2V.
Bias resistors: Not required (driver always enabled).
Output short circuit current: 250mA maximum.
Termination resistors 120 ohms, socketed.
Maximum cable length: 1200m (4000 ft.).
Port power requirements: Isolated +5V ±5%, 5mA typical, each port.

UART
IP511-16: Texas Inst. TL16C554FN or equivalent.
IP511-64: Startech ST16C654CJ68.

IP Compliance (ANSI/VITA 4)
Meets IP specifications per ANSI/VITA 4-1995.
IP data transfer cycle types supported:
- Input/output (IO/SEL*), ID read (IDSEL*), Interrupt select (INTSEL*).
Access times (8MHz clock):
- ID PROM read: 1 wait state (375ns cycle).
- I/O register read/write: 2 wait states (500ns cycle).
- Interrupt select read: 2 wait states (500ns cycle).

Environmental
Operating temperature: 0 to 70°C.
Storage temperature: -40 to 125°C.
Relative humidity: 5 to 95% non-condensing.
Power:
- +5V (±5%): 160mA maximum.
- ±12V (±5%): 0mA (not used).

MTBF: Consult factory.

Ordering Information

Industry Pack Modules
IP511-16
Four RS422B ports with 16-byte FIFOs.
IP511-64
Four RS422B ports with 64-byte FIFOs.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DLL driver software support package
IPSW-API-WIN64
64-bit Windows® DLL driver software support package

Accessories
See www.acromag.com for more information

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IP512-x
Isolated Serial 485 Communication

IP512 Industry Pack (IP) modules provide an isolated, high-performance serial communication interface for your computer. Large FIFO buffers on the transmit and receive lines of each serial port enable more efficient data processing. When the buffer is full, an interrupt is sent to the CPU to read the data. To match your budget and performance requirements, you can order 16 or 64-byte (IP512-16/64) buffers.

Features

- Four asynchronous RS485 serial ports
- Isolated serial ports
- 16 or 64-byte FIFO buffers
- Software-programmable baud rate (up to 512kbps)
- Individually controlled interrupts (unique vectors for each port)
- Line break generation and detection
- False start bit detection
- Industry-standard 16C550 UART including software compatible 16C450 mode

Benefits

- Isolation protects computer system from ground loops and transient signals.
- FIFO buffers minimize CPU interaction for more efficient data processing.
- Internal diagnostics help detect communication faults.
- Priority shifting scheme prevents continuous interrupts from blocking other ports.

Specifications

Serial Ports
Configuration: 4 independent, isolated, RS485 ports.
Interface: Asynchronous serial only.
Data rate: Programmable to 512K bits/second using internal baud rate generator.
Character size: Programmable 5-8 bits.
Parity: Programmable odd, even, or no parity.
Stop bits: Programmable 1, 1-1/2, or 2 bits.
Data register buffers: Double-buffered (16C450 mode) or 16/64-byte FIFO buffered.
Interrupts: Receiver Line Status, Received Data Available or Character Timeout, Transmitter Holding Register Empty.
Receiver input resistance: 12K ohms minimum.
Differential input threshold: ±0.2V.
Bias resistors: 560 ohms pull-ups.
Output short circuit current: 250mA maximum.
Termination resistors: 120 ohms. Installed in board sockets (removable).
Port power requirements: Isolated +5V ±5%, 15mA maximum, each port.
Maximum cable length: 1200m (4000 ft.).

UART
IP512-16: Texas Inst. TL16C554FN or equivalent.
IP512-64: Startech ST16C654CJ68.

IP Compliance (ANSI/VITA 4)
Meets IP specifications per ANSI/VITA 4-1995.
IP data transfer cycle types supported:
- Input/output (IODE*), ID read (IODE*), Interrupt select (INTSE**).
Access times (8MHz clock):
- ID PROM read: 1 wait state (375ns cycle).
- I/O register read/write: 2 wait states (800ns cycle).
- Interrupt select read: 2 wait states (500ns cycle).

Environmental
Operating temperature: 0 to 70°C
Storage temperature: -40 to 125°C
Relative humidity: 5 to 95% non-condensing
Power:
- +5V (±5%): 160mA maximum.
- ±12V (±5%): 0mA (not used).
MTBF: Consult factory.

Ordering Information

Industry Pack Modules
IP512-16
- Four RS485 ports with 16-byte FIFOs.
IP512-64
- Four RS485 ports with 64-byte FIFOs.
Acromag offers a wide selection of Industry Pack Carrier Cards.

Software
IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DLL driver software support package
IPSW-API-WIN64
64-bit Windows® DLL driver software support package

Accessories
See www.acromag.com for more information
IP520
Octal Serial 232
Communication

These modules provide eight asynchronous serial communication ports from a single IP carrier slot. Software configuration helps you quickly set baud rates, character-sizes, stop bits, and parity. Signal support for RTS/CTS handshaking is also included.

For more efficient data processing, each serial port is equipped with 64-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, and data set interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts from one port from blocking interrupts from another.

Features
- Eight RS232E ports
- 64-byte transmit FIFO buffers
- 64-byte receive FIFO buffers
- Intermuxes with unique vectors for each port
- Programmable baud rate (up to 230Kbps)
- Individual handshake lines (RTS, CTS) on each channel
- Line-break and false start-bit detection
- Industry-standard 16C654 family UART includes software-compatible 16C450 mode

Benefits
- High-density design lowers per-port costs and saves IP carrier card slots for other functions.
- 64-byte FIFO buffers minimize CPU interaction for improved system performance.
- Each serial channel provides handshake support to simplify interfacing with modems.

Specifications

**RS232E Serial Ports**
- Configuration: Independent, non-isolated serial ports with a common single return connection and configured as a DTE device.
- Data rate: Programmable up to 230K bits/second using internal baud rate generator.
- Max. cable length: 15 meters (50 feet) typical, limited to a cable capacitive load of 2500pF.
- Character size: 5 to 8 bits, software-programmable.
- Parity: Odd, even, or no parity; software-programmable.
- Stop bits: 1, 1-1/2, or 2 bits; software-programmable.
- Data register buffers: Double buffered or 64-byte FIFO buffered, mode selectable.
- Interrupts: Receiver line status (overrun, parity, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter (FIFO level reached); or modem status (CTS).

**Environmental**
- Operating temperature: 0 to 70°C (IP520-64) or -40 to 85°C (IP520-64E/5018-xE).
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: +5V (±5%): 340mA maximum.

**IP Compliance (ANSI/VITA-4)**
- Meets IP specifications per ANSI/VITA-4 1996.
- IP data transfer cycle types supported:
  - Input/output (IDSel*), ID read (IDSel*), Interrupt select (INTSel*).
- Access times (8MHz clock):
  - ID PROM read: 0 wait state (250ns cycle).
  - Channel register read/write: 1 wait state (375ns cycle).
  - Interrupt register read/write: 2 wait states (500ns cycle).

Ordering Information

**Industry Pack Modules**
- **IP520-64**: Eight RS232E serial ports.
- **IP520-64E**: Same as IP520-64 plus extended temperature range.
  - Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- **IPSW-API-VXW**: VxWorks® software support package
- **IPSW-API-WIN32**: 32-bit Windows® DLL driver software support package
- **IPSW-API-WIN64**: 64-bit Windows® DLL driver software support package

**Accessories**
- See www.acromag.com for more information

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IP521
Octal Serial 422/485 Communication

These modules provide eight asynchronous serial communication ports from a single IP carrier slot. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 64-character FIFO buffers on the transmit and receive lines.

The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts from one port from blocking interrupts from another.

Features
- Eight asynchronous, full duplex RS422B serial ports (supports RS485)
- 64-byte transmit FIFO buffers
- 64-byte receive FIFO buffers
- Interrupts with unique vectors for each port
- Programmable baud rate (up to 921.6Kbps)
- Line-break and false start-bit detection
- Failsafe receivers
- Socketed termination and bias resistors
- Industry-standard 16C654 family UART includes software-compatible 16C450 mode

Benefits
- High-density design lowers per-port costs and saves IP carrier card slots for other functions.
- 64-byte FIFO buffers minimize CPU interaction for improved system performance.
- Extended temperature ranges deliver dependable operation in extreme conditions.

With eight serial ports per module, the IP521 provides a high-density solution to reduce costs and use fewer card slots.

Specifications

**RS422B Serial Ports**
- Configuration: Independent, non-isolated serial ports with a common single return connection.
- Data rate: 921.6K bits/second, maximum.
- Max. cable length: 1200 meters (4000 feet), typical.
- Character size: 5 to 8 bits, software-programmable.
- Parity: Odd, even, or no parity, software-programmable.
- Stop bits: 1, 1-1/2, or 2 bits, software-programmable.
- Data register buffers: Double buffered or 64-byte FIFO buffered, mode selectable.
- Line status: Receiver line status (overrun, parity, framing error, or break interrupt), receive/transmit FIFO level reached or character time-out, Xon/Xoff or special character detected.

**Environmental**
- Operating temperature: 0 to 70°C (IP521-64) or -40 to 85°C (IP521-64E/5028-xE).
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- Power: +5V (±5%): 340mA maximum.

**IP Compliance (ANSI/VITA-4)**
- IP data transfer cycle types supported:
  - Input/output (IDSel**), ID read (IDSel**), Interrupt select (INTSel**).
- Access times (8MHz clock):
  - ID PROM read: 0 wait state (250ns cycle).
  - Channel register read/write: 1 wait state (375ns cycle).
  - Interrupt register read/write: 2 wait states (500ns cycle).

Ordering Information

**Industry Pack Modules**
- IP521-64
  - Eight RS422B serial ports.
- IP521-64E
  - Same as IP521-64 plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

**Software**
- IPSW-API-VXW
  - VxWorks® software support package
- IPSW-API-WIN32
  - 32-bit Windows® DLL driver software support package
- IPSW-API-WIN64
  - 64-bit Windows® DLL driver software support package

**Accessories**
- See www.acromag.com for more information

All trademarks are the property of their respective owners.
Industry Pack Modules

**IP560  CAN Bus Interface Modules**

**Description**

IP560 modules provide two independent CAN bus interface channels. Each channel has an NXP SJA1000 CAN controller with a TJA1043 transceiver. The advantage of this design is that it allows reporting of bus fault conditions directly from the TJA1043 transceivers. It also has the ability to transmit, receive and perform message filtering on extended and standard messages.

Using CAN to network controllers, actuators, sensors, and transducers provides many benefits to system developers. First, the ready availability of multi-sourced components and tools can significantly reduce design time. Next, the small, light cables used by CAN help lower connection costs. Additionally, CAN has fewer connections which improves reliability.

**Key Features & Benefits**

- Two complete CAN bus interfaces
- NXP SJA1000 CAN bus controller with high-speed TJA1043 CAN transceiver
- 1000V isolation, channel-to-channel and channel-to-host (IP560-i models)
- ISO 11898 compliance for Part A (11-bit) and Part B extended (29-bit) arbitration IDs
- CAN 2.0B protocol compatibility (extended frame passive in PCA82C200 compatibility mode)
- Data rates of up to 1Mb/s
- Supports both 8MHz and 32MHz IP operation
- 0 to 70°C or -40 to 85°C operating temperature range
- TXD dominant clamping handler with diagnosis
- RXD recessive clamping handler with diagnosis
- TXD-to-RXD short-circuit handler with diagnosis
- Bus line short-circuit diagnosis
- Bus dominant clamping diagnosis
- PCA82C200 mode (BasicCAN mode is default)
- Extended receive buffer (64-byte FIFO)
- 24 MHz clock frequency

- PeliCAN mode extensions:
  - Error counters with read/write access
  - Programmable error warning limit
  - Last error code register
  - Error interrupt for each CAN-bus error
  - Arbitration lost interrupt with detailed bit position
  - Single-shot transmission (no re-transmission)
  - Listen only mode
    (no acknowledge, no active error flags)
  - Hot plugging support
    (software driven bit rate detection)
  - Acceptance filter extension
    (4-byte code, 4-byte mask)
  - Reception of ‘own’ messages
    (self reception request)

- Undervoltage detection on VBAT

- Listen-only mode for node diagnosis and failure containment
# Industry Pack Modules

## IP560 CAN Bus Interface Modules

### Performance Specifications

- **CAN Bus**
  - **Configuration**
    - Two independent CAN bus channels.
    - NXP SJ1000 CAN controller with TJA1041 transceiver.
  - **ISO 11898 standard**
    - Supports the standard data and remote frame as well as the extended data and remote frame according to CAN specification 2.0 Part A and Part B.
  - **Isolation**
    - IP560: Non-isolated. Logic and field commons have a direct electrical connection.
    - IP560-i: 1kV DC isolation.
  - **Maximum data rate**
    - 1Mb/S.

- **IP Compliance (ANSI/VITA 4)**
  - Meets IP specifications per ANSI/VITA 4-1995 (R2002).
  - Data transfer cycle types supported:
    - Input/output (IOSel*), ID read (IDSel*), Interrupt Select (INTSel*), Memory (MEMSel*).
  - **Access times (8MHz clock)**
    - ID PROM Read: 1 wait state (375nS cycle).
    - I/O Space Read: 1 wait state (375nS cycle).
    - I/O Space Write: 0 wait state (250nS cycle).
    - Interrupt Select Read: 1 wait state (375nS cycle).
    - Memory Space Read: 3 wait state (750nS cycle).
    - Memory Space Write: 2 wait state (625nS cycle).
  - **Access times (32MHz clock)**
    - ID PROM Read: 1 wait state (94nS cycle).
    - I/O Space Read: 1 wait state (94nS cycle).
    - I/O Space Write: 0 wait state (63nS cycle).
    - Interrupt Select Read: 1 wait state (94nS cycle).
    - Memory Space Read: 5 wait state (250nS cycle).
    - Memory Space Write: 2 wait state (156nS cycle).

### Environmental

- **Operating temperature**
  - 0 to 70°C or -40 to 85°C (E models).
- **Storage temperature**
  - -55 to 125°C.
- **Relative humidity**
  - 5 to 95% non-condensing.
- **Power**
  - IP560/IP560E
    - +5V (±5%): 92 mA typical, 110 mA mA maximum.
    - +12 Volts (±5%): 0.12 mA typical, 0.2 mA maximum.
  - IP560-i/IP560E-i
    - +5V (±5%): 123 mA typical, 275 mA maximum.
  - **MTBF**
    - Contact the factory.

### Ordering Information

#### IP Modules
- **IP560**
  - Dual-channel CAN bus interface module.
- **IP560E**
  - Same as IOS-560 plus extended temperature range.
- **IP560-i**
  - Dual-channel isolated CAN bus interface module.
- **IP560E-i**
  - Same as IOS-560-i plus extended temperature range.

#### Carrier Cards
See [www.acromag.com for more information.](http://www.acromag.com)

#### Software development tools
See [www.acromag.com for more information.](http://www.acromag.com)
Industry Pack Modules

**IP570 MIL-STD-1553 Bus Interface Modules**

**Description**

**IP570** modules offer a choice of one or two channels to interface sensors and other devices to a 1553 bus.

MIL-STD-1553 (1553) is a digital internal time division command/response multiplex data bus. It is a military standard which has become one of the basic tools used by the U.S. Department of Defense for integration of weapon systems. MIL-STD-1553 describes the method of communication and the electrical interface requirements for subsystems connected to the data bus. Since its introduction, MIL-STD-1553 applications have extended to systems integration of flight controls, propulsion controls, and vehicle management (electrical, hydraulic, environmental control, etc.).

MIL-STD-1553 is designed for use in one of three forms:

- **Bus Controller (BC)** – There is only one Bus Controller at a time on any MIL-STD-1553 bus. It initiates all message communication over the bus.
- **Remote Terminal (RT)** – Up to 31 remote terminals can be present in the system.
- **Bus Monitor (BM)** – A Bus Monitor cannot transmit messages over the data bus. Its primary role is to monitor and record bus transactions without interfering with operation of the Bus Controller or the Remote Terminals. Bus Monitor is often configured to record a subset of the transactions, based on criteria provided by the application program.

MIL-STD-1553 is ideal for these applications:

- Missile system testing
- Air traffic control system testing
- On-board aircraft system monitoring
- Satellite test systems
- Aircraft simulators

**Key Features & Benefits**

- One or two complete dual-redundant MIL-STD-1553 bus interfaces
- Supports both MIL-STD-1553 revision B and MIL-STD-1760 transceivers
- All channels are transformer coupled
- Data rates of up to 1Mb/s
- Supports both 8 MHz and 32MHz IP operation

- DDC Micro-ACE controls 1553 interface
  - Fully integrates 1553 Rev A/B Notice 2 terminal
  - Supports transceiver power-down options
  - Supports enhanced Mini-ACE architecture
  - Supports multiple Mini-ACE architecture
  - Supports 1553 Rev A/B Notice 2 and STANAG 3838 protocols
  - MIL-STD-1760 amplitude compliant transceiver
  - Provides highly flexible host-side interface
  - Compatible with Mini-ACE and ACE
  - Provides highly autonomous bus controller with built-in message sequence controller
  - Offers choice of single, dual, and circular remote terminal buffering options
  - Provides selective message monitor
  - Includes comprehensive built-in self-test
  - 16MHz clock
  - Software libraries and drivers available for Windows® 2000/XP/Vista/7 (32-bit), VxWorks® and Linux

**One or two 1553 interface channels ◆ DDC Micro-ACE controls 1553 interface**

**Acromag**

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Bulletin #8400-618f
IP570  MIL-STD-1553 Bus Interface Modules

**Performance Specifications**

- **MIL-STD-1553 Bus**
  - Configuration
    One or two dual-redundant MIL-STD-1553 Rev. A/B Notice 2 bus interface channels
  - Data memory
    64K RAM per channel.
  - Maximum data rate
    1MHz.

- **IP Compliance (ANSI/VITA 4)**
  - Meets IP specifications per ANSI/VITA 4-1995 (R2002).
  - Data transfer cycle types supported:
    Input/output (IOSel*), ID read (IDSel*), Interrupt Select (INTSel*), Memory (MEMSel*).
  - Access times (8MHz clock)
    ID PROM Read: 1 wait state (375nS cycle).
    I/O Space Read: 1 wait state (375nS cycle).
    I/O Space Write: 0 wait state (250nS cycle).
    Interrupt Select Read: 1 wait state (375nS cycle).
    Memory Space Read: 3 wait state (750nS cycle).
    Memory Space Write: 1 wait state (375nS cycle).
  - Access times (32MHz clock)
    ID PROM Read: 1 wait state (94nS cycle).
    I/O Space Read: 1 wait state (94nS cycle).
    I/O Space Write: 0 wait state (63nS cycle).
    Interrupt Select Read: 1 wait state (94nS cycle).
    Memory Space Read: 9 wait state (344nS cycle).
    Memory Space Write: 8 wait state (313nS cycle).

- **Environmental**
  - Operating temperature
    0 to 70°C or -40 to 85°C (E models).
  - Storage temperature
    -55 to 125°C.
  - Relative humidity
    5 to 95% non-condensing.
  - Power
    - IP571
      +5V: 0.3A typical, 0.6A maximum.
      +12V: 0A maximum.
      -12V: 0A maximum.
    - IP572
      +5V: 0.6A typical, 1.2A maximum.
      +12V: 0A maximum.
      -12V: 0A maximum.
  - MTBF
    Contact the factory.

**Ordering Information**

- **IP Modules**
  - IP571
  - IP571E
    Same as IP571 plus extended temperature range.
  - IP572
    Dual-channel MIL-STD-1553 bus interface module.
  - IP572E
    Same as IP572 plus extended temp. range.

- **Accessories**
  - IP-IOS570-EDK
    Engineering Design Kit (one kit required).
    Contains 1553 library to allow interface to standard Acromag drives.
  - 5028-570
    Cable with SCSI II style connectors for use when IP571 or IP572 module is installed on the VME carrier board model AVME9668. 3 feet long.

- **Carrier Cards**
  See [www.acromag.com](http://www.acromag.com) for more information.
APC424 Digital I/O (Differential & TTL) and Counter/Timers

The APC424 provides 24 differential input/outputs, 16 TTL input/output channels, and four 16-bit multifunction counter/timers.

The 16 TTL input/output channels can be programmed as inputs or as outputs on an individual channel basis. The 24 differential input/output channels are programmed as inputs or outputs on a 4-channel port basis. All input channels can be enabled for change of state, low, or high level transition interrupts.

Four 16-bit multifunction counters/timers can be configured for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers.

Features

Digital I/O
- 40 digital input/output channels: 24 differential input/outputs, 16 TTL input/output channels
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

Counter/Timer
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TTL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset are fail-safe

Approvals
- CE marked, FCC Part 15, Class B

Specifications

Differential Digital I/O
I/O channel configuration: 24 bidirectional differential signals. Direction is controlled as a 4-channel group.
Differential driver output voltage with 50 ohm load: 2V minimum, 5V maximum
Common mode output voltage: 3V maximum
Minimum input resistance: 12K ohms
Termination resistors: 120 ohm termination resistor networks are installed in sockets.

TTL Digital I/O
I/O channel configuration: 16 bidirectional TTL transceivers with direction controlled independently (shared as counter/timer control signals).
Reset/power-up condition: All channels default to input.

Digital Input
Input voltage range: 0 to 5V DC
Input signal threshold, low to high: 1.5V typical
Input signal threshold, high to low: 3.5V typical

Digital Output
Output voltage range: 0 to 5V DC
Output ON current range: -32 to 32mA
Output pullups: 4.7K ohm socketed resistors

Input Interrupts
40 channels of interrupts are available for high-to-low, low-to-high, or any change-of-state event type.
Debounce: Selectable for each channel. User-selectable (5.6µs, 50.4µs, 408.8µs, or 3.276mS).

Counter/Timers
Counter/timer configuration: Four 16-bit counters can be configured into two 32-bit counters.

Counter input: Each counter has an INA, INB, and INC port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.
Counter output: Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6µs pulse upon counter function completion. Programmable as active high or low.

Environmental
Operating temperature: 0 to 70°C (APC424) or -40 to 85°C (APC424E)
Storage temperature: -55 to 125°C
Relative humidity: 5 to 95% non-condensing
MTBF: Consult factory.
Power: 216mA at +5V, typical.

PCB Bus Compliance
This device meets or exceeds all written PCI local bus specifications per rev 2.2 dated December 1998.
System base address: This board operates in memory space.
It consumes 4K of memory space.
Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation.
Interrupts (INTA): Interrupts requested on Interrupt A.

Ordering Information

PCL Boards
APC424: Digital I/O and counter/timer module
APC424E: Same as APC424 plus extended temp. range

Software
PMCSW-API-VXW: VxWorks® software support package
PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
PCISW-API-LNX: Linux® support (website download only)

Accessories
5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
5028-432: Cable, shielded, SCSI-3 connector both ends
Visit web page for more information
APC464
Digital I/O (TTL) and Counter/Timers

The APC464 provides 64 TTL digital input/output channels and four 16-bit multi-function counter/timers. All 64 I/O channels, when set as inputs, support configuration for interrupts on either a change-of-state or on a high-to-low or low-to-high transition. A debounce timer is selectable to help filter out false transitions.

Four 16-bit multifunction counters/timers are configurable for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers.

Features
Digital I/O
- 64 TTL digital input/output channels:
  - 16 individually programmable channels
  - 48 channels configured on an 8-bit port basis
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

Counter/Timer
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TTL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset is failsafe

Approvals
- CE marked, FCC Part 15, Class B

Specifications

Digital I/O
-I/O channel configuration:
  - 64 bidirectional TTL transceivers.
  - Channels 0-47: Direction controlled on a port basis.
  - Channels 48-63: Direction controlled independently (shared as counter/timer control signals).
- Reset/power-up condition: All channels default to input.

Digital Input
- Input voltage range: 0 to 5V DC.
- Input signal threshold (channels 0-47):
  - Low to high: 2.0V typical.
  - High to low: 0.8V typical.
- Input signal threshold (channels 48-63):
  - Low to high: 3.5V typical.
  - High to low: 1.5V typical.
- Intermittents: 64 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.
- Debounce: Selectable for each channel. User-selectable (5.6μS, 50.4μS, 408.8μS, or 3.276mS).

Digital Output
- Output voltage range: 0 to 5V DC.
- Output ON current range (channels 0-47): -15 to 64mA.
- Output ON current range (channels 48-63): -32 to 32mA.
- Output pullups: 4.7K ohm socketed resistors.

Counter/Timers
- Counter/timer configuration: Four 16-bit counters can be configured into two 32-bit counters.
  - Functions: Pulse width modulation, watchdog timer, event counting, frequency measurement, period measurement, pulse width measurement, and one-shot/repetitive.
- Counter input: Each counter has an IN_A, IN_B, and IN_C port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.
- Counter output: Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6μS pulse upon counter function completion. Programmable as active high or low.

Counter clock frequencies:
- Selectable for 20MHz, 10MHz, 5MHz, 2.5MHz, 1.25MHz or external up to 8MHz.
- Minimum I/P event: 100nS (debounce disabled).
- Minimum pulse measurement: 100nS (debounce disabled).
- Minimum period measurement: 200nS (debounce disabled).
- Minimum gate/trigger pulse: 100nS (debounce disabled).

PCI Bus Compliance
- This device meets or exceeds all written PCI local bus specifications per rev. 2.2 dated December 1998.
- System base address: This board operates in memory space. It consumes 4K of memory space.
- Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation.
- Intermittents (INTA#): Interrupts requested on Interrupt A.

Environmental
- Operating temperature: 0 to 70°C (APC464) or -40 to 85°C (APC464E)
- Storage temperature: -55 to 125°C
- Relative humidity: 5 to 95% non-condensing
- MTBF: Consult factory.
- Power: 160mA at +5V, typical.

Ordering Information

PCI Boards
- APC464: Digital I/O and counter/timer module
- APC464E: Same as APC464 plus extended temp. range

Software
- PMCSW-API-VxW: VxWorks® software support package
- PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
- PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
- PCISW-API-LNX: Linux® support (website download only)

Accessories
- 5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
- 5028-432: Cable, shielded, SCSI-3 conn. both ends

Visit webpage for more information
APC48x Counter/Timer with Quadrature

- **APC482**: Ten 16-bit counters — TTL
- **APC483**: Four 16-bit counters — TTL and Four 32-bit counters — RS422
- **APC484**: Six 32-bit counters — RS422

Several models with a variety of configurations provide up to ten counter/timer channels for counting events, generating waveform control signals, measuring pulse-widths, periodic rates, or quadrature position and monitoring operations.

Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

**Features**
- Ten 16-bit counter/timers (APC482 only) or six 32-bit counter/timers (APC484 only)
- Two 16-bit counters can be combined to create one 32-bit counter
- Available with both TTL and RS422 driver interface (APC483 only)
- 16 bi-directional digital I/O
- 20MHz clock time base
- Counter/timer functions: 
  - Quadrature position measurement
  - Pulse width modulation
  - Watchdog timer
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - One-shot/repetitive
- Extended temperature option (-40 to 85°C)

**Benefits**
- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.

**Approvals**
- CE marked, FCC Part 15, Class B

**Specifications**

**Counter/Timers**
- Counter/timer configuration:
  - APC482: Ten 16-bit counters — TTL
  - APC483: Four 16-bit counters — TTL
  - APC484: Six 32-bit counters — RS422
  - Other I/O mixes can be made available as specials.
- Clock frequency: 20MHz.
- Field I/O: Front panel SCSI-3 connector.
- Speed (with 20MHz internal clock):
  - Maximum output pulse/square wave freq.: 200nS.
  - Minimum event pulse width: 100nS.
  - Minimum pulse width measurement: 100nS.
  - Minimum period measurement: 200nS.
- Mode accuracy (with external clocking):
  - Waveform generation: Period is ±125nS.
  - Watchdog: Timeout occurs within ±1 clock cycle.
  - Pulse/period measurement: ±1 clock cycle.
- Internal clocks: Programmable 1.25, 2.5, 5, 10 or 20MHz via the counter control register.
- External clocks: Supported on a per-counter basis via clock line. Maximum frequency 20MHz.
- Interrupts: Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).
- Triggering/gate: Programmable via register write or external trigger. Minimum pulse width 100nS. Line may be used for gating of counter.
- Counter trigger: Interface for triggering counter functions. Input level is TTL or RS422 differential digital.
- Counter input: Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL or RS422 differential digital.
- TTL compatibility: VIH = 2.0V and VIL = 0.8V. Inputs are buffered and include 4.7K ohm pull-ups to +5V.
- Counter output: Level is TTL or RS422 differential digital.

**Digital I/O**
- I/O channel configuration:
  - 16 bi-directional TTL transceivers
  - Direction controlled as 16 independent channels.

**Ordering Information**

**PCI Boards**
- **APC482**: Ten 16-bit counters — TTL
- **APC482E**: APC482 with extended temperature range.
- **APC483**: Four 16-bit counters — TTL
- **APC483E**: APC483 with extended temperature range.
- **APC484**: Six 32-bit counters — RS422
- **APC484E**: APC484 with extended temperature range.

**Software**
- PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
- PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
- PCISW-API-LNX: Linux® support (website download only)

**Accessories**
- 5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
- 5028-432: Cable, shielded, SCSI-3 connector both ends

Visit web page for more information
APC730 Multi-function I/O

- Analog Input
- Analog Output
- Digital I/O
- Counter/Timer

APC730 I/O boards provide a variety of I/O functions on a single card. These new high-density boards perform both high-speed and high-resolution A/D and D/A conversion and also handle digital I/O plus counter/timer functions.

Now you can conserve your precious card slots and still get all the I/O functionality you need. The APC730 is designed for extreme versatility with many deluxe features to meet most applications. However, the APC730 is still very budget-friendly.

Features

Analog Inputs
- 16 differential or 32 single-ended inputs (±3.3V, ±5V, ±10V, 0-5V, and 0-10V ranges)
- 16-bit ADC with 512 sample RAM
- 10μS conversion time (100kHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable internal timer

Analog Outputs
- Eight analog output channels (±10V range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- 12.375μS settling time (80.8kHz throughput)
- Interrupt on user-programmable FIFO threshold

Digital I/O
- 16 TTL bidirectional input/outputs

Counter/Timer
- One 32-bit counter/timer

Approvals
- CE marked, FCC Part 15, Class B

Specifications

Analog Input
- Input configuration: 16 differential or 32 single-ended channels multiplexed to a single A/D converter.
- A/D resolution: 16 bits.
- Input ranges: ±3.3V, ±5V, ±10V, 0-5V, and 0-10V.
- Maximum throughput rate:
  - One channel updated at a time: 10μS
  - 16 channels (maximum): 160μS
  - 32 channels (maximum): 320μS
- Data sample memory: 512 samples shared by all channels.
- A/D trigger: Internal timer, external source, software.
- On-board timer: One user-programmable timer for analog input acquisition control.
- System accuracy: ±3 LSB typ. (SW calib., gain=1, 25°C).
- Data format: Straight binary or binary two’s compliment.
- Input overvoltage protection: -40 to 55V power off.
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

Analog Output
- Output configuration: 8 single-ended channels, each controlled by its own independent D/A converter.
- D/A resolution: 16 bits.
- Output range: ±10V.
- Maximum throughput rate:
  - Outputs updated simultaneously or individually: 12.375μS
  - 8 different channels: 12.375μS
- DAC programming: Via independent channel registers or through shared FIFO.
- Data sample memory: 1024 sample FIFO shared by all channels.
- D/A trigger: Internal timer, external source, software.
- On-board timer: One user-programmable timer for analog output control.
- System accuracy: 0.0076% of 20V span max. error corrected (i.e. calibrated) at 25°C with output unloaded.
- Data format: Straight binary.
- Output at reset: 0V.

Digital I/O
- I/O channel configuration: 16 TTL transceivers, input/output direction selectable on an 8-channel basis.

Digital Input
- Input voltage range: 0 to 5V DC.
- Input signal threshold: Low to high: 2.0V typical.
- High to low: 0.8V typical.
- Input response time: 250 nanoseconds.
- Interrupts: 16 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.
- Debounce: Individual debounce selectable on each channel. User-selectable (4μS, 64μS, 1mS, or 8mS).

Digital Output
- Output voltage range: 0 to 5V DC.
- Output ON current range: -15 to 64mA.
- Output pullups: 4.7k ohm socketed resistors.

Counter/Timers
- Counter/timer configuration: one 32-bit counter (requires use of channels 2 through 5 of digital I/O section).

Functions:
- Watchdog timer, event counting, pulse measurement, period measurement, output waveform generation (pulse width modulation, continuous pulse, single pulse, continuous waveform).
- Internal clock: Programmable 1, 4, 8MHz.
- External clock: 3.4MHz.
- Input voltage range: 0 to 5V DC.
- Output voltage range: 0 to 5V with 4.7 ohm pull-up.
- Maximum of 0 to 35V with external supply.

Continued on the next page.
Specifications (continued)

PCI Bus Compliance
This device meets or exceeds all written PCI local bus specifications per rev. 2.2 dated June 1998.
System base address: This board operates in memory space. It consumes 1K of memory space.
Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation: 32-bit read or write accesses implemented as two 16-bit transfers.
Interrupts (INTA#): Interrupt A is used to request an interrupt.

Environmental
Operating temperature: 0 to 70°C
(E version -40 to 85°C)
Storage temperature: -40 to 85°C.
Relative humidity: 5 to 95% non-condensing
Power: 245mA at +5V (290mA maximum)
MTBF: Consult factory.

Ordering Information
I/O Boards
APC730
Multi-function I/O board
APC730E
Same as APC730 plus extended temperature range
Software
PMCSW-API-VXW: VxWorks® software support package
PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
PCISW-API-LNX: Linux™ support (website download only)

Ordering Information

Accessories
5025-288
Termination panel, SCSI-3 connector, 68 screw terminals
5028-432
Cable, shielded, SCSI-3 connector at both ends

Visit our web page for more information
Acromag offers a wide variety of high-performance I/O solutions for CompactPCI computers.

### AcPC Series Products

#### Analog Input Modules
- **AcPC330** 16-bit A/D
- **AcPC341** 14-bit A/D, simultaneous conversion

#### Digital I/O Modules
- **AcPC424** Digital I/O (differential and TTL) with counter/timers
- **AcPC464** Digital I/O (TTL) with counter/timers

#### Counter/Timer Modules
- **AcPC482** Counter/timer, quadrature, TTL
- **AcPC483** Counter/timer, quadrature, TTL/RS422
- **AcPC484** Counter/timer, quadrature, RS422

#### Multi-Function I/O Modules
- **AcPC730** Analog input, analog output, digital I/O, counter/timer

#### Accessories
- **Software** Support for VxWorks, Windows, and Linux
- **Hardware** Termination panels and cables

See all CompactPCI boards on Acromag’s website

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### CompactPCI I/O Boards

Our new CompactPCI boards are based on technology and circuit designs with time-tested reliability in thousands of installations. Several models are now available for a variety of analog and digital I/O functions. These modules offer an unmatched balance of performance, features, and price for the best value in CompactPCI I/O.

Acromag CompactPCI boards are well-suited for COTS and industrial projects. Great effort goes into selecting high-performance parts to withstand the demands of military, aerospace, and manufacturing applications. Most models are available with extended temperature ranges for reliable operation in harsh environments. Acromag products are also designed for the long lifecycles required for OEM and defense projects.

And to simplify the implementation of Acromag I/O modules, a variety of software development tools are available. Function libraries provide example routines to integrate Acromag’s I/O with your application code and establish communication with your other embedded computer boards.

#### Benefits
- High channel density saves money
- Independent A/D and D/A converters on each channel improve performance
- Multi-function I/O board can replace up to four single function boards
- Versatile counter/timer boards can perform many functions including quadrature position measurement.
- Rugged design and long product lifecycles are ideal for COTS applications
- Software development tools for a variety of operating systems speed system integration
- One stop shopping for termination panels and cables saves time

These new boards were designed for applications requiring long lifecycles and dependable operation in harsh environments.
AcPC330
16-bit A/D Analog Input

AcPC330 boards provide fast, high resolution A/D conversion.

The AcPC330 has many features to improve your overall system throughput rate. You can scan all channels or define a subset for more frequent sampling. Burst mode scans selected channels at the maximum conversion rate. Uniform mode performs conversions at user-defined intervals. Both modes can scan continuously, or execute a single cycle upon receiving a trigger.

“Mail box” memory allows the CPU to read the latest data in 32 storage buffer registers without interrupting the A/D converter.

Features

- 16-bit A/D converter (ADC)
- 8µS conversion time (125KHz)
- 16 differential or 32 single-ended inputs (±5V, ±10V, 0-5V, and 0-10V input ranges)
- Individual channel mailbox with one or two storage buffer registers per channel
- Programmable scan control
- Four scanning modes
- User-programmable interval timer
- External trigger input and output
- Programmable gain for individual channels
- Post-conversion interrupts

Benefits

- “Mailbox” memory eliminates scanning interruptions for optimum throughput.
- Data register indicates new and missed (overwritten) data values in the mail box.
- Programmable interrupts simplify data acquisition by providing greater control.

Specifications

Analog Input

- Input configuration: 16 differential or 32 single-ended channels.
- A/D resolution: 16 bits.
- Input ranges: ±5V, ±10V, 0-5V, and 0-10V.
- Programmable gains: 1x, 2x, 4x, 8x.

Maximum throughput rate:
- Only one channel can be updated at a time.
- One channel: 125kHz (8µS/conversion)
- [66kHz (15µS/conversion) recommended]
- 16 channels (differential): 4.2kHz (240µS/16 ch)
- 32 channels (single-ended): 2.1kHz (480µS/32 ch).

Data sample memory: Individual channel mailbox with one or two storage buffer registers per channel

A/D triggers: External and software.

Internal timer: One user programmable timer for analog input acquisition control.

System accuracy: ±0.15 LSB (0.005%) typical

Data format: Straight binary or two’s complement.

Input overvoltage protection: ±20V to ±40V with power on, ±35V to ±55V power off.

Common mode rejection ratio (60Hz): 96dB typical.

Environmental

- Operating temperature: 0 to 70°C (E version -40 to 85°C).
- Storage temperature: -55 to 100°C.
- Relative humidity: 5 to 95% non-condensing.
- MTBF: Consult factory.
- Power: 290mA at +5V (350mA maximum).

CompactPCI bus Compliance

Meets PCI spec. V2.2 and PICMG 2.0, R3.0.

Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.

Interrupts (INTA#): Interrupt A is used to request an interrupt.

Plug-and-Play: The system maps the base address into the PCI bus 32-bit memory space.

Ordering Information

I/O Boards

- AcPC330: Analog input board
- AcPC330E: Same as AcPC330 plus extended temperature range

Software

- PMCSW-API-VXW: VxWorks software support package
- PCISW-API-WIN32: 32-bit Windows’ DLL Driver software package
- PCISW-API-WIN64: 64-bit Windows’ DLL Driver software package
- PCISW-API-LNX: Linux’ support (website download only)

Accessories

- 5028-378: Termination panel, SCSI-2 connector, 50 screw terminals
- 5028-438: Cable, shielded, SCSI-2 connector at both ends

Visit web page for more information
AcPC341 boards provide fast, high resolution, simultaneous A/D conversion of eight channels.

These boards have sixteen analog inputs which are sampled as two eight-channel banks. Eight A/D converters (ADCs) permit simultaneous conversion of all eight channels in a bank. All 16 channels share two generous 512-sample memory buffers. Conversion of each bank requires only 8µs, and all 16 channels can be sampled in just 16µs.

Flexible configuration options give you extensive control over the conversion process. The channels or bank to be converted, timing, scan mode, and other parameters are user-programmable. Interrupt support adds further control to interrupt upon a programmable threshold when the data in memory exceeds the set threshold.

Features
- 16 differential inputs (±10V DC input range)
- Eight 14-bit A/D converters with simultaneous multi-channel conversion
- 8µS conversion time (125KHz) for 8-channel bank
- Two 512-sample memory buffers
- Data tagging for channel identification
- Programmable conversion timer
- Programmable channel conversion control
- External trigger input and output
- Continuous and single-cycle conversion modes
- Interrupt generation for memory full threshold conditions
- Precision calibration voltages stored on-board

Benefits
- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.

Specifications

**Analog Inputs**
- Input channels: 16 differential.
- A/D resolution: 14 bits.
- Input range: ±10V.
- Maximum throughput rate:
  - Eight channels can be simultaneously acquired.
  - One channel: 125KHz (8µS/conversion)
  - 8 channels (same bank): 1MHz (8µS/8 channels)
  - 16 channels (high & low banks): 1MHz (16µS/16 ch. at maximum 2.2K ohm source resistance).
- Data sample memory: Two 512-sample memory buffers allows writing to one buffer while reading from the other.
- A/D triggers: Internal timer, external, and software.
- Internal conversion timer: User-programmable delay between simultaneous conversion of 8-channel banks.
- Maximum delay is 2.09 second interval.
- System accuracy: ±2.4 LSB (0.014%).
- Data format: Binary two’s compliment.
- Overvoltage protection: ±25V (power on), ±40V (off).
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

**Environmental**
- Operating temperature: 0 to 70°C
  (E version -40 to 85°C).
- Storage temperature: -55 to 105°C.
- Relative humidity: 5% to 95% non-condensing.
- MTBF: Consult factory.
- Power: 265mA at +5V (320mA maximum).

**CompactPCI bus Compliance**
- Meets PCI spec. V2.2 and PICMG 2.0, R3.0.
- Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.
- Interrupts (INTA): Interrupt A is used to request an interrupt.
- Plug-and-Play: The system maps the base address into the PCI bus 32-bit memory space.

**Ordering Information**
- AcPC341
  - Analog input board
- AcPC341E
  - Same as AcPC341 plus extended temperature range

**Software**
- PMCSW-API-VXW
  - VxWorks® software support package
- PCISW-API-WIN32
  - 32-bit Windows® DLL Driver software package
- PCISW-API-WIN64
  - 64-bit Windows® DLL Driver software package
- PCISW-API-LNX
  - Linux® support (website download only)

**Accessories**
- 5028-378
  - Termination panel, SCSI-2 connector, 50 screw terminals
- 5028-438
  - Cable, shielded, SCSI-2 connector at both ends

Visit web page for more information
AcPC424
Digital I/O
(Differential & TTL) and
Counter/Timers

The AcPC424 provides 24 differential input/outputs, 16 TTL input/output channels, and four 16-bit multifunction counter/timers.

The 16 TTL input/output channels can be programmed as inputs or outputs on an individual channel basis. The 24 differential input/output channels are programmed as inputs or outputs on an 4-channel port basis. All input channels can be enabled for change of state, low, or high level transition interrupts.

Four 16-bit multifunction counters/timers can be configured for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers.

**Features**

**Digital I/O**
- 40 digital input/output channels:
  - 24 differential input/outputs
  - 16 TTL input/output channels
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

**Counter/Timer**
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TTL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset are failsafe

**Specifications**

**Differential Digital I/O**
I/O channel configuration: 24 bidirectional differential signals. Direction is controlled as a 4-channel group.

Differential driver output voltage with 50 ohm load:
- 2V minimum, 5V maximum.
Common mode output voltage: 3V maximum.
Minimum input resistance: 12K ohms.
Termination resistors: 120 ohm termination resistor networks are installed in sockets.

**TTL Digital I/O**
I/O channel configuration: 16 bidirectional TTL transceivers with direction controlled independently (shared as counter/timer control signals).

Reset/power-up condition: All channels default to input.

**Digital Input**
Input voltage range: 0 to 5V DC.
Input signal threshold, low to high: 3.5V typical.
Input signal threshold, high to low: 1.5V typical.

**Digital Output**
Output voltage range: 0 to 5V DC.
Output ON current range: -32 to 32mA.
Output pullups: 4.7K ohm socketed resistors.

**Input Interrupts**
40 channels of interrupts are available for high-to-low, low-to-high, or any change-of-state event type.

Debounce: Selectable for each channel. User-selectable (5.6µS, 50.4µS, 408.8µS, or 3.276mS).

**Counter/Timers**
Counter/timer configuration: 16-bit counters can be configured into two 32-bit counters.

Counter input:
- Each counter has an INX, INY, and INp port. These TTL input signals control start/stop, reload, event input, external clock, trigger, and up/down operations.

Counter output:
- Each counter has one output signal. The TTL output is used for waveform output, watchdog active indicator, or 1.6µS pulse upon counter function completion. Programmable as active high or low.

**CompactPCI Boards**

- AcPC424: Digital I/O and counter/timer module
- AcPC424E: Same as AcPC424 plus extended temp. range

**Software**
- PMCSW-API-VXW: VxWorks® software support pkg.
- PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
- PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
- PCISW-API-LNX: Linux® support (website download only)

**Accessories**
- 5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
- 5028-432: Cable, shielded, SCSI-3 connector both ends

Visit web page for more information
AcPC464
Digital I/O and Counter/Timers

The AcPC464 module provides 64 digital input/output channels and four 16-bit multifunction counter/timers. All 64 I/O channels, when set as inputs, support configuration for interrupts on either a change-of-state or on a high-to-low or low-to-high transition. A debounce timer is selectable to help filter out false transitions.

Four 16-bit multifunction counters/timers are configurable for pulse width modulated output, watchdog timer, event counter, frequency measurement, pulse width measurement, period measurement, or one shot pulse output. The four 16-bit counters can also be configured into two 32-bit counter/timers.

Features

Digital I/O
- 64 digital input/output channels:
  - 16 individually programmable channels
  - 48 channels configured on an 8-bit port basis
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

Counter/Timer
- Four 16-bit or two 32-bit counter/timer channels (control lines shared with 16 TLL I/O channels)
- Six operating modes:
  - Pulse width modulation
  - Watchdog timer
  - Event counter
  - Frequency measurement
  - Pulse width or period measurement
  - One-shot and repetitive one-shot
- TTL-compatible thresholds
- Power-up and system reset is failsafe

Specifications

Digital I/O
I/O channel configuration:
- 64 bidirectional TTL transceivers.
- Channels 0-47: Direction controlled on a port basis.
- Channels 48-63: Direction controlled independently (shared as counter/timer control signals).

Digital Input
- Input voltage range: 0 to 5V DC.
- Input signal threshold (channels 0-47):
  - Low to high: 2.0V typical.
  - High to low: 0.8V typical.
- Input signal threshold (channels 48-63):
  - Low to high: 3.5V typical.
  - High to low: 1.5V typical.

Interrupts: 64 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.
- Debounce: Selectable for each channel. User-selectable (5.6µS, 50.4µS, 408.8µS, or 3.276mS).

Counter/Timers
- Four 16-bit or two 32-bit counter/timer channels:
  - Configurable as active high or low.
  - 48 channels configured on an 8-bit port basis.
  - Channels 0-47:
    - Frequency measurement, period measurement, or one shot pulse output.
  - Channels 48-63:
    - Direction controlled independently.

Counter clock frequencies: Selectable for 20MHz, 10MHz, 5MHz, 2.5MHz, 1.25MHz or external up to 8MHz.
- Minimum I/P event: 100ns (debounce disabled).
- Minimum pulse measurement: 100ns (debounce disabled).
- Minimum period measurement: 200ns (debounce disabled).
- Minimum gate/trigger pulse: 100ns (debounce disabled).

CompactPCI bus Compliance
- Meets PCI spec. V2.2 and PICMG 2.0, R3.0.
- Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.
- Interrupts (INTA#): Interrupts requested on Interrupt A.
- Plug-and-Play: The system maps the base address into the PCI bus 32-bit memory space.

Environmental
- Operating temperature: 0 to 70°C (AcPC464) or -40 to 85°C (AcPC464E).
- Storage temperature: -55 to 125°C.
- Relative humidity: 5 to 95% non-condensing.
- MTBF: Consult factory.
- Power: 160mA at +5V, typical.

Ordering Information

CompactPCI Boards
- AcPC464: Digital I/O and counter/timer module
- AcPC464E: Same as AcPC464 plus extended temp. range

Software
- PCISW-API-VXW: VxWorks® software support package
- PCISW-API-VIN32: 32-bit Windows™ DLL Driver software package
- PCISW-API-VIN64: 64-bit Windows™ DLL Driver software package
- PCISW-API-LNX: Linux® support (website download only)

Accessories
- 5025-288: Termination panel, SCSI-3 connector, 68 screw terminals
- 5028-432: Cable, shielded, SCSI-3 connector both ends

This module saves money and CompactPCI slots by combining digital I/O and counter/timer functions on a single card.
AcPC48x Counter/Timer with Quadrature

- **AcPC482**: Ten 16-bit counters – TTL
- **AcPC483**: Four 16-bit counters – TTL, and Four 32-bit counters – RS422
- **AcPC484**: Six 32-bit counters – RS422

Several models with a variety of configurations provide up to ten counter/timer channels for counting events, generating waveform control signals, measuring pulse-widths, periodic rates, or quadrature position and monitoring operations.

Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

**Features**
- Ten 16-bit counter/timers (AcPC482 only) or six 32-bit counter/timers (AcPC484 only)
- Two 16-bit counters can be combined to create one 32-bit counter
- Available with both TTL and RS422 driver interface (AcPC483 only)
- 16 bi-directional digital I/O
- 20MHz clock time base
- Counter/timer functions:
  - Quadrature position measurement
  - Pulse width modulation
  - Watchdog timer
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - One-shot/repetitive
- Extended temperature option (-40 to 85°C)

**Benefits**
- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.

These modules are very flexible and available in several varieties to accommodate a broad range of counter/timer applications.

**Specifications**

<table>
<thead>
<tr>
<th>Counter/Timers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter/timer configuration:</td>
<td></td>
</tr>
<tr>
<td>AcPC482: Ten 16-bit counters – TTL</td>
<td></td>
</tr>
<tr>
<td>AcPC483: Four 16-bit counters – TTL</td>
<td></td>
</tr>
<tr>
<td>AcPC484: Six 32-bit counters – RS422</td>
<td></td>
</tr>
</tbody>
</table>

Other I/O mixes can be made available as specials.

<table>
<thead>
<tr>
<th>Clock frequency</th>
<th>20MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field I/O</td>
<td>Front panel SCSI-3 connector</td>
</tr>
<tr>
<td>Speed (with 20MHz internal clock):</td>
<td>Maximum output pulse/square wave freq.: 200ns</td>
</tr>
<tr>
<td>Minimum event pulse width:</td>
<td>100ns</td>
</tr>
<tr>
<td>Minimum pulse width measurement:</td>
<td>100ns</td>
</tr>
<tr>
<td>Minimum period measurement:</td>
<td>200ns</td>
</tr>
</tbody>
</table>

Mode accuracy (with external clocking):
- Waveform generation: Period is ±125ns.
- Watchdog: Timeout occurs within ±1 clock cycle.
- Pulse/period measurement: ±1 clock cycle.

Internal clocks: Programmable 1.25, 2.5, 5, 10 or 20MHz via the counter control register.

External clocks: Support a per-counter basis via clock line.

Interupts: Supports for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse width complete (one-shot mode), successive waveform generation (continuous).

Triggering/gate: Programmable via register write or external trigger. Minimum pulse width 100ns. Line may be used for gating of counter.

Counter trigger: Interface for triggering counter functions. Input level is TTL or RS422 differential digital.

Counter input: Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL or RS422 differential digital.

TTL compatibility: $V_{IL} = 2.0V$ and $V_{IH} = 0.8V$. Inputs are buffered and include 47K ohm pull-ups to +5V.

Counter output: Level is TTL or RS422 differential digital.

**Digital I/O**

I/O channel configuration:
- 16 bi-directional TTL transceivers
- Direction controlled as 16 independent channels.

**CompactPCI bus Compliance**

Meets PCI spec. V2.2 and PICMG 2.0, R3.0.

Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.

Interrupts (INTA#): Interrupt A is used to request an interrupt.

Plug-and-Play: The system maps the base address into the PCI bus 32-bit memory space.

**Environmental**

Operating temperature: 0 to 70°C or -40 to 85°C (E versions)

Storage temperature: -55 to 125°C.

Relative humidity: 5 to 95% non-condensing.

Power: 320mA at +5V, typical.

MTBF: Hours at 25°C, MIL-HDBK-217F, notice 2

AcPC482 1,744,259; AcPC483 1,727,707; AcPC484 1,708,729

**Ordering Information**

**CompactPCI Boards**

- **AcPC482**: Ten 16-bit counters – TTL
- **AcPC482E**: AcPC482 with extended temperature range
- **AcPC483**: Four 16-bit counters – TTL
- **AcPC483E**: AcPC483 with extended temperature range
- **AcPC484**: Six 32-bit counters – RS422
- **AcPC484E**: AcPC484 with extended temperature range

**Software**

- PMCSW-API-VXW: VxWorks® software support package
- PCISW-API-WIN32: 32-bit Windows® DLL Driver software package
- PCISW-API-WIN64: 64-bit Windows® DLL Driver software package
- PCISW-API-LNX: Linux® support (website download only)

**Accessories**

- S025-288: Termination panel, SCSI-3 connector, 68 screw terminals
- S028-432: Cable, shielded, SCSI-3 connector both ends

Visit web page for more information
AcPC730
Multi-function I/O

- Analog Input
- Analog Output
- Digital I/O
- Counter/Timer

AcPC730 I/O boards provide a variety of I/O functions on a single card. These new high-density boards perform both high-speed and high-resolution A/D and D/A conversion and also handle digital I/O plus counter/timer functions.

Now you can conserve your precious card slots and still get all the I/O functionality you need. The AcPC730 is designed for extreme versatility with many deluxe features to meet most applications. However, the AcPC730 is still very budget-friendly.

Features

Analog Inputs
- 16 differential or 32 single-ended inputs (±3.3V, ±5V, ±10V, 0-5V, and 0-10V ranges)
- 16-bit ADC with 512 sample RAM
- 10µS conversion time (100kHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable interval timer

Analog Outputs
- Eight analog output channels (±10V range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- 12.375µS settling time (80.8kHz throughput)
- Interrupt on user-programmable FIFO threshold

Digital I/O
- 16 TTL bidirectional input/outputs

Counter/Timer
- One 32-bit counter/timer

Specifications

Analog Input
- Input configuration: 16 differential or 32 single-ended channels multiplexed to a single A/D converter.
- A/D resolution: 16 bits.
- Input ranges: ±3.3V, ±5V, ±10V, 0-5V, and 0-10V.
- Maximum throughput rate:
  - One channel updated at a time: 10µS
  - 16 channels (maximum): 160µS
  - 32 channels (maximum): 320µS
- Data sample memory: 512 samples shared by all channels.
- A/D trigger: Internal timer, external source, software.
- System accuracy: ±3 LSB typ. (SW calib., gain=1, 25°C).
- Data format: Straight binary or binary two's compliment.
- Input overvoltage protection: -40 to 55V power off.
- Common mode rejection ratio (60Hz): 96dB typical.
- Channel-to-channel rejection ratio (60Hz): 96dB typical.

Analog Output
- Output configuration: 8 single-ended channels, each controlled by its own independent D/A converter.
- D/A resolution: 16 bits.
- Output range: ±10V.
- Maximum throughput rate:
  - Outputs updated simultaneously or individually: 12.375µS
  - 8 different channels: 12.375µS
- DAC programming: Via independent channel registers or through shared FIFO.
- Data sample memory: 1024 sample FIFO shared by all channels.
- DAC trigger: Internal timer, external source, software.
- System accuracy: 0.0076% of 20V span max. error corrected (i.e. calibrated) at 25°C with output unloaded.
- Data format: Straight binary.
- Output at reset: 0V.

Digital I/O
- I/O channel configuration: 16 TTL transceivers, input/output direction selectable on an 8-channel basis.
- Input voltage range: 0 to 5V DC.
- Input signal threshold:
  - Low to high: 2.0V typical.
  - High to low: 0.8V typical.
- Input response time: 250 nanoseconds.
- Interrupts: 16 channels of interrupts for high-to-low, low-to-high, or any change-of-state event types.
- Debounce: Individual debounce selectable on each channel. User-selectable (4µS, 64µS, 1mS, or 8mS).

Digital Output
- Output voltage range: 0 to 5V DC.
- Output ON current range: -15 to 64mA.
- Output pullups: 4.7K ohm socketed resistors.

Counter/Timer
- Counter/timer configuration: one 32-bit counter (requires use of channels 2 through 5 of digital I/O section).
- Functions:
  - Watchdog timer, event counting, pulse measurement, period measurement, output waveform generation (pulse width modulation, continuous pulse, single pulse, continuous waveform).
  - Internal clock: Programmable 1, 4, 8MHz.
  - External clock: 3.4MHz.
- Input voltage range: 0 to 5V DC.
- Output voltage range: 0 to 5V with 4.7 ohm pull-up. Maximum of 0 to 35V with external supply.

Continued on the next page.
Specifications (continued)

CompactPCI bus Compliance
Meets PCI spec. V2.1 and PICMG 2.0, R3.0.
Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit
data transfer operation 32-bit read/write accesses areimplemented as two 16-bit transfers.
Interrupts (INTA#): Interrupt A is used to request an interrupt.
Plug-and-Play: The system maps the base address into the
PCI bus 32-bit memory space.

Environmental
Operating temperature: 0 to 70°C (E version -40 to 85°C)
Storage temperature: -40 to 85°C
Relative humidity: 5 to 95% non-condensing.
Power: 245mA at +5V (290mA maximum).
MTBF: Consult factory.

Ordering Information
I/O Boards
AcPC730
Multi-function I/O board
AcPC730E
Same as AcPC730 plus extended temperature range

Software
PMCSW-API-VXW
VxWorks’ software support package
PCISW-API-WIN32
32-bit Windows’ DLL Driver software package
PCISW-API-WIN64
64-bit Windows’ DLL Driver software package
PCISW-API-LNX
Linux® support (website download only)

Accessories
5025-288
Termination panel, SCSI-3 connector, 68 screw terminals
5028-432
Cable, shielded, SCSI-3 connector at both ends

Visit web page for more information

All trademarks are the property of their respective owners.
Description
Acromag's ARCX embedded computer is a customizable-off-the-shelf (COTS), SWaP-optimized deployable solution. This rugged, small form factor mission computer is designed for extreme rugged and MIL-AERO applications. This true COTS solution uses the Acromag COM Express Type 6 product platform.

Typical applications include military/aerospace deployable systems such as: vetronics, C4ISR, payload management, as well as command and control for drones and robotics. More specifically the ARCX is perfect as a portable data acquisition system in an aircraft by adding a 1553 interface board to a dual unit. Add a FPGA and high-speed graphics card for high-speed video transfer. For multi-sensor monitoring on mobile applications simply add a CAN bus interface.

High-Performance, 4th Generation CPU
Intel’s 4th generation of multi-core processors provide enhanced capabilities for floating-point-intensive computations, media, graphics, and security. Better power efficiency reduces heat and allows smaller, lighter designs with more portability.

Cutting-edge technology features programmable power limits, allowing the user to “dial-down” the maximum power consumption of the CPU in systems where heat and/or power is a concern.

Rugged Military Design
The ARCX is designed and tested to meet IP67 ratings for reliably sealed protection from dust and limited immersion. Thick circuit boards and advanced thermal management allow the computer to operate reliably under hostile conditions. This rugged computer can withstand extended temperatures. Shock and vibration has been tested to MIL-STD-810 specifications.

The front panel features 38999 type high-speed cylindrical connectors for extended I/O interfacing. Optional power filter is designed to meet the requirements of MIL-STD-704 and MIL-STD-1275. Optional removable solid state drives allow for a variety of configurations including quick security access. Load the operating system on one drive and then collect data on the other drive.

Customizable Expansion
The ARCX offers great flexibility to meet ever-changing requirements for long-term applications with its customizable-off-the-shelf (COTS) design. PMC, XMC, Mini PCIe and mSATA slots allow the addition of specialized I/O, storage, and FPGA modules. Optional removable solid state drives allow large amounts of data storage plus quick security access.

Key Features & Benefits
- 4th Generation Intel Core i7
- Programmable power limits
- IP67 NEMA rating
- MIL-STD-810F environmental specification
- Optional power filter
- Wide range DC input power
- Provides access to standard computer peripherals via Type 6 COM Express CPU
- Ports available - varies by model
  - Two HDMI/DVI ports or three display ports
  - One VGA port
  - Three or two USB 2.0 ports
  - One Sata port
  - Two Gigabit Ethernet ports
  - Two COM RS232/485 ports
- Audio
- Fault/Status LED
- Two mPCIe/mSATA slots
- PMC/XMC expansion
- Dual/Quad SSD drive bay (optional)
- Two or four Sata SSD drive bays
Embedded Computers

**ARCX-4000** Rugged, Small Form Factor Embedded Computer

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**Performance Specifications**

- **Processor Module**
  - Processor: Intel Core™ i7 processor (4th generation, codename Haswell). The CPU allows programming a lower power limit in the BIOS setup allowing use in applications where less power is required.  
  - i7-4700EQ: 2.4GHz, quad core, 6Mb cache, 47W.
  - Chipset: Intel 8-Series QM87 PCH chipset (codename Lynx Point).
  - Memory: 16GB of 1600 DDR3L ECC memory.

- **Processor Module Carrier**

- **I/O Slots**

- **Removable Solid State Bay Option**

- **ARCX-41xx**
  - SATA drives: Supports two 2.5" drives (not included).
  - Drives: Supports Raid 0 and Raid 1 (software).
  - Enclosure: IP67 standard maintained.

- **ARCX-412xx**
  - SATA drives: Supports four 2.5" drives (not included).
  - Drives: Supports Raid 0, 1, 5 (software).
  - Enclosure: IP67 standard maintained.

- **Operating System**

- **Interface Connections**
  - Access to standard computer peripherals of the processor module through B-keyed connector.
  - Graphics: ARCX-41xx
    - 1 x VGA port.
    - 2 x HDMI/DVI ports.
  - ARCX-412x
    - 3 display ports.
  - Audio: 1 x speaker out. 1 x mic in.
  - LAN Port: 2 x Gigabit Ethernet.
  - Serial ATA Interface
    - ARCX-41xx
      - 1 x SATA Port.
    - ARCX-412x
      - 3 x USB 2.0 ports.
  - USB Interface
    - ARCX-41xx
      - 3 x USB 2.0 ports.
  - ARCX-412x
    - 3 x USB 2.0 ports.
  - Serial Ports
    - 2 x RS-232/485.

- **Power Filter Option**

- **Physical & Environmental**

- **Size**
  - ARCX-4110: 5.46" (138.684mm) W x 3.29" (83.566mm) H x 8.108" (205.943mm) D.
  - ARCX-4120: 8.405" (213.487mm) W x 3.29" (83.566mm) H x 8.108" (205.943mm) D.
  - ARCX-22x: 8.405 (213.487mm) W x 5.78" (146.812mm) H x 8.108" (205.943mm) D.

- **Weight**
  - ARCX-4110: 6.8 lbs (3.08 Kg).
  - ARCX-4120: 9.1 lbs (4.13 Kg).
  - ARCX-4122: 14.11 lbs (6.395Kg) estimated.

- **Operational Temperature**
  - -40°C to +85°C based on end application configuration.
  - Refer to manual for details.
  - Up to 110W on the ARCX-411x.
  - Up to 125W on the ARCX-412x and ARCX-4122x.

- **Storage Temperature**
  - -40°C to 85°C

- **Relative Humidity**
  - 5% to 95% non-condensing.

- **MTBF**
  - 110,080 hrs. at 25°C.
  - 81,332 hrs. at 40°C.

- **Ruggedization**
  - Thicker PCB.
  - High shock and vibration SODIMM hold-down mechanism and heat sink.

- **Shock**
  - Operating and Non-operating:
    - 50g peak-to-peak, 11ms duration, MIL-STD-810F Method 516.6 Procedure I (Functional shock)
  - Vibration (8Hz-500Hz)
    - Operating and Non-operating:
      - 5g sinusoidal, 1hr/axis
      - MIL-STD-810F Method 514.6 Procedure I (General vibration)
      - Category 20 (Ground vehicles/ground mobile)

- **Power**
  - 10–36VDC (on-board DC/DC, fused).180 W Maximum

- **Base Line Power Usage:**
  - (i7 CPU carrier, no PMC/XMC or MiniPCIe installed)
  - Idle (~5% CPU usage) - 20W
  - Typical (~40% CPU usage) - 45W
  - Max (~100% CPU usage) - 70W

- **EMC Directive 204/108/EC**

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**Acromag**

**THE LEADER IN INDUSTRIAL I/O**

Tel 248-295-0310  Fax 248-624-9234  solutions@acromag.com  www.acromag.com  30765 Wixom Rd, Wixom, MI 48393 USA
## ARCX-4000  Rugged, Small Form Factor Embedded Computer

### Ordering Information

**NOTE:** Build your model using the tables below. Single size not available for quad SSD drive bay version.

<table>
<thead>
<tr>
<th>Expansion Size</th>
<th>Drive Bay</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Single PMC/XMC</td>
<td>0 = Standard (No Bay)</td>
<td>00 = Standard</td>
</tr>
<tr>
<td>2 = Double PMC/XMC</td>
<td>1 = Dual SSD Drive Bay</td>
<td>PF = Power Filter</td>
</tr>
<tr>
<td>2 = Double PMC/XMC</td>
<td>2 = Quad SSD Drive Bay</td>
<td>01 = Front Panel with Mezzanine*</td>
</tr>
</tbody>
</table>

**Accessories**

For more information, see [www.acromag.com/ARCX](http://www.acromag.com/ARCX).

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5028-556</td>
<td>Size #23 38999 Type Peripheral I/O Breakout Cable for ARCX-41xx models.</td>
</tr>
<tr>
<td>5028-573</td>
<td>High-Speed Type Peripheral I/O Breakout Cable for ARCX-4122 models.</td>
</tr>
<tr>
<td>5028-557</td>
<td>Size #12 38999 Type Power Cable.</td>
</tr>
<tr>
<td>5028-566</td>
<td>High-Speed Type A-keyed mating cable to SCSI-3 Breakout Box</td>
</tr>
<tr>
<td>5028-567</td>
<td>High-Speed Type C-keyed mating cable to SCSI-3 Breakout Box</td>
</tr>
<tr>
<td>5028-558</td>
<td>Size #23 38999 Type A-Keyed Mating Connector Kit.</td>
</tr>
<tr>
<td>5028-559</td>
<td>Size #23 38999 Type C-Keyed Mating Connector Kit.</td>
</tr>
<tr>
<td>5028-560</td>
<td>Size #23 38999 Type B-Keyed Mating Connector Kit.</td>
</tr>
<tr>
<td>5028-561</td>
<td>Size #12 38999 Type A-Keyed Mating Connector Kit.</td>
</tr>
<tr>
<td>5028-571</td>
<td>Drive Bay additional tray.</td>
</tr>
<tr>
<td>ATMD-02</td>
<td>Air cooled assembly.</td>
</tr>
<tr>
<td>ATMD-03</td>
<td>Aluminum liquid cooled cold plate.</td>
</tr>
<tr>
<td>*</td>
<td>Front Panel with Mezzanine * Allows for front panel signal conditioning. Please contact the factory for details.</td>
</tr>
</tbody>
</table>

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* SSID not included
COM Express

ACEX-4600  COM Express Module Type 6 Rugged Carrier Cards

Supports Type 6 COM Express module ◆ Single/dual PMC/XMC sites ◆ High-density, high-speed connector

Description

Acromag’s ACEX-4600 Type 6 COM Express carrier cards employ a number of key features that are critical for successful use in the rugged environments of defense/industrial applications.

High-density connectors (Samtec® SEARAY™) provide all field connections to standard I/O, CPU, and PMC/XMC module(s). This connector offers both a high-density (500 connections) and high-speed interface (10GHz) required to support Type 6 COM modules. The SEARAY connector supports both board-to-board and cable interfaces.

These carrier cards are ready for conduction cooling. Developers can install a CPU, carrier and expansion boards into a completely sealed enclosure. Acromag has developed a heat dissipation approach that meets the cooling needs of all three components.

Another vital feature is the on-board DC/DC power supply. The carrier card operates from a single external 10–32V DC power source. All internal supply voltages are derived from this single external DC power source and built onto the carrier card.

An engineering development system, Model ACEX-4600-DLS, simplifies development and testing. The system provides a connector breakout board that plugs into the carrier card.

Key Features & Benefits

Carrier Functions
- Type 6 COM Express module site for compact or basic size processor board
- Two Mini PCIe sites for I/O expansion
- Single or dual PMC/XMC sites
- High-density, high-speed connector for CPU, I/O, and PMC/XMC interface

CPU Supported Functions
- Two Gigabit Ethernet ports
- PCIe port x 4
- Four USB 3.0 ports
- Two USB 2.0 ports
- Three Digital Display Interfaces
- Two SATA III ports
- Audio Line in/out
- Two RS232/RS485 serial ports
- Eight GPIO
- System temperature sensor (on-board)
- Two fan control line (on-board)
- System battery (on-board)
- Power monitoring LED (on-board)

Form Factor
- One PMC/XMC – (125mm x 170.73mm)
- Two PMC/XMC – (200mm x 170.73mm)

Power
- Input Power 10–36VDC
  (on-board DC/DC, fused)
- Reset button

Environmental
- -40 to 85°C operation
- -50 to 100°C storage

Accessories
- Front panel with 38999-type cylindrical connectors
- Conduction cooling kit

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Bulletin #B400-759h
ACEX-4600 COM Express Module Type 6 Rugged Carrier Cards

ACEX-4620 double-width carrier card shown with optional ACEX-CC-01 conduction cooling kit rails and XCOM-6400 COM Express module

ACEX-4610 single-width carrier card shown with optional ACEX-CC-01 conduction cooling kit rails and XCOM-6400 COM Express module

ACEX-FP-01 front panel with ACEX-FP-PF power filter/bridge board mounted on an ACEX-4610 single-width carrier card

ACEX-FP-02 front panel with ACEX-CC-01 conduction rails and XCOM-6400 CPU module mounted on an ACEX-4620 double-width carrier card
COM Express

ACEX-4600 COM Express Module Type 6 Rugged Carrier Cards

- COM Express Module
- Carriage Card
- Removable Memory
- Lock-Down Plate
- PMC/XMC Modules
- Mini PCIe Modules
**Performance Specifications**

- **General**
  - Form Factor
    - ACEX-4610: 125mm x 170.73mm.
    - ACEX-4620: 200mm x 170.73mm.
  - PICMG Compliance
    - Complies with PICMG COM.0.
  - Processor
    - Hosts basic or compact Type 6 COM Express module.
  - Software Support
    - See COM Express module.

- **I/O**
  - Mini PCIe Expansion
    - Two Mini PCIe sockets, 30mm x 51mm.
  - PMC/XMC Expansion
    - Single or dual slots depending on model.
  - Connector Types
    - Ethernet: two RJ45 ports.
    - PCIe x 4
    - Four USB 3.0 ports.
    - Two USB 2.0 ports.
    - Video: three digital display interfaces.
    - Audio: input/output
    - SATA: two SATA III ports.
    - RS-232/485: two serial ports.
    - GPIO: 8 channels.

- **Environmental**
  - Operating temperature
    - -40 to 85°C.
  - Storage temperature
    - -50 to 100°C.
  - Relative humidity
    - 20 to 80% non-condensing.
  - Power
    - 10–36VDC (on-board DC/DC, fused).
  - Shock
    - Operating: 30g peak acceleration, 11ms duration.
    - Non-operating: 50g peak acceleration, 11ms duration.
  - Vibration (5Hz-2kHz)
    - Operating: 0.015” (380µm) peak-to-peak displacement, 2.5g max acceleration.
    - Non-operating: 0.030” (760µm) peak-to-peak displacement, 5.0g max acceleration.

**Ordering Information**

- **Carrier Cards**
  - ACEX-4610-LF
    - Single-width Type 6 COM Express carrier card with one PMC/XMC slot and two Mini PCIe slots
  - ACEX-4620-LF
    - Double-width Type 6 COM Express carrier card with two XMC/PMC slots and two Mini PCIe slots
    - NOTE: Contact factory for lead solder options.

- **Accessories**
  - ACEX-CC-01
    - Conduction cooling kit for ACEX-4610/4620
  - ACEX-FP-01
  - ACEX-FP-02
    - Front panel with 38999-type cylindrical connectors for single-width (-01) or dual-width (-02) carrier card
  - ACEX-FP-I0-01-LF
  - ACEX-FP-I0-02-LF
    - Front panel with 38999-type cylindrical connectors for single-width (-01) or dual-width (-02) carrier card with IO mezzanine board support
  - ACEX-FP-PF
    - Power filter/bridge board
    - NOTE: For COM Express Development System see ACEX-4600-DLS
COM Express

**ACEX-4600-DLS** COM Express Type 6 Development System

**Description**
For easier testing and development, Acromag offers an engineering development system to streamline your COM Express® system for fast field deployment.

The engineering development system is an engineering development board and an ACEX-4610-LF or ACEX-4620-LF COM Express® carrier board mounted to a metal baseplate. To ensure proper air circulation two fans are mounted to the baseplate forcing air across the one/two XMC/PMC sites. The development board allows access to all signals delivered from the carrier card’s Samtec® SEARAY™ high-density connectors through to the I/O breakout board connectors. The breakout board provides all standard peripheral I/O from the CPU, I/O expansion modules, and accommodates two SSD devices for program storage. The I/O breakout board has two power supply connections for a choice of the included 24V DC (160W) brick-type power supply or your own external power adapter.

**EDK Peripheral Connectors**
- Power Connection (x2)
- Video Port 1 - 3
  - HDMI and Display Ports
- VGA Port
- Audio Port
- SATA Port (x2)
  - For user-installed SSD/hard drive
- 1Gb LAN Ports (x2) RJ45
- USB 3.0 Ports (x4)
- USB 2.0 Ports (x2)
- Serial Ports (x2)
  - 9-Pin, D-sub, male connector
- PMC Rear I/O Site 1 & 2
  - 68-Pin, SCSI-3
- XMC Rear I/O Site 1 & 2
  - 0.50mm High-speed Q Series, Samtec QTH Series, 20/pairs
- PCIe x16 4-lane port
- Fan Power (x3)
- ACEX-4600 Carrier Connection(s)

**Ordering Information**

- **Development Systems**
  - ACEX-4610-DLS
    - I/O brakeout board, ACEX-4610-LF carrier board, power supply, and mounting plate with cooling fans.
  - ACEX-4620-DLS
    - I/O brakeout board, ACEX-4620-LF carrier board, power supply, and mounting plate with cooling fans.

- **Required for Use**
For more information, please see www.acromag.com

- **XCOM-6400**
  - COM Express Type 6 4th Gen Intel® Core™ i7 / i5 CPU Module

- **XHSA-6400**
  - Active heat sink with fan

Please note, a USB keyboard, USB mouse, computer monitor (VGA, HDMI, or DisplayPort) and a 2.5 inch SATA Hard Disk drive are also necessary for use of the development systems.
Description

Acromag’s XCOM-6400 is a basic size platform (95 x 125mm) processor module with Type 6 interconnects. Several models are available with the 4th generation (Haswell) Intel Core i7 or i5 CPUs. Designed for industrial and defense applications, the XCOM-6400 has an extra rigid PCB and extended temperature support.

The 4th generation of Intel’s i5 and i7 processors delivers many enhanced capabilities for media, graphics, security, and power management. Huge performance improvements were made for floating-point-intensive computations which are critical for digital signal and image processing applications such as radar and sonar. Enhanced graphics enable smoother playback of high-quality images for digital signage or displays. Better power efficiency reduces heat and allows smaller, lighter designs with more portability.

This module sets a new standard for shock and vibration by implementing a SODIMM hold down mechanism. Soldering down the memory is no longer necessary.

The XCOM-6400 also provides a heat sink capability not available on traditional COM Express designs. Conduction-cooled rails set a new standard for carrier cards.

Key Features & Benefits

- Intel 4th Gen (Haswell) multi-core processor: Core i7 CPU for high performance (47W) or Core i5 CPU for low power (25W)
- Intel 8-Series QM87 PCH chipset (formerly Lynx Point)
- Up to 16GB of high-speed DDR3L memory with SODIMM lock-down mechanism (permits user removal or upgrades)
- Advanced heat management technologies with heat spreader plates, conduction-cooled rails, and optional fan
- Up to -40 to 85°C extended operating range
- PEG/ General Purpose PCIe x16 (bifurcation/trifurcation supported)
- 7 ports of PCIe x1 (gangable into ports of greater width)
- SPI bus
- LPC bus
- SMBus (system)
- I²C (user)
- VGA Interface
- 3x Digital Display Interface
- eDP Interface (x2)
- HDA Audio Interface
- Gigabit Ethernet Medium Dependent Interface (MDI)
- 4 USB 3.0/2.0 Ports
- 4 USB 2.0 only Ports
- 4 SATA III Ports (6 Gb/s)
- 4 General Purpose Outputs
- 4 General Purpose Inputs
- Post code display (Port 80)
COM Express

**XCOM-6400** Rugged COM Express Type 6 Module

### Performance Specifications

- **COM Express**
  - Form Factor
    - Basic form factor (95 x 125mm), 8mm stack height.
    - Type 6 pinouts.
  - PICMG Compliance
    - Complies with PICMG COM.0.

- **Processor and Memory**
  - **Processor**
    - Intel Core™ i7 or i5 processor (4th generation, codename Haswell).
    - i7-4700EQ: 2.4GHz, quad core, 6Mb cache, 47W.
    - i5-4402E: 1.6GHz, dual core, 3Mb cache, 25W.
  - **Chipset**
    - Intel 8-Series QM87 PCH chipset (codename Lynx Point).
    - Intel DH82QM87 Platform Controller Hub.
  - **Memory**
    - Up to 16GB total of 1600 DDR3L ECC memory.

- **Interfaces**
  - **Graphics**
    - Intel integrated graphics processor.
    - 3x digital display interface (DVI or DisplayPort).
    - eDP interface (2x)
  - **Audio**
    - HDA audio interface
  - **LAN Port**
    - Gigabit Ethernet Medium Dependent Interface (MDI)
  - **Serial ATA Interface**
    - 4 SATA III Ports (6 Gbps)
  - **PCIe Interface**
    - PEG / general-purpose PCIe x16 (bifurcation/trifurcation supported).
    - PCIe x1 (gangable into ports of greater width).
  - **USB Interface**
    - 4 USB 3.0/2.0 ports
    - 4 USB 2.0 ports.
  - **Other Interfaces**
    - SPI bus.
    - LPC bus.
    - SMBus (system).
    - I²C (user).
    - I/O
      - 4 general-purpose outputs,
      - 4 general-purpose inputs.

- **Environmental**
  - **Operating temperature**
    - Standard temperature models: 0 to 70°C.
    - Extended temperature models: -40 to 85°C.
    - NOTE: CPU internal temperature cannot exceed 100°C.
  - **Storage temperature**
    - -55 to 100°C.
  - **Relative humidity**
    - 90% at 60°C non-condensing.
  - **Ruggedization**
    - Thicker PCB.
    - High shock and vibration SODIMM hold-down mechanism and heat sink.
  - **Shock**
    - 50g peak-to-peak, 11ms duration, MIL-STD-202G Method 213B.
  - **Vibration**
    - 11.96 g rms, 50-20,000 Hz, each axis, MIL-STD-202G Method 214A.
  - **Power Inputs from carrier board:**
    - 12V (+/- 5%): 36W typical, 61W max
    - 5V_SBY* (+/- 5%): 0.5W typical, 1W max
    - *Optional. Please see the manual for full power requirement information.

---

**Diagram of XCOM-6400**

- **COM-EXPRESS CONNECTORS**
- **INTEL GEN4 I7 or I5 CPU**
- **INTEL 8 SERIES QM87 CHIPSET PLATFORM CONTROLLER HUB**
- **DDR3 CH. A**
- **DDR3 CH. B**
- **2-8GB DDR3L (ECC SODIMM)**
- **JTAG**
- **XDP DEBUG**
- **228Mb FLASH**
- **NUVOTON NCT6776D**
- **ATMEL AT97SC3205**
- **16K x 8 EEPROM**
- **PCA9540 I2C MULTIPLEXER**
- **1Gbps PHY**
- **PECI**
- **28Mb FLASH**
- **CPU FAN TACH/PWM**
- **PORT 80 DEBUG 7-SEG DISPLAY**
- **COM PORT (TX/RX RTS ONLY)**
  - (1) Gigabit Ethernet
  - (2) COM PORT (TX/RX RTS ONLY)
  - (6) 6GB/s SATA
  - (4) USB 3.0/2.0
  - (4) USB 2.0
  - (4) Gigabit Ethernet
  - (2) COM PORT (TX/RX RTS ONLY)
  - (4) Gigabit Ethernet
  - (2) Gigabit Ethernet
  - (1) Gigabit Ethernet
  - (2) Gigabit Ethernet
  - (4) Gigabit Ethernet
XCOM-6400  Rugged COM Express Type 6 Module

Ordering Information
- COM Express Module
  XCOM-6400-104-LF
  i7, 2.4GHz, quad core processor with 6Mb cache and 4GB memory.
  XCOM-6400-104E-LF
  Same as XCOM-6400-104-LF plus extended operating temperature.
  XCOM-6400-108-LF
  i7, 2.4GHz, quad core processor with 6Mb cache and 8GB memory.
  XCOM-6400-108E-LF
  Same as XCOM-6400-108-LF plus extended operating temperature.
  XCOM-6400-116-LF
  i7, 2.4GHz, quad core processor with 6Mb cache and 16GB memory.
  XCOM-6400-116E-LF
  Same as XCOM-6400-116-LF plus extended operating temperature.
  XCOM-6400-304-LF
  i5, 1.6GHz, dual core processor with 3Mb cache and 4GB memory.
  XCOM-6400-304E-LF
  Same as XCOM-6400-304-LF plus extended operating temperature.
  XCOM-6400-308-LF
  i5, 1.6GHz, dual core processor with 3Mb cache and 8GB memory.
  XCOM-6400-308E-LF
  Same as XCOM-6400-308-LF plus extended operating temperature.
  XCOM-6400-316-LF
  i5, 1.6GHz, dual core processor with 3Mb cache and 16GB memory.
  XCOM-6400-316E-LF
  Same as XCOM-6400-316-LF plus extended operating temperature.

Note: Please contact factory for lead solder options

- Accessories
  For more information, see www.acromag.com.
  XHSA-6400
  Active heat sink with fan

Module with optional XHSA-6400 heat sink and fan.
AVME9660  VMEbus 6U, Non-intelligent, IP Carrier Cards

Description

The AVME9660 is a non-intelligent slave boards that interface IP modules to the VMEbus. The full-height (6U) board holds four IP modules. All field I/O connections are made to the carrier board.

Acromag's carrier boards provide full data access to the IP module's I/O, ID and memory spaces. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the VMEbus.

Up to two interrupt requests are supported for each IP module. The VMEbus interrupt level is software programmable.

Individual passive filters on each IP module power supply line provide optimum filtering and power isolation between the IP modules and the carrier board.

Key Features & Benefits

- Full IP module data access enables convenient software configuration and control of the IP modules.
- Front panel LEDs simplify debugging with a visual indication of successful IP accesses.
- Front panel connectors provide ribbon cable access to field I/O without interference from boards in adjacent slots.
Industry Pack Carriers

AVME9660  VMEbus 6U, Non-intelligent, IP Carrier Cards

Performance Specifications

- **IP Compliance (ANSI/VITA 4)**
  Meets IP specifications per ANSI/VITA 4-1995. Electrical/mechanical interface: Supports single or double size IP modules. 32-bit IP modules are not supported. I/O space and ID space supported. Memory space: Supports 1MB to 8MB per IP module. Interrupts: Supports two interrupt requests per IP module and interrupt acknowledge cycles, D16/D08(O).

- **VMEbus Compliance**
  Meets VME specifications per revision C.1 dated October 1985, IEC 821-1987 and IEEE 1014-1987. Data transfer bus: A24/A16:D16/D08(EO) DTB slave; supports Read-Modify-Write cycles. Interrupts: Creates (I1-7) programmable request levels (up to two requests sourced from each IP module), D16/D08(O) interrupter (interrupt vectors come from IP modules). Carrier registers are for control and status monitoring. Interrupt release mechanism is Release on Register Access (RORA) type.

- **Environmental**
  Operating temperature: 0 to 70°C (AVME9660) or -40 to 85°C (AVME9660E models). Storage temperature: -25 to 85°C (AVME9660) or -40 to 85°C (AVME9660E models). Relative humidity: 5 to 95% non-condensing.
  Power: 5V (±5%): 275mA maximum. ±12V (±5%): 0mA (not used). Plus IP module load.

- **Physical**
  Physical Configuration:
  - Length: 9.187 inches (233.3 mm).
  - Width: 6.299 inches (160.0 mm).
  - Board Thickness: 0.062 inches (1.59 mm).
  - Max Component Height: 0.550 inches (13.97 mm).
  - Recommended Card Spacing: 0.800 inches (20.32mm)

  Connectors:
  - P1 (VMEbus): DIN 41612 96-pin Type C, Level II
  - P2 (VMEbus): Not Used.
  - A-D (Carrier Field I/O): 50-pin Male Header x2 stacked “condo type” 3M 3433-D303 with ejector latches

Ordering Information

- **Carrier Card**
  AVME9660
  6U carrier. Holds four IP modules.
  AVME9660E
  Same as AVME9660 plus extended temperature range.

- **Accessories**
  - 5025-550
    Cable, unshielded, 50-pin header both ends
  - 5025-551
    Same as 5025-550 except shielded
  - 5025-552
    Termination panel, 50-pin connector, 50 screw terminals

- **IP Modules**
  See www.acromag.com for more information.

- **Software Development Tools**
  See www.acromag.com for more information.
Industry Pack Carriers

AVME9668 VMEbus 6U, Non-intelligent, IP Carrier Cards

Holds four IP modules ◆ Front panel SCSI-2 connectors ◆ Supports 8MHz and 32MHz clocks

Description

The AVME9668 is a non-intelligent slave board that interfaces IP modules to the VMEbus. The full-height (6U) board holds four IP modules. All field I/O connections are made through the front panel of the carrier board.

This carrier card is ready for rugged, high-performance applications. The front-panel SCSI-2 connectors provide screw-down or spring latch connections to hold cables securely. And with support for 8MHz and 32MHz clocks, you can process data at very high speeds.

Acromag’s carrier boards provide full data access to the IP module’s I/O, ID and memory spaces. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the VMEbus.

Up to two interrupt requests are supported for each IP module. The VMEbus interrupt level is software programmable.

Individual passive filters and fuses on each IP module power supply line provide optimum filtering between the IP modules and the carrier board.

Key Features & Benefits

■ 6U VMEbus card holds four IP modules
■ Industry-standard IP module interface
■ Front panel SCSI-2 connectors for field I/O signals
■ Supports two interrupt channels per IP
■ Provides individually fused and filtered +5V, +12V, and -12V DC power lines to each IP module
■ Accepts other manufacturers’ IP modules
■ Accommodates 8MHz and 32MHz IP clocks
■ Up to 8MB of memory space per IP module
■ Full IP module data access enables convenient software configuration and control of the IP modules.
■ Front panel connectors provide shielded SCSI-2 cable connections to field I/O for maximum noise immunity.
■ SCSI-2 cables lock down for secure connections.
■ 32MHz clock support allows faster data processing.
AVME9668  VMEbus 6U, Non-intelligent, IP Carrier Cards

Performance Specifications

- **IP Compliance (ANSI/VITA 4)**
  Meets IP specifications per ANSI/VITA 4-1995. 
  Electrical/mechanical interface: Supports single or double size IP modules. 
  32-bit IP modules are not supported. 
  I/O space and ID space supported. 
  Memory space: Supports 1MB to 8MB per IP module. 
  8 and 32MHz IP modules are supported. 
  Interrupts: Supports two interrupt requests per IP module and interrupt acknowledge cycles, D16/ D08(O).

- **VMEbus Compliance**
  Data transfer bus: A24/A16:D16/D08(EO) DTB slave; supports Read-Modify-Write cycles. 
  Interrupts: Creates I(1-7) programmable request levels (up to two requests sourced from each IP module). 
  D16/D08(O) interrupter (interrupt vectors come from IP modules). Carrier registers are for control and status monitoring. Interrupt release mechanism is Release on Register Access (RORA) type.

- **Physical**
  **Physical Configuration**
  Length: 9.187 inches (233.3 mm). 
  Width: 6.299 inches (160.0 mm). 
  Board Thickness: 0.062 inches (1.59 mm). 
  **Connectors**
  P1, 2 (VMEbus): DIN 41612 96-pin Type C, Level II. P2 has no connections. 
  A-D (Carrier field I/O): 50-pin female SCSI-2 connectors. 
  P3, 5, 7, 9 (IP field I/O): 50-pin male plug header (AMP 173280-3 or equivalent). 
  P4, 6, 8, 10 (IP logic interface): 50-pin male plug header (AMP 173280-3 or equivalent).

- **Environmental**
  Operating temperature
  0 to 70°C (AVME9668) or -40 to 85°C (AVME9668E models). 
  Storage temperature
  -25 to 85°C (AVME9668) or -40 to 85°C (AVME9668E models). 
  Relative humidity
  5 to 95% non-condensing. 
  **Power**
  +5V (±5%): Consult factory. 
  ±12V (±5%): 0mA (not used). 
  Plus IP module load. 
  **MTBF**

Ordering Information

- **Carrier Card**
  AVME9668
  6U carrier. Holds four IP modules. 
  AVME9668E
  Same as AVME9668 plus extended temperature range.

- **Accessories**
  5028-438
  Cable, SCSI-2 to SCSI-2, shielded. 
  5028-378
  Termination panel, SCSI-2 connector, 50 screw terminals.

- **IP Modules**
  See www.acromag.com for more information.

- **Software Development Tools**
  See www.acromag.com for more information.

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See www.acromag.com/industrypack for Industry Pack modules
Industry Pack Carriers

AVME967x  VME64 6U, Non-intelligent, IP Carrier Cards

**Description**

The AVME9670 and AVME9675 are non-intelligent slave boards that interface up to four IP modules to the VMEbus. The only difference is that the AVME9675 adds fully implemented geographical addressing. Both are full-height (6U) IP carrier cards that use VME64-compliant connectors to increase the quantity of rear I/O connections beyond that of standard VME.

When used with a VME64 backplane, the AVME9670 brings all 200 I/O points out the rear P0 and P2 connectors. This convenience eliminates messy cables from hanging out the front of the cage. In addition to a cleaner cage design, it is also much easier to insert and replace boards into the system.

Acromag’s carrier boards provide full data access to the IP module’s I/O, ID and memory spaces. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the VMEbus.

Up to two interrupt requests are supported for each IP module. The VMEbus interrupt level is software programmable.

Individual passive filters on each IP module power supply line provide optimum filtering and isolation between the IP modules and the carrier board.

**Key Features & Benefits**

- Four industry-standard IP module slots (two IP slots on AVME9675-2 models)
- 200 I/O points with rear access
- VME64x high-density rear connectors
- Full geographical addressing (AVME9675 only)
- Two interrupts per IP module
- Individually filtered and fused power to each IP
- Front panel status LEDs

Holds four IP modules ◆ VME64 high-density rear connectors ◆ Geographical or user-defined addressing

See www.acromag.com/industrypack for Industry Pack modules
Industry Pack Carriers

AVME967x  VME64x 6U, Non-intelligent, IP Carrier Cards

Performance Specifications

■ IP Compliance (ANSI/VITA 4)
  Electrical/mechanical interface:
  Supports single or double size IP modules.
  32-bit IP modules are not supported.
  I/O space and ID space supported.
  Memory space: Supports 1MB to 8MB per IP module.
  Interrupts: Supports two interrupt requests per IP module and interrupt acknowledge cycles, D16/D08(O).

■ VMEbus Compliance
  Data transfer bus: A24/A16:D16/D08(E0) DTB slave; supports Read-Modify-Write cycles.
  Interrupts: Creates I(1-7) programmable request levels (up to two requests sourced from each IP module).
  Supports D16/D08(O): round-robin hardware interrupt prioritization of IP sources. Carrier registers support interrupt control and status monitoring. Interrupt release mechanism is Release on Register Access (RORA) type.

■ Physical
  Physical Configuration
  Length: 9.187 inches (233.3 mm).
  Width: 6.299 inches (160.0 mm).
  Board Thickness: 0.062 inches (1.59 mm).
  Max Component Height: 0.550 inches (13.97 mm)
  Recommended Card Spacing: 0.800 inches, (20.32mm)
  Connectors
  P1 & P2 (VME64x bus): DIN 41612 160-pin Type C, Level II.
  P0 (VME64x bus): J3 Type B, Right-Angle Female 95-contacts, with upper ground shield.
  P3, 5, 7, 9 (IP Field I/O): 50-pin male plug header (AMP 173280-3 or equivalent).
  P4, 6, 8, 10 (IP Logic Interface): 50-pin male plug header (AMP 173280-3 or equivalent).
  ■ Environmental
  Operating temperature
  0 to 70°C (AVME9670/75) or -40 to 85°C (AVME9670E/75E models).
  Storage temperature
  -25 to 85°C (AVME9670/75) or -40 to 85°C (AVME9670E/75E models).
  Relative humidity
  5 to 95% non-condensing.
  Power
  +5V (±5%): 525mA maximum.
  ±12V (±5%): 0mA (not used).
  MTBF

Ordering Information

Carrier Card
AVME9670
VME64x 6U carrier, user-defined addressing.
Holds four IP modules.

AVME9670E
Same as AVME9670 plus extended temperature range.

AVME9670-2
Same as AVME9670 except it holds two IP modules (no P0 connector).

AVME9670-2E
Same as AVME9670-2 plus extended temperature range.

AVME9675-4
Same as AVME9670 plus geographical addressing.
Holds four IP modules.

AVME9675-4E
Same as AVME9675-4 plus extended temperature range.

AVME9675-2
Same as AVME9675-4 except it holds two IP modules (no P0 connector).

AVME9675-2E
Same as AVME9675-2 plus extended temperature range.

Accessories
5028-438
Cable, SCSI-2 to SCSI-2, shielded.

5028-378
Termination panel, SCSI-2 connector, 50 screw terminals

TRANS-200
Transition module

IP Modules
See www.acromag.com for more information.

Software Development Tools
See www.acromag.com for more information.

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**AcPC4610CC**
**CompactPCI**
**Non-intelligent PMC Carrier Card**
*(conduction-cooled)*

**Description**
This board provides an easy and low cost solution that enables use of a PMC mezzanine I/O module in a standard 3U CompactPCI computer system. The carrier card acts simply as an adapter to route PCI bus signals to and from the PMC module through the CompactPCI card slot edge connector. All Acromag PMC modules and those from other vendors are supported.

This board uses a PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to the PMC site. The bridge device provides a 32-bit 33/66 MHz PCI interface.

A heat frame enables conduction cooling in applications where ambient or forced air can’t provide adequate cooling. This unit is ideal for airborne systems, deployment in battleground equipment, and other situations with advanced thermal management requirements.

Field I/O signals are routed through the carrier card’s rear J2 connector.

An air-cooled rear transition board, Acromag Model TRANS-C4610, is available to map the field I/O on the PMC module to the rear of the CompactPCI system.

**Features**
- 3U CompactPCI card
- Holds one PMC card
- 32-bit 33/66 MHz PCI Interface
- Transparent PCI/PCI bridge for data transactions from the PCI bus to PMC module
- Rear connection I/O access
- Supports both 5V and 3.3V signalling
- Conduction-cooled -40 to 85°C

**Specifications**

**Environmental**
- Operating temperature: -40 to 85°C (conduction-cooled.)
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing


Power (received from the CompactPCI 3U Back Plane):
- 3.3V DC (±5%)*: 135mA typical, 150mA max.
- 5.0V DC (±5%)*: 50mA typical, 70mA max.
- ±12V DC (±5%)**: Per PMC module.

* With no PMC module installed, ±12V DC not used.
** Max. power 7.5W (total all supplies) per PMC standard.

MTBF: Call factory

**Physical: CompactPCI Carrier Card**
- Physical configuration: 3U CompactPCI Card
- 100 x 160mm.
- Rear CompactPCI connectors: 2mm J1 & J2 connectors.
- PMC connectors: Three 1mm connectors.
- The conduction-cooled model (AcPC4610CC) uses a conduction-cooled frame with wedge-loks® and thermo bars.

**Physical: Transition Module**
- Physical configuration: Half-length 3U CompactPCI Card
- 100 x 80mm.
- Connectors: 2mm RJ2 connector which maps the rear I/O signals to a SCSI-3 connector. This model also uses a standard rear front panel assembly with a SCSI-3 connector cutout.

**PMC and CompactPCI bus Compliance**
- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.
- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.
- Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.
- Interrupts: CompactPCI bus INTA# interrupt signal.
- PCI Interface: PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to the PMC site. The bridge device provides a 32-bit 33/66 MHz PCI interface.

**Ordering Information**

**Carrier Cards**
- AcPC4610CC
  - CompactPCI bus carrier card for one **PMC module**, conduction-cooled

**Accessories**
- (see accessories documentation for details)
  - TRANS-C4610: Transition module, air-cooled
  - 5028-432: Shielded cable, SCSI-3 68-pin connector, 2m long.
  - 5025-288: Termination panel, DIN rail-mount, 68 screw terminals, SCSI-3 connector.

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**AcPC4610E**
**CompactPCI**
**Non-intelligent**
**PMC Carrier Card**
(air-cooled)

**Description**
This board provides an easy and low cost solution that enables use of a PMC mezzanine I/O module in a standard 3U CompactPCI computer system. The carrier card acts simply as an adapter to route PCI bus signals to and from the PMC module through the CompactPCI card slot edge connector. All Acromag PMC modules and those from other vendors are supported.

This board uses a PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to the PMC module. The bridge device provides a 32-bit 33/66 MHz PCI interface.

Front and rear-panel access to field I/O signals are accommodated. The carrier card’s front panel cut-out provides access to a PMC module’s front I/O connector. Alternatively, all I/O signals can be routed through the carrier card’s rear J2 connector.

An air-cooled rear transition board, Acromag Model TRANS-C4610 maps the field I/O to the backplane and to the rear of the CompactPCI system.

**Features**
- 3U CompactPCI card
- Holds one PMC card
- 32-bit 33/66 MHz PCI Interface
- Transparent PCI/PCI bridge for data transactions from the PCI bus to PMC module
- Rear connection I/O access
- Supports both 5V and 3.3V signalling
- -40 to 85°C

**Specifications**

**Environmental**
- Operating temperature: -40 to 85°C.
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing

**Power (received from the CompactPCI 3U Back Plane):**
- 3.3V DC (±5%)*: 135mA typical, 150mA max.
- 5.0V DC (±5%)*: 50mA typical, 70mA max.
- ±12V DC (±5%)**: Per PMC module.
  - * With no PMC module installed, ±12V DC not used.
  - ** Max. power 7.5W (total all supplies) per PMC standard.

**MTBF:** Call factory

**Physical: CompactPCI Carrier Card**
- Physical configuration: 3U CompactPCI Card 100 x 160mm.
- Rear CompactPCI connectors: 2mm J1 & J2 connectors.
- PMC connectors: Three 1mm connectors.
- The air-cooled model (AcPC4610E) uses the standard front panel assembly with a PMC bezel cutout.

**Physical: Transition Module**
- Physical configuration: Half-length 3U CompactPCI Card 100 x 80mm.
- Connectors: 2mm R12 connector which maps the rear I/O signals to a SCSI-3 connector. This model also uses a standard rear front panel assembly with a SCSI-3 connector cutout.

**PMC and CompactPCI bus Compliance**
- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.
- Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.
- Interrupts: CompactPCI bus INTA# interrupt signal.
- PCI Interface: PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to the PMC site. The bridge device provides a 32-bit 33/66 MHz PCI interface.

**Ordering Information**

**Carrier Cards**
- AcPC4610E: CompactPCI bus carrier card for one PMC module, air-cooled

**Accessories**
- TRANS-C4610: Transition module, air-cooled
- 5028-432: Shielded cable, SCSI-3 68-pin connector, 2m long.
- 5025-288: Termination panel, DIN rail-mount, 68 screw terminals, SCSI-3 connector.

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**AcPC4620CC**  
**CompactPCI**  
**Non-intelligent PMC Carrier Card (conduction-cooled)**

**Description**
This board provides an easy and low cost solution that enables use of a PMC mezzanine I/O module in a standard 6U CompactPCI computer system. The carrier card acts simply as an adapter to route PCI bus signals to and from the PMC module through the CompactPCI card slot edge connector. All Acromag PMC modules and those from other vendors are supported.

This board uses a PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to two PMC sites. The bridge device provides a 32 or 64-bit PCI interface with 33 or 66MHz bus frequencies.

A heat frame enables conduction cooling in applications where ambient or forced air can’t provide adequate cooling. This unit is ideal for airborne systems, deployment in battleground equipment, and other situations with advanced thermal management requirements.

Field I/O signals are routed through the carrier card’s rear J3 and J5 connectors

An air-cooled rear transition board, Acromag Model TRANS-C4620, maps the field I/O on the PMC module to the rear of the CompactPCI system.

**Features**
- 6U CompactPCI card
- Holds two PMC cards
- 32 or 64-bit PCI Interface at 33 or 66 MHz
- Transparent PCI/PCI bridge for data transactions from the PCI bus to PMC module
- Rear connection I/O access
- Supports both 5V and 3.3V signalling
- Conduction-cooled -40 to 85°C

**Specifications**

**Environmental**
- Operating temperature: -40 to 85°C (conduction-cooled.)
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing


Power (received from the CompactPCI 3U Back Plane):
- 3.3V DC (±5%)*: 135mA typical, 150mA max.
- 5.0V DC (±5%)*: 50mA typical, 70mA max.
- ±12V DC (±5%)**: Per PMC module.
- * With no PMC module installed, ±12V DC not used.
- ** Max. power 7.5W (total all supplies) per PMC standard.

**Physical: CompactPCI Carrier Cards**
- Physical configuration: 6U CompactPCI Card 233.35 x 160mm.
- Rear CompactPCI connectors: 2mm J1, J2, J3, J5 connectors.
- PMC connectors: Eight 1mm connectors.

The conduction-cooled model (AcPC4620CC) uses a conduction-cooled frame with wedge-locks® and thermo bars.

**Physical: Transition Module**
- Physical configuration: Half-length 6U CompactPCI Card 233.35 x 80mm.
- Connectors: 2mm RJ2 connector which maps the rear I/O signals to a SCSI-3 connector. This model also uses a standard rear front panel assembly with a SCSI-3 connector cutout.

**PMC and CompactPCI bus Compliance**
- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.

**Ordering Information**

**Carrier Cards**
- AcPC4620CC: CompactPCI bus carrier card for two PMC modules, conduction-cooled

**Accessories** (see accessories documentation for details)
- TRANS-C4620: Transition module
- S028-432: Shielded cable, SCSI-3 68-pin connector, 2m long.
- S025-288: Termination panel, DIN rail-mount, 68 screw terminals, SCSI-3 connector.

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**AcPC4620E**

**CompactPCI**

**Non-intelligent**

**PMC Carrier Card**

(air-cooled)

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**Description**

This board provides an easy and low cost solution that enables use of a PMC mezzanine I/O module in a standard 6U CompactPCI computer system. The carrier card acts simply as an adapter to route PCI bus signals to and from the PMC module through the CompactPCI card slot edge connector. All Acromag PMC modules and those from other vendors are supported.

This board uses a PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to two PMC sites. The bridge device provides a 32 or 64-bit PCI interface with 33 or 66MHz bus frequencies.

Front and rear-panel access to field I/O signals are accommodated. The carrier card’s front panel cut-out provides access to a PMC module’s front I/O connector. Alternatively, all I/O signals can be routed through the carrier card’s rear J3 and J5 connectors.

An air-cooled rear transition board, Acromag Model TRANS-C4620, maps the field I/O on the PMC module to the rear of the CompactPCI system.

**Features**

- 6U CompactPCI card
- Holds two PMC cards
- 32 or 64-bit PCI Interface at 33 or 66 MHz
- Transparent PCI/PCI bridge for data transactions from the PCI bus to PMC module
- Rear connection I/O access
- Supports both 5V and 3.3V signalling
- -40 to 70°C

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**Specifications**

**Environmental**

- Operating temperature: -40 to 85°C.
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing

**Power (received from the CompactPCI 3U Back Plane):**

- 3.3V DC (±5%)*: 135mA typical, 150mA max.
- 5.0V DC (±5%): 50mA typical, 70mA max.
- ±12V DC (±5%**): Per PMC module.

* With no PMC module installed, ±12V DC not used.

**MTBF:** Call factory

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**Physical: CompactPCI Carrier Card**

- Physical configuration: 6U CompactPCI Card 233.35 x 160mm.
- Rear CompactPCI connectors: 2mm J1, J2, J3, J5 connectors.
- PMC connectors: Eight 1mm connectors.
- The air-cooled model (AcPC4620E) uses the standard front panel assembly with a PMC bezel cutout.

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**Physical: Transition Module**

- Physical configuration: Half-length 6U CompactPCI Card 233.35 x 80mm.
- Connectors: 2mm K12 connector which maps the rear I/O signals to a SCSI-3 connector. This model also uses a standard rear front panel assembly with a SCSI-3 connector cutout.

**PMC and CompactPCI bus Compliance**

- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.
- Meets PCI specification version 2.3, CompactPCI specification PICMG 2.3 R1.0, and PMC specification P1386.1.
- Data transfer bus: Slave with 32-bit, 16-bit, and 8-bit data transfer operation.
- Interrupts: CompactPCI bus INTA# interrupt signal.
- PCI Interface: PLX Technology PCI6540 transparent PCI/PCI bridge for data transactions from the PCI bus (system host) to the PMC site. The bridge device provides a 32-bit 33/66 MHz PCI interface.

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**Ordering Information**

**Carrier Cards**

- AcPC4620E
  - CompactPCI bus carrier card for two PMC modules, air-cooled

**Accessories**

- TRANS-C4620: Transition module
- 5028-432: Shielded cable, SCSI-3 68-pin connector, 2m long.
- 5025-288: Termination panel, DIN rail-mount, 68 screw terminals, SCSI-3 connector.

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AcPC8625A CompactPCI Carrier Cards for Industry Pack Modules

**Description**
The AcPC8625A is a non-intelligent slave board that interfaces four IP modules to the CompactPCI (cPCI) bus. All 200 I/O points are brought out the rear J4 and J5 connectors. This convenience eliminates messy cables from hanging out the front of the cage. In addition to a more efficient cage wiring design, it is also much easier to insert and replace boards. And with Acromag’s 80mm transition module (TRANS-C200), all 200 I/O points are easily ported out the back of the cage.

**Key Features & Benefits**
- Four industry-standard IP module slots
- Board resides in memory space
- Supports 8 and 32MHz operation
- Supports IP module I/O, ID, INT, and MEM spaces
- 200 I/O points with rear access
- High-density rear connectors
- Compatible with all CompactPCI CPUs
- Plug-and-play carrier configuration and interrupt support
- Two interrupts per IP module
- Front panel LEDs
- Supervisory circuit for reset generation
- Individually filtered and fused power to each IP
- Ruggedized with ESD strip and EMC front panel
- Easily integrate IPs with your software using RTOS VxWorks, Linux, or Win DLL for Windows® 2000/XP/Vista/7 32-bit systems.
- Clean system cabling.
- Easy board replacement.
- Simplified debugging with status LEDs.

**Four Industry Pack mezzanine module slots**
- Non-Intelligent carrier card
- CompactPCI bus interface
Industry Pack Carrier Cards

AcPC8625A  CompactPCI Carrier Cards for Industry Pack Modules

Performance Specifications

■ General
Acromag's carrier boards provide full data access to the IP module's I/O, ID, interrupt spaces, and memory. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the CompactPCI bus.

Up to two interrupt requests are supported for each IP module. All board interrupts are mapped to PCI bus INTA# signal.

Individual passive filters on each IP power supply line provide optimum filtering and noise isolation between the IP modules and the carrier board.

IP Compliance (ANSI/VITA 4)
Meets IP specs per ANSI/VITA 4-1995 (8MHz and 32MHz) and IP I/O mapping to PICMG 2.4 R1.0.

Electrical/mechanical interface
Supports single or double size IP modules. 32-bit IP modules are not supported.

IP Module I/O space, ID space, INT space, and MEM space supported.

Interrupts
Supports two interrupt requests per IP module and interrupt acknowledge cycles via access to IP INT space.

CompactPCI bus Compliance
Meets PCI spec. V2.1 and PICMG 2.0, R2.1.

Data transfer bus
Slave with 32-bit, 16-bit, and 8-bit data transfer operation. 32-bit read/write accesses are implemented as two 16-bit transfers to the IPs.

Interrupts
CompactPCI bus INTA# interrupt signal. Up to two requests sourced from each IP mapped to INTA#.

Interrupt vectors come from IP modules via access to IP module INT space.

Plug-and-Play
The system maps the base address into the PCI bus 32-bit memory space.

■ Power Requirements
Power
+3.3V (±5%): 300mA maximum.
+5V (±5%): 30mA maximum.
±12V (±5%): 0mA (not used).

MTBF
Contact factory

■ Environmental
Operating temperature
-25 to 85°C (AcPC8625) or -40 to 85°C (AcPC8625E models).
Storage temperature
-25 to 85°C (AcPC8625) or -40 to 85°C (AcPC8625E models).

Relative humidity
5 to 95% non-condensing.

Ordering Information

Carrier Cards
AcPC8625A
CompactPCI carrier. Holds four IP modules.

AcPC8625AE
Same as AcPC8625A plus extended temp. range.

Accessories
5028-438
Cable, SCSI-2 to SCSI-2, shielded.

5028-378
Termination panel, SCSI-2 connector, 50 screw terminals.

TRANS-C200
Transition module
See www.acromag.com for more information.

Software Development Tools
IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN32
32-bit Windows® DDL driver and demo software

IPSW-API-WIN64
64-bit Windows® DDL driver and demo software

IPSW-API-LINUX
Linux™ support (website download only)

See www.acromag.com for more information.
**AcPC8630A** CompactPCI Carrier Cards for Industry Pack Modules

**Description**
The AcPC8630A is a non-intelligent slave board that interfaces two IP modules to the CompactPCI® (cPCI) bus. All 100 I/O points are brought out the front connectors for easy cable access.

**Key Features & Benefits**
- Two industry-standard IP module slots
- Board resides in memory space
- Supports 8 and 32MHz operation
- Supports IP module I/O, ID, INT, and MEM spaces
- 100 I/O points with front access
- High-density front connectors
- Compatible with all CompactPCI CPUs
- Compatible with 32-bit and 64-bit CompactPCI® and PXI™ backplane
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Front panel LEDs
- Supervisory circuit for reset generation
- Individually filtered and fused power to each IP
- Ruggedized with ESD strip and EMC front panel
- Easily integrate IPs with your software using RTOS VxWorks, Linux, or Win DLL for Windows® 2000/XP/Vista/7 32-bit systems.

- Easy access to I/O cables.
- Quick development of custom I/O boards.
- Flexibility to mix and match I/O functions as requirements change.
Industry Pack Carrier Cards

AcPC8630A CompactPCI Carrier Cards for Industry Pack Modules

Performance Specifications

■ General
Acromag’s carrier boards provide full data access to the IP module’s I/O, ID, interrupt and memory spaces. With full access to the IP module’s programmable registers, you can easily configure and control their operation from the CompactPCI bus.

Up to two interrupt requests are supported for each IP module. All board interrupts are mapped to PCI bus INTA# signal.

Individual passive filters on each IP power supply line provide optimum filtering and noise isolation between the IP modules and the carrier board.

IP Compliance (ANSI/VITA 4)
Meets IP specs per ANSI/VITA 4-1995 (8MHz and 32 MHz operation) and IP I/O mapping to the front panel.

Electrical/mechanical interface
Supports single or double size IP modules.
IP Module I/O space, ID space, INT, and MEM space supported.

■ Environmental
Operating temperature
0 to 70°C (AcPC8630A model) or -40 to 85°C (AcPC8630AE model).
Storage temperature
-55 to 100°C
Relative humidity
5 to 95% non-condensing.

Power Requirements

Power
+3.3V (±5%): 300mA maximum.
+5V (±5%): 30mA maximum.
±12V (±5%): 0mA (not used).
Plus IP module load.

MTBF
Contact factory

CompactPCI bus Compliance
Meets PCI specification
V2.1 and PICMG 2.0, R2.1.

Data transfer bus
Slave with 32-bit, 16-bit, and 8-bit data transfer operation. 32-bit read/write accesses are implemented as two 16-bit transfers to the IPs.

■ Interrupts
Supports two interrupt requests per IP module and interrupt acknowledge cycles via access to IP INT space.

Ordering Information

Carrier Cards
AcPC8630A
CompactPCI carrier. Holds two IP modules.
AcPC8630AE
Same as AcPC8630A with extended temperature range.

Accessories
5028-372
Cable, SCSI-2 to CHAMP connection
5028-378
Termination panel, SCSI-2 connector,
50 screw terminals
See www.acromag.com for more information.

Software Development Tools
IPSW-API-VXW
VxWorks® software support package
IPSW-API-WIN32
32-bit Windows® DDL driver and demo software
IPSW-API-WIN64
64-bit Windows® DDL driver and demo software
IPSW-API-LINUX
Linux™ support (website download only)
See www.acromag.com for more information.

Please see the diagram for a visual representation of the pinouts and connections.

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**AcPC8635A** CompactPCI Carrier Cards for Industry Pack Modules

**Description**
The AcPC8635A is a nonintelligent slave board that interfaces two IP modules to the CompactPCI® (cPCI) bus. All 100 I/O points are brought out the rear J2 connector. This convenience eliminates messy cables from hanging out the front of the cage. In addition to a more efficient cage wiring design, it is also much easier to insert and replace boards.

**Key Features & Benefits**
- Two industry-standard IP module slots
- Board resides in memory space
- Supports IP module I/O, ID, INT, and MEM spaces
- Supports 8 and 32 MHz operation
- 100 I/O points with rear access
- High-density rear connectors
- Compatible with 32-bit CompactPCI® backplane
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Front panel LEDs
- Supervisory circuit for reset generation
- Individually filtered and fused power to each IP
- Ruggedized with ESD strip and EMC front panel
- Easily integrate IPs with your software using RTOS VxWorks, Linux, or Win DLL for Windows® 2000/XP/Vista/7 32-bit systems.
- Clean system cabling.
- Easy board replacement as I/O needs change.
- Simplified debugging with status LEDs.
- Quick development of custom I/O boards.
- Flexibility to mix and match I/O functions as requirements change.
Industry Pack Carrier Cards

AcPC8635A CompactPCI Carrier Cards for Industry Pack Modules

Performance Specifications

General
Acromag’s carrier boards provide full data access to the IP module’s I/O, ID and interrupt spaces. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the cPCI bus.

Up to two interrupt requests are supported for each IP module. All board interrupts are mapped to PCI bus INTA# signal.

Individual passive filters on each IP power supply line provide optimum filtering and noise isolation between the IP modules and the carrier board.

IP Compliance (ANSI/VITA 4)
Meets IP specs per ANSI/VITA 4-1995 (8MHz operation only) and IP I/O mapping to J2 per PICMG 2.4 R1.0.

Electrical/mechanical interface
Supports single or double size IP modules.

interrupts
Supports two interrupt requests per IP module and interrupt acknowledge cycles via access to IP INT space.

CompactPCI bus Compliance
Meets PCI spec V2.1 and PICMG 2.0, R2.1.

Data transfer bus
Slave with 32-bit, 16-bit, and 8-bit data transfer operation. 32-bit read/write accesses are implemented as two 16-bit transfers to the IPs.

Interrupts
CompactPCI bus INTA# interrupt signal. Up to two requests sourced from each IP mapped to INTA#.

Interrupts come from IP modules via access to IP module INT space.

32-bit memory space
Upon power-up, the system auto-configuration process (plug & play) maps the carrier’s base address (for a 1K byte block of memory) into the PCI bus 32-bit memory space.

Power Requirements
Power
+3.3V (±5%): 300mA maximum.
+5V (±5%): 30mA maximum.
±12V (±5%): 0mA (not used).
Plus IP module load.

MTBF
Contact factory

Environmental
Operating temperature
0 to 70°C (AcPC8635A model) or -40 to 85°C (AcPC8635AE model).

Storage temperature
-55 to 100°C.

Relative humidity
5 to 95% non-condensing.

Ordering Information
Carrier Cards
AcPC8635A
CompactPCI carrier. Holds two IP modules.

AcPC8635AE
Same as AcPC8635A with extended temperature range.

Accessories
5025-550
Cable, unshielded, 50-pin header both ends

5025-551
Same as 5025-550 except shielded

5025-552
Termination panel, 50-pin connector, 50 screw terminals

TRANS-C100
Transition module

See www.acromag.com for more information.

Software Development Tools
IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN32
32-bit Windows® DDL driver and demo software

IPSW-API-WIN64
64-bit Windows® DDL driver and demo software

IPSW-API-LINUX
Linux™ support (website download only)

See www.acromag.com for more information.
PMC Carriers

APC-PMC
PCI Non-intelligent
PMC Carrier Card

Description
This board provides an easy and low cost solution that enables use of a PMC mezzanine I/O module in a standard PCI computer system. The carrier card acts simply as an adapter to route PCI bus signals to and from the PMC module through the PCI card slot edge connector. All Acromag PMC modules and those from other vendors are supported.

Features
- Half-length PCI card
- Holds one PMC card
- 32-bit 66 MHz; PCI Interface
- Front or rear connection I/O access
- Supports both 5V and 3.3V signalling

Specifications

Environmental
- Operating temperature: -40 to 85°C.
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing

Physical
- Physical configuration: PCI Card
  - Length: 6.600 inches (167.64 mm)
  - Height: 4.200 inches (106.68 mm)
  - Board thickness: 0.062 inches (1.59 mm)
  - Maximum component height: 0.380 in. (9.65 mm)
  - Max. height under IP modules: 0.180 in. (4.57 mm).
- Rear connector (carrier field I/O): 64-pin male header

PCI Bus Compliance
The carrier card may compromise signal integrity at 66 MHz (due to longer trace lengths).

Ordering Information
Carrier Card
APC-PMC
PCI bus carrier card for one PMC module
Industry Pack Carriers

APC8620A
PCI Bus IP Carrier Card

This board interfaces industry-standard Industrial I/O Pack (IP) modules to a PCI bus on a PC-based computer system.

Five IP module slots give you the freedom to mix a variety of I/O functions (A/D, D/A, digital in, digital out, serial I/O, etc.) on a single board. Or, combine modules of the same type for hundreds of channels on a single card. Either way, the APC8620A saves your precious card slots and reduces your costs.

Select I/O modules from Acromag’s offering of more than forty models or use any third-party IP mezzanine ANSI/VITA 4 modules.

Features
- Five industry-standard IP module slots
- Board resides in memory space
- Supports IP module I/O, ID, INT, and MEM spaces
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Supervisory circuit reset generation
- Individually filtered and fused power

Benefits
- Quickly create custom I/O boards by mixing and matching I/O functions.
- Conveniently configure and control the I/O modules through software with full IP module register/data access.
- Easily integrate IPs with your software using RTOS VxWorks, QNX, Linux, or Win DLL for Windows® 2000/XP/Vista/7 32-bit systems.

Specifications

IP Module Compliance (ANSI/VITA 4)
Meets or exceeds all written IP specifications per ANSI/VITA 4-1995 for 8MHz or 32MHz operation.
Supports Type I and Type II ID space formats.
Electrical/mechanical interface: Supports five single-size IP modules (A-E), or two double-size and one single-size IP module.
IP module I/O space, ID space, INT, and MEM space supported.
IP module I/O space: 16 and 8-bit, supports 128 byte values per IP module.
IP module ID space: 16 and 8-bit, Supports Type I 32 bytes per IP (consecutive even byte addresses) and Type II 32 words per IP via D16 data transfers.
IP module memory space: 16 and 8-bit, supports up to 8M bytes of memory space per IP module.
Interrupts: Supports two interrupt requests per IP and interrupt acknowledge cycles via access to IP INT space.

PCI Bus Compliance
This device meets or exceeds all written PCI local bus specifications per rev. 2.2 dated December 1998.
System base address: This board operates in PCI memory space. It requires 1K of memory space for mapping the carrier controls, and IP module-ID, INT, and I/O space. An optional 64MB of PCI memory space is required to use IP module memory space.
Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation. 32-bit read or write accesses implemented as two 16-bit transfers to IP modules.
Interrupts (PCI bus INTA# interrupt signal): To two requests sourced from each IP mapped to INTA#.
Interrupt vectors come from IP modules via access to IP module INT space.

Environmental
Operating temperature: 0 to 70°C (APC8621A) or -40 to 85°C (APC8621AE model).
Storage temperature: -55 to 100°C (all models).
Relative humidity: 5-95% non-condensing
Power: +3.3 Volts (±10%): 130mA, typical; 50mA max.
+5 Volts (±5%): 30mA, typical; 50mA, max.
±12 Volts provided to each IP module.
MTBF: 413,003 hrs. at 25°C, MIL-HDBK-217F, notice 2

Physical
Physical configuration: PCI universal card (3.3V or 5V)
Length: 12.283 inches (312.0 mm)
Height: 4.200 inches (106.68 mm)
Board thickness: 0.062 inches (1.59 mm)
Maximum component height: 0.380 in. (9.65 mm)
Max. height under IP modules: 0.180 in. (4.57 mm).
Connectors:
A-E (carrier field I/O): 50-pin pin male header

Ordering Information
Industry Pack Carriers
APC8620A
Non-intelligent PCI bus carrier board.
Holds five IP modules.

APC8620AE
Same as APC8620A plus extended temperature range.

Software
IPSW-API-VXW: VxWorks® software support package
IPSW-API-WIN32: 32-bit Windows® DLL driver software support pkg.
IPSW-API-WIN64: 64-bit Windows® DLL driver software support pkg.
IPSW-LINUX: Linux™ support (website download only)

Accessories
5025-550: Cable, unshielded, 50-pin header both ends
5025-551: Same as 5025-550 except shielded
5025-552: Termination panel, 50-pin connector, 50 screw terminals

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APC8621A
PCI Bus Half-Length
IP Carrier Card

This board interfaces industry-standard Industrial I/O Pack (IP) modules to a PCI bus on a PC-based computer system. The half-length card is ideal for use in smaller PC chassis.

Three IP module slots give you the freedom to mix a variety of I/O functions (A/D, D/A, digital in, digital out, serial I/O, etc.) on a single board. Or, combine modules of the same type for dozens of channels on a single card. Either way, the APC8621A saves your precious card slots and reduces your costs.

Select I/O modules from Acromag’s offering of more than forty models or use any third-party IP mezzanine ANSI/VITA 4 modules.

Features
- Half-length card for smaller PC chassis
- Three industry-standard IP module slots
- Board resides in memory space
- Supports IP module I/O, ID, INT, and MEM spaces
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Supervisory circuit reset generation
- Individually filtered and fused power

Benefits
- Quickly create custom I/O boards by mixing and matching I/O functions.
- Conveneitly configure and control the I/O modules through software with full IP module register/data access.
- Easily integrate IPs with your software using RTOS VxWorks, QNX, Linux, or Win DLL for 2000/XP/Vista/7 32-bit operating system.

Specifications

**IP Module Compliance (ANSI/VITA 4)**
- Meets or exceeds all written IP specifications per ANSI/VITA 4-1995 for 8MHz or 32MHz operation.
- Supports Type I and Type II ID space formats.
- Electrical/mechanical interface: Supports three single-size IP modules (A-C), or one double and one single-size IP module. 32-bit IP modules are not supported.
- IP module I/O space, ID space, INT, and MEM space supported.
- IP module I/O space: 16 and 8-bit; supports 128 byte values per IP module.
- IP module ID space: 16 and 8-bit; Supports Type I 32 bytes per IP (consecutive even byte addresses) and Type II 32 words per IP via D16 data transfers.
- IP module memory space: 16 and 8-bit; supports up to 8M bytes of memory space per IP module.
- Interrupts: Supports two interrupt requests per IP and interrupt acknowledge cycles via access to IP INT space.

**PCI Bus Compliance**
- This device meets or exceeds all written PCI local bus specifications per rev. 2.2 dated December 1998.
- System base address: This board operates in PCI memory space. It requires 1K of memory space for mapping the carrier controls, and IP module-ID, INT, and I/O space. An optional 64MB of PCI memory space is required to use IP module memory space.
- Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation. 32-bit read or write accesses implemented as two 16-bit transfers to IP modules.
- Interrupts (PCI bus INTA# interrupt signal): Up to two requests sourced from each IP mapped to INTA#.
- Interrupt vectors come from IP modules via access to IP module INT space.

Environmental
- Operating temperature: 0 to 70°C (APC8621) or -40 to 85°C (APC8621E model).
- Storage temperature: -55 to 100°C (all models).
- Relative humidity: 5-95% non-condensing
- Power: +3.3 Volts (±10%): 130mA, typical; 50mA max.
  +5 Volts (±5%): 30mA, typical; 50mA, max.
  ±12 Volts provided to each IP module.
- MTBF: 413,003 hrs. at 25°C, MIL-HDBK-217F, notice 2

Physical
- Physical configuration: PCI universal card (3.3V or 5V)
  - Length: 6.600 inches (167.64 mm)
  - Height: 4.200 inches (106.68 mm)
  - Board thickness: 0.062 inches (1.59 mm)
  - Maximum component height: 0.380 in. (9.65 mm)
  - Max. height under IP modules: 0.180 in. (4.57 mm).
- Connectors:
  - A-C (carrier field I/O): 50-pin male header

Ordering Information

**Industry Pack Carriers**

**APC8621A**
- Non-intelligent PCI bus carrier board.
- Holds three IP modules.

**APC8621AE**
- Same as APC8621A plus extended temperature range.

**Software**

- IIPSW-API-VXW: VxWorks® software support package
- IIPSW-API-WIN32: 32-bit Windows® DLL driver software support pkg.
- IIPSW-API-WIN64: 64-bit Windows® DLL driver software support pkg.
- IIPSW-LINUX: Linux™ support (website download only)

**Accessories**

- 5025-550: Cable, unshielded, 50-pin header both ends
- 5025-551: Same as 5025-550 except shielded
- 5025-552: Terminator panel, 50-pin connector, 50 screw terminals

All trademarks are the property of their respective owners.
AcroPack® Module Carriers

**APCe7020** PCI Express Carrier Cards for AcroPack® Modules

**Description**
The AcroPack® product line updates our popular Industry Pack I/O modules with a PCIe interface format. This tech-refresh design offers a compact size, low-cost I/O, the same functionality and memory map of the existing Industry Pack modules.

This board interfaces two AcroPack mezzanine modules to a PCI Express bus on a PC-based computer system.

Two AcroPack module slots give you the freedom to mix a variety of I/O functions (A/D, D/A, digital in, digital out, serial I/O, etc.) on a single board. Or, combine modules of the same type for almost one hundred channels on a single card. Either way, the APCe7020 saves your precious card slots and reduces your costs.

Select I/O modules from Acromag's offering or use most third-party mPCIe compliant modules.

**Key Features & Benefits**
- Two AcroPack or mini-PCIe module slots support any combination of I/O functions
- PCI Express compliant
- Plug-and-play carrier configuration and interrupt support
- Fused +1.5V, +3.3V, +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each AcroPack module.
- Front panel SCSI-2 connectors for field I/O signals
- Extended temperature range
- DIP switch card identification
- Standard 14-pin Xilinx JTAG programming header
- Software development tools for VxWorks, Linux, and Windows environments

Two AcroPack or mini-PCIe mezzanine module slots ◆ Non-Intelligent carrier card ◆ PCIe x4 interface

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AcroPack® Module Carriers

**APCe7020** PCI Express Carrier Cards for AcroPack® Modules

**Key Features & Benefits**
- Two AcroPack or mini-PCIe module slots support any combination of I/O functions
- PCI Express compliant
- Plug-and-play carrier configuration and interrupt support
- Fused +1.5V, +3.3V, +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each AcroPack module.
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**AcroPack® Module Carriers**

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**Key Features & Benefits**
- Two AcroPack or mini-PCIe module slots support any combination of I/O functions
- PCI Express compliant
- Plug-and-play carrier configuration and interrupt support
- Fused +1.5V, +3.3V, +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each AcroPack module.
- Front panel SCSI-2 connectors for field I/O signals
- Extended temperature range
- DIP switch card identification
- Standard 14-pin Xilinx JTAG programming header
- Software development tools for VxWorks, Linux, and Windows environments

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Select I/O modules from Acromag's offering or use most third-party mPCIe compliant modules.

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**AcroPack® Module Carriers**

**APCe7020** PCI Express Carrier Cards for AcroPack® Modules

**Key Features & Benefits**
- Two AcroPack or mini-PCIe module slots support any combination of I/O functions
- PCI Express compliant
- Plug-and-play carrier configuration and interrupt support
- Fused +1.5V, +3.3V, +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each AcroPack module.
- Front panel SCSI-2 connectors for field I/O signals
- Extended temperature range
- DIP switch card identification
- Standard 14-pin Xilinx JTAG programming header
- Software development tools for VxWorks, Linux, and Windows environments

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Select I/O modules from Acromag's offering or use most third-party mPCIe compliant modules.
AcroPack® Module Carriers

APCe7020  PCI Express Carrier Cards for AcroPack® Modules

Performance Specifications

PCI Express Bus Compliance
This device meets or exceeds all written PCI Express specifications per revision 2.1.
Includes a PCIe Gen 2 switch to expand the single host PCIe port to two ports, one to each device (AcroPack or mini-PCIe).
The host port consists of four PCIe lanes, each of the mini-PCIe sites have one lane each.

Ease of Use
A unique carrier and site number can be set for each AcroPack site by a DIP switch. This provides the capability to distinguish a particular AcroPack module from others when multiple instances of the same module are used in a system.
A standard 14-pin Xilinx JTAG programming header is provided for programming and debugging the FPGA on some AcroPack modules. The JTAG ports of the two AcroPack modules are daisy-chained.

Environmental
Operating temperature
-40 to +85°C
Storage temperature
-55 to +125°C
Relative humidity
5 to 95% non-condensing.

Power
+3.3 Volts (±10%): 0.55mA typical
+12 Volts (±5%): 25mA Typical
The APCe7020E-LF has three DC/DC converters to provide the power supply voltages to the AcroPack modules that are not present at the host interface. The +1.5 Volt supply is sourced from the +3.3 Volt host power. The +5 Volt and -12 Volt supply is sourced from +12 Volt host power.

Ordering Information

Carrier Card
APCe7020E-LF
AcroPack carrier card for AcroPack or mPCIe modules, plus extended temperature range

Accessories
5028-372
Round cable, shielded, SCSI-2 to CHAMP 0.8mm, 2 meters long.
5028-378
Termination panel, SCSI-2 connector, 50 screw terminals

AcroPack® Modules
See www.acromag.com/AcroPacks for more information.

Software Development Tools
APSW-API-VXW
VxWorks® software support package
APSW-API-WIN
Windows® DLL driver software support package
APSW-API-LNX
Linux® support (website download only)

AcroPack modules snap onto the APCe7020, eliminating messy ribbon cables.
VPX AcroPack® Carrier Cards

VPX4500 VPX Carrier Cards for AcroPack® Modules

Description
Models
VPX4500E-LF: Air-cooled
VPX4500-CC-LF: Conduction-cooled

The VPX4500 is a 3U VPX carrier for Acromag AcroPack (AP) mezzanine board modules. The carrier board provides a modular approach to system assembly since each carrier can be populated with any combination of analog input/output, digital input/output, communication, AP modules. The modularity allows the user to create a board which is customized to the application. This saves money and space; a single carrier board populated with AP modules may replace several dedicated function VPX boards. The VPX4500 carrier board provides impressive functionality at low cost.

Model VPX4500E-LF is an air-cooled product that supports three AcroPack sites. Two of the sites provide field I/O connections through front panel mounted 50 pin shielded connectors. The third site provides field I/O connections through the VPX backplane.

Model VPX4500-CC-LF is a conduction-cooled product that supports three AcroPack sites. Two of the sites provide field I/O connections through 50 pin ribbon cable connectors. The third site provides field I/O connections to the VPX backplane.

Key Features & Benefits
- Three AcroPack or mini-PCIe module slots support any combination of I/O functions.
- PCI Express version 2.1 compliant.
- Fused +1.5V, +3.3V, +5V, +12V, and -12V DC power is provided. A fuse is present on each supply line serving each AcroPack module.
- Front panel SCSI-2 connectors for the field I/O signals using VPX4500E-LF.
- Extended temperature range.
- Standard 14-pin Xilinx JTAG programming header.
- Software development tools for VxWorks, Linux, and Windows environments.

Air-cooled and conduction-cooled versions ◆ 3U Format ◆ Three AcroPack slots ◆ PCIe Gen 1 interface
VPX AcroPack® Carrier Cards

VPX4500 VPX Carrier Cards for AcroPack® Modules

### Performance Specifications

- **PCI Express Bus Compliance**
  This device meets or exceeds all written PCI Express specifications per revision 2.1. Includes a PCIe Gen 2 switch to expand the single host PCIe port to three ports, one to each device (AcroPack or mini-PCIe). The host port consists of four PCIe lanes, each of the mini-PCIe sites have one lane each.

- **Ease of Use**
  A unique carrier and site number is set via slot address. This provides the capability to distinguish a particular AcroPack module from others when multiple instances of the same module are used in a system. A standard 14-pin Xilinx JTAG programming header is provided for programming and debugging the FPGA on some AcroPack modules. The JTAG ports of the two AcroPack modules are daisy-chained.

- **General**
  - **Form Factor**
    3U VPX bus 6.299” (160mm) x 3.937” (100.0mm).
  - **Pitch**
    VPX4500-LF (air-cooled): 1” pitch.
    VPX4500-CC-LF (conduction-cooled): 1” pitch.
  - **VPX Carrier Interface**
    Compatible VITA 65 module / slot profiles: FRU EEPROM with temperature monitor.
  - **AcroPack Interface**
    One AcroPack module in single VPX slot. 3.3V, 5V and ±12V provided for AcroPack modules via the VPX backplane.

### Power Requirements

- **Power**
  +3.3 Volts (±10%): 0.55mA typical
  +12 Volts (±5%): 25mA Typical
  The VPX4500 has two DC/DC converters to provide the power supply voltages to the AcroPack modules that are not present at the host interface. The +1.5 Volt supply is sourced from the 5 Volt host power. The -12 Volt supply is sourced from +12 Volt host power.

### Physical

- **Physical Configuration**
  PCIe x4 lane.
- **Field I/O Connector**
  VPX4500-CC-LF: Two 50-pin male headers.
  VPX4500-LF: Two 50-pin Champ 0.8mm connectors.

### Environmental

- **Operating temperature**
  VPX4500-LF: -40 to +85°C.
  VPX4500-CC-LF: -40 to +85°C.
  VPX4500-RTM-LF: -40 to +85°C.
- **Storage Temperature Range**
  -55 to 125°C.
- **Relative Humidity**
  5 to 95% non-condensing.
- **Vibration**
  0.05g RMS (20 - 2000Hz) random, operating 6g RMS per Hz spectrum.
- **Shock**
  30g each axis, 11ms.

### Ordering Information

- **Carrier Cards**
  - **VPX4500-LF**
    VPX carrier card, 3U, three AcroPack slots.
  - **VPX4500-CC-LF**
    Conduction-cooled version of VPX-4500.

- **Accessories**
  - **VPX4500-RTM-LF**
    Rear transition module
  - 5028-372 Round cable, shielded, SCSI-2 to CHAMP 0.8mm, 2 meters long.
  - 5028-378 Termination panel, SCSI-2 connector, 50 screw terminals.
  - 5025-552 Termination panel, DIN-rail mountable panel
  - 5025-550-3 Non-shielded cable, 3 feet long
  - 5025-550-7 Non-shielded cable, 7 feet long
  - 5025-550-10 Non-shielded cable, 10 feet long
  - 5025-551-3 Shielded cable, 3 feet long
  - 5025-551-4 Shielded cable, 4 feet long
  - 5025-551-7 Shielded cable, 7 feet long
  - 5025-551-10 Shielded cable, 10 feet long

- **Software**
  (see software documentation for details)
  - APSW-API-VXW
    VxWorks® software support package
  - APSW-API-WIN
    Windows® DLL driver software support package
  - APSW-API-LNX
    Linux® support (website download only)

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Industry Pack Module Carriers

APCe8650  PCI Express Carrier Cards for Industry Pack Modules

Description
This board interfaces standard Industry Pack (IP) mezzanine modules to a PCI Express bus on a PC-based computer system.

Four IP module slots give you the freedom to mix a variety of I/O functions (A/D, D/A, digital in, digital out, serial I/O, etc.) on a single board. Or, combine modules of the same type for hundreds of channels on a single card. Either way, the APCe8650 saves your precious card slots and reduces your costs.

Select I/O modules from Acromag's offering of more than forty models or use any third-party ANSI/VITA 4 compliant IP modules.

Key Features & Benefits
- Four IP module slots (ANSI/VITA 4 mezzanine) support any combination of I/O functions
- Board resides in memory space
- Supports IP's I/O, ID, INT, and MEM spaces
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Supervisory circuit reset generation
- Individually filtered and fused power
- Full IP module register and data access for convenient configuration or control of the I/O modules through software
- Non-volatile ID register to identify carrier
- Software development tools for VxWorks, Linux, and Windows environments

Four Industry Pack mezzanine module slots ◆ Non-Intelligent carrier card ◆ PCIe x1 interface

APCe8650 shown with four IP modules inserted.

Acromag offers more than 40 IP modules to perform analog I/O, digital I/O, serial communication, CAN bus, Mil-Std-1553, and configurable FPGA functions.
### Industry Pack Module Carriers

#### APCe8650  PCI Express Carrier Cards for Industry Pack Modules

**Performance Specifications**

- **IP Module Compliance**
  Meets or exceeds all written IP specifications per ANSI/VITA 4-1995 for 8MHz or 32MHz operation. Supports Type I and Type II ID space formats.

- **Electrical/mechanical interface**
  Supports four single-size IP modules (A-D).
  IP module I/O space, ID space, INT, and MEM space supported.
  IP module I/O space supports 16 and 8-bit; supports 128 byte values per IP module.

- **IP module ID space**
  16 and 8-bit; Supports Type I 32 bytes per IP (consecutive even byte addresses) and Type II 32 words per IP via D16 data transfers.

- **IP module memory space**
  16 and 8-bit; supports up to 8M bytes of memory space per IP module.

- **Interrupts**
  Supports two interrupt requests per IP and interrupt acknowledge cycles via access to IP INT space.

- **PCI Express Bus Compliance**
  This device meets or exceeds all written PCI local bus specifications per rev. 1.1 dated March 28, 2005.

- **System base address**
  This board operates in PCI memory space. It requires 256 bytes for mapping the PCI configuration registers and 64M bytes for IP module ID, IO, INT and memory space.

- **Data transfer bus**
  Slave with 32, 16, and 8-bit data transfer operation. 32-bit read or write accesses implemented as two 16-bit transfers to IP modules.

- **Interrupts (PCI bus INTA# interrupt signal)**
  Up to two requests sourced from each IP mapped to INTA#.

**Physical**

- **Physical Configuration**
  PCIe x1 lane
  - Length: 12.283 inches (312.0 mm)
  - Height: 4.380 inches (111.25 mm)
  - Board thickness: 0.062 inches (1.59 mm)
  - Max. height under IP modules: 0.110 in. (2.80 mm)

- **Connectors**
  A-D (carrier field I/O): 50-pin male header.
  Power: Auxiliary +12V power

**Environmental**

- **Operating temperature**
  0 to 70°C (APCe8650) or -40 to 85°C (APCe8650E model).

- **Storage temperature**
  -55 to 100°C.

- **Relative humidity**
  5 to 95% non-condensing.

- **Power**
  +3.3 Volts (+10%): 190mA, typical; 220mA max.
  +12 Volts (+5%): 130mA, typical; 150mA max.
  All IP module power is derived from the +12V power supply. +5V, +12V, and –12V are supplied to IP modules. The +12V power can be supplied from the PCIe bus or optionally from either of two auxiliary power connectors.

- **MTBF**
  Contact the factory.

**Ordering Information**

- **Carrier Card**
  - APCe8650: PCI Express carrier card for Industry Pack modules
  - APCe8650E: Same as APCe8650 plus extended temperature range

- **Accessories**
  - 5025-550-x: Flat ribbon cable, non-shielded, 50-pin connector at both ends. Specify x = length, in feet (12ft. max.)
  - 5025-551-x: Flat ribbon cable, shielded, 50-pin connector at both ends. Specify x = length, in feet (12ft. max.)
  - 5025-552: Termination panel, DIN rail-mount, 50 screw terminals, 50-pin ribbon cable connector

- **Industry Pack Modules**
  See [www.acromag.com](http://www.acromag.com) for more information.

- **Software Development Tools**
  See [www.acromag.com](http://www.acromag.com) for more information.

  - IPSW-API-VXW: VxWorks® software support package
  - IPSW-API-WIN32: 32-bit Windows® DLL driver software support package
  - IPSW-API-WIN64: 64-bit Windows® DLL driver software support package
  - IPSW-LINUX: Linux® support (website download only)
**Description**

Acromag’s APCe8670 carrier card interfaces a PMC mezzanine module to a PCI Express bus in a PC-based desktop computer system.

The APCe8670 is a PCIe bus adapter board that allows a PC (PCIe bus master) to control and communicate with the hosted PMC module. It simply acts as an adapter to route signals between the system’s PCIe bus and the PMC module connectors.

One PMC mezzanine module slot ◆ Non-Intelligent carrier card ◆ PCIe x4 interface

The I/O signals are accessible via rear connectors and though the front mounting bracket. Cables are available to connect the carrier’s rear I/O to a front panel connector in an adjacent slot.

Select PMC modules from Acromag’s offering of high-performance FPGA and I/O solutions or use any third-party ANSI/VITA 20 compliant mezzanine modules.

**Key Features & Benefits**

- One PMC module slot
- 4-lane PCI Express interface
- PCI-X interface supports 32/64-bit addressing, 32/64-bit data bus at up to 100MHz operation
- Carrier routes 32 differential pairs to rear connector for LVDS I/O from the PMC module
- JTAG connector supports Xilinx programmer for use with hosted FPGA modules
- Cooling fan
- Auxilliary power connection for 12V source
- Diagnostic LEDs indicate communication speed
PMC/XMC Module Carriers

APCe8670  PCI Express Carrier Card for PMC Modules

Performance Specifications

- **PMC Compliance**
  - PMC Module
    - Conforms to CMC/PMC Specification, P1386.1.

- **PCI/X Bridge**
  - Compliant to the following specifications:
    - PCI Express Base Specification (Rev. 1.1)
    - PCI Express-to-PCI/PCI-X Bridge Specification (Rev. 1.0)
    - PCI-to-PCI Bridge Specification (Rev. 1.2)
    - PCI Local Bus Specification (Rev. 3.0)
    - PCI-X Addendum to PCI Local Bus Specification (Rev. 2.0, mode 1 only)
    - PCI Bus Power Management Interface Specification (Rev. 1.2)
  - **Addressing**
    - 32/64-bit.
  - **Data bus**
    - 32/64-bit.
  - **Interface**
    - Supports up to 100MHz operation.

- **PCI Express Interface**
  - PCI Express interface
    - 4 lane, Gen 1 capable.
  - **PCIe bus compliance**
    - This device meets or exceeds all written PCI Express specifications per revision 1.1 dated March 28, 2005.

- **I/O Interface**
  - Rear I/O (J6)
    - Connector: MD68 (internal SCSI), male.
    - 32 LVDS pairs routed from the PMC P4 connector.

- **Environmental**
  - **Operating temperature**
    - 0 to 70°C.
  - **Storage temperature**
    - -55 to 125°C.
  - **Relative humidity**
    - 5 to 95% non-condensing.
  - **Power**
    - The carrier provides +3.3V, +5V, +12V and -12V power to the PMC module. The +12V power source is jumper-selectable from the PCIe bus +12V supply or the PCIe graphics power connector. DC/DC converters generate a +5V or -12V supply from the +12V source.
    - +3.3V (±10%): 0mA.
    - +12V (±5%): ?mA, typical with fan operating.
    - Currents specified are for the carrier board only. For the total current required from each supply, add the PMC module currents.
  - **MTBF**
    - Contact the factory.

- **Physical**
  - **Dimensions**
    - Length: 9.342 inches (237.3 mm).
    - Height: 4.376 inches (111.2 mm).
    - Width: Occupies two slots with fan installed (fan is mounted on solder side, height is 10 mm). Occupies one slot with fan removed.
  - **Board thickness**: 0.062 inches (1.59 mm).
  - **Connectors**
    - J1, J2, J3: PMC PCI-X signals.
    - J4: PMC user signals (rear I/O).
    - J5: Auxiliary power connector (PCIe graphics).
    - J6: Board-to-board connection of J4 user signals.
    - P1: PCI Express V1.1 x4 lanes card edge.
    - P3: Fan power.
    - P4: JTAG (Xilinx programming adapter).

- **Approvals**
  - CE marked, FCC Part 15, Class A

Ordering Information

- **Carrier Cards**
  - APCe8670
    - PCI Express carrier card for PMC modules

- **Accessories**
  - 5025-913
    - CS Electronics internal SCSI cable with PCI bracket-mounted HD68 female connector. Brings the PMC J4 rear I/O signals to back panel of the PC.

- **PMC Modules**
  - See www.acromag.com for more information.
PMC/XMC Module Carriers

APCe8675 PCI Express Carrier Card for XMC Modules

**Description**

Acromag’s APCe8675 carrier card interfaces an XMC mezzanine module to a PCI Express bus in a PC-based desktop computer system.

The APCe8675 is a PCIe bus adapter board that allows a PC (PCIe bus master) to control and communicate with the hosted XMC module. It simply acts as an adapter to route signals between the system’s PCIe bus and the XMC module connector.

The I/O signals are accessible via rear connectors and through the front mounting bracket. To simplify wiring, Acromag offers cables to connect the carrier’s rear I/O signals to other carrier cards in adjacent slots. Cables are also available to connect the carrier’s rear I/O to a front panel connector in an adjacent slot.

Select XMC modules from Acromag’s offering of high-performance FPGA and I/O solutions or use any third-party ANSI/VITA 42 compliant mezzanine modules.

**Key Features & Benefits**

- One XMC module slot
- 8-lane PCI Express interface
- Cooling fan
- Supports high-speed serial interface between neighboring cards using protocols such as XAUI or Aurora
- Routes 32 differential pairs to rear connector for LVDS I/O from the XMC module
- JTAG programming connector supports Xilinx programmer for use in with hosted FPGA modules
- Auxiliary power connection for 12V source
PMC/XMC Module Carriers

APCe8675  PCI Express Carrier Card for XMC Modules

Performance Specifications

- **XMC Compliance**
  XMC Module
  Complies with ANSI/VITA 42.0-2008.

- **I/O Interface**
  Serial Rear I/O (P2, P3)
  Connector: Samtec QSH-DP 0.50 mm Q Pairs® high speed ground plane socket strip, differential pair.
  These ports provide the ability to connect to left and right neighbor carrier cards using high speed serial protocols such as XAUI or Aurora.
  Supports up to five transmit and five receive high speed (5Gbps) differential pairs or five LVDS pairs when used with Samtec QPairs® High Speed Twinax cables.
  Rear I/O (J1)
  Connector: MD68 (internal SCSI), male.
  32 LVDS pairs routed from the XMC P4 connector.

- **PCI Express Interface**
  PCI Express interface
  8 lane, Gen 1 capable.
  PCIe bus compliance
  This device meets or exceeds all written PCI Express specifications per revision 1.1 dated March 28, 2005.

- **Environmental**
  Operating temperature
  0 to 70°C.
  Storage temperature
  -55 to 125°C.
  Relative humidity
  5 to 95% non-condensing.
  Power
  The carrier provides +3.3V, +12V and -12V power to the XMC module. The +12V power source is jumper-selectable from the PCIe bus +12V supply or the PCIe graphics power connector. The DC/DC converter generates a -12V supply from the +12V source.
  +3.3V (±10%): 0mA.
  +12V (±5%): 270mA, typical with fan operating.
  Currents specified are for the carrier board only. For the total current required from each supply, add the XMC module currents.
  MTBF
  Contact the factory.

- **Physical**
  Dimensions
  Length: 12.283 inches (312.0 mm).
  Height: 4.200 inches (106.68 mm).
  Width: Occupies two slots with fan installed (fan is mounted on solder side, height is 10 mm). Occupies one slot with fan removed.
  Board thickness: 0.062 inches (1.59 mm).
  Connectors
  J1: Board-to-board connection of J14 user signals.
  J2: Power source select jumper.
  J3: Auxiliary power connector (PCIe graphics).
  J4: JTAG I/O voltage select jumper.
  J14, J16: XMC user signals (rear I/O).
  J15: XMC PCIe signals.
  P1: PCI Express V1.1 x8 lanes card edge.
  P2, P3: Board-to-board connection of J16 user signals.
  P4: Fan power.
  P5: JTAG (Xilinx programming adapter).

- **Approvals**
  CE marked, FCC Part 15, Class A

Ordering Information

Carrier Cards
APCe8675
PCI Express carrier card for XMC modules

Accessories
5025-917
Samtec Q Pairs® high speed twinax cable for board-to-board connections. 3 inches long, 20 differential pairs.
Connects carrier cards in adjacent slots between P2 or P3 connectors. High-speed serial signals originate from XMC J16 rear I/O.

5025-913
CS Electronics internal SCSI cable with PCI bracket-mounted HD68 female connector. Brings the XMC J14 rear I/O signals to back panel of the PC.

XMC Modules
See www.acromag.com for more information.
PMC Module Carriers

APMC4110 Busless PMC Module Carrier Card

Holds one PMC module ◆ Delivers power to PMC module ◆ Enables a trouble-free start-up sequence

Description
This PMC module carrier card allows use of a PMC module in an independent stand-alone mode. The carrier card delivers power to the PMC module and regulates the PCI bus start-up sequence to prevent a system lock-up by the connection to the local bus.

As a non-intelligent carrier, the board acts simply as an adapter to route signals to and from the PMC module. The user has full access to the field I/O via two 50-pin ribbon cable connectors.

Using an external power supply, this carrier card allows use of any industry-standard PMC module. The on-board DC-DC converter creates +3.3VDC from the external +5VDC source, lowering the number of external power connections required.

For troubleshooting, a 14-pin Xilinx JTAG connector facilitates boundary scan debugging. Also, a manual reset button allows the user to force an RST# signal when needed.

Key Features & Benefits
- Single-slot PMC carrier card
- Stand-alone design does not require expensive card cage or other computer chassis
- Ideal for custom computing solutions based on configurable FPGA modules
- On-board DC-DC converter provides +3.3V DC to the PMC module from a +5V power source
- Users can optionally provide a ±12V DC source
- Manual reset button initiates a PCI reset at user’s discretion
- Voltage monitor designed to prevent code execution errors during power-up, power-down, or potential brown-out conditions when +5V DC supply dips too low
- A standard 14-pin Xilinx JTAG connection is available for utilizing the TDI, TDO, TCK, and TMS signals
- Front or rear connection I/O access

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Bulletin #8400-622b
**APMC4110** Busless PMC Module Carrier Card

### Performance Specifications

**PMC Compatibility**
Pin assignment conforms to PCI Bus Specification, Revision 3.0.

**Physical**
Physical Configuration
Height: 3.300 inches (83.820 mm).
Depth: 3.520 inches (89.408 mm).
Board Thickness: 0.063 inches (1.600 mm).
Unit Weight: 0.107 lbs. (0.053 kg).

Connectors
P1, P2 (Field I/O): 50-pin, ribbon cable, male receptacle headers.
P3: 4-pin power header.
P4: 14-pin Xilinx JTAG port.
J1 - J4: 64-pin PMC module connectors.

**Environmental**
- Operating temperature: -40 to 85°C.
- Storage temperature: -55 to 120°C.
- Relative humidity: 5 to 95% non-condensing.
- Power:
  - +5V (±5%): 66mA, typical.
  - +12V (±10%): 0mA, used by PMC module only.
  - -12V (±10%): 0mA, used by PMC module only.
- Note that 3.3V is generated from the 5V supply. Power requirements do not include the PMC module.
- ±12.0V DC is optional based on user’s needs.
- Isolation:
  - Non-Isolated. PCI interface and field commons have a direct electrical connection.
- MTBF:
  - Contact the factory.

### Ordering Information

**Carrier Card**
APMC4110
Stand-alone powered PMC module carrier card.

**Accessories**
- 5025-550-x
  Flat ribbon cable, non-shielded, 50-pin connector at both ends. Specify x = length, in feet (12ft. max.).
- 5025-551-x
  Flat ribbon cable, shielded, 50-pin connector at both ends. Specify x = length, in feet (12ft. max.).
- 5025-552
  Termination panel, DIN rail-mount, 50 screw terminals, 50-pin ribbon cable connector.

**PMC Modules**
See [www.acromag.com](http://www.acromag.com) for more information.

**Software Development Tools**
See [www.acromag.com](http://www.acromag.com) for more information.
VPX Carrier Cards

VPX4810  VPX Carrier Cards for XMC or PMC Modules

Description
These 3U mezzanine carrier cards provide a simple and cost-effective solution for interfacing a PMC or XMC module to a VPX computer system. The carrier card routes power and bus signals to a plug-in mezzanine module through the VPX card slot connector. Industrial I/O and configurable FPGA modules from Acromag or other vendors are supported.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion. The VPX4810-LF is available in three versions: air-cooled, conduction-cooled and a Ruggedized Enhanced Design Implementation (REDI VITA 48).

Key Features & Benefits
- PMC/XMC site uses 64-bit, 66/133MHz PLX technology with a PCIe to PCI-X bridge
- PCIe bus 8-lane Gen 1 or 2 interface
- Supports standard PMC/XMC modules (IEEE 1386.1)
- Conforms to VPX VITA 46.0, 46.4 and 46.9 specifications and optionally VITA 48
- Supports front or rear panel PMC/XMC I/O
- Supports 64 I/O lines (P14, VITA 46.9) via the P2 VPX connector
- 3.3V PCI-X signaling PMC site
- +12V and –12V provided to PMC/XMC site
- Monitors FRU information and module temperature

Air-cooled, conduction-cooled and REDI versions  •  3U  •  One PMC/XMC slot  •  PCIe x8 Gen 2 interface

Conduction-cooled version

VPX REDI VITA 48 version
## VPX4810  VPX Carrier Cards for XMC or PMC Modules

### Performance Specifications

**General**

- **Form Factor**: 3U VPX bus 6.299" (160mm) x 3.937" (100.0mm).

- **Pitch**
  - VPX4810 (air-cooled): 0.80" pitch
  - VPX4810CC (conduction-cooled): 0.85" pitch
  - VPX4810REDI (conduction-cooled REDI): 1.00" pitch

- **VPX Carrier Interface**
  
  Compatible VITA 65 module / slot profiles:
  
  MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2
  MOD3-PAY-1D-16.2.6-1 / SLT3-PAY-1D-14.2.6
  
  **Note 1**: Board is compatible with payload profiles but has no hosting capabilities.

- **FRU EEPROM with temperature monitor.**

- **PMC/XMC Interface**
  
  One IEEE 1386.1 PMC/XMC module in single VPX slot.
  
  PMC site is PCI 3.0 compliant, 32/64-bit, 33/66MHz.
  
  PMC site is PCI-X 1.0b compliant, 64-bit, 66/100/133MHz.
  
  XMC site is PCIe Gen. 2.0 and 8 lanes wide.
  
  3.3V, 5V and ±12V provided for PMC modules via the VPX backplane.

- **Front or rear panel I/O support for the PMC site with 64 I/O lines, or 32 differential pairs. Rear I/O is compliant to VITA 46.9 P2w1-P64s.**

### Power Requirements

- **Carrier-Only Power Requirements**
  
  +3.3V DC: 0.9A typical plus any additional power consumed by PMC/XMC.
  
  +5V DC: 0.9A typical plus any additional power consumed by PMC and XMC (VPWR).
  
  +12V DC and –12V DC provided to PMC and XMC site (aux only).

- **MTBF**
  
  MIL Spec 217-F @ 105,000 hours.

### Environmental

- **Air-Cooled Operating Temperature**
  
  0 to 70°C (air flow requirement as measured to be greater than 200 LFM).

- **Conduction-Cooled Operating Temperature Range**
  
  -40 to 85°C (board must operate in a fully-installed conduction-cooled rack).

- **REDI (VITA 48) Operating Temperature Range**
  
  -40 to 85°C (board MUST operate in a fully-installed conduction-cooled, REDI supported rack).

- **Storage Temperature Range**
  
  -55 to 100°C.

- **Relative Humidity**
  
  5 to 95% non-condensing.

- **Vibration**
  
  0.05g RMS (20 - 2000Hz) random, operating 6g RMS per Hz spectrum.

- **Shock**
  
  30g each axis, 11ms.

### Ordering Information

- **Carrier Cards**
  
  - **VPX4810-LF**: VPX carrier card, 3U, one PMC/XMC slot
  
  - **VPX4810-CC-LF**: Conduction-cooled version of VPX-4810
  
  - **VPX4810-REDI-LF**: Ruggedized enhanced design implementation (REDI VITA 48) version of VPX-4810-LF

- **Accessories**
  
  See www.acromag.com for more information.

- **Software Development Tools**
  
  See www.acromag.com for more information.
VPX Carrier Cards

VPX4812 / VPX4814  VPX Carrier Cards for XMC Modules

Description
These 3U mezzanine carrier cards provide a simple and cost-effective solution for interfacing a XMC module to a VPX computer system. The carrier card routes power and bus signals to a plug-in mezzanine module through the VPX card slot connector. Industrial I/O and configurable FPGA modules from Acromag or other vendors are supported.

The VPX4812 can be used as a VPX switch card allowing a host CPU to communicate with up to 3 downstream cards in addition to the XMC card. Each VPX port can be configured to be x4 or x8.

The VPX4814 is a peripheral XMC carrier board designed to be used in a system that uses a VPX AcroExpress CPU.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion. The VPX4812 and VPX4814 is available in three versions: air-cooled, conduction-cooled and a Ruggedized Enhanced Design Implementation (REDI VITA 48).

Key Features & Benefits
- PCIe bus 8-lane Gen 1 or 2 interface
- Supports standard XMC modules (IEEE 1386.1)
- Conforms to VPX VITA 46.0, 46.4, and 46.9 specifications and optionally VITA 48
- Supports front or rear panel XMC I/O
- Rear I/O is compliant to VITA 46.9
- X24s+X8d+X12d
- +12V and –12V provided to XMC site
- Monitors FRU information and module temperature
VPX Carrier Cards

VPX4812 / VPX4814  VPX Carrier Cards for XMC Modules

Performance Specifications

- **General**
  - **Form Factor**
    - 3U VPX bus 6.3" (160mm) x 3.94" (100.0mm).
  - **Bus Compliance**
    - VITA 46.0, 46.4, 46.9, 48 and 65.
    - MIL Spec 217-F @ 105,000 hours.

- **VPX Carrier Interface**
  - **VPX4812**
    - Compatible VITA 65 module / slot profiles:
      - MOD3-SWH-4F-16.4.5-2 / SLT3-SWH-4F-14.4.4
      - MOD3-PER-1F-16.3.2 / SLT3-PER-1F-14-3.2
    - FRU EEPROM with temperature monitor.
  - **VPX4814**
    - AcroExpress™ VPX6600 system compatible.
    - Compatible VITA 65 module / slot profiles:
      - MOD3-PER-1F-16.3.2 / SLT3-PER-1F-14-3.2
    - FRU EEPROM with temperature monitor.
    - Compatible with systems that use UTP control plane interfaces.

- **XMC Interface**
  - One IEEE 1286.1 XMC module in single VPX slot.
  - XMC site is PCIe Gen. 2.0 and 8 lanes wide.
  - 3.3V and ±12V provided for XMC modules via the VPX backplane.
  - Front I/O is supported on air-cooled only.
  - Rear I/O is supported via XMC P16 and is compliant to VITA 46.9 X24s+X8d+X12d.

- **Power Requirements**
  - Carrier-Only Power Requirements
    - +3.3V DC: 0.2A typical plus any additional power consumed by XMC (4A max).
    - +5V DC: 0.8A typical (4A max).
    - +12V DC and −12V DC provided to XMC site from VPX backplane.

- **Environmental**
  - **Air-Cooled Operating Temperature**
    - -40 to 85°C (air flow requirement to be greater than 200 LFM).
  - **Conduction-Cooled Operating Temperature**
    - -40 to 85°C (board must operate in a fully-installed conduction-cooled rack).
  - **REDI (VITA 48) Operating Temperature**
    - -40 to 85°C (board MUST operate in a fully-installed conduction-cooled, REDI supported rack).
  - **Storage temperature**
    - Air-cooled: -40 to 85°C.
    - Conduction-cooled/REDI: -40 to 105°C.
  - **Relative humidity**
    - 20 to 80% non-condensing.
  - **MTBF**
    - 1,595,069 hrs. at 25°C.
    - 1,225,286 hrs. at 40°C.
  - **Shock**
    - Operating:
      - 30g peak acceleration, 11ms duration.
    - Non-operating:
      - 50g peak acceleration, 11ms duration.
  - **Vibration (5Hz-2kHz)**
    - Operating:
      - 0.015" (380µm) peak-to-peak displacement, 2.5g max acceleration.
    - Non-operating:
      - 0.030" (760µm) peak-to-peak displacement, 5.0g max acceleration.

Ordering Information

- **Carrier Cards - Go**
  - **VPX4812-LF**
    - VPX carrier card, 3U, one XMC slot.
  - **VPX4812-CC-LF**
    - Conduction-cooled version of VPX4812.
  - **VPX4812-REDI-LF**
    - Ruggedized enhanced design implementation (REDI VITA 48) version of VPX4812.
  - **VPX4814-LF**
    - AcroExpress™ VPX6600 system compatible.
    - VPX carrier card, 3U, one XMC slot.
  - **VPX4814-CC-LF**
    - Conduction-cooled version of VPX4814.
  - **VPX4814-REDI-LF**
    - Ruggedized enhanced design implementation (REDI VITA 48) version of VPX4814.

- **Accessories**
  - **TRANS-V112-LF**
    - Rear transition module.
  - **5028-564**
    - JTAG development cable

- **Software Development Tools**
  - See [www.acromag.com](http://www.acromag.com) for more information.

- **Related Products**
  - XMC boards

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ISO9001 AS9100

Tel 248-295-0310  ■  Fax 248-624-9234  ■  solutions@acromag.com  ■  www.acromag.com  ■  30765 Wixom Rd, Wixom, MI 48393  USA

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VPX Carrier Cards

VPX4820 VPX Carrier Cards for XMC or PMC Modules

Description
The VPX4820 carrier card provides a simple and cost-effective solution for interfacing a PMC or XMC module to a VPX computer system.

Connect to the OpenVPX™ via Expansion plane for a direct PCIe connection over the VPX backplane. This allows host processors access to a high-performance, low latency interconnect to the PMC and XMC modules on the carrier card.

The PMC site uses 32/64-bit, PLX technology with a PCIe to PCI-X bridge; while the XMC site enables rapid data throughput with its use of an 8-lane PCIe Gen 2 interface. These sites support front or rear panel I/O.

By inserting PMC or XMC industrial I/O and configurable FPGA modules, developers can now leverage hundreds of available functions currently unavailable in a VPX platform.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion. The VPX4820 is available in two versions: air-cooled and conduction-cooled.

The VPX4820 is one member of a family of 3U and 6U OpenVPX mezzanine carrier cards that support a simple and cost-effective solution for interfacing XMC or PMC modules to OpenVPX computer systems.

Key Features & Benefits

- Connects to OpenVPX™ via Expansion plane
- Support for upstream/downstream
- Optional backplane configuration for one 16-lane port, two 8-lane ports, or four 4-lane ports
- Supports dual standard (IEEE 1386.1) PMC/XMC modules with 25W mezzanine sites
- PMC site uses 32/64-bit, 33/66/133MHz PLX technology with a PCIe to PCI-X bridge
- Supports 64-bits of PMC I/O including differential routing to backplane per pattern "P64s" of VITA 46.9
- 5V tolerant with respect to PMC connectors
- XMC site uses PCIe x8 Gen 1 or 2 interface
- Supports 40-bits (20 pairs) of XMC I/O to backplane per pattern "X12d+X8d" of VITA 46.9
- Conforms to VITA 46.0, 46.4, 46.9
- Supports front or rear panel PMC/XMC I/O
- ±12V AUX power to PMC/XMC site
- Monitors FRU information and module temperature

PCIe x8 Gen 2 interface via Expansion plane  Two PMC/XMC slots  6U form factor
VPX Carrier Cards

VPX4820  VPX Carrier Cards for XMC or PMC Modules

**Performance Specifications**

NOTE: Specifications below only for VPX4820 carrier. See PMC/XMC data sheet for additional specifications.

**General**
Form Factor
6U VPX bus 6.299” (160mm) x 9.173” (233.0mm).

Pitch
VPX4820 (air-cooled): 0.8" pitch.
VPX4820CC (conduction-cooled): 0.81" pitch.

VPX Carrier Interface
Compatible VITA 65 module / slot profiles:
MOD6-PER-1Q-12.3.5-1 Expansion Plane PCIe Gen1
MOD6-PER-1Q-12.3.5-2 Expansion Plane PCIe Gen2
Note 1: Board is compatible with payload profiles but has no hosting capabilities.
FRU EEPROM with temperature monitor.

PMC/XMC Interface
Two IEEE 1386-2001 PMC/XMC modules in a single VPX slot.
PMC site is PCI-X 2.0 compliant, 32/64-bit, 33/66/133MHz, up to 1GB/s.
XMC site is PCIe Gen 2 and 8 lanes wide.
Front panel I/O support for the PMC/XMC site with 32 differential pairs (air cooled only).
Rear I/O support for the PMC site with 64 I/O lines.
Rear I/O support for XMC site with 20 differential pairs.
VITA 46.9 compliance:
Slot 1 rear I/O map is P3w1-P64s+P4w1-X12d+X8d.
Slot 2 rear I/O map is P5w1-P64s+P6w1-X12d+X8d.

**Power**
Power Requirements
+5V DC (0 to 70°C): 8A maximum generated from +12V supply.
+5V DC (-40 to 85°C): 5A maximum generated from +12V supply.
+3.3V DC (0 to 70°C): 8A maximum generated from +12V supply.
+3.3V DC (-40 to 85°C): 5A maximum generated from +12V supply.
+3.3V Aux DC: 5mA typical.
+12V DC and –12V DC provided to PMC site from VPX backplane.
–12V Aux DC.
Note: see manual for further information.

**Environmental**
Air-Cooled Operating Temperature
-20 to 70°C (air flow requirement as measured to be greater than 200 LFM).
Conduction-Cooled Operating Temperature Range
-40 to 85°C (board must operate in a fully-installed conduction-cooled rack).
Storage Temperature Range
-55 to 100°C.
Relative Humidity
5 to 95% non-condensing.

**Weight**
VPX4820-LF: 1.021 lbs. (0.4631 kg)
VPX4820-CC-LF: 1.418 lbs. (0.6432 kg)

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>MTBF (hours)</th>
<th>MTBF (years)</th>
<th>Failure Rate (FIT)</th>
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<td>1.545</td>
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<tr>
<td>40</td>
<td>426,934</td>
<td>48.7</td>
<td>2.342</td>
</tr>
</tbody>
</table>

**Ordering Information**

Carrier Cards
VPX4820-LF
VPX carrier card, 6U, two PMC/XMC slots, lead-free
VPX4820-CC-LF
Conduction-cooled version of VPX-4820-LF
Consult factory for lead solder versions

Accessories
See www.acromag.com for more information.

Software Development Tools
See www.acromag.com for more information.
VPX4821  VPX Carrier Cards for XMC or PMC Modules

Description
The VPX4821 carrier card provides a simple and cost-effective solution for interfacing a PMC or XMC module to a VPX computer system.

Connect to the OpenVPX™ via Data plane for a direct PCIe connection over the VPX backplane. This allows host processors access to a high-performance, low latency interconnect to the PMC and XMC modules on the carrier card.

The PMC site uses 32/64-bit, PLX technology with a PCIe to PCI-X bridge; while the XMC site enables rapid data throughput with its use of an 8-lane PCIe Gen 2 interface. These sites support front or rear panel I/O.

By inserting PMC or XMC industrial I/O and configurable FPGA modules, developers can now leverage hundreds of available functions currently unavailable in a VPX platform.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion. The VPX4821 is available in two versions: air-cooled and conduction-cooled.

The VPX4821 is one member of a family of 3U and 6U OpenVPX mezzanine carrier cards that support a simple and cost-effective solution for interfacing XMC or PMC modules to OpenVPX computer systems.

Key Features & Benefits
- Connects to OpenVPX™ via Data plane
- Support for upstream/downstream
- Optional backplane configuration for one 16-lane port, two 8-lane ports, or four 4-lane ports
- Supports dual standard (IEEE 1386.1) PMC/XMC modules with 25W mezzanine sites
- PMC site uses 32/64-bit, 33/66/133MHz PLX technology with a PCIe to PCI-X bridge
- Supports 64-bits of PMC I/O including differential routing to backplane per pattern “P64s” of VITA 46.9
- 5V tolerant with respect to PMC connectors
- XMC site uses PCIe x8 Gen 1 or 2 interface
- Supports 40-bits (20 pairs) of XMC I/O to backplane per pattern “X12d+X8d” of VITA 46.9
- Conforms to VITA 46.0, 46.4, 46.9
- Supports front or rear panel PMC/XMC I/O
- ±12V AUX power to PMC/XMC site
- Monitors FRU information and module temperature
VPX Carrier Cards

VPX4821  VPX Carrier Cards for XMC or PMC Modules

Performance Specifications

NOTE: Specifications below only for VPX4821 carrier. See PMC/XMC data sheet for additional specifications.

### General
- **Form Factor**: 6U VPX bus 6.299" (160mm) x 9.173" (233.0mm).
- **Pitch**:
  - VPX4821 (air-cooled): 0.8" pitch.
  - VPX4821CC (conduction-cooled): 0.81" pitch.
- **VPX Carrier Interface**
  - Compatible VITA 65 module / slot profiles:
    - Data Plane PCIe Gen 1: MOD6-PER-4F-12.3.1-2, MOD6-PER-2F-12.3.2-1, MOD6-PER-1U-12.3.3-1, MOD6-PER-1F-12.3.4-1
    - Data Plane PCIe Gen 2: MOD6-PER-4F-12.3.1-3, MOD6-PER-2F-12.3.2-2, MOD6-PER-1U-12.3.3-2, MOD6-PER-1F-12.3.4-2
- ** PMC/XMC Interface**
  - Two IEEE 1386-2001 PMC/XMC modules in a single VPX slot.
  - PMC site is PCI-X 2.0 compliant, 32/64-bit, 33/66/133MHz, up to 1GB/s.
  - XMC site is PCIe Gen 2 and 8 lanes wide.
  - Front panel I/O support for the PMC/XMC site with 32 differential pairs (air cooled only).
  - Rear I/O support for the PMC site with 64 I/O lines.
  - Rear I/O support for XMC site with 20 differential pairs.
- **VITA 46.9 compliance**: Slot 1 rear I/O map is P3w1-P64s+P4w1-X12d+X8d. Slot 2 rear I/O map is P5w1-P64s+P6w1-X12d+X8d.

### Power
- **Power Requirements**
  - +5V DC (0 to 70°C): 8A maximum generated from +12V supply.
  - +5V DC (-40 to 85°C): 9A maximum generated from +12V supply.
  - +3.3V DC (0 to 70°C): 8A maximum generated from +12V supply.
  - +3.3V DC (-40 to 85°C): 10A maximum generated from +12V supply.
  - +3.3V Aux DC: 5mA typical.
  - 12V DC and −12V DC provided to PMC site from VPX backplane.
  - 12V DC: Backplane voltage provided to XMC.
  - ±12V Aux DC.
- **Note**: see manual for further information.

### Environmental
- **Air-Cooled Operating Temperature**: -20 to 70°C (air flow requirement as measured to be greater than 200 LFM).
- **Conduction-Cooled Operating Temperature Range**: -40 to 85°C (board must operate in a fully-installed conduction-cooled rack).
- **Storage Temperature Range**: -55 to 100°C.
- **Relative Humidity**: 5 to 95% non-condensing.
- **Weight**
  - VPX4821-LF: 1.021 lbs (0.4631kg)
  - VPX4821-CC-LF: 1.418 lbs (0.6432kg)

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Ordering Information

**Carrier Cards**
- **VPX4821-LF**: VPX carrier card, 6U, two PMC/XMC slots, lead-free
- **VPX4821-CC-LF**: Conduction-cooled version of VPX-4821-LF
  - Consult factory for lead solder versions

**Accessories**
See www.acromag.com for more information.

**Software Development Tools**
See www.acromag.com for more information.
**Description**

Acromag’s ACEX4405-L carrier card supports both Type 2 and Type 3 COM Express modules at a small footprint of only 95mm x 125mm. Designed for extreme applications, the ACEX4405-L has an extra rigid PCB and extended temperature support.

**Key Features & Benefits**

- Mini PCIe site for I/O expansion
- Compact Flash site with ejector
- COM module must support SATA2
- Dual Gigabit Ethernet (if supported by COM Express module)
- Optional fan power interface
- Standard ATX power connector
- LVDS for LCD panel display
- LCD backlight control
- Power and status LEDs

**Performance Specifications**

- **General**
  - Form Factor: Small (SFF): 95mm x 125mm.
  - PICMG Compliance: Complies with PICMG COM.0.
  - Processor: Supports Type 2 and Type 3 COM Express module (i.e., ATOM™, Pentium® Core™ 2 Duo, Core™ i7, PowerPC™).
  - Flash Memory: On-board compact flash site (if COM module supports SATA).
  - Expansion: Mini PCIe socket 30mm x 51mm.
  - Connector Types: Ethernet: RJ45.
  - LVDS/LCD: 30-pin single row, dual channel.
  - VGA: 16-pin, dual row.
  - HD Audio: 10-pin, dual row.
  - SATA: SATA Header with latch.
  - USB: 10-pin, dual row.
  - Software Support: See COM Express module.

- **Environmental**
  - Operating temperature: 0 to 70°C.
  - Storage temperature: -40 to 105°C.
  - Relative humidity: 20 to 80% non-condensing.
  - Shock:
    - Operating: 30g peak acceleration, 11ms duration.
    - Non-operating: 50g peak acceleration, 11ms duration.
  - Vibration (5Hz-2kHz):
    - Operating: 0.015” (380µm) peak-to-peak displacement, 2.5g max acceleration.
    - Non-operating: 0.030” (760µm) peak-to-peak displacement, 5.0g max acceleration.

**Ordering Information**

- **Carrier Cards**
  - ACEX4405-L
  - COM Express module carrier card

- **Accessories**
  - For more information, see www.acromag.com.
Support Software

VxWorks® Libraries  I/O Function Routines

VxWorks®

Supports any CPU target with quick modification  ◆  API easily convertible for any operating system

Description

IPSW-API-VXW
Support for Industry Pack modules and carriers

PMCSW-API-VXW
Support for XMV, PMC, PCI, and CompactPCI boards

APSW-API-VXW
Support for AcroPack™ modules and carriers

Application Programming Interface (API)

Acromag’s software development tools greatly simplify the interface between the I/O boards and your software application program. VxWorks libraries are supplied as “C” source code. These libraries provide easy-to-use function routines that quickly integrate with your application. Function routines are ready for use “as-is,” but they are also easily customized for your unique application.

This powerful program lets you fully exercise the libraries and your hardware before running the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration program steps you through the exact functions that are called in your application.

Target any CPU

Acromag provides direct support for VxWorks when using PowerPC, x86 and 68000 CPU boards. The VxWorks C Library includes support for x86 PCI, MV167 and MV2700 CPU boards. Each library contains detailed information on integrating with the CPU's Board Support Package (BSP). The libraries also include instructions for implementing this software with other manufacturer’s CPU board BSPs. Use with Industry Pack carriers from third-party board vendors is also supported.

The IPSW-API-VXW library package offers support for Acromag carriers. Other carriers are compatible, but require some minor modifications. Acromag uses a very innovative modular programming technique. This allows new carrier files to be created without affecting any of the complex IP module files or interrupt service routines.

User-Friendly Licensing

Acromag's VxWorks software libraries are provided with a full site license. This allows anyone at your location to use this software without any additional charges. Additionally, no run-time license is required either.

The VxWorks software libraries include support for the full family of boards or modules, not just certain models. For example, the IPSW-API-VXW package includes support for all Acromag Industry Pack Modules and carriers.

Key Features & Benefits

- Easy installation procedure
- Readme files with step-by-step instructions
- Quickly creates libraries for any IP carrier board (supports third-party vendors)
- Targeted support for Power PC, x86, and 68000 series CPUs
- Supports any CPU target with quick modification
- API easily convertible for any operating system
- Source code provided to ensure maximum flexibility in implementing your application
- Ability to verify operation of your Industry Pack modules and carriers with a demonstration program to ensure proper hardware operation before attaching your application

Ordering Information

IPSW-API-VXW
VxWorks software support package for Industry Pack products (supports all Acromag IP modules & carriers)

PMCSW-API-VXW
VxWorks software support package for PMC, PCI, and CompactPCI products (supports all Acromag PMC modules and PCI or cPCI boards except IP carriers)

APSW-API-VXW
VxWorks software support package for AcroPack products

Tel 248-295-0310  Fax 248-624-9234  solutions@acromag.com  www.acromag.com  30765 Wixom Rd, Wixom, MI 48393 USA

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Software Support

PCISW-API-WIN  PCI Driver Software for Windows® Operating Systems

Description
Application Programming Interface
Acromag's software development tools greatly simplify the interface between the I/O boards and your Windows-based application program. This package provides DLL driver level support for Acromag's complete line of PMC, XMC, PCI and cPCI products. In addition, "C" source demonstration programs provide easy-to-use tools to test the operation of the module.

Demonstration Programs
Powerful programs let you fully exercise your hardware before developing the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration programs step you through the exact functions that are called in your application.

Key Features & Benefits
- Easy installation procedure
- Documentation with step-by-step instructions
- Support for all active Acromag I/O PMC, XMC, PCI and CompactPCI boards and all Acromag FPGA PMC, XMC, PCI and CompactPCI boards except PMC CX family Virtex-II boards.
- Support for 32-bit and 64-bit systems
- Demonstration Programs
- Driver level support for desktop and embedded Windows level programming environments
- Compatible with Windows Embedded Standard applications
- Verifies operation of your I/O boards with a demonstration program to ensure proper hardware performance before attaching your application

Ordering Information
Software
For more information, see www.acromag.com.
PCISW-API-WIN 32 or 64-bit Windows driver software package with DLLs and demonstration programs for PMC, XMC, PCI, and cPCI products. Supplied on CD-ROM.

NOTE: For Industry Pack module and carrier card support software, please refer to IPSW-API-WIN.

User-Friendly Licensing
Acromag's PCI Windows driver software is provided with a full site license. This allows anyone at your location to use this software without any additional charges. No run-time license is required.
Each package supports all active PCI-based (PMC, XMC, PCI, CompactPCI) products. You do not need to order additional software for different models within the family. (does not support PMC CX family Virtex-II boards)

For Windows 8 / 7 / Vista / XP ◆ Supports Acromag XMC, PMC, PCI, CompactPCI cards ◆ Includes DLLs

ISO9001
AS9100
Made in USA

Tel 248-295-0310  Fax 248-624-9234  solutions@acromag.com  www.acromag.com  30765 Wixom Rd, Wixom, MI 48393  USA

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Software Support

IPSW-xxx-WIN  Industry Pack Driver Software for Windows® Operating Systems

Description

Application Programming Interface
Acromag's software development tools greatly simplify the interface between the I/O boards and your Windows-based application program. These packages provide DLL driver level support for Acromag's line of Industry Pack products. In addition, "C" source demonstration programs provide easy-to-use tools to test the operation of the module.

Demonstration Programs
Powerful programs let you fully exercise your hardware before developing the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration programs step you through the exact functions that are called in your application.

Key Features & Benefits

- Easy installation procedure
- Documentation with step-by-step instructions
- Support for active Acromag Industry Pack I/O and Industry Pack FPGA modules and carriers
- Support for 32-bit and 64-bit systems
- Demonstration Programs
- Driver level support for desktop and embedded Windows level programming environments
- Compatible with Windows Embedded Standard applications
- Verifies operation of your I/O boards with a demonstration program to ensure proper hardware performance before attaching your application

Ordering Information

- Software
  For more information, see www.acromag.com.
  IPSW-API-WIN
  32-bit and 64-bit Windows driver software package with DLLs and demonstration programs for Industry Pack products. Supports all active IP-based (Industry Pack modules, PCI carriers, & CompactPCI carriers) products. Supplied on CD-ROM.
  IPSW-VME-WIN
  32-bit and 64-bit Windows driver software package with DLLs and demonstration programs for Industry Pack products. Supports carrier models AVME9630, AVME9660, AVME9668, AVME9670 and all IP modules except IP5xx and XVME-6300 or XVME-6400 single board computers. Supplied on CD-ROM. (requires XVME board support package (BSP), sold separately)

NOTE: For PMC, XMC, PCI, and cPCI modules and carrier cards support software, please refer to PCISW-API-WIN.

User-Friendly Licensing
Acromag's PCI Windows driver software is provided with a full site license. This allows anyone at your location to use this software without any additional charges. No run-time license is required.

You do not need to order additional software for different models within the family.

For Windows 8 / 7 / Vista  ● Supports Acromag Industry Pack modules & Carriers  ● Includes DLLs

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Support Software

Linux™ Libraries  I/O Function Routines

Simplify interfacing between Acromag I/O boards and your software | Demonstration Program

**Description**
- **IPSW-API-LNX**
  Support for Industry Pack modules and carriers
- **PCISW-API-LNX**
  Support for PCIV/CompactPCI boards and PMC modules
- **APSW-API-LNX**
  Support for AcroPack™ modules and carriers

**Application Programming Interface (API)**
Acromag’s software development tools greatly simplify the interface between the I/O boards and your software application program. The Linux libraries are supplied as “C” source code. These libraries provide easy-to-use function routines that quickly integrate with your application. Function routines are ready for use “as-is,” but they are also easily customized for your unique application.

**Demonstration Program**
This powerful program lets you fully exercise the libraries and your hardware before running the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration program steps you through the exact functions that are called in your application.

**Key Features & Benefits**
- Easy installation procedure
- Readme files with step-by-step instructions
- Programming tools for most Acromag I/O boards (excludes serial I/O and VME products)
- Demonstration program
- Downloadable at no charge from the Acromag website
- Source code provided to ensure maximum flexibility in implementing your driver
- Verify operation of your I/O modules and carrier cards with a demonstration program to ensure proper hardware operation before attaching your application

**Ordering Information**
NOTE: This unsupported software is available ONLY by download from Acromag’s website.
- **IPSW-API-LNX**
  Linux example libraries for Industry Pack modules and PCIV/CompactPCI carrier cards
- **PCISW-API-LNX**
  Linux example libraries for PCI, CompactPCI, and PMC modules.
- **APSW-API-LNX**
  Linux example libraries for AcroPack™ modules and carriers.

This free software utility is available for download from Acromag’s website.

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Ordering Information

Termination Panels
For technical illustrations see documentation.

5025-288
DIN rail-mount panel with 68 screw terminals for field I/O connections and SCSI-3 connector for I/O board connections.

5025-552
DIN rail-mount panel with 50 screw terminals for field I/O connections and 50-pin connector for I/O board connections.

5028-378
DIN rail-mount panel with 50 screw terminals for field I/O connections and SCSI-2 connector for I/O board connections.

Cables
(specify x = length in feet, 12 feet max. Three standard lengths -4, -7, and -10 which are available from stock. Custom lengths are available but will require extra lead time)
For technical illustrations see documentation.

5025-550-x
Flat cable, unshielded, 50-pin female connectors at both ends. Recommended for digital I/O applications.

5025-551-x
Same as 5025-550 above except shielded. Recommended for best performance with analog I/O applications.

5028-187
Round cable, shielded, 6 ft long, SCSI-2 50-pin connector to 50-pin ribbon female connector.

5028-432
Round cable, shielded, 6 ft long, SCSI-2 connector at both ends.

5028-438
Round cable, shielded, 6 ft long, SCSI-2 50-pin connector at both ends.

Transition Modules
For technical illustrations see documentation.

TRANS-200
80mm VME64 transition module for AVME967x IP carriers. Brings 200 I/O points from backplane out four 50-pin SCSI-2 connectors at rear of card cage.

TRANS-C100
80mm cPCI transition module for AcPC8635 carrier. Brings 100 I/O points from backplane to two 50-pin SCSI-2 connectors at the rear of the card cage.

TRANS-C200
80mm cPCI transition module for AcPC8625 carrier. Brings 200 I/O points from backplane to four 50-pin SCSI-2 connectors at the rear of the card cage.

TRANS-C4610
Air-cooled CompactPCI transition module for AcPC4610E and AcPC4610CC. Repeats field I/O signals of PMC modules for rear exit from CompactPCI card cages.

TRANS-C4620
CompactPCI transition module for AcPC4620E and AcPC4620CC. Repeats field I/O signals of PMC modules (Slot A & B) for rear exit from CompactPCI card cages.

TRANS-C5200
CompactPCI transition module for AcPC4620E & AcPC4620CC designed to be used with the PMC-LX/SX or the PMC-VLX/VFX/VSX modules. Converts the 2.5V rear I/O signals to 64 5V/3.3V selectable open-drain I/O.

TRANS-C5201
CompactPCI transition module for AcPC4620E & AcPC4620CC designed to be used with the PMC-LX/SX or the PMC-VLX/VFX/VSX modules. Converts the 2.5V rear I/O signals to 32 RS485/RS422 I/O.

Acromag offers a variety of cables to complete your system.

The 5025-552 termination panel and 5025-550 signal cable make field I/O connections to the APC8620 carrier easy.

All trademarks are the property of their respective owners.
5025-288 Termination Panel

5025-552 Termination Panel

5028-378 Termination Panel

NOTE:
DIMENSIONS ARE IN INCHES (MILLIMETERS)
TOLERANCE: ±0.020 (±0.5).

TERMINATION MARKINGS

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5025-550/551 Cable

```
+------------------+
| 50 Pin Connector |
|                  |
+------------------+
```

5028-187 Cable

```
+------------------+
| 50 Pin Connector |
|                  |
+------------------+
```

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5028-432 Cable

**TOP VIEW**

- **PIN 25**
- **PIN 26**
- **SPRING LATCH**

**Dimensions:**
- **2 METERS**
- **(78.72 INCHES, +4.0 / -0.0 INCHES)**

**Specifications:**
- **MALE 50-PIN HIGH DENSITY D-SUB CONNECTOR (.050" [1.27 MM] PIN SPACING)**
- **UL TYPE CL2, 25 TWISTED PAIRS 28 AWG STRANDED COPPER, ALUMINIZED POLYESTER SHIELD PLUS COPPER BRAID SHEILD, BEIGE PVC JACKET.**
- **(78.72 INCHES, +4.0 / -0.0 INCHES)**

5028-438 Cable

**TOP VIEW**

- **PIN 35**
- **PIN 68**

**Dimensions:**
- **2 METERS**
- **(78.72 INCHES, +4.0 / -0.0 INCHES)**

**Specifications:**
- **LATCH SPRING**
- **COPPER BRAID SHIELD, BEIGE PVC JACKET**
- **COPPER, ALUMINIZED POLYESTER SHIELD PLUS UL TYPE CL2, 25 TWISTED PAIRS 28 AWG STRANDED**
- **MOLDED HOOD AND STRAIN RELIEF, BEIGE**
- **LOSO° (1.27 MM) PIN SPACING**
- **D-SUB CONNECTOR MALE 50 PIN HIGH DENSITY**
TRANS-200

Industry Pack Transition Module

NOTE: DIMENSIONS ARE IN INCHES (MILLIMETERS).

AVME967x

TRANS-200

5028-438 Cable

5028-378 Termination Panel

VME64x Backplane

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TRANS-C100

Industry Pack Transition Module

3.150 (80.0)

3.937 (100.0)

TP1
GND

CompactPCI Backplane

ACPC 8635

TRANS-C100

5025-550 or 5025-551 Cable

5025-552 Termination Panel

All trademarks are the property of their respective owners.
TRANS-C4610
PMC Transition Module

TRANS-C4620
PMC Transition Module

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Hardware Accessories

TRANS-C520/C5201
PMC Transition Module

TRANS-C520x Transition Module

3.150'' (80.0)

9.187'' (233.35)

All trademarks are the property of their respective owners.
Hardware Accessories

Models PMC330, PMC341, PMC424, PMC464, PMC48x, PMC520, PMC521, PMC730, PMC-AXxxx, PMC-DXxxx

1. The usable space on the solder side of the PMC module is 0.075" (1.900mm) per PMC Mechanical Standard P1386.1. This PMC module is within limits.

2. The total height off the PMC carrier/CPU board is 0.532" (13.500mm) per PMC Mechanical Standard P1386.1. This PMC module is within limits.

3. The maximum component height for VME and CompactPCI is 0.540" (13.720mm). This PMC module is within limits.

4. Distance to interboard separation plane is 0.108" (2.743mm). The desired spacing is 0.100" (2.540mm) for VME and CompactPCI.

Models PMC230, PMC408, PMC440

1. The usable space on the solder side of the PMC module is 0.075" (1.900mm) per PMC Mechanical Standard P1386.1. This PMC module exceeds this by 0.063" (1.600mm).

2. The total height off the PMC carrier/CPU board is 0.532" (13.500mm) per PMC Mechanical Standard P1386.1. This PMC module exceeds this by 0.063" (1.600mm).

3. The maximum component height for VME and CompactPCI is 0.540" (13.720mm). This PMC module exceeds this by 0.055" (1.400mm).*

4. Distance to interboard separation plane is 0.045" (1.143mm). The desired spacing is 0.100" (2.540mm) for VME and CompactPCI.

* Adequate clearance must be determined for the application.
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