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RELIABILITY

FLEXIBILITY

FAST DELIVERY

ENGINEERING  
SUPPORT

ONE STOP  
SOLUTIONS



updated 10/2014 8400-139Q1

## EMBEDDED COMPUTING SOLUTIONS



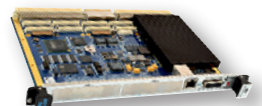
FPGA Modules



I/O Modules



COM Express



Single Board Computers

# Depend on Acromag



*Experience counts – especially when engineering the right embedded solution. And with more than 50 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.

## 50+ Years of I/O Experience

With over 50 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
- aerospace
- transportation
- manufacturing
- semiconductors
- scientific
- communication
- research labs

## Quality You Can Count On

We take every measure to guarantee dependable operation with ISO9001 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 Assistance

Drawing on a wealth of embedded I/O experience, our sales engineers are well qualified to help you design and develop your computing system. 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.



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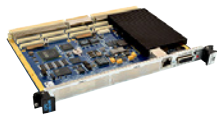
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Acromag, Incorporated ■ 30765 South Wixom Road ■ Wixom, Michigan 48393 ■ USA

# Embedded Processing Solutions



Photo credit: US Air Force



## 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 System Enclosures

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 RAID & SATA/SAS Modules

Data storage modules offer an effective solution for connecting SATA/SAS drives or RAID controllers to your CPU card.

- Bootable SATA/SAS drive modules
- RAID controller modules
- Support for dual slim SATA drives



## VPX Single Board Computers

VPX 3U single board computers achieve high-performance multi-core computing with great flexibility for high-speed communication and I/O.

- Intel Core i7 CPU, up to 2.53GHz
- Dual 4-lane PCIe ports
- Air-cooled, conduction-cooled, or REDI



## 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](http://www.acromag.com/boards)



## 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



## Software Library Support

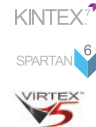
For easier development, Acromag function libraries greatly simplify the interface between our I/O boards and your application program.



## 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



## 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](http://www.acromag.com/fpgas)



## 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



## 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



## 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



## 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](http://www.acromag.com/embeddedio)



## 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 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



## 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



## 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.



## Engineering Design Kit and Development System

For easier development and testing, the break-out board routes all I/O signals from the carrier's high-density connector to standard peripheral connectors.

Get just the break-out board or have it mounted on a panel with cooling fans.



## 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](http://www.acromag.com/comexpress)



SBCs	CPU	Memory	Comments
<b>VPX Single Board Computers</b>			
XVPX-6300 (3U, air-cooled)	Intel® Core™ i7 620UE (1.06GHz), 620LE (2.0GHz), or 610E (2.53GHz)	4GB DDR3 ECC soldered RAM; 8GB Flash	Profile A/B, extended temperature options
XVPX-6300 (3U, conduction)			Profile A/B, -40 to 85°C operation
XVPX-6300 (3U, REDI covers)			
<b>VME Single Board Computers</b>			
XVME-6400 (6U, air-cooled)	Intel Core i7 (2.4GHz) or Core i5 (1.6GHz)	Up to 16GB of DDR3L ECC RAM with SODIMM lock-down mechanism	Extended temperature options
XVME-6400 (6U, conduction)			-40 to 85°C operation
XVME-6300 (6U, air-cooled)	Intel Core i7 620UE (1.06GHz), 620LE (2.0GHz), or 610E (2.53GHz)	4GB DDR3 ECC soldered RAM; 8GB Flash <i>NOTE: 8GB RAM available on 610E only</i>	PO, extended temperature options
XVME-6300 (6U, conduction)			PO, -40 to 85°C operation
XVME-6200 (6U)	Intel Core 2 Duo L7400 (1.56GHz) or T7400 (2.16GHz)	Up to 4GB DDR2 ECC RAM	PO, extended temperature options
<b>COM Express® CPU Modules</b>			
XCOM-6400	Intel Core i7 (2.4GHz) or Core i5 (1.6GHz)	Up to 16GB of DDR3L ECC RAM with SODIMM lock-down mechanism	Extended temperature options

10GbE Networking	Ethernet Interface	Memory	Comments
<b>XMC 10GbE Interface Modules</b>			
XMC-6260-CC	Dual XAUI 10GBASE-KX4	External memory for storage of offloaded connection states and buffers	-40 to 85°C operation
XMC-6280	Quad SFP+ ports		-40 to 70°C operation

Mass Storage	Type/Format	Features	Compatibility
<b>VPX Storage Solutions</b>			
XVPX-9400	Raid controller module	Supports up to 8 SATA / SAS drives; Double fat-pipe (x8) PCIe interface	XVPX-6300 MOD3-PAY-1D-16.2.6-2
XVPX-9756	Bootable SATA / SAS drive module	Supports dual slim SATA drives or single 2.5" drive (rotating or solid-state)	XVPX-6300 MOD3-PER-1U-16.3.3-1 (PCIe) MOD3-STO-1U-16.5.1-2 (SATA)
<b>VME Storage Solutions</b>			
XBRD-9050	SBC expansion module	Accepts 1.8" SATA drive; USB; Ethernet; Serial	XVME-6300
XVME-9630	6U rear transition module	Allows for custom set of new connectors	XVME-6300
XVME-912	On-board carrier for Type I or II Compact Flash	Processor board can boot from Compact Flash	XVME-6200
XVME-913S	On-board carrier for 1.8" solid-state drive	Processor board can boot from drive	XVME-6200
XVME-990	6U rear transition module	Adds additional connectors, with or without PO	XVME-6200

FPGA Modules	Logic Cells	DSP	Comments
<b>PMC / XMC Modules</b>			
Xilinx® Kintex®-7 FPGA (High-Speed Serial I/O)	Up to 410k logic cells	Up to 1540 DSP48E1 slices	8 high-speed serial lanes; dual SFP+ ports
Xilinx Kintex-7 FPGA (AXM I/O)	Up to 410k logic cells	Up to 1540 DSP48E1 slices	8 high-speed serial bus lanes; plug-in extension I/O
Xilinx Virtex®-6 FPGA	Up to 365k logic cells	Up to 768 DSP48E1 slices	8 high-speed serial lanes; dual SFP+ ports
Xilinx Spartan®-6 FPGA	150k logic cells	180 DSP48A1 slices	32 LVDS; plug-in extension I/O
Xilinx Virtex-5 FPGA	Up to 155k logic cells	Up to 640 DSP48E slices	32 LVDS; plug-in extension I/O
Xilinx Virtex-4 FPGA	Up to 60k logic cells	Up to 192 XtremeDSP slices	32 LVDS; plug-in extension I/O
<b>IP Modules</b>			
Altera® Cyclone® II FPGA	20k logic cells	--	Up to 48 TTL, 24 RS-485, or 24 LVDS I/O

(continues on next page)



# Embedded Computing Solutions

I/O Boards	Inputs	Outputs	Comments
<b>IndustryPack I/O Modules</b>			
IP200 Series	--	Analog output; up to 16 channels	12 or 16-bit D/A; up to 100kHz
IP300 Series	Analog input; up to 20D/40SE channels	--	12, 14 or 16-bit A/D; up to 1MHz
IP400 Series	Digital input; up to 48 channels	Digital output; up to 48 channels	TTL, CMOS, ±60V DC, or differential
IP480 Series	Counter/timers; TTL or RS-232; up to 10 channels		16/32-bit; measure/generate; quadrature
IP500 Series	Serial communication; EIA/TIA-232/422/485, MIL-STD-1553, or CAN bus; dual/quad/octal		64-byte FIFOs; optional isolation
<b>PMC I/O Modules</b>			
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
<b>PCI and CompactPCI I/O Boards</b>			
APC300, AcPC300 Series	Analog input; up to 16D/32SE channels	--	14 or 16-bit A/D; up to 125kHz
APC400, AcPC400 Series	Digital input; up to 64 channels	Digital output; up to 64 channels	TTL, 0-60V DC, bi-directional
APC480, AcPC480 Series	Counter/timers; TTL or RS-232; up to 10 channels		16/32-bit; measure/generate; quadrature
APC700, AcPC700 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	Size	# of Slots	Field Connectors	Comments
<b>Carrier Cards for IP Modules</b>				
VME carrier cards	3U/6U VME	2 or 4 IP slots	Front or rear I/O; 50-pin or SCSI-2 connectors	VME64 support; -40 to 85°C operation
PCI carrier cards	Full/half-length PCI	3 or 5 IP slots	50-pin headers	-40 to 85°C operation
PCI Express carrier cards	Full-length PCIe	4 IP slots	50-pin headers	-40 to 85°C operation
CompactPCI carrier cards	3U/6U cPCI	2 or 4 IP slots	Front or rear I/O; 50-pin high-density connectors	-40 to 85°C operation
<b>Carrier Cards for PMC / XMC Modules</b>				
PCI carrier cards	Half-length PCI	1 PMC slot	Front or rear I/O	-40 to 85°C operation
PCI Express carrier cards	Full-length PCIe	1 PMC/XMC slot	Front or rear I/O; x4/x8 PCIe interface	Air-cooled
CompactPCI carrier cards	3U/6U cPCI	1 or 2 PMC slots	Front or rear I/O	-40 to 85°C or conduction-cooled
VPX carrier cards	3U/6U VPX	1 or 2 PMC/XMC slots	Front or rear I/O; x8 PCIe interface	Air-cooled, conduction-cooled, or RED1

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

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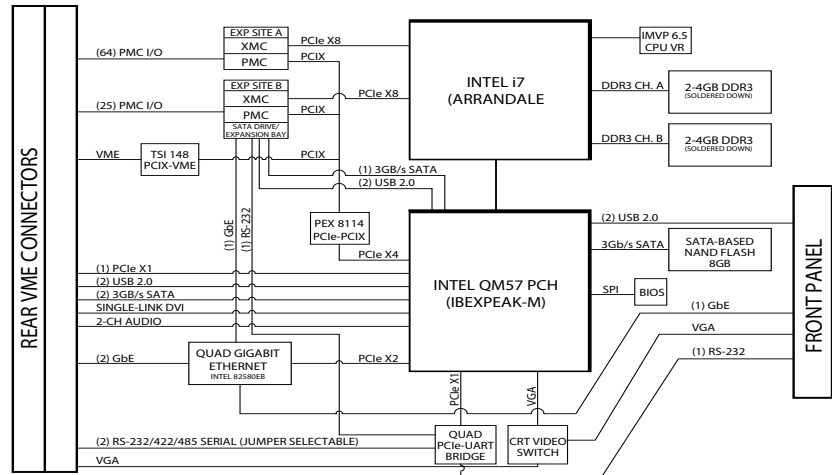


# Single Board Computers

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

2 YEAR WARRANTY

**XEMBEDDED™**



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

### 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](http://www.acromag.com)

XBRD-9050

Expansion I/O Carrier Module for Micro SATA

XVME-9630

6U VMEbus Rear Transition Module

**Acromag**   
 THE LEADER IN INDUSTRIAL I/O

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# Single Board Computers

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

### Performance Specifications

#### ■ General

##### Processor

- Intel® i7 Core™, 1066MHz 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 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
- 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

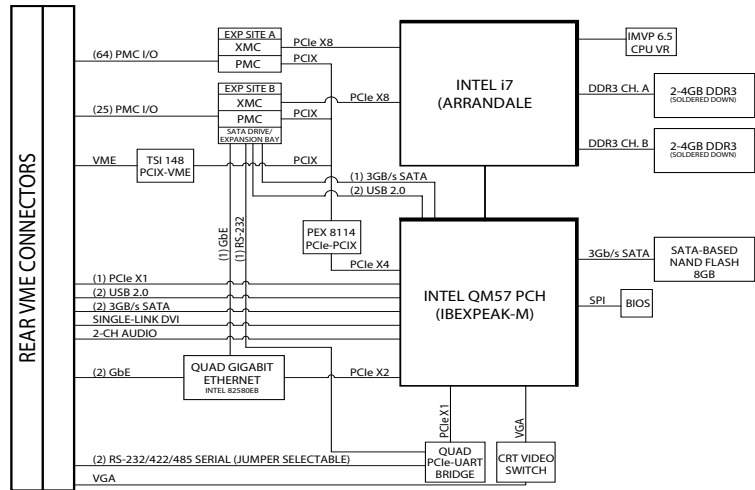
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# Single Board Computers

## XVME-6300-CC 6U VME Intel® i7 Core™ Conduction Cooled Processor Board



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

### 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

- 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
- Built-in self-test at power-on

### Performance Specifications

#### ■ General

##### Processor

- Intel® i7 Core™, 1066MHz 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 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

X = Solder

L - Lead solder

LF - Lead-free solder

Front panel and conformal coating options available, please consult factory.

#### ■ Accessories

For more information, see [www.acromag.com](http://www.acromag.com)

XVME-9630

6U VMEbus Rear Transition Module



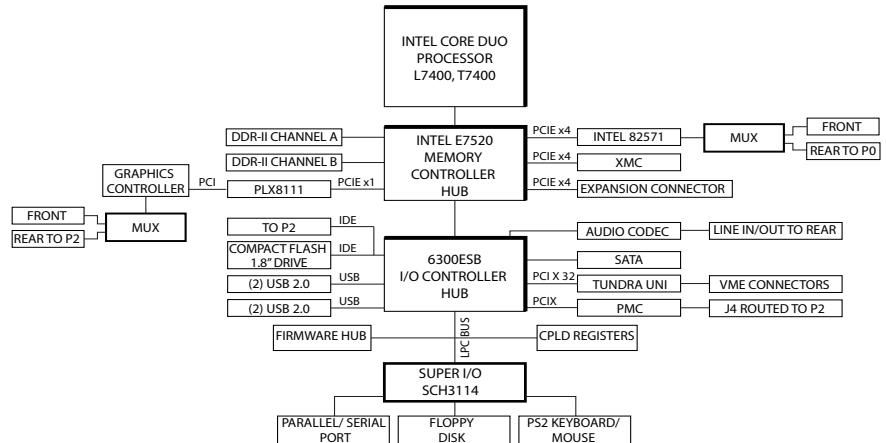
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# Single Board Computers

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

2 YEAR WARRANTY

**XEMBEDDED™**



Intel® Core™ 2 Duo CPU (up to 2.16GHz)

◆ 4GB DDR2 ECC SODIMM

◆ PCIe x4 site

### 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

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THE LEADER IN INDUSTRIAL I/O

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# Single Board Computers

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

### 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.



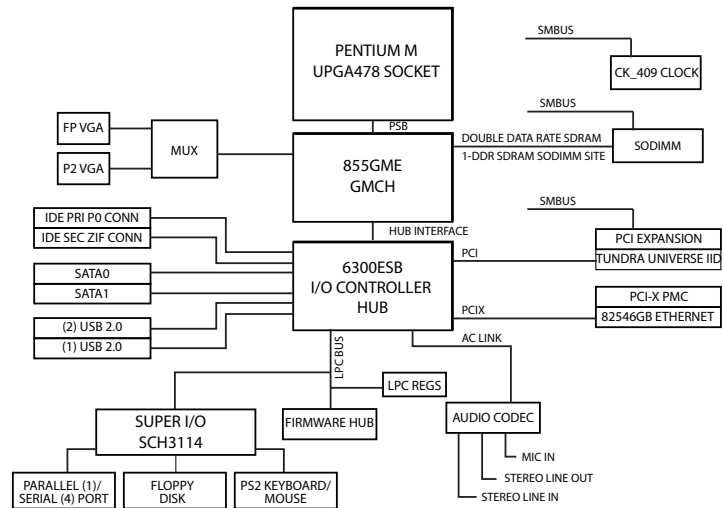
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# Single Board Computers

## XVME-690 6U VME Intel® Pentium® M Processor Board

2 YEAR WARRANTY

**EMBEDDED™**



Intel® Pentium® M 1.8GHz CPU

1GB DDR3 ECC RAM

PMC/XMC (PCI-X) Site

### Description

The XVME-690 is a powerful 6U VME processor board integrating an Intel® Pentium® M processor running at 1.8GHz. With a PCI-to-VMEbus interface, this module allows users to take advantage of multi-processing capabilities of the VMEbus while using standard off-the-shelf PC software, operating systems and VMEbus I/O modules.

### Key Features & Benefits

- 855GME and 6300ESB chipset
- Enhanced Intel® SpeedStep®
- Headless operation using serial console mode including BIOS setup
- Parallel printer port (ECP, EPP, and IEEE1284)
- Front panel reset switch and status LEDs
- Line level stereo input and output via P2
- Keyboard and mouse port via shared PS/2 on front panel
- Long duration Watchdog timer
- Front panel I/O includes:
  - COM1: One RS-232/422/485 port
  - Single USB 2.0 port
  - Dual 10/100/1000 ports via front panel or optional P0 rear connector
  - VGA resolutions up to 1600 x 1200 (optional rear support)
- Backplane I/O includes:
  - COM2, COM3: Two RS-232 ports via P2
  - Dual USB 2.0 ports via P2

### Ordering Information

#### ■ XVME-690-8A3-X

A = P0  
1 - no P0  
3 - with P0

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 Solid State Drive Kit

#### XVME-976

6U Dual PMC Module

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# Single Board Computers

## **XVME-690** 6U VME Intel® Pentium® M Processor Board

### Performance Specifications

#### ■ General

##### Processor

745 Intel® Pentium® M, 1.8GHz

##### Memory

1GB DDR ECC 266/333MHz SODIMM

##### Mass Storage

- Dual SATA channel via P2
- Floppy drive interface via P2
- EIDE Ultra-DMA 100 interface supports up to three devices:
  - Two channels via P0
  - One channel on-board for optional 1.8" SSD EIDE or Compact Flash carrier

##### Software Support

Microsoft 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

##### PMC/XMC (PCI-X) Site

- 32/64-bit, 33/66MHz sites (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: -25 to 70°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

2.5g max acceleration

Non-operating:

0.030" (760µm) peak-to-peak displacement

5.0g max acceleration

ISO9001  
AS9100



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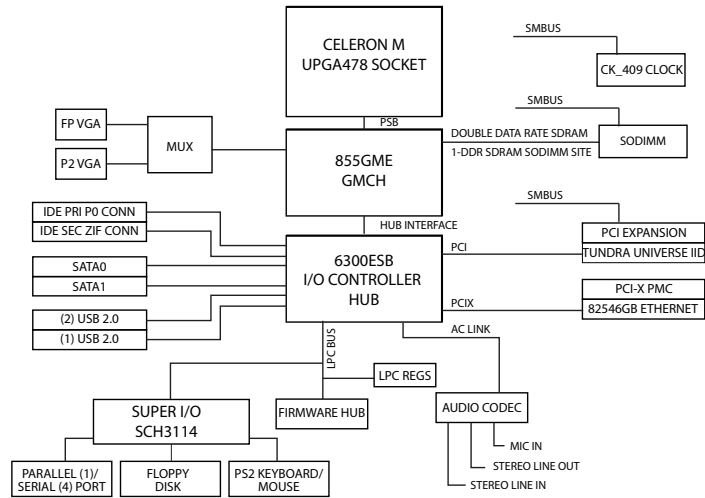
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# Single Board Computers

## XVME-689 6U VME Intel® Celeron® M Processor Board

2 YEAR WARRANTY

**XEMBEDDED™**



Intel® Celeron® M 1.0GHz CPU

◆ Up to 1GB DDR3 ECC RAM

◆ PMC/XMC (PCI-X) Site

### Description

The XVME-689VR7 is a powerful, low power 6U VME processor board based on the Intel® Celeron® M. Running at 1.0GHz with a PCI-to-VMEbus interface, this module allows users to take advantage of low power multi-processing capabilities of the VMEbus while using standard off-the-shelf PC software, operating systems and VMEbus I/O modules.

### Key Features & Benefits

- 855GME and 6300ESB chipset
- Replacement for the VR7 VMEbus processor with a similar P2 pin-out as the VR7 processor
- Headless operation using serial console mode including BIOS setup
- Parallel printer port (ECP, EPP, and IEEE1284)
- Front panel reset switch and status LEDs
- Line level stereo input and output via P2
- Keyboard and mouse port via shared PS/2 on front panel
- Front panel I/O includes:
  - COM1: One RS-232/422/485 port
  - Single USB 2.0 port
  - Dual 10/100/1000 ports via front panel or optional P0 rear connector
  - VGA resolutions up to 1600 x 1200 (optional rear support)
- Backplane I/O includes:
  - COM2, COM3, COM4: Three RS-232 ports via P2
  - Dual USB 2.0 ports via P2

### Ordering Information

#### ■ XVME-689VR7-1A3B-X

A = P0  
1 - no P0  
3 - with P0

B = Extended Temperature  
Blank - Standard temperature  
E - Extended temperature

X = Solder  
LF - Lead-free solder

NOTE: The optional P0 connector is used to implement IDE hard drive and PMC rear I/O functions.

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 Solid State Drive Kit

XVME-976

6U Dual PMC Module

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Bulletin #8400-685b



# Single Board Computers

## **XVME-689VR7** 6U VME Intel® Celeron® M Processor Board

### Performance Specifications

#### ■ General

##### Processor

373 Intel® Celeron® M, 1.0GHz

##### Memory

1GB DDR ECC 266/333MHz SODIMM

##### Mass Storage

- SATA channel via P2
- Floppy drive interface via P2
- EIDE Ultra-DMA 100 interface supports up to three devices:
  - Two channels via P0
  - One channel on-board for optional 1.8" SSD EIDE or Compact Flash carrier

##### Software Support

Microsoft 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

##### PMC/XMC (PCI-X) Site

- 32/64-bit, 33/66MHz sites (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: -25 to 70°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

ISO9001  
AS9100

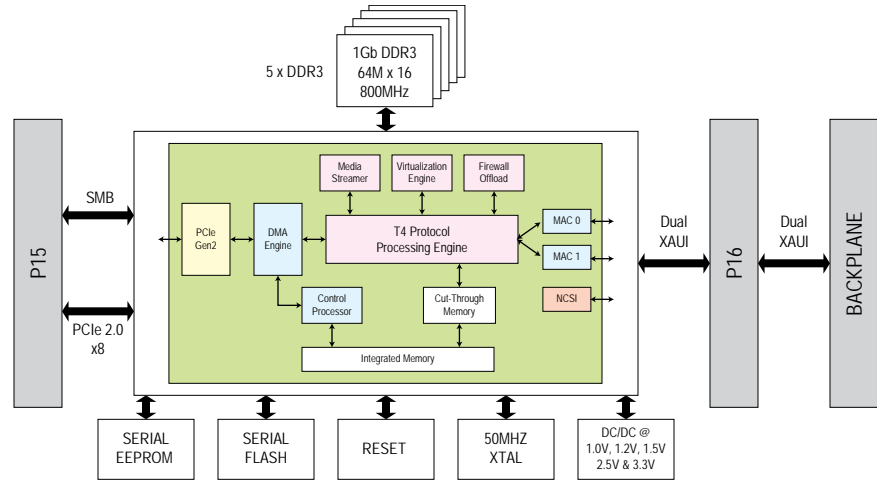
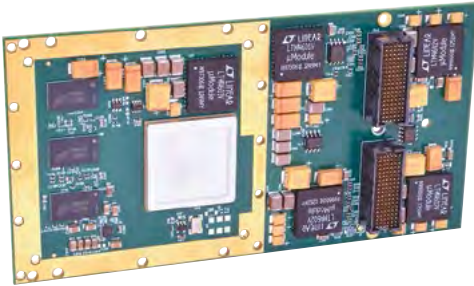


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## XMC-6260-CC 10-Gigabit Ethernet Interface Module with Dual XAUI Ports

2 YEAR WARRANTY  
24 HOUR STOCK ITEM



XMC module with TCP/IP offload engine ASIC ◆ Dual XAUI 10GBASE-KX4 ports ◆ PCIe x8 Gen2

### 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.

### Key Features & Benefits

- Dual port 10 GbE via XAUI 10GBASE-KX4
- XMC PCI Express Gen2 x8
- Supports up to 1M connections
- Full offload support for:
  - TCP
  - UDP
  - iSCSI,
  - FCoE (Fiber 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
- Designed for conduction-cooled host card or up to -40 to 85°C operation

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

### Performance Specifications

#### ■ Communication

Ethernet interface

Dual XAUI 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.

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.

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

	Acromag ASIC TOE 10GbE Interface	Software Stack TOE 10GbE Interface
Throughput per Port, Full-Duplex	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 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.

### Ordering Information

#### ■ XMC Modules

XMC-6260-CC-LF

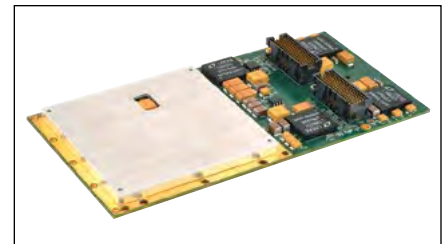
10-gigabit Ethernet interface module, lead-free

XMC-6260-CC-L

10-Gigabit Ethernet interface module, leaded solder (consult factory for availability)

#### ■ Accessories

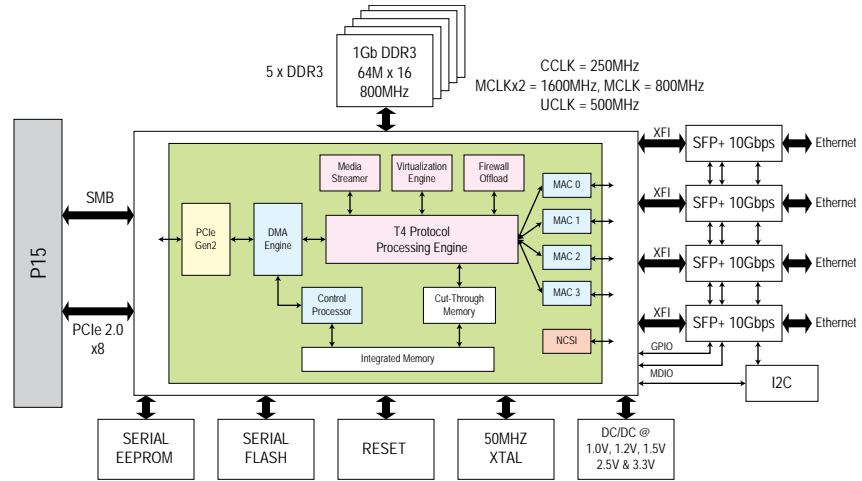
For more information, see [www.acromag.com](http://www.acromag.com).



Model XMC-6260-CC shown as it ships with pre-installed heat sink.



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



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

### 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-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.

The SFP+ limited mode allows a maximum drive of 5m of twin ax cable and a maximum of 300m of fiber.

#### ■ 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.

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

	Acromag ASIC TOE 10GbE Interface	Software Stack TOE 10GbE Interface
Throughput per Port, Full-Duplex	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 (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.

##### 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\_disable, MOD\_DEF(0), MOD\_DEF(1), MOD\_DEF(2), rate select, LOS, 3.3 Vdc, and ground)

#### ■ Environmental

##### Operating temperature

-40 to 70°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.

### Ordering Information

#### ■ XMC Modules

##### XMC-6280-LF

10-Gigabit Ethernet interface module, lead-free

##### XMC-6280-L

10-Gigabit Ethernet interface module, leaded solder (consult factory for availability)

#### ■ Accessories

For more information, see [www.acromag.com](http://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

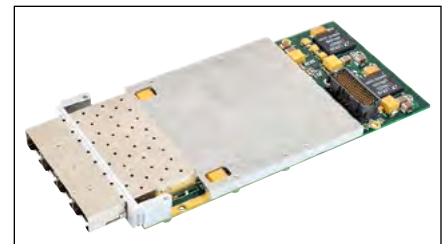
Optical module SFP transceiver, MSA, 1000Base-T RJ45 copper

##### 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.

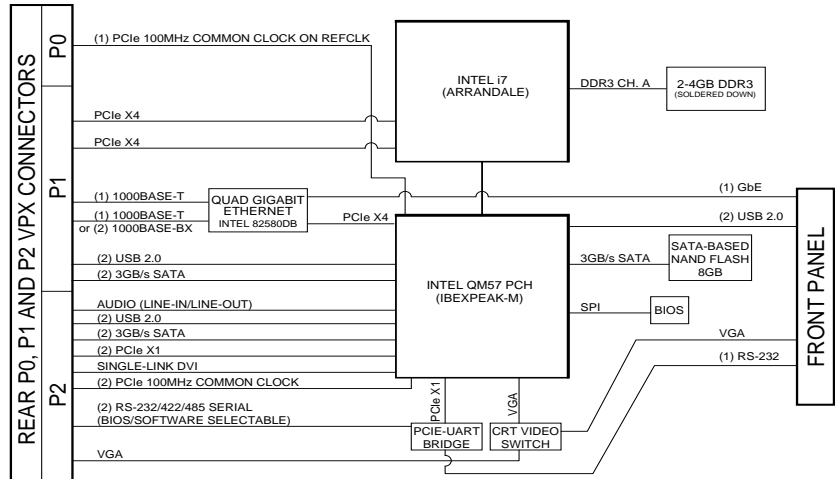


# Single Board Computers

## XVPX-6300-AC 3U VPX Intel® i7 Core™ Air Cooled Processor Board

2 YEAR WARRANTY

**X EMBEDDED™**



Intel® i7 CPU (up to 2.53GHz) ◆ 4GB DDR3 ECC RAM ◆ 8GB Flash ◆ Dual PCIe x4 interface

### Description

The XVPX-6300 is a high performance 3U VPX processor board based on the Intel® i7 Core™. This module offers a wide range of front and rear I/O options at a competitive price.

### Key Features & Benefits

- Includes additional ports on the front panel
- Dual 4-lane (Fat Pipe) PCIe ports
- Built-in self-test at power-on
- Dual PCIe x1 interface to rear RTM module for expansion

### Performance Specifications

#### General

##### Processor

- Intel® i7 Core™, 1066MHz FSB
- 620UE at 1.06GHz
  - 620LE at 2.0GHz
  - 610E at 2.53GHz

##### Memory

4GB DDR3 ECC 1066MHz (800MHz for 620UE) of soldered on memory

##### Flash Memory

8GB of bootable flash memory

##### Software Support

Microsoft Windows® 7, Linux

#### Front Panel I/O

- Gigabit Ethernet port
- Dual USB ports
- RS-232 port
- VGA port is switchable to rear I/O port

#### Bus Compliance

VITA 46.4, VITA 46.6, VITA 48, and VITA 65

#### Backplane I/O

- Dual PCIe x4 ports
- Profile A: Dual 1000Base T Gigabit Ethernet
- Profile B: Dual 1000Base BX & Single 1000Base T Gigabit Ethernet
- Quad USB 2.0 ports
- Dual RS-232/422/485 ports
- VGA, DVI-D Video
- Quad 3GB/s SATA ports
- Dual PCIe x1 (for expansion on our RTM)
- Audio line in/out

#### Form Factor

3U VPXbus 3.94" (100.01mm) x 6.5" (165.1mm)

#### 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

##### 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  
2.5g max acceleration

#### Non-operating:

0.030" (760µm) peak-to-peak displacement  
5.0g max acceleration

### Ordering Information

#### XVPX-6300-1ABC-X

A = CPU

- 2 - i7-620UE (1.06GHz)
- 3 - i7-620LE (2.0GHz)
- 4 - i7-610E (2.53GHz)

B = Memory & CTRL Plane

- 4 - 4GB with Profile A
- 5 - 4GB with Profile B

C = 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)

XVPX-9630

3U VPXbus Rear Transition Module

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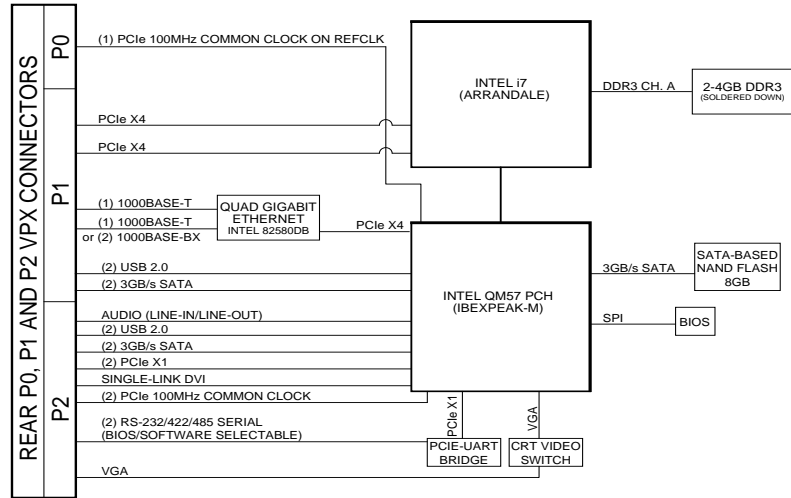
Tel 248-295-0885 ■ [xembeddedsales@acromag.com](mailto:xembeddedsales@acromag.com) ■ [www.acromag.com/xembedded](http://www.acromag.com/xembedded) ■ 30765 Wixom Rd, Wixom, MI 48393 USA

# Single Board Computers

**XVPX-6300-CC** 3U VPX Intel® i7 Core™ Conduction Cooled Processor Board

2 YEAR WARRANTY

**X EMBEDDED™**



Intel® i7 CPU (up to 2.53GHz) ◆ 4GB DDR3 ECC RAM ◆ 8GB Flash ◆ Dual PCIe x4 interface

## Description

The XVPX-6300 is a high performance 3U VPX processor board based on the Intel® i7 Core™. This module offers a wide range of front and rear I/O options at a competitive price.

## Key Features & Benefits

- Dual 4-lane (Fat Pipe) PCIe ports
- Built-in self-test at power-on
- Dual PCIe x1 interface to rear RTM module for expansion

## Performance Specifications

### General

#### Processor

- Intel® i7 Core™, 1066MHz FSB
- 620UE at 1.06GHz
  - 620LE at 2.0GHz
  - 610E at 2.53GHz

#### Memory

4GB DDR3 ECC 1066MHz (800MHz for 620UE) of soldered on memory

#### Flash Memory

8GB of bootable flash memory

#### Software Support

Microsoft Windows® 7, Linux

### Bus Compliance

VITA 46.4, VITA 46.6, VITA 48, and VITA 65

### Form Factor

3U VPXbus 3.94" (100.01mm) x 6.5" (165.1mm)

### Backplane I/O

- Dual PCIe x4 ports
- Profile A: Dual 1000Base T Gigabit Ethernet
- Profile B: Dual 1000Base BX & Single 1000Base T Gigabit Ethernet
- Quad USB 2.0 ports
- Dual RS-232/422/485 ports
- VGA, DVI-D Video
- Quad 3GB/s SATA ports
- Dual PCIe x1 (for expansion on our RTM)
- Audio line in/out

### Environmental

#### Operating temperature

-40 to 85°C\*\*

\*\* must operate in a fully installed conduction cooled rack

#### 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

### XVPX-6300-2AB-X

A = CPU

- 2 - i7-620UE (1.06GHz)
- 3 - i7-620LE (2.0GHz)
- 4 - i7-610E (2.53GHz)

B = Memory & CTRL Plane

- 4 - 4GB with Profile A
- 5 - 4GB with Profile B

X = Solder

- L - Lead solder
- LF - Lead-free solder

Front panel and conformal coating options available, please consult factory.

### Accessories

For more information, see [www.acromag.com](http://www.acromag.com)

XVPX-9630

3U VPXbus Rear Transition Module

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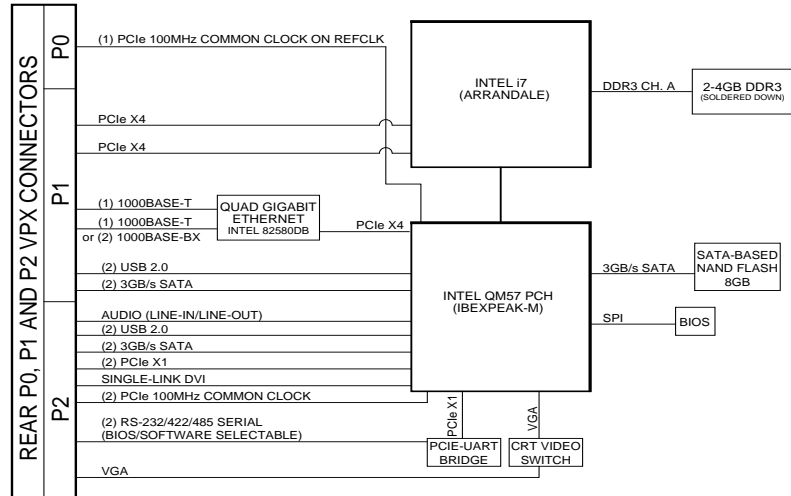
Tel 248-295-0885 ■ [xembeddedsales@acromag.com](mailto:xembeddedsales@acromag.com) ■ [www.acromag.com/xembedded](http://www.acromag.com/xembedded) ■ 30765 Wixom Rd, Wixom, MI 48393 USA

# Single Board Computers

**XVPX-6300-REDI** 3U VPX Intel® i7 Core™ REDI Conduction Cooled Processor Board

2 YEAR WARRANTY

**X EMBEDDED™**



Intel® i7 CPU (up to 2.53GHz) ◆ 4GB DDR3 ECC RAM ◆ 8GB Flash ◆ Dual PCIe x4 interface

## Description

The XVPX-6300 is a high performance 3U VPX processor board based on the Intel® i7 Core™. This module offers a wide range of front and rear I/O options at a competitive price.

## Key Features & Benefits

- Dual 4-lane (Fat Pipe) PCIe ports
- Built-in self-test at power-on
- Dual PCIe x1 interface to rear RTM module for expansion

## Performance Specifications

### General

#### Processor

- Intel® i7 Core™, 1066MHz FSB
- 620UE at 1.06GHz
  - 620LE at 2.0GHz
  - 610E at 2.53GHz

#### Memory

4GB DDR3 ECC 1066MHz (800MHz for 620UE) of soldered on memory

#### Flash Memory

8GB of bootable flash memory

#### Software Support

Microsoft Windows® 7, Linux

### Bus Compliance

VITA 46.4, VITA 46.6, VITA 48, and VITA 65

### Form Factor

3U VPXbus 3.94" (100.01mm) x 6.5" (165.1mm)

### Backplane I/O

- Dual PCIe x4 ports
- Profile A: Dual 1000Base T Gigabit Ethernet
- Profile B: Dual 1000Base BX & Single 1000Base T Gigabit Ethernet
- Quad USB 2.0 ports
- Dual RS-232/422/485 ports
- VGA, DVI-D Video
- Quad 3GB/s SATA ports
- Dual PCIe x1 (for expansion on our RTM)
- Audio line in/out

### Environmental

#### Operating temperature

-40 to 85°C\*\*

\*\* must operate in a fully installed conduction cooled rack

#### 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

### XVPX-6300-3AB-X

A = CPU

- 2 - i7-620UE (1.06GHz)
- 3 - i7-620LE (2.0GHz)
- 4 - i7-610E (2.53GHz)

B = Memory & CTRL Plane

- 4 - 4GB with Profile A
- 5 - 4GB with Profile B

X = Solder

- L - Lead solder
- LF - Lead-free solder

Conformal coating options available, please consult factory.

### Accessories

For more information, see [www.acromag.com](http://www.acromag.com)

XVPX-9630

3U VPXbus Rear Transition Module

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# VME Storage

**XBRD-9050** Expansion Module for the XVME-6300

**2**  
YEAR  
WARRANTY



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

## 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.

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# VME Storage

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



**2**  
YEAR  
WARRANTY



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

## 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  
NOTE: Optionally, deliverable as complete assembly mounted to 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

XVME-912-001  
On-board Compact Flash Carrier Module  
XVME-913S-064  
On-board 64GB 1.8" Solid State Drive Module

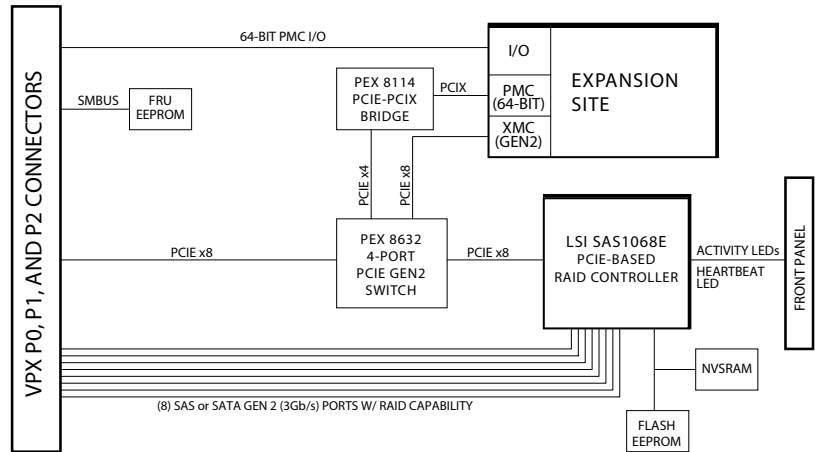
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# VPX Controller Modules

2 YEAR WARRANTY

## XVPX-9400 3U VPX RAID Controller Module



Supports up to 8 SAS/SATA drives

◆ PMC/XMC site included

◆ Supports RAID 0, 1, and 1E

### 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

#### General

Profile  
MOD3-PAY-1D-16.2.6-2  
Software Support  
Microsoft Windows® 7, Linux

#### 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 1386.1 (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\*\*\*

\* w/ 200 lfm airflow  
\*\* must operate in a fully installed conduction cooled rack  
\*\*\* must operate in a fully installed conduction cooled REDI rack

#### 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

### 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



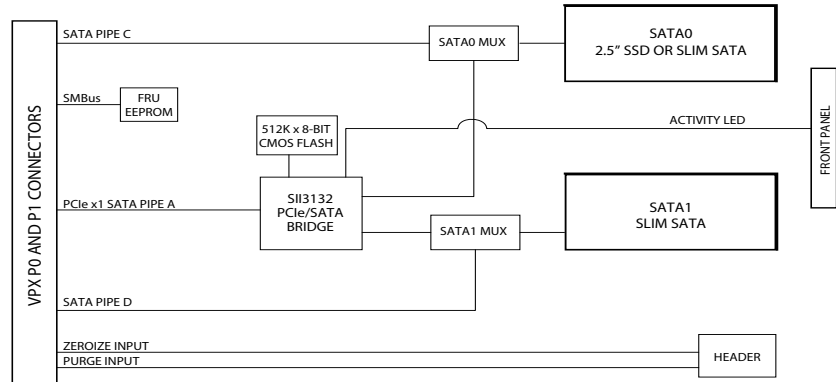
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# VPX Storage Modules

2 YEAR WARRANTY

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

**X EMBEDDED™**



Boot via PCIe or SATA/SAS ♦ Supports dual SSD or a single 2.5" drive ♦ Dual SSDs are RAID 0/1 configurable

### 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\*\*\*

\* w/ 200 lfm airflow

\*\* must operate in a fully installed conduction cooled rack

\*\*\* must operate in a fully installed conduction cooled REDI rack

##### 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  
2.5g max acceleration

Non-operating:  
0.030" (760µm) peak-to-peak displacement  
5.0g max acceleration

### Ordering Information

#### ■ XVPX-9756-AB0-X

A = Thermal

- 1 - Air cooled
- 2 - Conduction cooled
- 3 - REDI

B = Drive connector type

- 0 - HD/SDD (SATA)
- 1 - Dual slim SATA

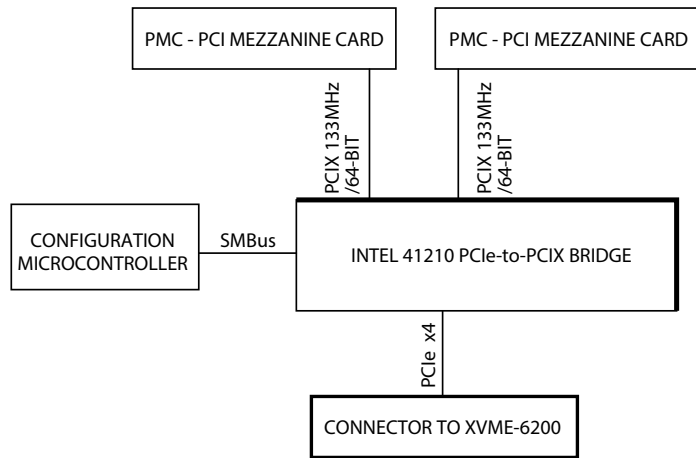
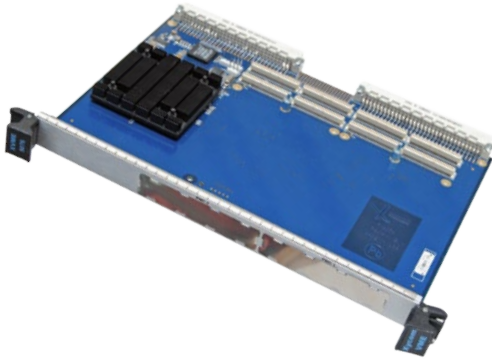
X = Solder

- L - Lead solder
- LF - Lead-free solder

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



1GB bandwidth in each direction ◆ Two additional PCI-X sites ◆ Seamless integration with 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  
2 - 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

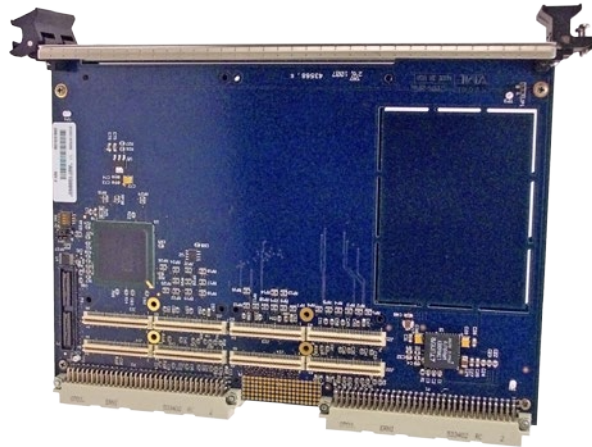
Compatible with PMC 2.0 Specifications for IEEE P1386 modules

BGXIN\* tied to BGXOUT\* on this module

#### ■ Form Factor

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





Up to five PMC modules ◆ Occupies only one VMEbus slot ◆ Fits into any standard 6U VMEbus card cage

### 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-9630** Rear Transition Module for the XVME-6300

2  
YEAR  
WARRANTY



Variety of additional connectors

◆ VITA-36 compliant module site

◆ Multiple configurations

## 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

### XVME-9630-100

Rear Transition Module with P0, VGA, (2) USB, (2) SATA, audio, (2) Serial, (4) GPI, and (4) GPO

### XVME-9630-102

Same as XVME-9630-100 plus Dual Ethernet

### XVME-9630-103

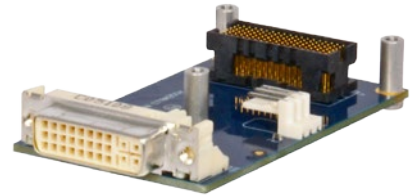
Same as XVME-9630-100 plus DVI

### XVME-9630-200

Rear Transition Module without P0- includes VGA, (2) USB, (2) SATA, audio, (2) Serial, (4) GPI, and (4) GPO

### XVME-9630-203

Same as XVME-9630-200 plus DVI



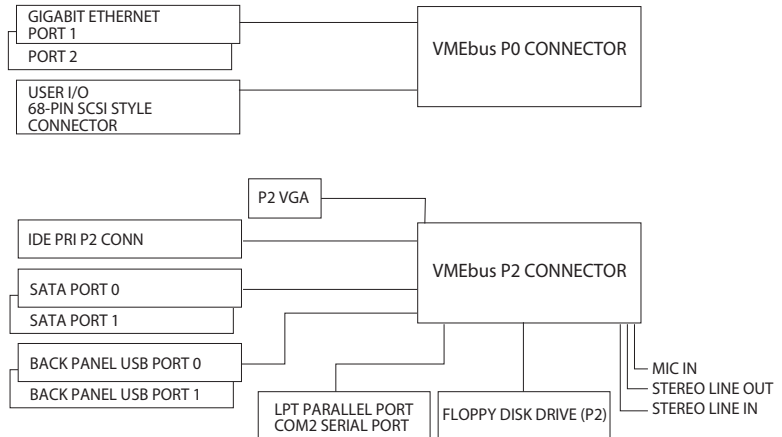
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# VME Rear Transition Modules

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



Variety of additional connectors ◆ Available with and without P0 ◆ Connects to external storage units

### Description

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).

### 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



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# VPX Rear Transition Modules

**XVPX-9630** Rear Transition Module for the XVPX-6300

2  
YEAR  
WARRANTY



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

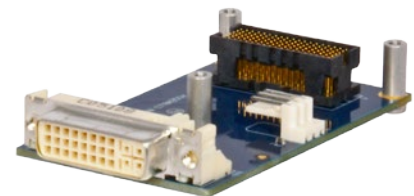
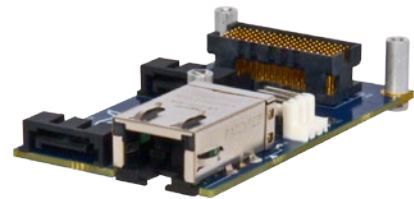
Same as XVPX-9630-100 plus Ethernet, (2) SATA, and 3-pin RS-232

### 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



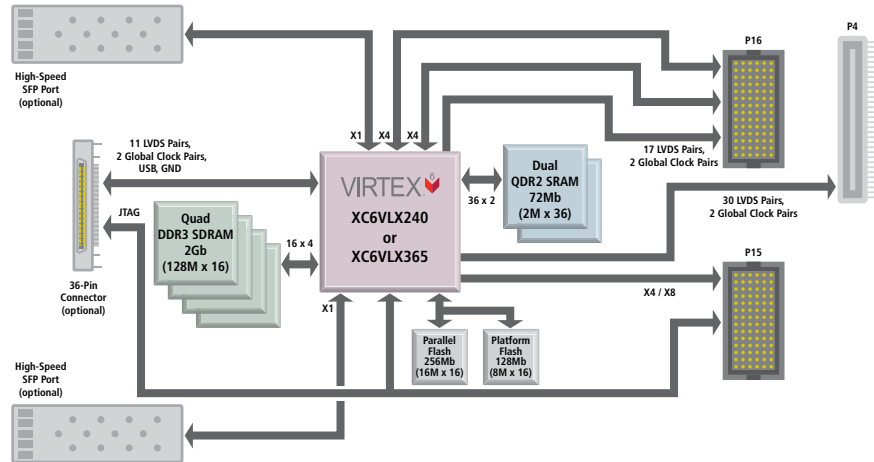
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# XMC Modules

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

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



VIRTEX<sup>6</sup>

### XMC module with PCIe and SRIO/Aurora interface ♦ Logic-optimized Virtex-6 FPGA ♦ Gigabit Ethernet

#### 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 PCI Express, Serial RapidIO, 10-Gigabit Ethernet, or Xilinx Aurora implementation. P16 also supports 34 SelectIO channels. The P4 port adds another 60 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 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 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 QDR2 SRAM, 128M x 64-bit DDR3 SDRAM
- 16M x 16-bit parallel flash memory for MicroBlaze program code storage
- 128Mb platform 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

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## 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](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 (Serial RapidIO, PCIe, 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

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. 2.5Gb/s maximum data rate.

SFP copper (Gigabit Ethernet) or fibre optic modules available from Acromag.

#### ■ Environmental

##### 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

NOTE: XMC-6VLX-EDK is required to configure FPGA.

#### ■ 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.

##### 5028-455

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

For more information, see [www.acromag.com](http://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-LINUX

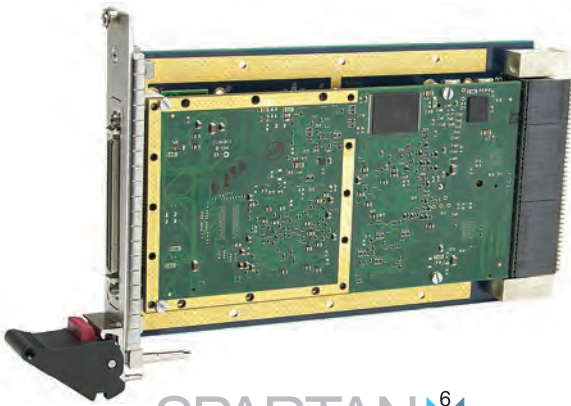
Linux™ support (website download only)



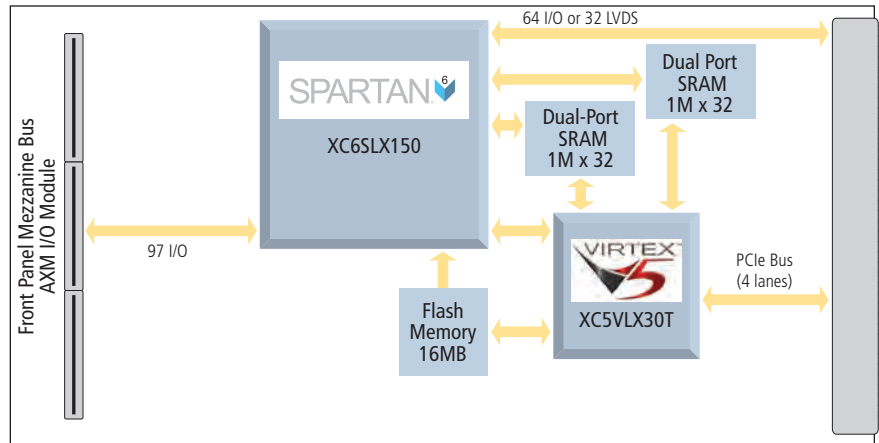
# VPX Boards

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

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



SPARTAN-6



VPX 3U card with PCIe interface ♦ Logic-optimized Spartan-6 FPGA ♦ Air and conduction-cooled models

### 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.

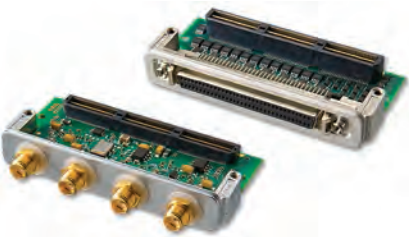
64 I/O lines are accessible through the rear (P2) connector. Additional I/O processing is supported on a separate mezzanine card that plugs into the FPGA base board. A variety of these external AXM I/O cards are available to interface your analog and digital I/O signals.

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.



Conduction-cooled version



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

### 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 to/from 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

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# 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-16.3.1-3 / SLT3-PER-2F-14.3.1

MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2

MOD3-PAY-1D-16.2.6-1' / SLT3-PAY-1D-14.2.6

MOD3-PAY-2F-16.2.7-1' / SLT3-PAY-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

##### 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 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](http://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](http://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](http://www.acromag.com).

##### XMC-SLX-EDK

Engineering Design Kit (one kit required)

##### PMCSW-API-VXW

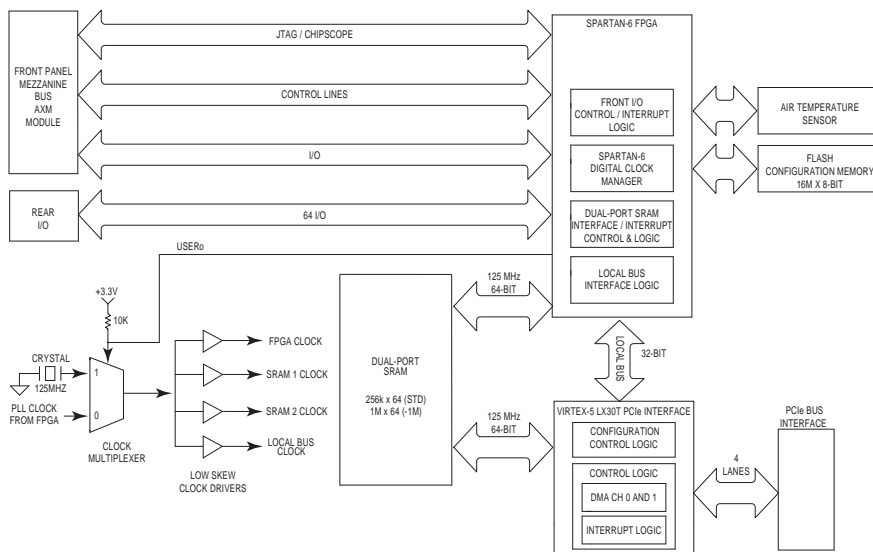
VxWorks® software support package

##### PCISW-API-WIN

Windows® DLL software support package

##### PCISW-LINUX

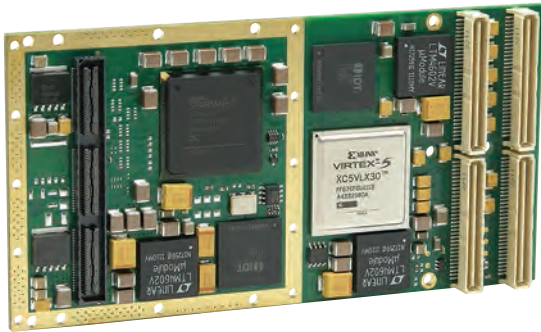
Linux™ support (website download only)



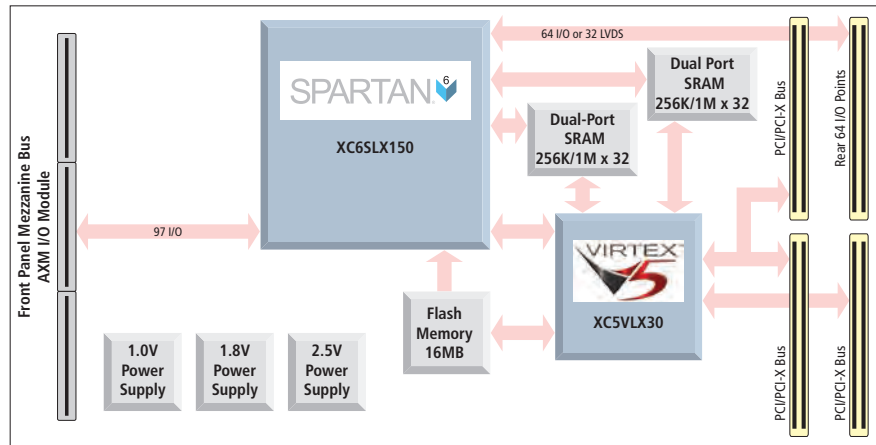
# PMC Modules

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

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



SPARTAN-6



### PMC module with PCI-X interface ♦ Logic-optimized Spartan-6 FPGA ♦ I/O extension mezzanine modules

#### 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.



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

#### 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

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## 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](http://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](http://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](http://www.acromag.com).

##### PMC-SLX-EDK

Engineering Design Kit (one kit required)

##### PMCSW-API-VXW

VxWorks® software support package

##### PCISW-API-WIN32

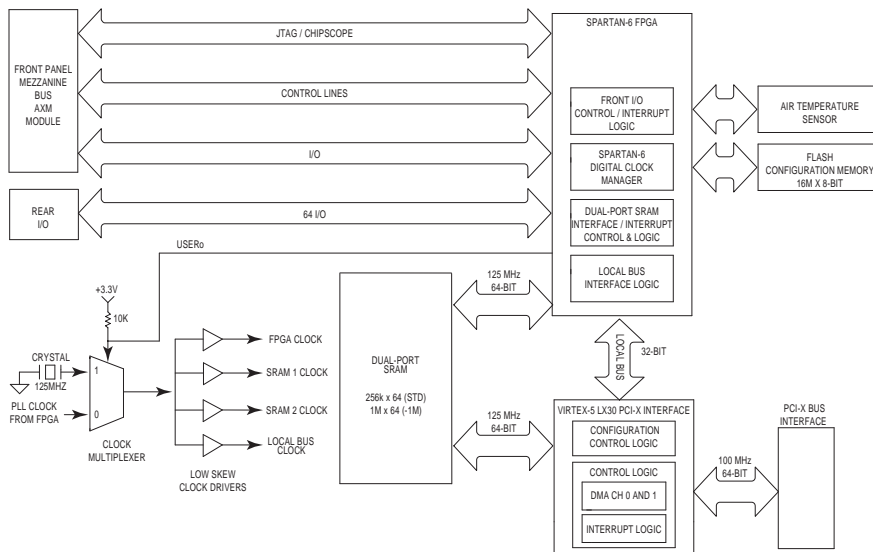
32-bit Windows® driver (DLL) software package

##### PCISW-API-WIN64

64-bit Windows® driver (DLL) software package

##### PCISW-LINUX

Linux™ support (website download only)

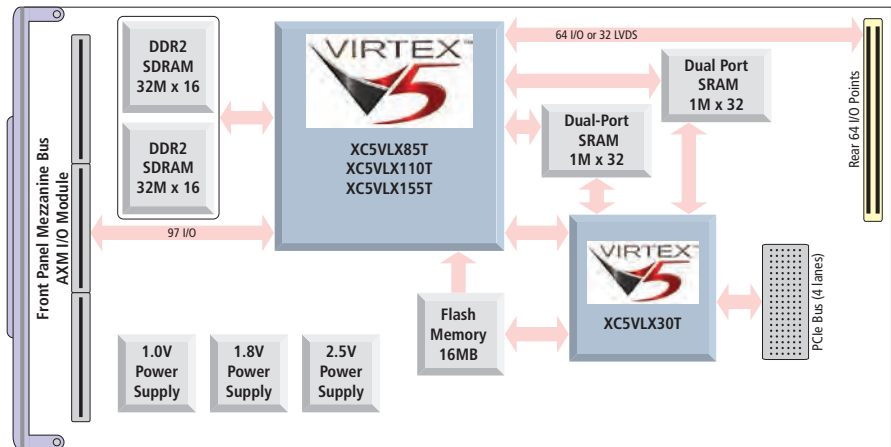
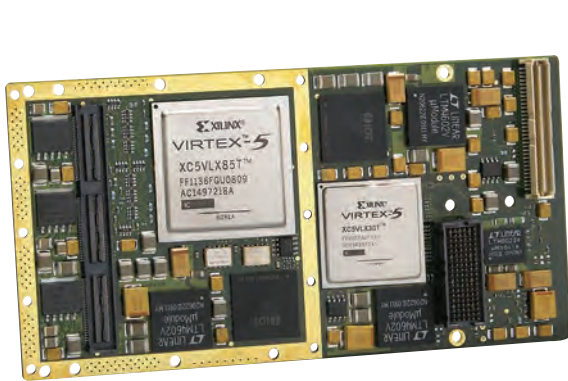




# XMC Modules

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

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



### XMC module with PCIe interface ♦ Logic-optimized Virtex-5 FPGA ♦ I/O extension mezzanine modules

#### 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.



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

#### 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

**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

## 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.

##### Model XMC-LX155:

XC5VLX155T-1FF1136 FPGA with 155,648 logic cells and 128 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](http://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 ANSIVITA 42.0 specification for XMC module mechanicals and connectors.

Complies with ANSIVITA 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%): 820mA typical, 984mA maximum

##### MTBF

Contact the factory.

### 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](http://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](http://www.acromag.com).

##### PMCSW-API-VXW

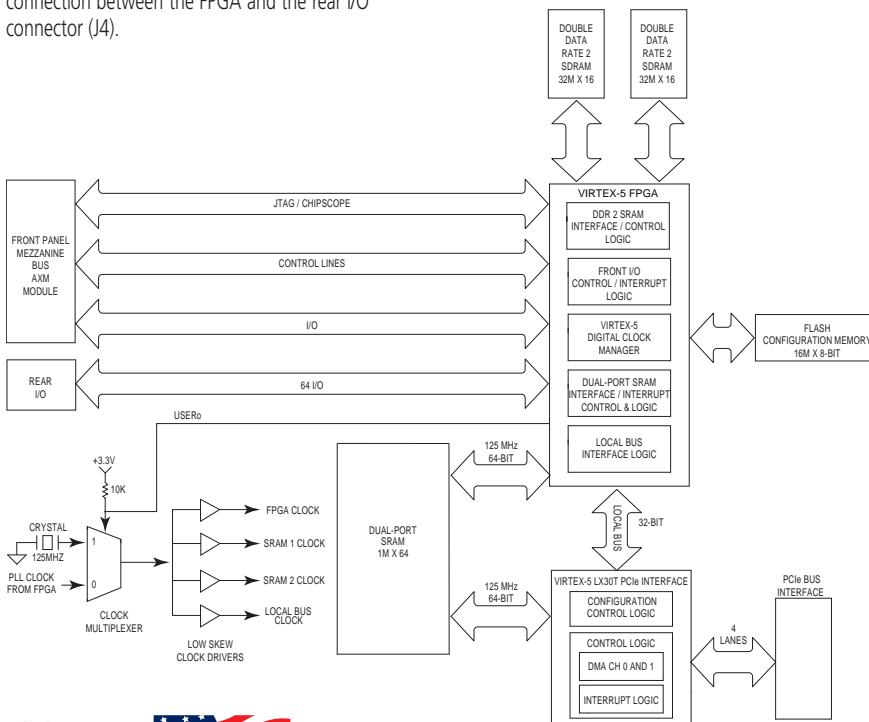
VxWorks® software support package

##### PCISW-API-WIN

Windows® DLL software support package

##### PCISW-LINUX

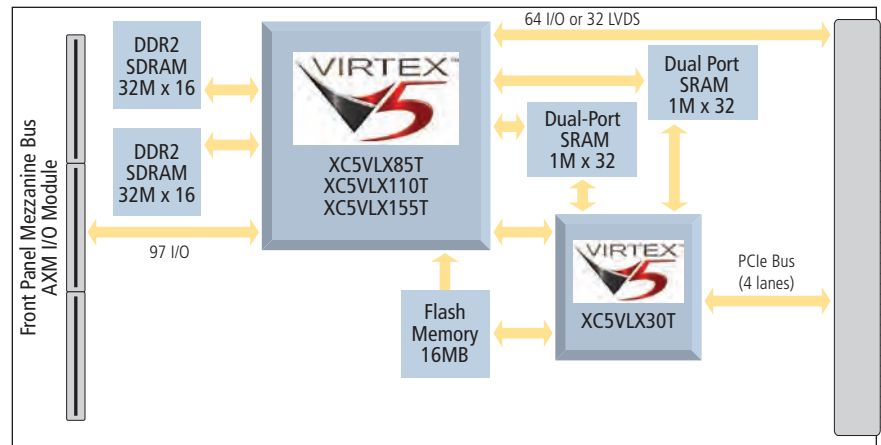
Linux™ support (website download only)



# VPX Boards

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

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



### VPX 3U card with PCIe interface ♦ Logic-optimized Virtex-5 FPGA ♦ Air and conduction-cooled models

#### 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.

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.



Conduction-cooled version



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

#### 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

**Acromag**   
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## 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-PER-2F-16.3.1-3 / SLT3-PER-2F-14.3.1

MOD3-PER-1F-16.3.2-2 / SLT3-PER-1F-14.3.2

MOD3-PAY-1D-16.2.6-1' / SLT3-PAY-1D-14.2.6

MOD3-PAY-2F-16.2.7-1' / SLT3-PAY-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

VPX Model	Virtex-5 FPGA Device	Logic Cells	DSP48E Slices
VPX-VLX85	XC5VLX85T	82,944	48
VPX-VLX110	XC5VLX110T	110,592	64
VPX-VLX155	XC5VLX155T	155,648	128

##### 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 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](http://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-VLX-EDK is required to configure FPGA.

#### VPX Boards

##### VPX-VLX85

3U VPX, Virtex-5 FPGA, 85k logic cells, air-cooled

##### VPX-VLX85-CC

Same as VPX-VLX85 except conduction-cooled

##### VPX-VLX110

3U VPX, Virtex-5 FPGA, 110k logic cells, air-cooled

##### VPX-VLX110-CC

Same as VPX-VLX110 except conduction-cooled

##### VPX-VLX155

3U VPX, Virtex-5 FPGA, 155k logic cells, air-cooled

##### VPX-VLX155-CC

Same as VPX-VLX155 except conduction-cooled

#### AXM Plug-In I/O Extension Modules

For more information, see [www.acromag.com](http://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](http://www.acromag.com).

##### XMC-VLX-EDK

Engineering Design Kit (one kit required)

##### PMCSW-API-VXW

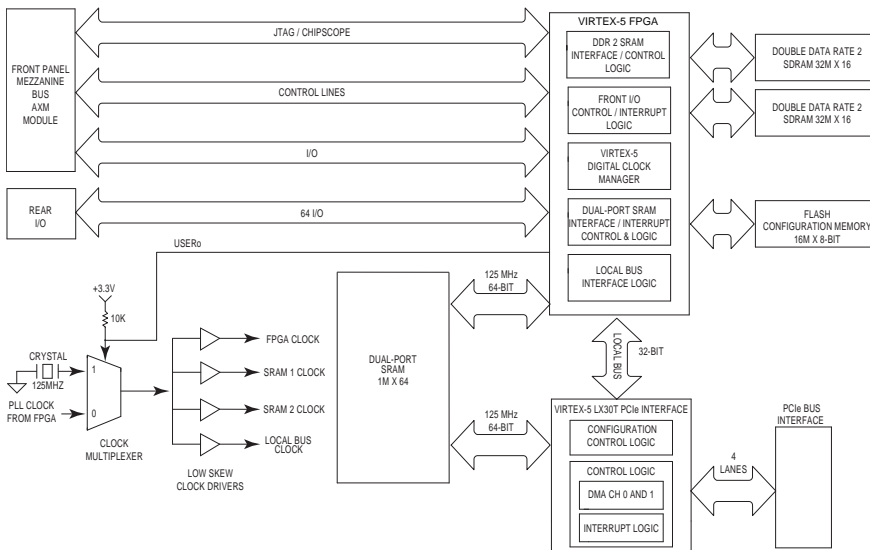
VxWorks® software support package

##### PCISW-API-WIN

Windows® DLL software support package

##### PCISW-LINUX

Linux™ support (website download only)



## 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.

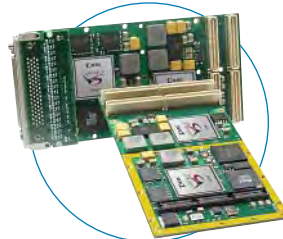
All trademarks are the property of their respective owners.



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
- 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



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



Plug-in modules sold separately for analog and digital I/O functions.

### 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 64 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

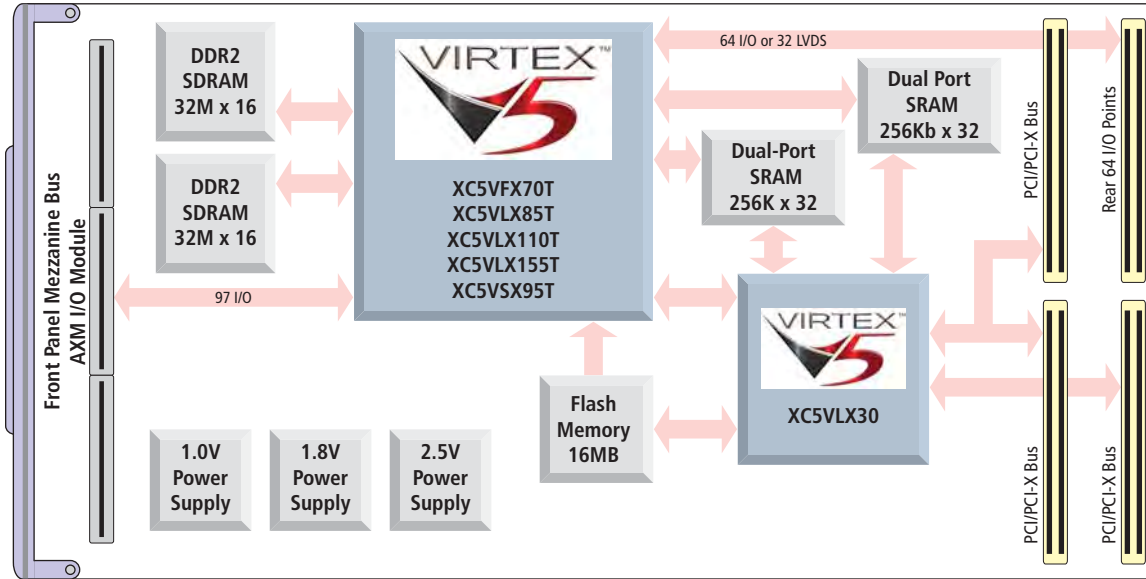
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-VLX module

#### 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.



PMC Modules

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-LINUX

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.

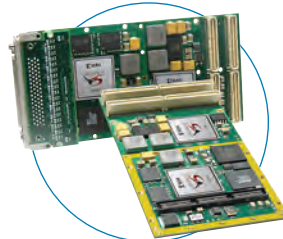
Acromag's Engineering Design Kit provides software utilities and example VHDL code to simplify your program development and get you running quickly. A JTAG interface enables on-board VHDL simulation.



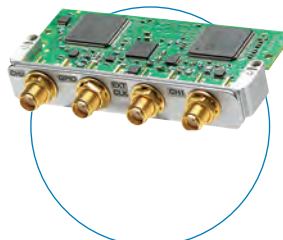
Download your own programs into the reconfigurable FPGA to quickly create custom I/O module. Optional I/O modules plug into the front mezzanine.

### 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



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



Plug-in modules sold separately for analog and digital I/O functions.

### 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)

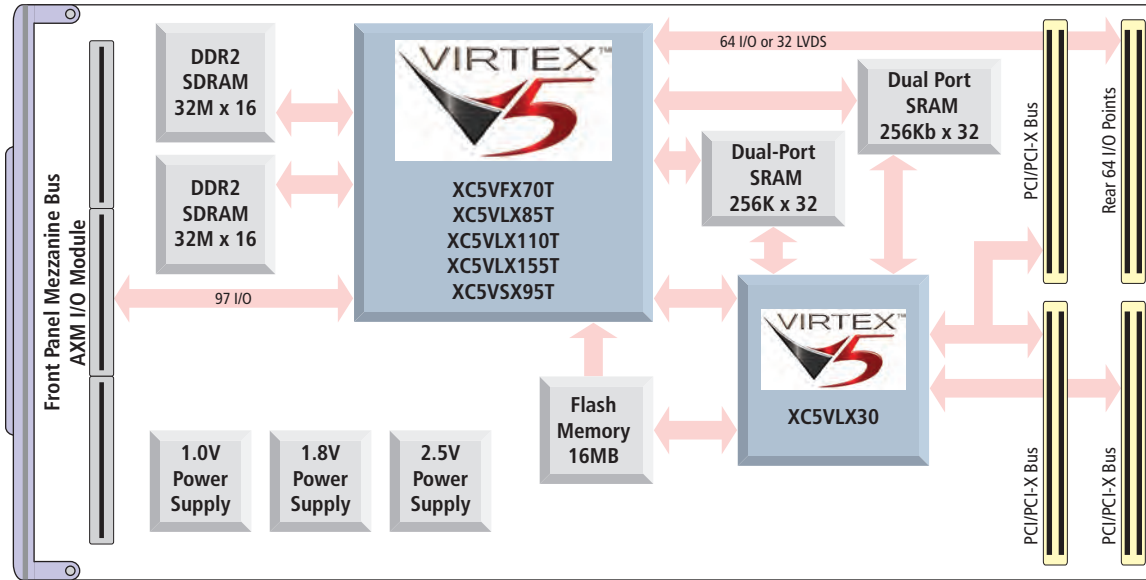
Storage temperature: -55 to 105°C.

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

All trademarks are the property of their respective owners.



## 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.

### Software

(see [software documentation](#) for details)

#### PMCSW-API-VXW

VxWorks® software support package

#### PCISW-API-WIN

Windows® DLL software support

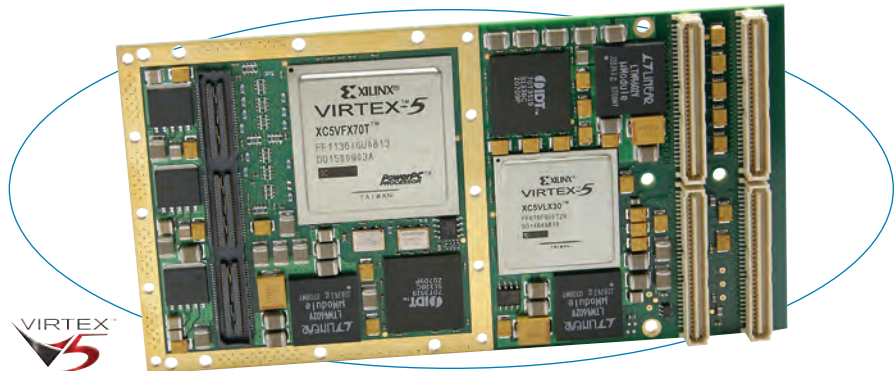
#### PCISW-LINUX

Linux™ support (website download only)



## 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



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

### 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.

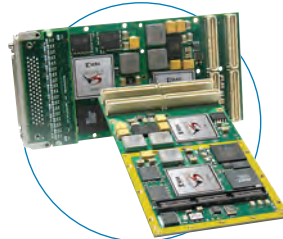
Take advantage of the module's support of conduction cooling for efficient dissipation of heat in environments with inadequate cooling air flow. Optional extended temperature models operate from -40 to 85°C.

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.

All trademarks are the property of their respective owners.

### 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



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



Plug-in modules sold separately for analog and digital I/O functions.

### 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

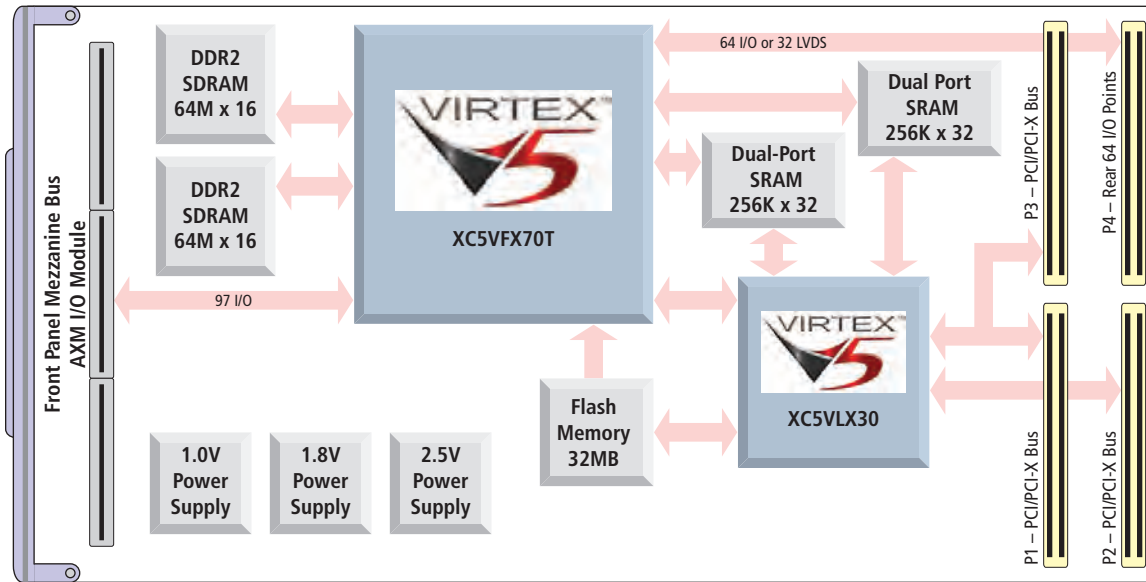
Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase of a PMC-VFX module.

#### 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.



PMC Modules

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-LINUX

Linux® support (website download only)

## 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.

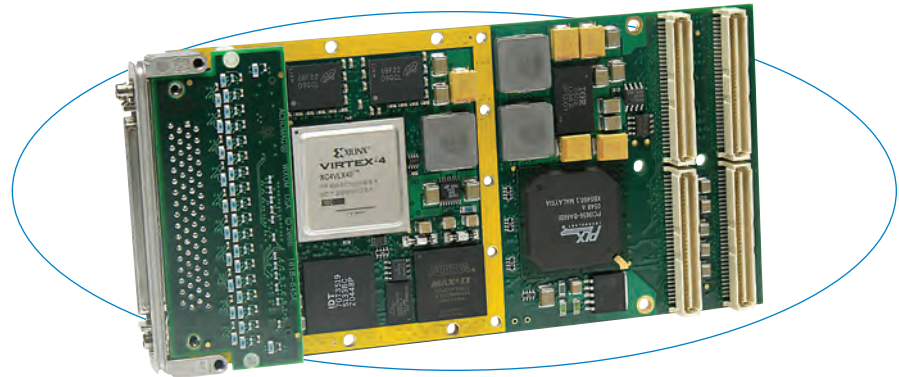
I/O processing is handled on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the AXM I/O Card for more details. Additionally, 64 I/O lines are supported via the rear (J4) connector.

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.



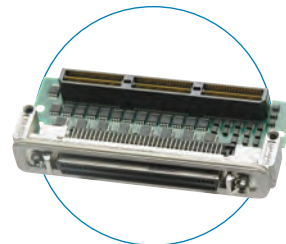
Download your own logic programs into the user-configured FPGA to quickly create a custom I/O module. Shown with optional plug-in I/O module.

### 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



The base board is ready for conduction-cooled applications.



Plug-in AXM modules sold separately for analog and digital I/O.

### 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.

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.

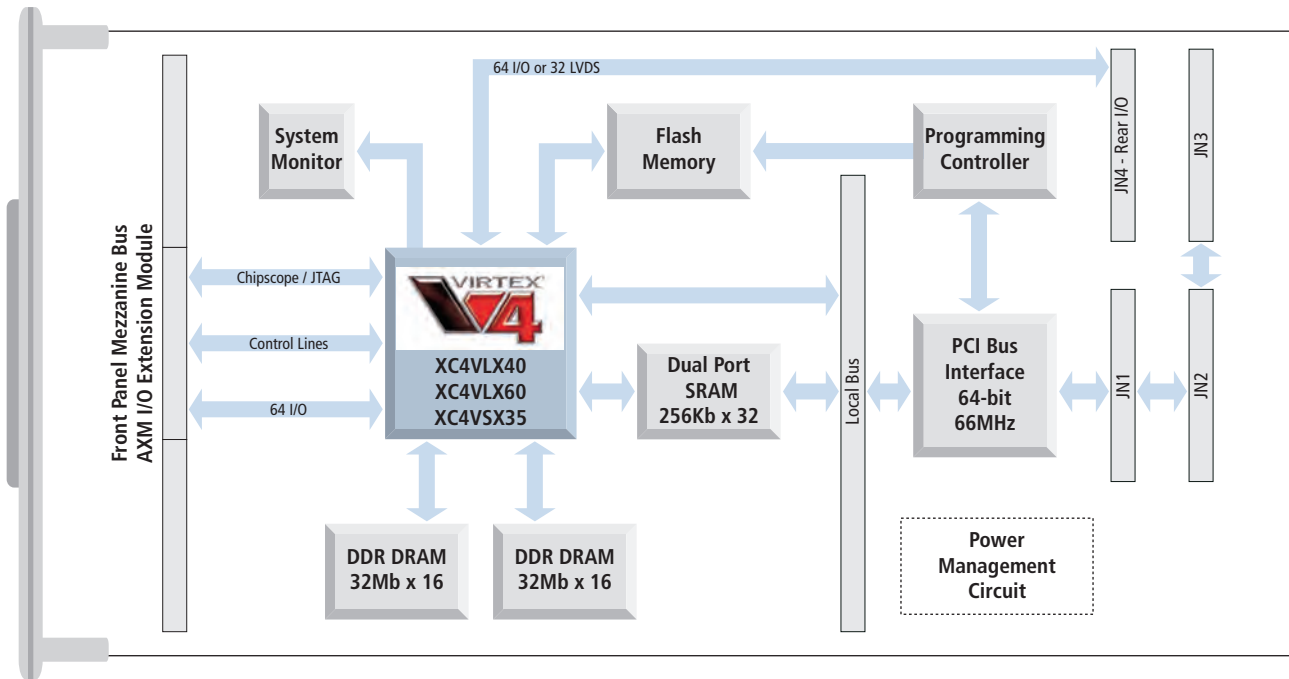
Relative humidity: 5 to 95% non-condensing.

Power: Consult factory. Operates from 3.3V supply.

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<sup>®</sup> software support package

#### PCISW-API-WIN

Windows<sup>®</sup> DLL software support

#### PCISW-LINUX

Linux<sup>™</sup> support (website download only)

## 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.

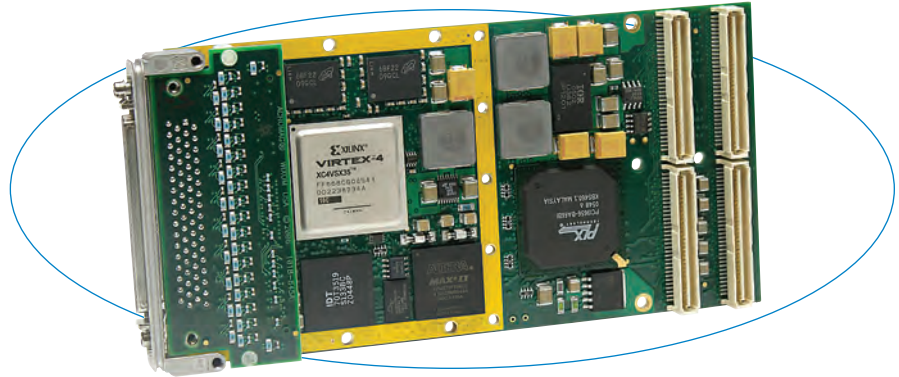
I/O processing is handled on a separate mezzanine card that plugs into the FPGA base board. A variety of these external I/O cards offer an interface for your analog and digital I/O signals. See the [AXM I/O Card](#) for more details. Additionally, 64 I/O lines are supported via the rear (J4) connector.

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.

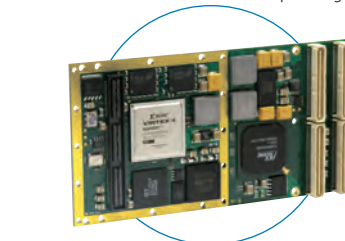
Acromag provides software utilities and examples to simplify your programming and get you started quickly. A JTAG interface enables on-board VHDL simulation.



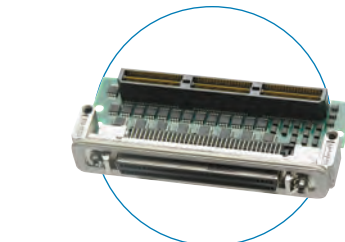
Download your own logic programs into the user-configured FPGA to quickly create a custom I/O module. Shown with optional plug-in I/O module.

### Features

- Customizable FPGA (Xilinx Virtex-4 XC4V5X35) 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



The base board is ready for conduction-cooled applications.



Plug-in AXM modules sold separately for analog and digital I/O.

### Specifications

#### FPGA

FPGA: Xilinx Virtex-4 FPGA XC4V5X35 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

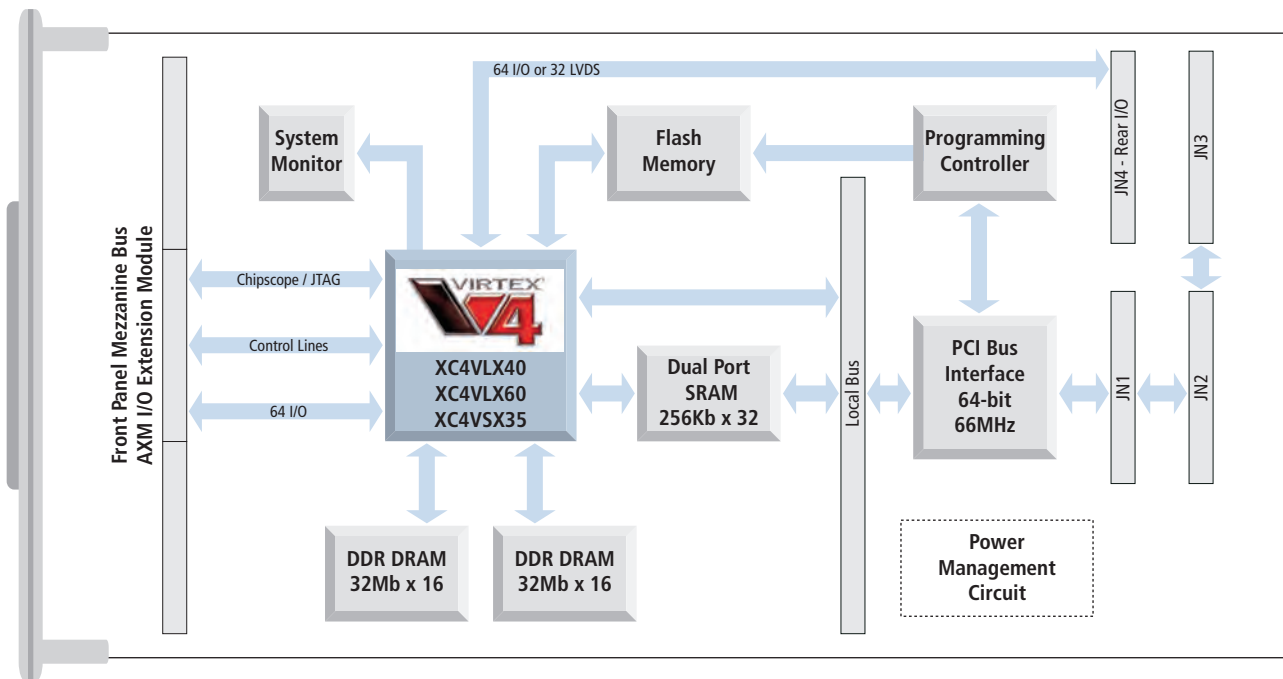
Operating temperature: 0 to 70°C

Storage temperature: -55 to 105°C.

Relative humidity: 5 to 95% non-condensing.

Power: Consult factory. Operates from 3.3V supply.

MTBF: 869,686 hrs. at 25°C, MIL-HDBK-217F, Notice 2.



## 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

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

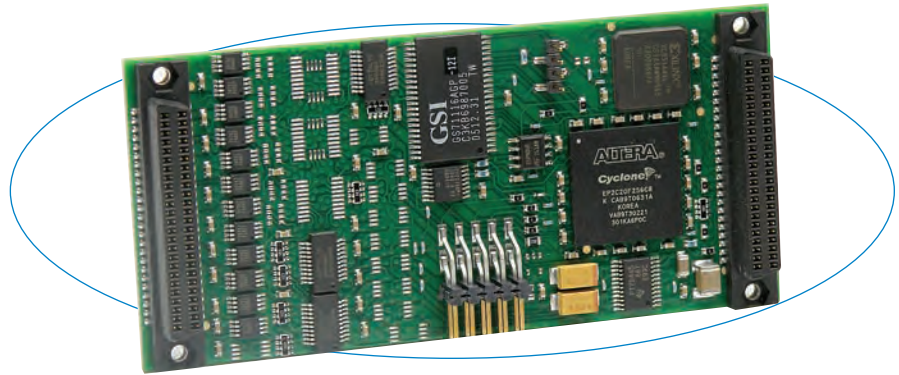
#### PCISW-API-WIN

Windows® DLL software support

#### PCISW-LINUX

Linux® support (website download only)

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



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

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 over TTL-switched lines, and analysis of acquired data 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-EP202: 24 differential RS485 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
- LVTTTL 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

### Specifications

#### FPGA

FPGA: Altera Cyclone II EP2C20.  
 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  
 IP-EP204: 24 LVDS lines  
 All models: LVTTTL 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 (IOSel\*), ID read (IDSel\*), Interrupt select (INTSel\*).

Access times (8MHz or 32MHz clock):  
 ID space read: 1 wait state (375nS cycle @ 8MHz).  
 Registers read/write: 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 programs 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-EP202](#): 24 differential RS485 I/O lines
  - [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](#).

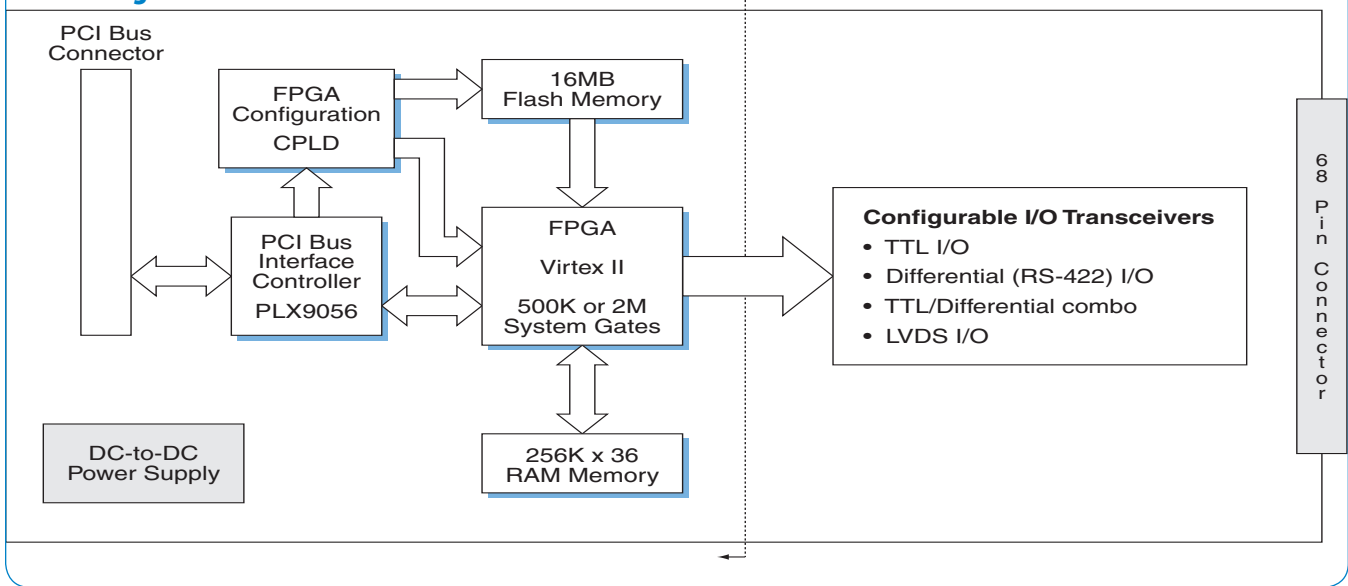
#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information

#### Accessories

See [www.acromag.com](http://www.acromag.com) for more information

## Block Diagram



## 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.

AXM extension modules attach to the configurable FPGA PMC module's front mezzanine to provide I/O processing capabilities.

### 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 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

MTBF: 1,972,542 hrs. at 25°C, MIL-HDBK-217F, Notice 2.

### 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

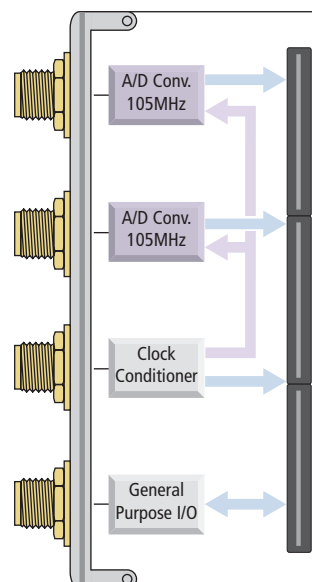
PMC-LX, PMC-SX, PMC-VLX, PMC-VSX, PMC-VFX

**Software** (see software documentation for details)

**Accessories** (see accessories documentation for details)

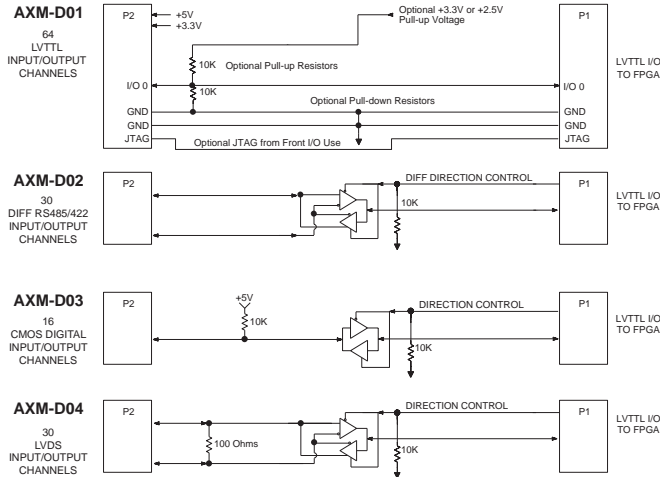
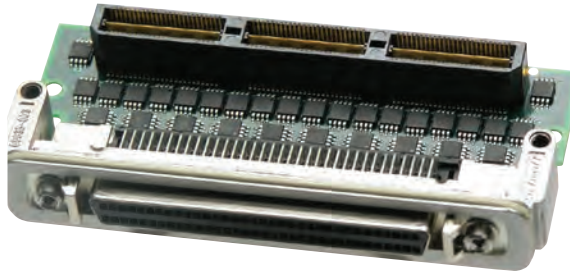


AXM modules attach to PMC Modules with user-configurable FPGAs.



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## AXM Series Digital I/O Extension Modules for PMC FPGA Boards



Plug-In I/O Modules ♦ Choose from four I/O Options ♦ JTAG Support Option

### 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), PMC-VLX/VSX/VFX (Virtex-5 FPGA) modules, and PMC-SLX (Spartan-6 FPGA) modules.

#### AXM-D01 LVTTTL I/O

This module provides 64 LVTTTL 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. JTAG option.



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

#### 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 allows 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.

## AXM Series Digital I/O Extension Modules for PMC FPGA Boards

### Performance Specifications

#### AXM-D01

Channel configuration: 64 channel bi-directional LVTTTL signals are independently direction controlled. LVTTTL 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.

#### 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:

VoH: 3.8V minimum    Vol: 0.55V maximum

IoH: -32.0mA        IoL: 32.0mA

ViH: 3.5V minimum    ViL: 1.5V 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: 1.37V 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 LVTTTL I/O channels

##### AXM-D02

30 RS-485 Differential 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.

#### 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

[\(see accessories documentation for details\)](#)

ISO9001  
AS9100



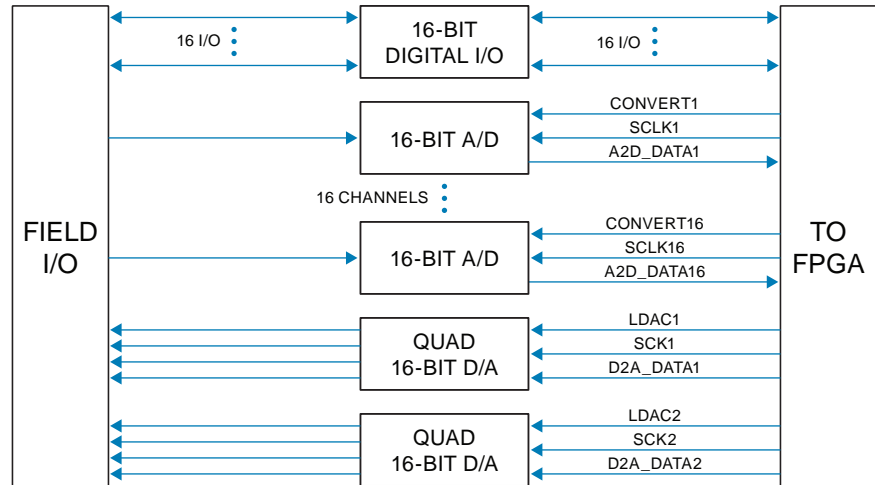
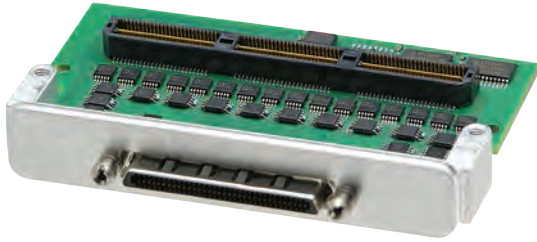
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# Extension I/O Modules

## AXM-A75 Multi-function I/O extension module for Acromag FPGA cards

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



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  $\pm 10.24$  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 10 $\mu$ s settling time
- Analog output range of  $\pm 10$  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



AXM extension I/O modules plug into a mezzanine connector on many Acromag FPGA boards to provide additional I/O signal processing capabilities.

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# 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

2 $\mu$ S 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

10 $\mu$ S (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).

##### Stacking height

5.0 mm (0.315 in).

##### 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.

##### Electromagnetic Compatibility (EMC)

Minimum immunity per European Norm EN61000-6-2:2005.

##### Electrostatic Discharge (ESD) Immunity

4KV direct contact and 8KV air-discharge to the enclosure port per IEC61000-4-2.

##### Radiated Field Immunity (RFI)

10V/m, 80 to 1000MHz AM; 3V/m, 1.4 to 2.0GHz;

1V/m, 2.0 to 2.7GHz, per IEC61000 4 3.

##### Electrical Fast Transient Immunity (EFT)

2KV to power, and 1KV to signal I/O per IEC61000-4-4.

##### Conducted RF Immunity (CRFI)

10Vrms, 150KHz to 80MHz, per IEC61000-4-6.

##### Surge Immunity

0.5KV to power and 1KV to signal per IEC61000-4-5.

##### Emissions

Per European Norm EN61000-6-4:2007.

##### Radiated Frequency Emissions

30 to 1000MHz per CISPR16 Class A.

### Ordering Information

#### ■ AXM Plug-In I/O Extension Modules

For more information, see [www.acromag.com](http://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](http://www.acromag.com).

##### 5028-420

Cable, VHDCI 68-Pin to SCSI-3 MD68, 2 meters

##### 5028-288

Termination panel

ISO9001  
AS9100



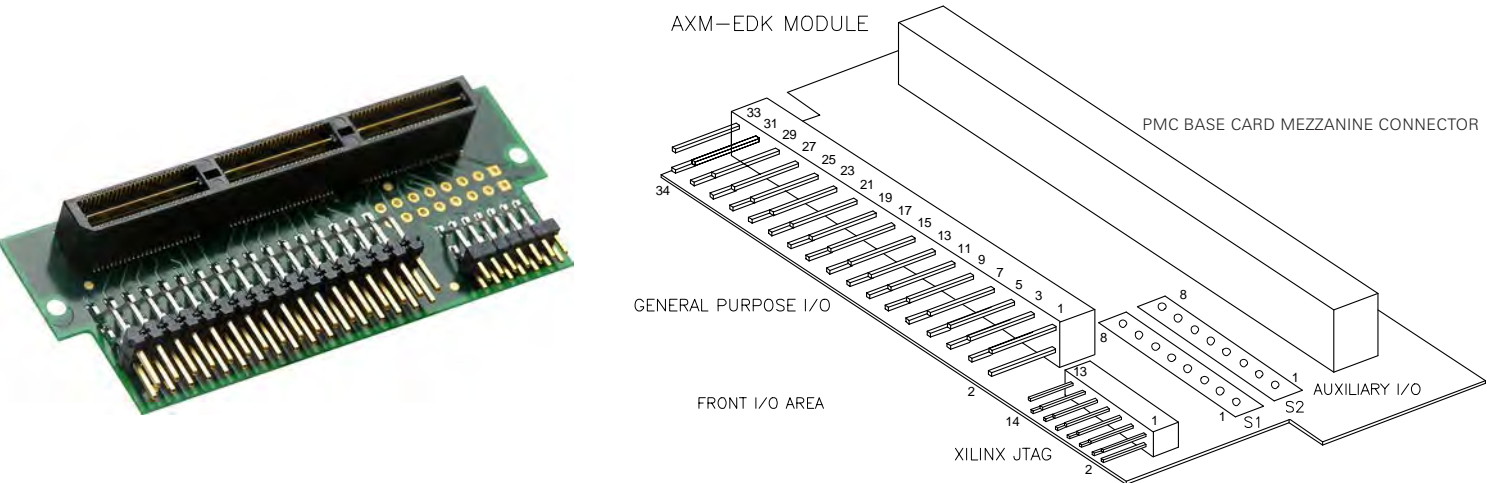
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# AXM Modules

## AXM-EDK FPGA Interface Board Extension Module

2 YEAR WARRANTY  
24 HOUR STOCK ITEM



Extension module design tool ♦ Provides JTAG Interface to FPGA ♦ Emulates differential I/O

### Description

The AXM-EDK board provides the standard Xilinx JTAG header as well as direct connections to the Xilinx FPGA. These general purpose LVTTTL (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 LVTTTL 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 LVTTTL.

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 LVTTTL 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 LVTTTL 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

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# AXM Modules

## AXM-EDK FPGA Interface Board Extension Module

<b>34-Pin Double Row 0.1" I/O Header</b>			
Pin Description	Pin	Pin Description	Pin
COMMON	1	COMMON	2
LVTTTL Channel 0	3	LVTTTL Channel 1	4
LVTTTL Channel 2	5	LVTTTL Channel 3	6
LVTTTL Channel 4	7	LVTTTL Channel 5	8
LVTTTL Channel 6	9	LVTTTL Channel 7	10
LVTTTL Channel 8	11	LVTTTL Channel 9	12
LVTTTL Channel 10	13	LVTTTL Channel 11	14
LVTTTL Channel 12	15	LVTTTL Channel 13	16
LVTTTL Channel 14	17	LVTTTL Channel 15	18
LVTTTL Channel 16	19	LVTTTL Channel 17	20
LVTTTL Channel 18	21	LVTTTL Channel 19	22
LVTTTL Channel 20	23	LVTTTL Channel 21	24
LVTTTL Channel 22	25	LVTTTL Channel 23	26
LVTTTL Channel 24	27	LVTTTL Channel 25	28
LVTTTL Channel 26	29	LVTTTL Channel 27	30
LVTTTL Channel 28	31	LVTTTL Channel 29	32
COMMON	33	COMMON	34

<b>14-Pin 2mm Double Row JTAG Header</b>			
Pin Description	Pin	Pin Description	Pin
COMMON	1	+3.3V	2
COMMON	3	TMS	4
COMMON	5	TCK	6
COMMON	7	TDO	8
COMMON	9	TDI	10
COMMON	11	Not Connected	12
COMMON	13	Not Connected	14

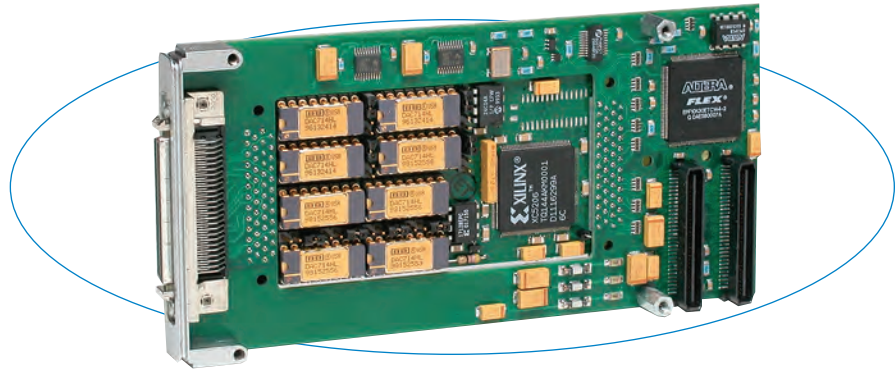
<b>Auxiliary (LVTTTL) I/O Pin Connections (SIP)</b>			
<b>SIP 1 (S1)</b>		<b>SIP 2 (S2)</b>	
Pin Description	Pin	Pin Description	Pin
AUX Channel 0	1	AUX Channel 8	1
AUX Channel 1	2	AUX Channel 9	2
AUX Channel 2	3	AUX Channel 10	3
AUX Channel 3	4	AUX Channel 11	4
AUX Channel 4	5	AUX Channel 12	5
AUX Channel 5	6	AUX Channel 13	6
AUX Channel 6	7	AUX Channel 14	7
AUX Channel 7	8	AUX Channel 15	8

ISO9001  
AS9100   
MADE IN USA

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## PMC230A-8 16-Bit D/A Analog Output



Independent D/A converters on each channel provide better performance and smoother operation.

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
- 10 $\mu$ S settling time (100KHz throughput)
- Three output ranges:  $\pm 5V$ ,  $\pm 10V$ , 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:  $\pm 5V$ ,  $\pm 10V$ , 0 to 10V (jumper-selectable).

Maximum throughput rate:

Outputs can be updated simultaneously or individually.

One channel: 100KHz (10 $\mu$ S/conversion)

Eight channels: 100KHz (10 $\mu$ S/8 ch).

DAC programming: Immediate (transparently programmed to DAC output); simultaneous (input latches of DACs are loaded before simultaneously updating outputs).

System accuracy: 0.0061% of 20V span max. corrected error (i.e. calibrated) at 25 $^{\circ}$ 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 $^{\circ}$ 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.

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.

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.

Access Times: 1000nS for all registers.

#### Environmental

Operating temperature: 0 to 70 $^{\circ}$ C (PMC230A-8) or -40 to 85 $^{\circ}$ C (PMC230A-8E model)

Storage temperature: -55 to 100 $^{\circ}$ C (all models).

Relative humidity: 5 to 95% non-condensing.

Power: 100mA at +5V. 140mA at +12V. 225mA at -12V.

MTBF: 662,291 hrs. at 25 $^{\circ}$ C, MIL-HDBK-217F, notice 2.

### 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<sup>®</sup> software support package

##### PCISW-API-WIN

Windows<sup>®</sup> DLL Driver software package

##### PCISW-LINUX

Linux<sup>®</sup> 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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## 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.

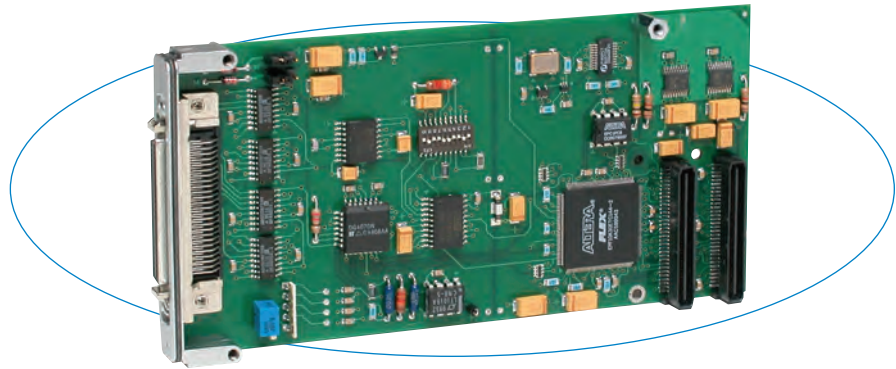
“Mail box” memory allows the CPU to read the latest data in 32 storage buffer registers without interrupting the A/D converter.

### Features

- 16-bit A/D converter (ADC)
- 8 $\mu$ S conversion time (125KHz)
- 16 differential or 32 single-ended inputs ( $\pm 5V$ ,  $\pm 10V$ , 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.



Advanced memory management techniques allow the PMC330 to operate with minimal interruption of the A/D converter.

### Specifications

#### Analog Inputs

Input configuration: 16 differential or 32 single-ended.

A/D resolution: 16 bits.

Input ranges:  $\pm 5V$ ,  $\pm 10V^*$ , 0-5V, and 0-10V\*.

\* Requires  $\pm 15V$  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 (8 $\mu$ S/conversion)

[66KHz (15 $\mu$ S/conversion) recommended]

16 channels (differential): 4.2KHz (240 $\mu$ S/16 ch)

32 channels (single-ended): 2.1KHz (480 $\mu$ S/32 ch).

Programmable gains: 1x, 2x, 4x, 8x.

A/D triggers: External and software.

System accuracy:  $\pm 3$  LSB (0.005%) typical (SW calib., gain=1, 25°C).

Data format: Straight binary or two's complement.

Input overvoltage protection:  $V_{SS}$  -20V to  $V_{DD}$  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-LINUX

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

All trademarks are the property of their respective owners.

## 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 8 $\mu$ S, and all 16 channels can be sampled in just 16 $\mu$ s.

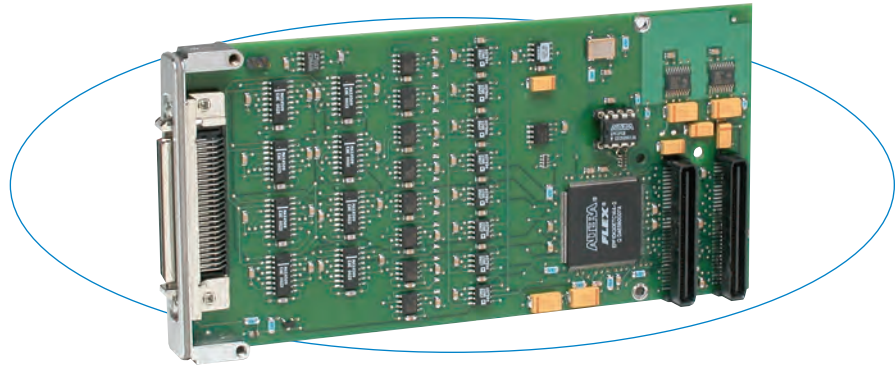
Flexible configuration options give you extensive control over the conversion process. The channels or bank to be converted, timing, scan mode, and other parameters are user-programmable. Interrupt support adds further control to interrupt upon a programmable threshold when the memory is full.

### Features

- 16 differential inputs ( $\pm 10V$  DC input range)
- Eight 14-bit A/D converters with simultaneous multi-channel conversion
- 8 $\mu$ S 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:  $\pm 10V$ .  
 Data sample memory: 512 sample FIFO buffer.  
 Max. throughput rate:  
 Eight channels can be simultaneously acquired.  
 One channel: 125KHz (8 $\mu$ S/conversion)  
 8 channels (same bank): 1MHz (8 $\mu$ S/8 channels)  
 16 channels (high & low banks): 1MHz (16 $\mu$ S/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 complement.  
 Input overvoltage protection:  $\pm 25V$  (power on),  $\pm 40V$  (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.  
 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.  
 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)

- PMCSW-API-VXW**  
VxWorks® software support package
- PCISW-API-WIN**  
Windows® DLL Driver software package
- PCISW-LINUX**  
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.

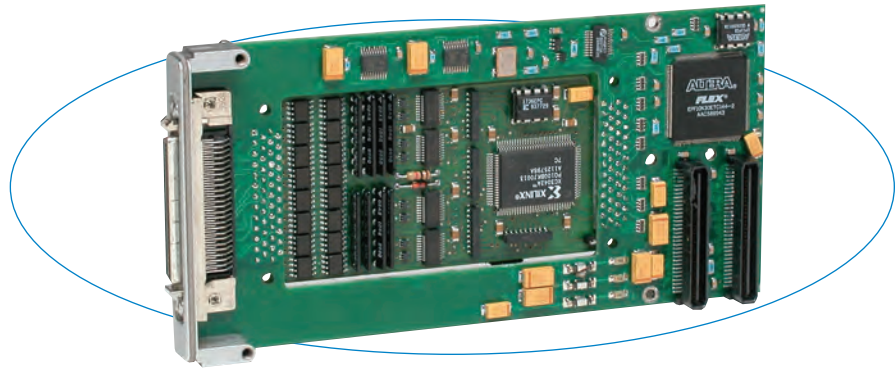
Loopback monitoring of critical control signals is easy since the input and output circuitry are connected in tandem to each channel.

### 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.



The PMC408 provides an easy method to perform loop-back monitoring of your critical control signals.

### 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).

MTBF: 958,506 hrs. at 25°C, MIL-HDBK-217F, notice 2.

### 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-LINUX

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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## PMC424 Digital I/O (Differential & TTL) and Counter/Timers

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 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. A conduction-cooled version is also available.

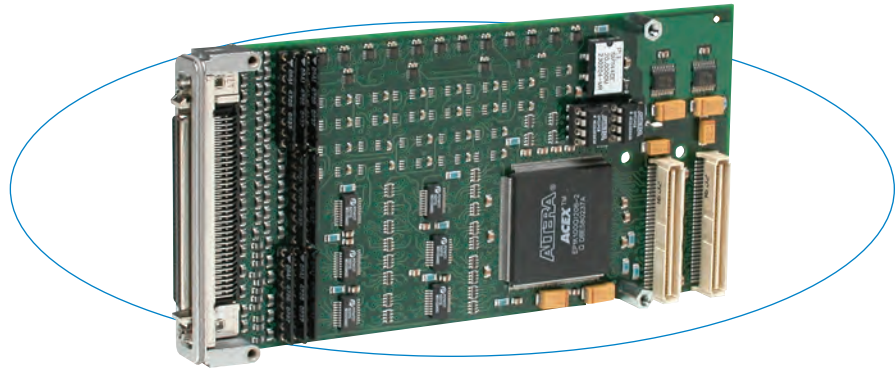
### Features

#### Digital I/O

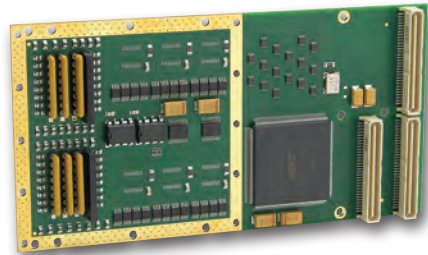
- 40 digital input/output channels:
  - 24 differential input/outputs
  - 16 TTL input/output channels (15 ch. for 434R)
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

#### 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 are failsafe



This module saves money and PMC slots by combining differential I/O, TTL I/O, and counter/timer functions on one card.



PMC424CC for conduction cooling

### 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, low to high: 3.5V typical.

Input signal threshold, high to low: 1.5V typical.

Input response time: 10 nanoseconds, typical.

#### Digital Output

Output voltage range: 0 to 5V DC.

Output ON current range: -32 to 32mA.

Output pullups: 4.7K ohm socketed resistors.

Turn on time: 10nS.

Turn off time: 10nS.

#### 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 IN<sub>A</sub>, IN<sub>B</sub>, and IN<sub>C</sub> 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 (PMC424E / CC)

Storage temperature: -55 to 105°C.

Relative humidity: 5 to 95% non-condensing.

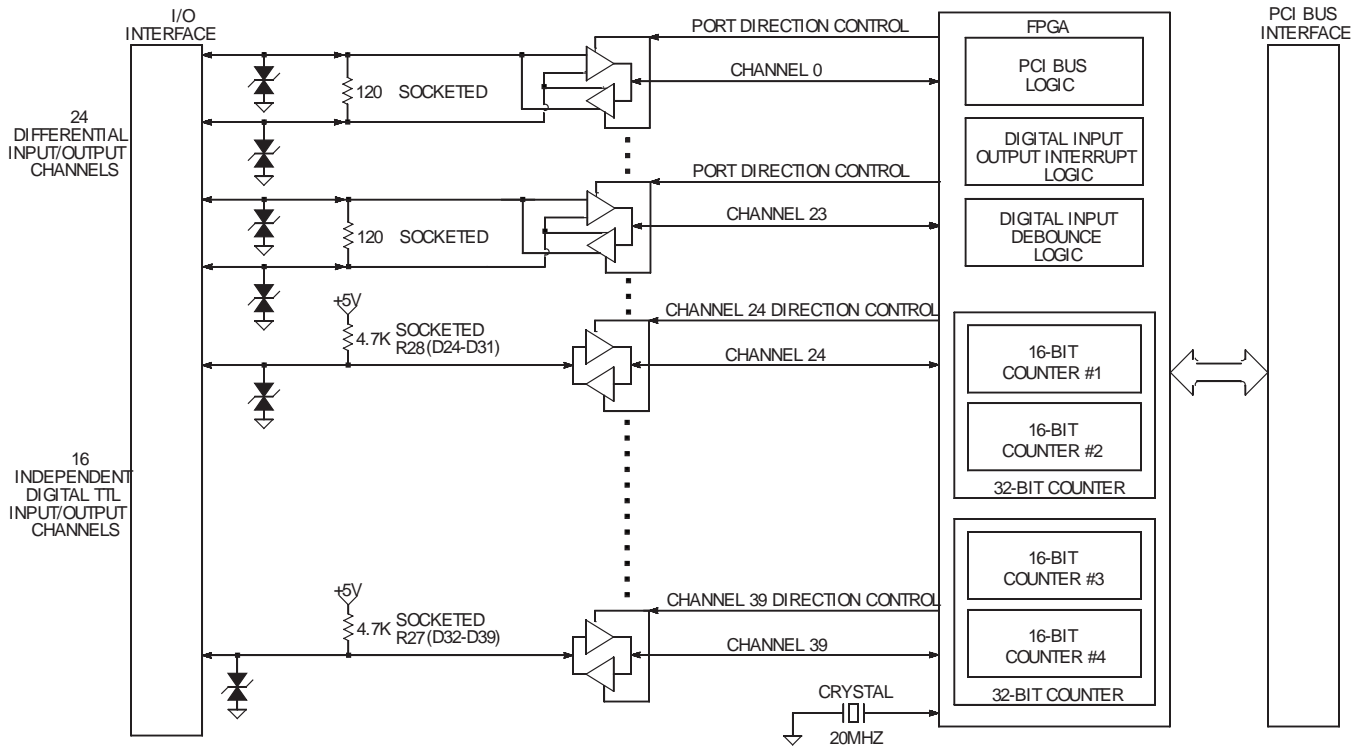
MTBF: 1,596,123 hrs. at 25°C, MIL-HDBK-217F, notice 2.

Power: 216mA at +5V, typical.

Continued on the next page.

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## 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-LINUX:** 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.

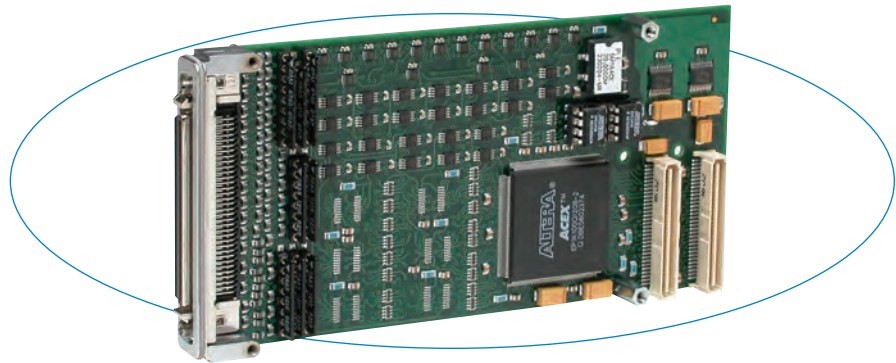
### Features

#### Digital I/O

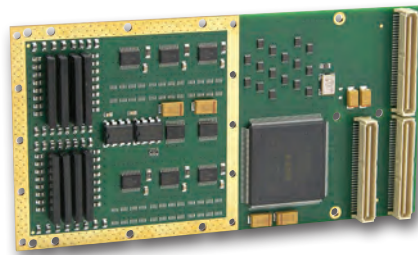
- 64 digital input/output channels:
  - 16 individually programmable channels (15 channels for 464R)
  - 48 channels configured on an 8-bit port basis
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

#### 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 fail-safe



This module saves money and PMC slots by combining digital I/O, and counter/timer functions on a single card.



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.

#### 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 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, 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.

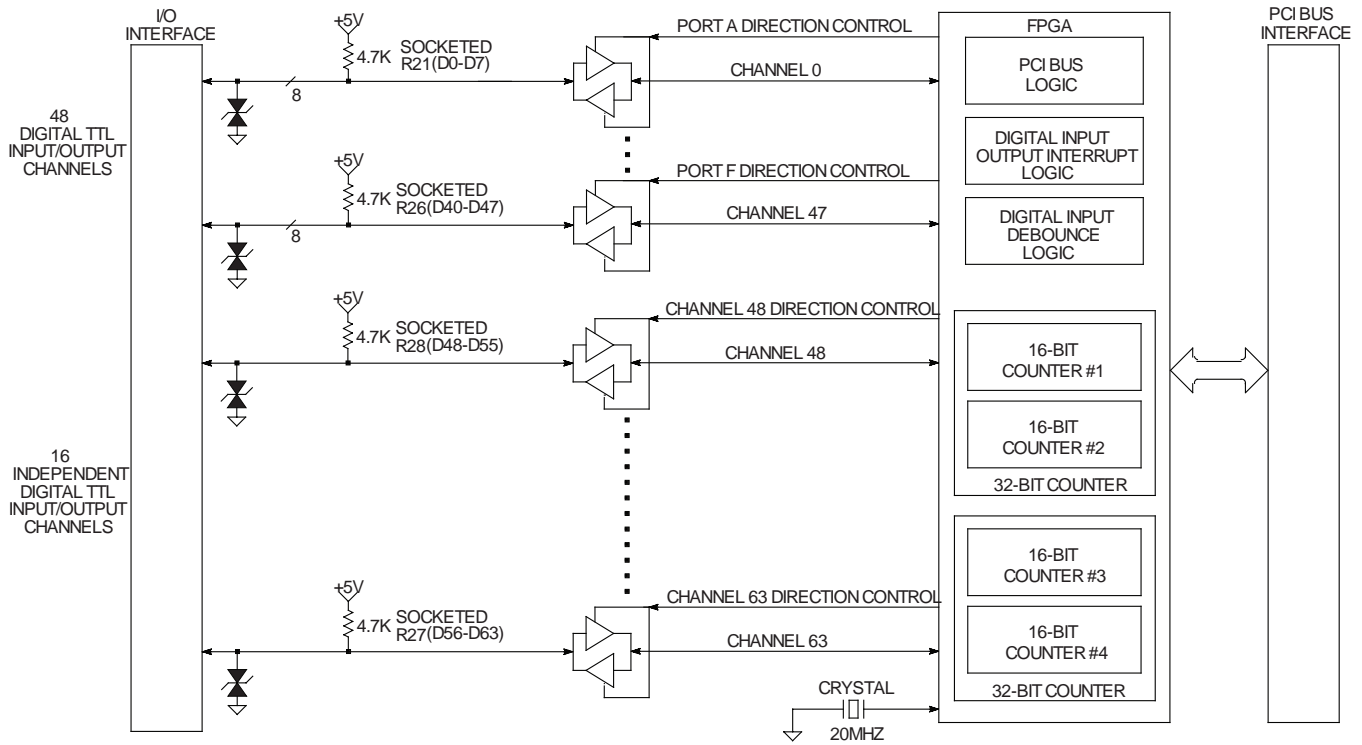
#### Environmental

Operating temperature: 0 to 70°C (PMC464 / R) or -40 to 85°C (PMC464E / CC)  
Storage temperature: -55 to 105°C.  
Relative humidity: 5 to 95% non-condensing.  
MTBF: 1,750,590 hrs. at 25°C, MIL-HDBK-217F, notice 2.  
Power: 160mA at +5V, typical.

Continued on the next page.

All trademarks are the property of their respective owners.

## 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-LINUX:** 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.

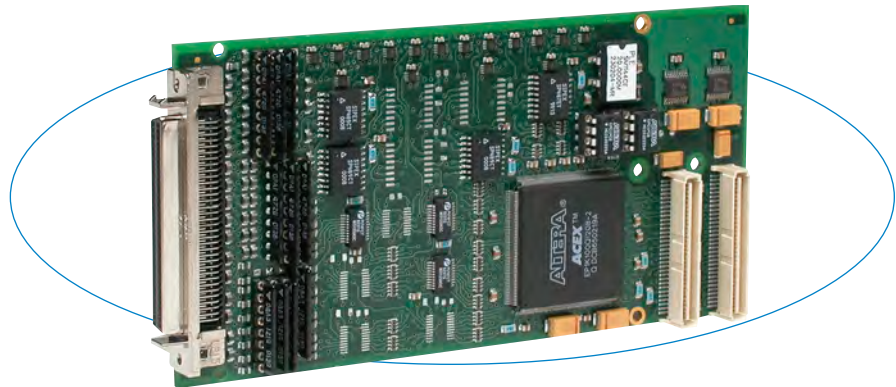
Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

### 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.

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  $\pm 62nS$ .
- Watchdog: Timeout occurs within  $\pm 1$  clock cycle.
- Pulse/period measurement:  $\pm 1$  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 8MHz.

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:  $V_{IH} = 2.0V$  and  $V_{IL} = 0.8V$ . inputs are buffered and include 4.7K pull-ups to +5V.

Counter output: Level is TTL or RS422 differential digital.

#### 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.

Register Access Times: 8 PCI clock cycles, typical.

#### 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.

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

PMC482 1,744,259; PMC483 1,727,707; PMC484 1,708,729

### Ordering Information

#### PMC Modules

**PMC482:** Ten 16-bit TTL counters

**PMC482E:** Same as PMC482 plus extended temp. range

**PMC482R:** Same as PMC482 with rear I/O connector

**PMC482RE:** Same as PMC482E with rear I/O connector

**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

**PMC484:** Six 32-bit RS422 counters

**PMC484E:** Same as PMC484 plus extended temp. range

**PMC484R:** Same as PMC484 with rear I/O connector

**PMC484RE:** Same as PMC484E 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-LINUX:** Linux™ support (website download only)

**Accessories** (see [accessories documentation](#) for details)

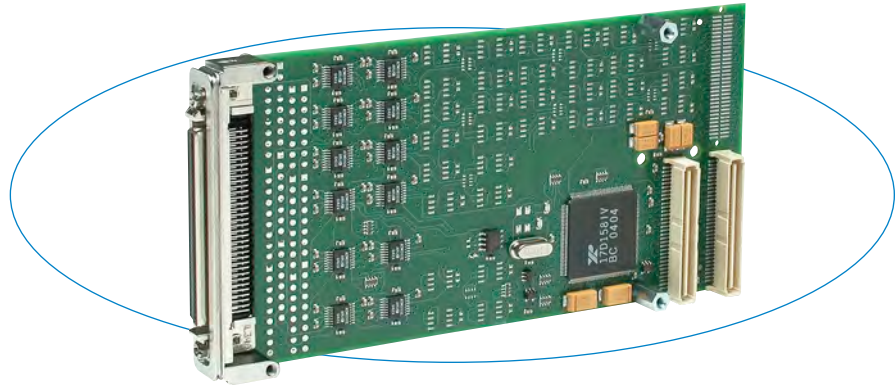
**5025-288:** Termination panel, SCSI-3 connector, 68 screw terminals

**5028-432:** Cable, shielded, SCSI-3 connector both ends

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## PMC520 Octal Serial 232 Communication



With eight serial ports per module, the PMC520 provides a high-density solution to reduce costs and use fewer card slots.

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. 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. 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.

MTBF: 2,848,670 hrs at 25°C, MIL-HDBK-217F, notice 2.

#### 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

##### 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 (see [software documentation](#) for details)

##### PMCSW-API-VXW

VxWorks® software support package

##### PCISW-API-WIN

Windows® DLL software support

##### PCISW-LINUX

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

All trademarks are the property of their respective owners.

## 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.

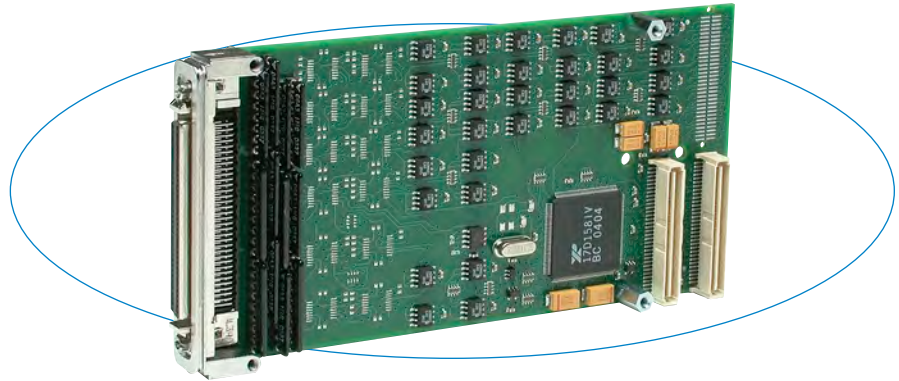
The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. A global interrupt source register provides interrupt status indication for all eight channels to speed up interrupt parsing.

### 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.



With eight serial ports per module, the PMC521 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: 20MB /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.

MTBF: 2,321,047 hrs at 25°C, MIL-HDBK-217F, notice 2.

#### 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

##### PMC521

Eight RS422B serial ports, front I/O connector

##### PMC521E

Same as PMC521 plus extended temperature range.

##### PMC521R

Same as PMC521 except with rear I/O connector

##### PMC521RE

Same as PMC521R 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-LINUX

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

All trademarks are the property of their respective owners.

## 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 ( $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$  ranges)
- 16-bit ADC with 512 sample RAM
- $10\mu s$  conversion time (100KHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable interval timer

#### Analog Outputs

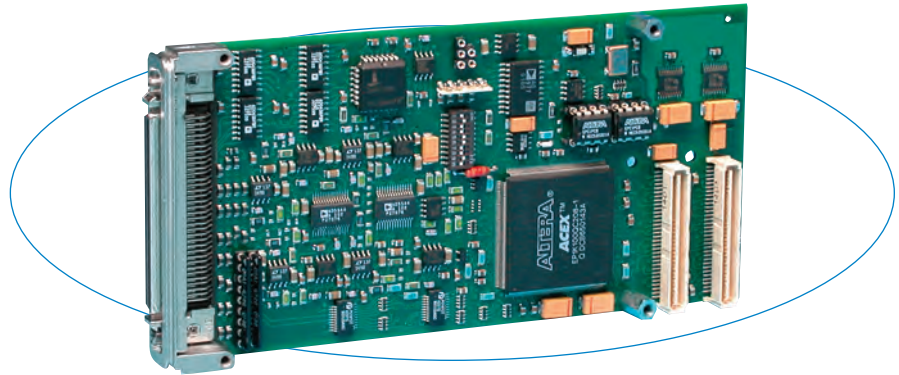
- Eight analog output channels ( $\pm 10V$  range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- $12.375\mu s$  settling time (80.8KHz throughput)
- Interrupt on user-programmable FIFO threshold

#### Digital I/O

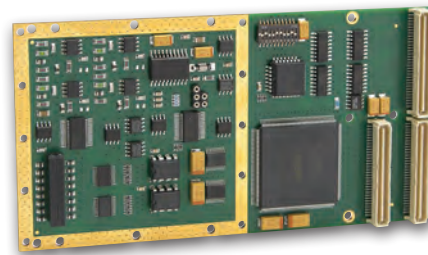
- 16 TTL bidirectional input/outputs

#### Counter/Timer

- One 32-bit counter/timer



The PMC730 combines analog I/O, digital I/O, and counter/timer functions on a single high-density module to save PMC slots.



PMC730CC for conduction cooling.

### 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:  $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$ .

Maximum throughput rate:

One channel updated at a time.

1 channel (maximum):  $10\mu s$

16 channels (maximum):  $160\mu s$

32 channels (maximum):  $320\mu s$

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:  $\pm 3$  LSB typ. (SW calib., gain=1, 25°C).

Data format: Straight binary or binary two's complement.

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:  $\pm 10V$ .

Maximum throughput rate:

Outputs updated simultaneously or individually.

1 channel:  $12.375\mu s$

8 different channels:  $12.375\mu s$

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.

#### 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 ( $4\mu s$ ,  $64\mu s$ , 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).

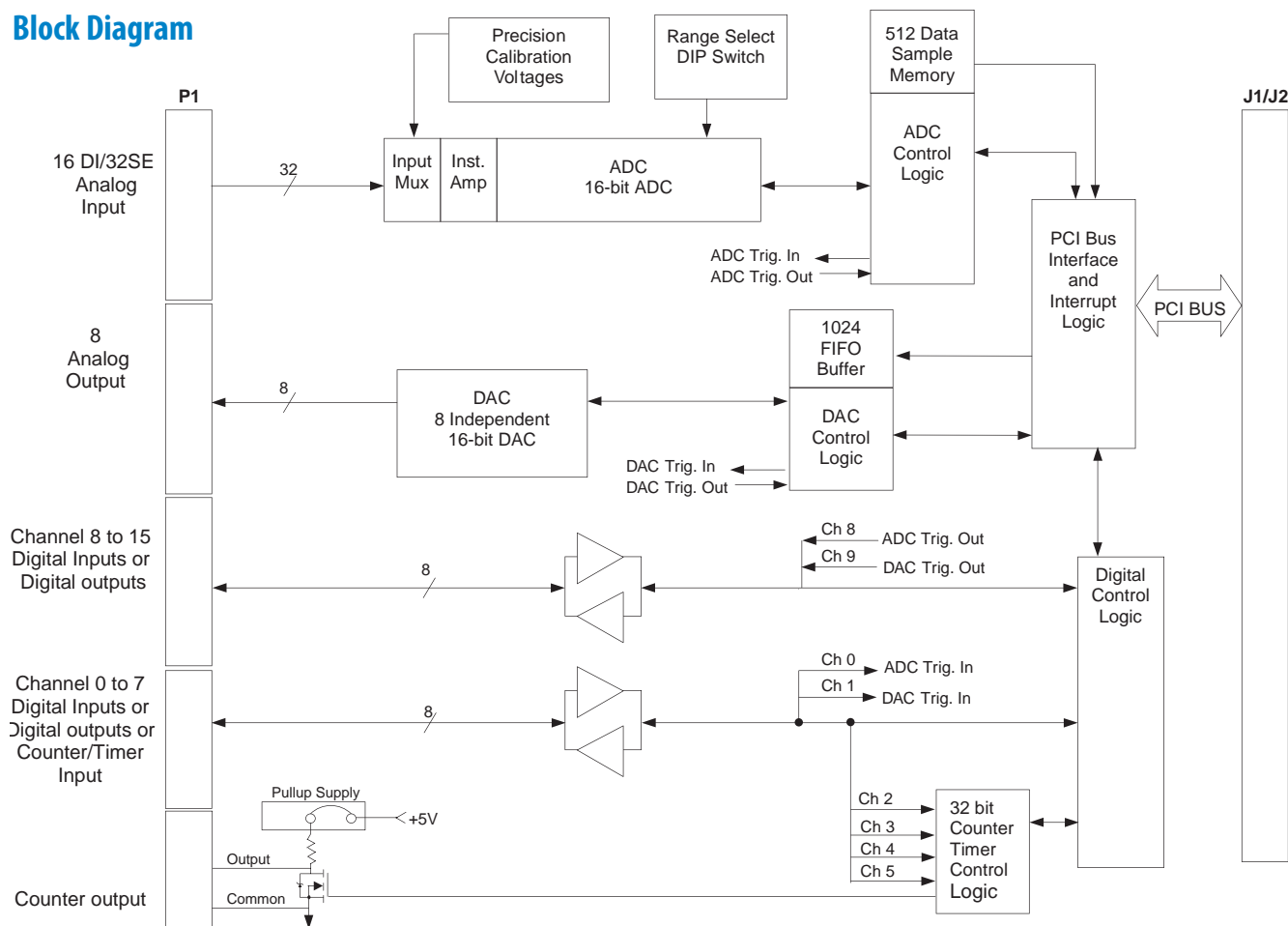
Functions:

Watchdog timer, event counting, pulse measurement, period measurement, output waveform generation (pulse width modulation, continuous pulse, single pulse, continuous waveform).

Continued on the next page.

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## Block Diagram



## 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.

MTBF: 929,541 hrs. at 25°C, MIL-HDBK-217F, notice 2.

## 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 induction-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-LINUX

Linux® support (website download only)

**Accessories** (see [accessories documentation](#) for details)

#### 5025-288

Termination panel, SCSI-3 connector, 68 screw terminals.

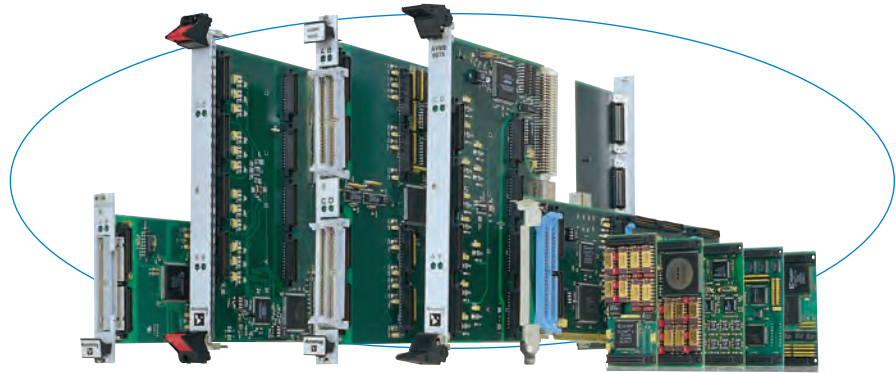
#### 5028-432

Cable, shielded, SCSI-3 connector both ends.

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## Industry Pack Carrier Cards and Modules

I/O solutions for VME, CompactPCI<sup>®</sup>, and PCI systems.



Acromag offers a wide variety of I/O modules and carrier cards for a broad range of applications.

Model #	Description	Page
<b>Industry Pack Carriers</b>		
AVME9660	AVME 6U carrier, four IP slots . . . . .	<a href="#">GO</a>
AVME9668	AVME 6U carrier, four IP slots . . . . .	<a href="#">GO</a>
AVME967x	VME64 carriers, two or four IP slots . . . . .	<a href="#">GO</a>
AcPC8625	cPCI 6U carrier, four IP slots . . . . .	<a href="#">GO</a>
AcPC8630A	cPCI 3U carrier, front I/O, two IP slots . . . . .	<a href="#">GO</a>
AcPC8635A	cPCI 3U carrier, rear I/O, two IP slots . . . . .	<a href="#">GO</a>
APC8620A	PCI carrier, five IP slots . . . . .	<a href="#">GO</a>
APC8621A	PCI carrier, three IP slots . . . . .	<a href="#">GO</a>
APCe8650	PCI Express carrier, four IP slots . . . . .	<a href="#">GO</a>
<b>Reconfigurable FPGA</b>		
IP-EP200	FPGA controls Cyclone II . . . . .	<a href="#">GO</a>
<b>Analog Output Modules</b>		
IP220A	12-bit D/A . . . . .	<a href="#">GO</a>
IP230A	16-bit D/A, 8 channels . . . . .	<a href="#">GO</a>
IP231	16-bit D/A, 16 channels . . . . .	<a href="#">GO</a>
IP235A	16-bit D/A with RAM buffer . . . . .	<a href="#">GO</a>
IP236A	16-bit D/A with FIFO buffer . . . . .	<a href="#">GO</a>
<b>Analog Input Modules</b>		
IP320A	12-bit A/D . . . . .	<a href="#">GO</a>
IP330A	16-bit A/D . . . . .	<a href="#">GO</a>
IP340	12-bit A/D, simultaneous conversion . . . . .	<a href="#">GO</a>
IP341	14-bit A/D, simultaneous conversion . . . . .	<a href="#">GO</a>
<b>Digital I/O Modules</b>		
IP400	Digital input, 0 to 60V DC . . . . .	<a href="#">GO</a>
IP405	Digital output, 0 to 60V DC . . . . .	<a href="#">GO</a>
IP408	Digital I/O (bi-directional), 0 to 60V DC . . . . .	<a href="#">GO</a>
IP409	Digital I/O, differential . . . . .	<a href="#">GO</a>
IP440A	Digital input, isolated . . . . .	<a href="#">GO</a>
IP445	Digital output, isolated . . . . .	<a href="#">GO</a>
IP470A	Digital I/O (bi-directional), TTL . . . . .	<a href="#">GO</a>
<b>Counter/Timer Modules</b>		
IP482/3/4	Counter/timer, quadrature . . . . .	<a href="#">GO</a>
<b>Serial Communication</b>		
IP500A	Quad 232 . . . . .	<a href="#">GO</a>
IP501	Quad 422/485, full-duplex . . . . .	<a href="#">GO</a>
IP502	Quad 485, half-duplex . . . . .	<a href="#">GO</a>
IP511	Quad 422, isolated . . . . .	<a href="#">GO</a>
IP512	Quad 485, isolated . . . . .	<a href="#">GO</a>
IP520	Octal 232 . . . . .	<a href="#">GO</a>
IP521	Octal 422/485 . . . . .	<a href="#">GO</a>
<b>Accessories</b>		
Software	Support for VxWorks, Win, Linux . . . . .	<a href="#">GO</a>
Hardware	Termination panels, cables, adapters . . . . .	<a href="#">GO</a>

### 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.

- 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
- Full line of accessories including termination panels, cables, and transition modules

### 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

## IP220A-x 12-Bit D/A, Analog Output

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.

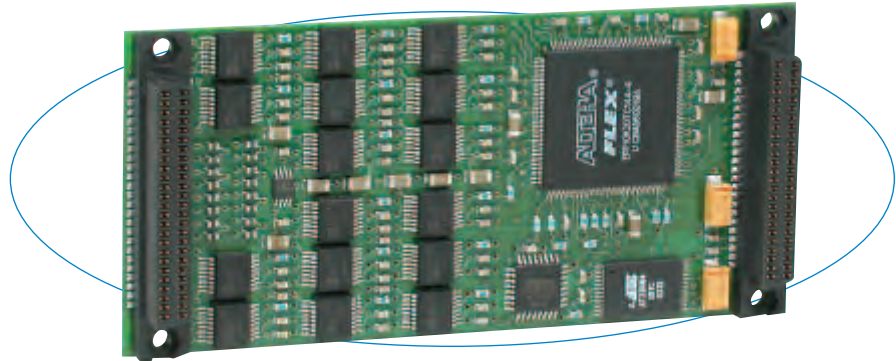
Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

### 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.



The IP220A features individual D/A converters on each channel for better performance.

### 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: -2 to +2mA (maximum). This corresponds to a minimum load resistance of 5K ohms with a 10V output.  
 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 (IP220-8/16) or -40 to 85°C (IP220-8E/16E models).  
 Storage temperature: -55 to 100°C (all models).  
 Relative humidity: 5 to 95% non-condensing  
 MTBF: 4,094,686 hrs. at 25°C, MIL-HDBK-217F, notice 2  
 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](#).

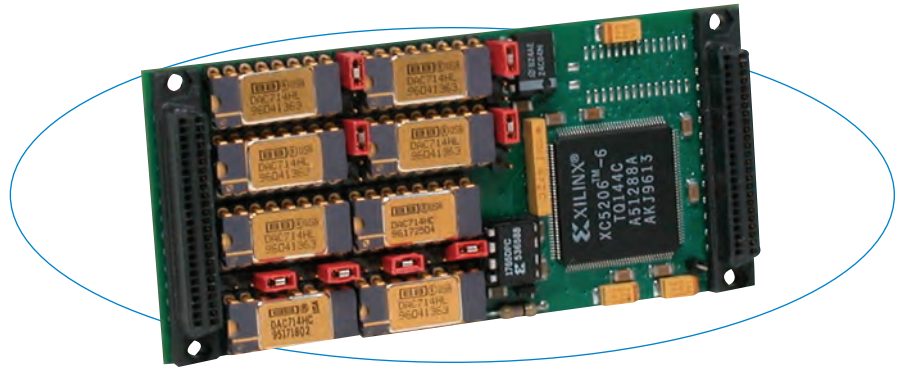
#### Software (see [software documentation](#) for details)

- 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.

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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
- 10 $\mu$ S settling time (100KHz throughput)
- Three output ranges:  $\pm 5V$ ,  $\pm 10V$ , 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.

Independent D/A converters on each channel provide better performance and smoother operation.

### Specifications

#### Analog Outputs

Output configuration: 4 (IP230A-4/4E) or 8 (-8/8E).  
 D/A Resolution: 16 bits.  
 Output ranges:  $\pm 5V$ ,  $\pm 10V$ , 0 to 10V (jumper-selectable).  
 Maximum throughput rate:  
 Outputs can be updated simultaneously or individually.  
 One channel: 100KHz (10 $\mu$ S/conversion)  
 Four channels (IP235A-4): 100KHz (10 $\mu$ S/4 ch)  
 Eight channels (IP235A-8): 100KHz (10 $\mu$ S/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.  
 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 ( $\pm 5\%$ ): 200mA maximum.  
 $\pm 12V$  ( $\pm 5\%$ ) from P1: 150mA maximum.  
 MTBF: 815,720 hrs. at 25°C, MIL-HDBK-217F, notice 2.

### 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](http://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.

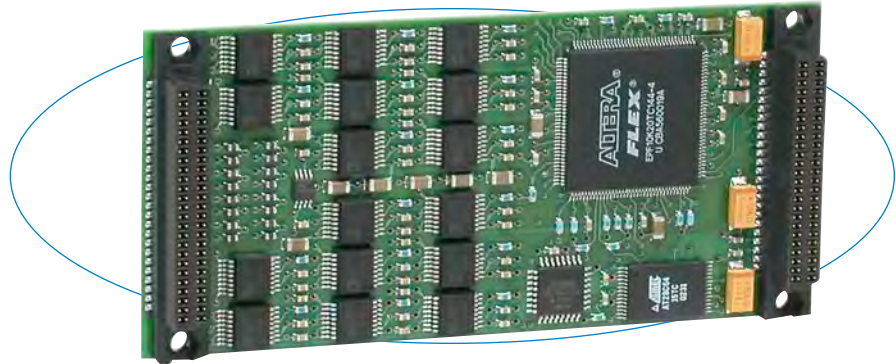
Individual channels also have double-buffered data latches. You can select to update each output when it is written to, or to update all outputs simultaneously. Simultaneous outputs better simulate linear movements in motion processes.

### 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.



The IP231 features individual D/A converters on each channel for better performance.

### 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:  
     Outputs can be updated simultaneously or individually.  
     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 LSB (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  
 MTBF: 3,445,793 hrs. at 25°C, MIL-HDBK-217F, notice 2.  
 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

##### [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)

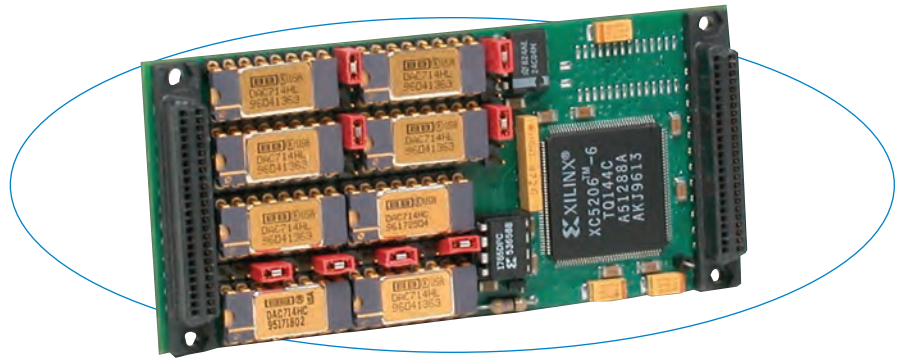
#### Accessories

See [www.acromag.com](http://www.acromag.com) for more information

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## 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.

The IP235's RAM buffer is useful for generating continuous waveform output cycles such as sine, triangle, or square signals.

### Specifications

#### Analog Outputs

Output configuration: 8  
D/A Resolution: 16 bits.  
Output ranges:  $\pm 5V$ ,  $\pm 10V$ , 0 to 10V (jumper-selectable).  
Data sample memory: 2K sample RAM buffer on each channel.

#### Maximum throughput rate:

Outputs can be updated simultaneously or individually.  
One channel: 100KHz (10 $\mu$ S/conversion)  
Eight channels: 100KHz (10 $\mu$ S/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.

IP data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*), Interrupt select (INTsel\*).

Access times (8MHz clock): 1 wait state (375nS cycle).

#### Environmental

Operating temperature: 0 to 70°C (IP235-8A) or -40 to 85°C (IP235A-8E models).  
Storage temperature: -55 to 125°C (all models).  
Relative humidity: 5 to 95% non-condensing  
MTBF: 815,720 hrs at 25°C, MIL-HDBK-217F, Notice 2.  
Power: +5V ( $\pm 5\%$ ): 250mA maximum.  
 $\pm 12V$  ( $\pm 5\%$ ) from P1: 150mA maximum.

### Ordering Information

#### Industry Pack Modules

##### [IP235A-8](#)

Eight voltage outputs with memory.

##### [IP235A-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](http://www.acromag.com) for more information

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## IP236A-8 16-bit D/A Analog Output with FIFO Buffers



Industry Pack Modules

Industry Pack Modules

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.

The IP236A-8A is ideal for generating waveforms. Large FIFO buffers reduce CPU interactions for increased overall performance.

### Specifications

#### Analog Outputs

- Output configuration: 8.
- D/A Resolution: 16 bits.
- Output ranges:  $\pm 5V$ ,  $\pm 10V$ , 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 (10 $\mu$ S/conversion)
  - Eight channels: 100KHz (10 $\mu$ S/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 (IOsel\*), ID read (IDsel\*), Interrupt select (INTsel\*).
- 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 ( $\pm 5\%$ ): 250mA maximum..
  - $\pm 12V$  ( $\pm 5\%$ ) 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

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## IP320A 12-Bit A/D, Analog Input

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.

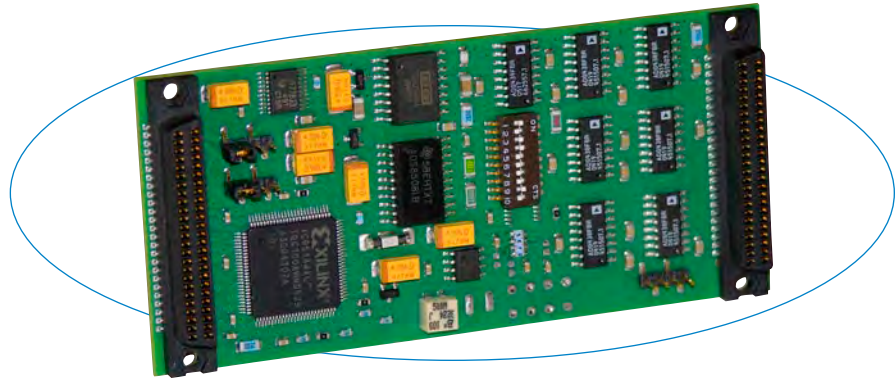
A jumper offers a choice of three input voltage ranges. Using the software programmable gain, you can easily customize the input voltage on an individual channel basis. The control register provides further flexibility with the option of single-ended or differential inputs and controlled channel selection. 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 4.5 $\mu$ S 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).



By installing multiple IP320As on one card, you can achieve extremely high channel density to reduce costs and preserve card slots

### 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  $\pm 15$ V external power supply.

Clipping occurs with  $\pm 12$ V supplies, typically to  $\pm 9$ V.

Maximum throughput rate: 200KHz (5 $\mu$ S/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.

Input Range (volts)	PGA Gain	ADC Range (volts)	Max. Error $\pm$ LSB (%span)
0 to 10	1	0 to 10	3.2 (0.078)
-5 to +5	1	-5 to +5	1.8 (0.044)
-10 to +10	1	-10 to +10	2.8 (0.069)

Data format (left-justified): Straight Binary.

Input overvoltage protection:  $\pm 32$ V 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.

IP data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*).

Access Times (8MHz clock):

All functions: 0 wait states (250nS cycle) except

Control register write: 1 wait state (375nS cycle),

Read ADC data: 2 wait states (500nS cycle).

Conversion Request (write): 1 wait state (375nS cycle)

#### 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

MTBF: 719,999 hrs at 25°C, MIL-HDBK-217F, Notice 2

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

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## IP330A 16-Bit A/D Analog Input

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.

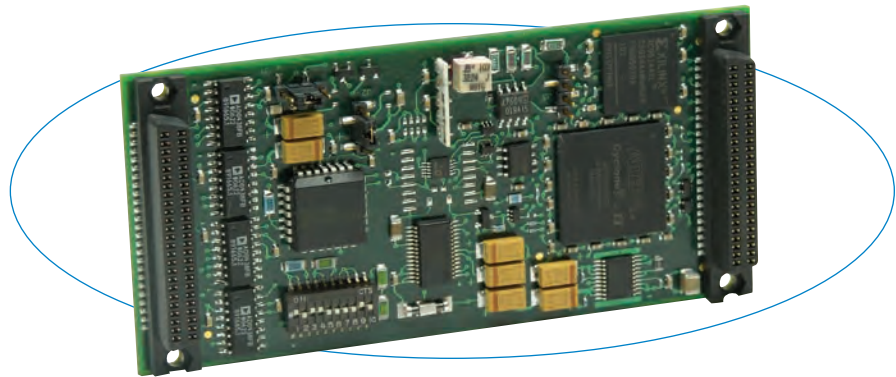
"Mail box" memory allows the CPU to read the latest data in 32 storage buffer registers without interrupting the A/D converter.

### Features

- 16-bit A/D converter (ADC)
- 5 $\mu$ S conversion time (200KHz)
- 16 differential or 32 single-ended inputs ( $\pm 5V$ ,  $\pm 10V$ , 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.



Advanced memory management techniques allow the IP330A to operate with minimal interruption of the A/D converter.

### Specifications

#### Analog Inputs

Input configuration: 16 differential or 32 single-ended.

A/D resolution: 16 bits.

Input ranges:  $\pm 5V$ ,  $\pm 10V^*$ , 0-5V, and 0-10V\*.

\* Requires  $\pm 15V$  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 (5 $\mu$ S/conversion)

[66KHz (15 $\mu$ S/conversion) recommended]

16 channels (differential): 4.2KHz (240 $\mu$ S/16 ch)

32 channels (single-ended): 2.1KHz (480 $\mu$ S/32 ch).

Programmable gains: 1x, 2x, 4x, 8x.

A/D triggers: External and software.

System accuracy: 2 LSB (0.0030%) typical

(SW calib., gain=1, 25°C).

Data format: Straight binary or two's complement.

Input overvoltage protection:  $V_{ss}$  -20V to  $V_{dd}$  40V with power on, -35V to 55V 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 PROM read: 1 wait state (375ns cycle).

I/O space read/write: 1 wait states.

Interrupt select cycle read: 1 wait state.

Mail box I/O read: 1 wait state. 3 wait states

if ongoing internal mail box write.

#### 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

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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 8 $\mu$ S, and all 16 channels can be sampled in just 16 $\mu$ S.

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.

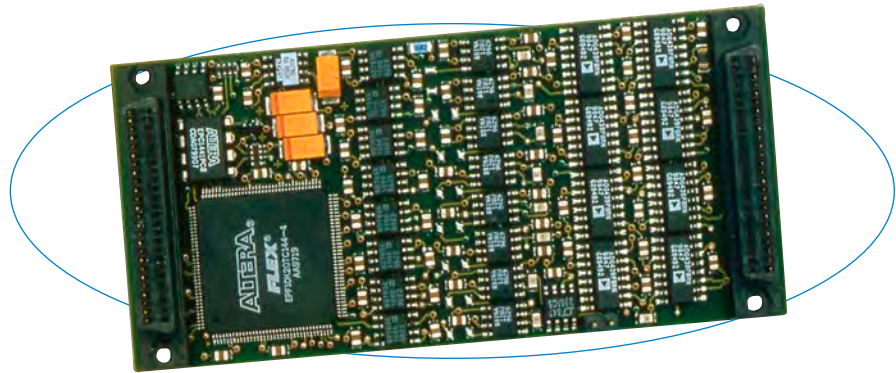
### Features

- 16 differential inputs ( $\pm 10V$  DC input range)
- Eight 12 or 14-bit A/D converters (IP340/341) with simultaneous multi-channel conversion
- 8 $\mu$ S 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.

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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:  $\pm 10V$ .  
 Data sample memory: 512 sample FIFO buffer.  
 Max. throughput rate:  
     Eight channels can be simultaneously acquired.  
     One channel: 125KHz (8 $\mu$ S/conversion)  
     8 channels (same bank): 1MHz (8 $\mu$ S/8 channels)  
     16 channels (high & low banks): 1MHz (16 $\mu$ S/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 complement.  
 Input overvoltage protection:  $\pm 25V$  with power on,  $\pm 40V$  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.  
 MTBF: 594,898 hrs at 25°C, MIL-HDBK-217F, Notice 2.  
 Power:  
     +5V: 65mA (IP340/341), 76mA (IP340E/341E).  
     +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.

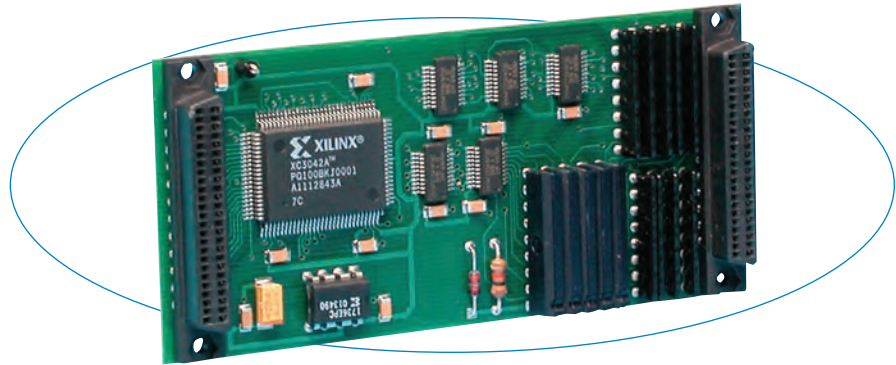
Configuration is easy with software commands that eliminate confusing jumper settings and switches. You can configure interrupts for a change of state or level detection of any bit on up to 12 channels.

### 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.



When used together, the IP400 input module and IP405 output module simplify loop-back monitoring of your critical signals.

### 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.

IP data transfer cycle types supported:  
Input/output (IOsel\*), ID read (IDsel\*).

Access Times (8MHz clock): 1 wait state (375ns cycle).

Interrupts:

Handling format: An 8-bit vector is provided during interrupt acknowledge cycles.

Updates: Requires two 16-bit and one 8-bit reads to update all channels.

#### 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

MTBF: 1,653,871 hrs at 25°C, MIL-HDBK-217F, Notice 2.

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](http://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.

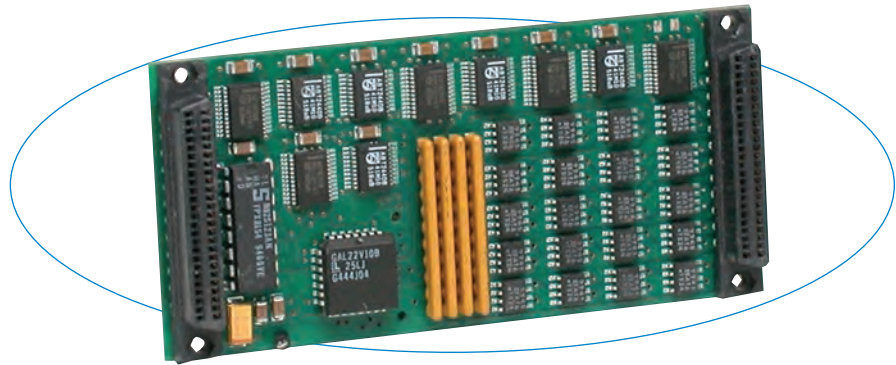
To ensure safe, reliable control under all conditions, the output operation is “fail-safe.” That is, outputs are always off on power-up and are automatically cleared following a system software reset.

### 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
- Failsafe 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.



When used together, the IP400 input module and IP405 output module simplify loop-back monitoring of your critical signals.

### 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 ambients.

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

MTBF: 901,313 hrs at 25°C, MIL-HDBK-217F, Notice 2.

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](http://www.acromag.com) for more information

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## 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.

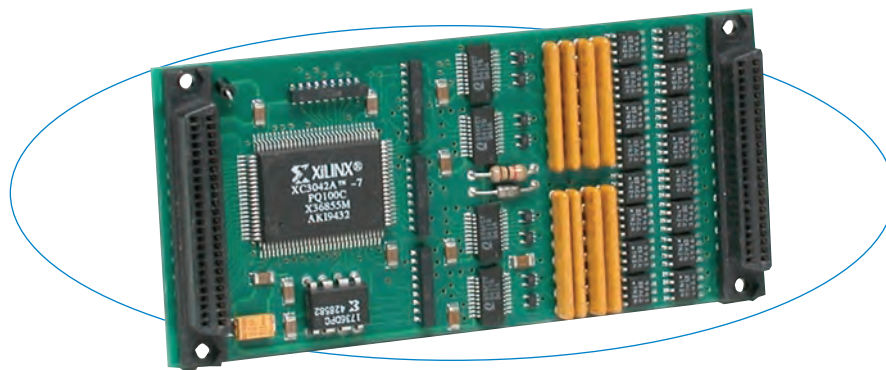
Loopback monitoring of critical control signals is easy since the input and output circuitry are connected in tandem to each channel.

### 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.



The IP408 provides an easy method to perform loop-back monitoring of your critical control signals.

### 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. 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).

Input response time: 250nS minimum to 375nS max.

Interrupts: Change-of-state and level on channels 0-7.

#### Digital Outputs

Channel configuration: 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 ambients.

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): 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

MTBF: 1,317,013 hrs at 25°C, MIL-HDBK-217F, Notice 2.

Power: +5V (±5%): 50mA max. +12V (±5%) from P1:  
8.5mA max. -12V (±5%) from P1: 0mA (not used).

### 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

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## 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.

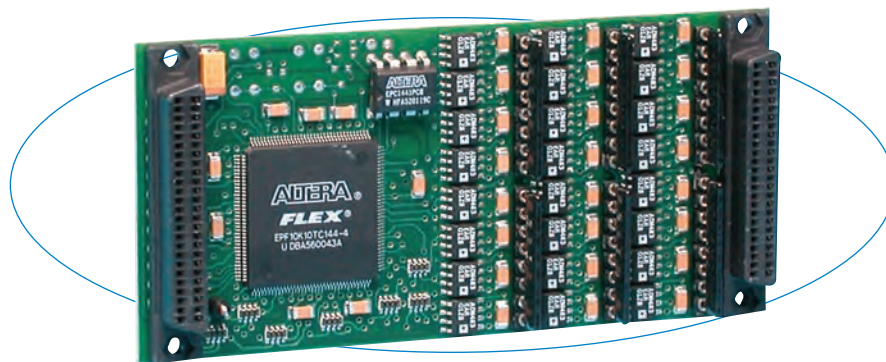
Each channel uses a robust RS485/422A transceiver that supports bi-directional data transfer in one direction at a time (half-duplex). Differential data transmission enables reliable, high speed communication across distances of up to 4000 feet, even through noisy environments. Differential transmission 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.



The IP409 has 24 channels with interrupts for reliable, high-speed serial or parallel data transfer across 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 (IOsel\*), ID read (IDsel\*).
- 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.
- MTBF: 5,258,978 hrs at 25°C, MIL-HDBK-217F, Notice 2.

### 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.

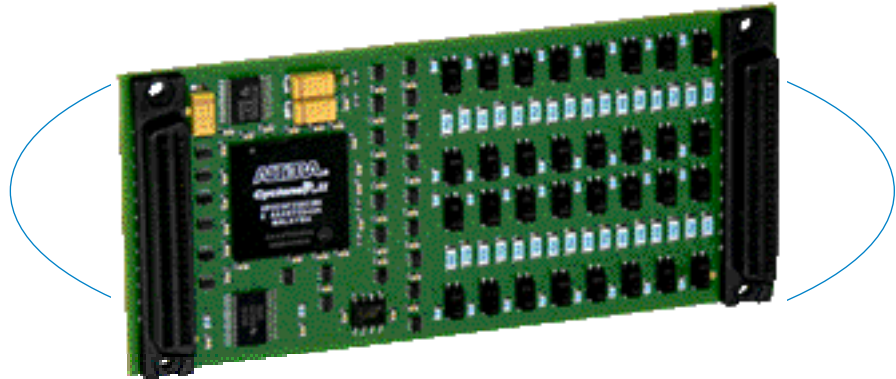
Closed-loop monitoring of critical control signals is easily accomplished using the IP440A in conjunction with Acromag's IP445 digital output module.

### Features

- 32 port-isolated input channels
- Three input ranges (different models):
  - IP440A-1:  $\pm 4$  to  $\pm 18V$  DC or AC peak
  - IP440A-2:  $\pm 16$  to  $\pm 40V$  DC or AC peak
  - IP440A-3:  $\pm 38$  to  $\pm 60V$  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.



When used together, the IP440A input module and IP445 output module simplify loop-back monitoring of your critical signals.

### 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:  $\pm 4$  to  $\pm 18V$  DC or AC peak
- IP440A-2:  $\pm 16$  to  $\pm 40V$  DC or AC peak
- IP440A-3:  $\pm 38$  to  $\pm 60V$  DC or AC peak

Input low-to-high threshold:

- IP440A-1:  $\pm 2V$  typical.
- IP440A-2:  $\pm 6.8V$  typical.
- IP440A-3:  $\pm 13.75V$  typical.

Input response time:

- On to off: 15 $\mu$ S typical.
- Off to on: 10 $\mu$ S typical.

Interrupts: 32 channels configurable as below.

- High-to-low transitions
- Low-to-high transitions
- Change-of-state (two inputs required)

Debounce: Selectable for 4 $\mu$ S, 64 $\mu$ S, 1mS, or 8mS.

#### 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): 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 ( $\pm 5\%$ ): 150mA maximum, 65mA typical.
- $\pm 12V$  ( $\pm 5\%$ ): 0mA (not used).

### Ordering Information

#### Industry Pack Modules

##### [IP440A-1](#)

Digital input,  $\pm 4$  to  $\pm 18V$  input range

##### [IP440A-1E](#)

Same as IP440A-1 plus extended temperature range

##### [IP440A-2](#)

Digital input,  $\pm 16$  to  $\pm 40V$  input range

##### [IP440A-2E](#)

Same as IP440A-2 plus extended temperature range

##### [IP440A-3](#)

Digital input,  $\pm 38$  to  $\pm 60V$  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](http://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.

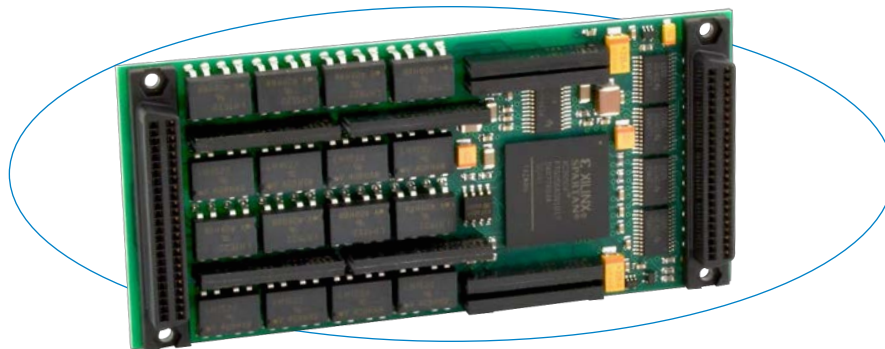
Readback buffers simplify output status monitoring. And for easy closed-loop monitoring of critical control signals, use the IP445A with an IP440A input module.

### Features

- 32 bipolar solid state relays
- High/low-side switch configuration
- Port-isolated output channels
- $\pm 60V$  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.



When used together, the IP440A input module and IP445A output module simplify loop-back monitoring of your critical signals.

### 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  $\pm 60V$  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.  
IP445AE 1mS typical, 2.5mS maximum\*.

Turn off time: IP445A 1mS typical, 2mS 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.

MTBF: 713,455 hrs at 25°C, MIL-HDBK-217F, Notice 2.

Power:

+5V ( $\pm 5\%$ ) all outputs on: 200mA maximum.

$\pm 5V$  ( $\pm 5\%$ ) 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.

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## 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.

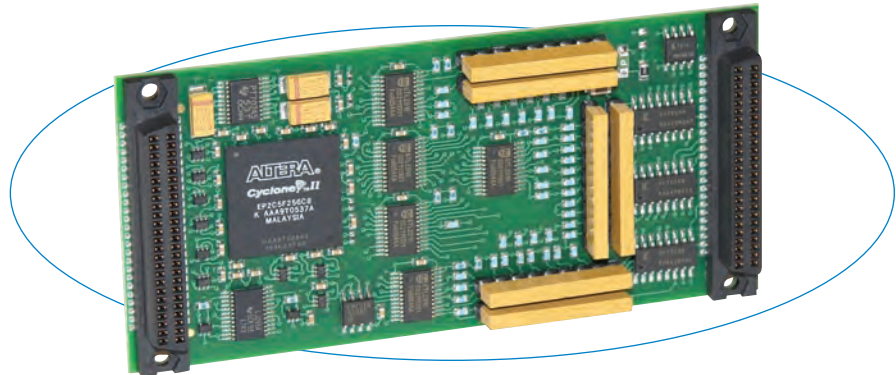
IP470A outputs are full-featured. They have socketed pull-ups and provide closed-loop readback status monitoring. TTL level thresholds and 15mA sink capability allow a direct interface to standard relay racks. And for safety, outputs go to a failsafe state upon power-up/reset without any instantaneous 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.



With four IP470A modules on a 6U VMEbus carrier card, you can monitor and control 192 devices from a single card slot.

### 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 (IOSel\*), 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](#)

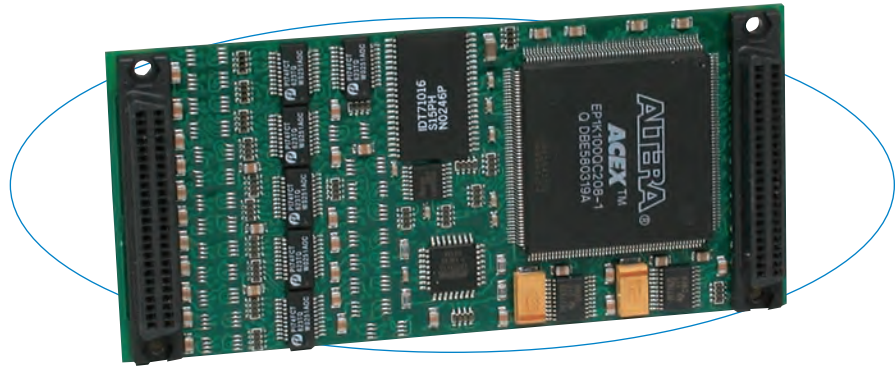
Linux™ support (website download only)

#### Accessories

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## IP482/483/484 Counter/ Timers



These modules are very flexible and available in several varieties to accommodate a broad range of counter/timer applications.

- 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  
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.
- External clock: 2MHz maximum frequency.
- 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.
- External clock: 8MHz maximum frequency.
- 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  $\pm 62nS$ .
- Watchdog: Timeout occurs within  $\pm 1$  clock cycle.
- Pulse/period measurement:  $\pm 1$  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:  $V_{IH} = 2.0V$  and  $V_{IL} = 0.8V$ . inputs are buffered and include 4.7K pull-ups to +5V.

Counter output: Level is TTL or RS422 differential digital.

#### 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 or 32MHz clock):

- ID space read: 0 wait states (250ns cycle).
- Registers read/write: 1 wait states (500ns cycle).
- Interrupt read/write: 0 wait states (250ns cycle).

#### 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,  
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](http://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 modem 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.

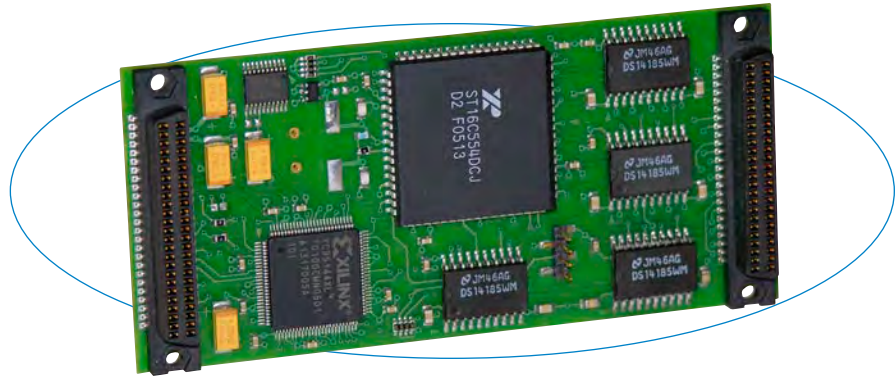
The data ports generate individually controlled transmit, receive, line status, and data set interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts from one 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.



The IP500A provides four 232 communication ports with FIFO buffers for reliable data transfer across serial communication lines.

### 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 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 (IOSel\*), 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.

MTBF: 3,055,730 hrs at 25°C, MIL-HDBK-21F, Notice 2.

### 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](http://www.acromag.com) for more information

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## 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.

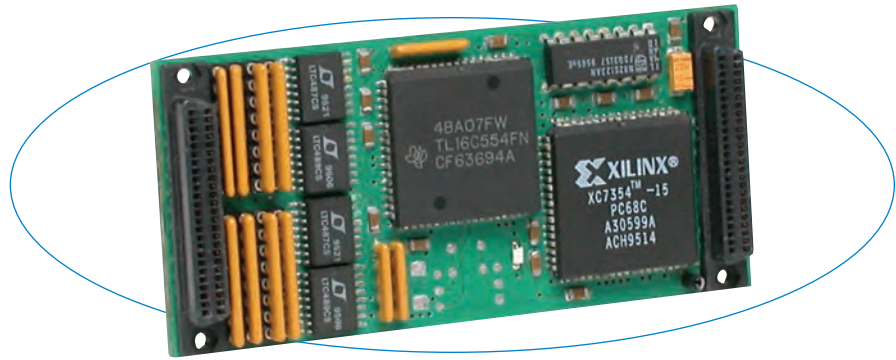
For more efficient data processing, each serial port is equipped with 16, 64 or 128-character FIFO buffers on the transmit and receive lines.

### 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.



Large, 128-byte FIFO buffers reduce the processing burden on the CPU to increase the overall 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 IntReq0 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 (IOSel\*), 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 (IP501-16E/128E/4861-xE/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).

MTBF: 7,150,212 hrs at 25°C, MIL-HDBK-217F, Notice 2.

### 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](#).

#### Customized Industry Pack Modules

##### † 4861-x

Modified IP501-16 with user specified crystal/baud rate.

##### † 4861-xE

Same as 4861-x plus extended temperature range

##### † 4988-x

Modified IP501-64 with user specified crystal/baud rate.

##### † 5024-x

Modified IP501-128 with user specified crystal/baud rate.

##### † 5024-xE

Same as 5024-x plus extended temperature range

† Specify x = crystal frequency when ordering.

3.686MHz or 14.745MHz models may be purchases as single units, other frequencies require a min. qty. per order of two units.

#### 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](http://www.acromag.com) for more information

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## IP502 Serial 485 Communication



The IP502 provides a cost-effective interface to RS485 networks. A variety of features add flexibility to handle more applications

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

- Failsafe 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 (overflow 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 (IOSel\*), 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.  
 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)  
 MTBF: 7,642,747 hrs at 25°C, MIL-HDBK-217F, Notice 2.

### Ordering Information

#### Industry Pack Modules

##### IP502

Four RS485 serial ports.

Acromag offers a wide selection of [Industry Pack Carrier Cards](#).

#### Customized Industry Pack Modules

##### † 5027-x

Modified IP502 with user specified crystal/baud rate.

† Specify x = crystal frequency when ordering. 3.686MHz or 14.745MHz models may be purchased as single units, other frequencies require a min. qty. per order of two units.

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

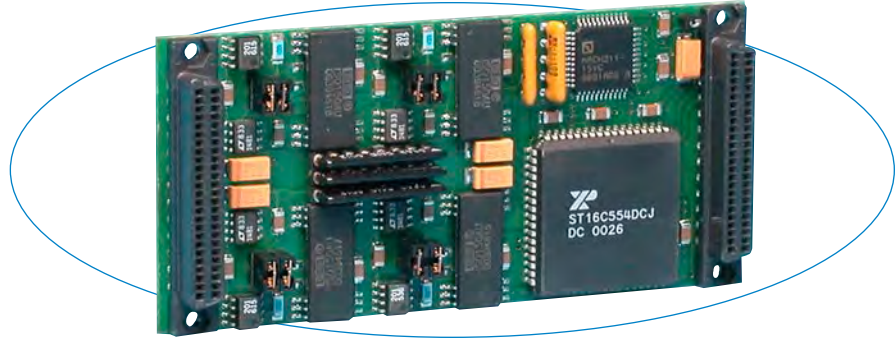
#### Accessories

See [www.acromag.com](http://www.acromag.com) for more information

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## 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 1Mbps)
- 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:  $\pm 0.2V$ .  
 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  $\pm 5\%$ , 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 (IOsel\*), 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 ( $\pm 5\%$ ): 160mA maximum.  
 $\pm 12V$  ( $\pm 5\%$ ): 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](#).

#### Customized Industry Pack Modules

##### † 4984-x

Modified IP511-64 with user specified crystal/baud rate.

† Specify x = crystal frequency when ordering.  
 3.686MHz or 14.745MHz models may be purchases as single units, other frequencies require a min. qty. per order of two units.

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](http://www.acromag.com) for more information

## IP512-x Isolated Serial 485 Communication

IP512 Industry Pack (IP) modules provide an isolated, high-performance serial communication interface for your computer.

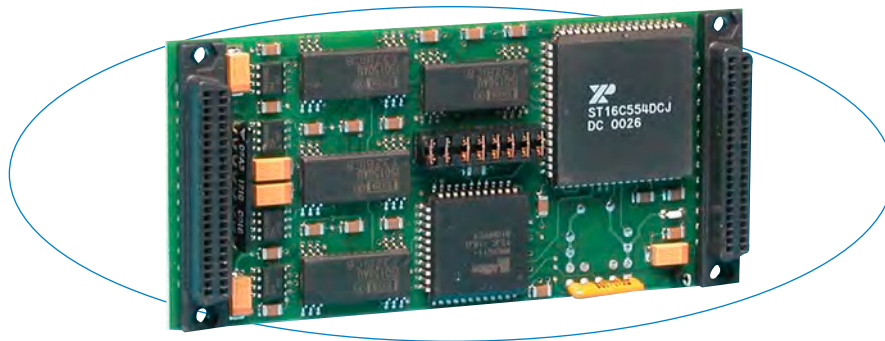
Large FIFO buffers on the transmit and receive lines of each serial port enable more efficient data processing. When the buffer is full, an interrupt is sent to the CPU to read the data. To match your budget and performance requirements, you can order 16 or 64-byte (IP512-16/64) buffers.

### 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.



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, 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:  $\pm 0.2V$ .  
 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  $\pm 5\%$ , 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 (IOSel\*), 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 ( $\pm 5\%$ ): 160mA maximum.  
 $\pm 12V$  ( $\pm 5\%$ ): 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](http://www.acromag.com) for more information

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## 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.

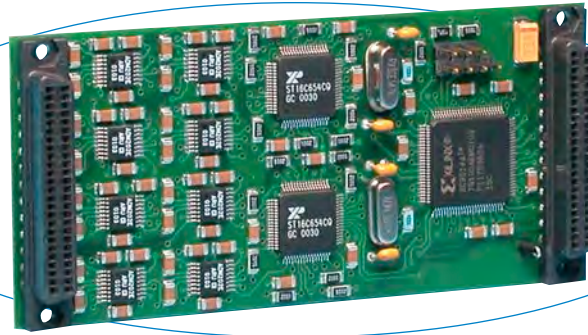
The data ports generate individually controlled transmit, receive, line status, and data set interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts from one port from blocking interrupts from another.

### Features

- Eight RS232E ports
- 64-byte transmit FIFO buffers  
64-byte receive FIFO buffers
- Interrupts 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.



With eight serial ports per module, the IP520 provides a high-density solution to reduce costs and use fewer card slots.

### 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.

MTBF: 3,000,012 hrs at 25°C, MIL-HDBK-217F, Notice 2.

#### IP Compliance (ANSI/VITA-4)

Meets IP specifications per ANSI/VITA-4 1996.

IP data transfer cycle types supported:

Input/output (IOSel\*), 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](#).

#### Customized Industry Pack Modules

##### † 5018-x

Modified IP520-64 with user specified crystal/baud rate.

##### † 5018-xE

Same as 5018-x plus extended temperature range.

† Specify x = crystal frequency when ordering.

3.686MHz or 14.745MHz models may be purchased as single units, other frequencies require a min. qty. per order of two units.

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](http://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.

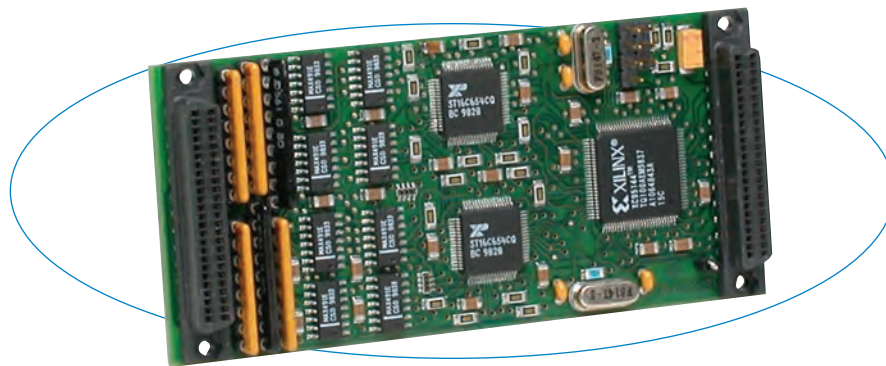
The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. Since unique interrupt vectors may be assigned to each port, it is easy for you to identify and locate the interrupt source. Also, a priority shifting scheme prevents continuous interrupts 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.

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 (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.

MTBF: 3,532,745 hrs at 25°C, MIL-HDBK-217F, Notice 2.

#### 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 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](#).

#### Customized Industry Pack Modules

##### † 5028-x

Modified IP521-64 with user specified crystal/baud rate.

##### † 5028-xE

Modified 5028-x with user specified crystal/baud rate.

† Specify x = crystal frequency when ordering. 3.686MHz or 14.745MHz models may be purchased as single units, other frequencies require a min. qty. per order of two units.

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

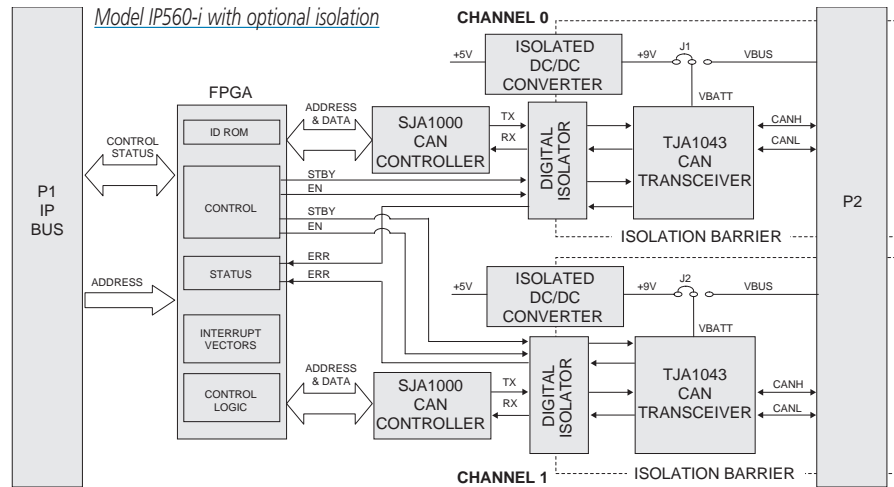
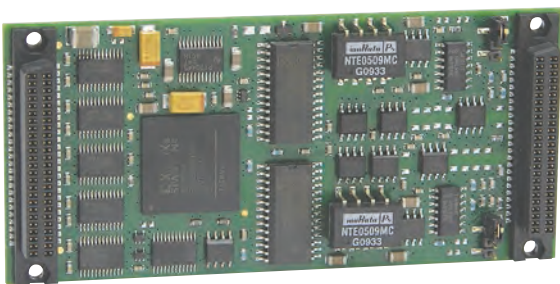
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# Industry Pack Modules

## IP560 CAN Bus Interface Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



### Two CAN bus channels with optional isolation ♦ NXP SJA1000 CAN controller with TJA1043 transceiver

#### Description

IP560 modules provide two independent CAN bus interface channels. Each channel has a 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.

CAN is ideal for the following applications:

- Marine control and navigation systems
- Elevator control systems
- Defense vehicles
- Production line control systems
- Machine tools
- Large optical telescopes
- Medical systems
- Paper and textile production machinery
- Packaging machinery

#### 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 VBATT
- Listen-only mode for node diagnosis and failure containment

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# Industry Pack Modules

## IP560 CAN Bus Interface Modules

### Performance Specifications

#### ■ CAN Bus

##### Configuration

Two independent CAN bus channels.  
NXP SJA1000 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)r

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 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](http://www.acromag.com) for more information.

#### Software development tools

See [www.acromag.com](http://www.acromag.com) for more information.

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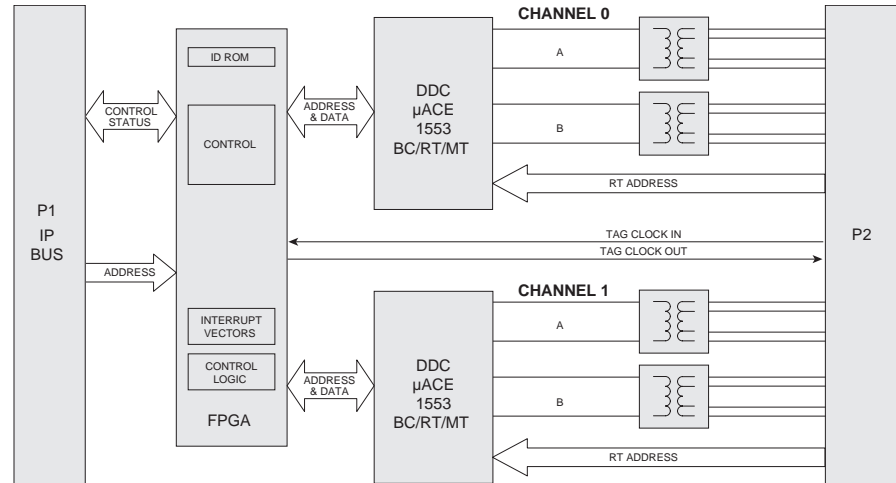
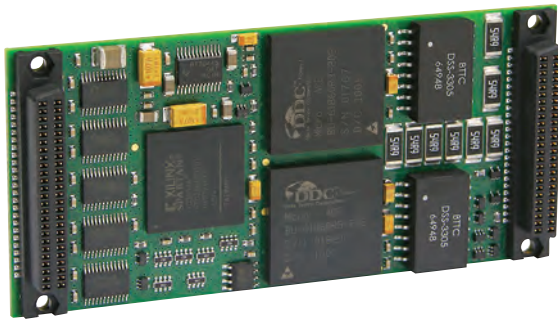
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# Industry Pack Modules

## IP570 MIL-STD-1553 Bus Interface Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



### One or two 1553 interface channels ♦ DDC Micro-ACE controls 1553 interface

#### 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 configurations with 64K RAM: bus controller, remote terminal, or bus monitor
- 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

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# Industry Pack Modules

## 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).

#### Engineering Design Kit

Provides user with basic information required to develop a custom FPGA program. Kit must be ordered with the first purchase.

#### ■ 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

Single-channel MIL-STD-1553 bus interface module.

##### 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.

#### IP-IOS570

Engineering Design Kit (one kit required).

#### 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.

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## APC330 16-bit A/D Analog Input

APC330 boards provide fast, high resolution A/D conversion.

The APC330 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)
- 8 $\mu$ S conversion time (125KHz)
- 16 differential or 32 single-ended inputs ( $\pm 5V$ ,  $\pm 10V$ , 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

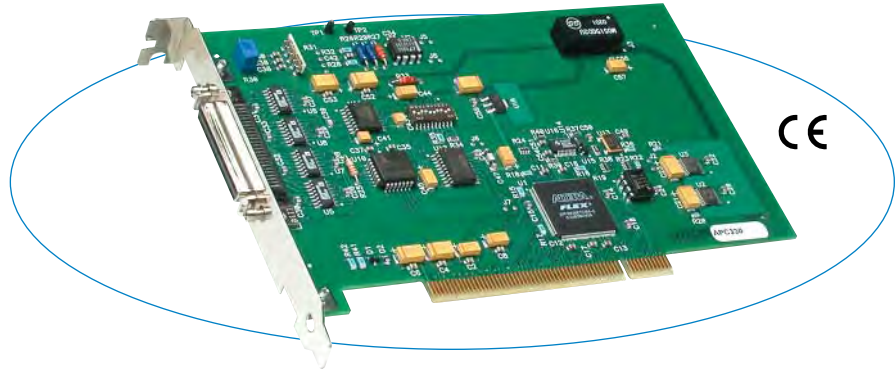
### Benefits

- "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.

### Approvals

- CE marked, FCC Part 15, Class B

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Advanced memory management techniques allow the APC330 to operate with minimal interruption of the A/D converter.

### Specifications

#### Analog Input

Input configuration: 16 differential or 32 single-ended channels.

A/D resolution: 16 bits.

Input ranges:  $\pm 5V$ ,  $\pm 10V$ , 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 (8 $\mu$ S/conversion)

[66KHz (15 $\mu$ S/conversion) recommended]

16 channels (differential): 4.2KHz (240 $\mu$ S/16 ch)

32 channels (single-ended): 2.1KHz (480 $\mu$ S/32 ch).

Data sample memory: Individual channel mailbox with one or two storage buffer registers per channel

A/D triggers: Internal timer, external source, and software.

Internal timer: One user programmable timer for data acquisition.

System accuracy:  $\pm 3$  LSB (0.005%) typical (SW calib., gain=1, 25°C).

Data format: Straight binary or two's complement.

Input overvoltage protection:  $V_{ss}$  -20V to  $V_{dd}$  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 (E version -40 to 85°C).

Storage temperature: -55 to 100°C.

Relative humidity: 5 to 95% non-condensing.

MTBF: Consult factory.

Power: 230mA at +5V (275mA maximum).

#### 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.

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

### Ordering Information

#### I/O Boards

##### APC330

Analog input board

##### APC330E

Same as APC330 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-LINUX:** Linux™ support (website download only)

#### Accessories

##### 5028-378

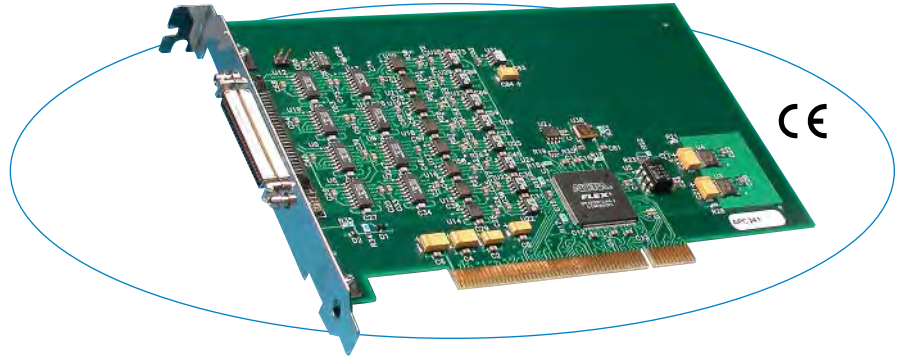
Termination panel, SCSI-2 connector, 50 screw terminals.

##### 5028-438

Cable, shielded, SCSI-2 connector at both ends

[Visit our web page for more information](#)

## APC341 Simultaneous A/D Conversion Analog Input



APC341 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 8 $\mu$ S, and all 16 channels can be sampled in just 16 $\mu$ s.

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 ( $\pm$ 10V DC input range)
- Eight 14-bit A/D converters with simultaneous multi-channel conversion
- 8 $\mu$ S 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
- CE marked, FCC Part 15, Class B

### Benefits

- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.

This board is ideal for high-speed data acquisition. A large memory buffer reduces CPU interactions for increased overall performance.

### Specifications

#### Analog Inputs

Input configuration: 16 differential channels.

A/D resolution: 14 bits.

Input range:  $\pm$ 10V.

Maximum throughput rate:

Eight channels can be simultaneously acquired.

One channel: 125KHz (8 $\mu$ S/conversion)

8 channels (same bank): 1MHz (8 $\mu$ S/8 channels)

16 channels (high & low banks): 1MHz (16 $\mu$ S/16 ch. at maximum 2.2K ohm source resistance).

Data sample memory: Two 512-sample memory buffers.

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 complement.

Overvoltage protection:  $\pm$ 25V (power on),  $\pm$ 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).

#### 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.

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

### Ordering Information

#### I/O Boards

##### APC341

Analog input board

##### APC341E

Same as APC341 plus extended temperature range

#### Software

**PMCSW-API-VXW:** VxWorks<sup>®</sup> software support package

**PCISW-API-WIN32:** 32-bit Windows<sup>®</sup> DLL Driver software package

**PCISW-API-WIN64:** 64-bit Windows<sup>®</sup> DLL Driver software package

**PCISW-LINUX:** Linux<sup>™</sup> 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 our web page 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 multi-function 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

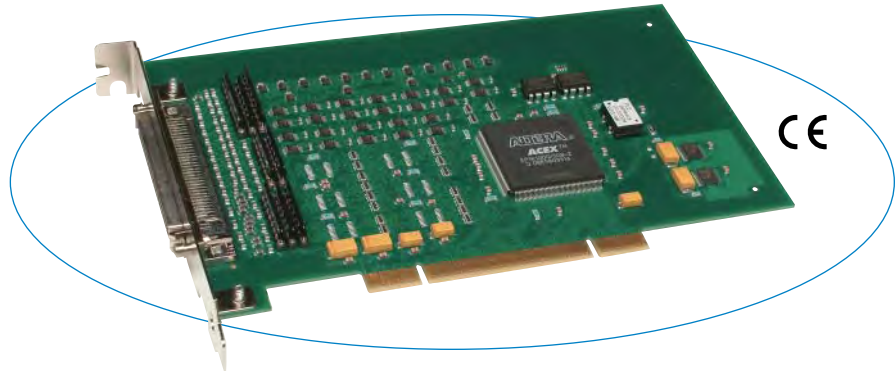
- 40 digital input/output channels:
  - 24 differential input/outputs
  - 16 TTL input/output channels
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

#### 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 failsafe

#### Approvals

- CE marked, FCC Part 15, Class B



This module saves money and PCI slots by combining differential I/O, TTL I/O, and counter/timer functions on one card.

### 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: Four 16-bit counters can be configured into two 32-bit counters.  
 Counter input: Each counter has an IN<sub>A</sub>, IN<sub>B</sub>, and IN<sub>C</sub> 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.  
 Interrupts (INTA#): Interrupts requested on Interrupt A.

#### 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.

### Ordering Information

#### PCI 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-LINUX:** 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

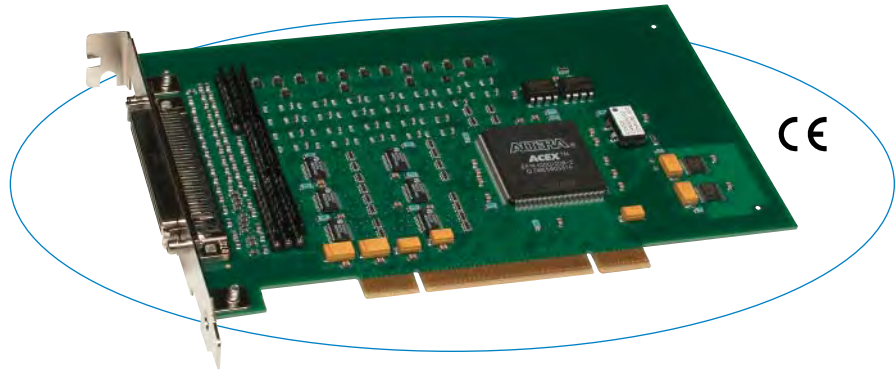
- 64 TTL digital input/output channels:
  - 16 individually programmable channels
  - 48 channels configured on an 8-bit port basis
- Programmable change of state/level interrupts
- Input signal filtering debounce logic

#### 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



This module saves money and PCI slots by combining TTL I/O and counter/timer functions on one card.

### 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.  
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.

#### 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<sub>A</sub>, IN<sub>B</sub>, and IN<sub>C</sub> 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.  
Interrupts (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-LINUX:** 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](#)

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## 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

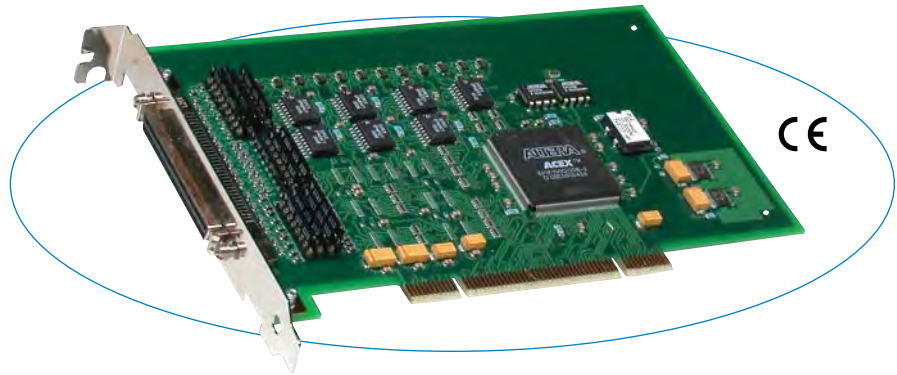
- Ten 16-bit counter/timers (APC482 only) or six 32-bit counter/timers (APC484 only)
- Two 16-bit counters can be combined to create one 32-bit counter
- Available with both TTL and RS422 driver interface (APC483 only)
- 16 bi-directional digital I/O
- 20MHz clock time base
- Counter/timer functions:
  - 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



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:

APC482: Ten 16-bit counters – TTL

APC483: Four 16-bit counters – TTL

Four 32-bit counters – RS422

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  $\pm 125$ nS.

Watchdog: Timeout occurs within  $\pm 1$  clock cycle.

Pulse/period measurement:  $\pm 1$  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 8MHz.

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:  $V_{IH} = 2.0V$  and  $V_{IL} = 0.8V$ . 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.

#### 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.

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

#### 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: 320mA at +5V, typical.

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

APC482 1,744,259; APC483 1,727,707;

APC484 1,708,729

### Ordering Information

#### PCI Boards

**APC482:** Ten 16-bit counters – TTL

**APC482E:** APC482 with extended temperature range.

**APC483:** Four 16-bit counters – TTL, Four 32-bit counters – RS422

**APC483E:** APC483 with extended temperature range.

**APC484:** Six 32-bit counters – RS422

**APC484E:** APC484 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-LINUX:** Linux® support (website download only)

#### Accessories

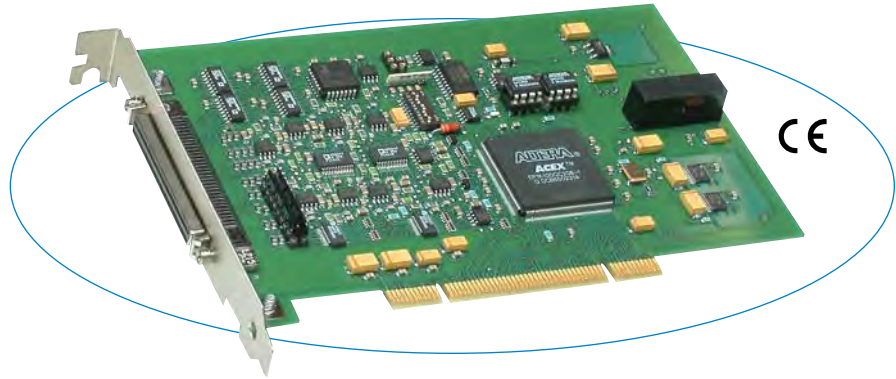
**5025-288:** Termination panel, SCSI-3 connector, 68 screw terminals

**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 ( $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$  ranges)
- 16-bit ADC with 512 sample RAM
- $10\mu S$  conversion time (100KHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable interval timer

#### Analog Outputs

- Eight analog output channels ( $\pm 10V$  range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- $12.375\mu S$  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

The APC730 combines analog I/O, digital I/O, and counter/timer functions on a single high-density module to save PCI slots.

### 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:  $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$ .  
 Maximum throughput rate:  
     One channel updated at a time.  
     1 channel (maximum):  $10\mu S$   
     16 channels (maximum):  $160\mu S$   
     32 channels (maximum):  $320\mu S$   
 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:  $\pm 3$  LSB typ. (SW calib., gain=1,  $25^\circ C$ ).  
 Data format: Straight binary or binary two's complement.  
 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:  $\pm 10V$ .  
 Maximum throughput rate:  
     Outputs updated simultaneously or individually.  
     1 channel:  $12.375\mu S$   
     8 different channels:  $12.375\mu S$   
 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  $25^\circ C$  with output unloaded.  
 Data format: Straight binary.  
 Output at reset: 0V.

Output current:  $-10$  to  $10mA$  (maximum).  
 Short circuit protection: Indefinite at  $25^\circ C$ .

#### 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 ( $4\mu S$ ,  $64\mu S$ ,  $1mS$ , 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

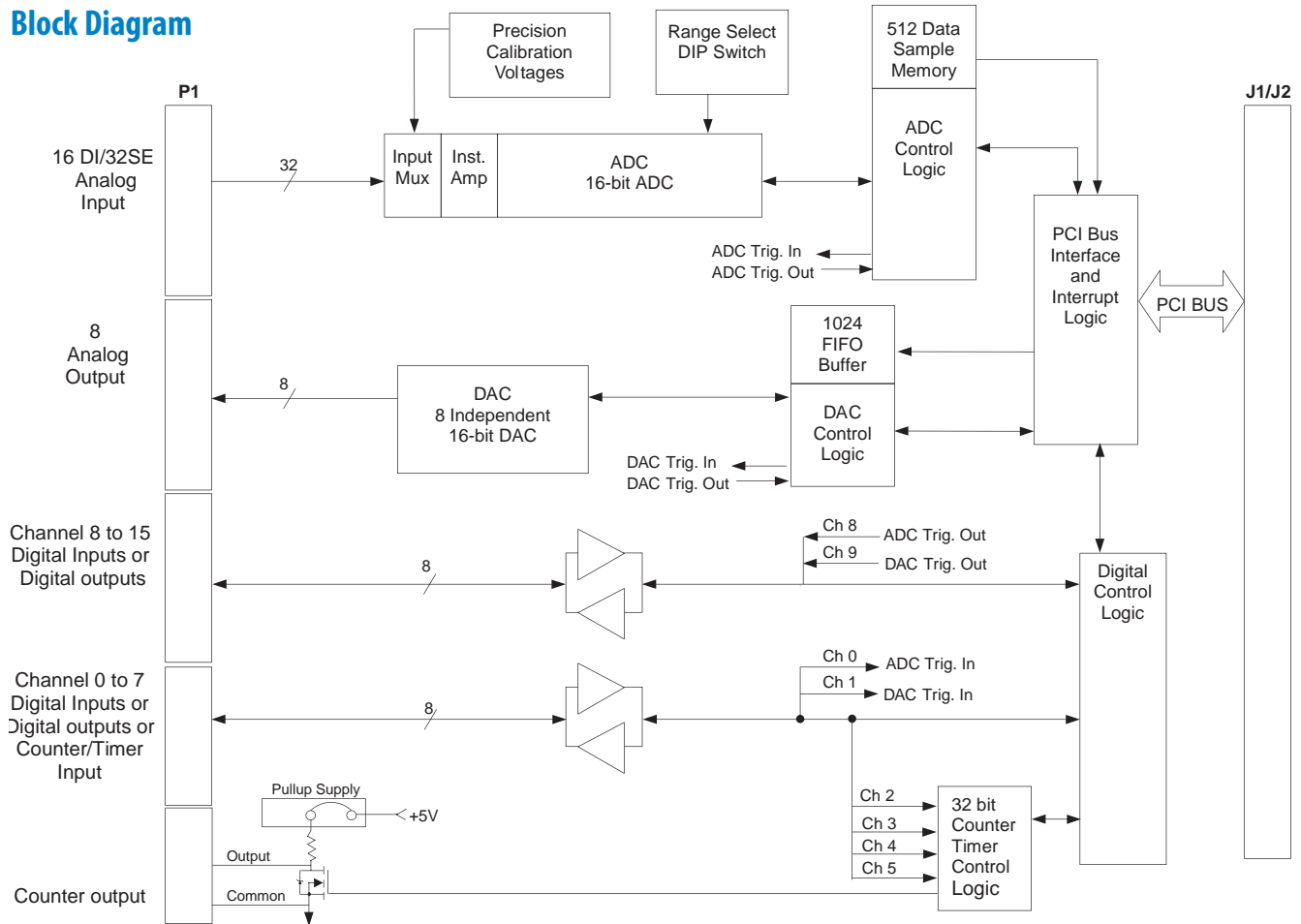
Counter/timer configuration: one 32-bit counter (requires use of channels 2 through 5 of digital I/O section).

#### 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.

## Block Diagram



CompactPCI Boards

CompactPCI Boards

### 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-LINUX:** 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 our web page for more information](#)

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## AcPC Series Products

Acromag offers a wide variety of high-performance I/O solutions for CompactPCI computers.

Model #	Description	Page
<b>Analog Input Modules</b>		
AcPC330	16-bit A/D .....	<a href="#">GO</a>
AcPC341	14-bit A/D, simultaneous conversion .....	<a href="#">GO</a>
<b>Digital I/O Modules</b>		
AcPC424	Digital I/O (differential and TTL) .....	<a href="#">GO</a>
	with counter/timers	
AcPC464	Digital I/O (TTL) with counter/timers .....	<a href="#">GO</a>
<b>Counter/Timer Modules</b>		
AcPC482	Counter/timer, quadrature, TTL .....	<a href="#">GO</a>
AcPC483	Counter/timer, quadrature, TTL/RS422 .....	<a href="#">GO</a>
AcPC484	Counter/timer, quadrature, RS422 .....	<a href="#">GO</a>
Also see AcPC424 and AcPC464 above.		
<b>Multi-Function I/O Modules</b>		
AcPC730	Analog input, analog output, digital I/O, counter/timer .....	<a href="#">GO</a>
<b>Accessories</b>		
Software	Support for VxWorks, Windows, and Linux .....	<a href="#">GO</a>
Hardware	Termination panels and cables .....	<a href="#">GO</a>

[See all CompactPCI boards on Acromag's website](#)



These new boards were designed for applications requiring long lifecycles and dependable operation in harsh environments.

### 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.

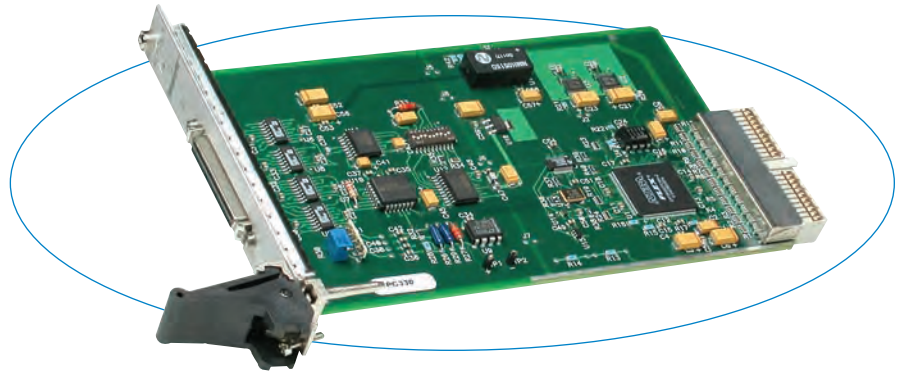
And to simplify the implementation of Acromag I/O modules, a variety of software development tools are available. Function libraries provide example routines to integrate Acromag's I/O with your application code and establish communication with your other embedded computer boards.

#### 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



## 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)
- 8 $\mu$ S conversion time (125KHz)
- 16 differential or 32 single-ended inputs ( $\pm 5V$ ,  $\pm 10V$ , 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.

Advanced memory management techniques allow the AcPC330 to operate with minimal interruption of the A/D converter.

### Specifications

#### Analog Input

Input configuration: 16 differential or 32 single-ended channels.

A/D resolution: 16 bits.

Input ranges:  $\pm 5V$ ,  $\pm 10V$ , 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 (8 $\mu$ S/conversion)

[66KHz (15 $\mu$ S/conversion) recommended]

16 channels (differential): 4.2KHz (240 $\mu$ S/16 ch)

32 channels (single-ended): 2.1KHz (480 $\mu$ S/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:  $\pm 3$  LSB (0.005%) typical (SW calib., gain=1, 25°C).

Data format: Straight binary or two's complement.

Input overvoltage protection:  $V_{ss}$  -20V to  $V_{dd}$  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 (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-LINUX

Linux™ support (website download only)

#### Accessories

##### 5028-378

Termination panel, SCSI-2 connector, 50 screw terminals

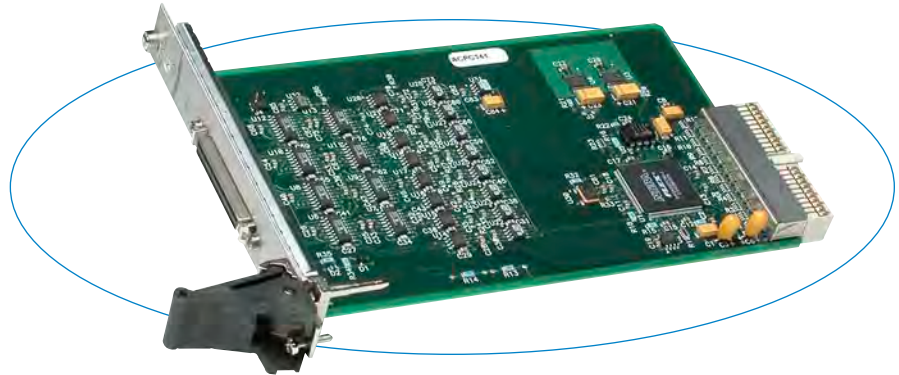
##### 5028-438

Cable, shielded, SCSI-2 connector at both ends

[Visit web page for more information](#)

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## AcPC341 Simultaneous A/D Conversion Analog Input



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 8 $\mu$ S, and all 16 channels can be sampled in just 16 $\mu$ S.

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 ( $\pm 10$ V DC input range)
- Eight 14-bit A/D converters with simultaneous multi-channel conversion
- 8 $\mu$ S 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.

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This board is ideal for high-speed data acquisition. A large memory buffer reduces CPU interactions for increased overall performance.

### Specifications

#### Analog Inputs

Input channels: 16 differential.

A/D resolution: 14 bits.

Input range:  $\pm 10$ V.

Maximum throughput rate:

Eight channels can be simultaneously acquired.

One channel: 125KHz (8 $\mu$ S/conversion)

8 channels (same bank): 1MHz (8 $\mu$ S/8 channels)

16 channels (high & low banks): 1MHz (16 $\mu$ S/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 complement.

Overvoltage protection:  $\pm 25$ V (power on),  $\pm 40$ V (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<sup>®</sup> software support package

##### PCISW-API-WIN32

32-bit Windows<sup>®</sup> DLL Driver software package

##### PCISW-API-WIN64

64-bit Windows<sup>®</sup> DLL Driver software package

##### PCISW-LINUX

Linux<sup>®</sup> 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 multi-function 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 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.

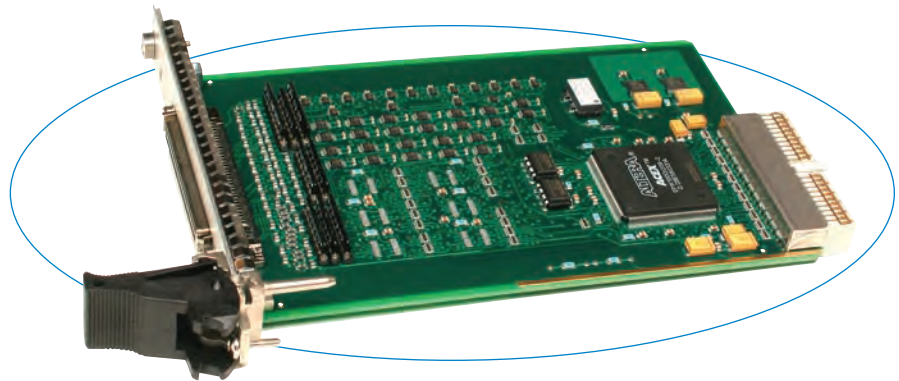
### Features

#### 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



This module saves money and CompactPCI slots by combining differential I/O, TTL I/O, and counter/timer functions on one card.

### 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: Four 16-bit counters can be configured into two 32-bit counters.

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).

#### 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 (AcPC424) or -40 to 85°C (AcPC424E)

Storage temperature: -55 to 125°C.

Relative humidity: 5 to 95% non-condensing.

MTBF: Consult factory.

Power: 216mA at +5V, typical.

### Ordering Information

#### 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-LINUX:** 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](#)

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## 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.

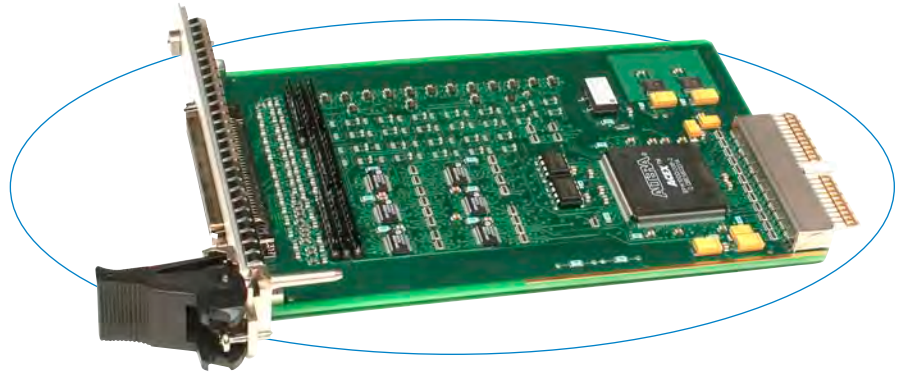
### Features

#### 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 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



This module saves money and CompactPCI slots by combining digital I/O and counter/timer functions on a single card.

### 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.

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.

#### 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<sub>A</sub>, IN<sub>B</sub>, and IN<sub>C</sub> 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).

#### 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

**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-LINUX:** Linux™ support (website download only)

#### Accessories

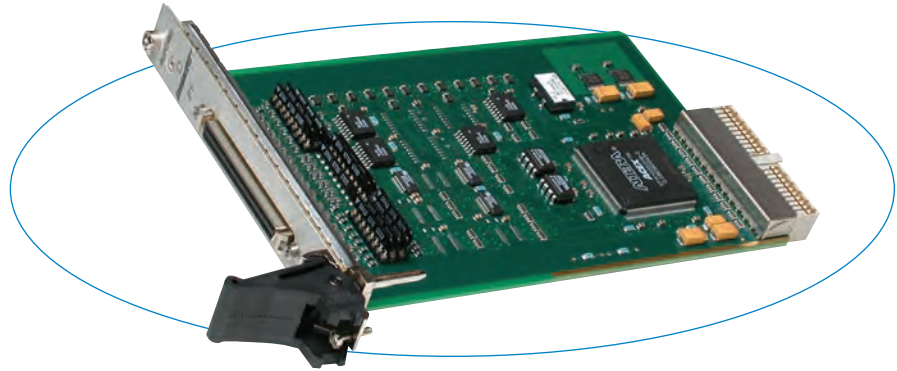
**5025-288:** Termination panel, SCSI-3 connector, 68 screw terminals

**5028-432:** Cable, shielded, SCSI-3 connector both ends

[Visit web page for more information](#)

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## 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

#### Counter/Timers

Counter/timer configuration:

- AcPC482: Ten 16-bit counters – TTL
- AcPC483: Four 16-bit counters – TTL  
Four 32-bit counters – RS422
- AcPC484: 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  $\pm 125$ nS.
- Watchdog: Timeout occurs within  $\pm 1$  clock cycle.
- Pulse/period measurement:  $\pm 1$  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 8MHz.

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:  $V_{IH} = 2.0V$  and  $V_{IL} = 0.8V$ . 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.

#### 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,  
Four 32-bit counters – RS422

**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-LINUX:** Linux® support (website download only)

#### Accessories

**5025-288:** Termination panel, SCSI-3 connector, 68 screw terminals

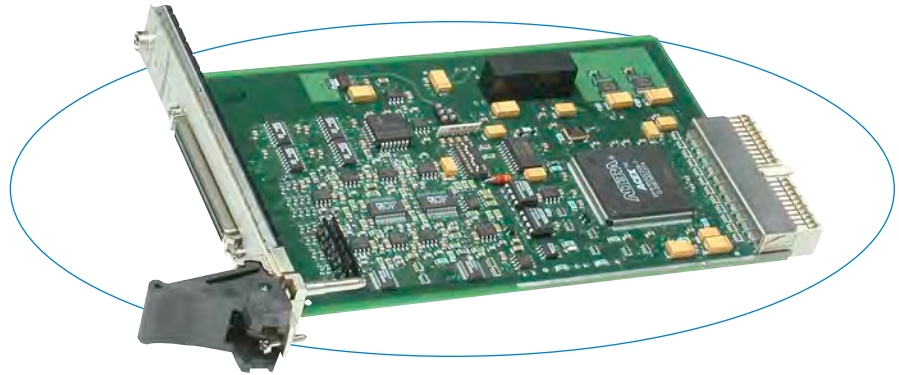
**5028-432:** Cable, shielded, SCSI-3 connector both ends

[Visit web page for more information](#)

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## 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 ( $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$  ranges)
- 16-bit ADC with 512 sample RAM
- $10\mu S$  conversion time (100KHz)
- Interrupt upon ADC memory threshold condition (user-programmable data sample threshold)
- User-programmable interval timer

#### Analog Outputs

- Eight analog output channels ( $\pm 10V$  range)
- Individual 16-bit DACs per channel
- 1024 sample FIFO for waveform generation
- $12.375\mu S$  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

The AcPC730 combines analog I/O, digital I/O, and counter/timer functions on a single high-density module to save cPCI slots.

### 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:  $\pm 3.3V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-5V$ , and  $0-10V$ .

Maximum throughput rate:

One channel updated at a time.

1 channel (maximum):  $10\mu S$

16 channels (maximum):  $160\mu S$

32 channels (maximum):  $320\mu S$

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:  $\pm 3$  LSB typ. (SW calib., gain=1,  $25^{\circ}C$ ).

Data format: Straight binary or binary two's complement.

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:  $\pm 10V$ .

Maximum throughput rate:

Outputs updated simultaneously or individually.

1 channel:  $12.375\mu S$

8 different channels:  $12.375\mu S$

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  $25^{\circ}C$  with output unloaded.

Data format: Straight binary.

Output at reset: 0V.

Output current:  $-10$  to  $10mA$  (maximum).

Short circuit protection: Indefinite at  $25^{\circ}C$ .

#### 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 ( $4\mu S$ ,  $64\mu S$ ,  $1mS$ , 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.

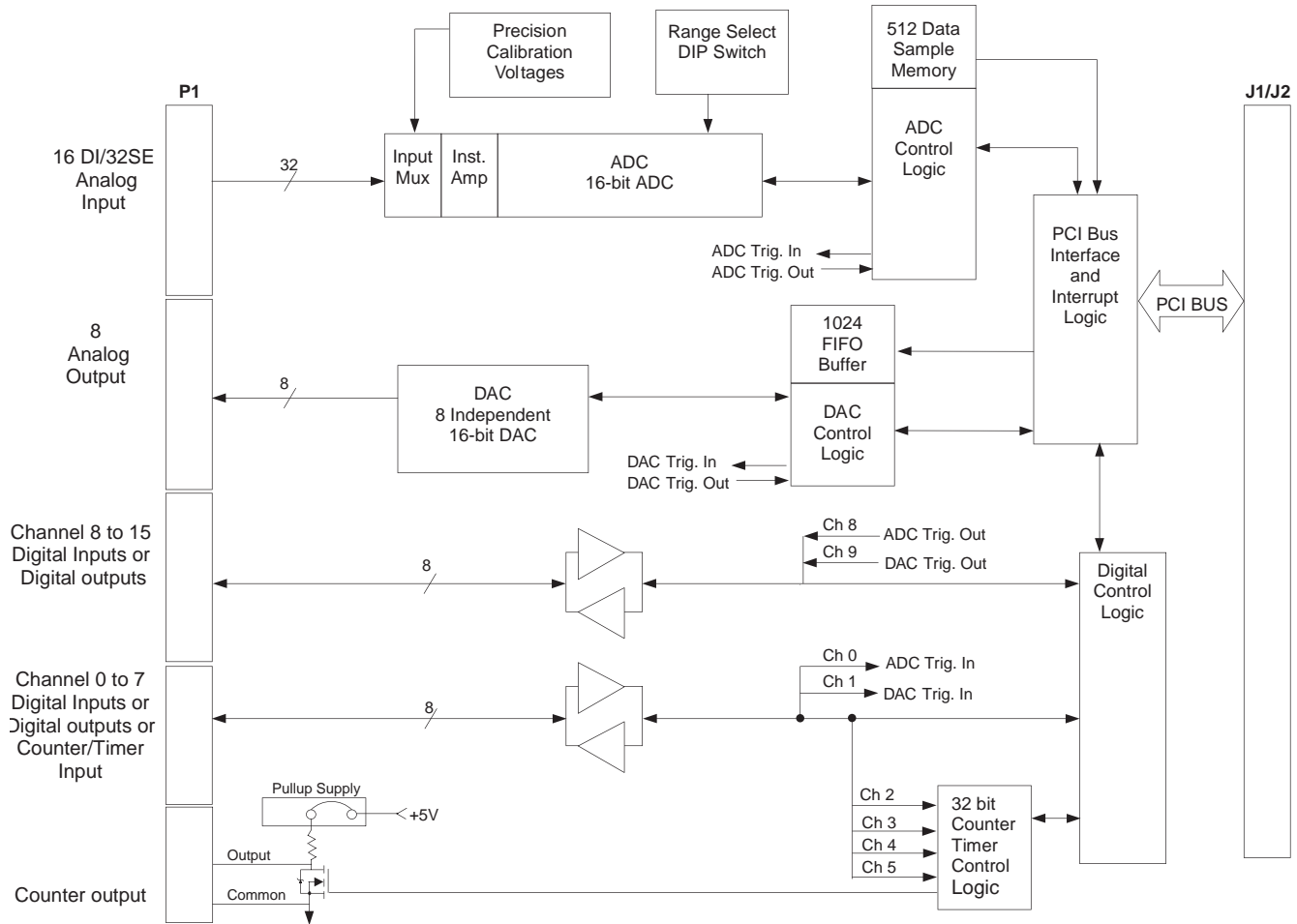
External clock: 3.4MHz.

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.

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CompactPCI Boards

CompactPCI Boards

## 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 are implemented 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-LINUX

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](#)

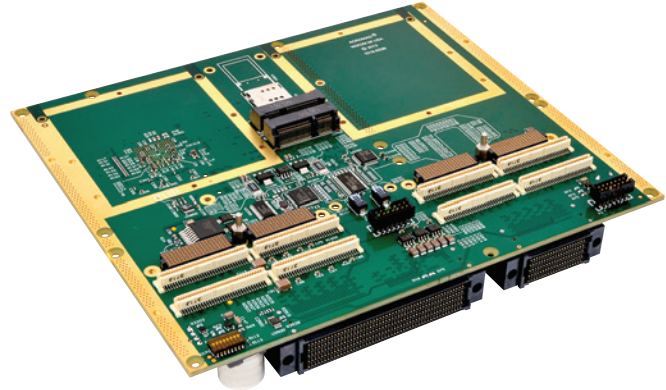
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## ACEX-4600 COM Express Module Type 6 Rugged Carrier Cards

TOP VIEW



BOTTOM VIEW



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 (400 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 design kit, Model ACEX-4600-EDK, simplifies development and testing. The EDK provides a connector break-out board that plugs into the carrier card. All signals delivered through the carrier card's SEARAY connector are accessible through the EDK board connectors.

### 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 XMC/PMC sites
- High-density, high-speed connector for CPU, I/O, and PMC/XMC interface

#### CPU Supported Functions

- Two Gigabit LAN ports
- PCIe port
- Four USB ports (2.0 or higher)
- One to three DVI-I ports
- Three SATA ports
- CFast port or similar (on-board)
- Audio in/out
- 1 or 2 RS232/RS485 port
- 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 165mm)
- Two PMC/XMC – Mini ITX (200mm x 165mm)

#### Power

- Input Power 10–32VDC (on-board DC/DC, fused)
- Reset button

#### Environmental

- -40 to 85°C operation
- -50 to 100°C storage

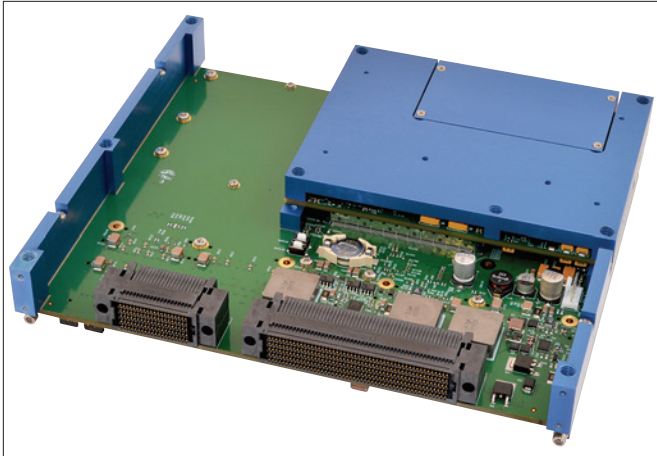
#### Accessories

- Front panel with MIL-DTL-38999 connectors
- Engineering development kit with I/O connector break-out board
- Conduction cooling kit

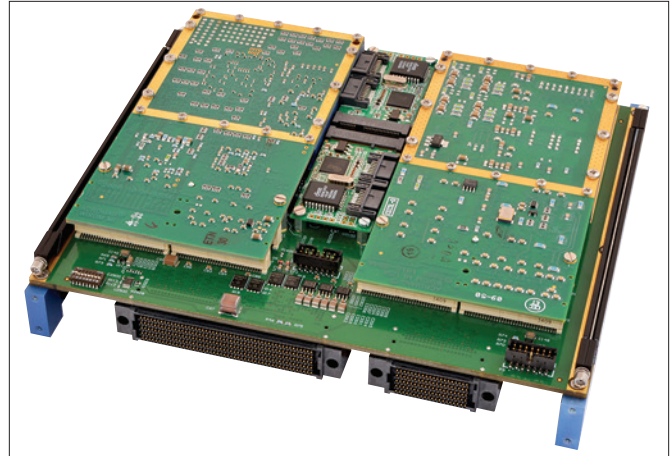


# COM Express

## ACEX-4600 COM Express Module Type 6 Rugged Carrier Cards



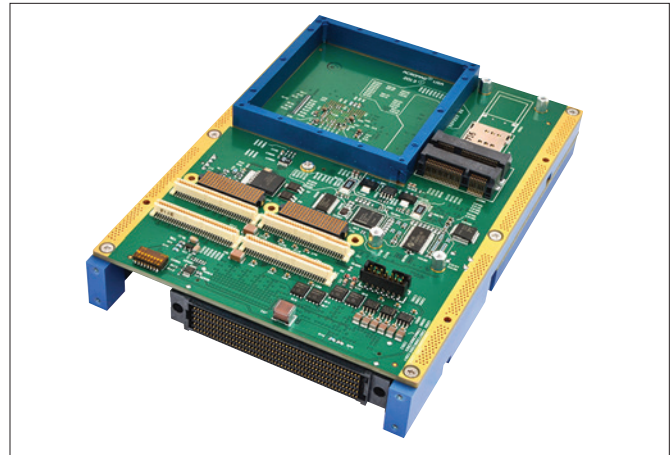
ACEX-4620 double-width carrier card shown with optional ACEX-CC-01 conduction cooling kit rails and XCOM-6400 COM Express module



ACEX-4620 carrier card with two XMC modules installed



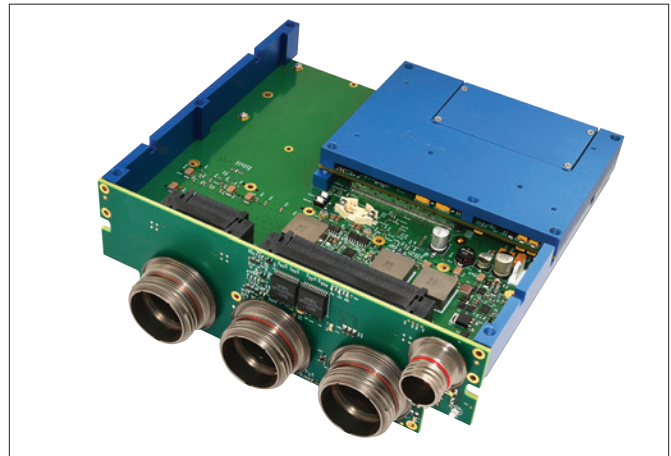
ACEX-4610 single-width carrier card shown with optional ACEX-CC-01 conduction cooling kit rails and XCOM-6400 COM Express module



ACEX-4610 carrier card bottom view showing PMC/XMC slot



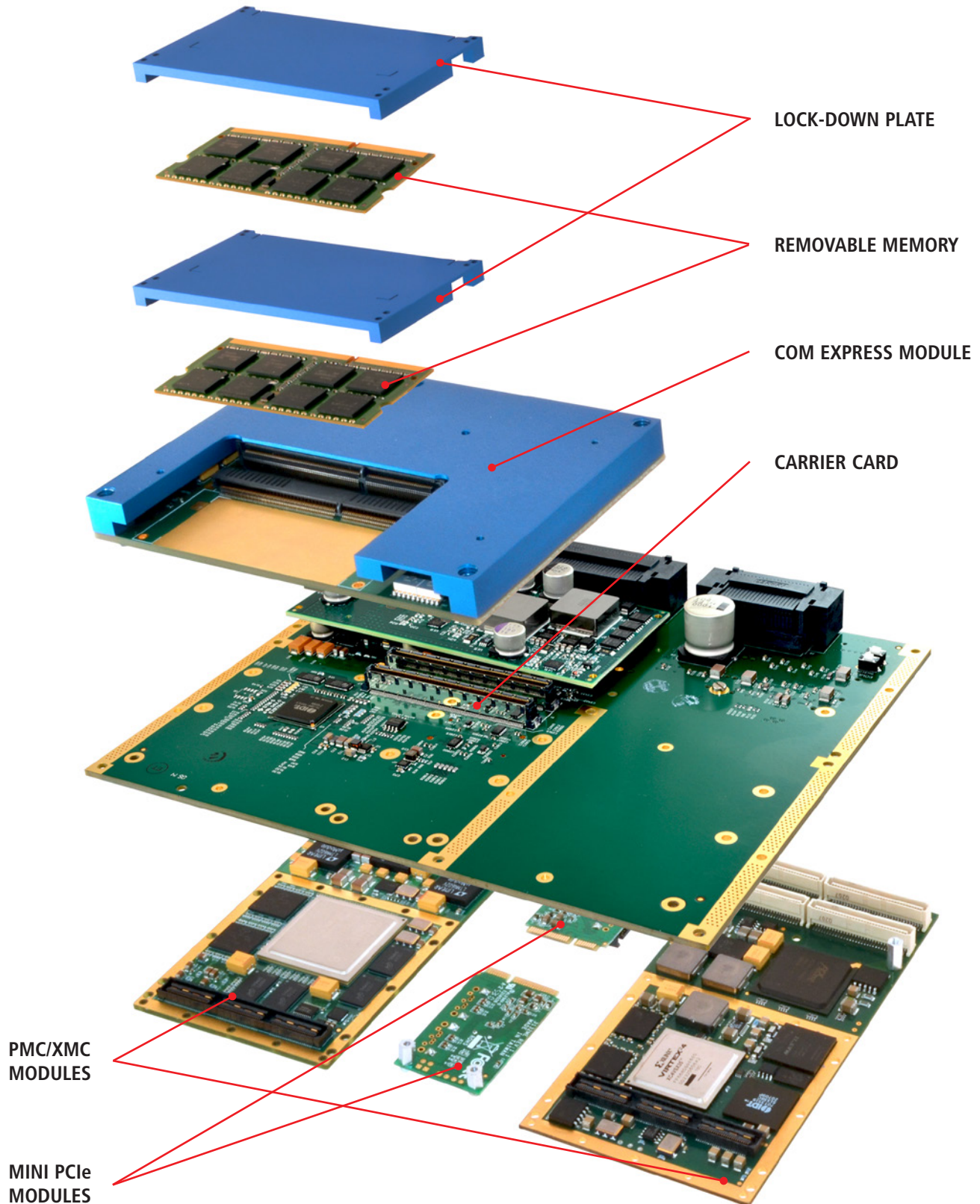
ACEX-FP-01 front panel with ACEX-FP-PF power filter/bridge board mounted on an ACEX-4610 single-width carrier card



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



## ACEX-4600 COM Express Module Type 6 Rugged Carrier Cards

### Performance Specifications

#### ■ General

##### Form Factor

ACEX-4605/4610: 125mm x 165mm.

ACEX-4620: Mini ITX, 200mm x 165mm.

##### 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, dual or no slots depending on model.

##### Connector Types

Ethernet: two RJ45 ports.

##### PCIe

USB: Up to four USB 2.0 ports, 10-pin, dual row.

Video: one to three DVI-I ports

Audio: input/output, 10-pin, dual row.

SATA: three SATA ports.

CFast port.

RS-232/485: Serial 10-pin dual row.

GPIO: 8 channels.

#### ■ Environmental

Operating temperature

-40 to 85°C.

Storage temperature

-50 to 100°C.

Relative humidity

20 to 80% non-condensing.

Power

10-32VDC (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 XMC/PMC 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

For more information, see [www.acromag.com](http://www.acromag.com).

##### ACEX-CC-01

Conduction cooling kit for ACEX-4605/4610/4620

##### ACEX-4600-EDK

Engineering design kit with connector break-out board

##### ACEX-4600-DLS

ACEX-4600-EDK mounted on a panel with fans

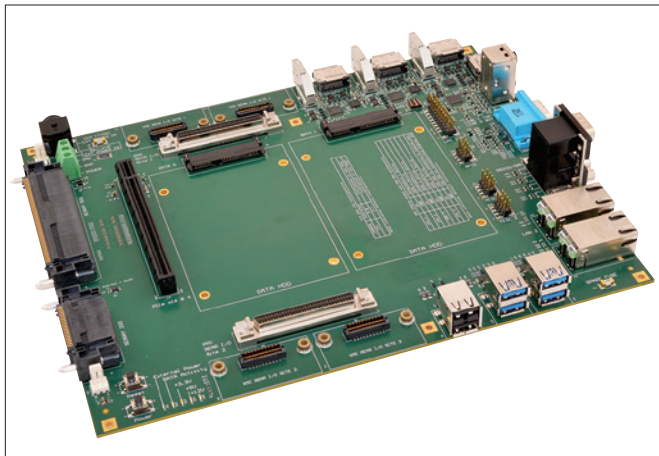
##### ACEX-FP-01

##### ACEX-FP-02

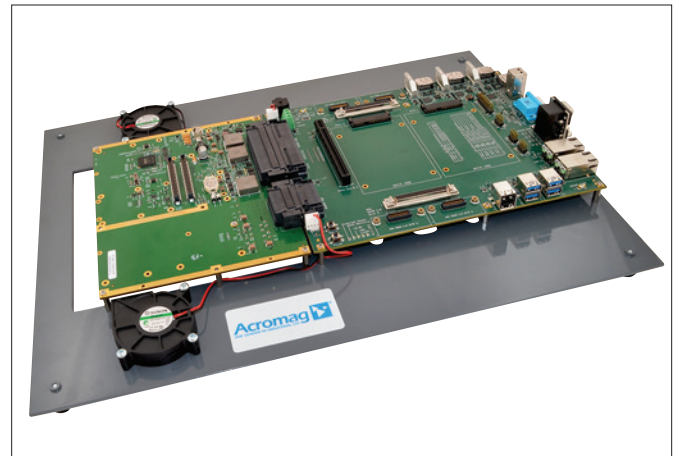
Front panel with MIL-DTL-38999 cylindrical connectors for single-width (-01) or dual-width (-02) carrier card

##### ACEX-FP-PF

Power filter/bridge board



ACEX-4600-EDK I/O breakout development board



ACEX-4620 carrier with the ACEX-DLS development system which includes the ACEX-4600-EDK board mounted on a panel with cooling fans

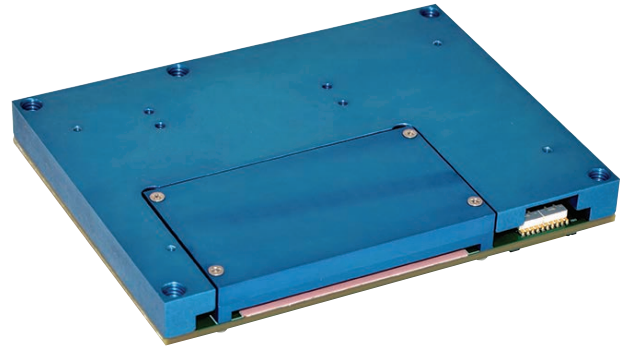
ISO9001  
AS9100



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## XCOM-6400 Rugged COM Express Type 6 Module



4th Generation Intel® Core™ i7 or i5 CPU ♦ Basic form factor ♦ Type 6 interconnects ♦ Ruggedized

### 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 4<sup>th</sup> 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)
- I<sup>2</sup>C (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)

## 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 (x2)

**Audio**  
HDA audio interface

**LAN Port**  
Gigabit Ethernet Medium Dependent Interface (MDI)

**Serial ATA Interface**  
4 SATA III Ports (6 Gb/s)

**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).  
I<sup>2</sup>C (user).

**I/O**  
4 general-purpose outputs,  
4 general-purpose inputs.

**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.

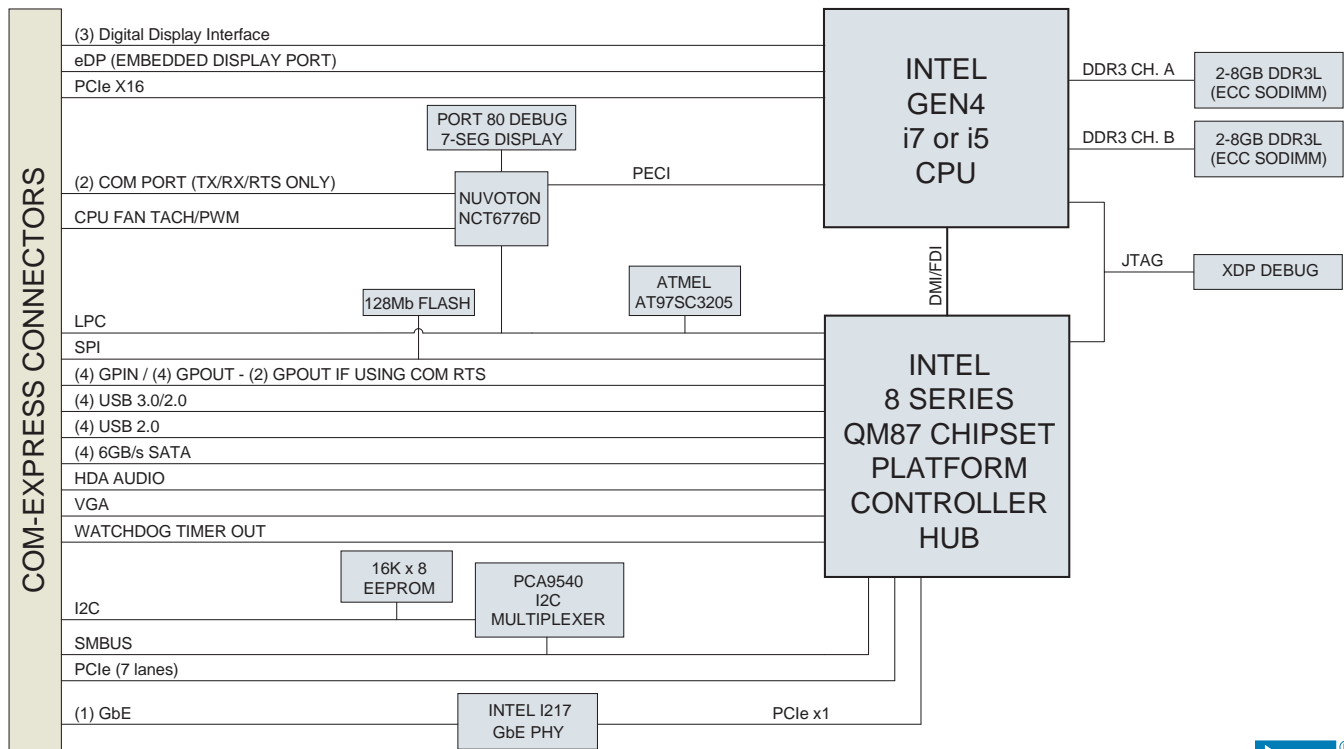
**Shock**  
50g peak-to-peak, 11ms duration,  
MIL-STD-202G Method 213B.

**Vibration**  
11.96 gr<sub>RMS</sub>, 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.

#### 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.*



## 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.

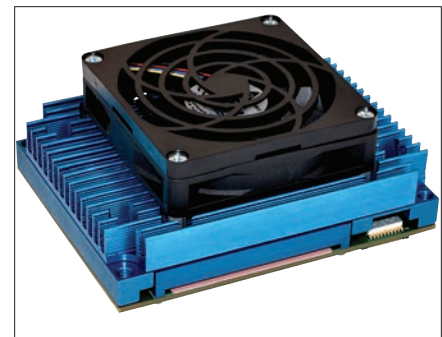
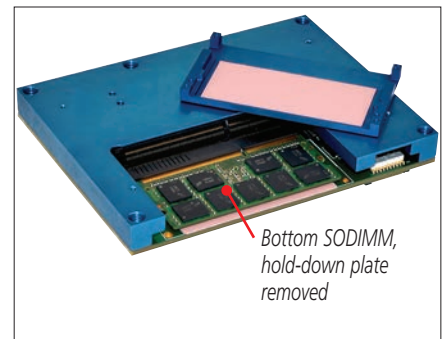
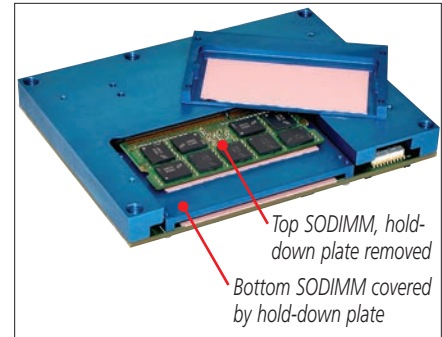
*Note: Please contact factory for lead solder options*

#### ■ Accessories

For more information, see [www.acromag.com](http://www.acromag.com).

XHSA-6400

Active heat sink with fan



Module with optional XHSA-6400 heat sink and fan.

ISO9001  
AS9100

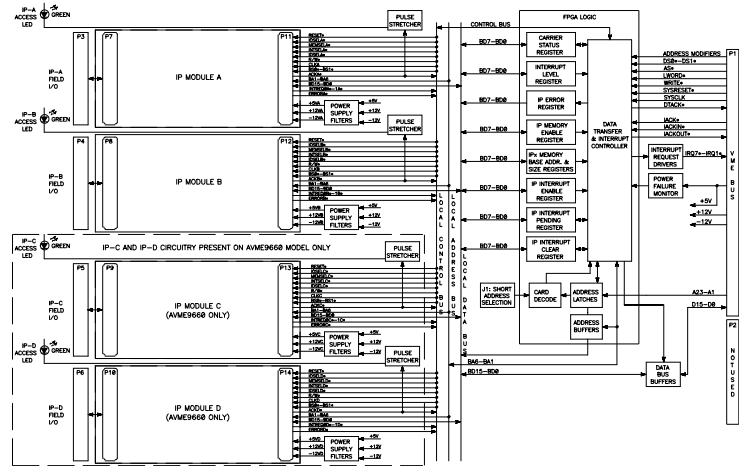
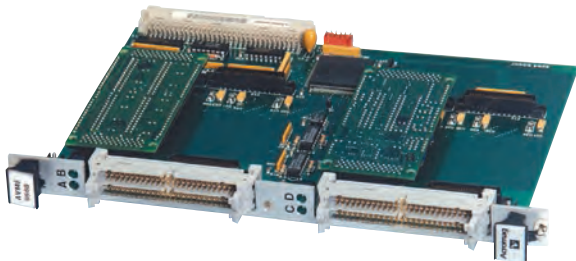


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# Industry Pack Carriers

**AVME9660** VMEbus 6U, Non-intelligent, IP Carrier Cards

1/24 HOUR STOCK ITEM  
2 YEAR WARRANTY



Holds four IP modules ◆ Supports 1MB-8MB memory per IP module ◆ Front panel connectors

## 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.

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# 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(E/O) 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).

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

A, B (Carrier Field I/O): 50-pin Male Headers. No ejector latches.

#### ■ 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.

MTBF  
453,851 hrs. at 25°C, MIL-HDBK-217F, notice 2.

### 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

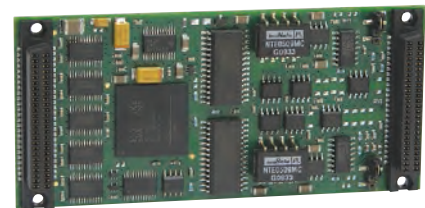
Termination panel, 50-pin connector,  
50 screw terminals

#### IP Modules

See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.



See [www.acromag.com/industryrack](http://www.acromag.com/industryrack) for Industry Pack modules

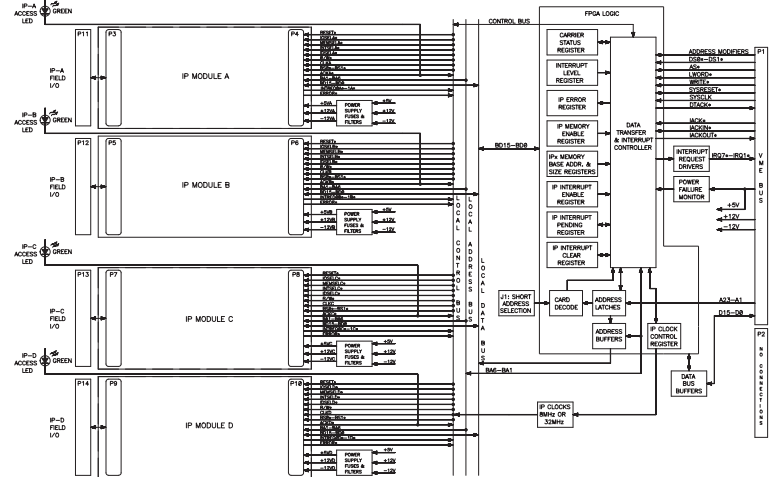




# Industry Pack Carriers

## AVME9668 VMEbus 6U, Non-intelligent, IP Carrier Cards

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



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.

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# Industry Pack Carriers

## 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

Meets VME specifications per revision C.1 dated October 1985, IEC 821-1987 and IEEE 1014-1987.

Data transfer bus: A24/A16:D16/D08(E/O) 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  
2,602,547 hrs at 25°C, MIL-HDBK-21F, Notice 2.

### 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

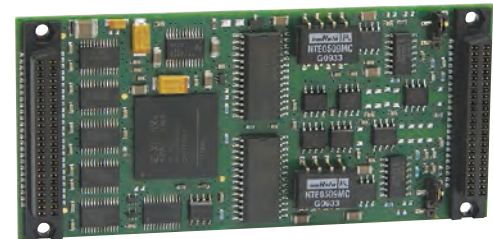
Termination panel, SCSI-2 connector, 50 screw terminals.

#### IP Modules

See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.



See [www.acromag.com/industryack](http://www.acromag.com/industryack) for Industry Pack modules

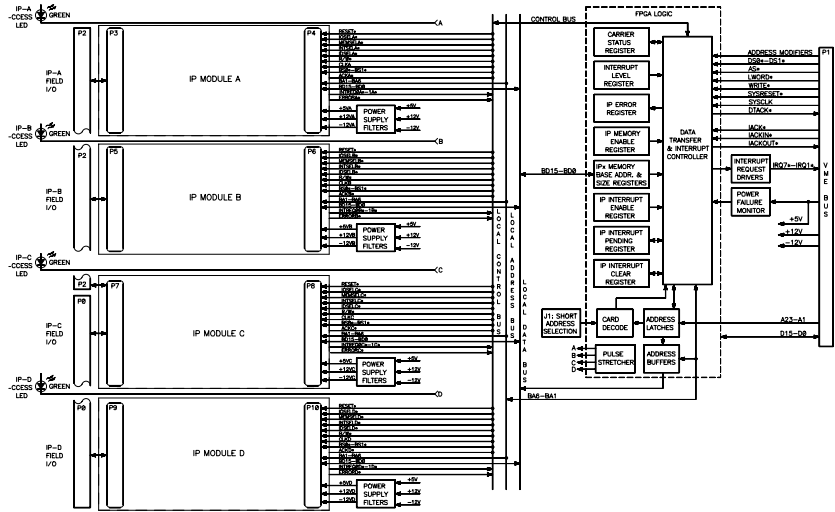
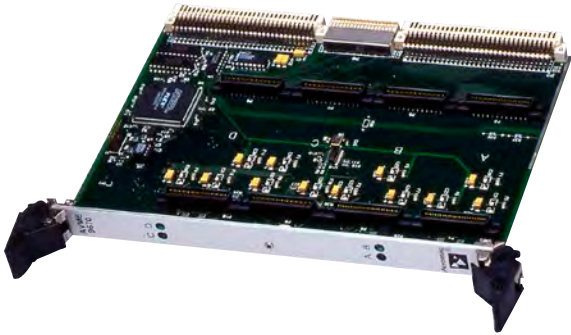


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# Industry Pack Carriers

## AVME967x VME64 6U, Non-intelligent, IP Carrier Cards

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



Holds four IP modules ♦ VME64 high-density rear connectors ♦ Geographical or user-defined addressing

### 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.

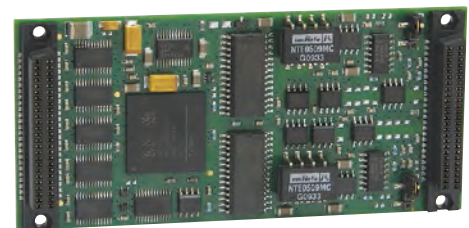
Acromag's carrier boards provide full data access to the IP module's I/O, ID and memory spaces. With full access to the programmable registers, you can easily configure and control the operation of the IP modules from the VMEbus.

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



See [www.acromag.com/industryack](http://www.acromag.com/industryack) for Industry Pack modules

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# Industry Pack Carriers

## AVME967x VME64 6U, Non-intelligent, IP Carrier Cards

### Performance Specifications

#### ■ IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995 and ANSI/VITA 4.1-1996 for I/O mapping.

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 VME64 specifications per ANSI/VITA 1-1994 and VME64x specifications per ANSI/VITA 1.1-1997.

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 ( $\pm 5\%$ ): 525mA maximum.  
 $\pm 12V$  ( $\pm 5\%$ ): 0mA (not used).  
Plus IP module load.

MTBF  
474,104 hrs. at 25°C, MIL-HDBK-217F, notice 2.

### 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

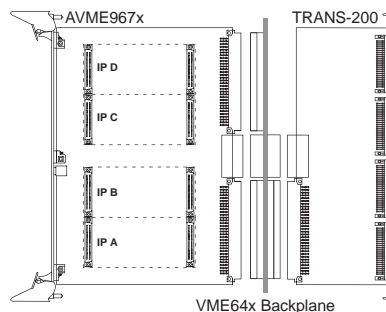
TRANS-200  
Transition module

#### IP Modules

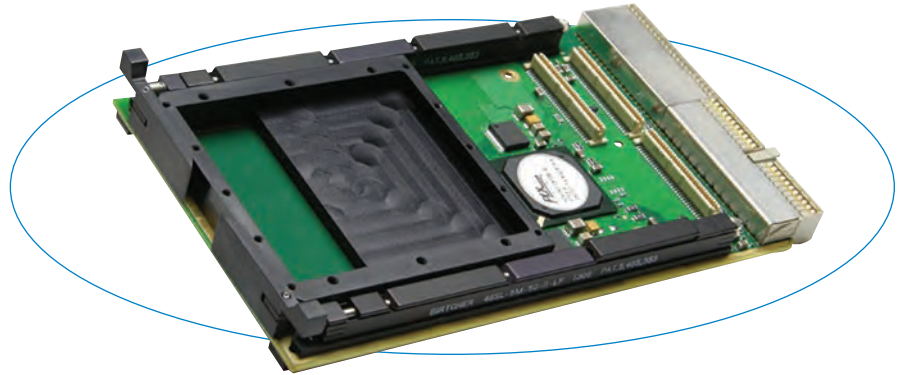
See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.



## 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

This conduction-cooled carrier card interfaces a PMC module to a CompactPCI computer system.

### Specifications

#### Environmental

- Operating temperature: -40 to 85°C (conduction-cooled.)
- Storage temperature: -55 to 100°C.
- Relative humidity: 5-95% non-condensing
- American National Standard for 2mm Connector Equipment Practice on Conduction Cooled Euroboards: ANSI/VITA 30.1-2002.
- American National Standard for Conduction Cooled PMC: ANSI/VITA 20-2001(R2005).
- Power (received from the CompactPCI 3U Back Plane):
  - 3.3V DC ( $\pm 5\%$ )\*: 135mA typical, 150mA max.
  - 5.0V DC ( $\pm 5\%$ )\*: 50mA typical, 70mA max.
  - $\pm 12V$  DC ( $\pm 5\%$ )\*\*: Per PMC module.
  - \* With no PMC module installed,  $\pm 12V$  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<sup>®</sup> 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.

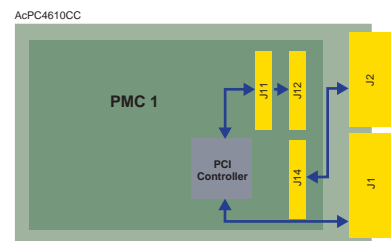
### Ordering Information

#### Carrier Cards

- AcPC4610CC**  
CompactPCI bus carrier card for one [PMC module](#), conduction-cooled

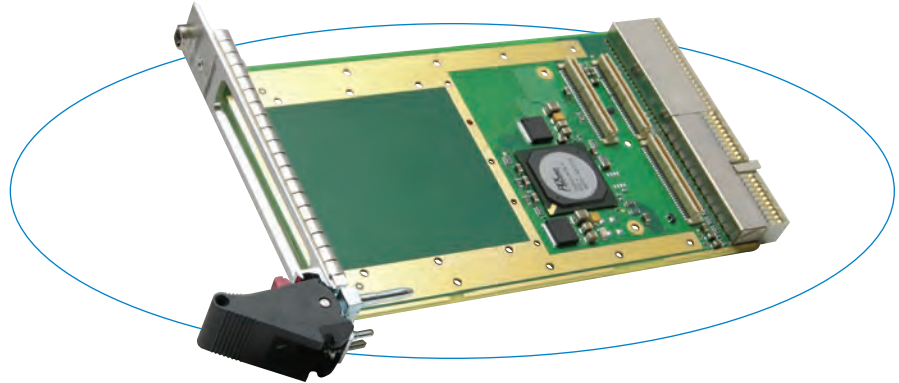
#### Accessories (see [accessories documentation](#) for details)

- 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 site. 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 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
- -40 to 85°C

This carrier card interfaces a PMC module to a CompactPCI computer system.

### 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 ( $\pm 5\%$ )\*: 135mA typical, 150mA max.
  - 5.0V DC ( $\pm 5\%$ )\*: 50mA typical, 70mA max.
  - $\pm 12V$  DC ( $\pm 5\%$ )\*\*: Per PMC module.
- \* With no PMC module installed,  $\pm 12V$  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 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.
- 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.

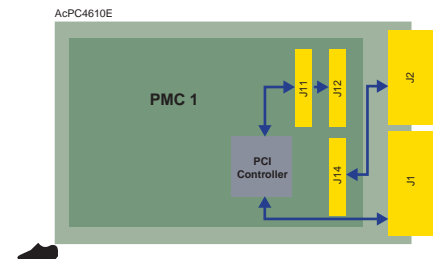
### Ordering Information

#### Carrier Cards

- AcPC4610E**  
CompactPCI bus carrier card for one [PMC module](#), air-cooled

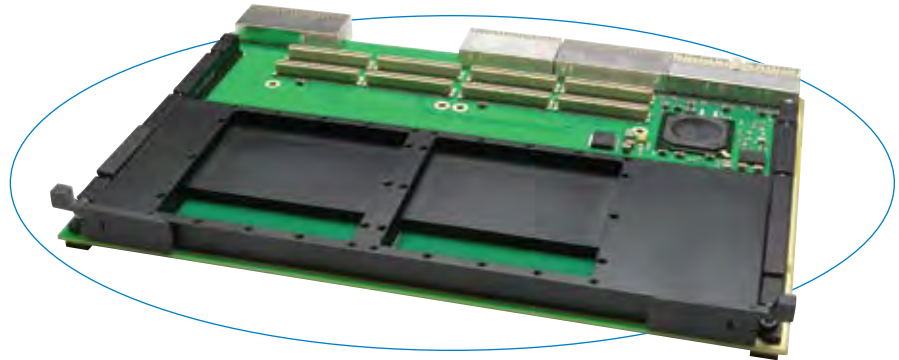
#### Accessories (see [accessories documentation](#) for details)

- 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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## 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

All trademarks are the property of their respective owners.

This conduction-cooled carrier card interfaces two PMC modules to a CompactPCI computer system.

### Specifications

#### Environmental

Operating temperature: -40 to 85°C (conduction-cooled.)

Storage temperature: -55 to 100°C.

Relative humidity: 5-95% non-condensing

American National Standard for 2mm Connector Equipment Practice on Conduction Cooled Euroboards: ANSI/VITA 30.1-2002.

American National Standard for Conduction Cooled PMC: ANSI/VITA 20-2001(R2005).

Power (received from the CompactPCI 3U Back Plane):

3.3V DC ( $\pm 5\%$ )\*: 135mA typical, 150mA max.

5.0V DC ( $\pm 5\%$ )\*: 50mA typical, 70mA max.

$\pm 12V$  DC ( $\pm 5\%$ )\*: Per PMC module.

\* With no PMC module installed,  $\pm 12V$  DC not used.

\*\* Max. power 7.5W (total all supplies) per PMC standard.

MTBF: Call factory

#### 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-loks<sup>®</sup> 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.

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

##### AcPC4620CC

CompactPCI bus carrier card for two [PMC modules](#), conduction-cooled

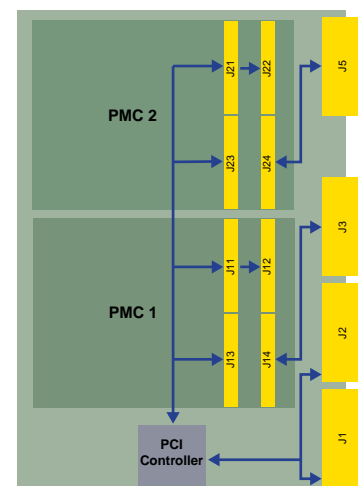
**Accessories** (see [accessories documentation](#) for details)

**TRANS-C4620:** Transition module

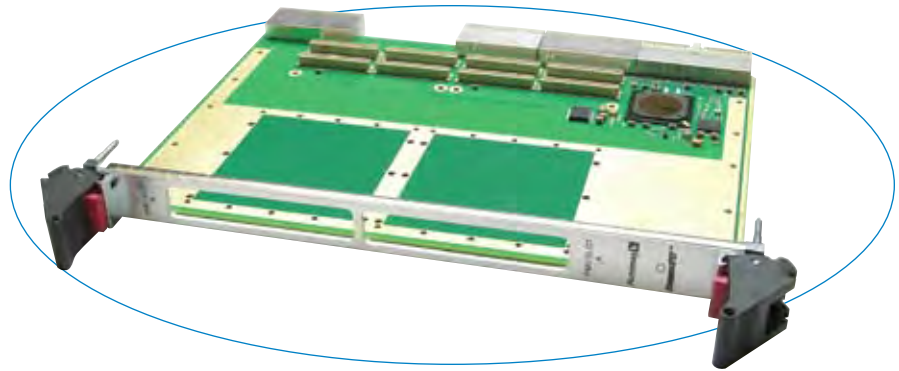
**5028-432:** Shielded cable, SCSI-3 68-pin connector, 2m long.

**5025-288:** Termination panel, DIN rail-mount, 68 screw terminals, SCSI-3 connector.

ACPC4620CC



## AcPC4620E 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 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

This carrier card interfaces two PMC modules to a CompactPCI computer system.

### 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: 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.

#### 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.  
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.

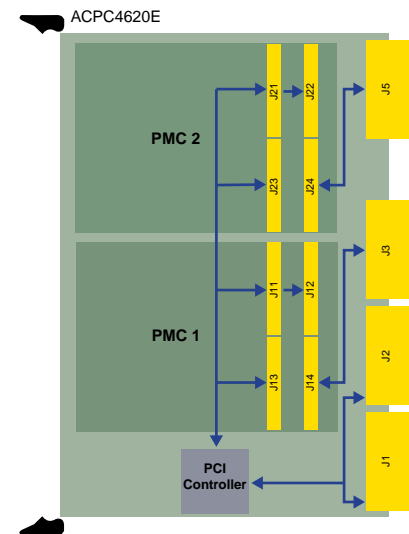
### Ordering Information

#### Carrier Cards

**AcPC4620E**  
CompactPCI bus carrier card for two [PMC modules](#), air-cooled

#### Accessories (see [accessories documentation](#) for details)

- 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.



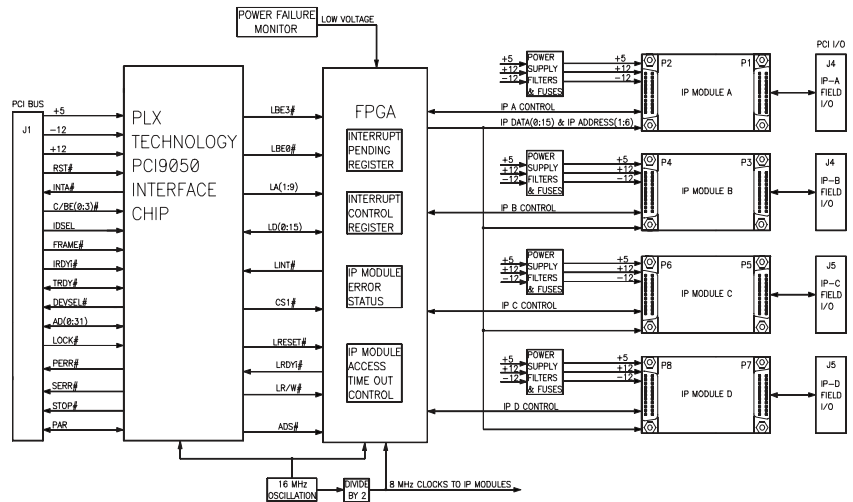
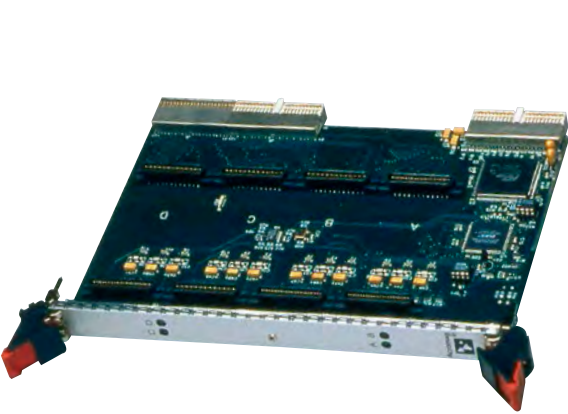
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# Industry Pack Carrier Cards

## AcPC8625A CompactPCI Carrier Cards for Industry Pack Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



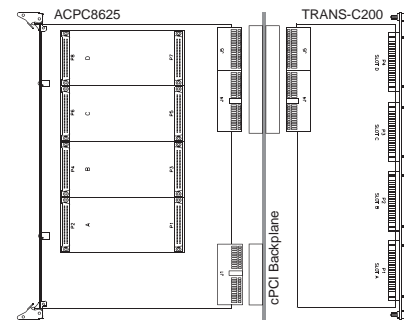
Four Industry Pack mezzanine module slots ♦ Non-Intelligent carrier card ♦ CompactPCI bus interface

### 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.



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# 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 ( $\pm 5\%$ ): 300mA maximum.

+5V ( $\pm 5\%$ ): 30mA maximum.

$\pm 12V$  ( $\pm 5\%$ ): 0mA (not used).

Plus IP module load.

##### 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](http://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

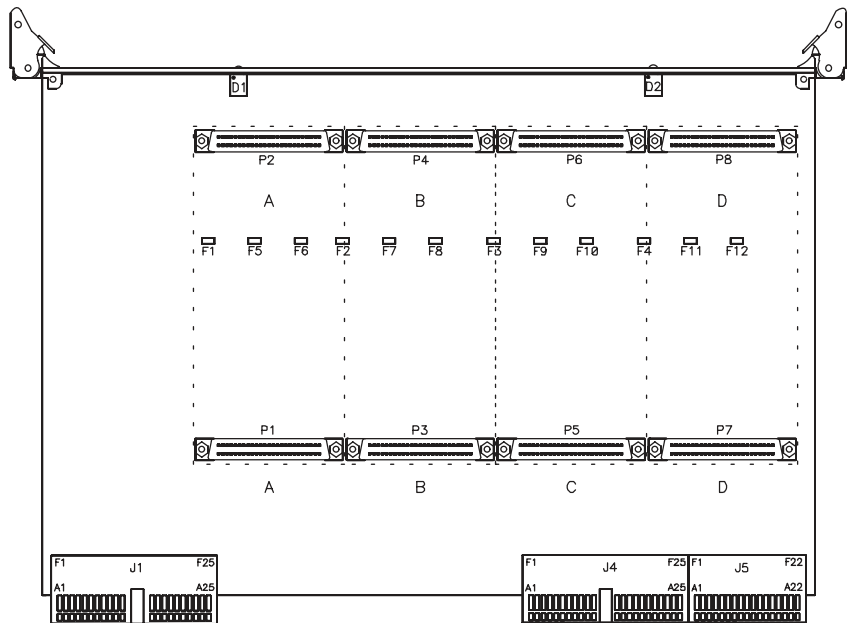
##### IPSW-API-WIN64

64-bit Windows® DDL driver and demo software

##### IPSW-API-LINUX

Linux™ support (website download only)

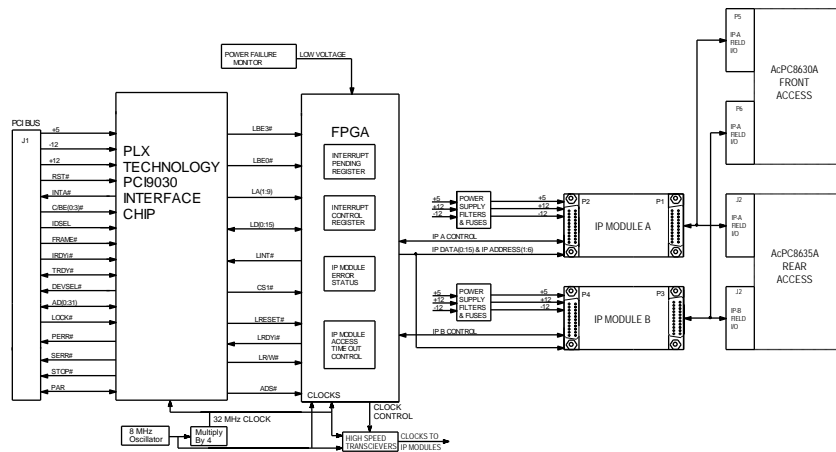
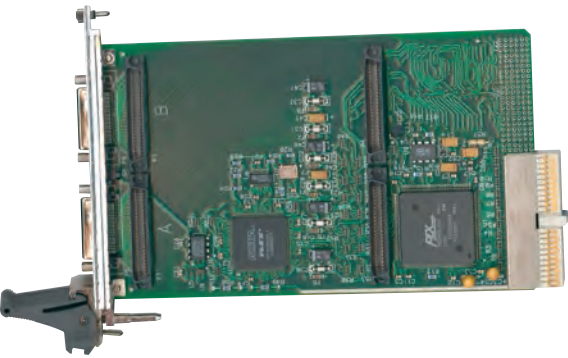
See [www.acromag.com](http://www.acromag.com) for more information.



# Industry Pack Carrier Cards

## AcPC8630A CompactPCI Carrier Cards for Industry Pack Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



Two Industry Pack mezzanine module slots ◆ Non-Intelligent carrier card ◆ CompactPCI bus interface

### 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.

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# 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.

#### Interrupts

Supports two interrupt requests per IP module and interrupt acknowledge cycles via access to IP INT space.

#### 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

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 (AcPC8630A model)  
or -40 to 85°C (AcPC8630AE model).

Storage temperature  
-55 to 100°C.

Relative humidity  
5 to 95% non-condensing.

### 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](http://www.acromag.com) for more information.

#### Software Development Tools

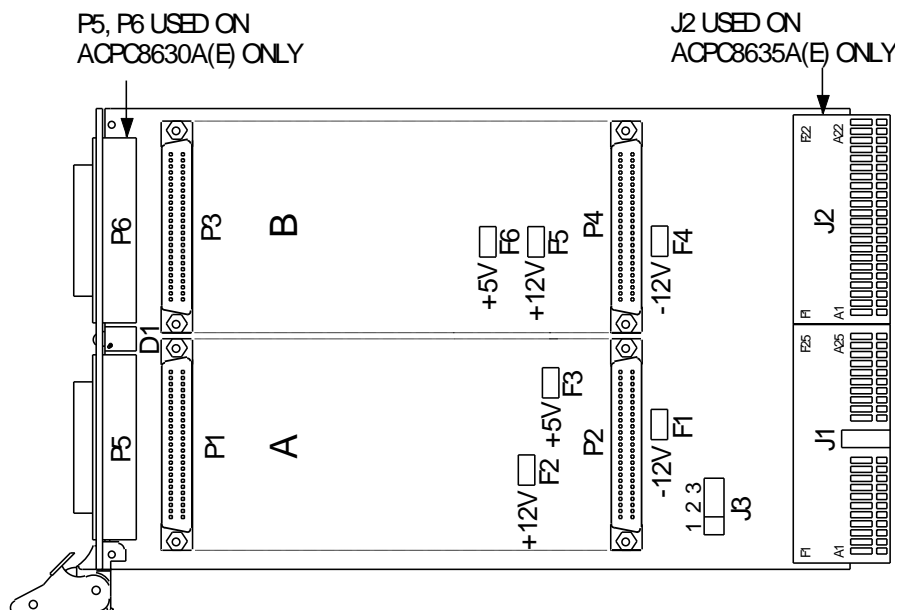
IPSW-API-VXW  
VxWorks® software support package

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](http://www.acromag.com) for more information.

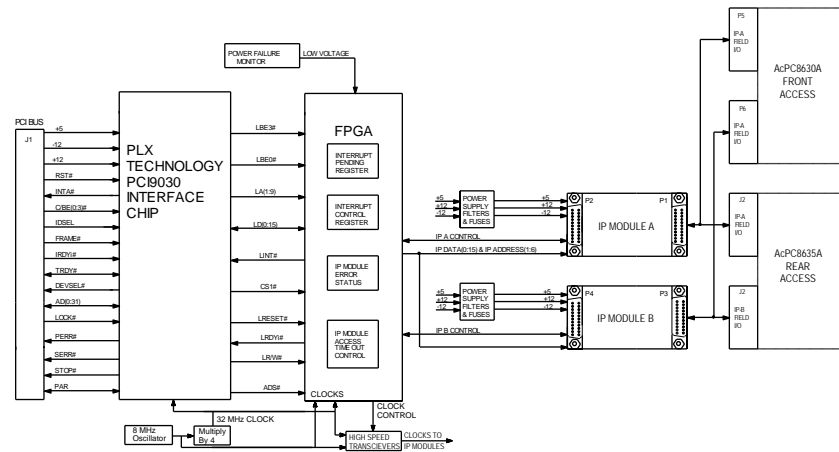
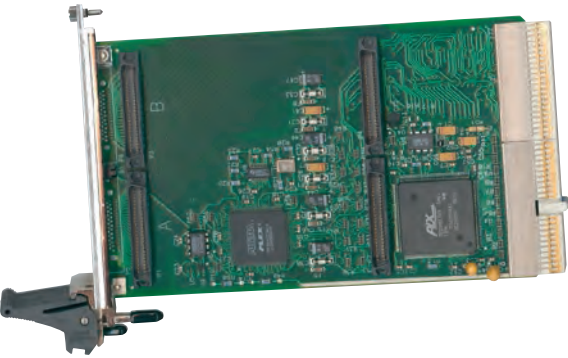


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# Industry Pack Carrier Cards

## AcPC8635A CompactPCI Carrier Cards for Industry Pack Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



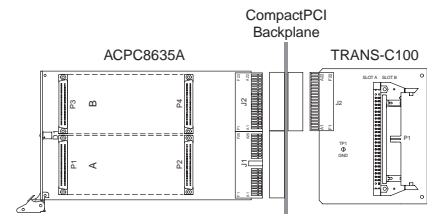
Two Industry Pack mezzanine module slots ♦ Non-Intelligent carrier card ♦ CompactPCI bus interface

### 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.



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# 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.

IP Module I/O space, ID space, INT, 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#. 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](http://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

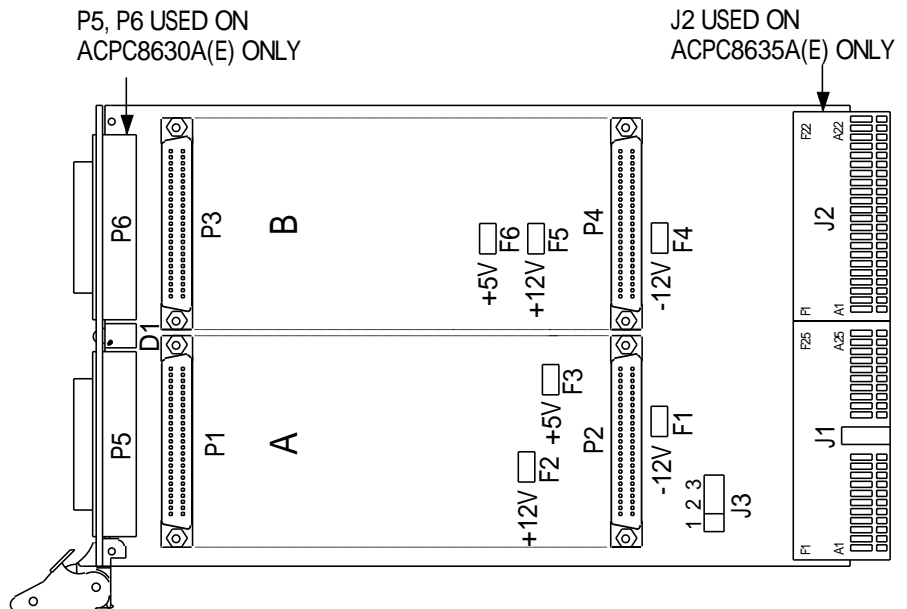
##### IPSW-API-WIN64

64-bit Windows® DDL driver and demo software

##### IPSW-API-LINUX

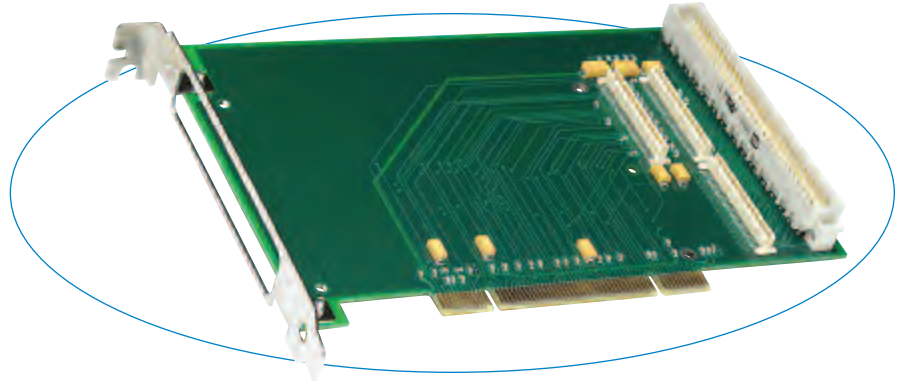
Linux™ support (website download only)

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## APC-PMC PCI Non-intelligent PMC Carrier Card



*This carrier card converts a PMC module to a PCI board form factor for easy use in a PC-based computer.*

### 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  
MTBF: 3,526,342 hrs. at 25°C, MIL-HDBK-217F, notice 2.

#### 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).

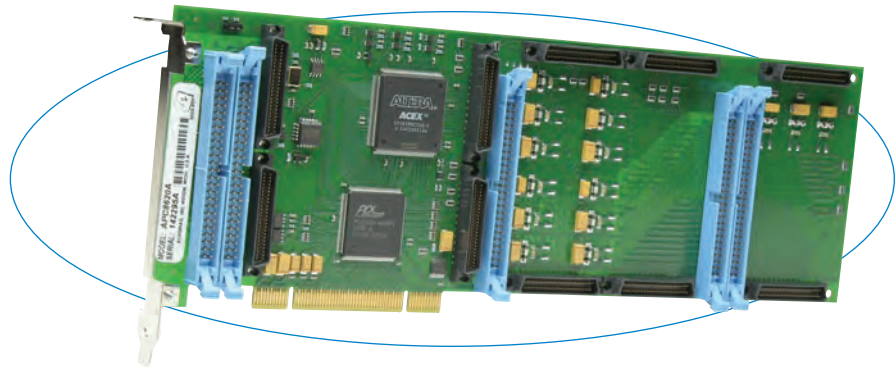
### Ordering Information

#### Carrier Card APC-PMC

PCI bus carrier card for one [PMC module](#)

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## 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.

The APC8620A carrier card holds up to five plug-in I/O modules for extremely high channel density.

### 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):  
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 (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 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

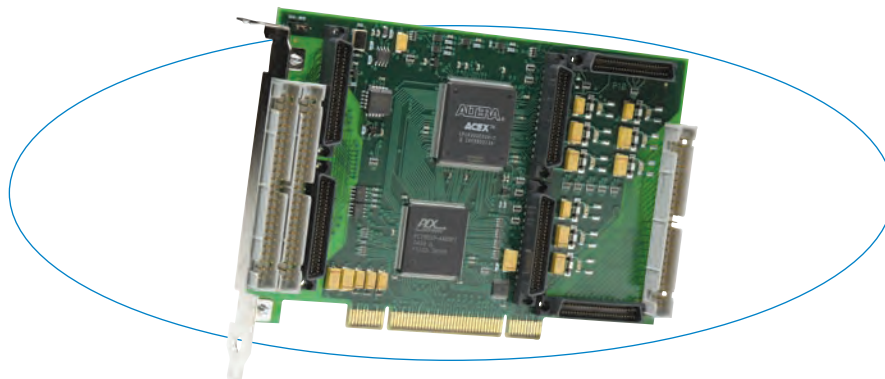
[5025-551](#): Same as 5025-550 except shielded

[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.
- 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 2000/XP/Vista/7 32-bit operating system.

The APC8621A offers high channel density and modular flexibility in a half-length PCI carrier card.

### 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

[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

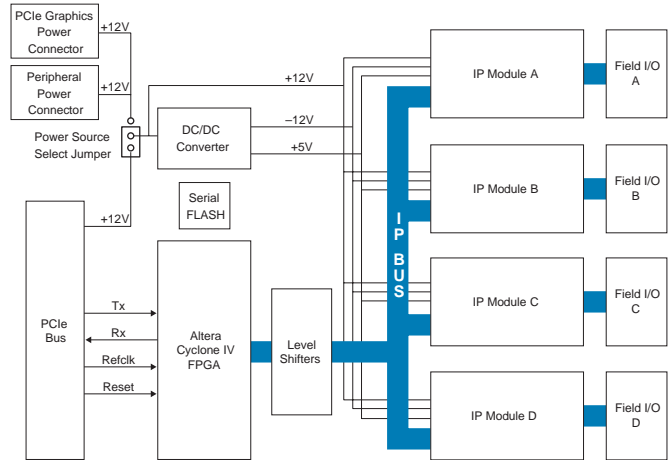
[5025-552](#): Termination panel, 50-pin connector, 50 screw terminals

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# Industry Pack Module Carriers

## APCe8650 PCI Express Carrier Cards for Industry Pack Modules

24 HOUR STOCK ITEM  
2 YEAR WARRANTY



Four Industry Pack mezzanine module slots ♦ Non-Intelligent carrier card ♦ PCIe x1 interface

### 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 APCA8650 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 ANSIVITA 4 compliant IP modules.

### Key Features & Benefits

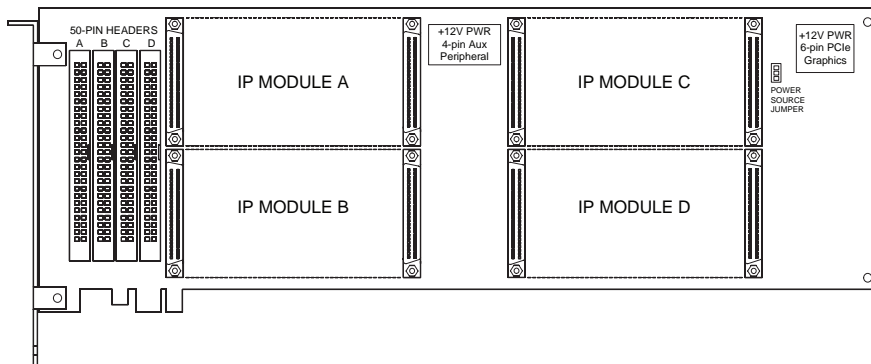
- Four IP module slots (ANSI/VITA 4 mezzanine) support any combination of I/O functions
- Board resides in memory space
- Supports IP's I/O, ID, INT, and MEM spaces
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Supervisory circuit reset generation
- 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



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.



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# 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

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#. Interrupt vectors come from IP modules via access to IP module INT space.

#### ■ 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 ( $\pm 10\%$ ): 190mA, typical; 220mA max.

+12 Volts ( $\pm 5\%$ ): 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

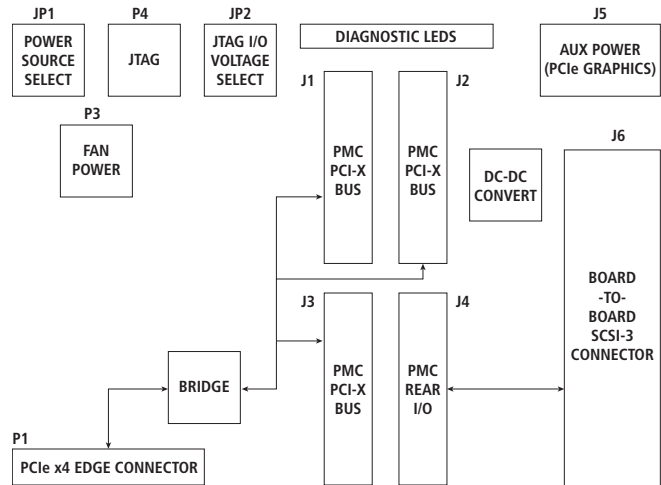
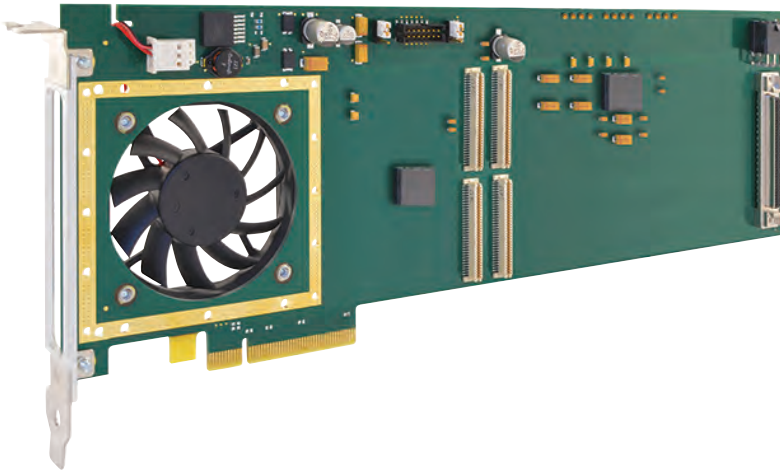
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# ▶ PMC/XMC Module Carriers

## APCe8670 PCI Express Carrier Card for PMC Modules



One PMC mezzanine module slot ◆ Non-Intelligent carrier card ◆ PCIe x4 interface

### Description

Acromag's APCI8670 carrier card interfaces a PMC mezzanine module to a PCI Express bus in a PC-based desktop computer system.

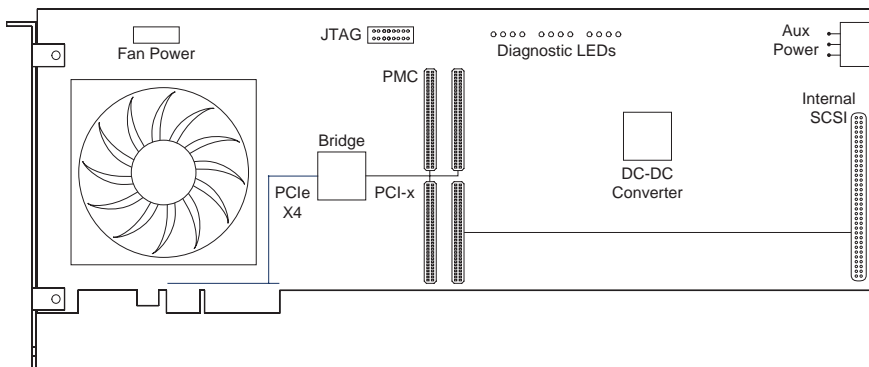
The APCI8670 is a PCIe bus adapter board that allows a PC (PCIe bus master) to control and communicate with the hosted PMC module. It simply acts as an adapter to route signals between the system's PCIe bus and the PMC module connectors.

The I/O signals are accessible via rear connectors and through 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
- Auxiliary 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.

JP1: Power source select jumper.

JP2: JTAG I/O voltage select jumper.

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](http://www.acromag.com) for more information.

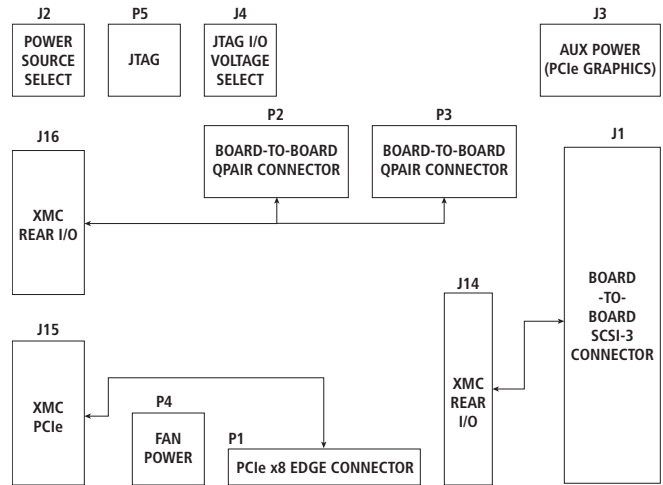
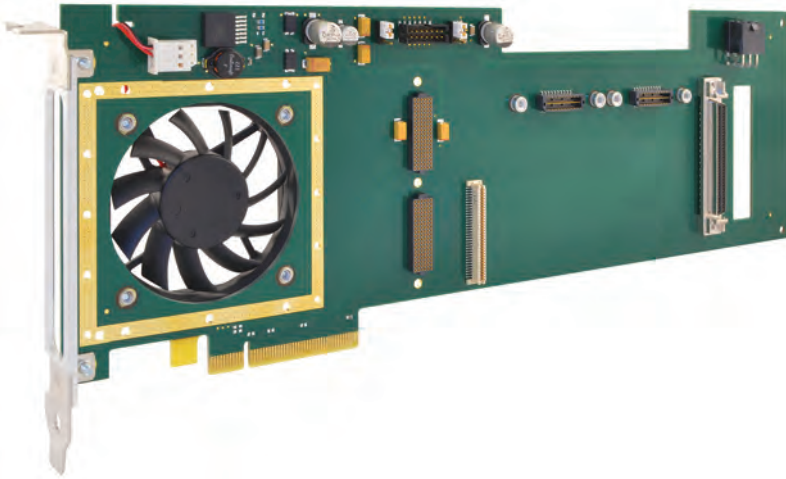
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# ▶ PMC/XMC Module Carriers

## APCe8675 PCI Express Carrier Card for XMC Modules



One XMC mezzanine module slot ◆ Non-Intelligent carrier card ◆ PCIe x8 interface

### Description

Acromag's APCI8675 carrier card interfaces an XMC mezzanine module to a PCI Express bus in a PC-based desktop computer system.

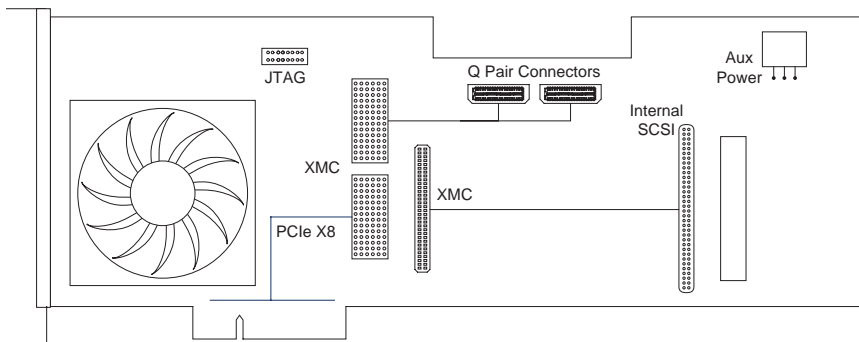
The APCI8675 is a PCIe bus adapter board that allows a PC (PCIe bus master) to control and communicate with the hosted XMC module. It simply acts as an adapter to route signals between the system's PCIe bus and the XMC module connector.

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
- Auxilliary 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 (5Gb/s) 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

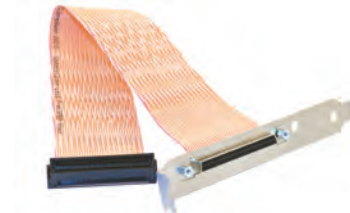
##### 5025-917

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](http://www.acromag.com) for more information.

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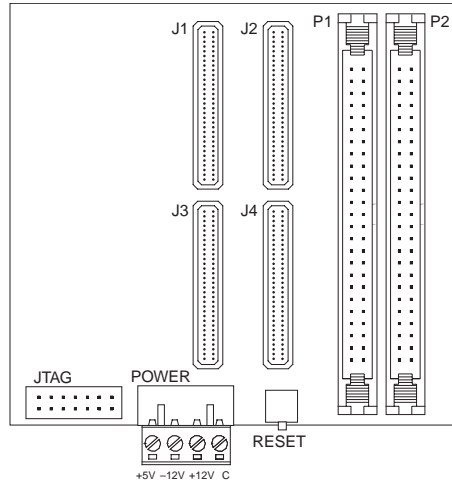
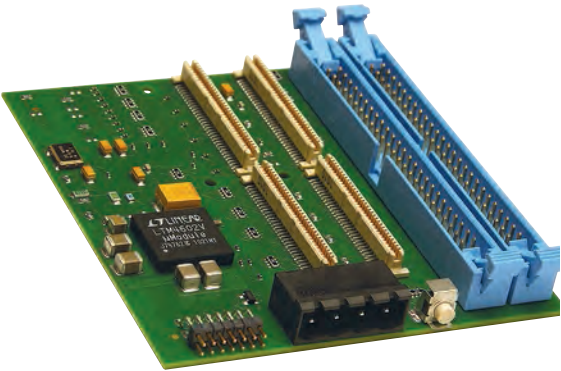
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# ▶ PMC Module Carriers

## APMC4110 Busless PMC Module Carrier Card

24  
HOUR  
STOCK ITEM

2  
YEAR  
WARRANTY



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  $\pm 12V$  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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# PMC Module Carriers

## 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 ( $\pm 5\%$ ): 66mA, typical.  
+12V ( $\pm 10\%$ ): 0mA, used by PMC module only.

-12V ( $\pm 10\%$ ): 0mA, used by PMC module only.  
Note that 3.3V is generated from the 5V supply.  
Power requirements do not include the PMC module.

$\pm 12.0V$  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

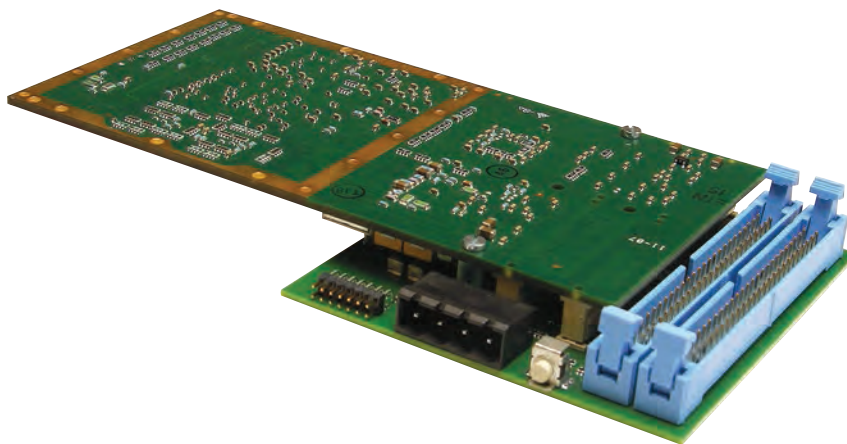
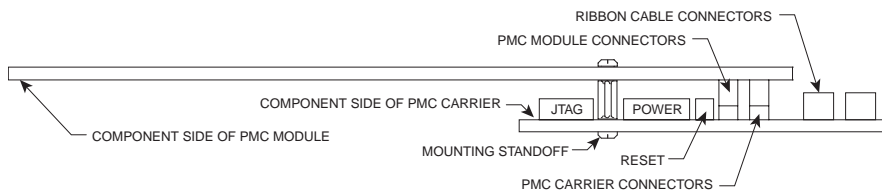
Termination panel, DIN rail-mount, 50 screw terminals, 50-pin ribbon cable connector.

#### 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.



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AS9100



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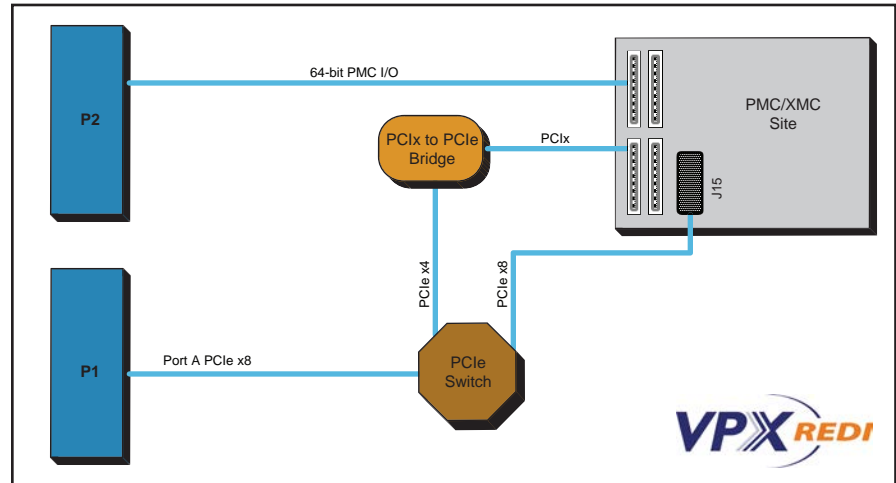
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# VPX Carrier Cards

## VPX4810 VPX Carrier Cards for XMC or PMC Modules

2  
YEAR  
WARRANTY



Air-cooled, conduction-cooled and REDI versions ♦ 3U ♦ One PMC/XMC slot ♦ PCIe x8 Gen 2 interface

### 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



Conduction-cooled version



VPX REDI VITA 48 version

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# VPX Carrier Cards

## VPX4810 VPX Carrier Cards for XMC or PMC Modules

### Performance Specifications

NOTE: Specifications for VPX4810 only.

#### ■ 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](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.

ISO9001  
AS9100



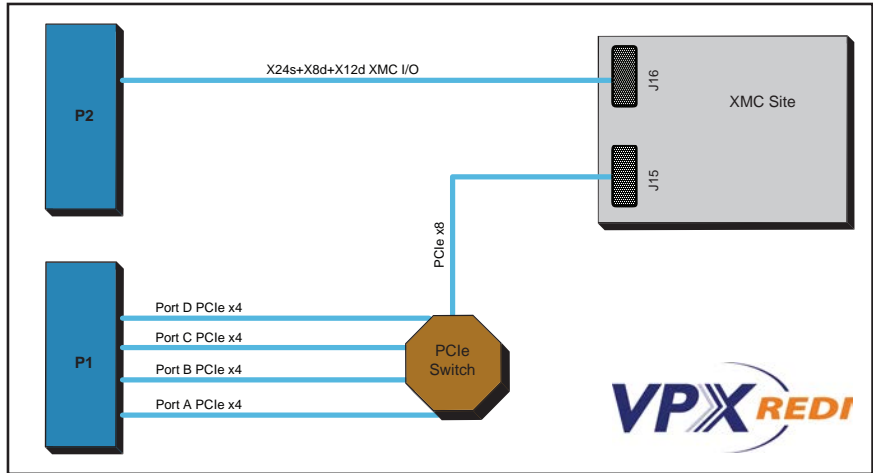
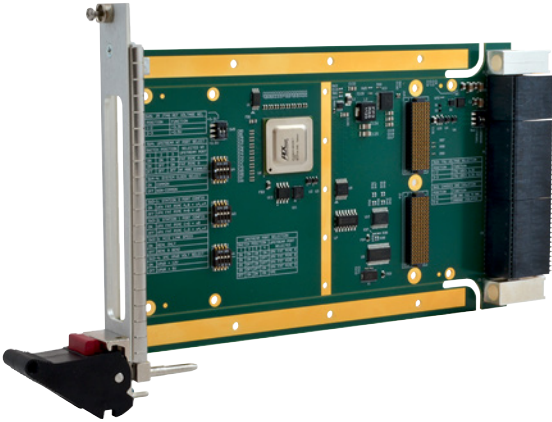
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# VPX Carrier Cards

## VPX4812 VPX Carrier Cards for XMC Modules w/ P16 Support Switch Card

2 YEAR WARRANTY



Air-cooled, conduction-cooled and REDI versions ♦ 3U Single XMC slot ♦ PCIe x8 Gen 2 interface

### 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.

These carriers are ideal for high-performance industrial, defense, scientific research, and telephony systems requiring high-speed I/O expansion. The VPX4812 is available in three versions: air-cooled, conduction-cooled and a Ruggedized Enhanced Design Implementation (REDI VITA 48).

The VPX4812 is one member of a family of 3U and 6U mezzanine carrier cards that support interfacing XMC and PMC modules to VPX systems.

### 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



Conduction-cooled version



VPX REDI VITA 48 version

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# VPX Carrier Cards

## VPX4812 VPX Carrier Cards for XMC Modules w/ P16 Support Switch Card

### Performance Specifications

NOTE: Specifications for VPX4812 only.

#### ■ 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

Compatible VITA 65 module / slot profiles:  
MOD3-SWH-4F-16.4.5-2 / SLT3-SWH-4F-14.4.4  
MOD3-PER-1F-103.2-2 / SLT3-PER-1F-14-3.2

FRU EEPROM with temperature monitor.

##### 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

0 to 70°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.

##### 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

##### 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

#### Accessories

##### TRANS-V112-LF

Rear transition module for the VPX4812

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.

ISO9001  
AS9100

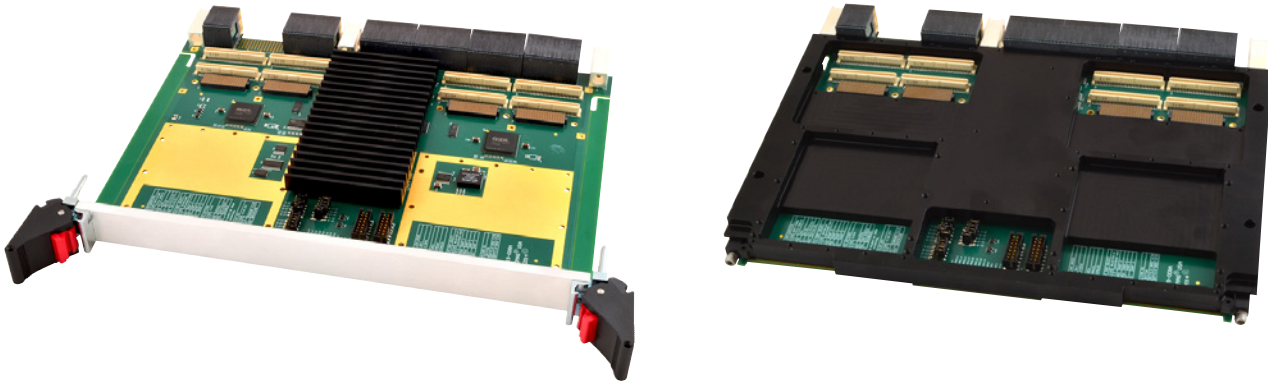


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# VPX Carrier Cards

## VPX4820 VPX Carrier Cards for XMC or PMC Modules



PCIe x8 Gen 2 interface via Expansion plane

Two PMC/XMC slots

6U form factor

### 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

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# 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 DC: Backplane voltage provided to XMC.

±12V Aux DC.

Note: see manual for further 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

Sinusoidal (IEC 60068-2-6): 10-500Hz, 5g, 1 hour/axis.

Random (IEC 60068-2-64): 10-500Hz, 5g RMS, 1 hour/axis.

##### Shock

Operating shock (IEC 60068-2-27):

30g, 11ms half sine, 18 shocks at 6 orientations.

##### MTBF

Consult factory.

### Ordering Information

#### Carrier Cards

##### VPX4820-LF

VPX carrier card, 6U, two PMC/XMC slots, lead-free

##### VPX4820CC-LF

Conduction-cooled version of VPX-4820-LF

*Consult factory for lead solder versions*

#### Accessories

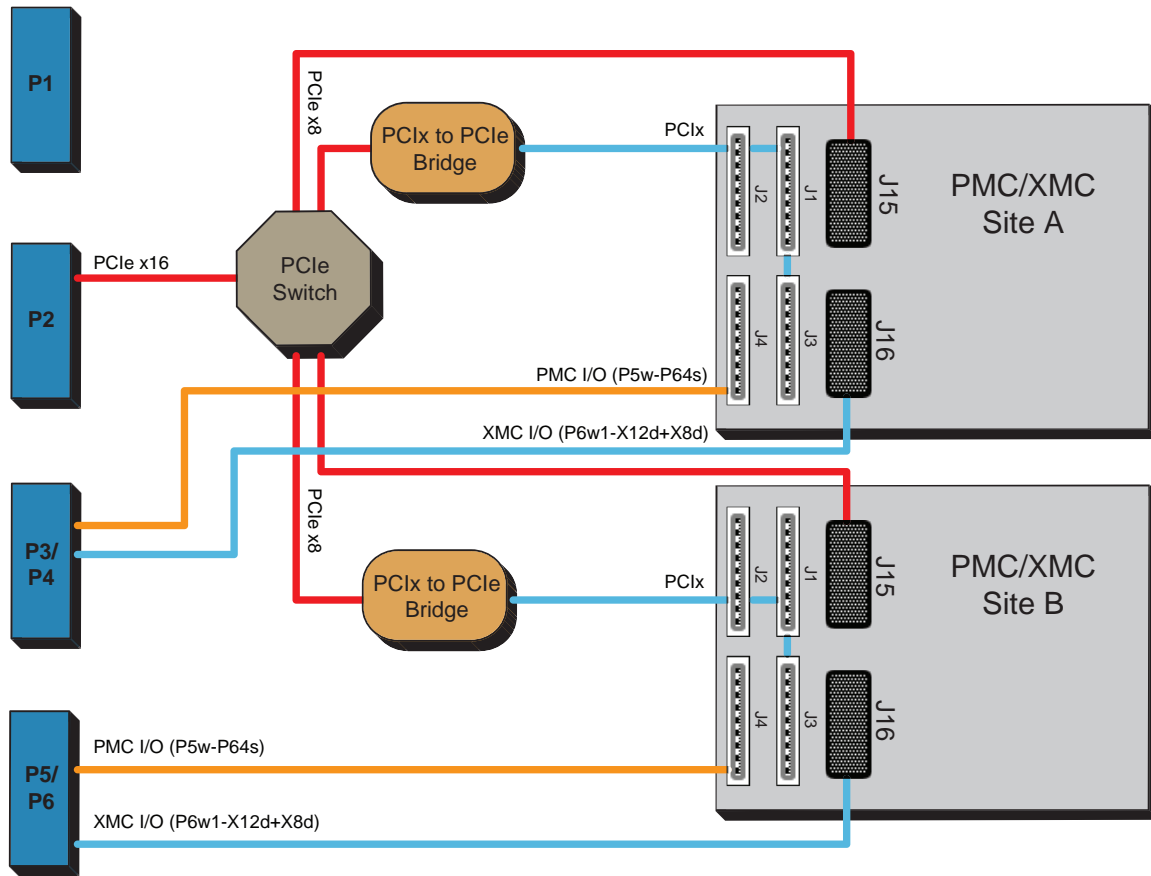
See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.

# VPX Carrier Cards

## VPX4820 VPX Carrier Cards for XMC or PMC Modules



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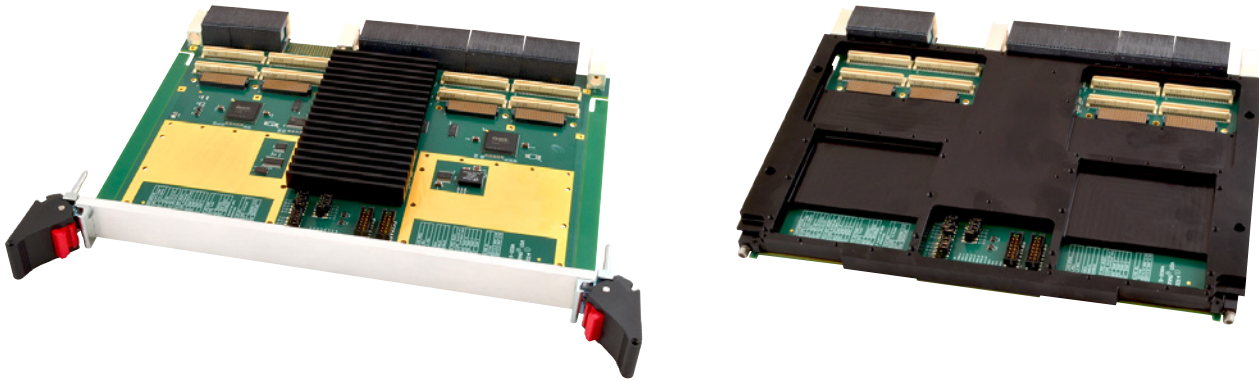
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# VPX Carrier Cards

## VPX4821 VPX Carrier Cards for XMC or PMC Modules



PCIe x8 Gen 2 interface via Data plane

Two PMC/XMC slots

6U form factor

### 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

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 DC: Backplane voltage provided to XMC.

±12V Aux DC.

Note: see manual for further 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

Sinusoidal (IEC 60068-2-6): 10-500Hz, 5g, 1 hour/axis.

Random (IEC 60068-2-64): 10-500Hz, 5g RMS, 1 hour/axis.

##### Shock

Operating shock (IEC 60068-2-27):

30g, 11ms half sine, 18 shocks at 6 orientations.

##### MTBF

Consult factory.

### Ordering Information

#### Carrier Cards

##### VPX4821-LF

VPX carrier card, 6U, two PMC/XMC slots, lead-free

##### VPX4821CC-LF

Conduction-cooled version of VPX-4821-LF

*Consult factory for lead solder versions*

#### Accessories

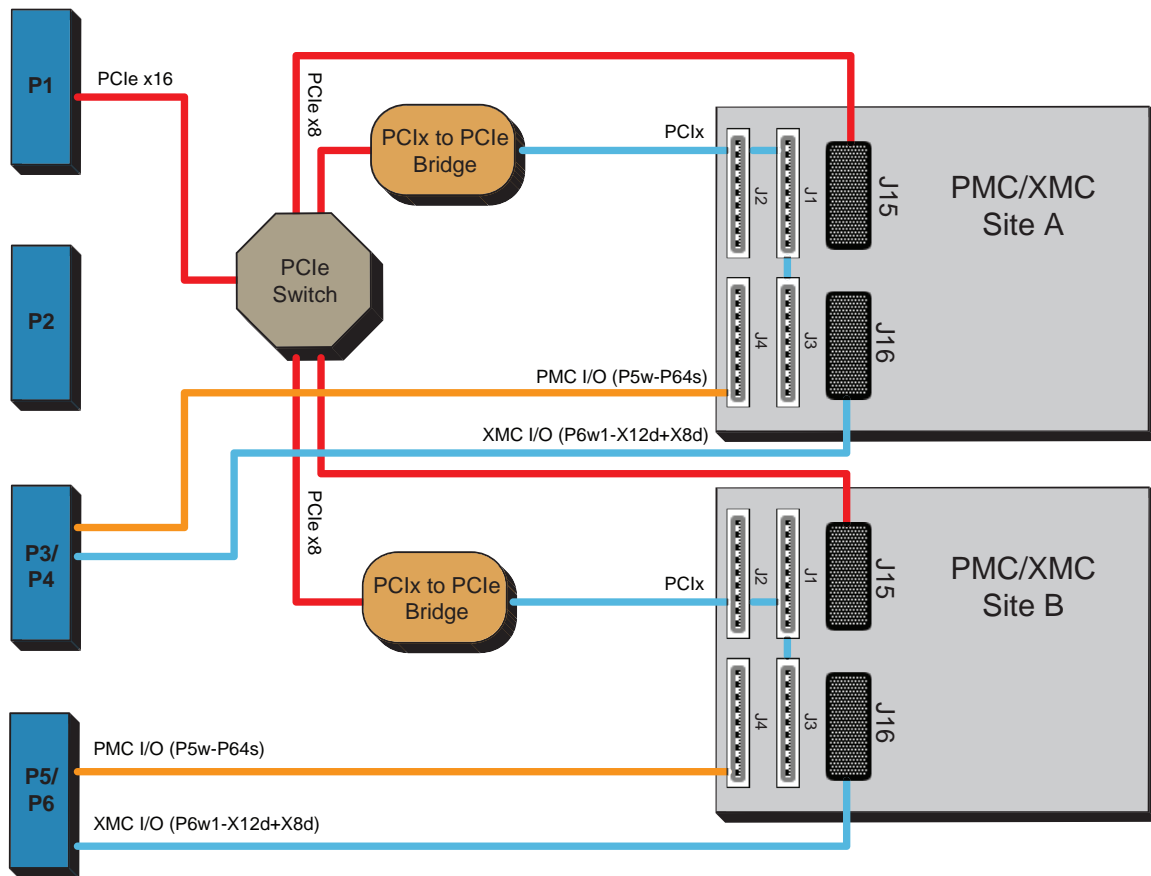
See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Development Tools

See [www.acromag.com](http://www.acromag.com) for more information.

# VPX Carrier Cards

## VPX4821 VPX Carrier Cards for XMC or PMC Modules



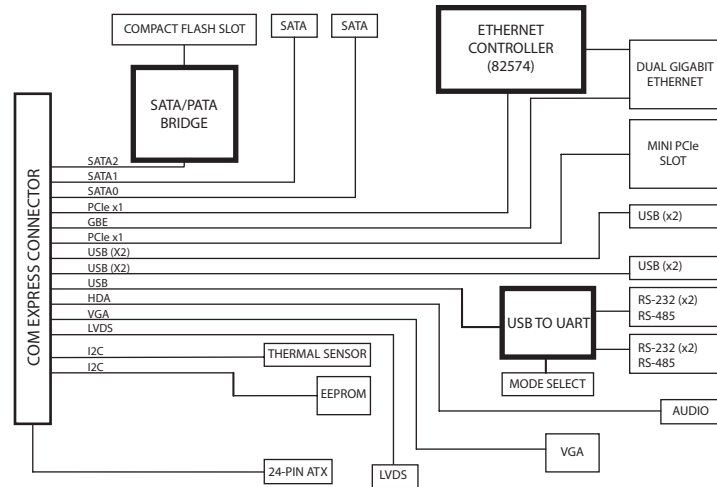
ISO9001  
AS9100



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## ACEX4405 COM Express Module Carrier Card



Supports Type 2/3 COM Express module ♦ Mini PCIe site ♦ ATX power connector ♦ Locking connectors

### 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.  
RS-232/485: Serial 10-pin dual row.  
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](http://www.acromag.com).

## VxWorks® Libraries (I/O Function Routines)



### IPSW-API-VXW

Support for Industry Pack modules and carriers

### PMCSW-API-VXW

Support for PMC, PCI, and CompactPCI boards

## 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.

## Features

- 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

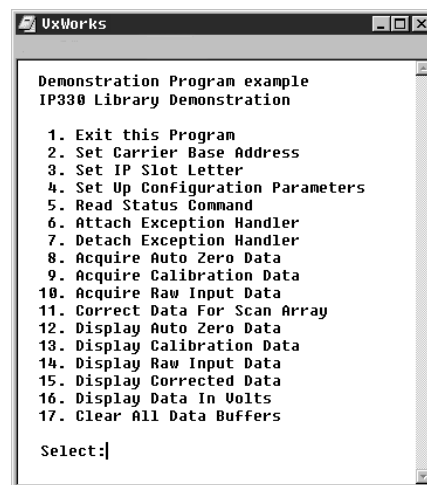
## Benefits

- 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

The VxWorks software libraries provide a simple API to quickly integrate Acromag's I/O boards with your application program.

## 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.



## 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.

## Ordering Information

### IPSW-API-VXW

VxWorks software support package for Industry Pack products (supports all Acromag IP modules and carriers) 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.

### 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)

### User-Friendly Licensing

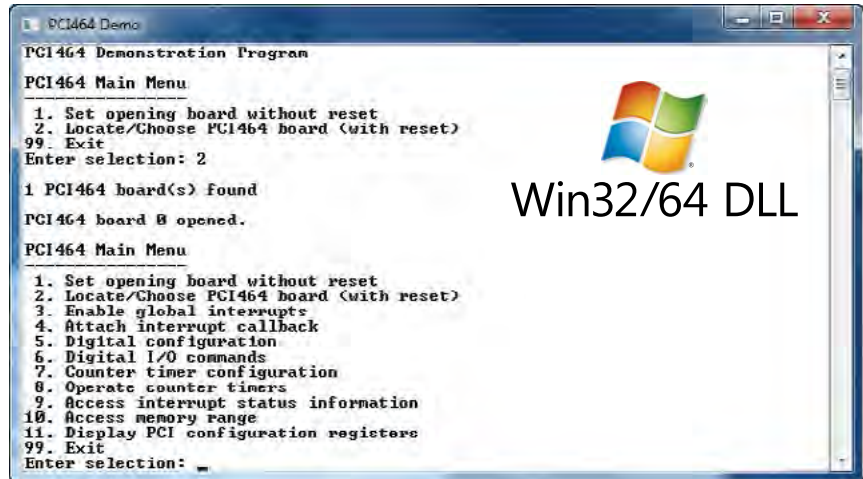
Acromag's VxWorks software libraries are provided with a full site license. This allows anyone at your location to use this software without any additional charges. Additionally, no run-time license is required either.

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.

All trademarks are the property of their respective owners.

# Software Support

## PCISW-API-WIN PCI Driver Software for Windows® Operating Systems



For Windows 8 / 7 / Vista / XP ♦ Supports Acromag XMC, PMC, PCI, CompactPCI cards ♦ Includes DLLs

### 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](http://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.

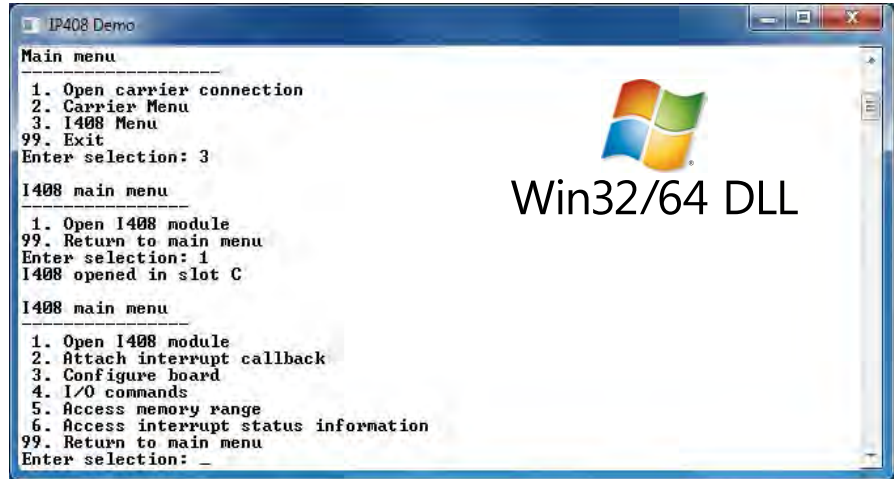
Each package supports all active PCI-based (PMC, XMC, PCI, CompactPCI) products. You do not need to order additional software for different models within the family. (does not support PMC CX family Virtex-II boards)



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# Software Support

## IPSW-API-WIN Industry Pack Driver Software for Windows® Operating Systems



For Windows 8 / 7 / Vista / XP ♦ Supports Acromag Industry Pack modules ♦ Includes DLLs

### 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 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 all active Acromag Industry Pack I/O and Industry Pack FPGA modules
- 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](http://www.acromag.com).

#### IPSW-API-WIN

32-bit and 64-bit Windows driver software package with DLLs and demonstration programs for Industry Pack products. Supplied on CD-ROM.

*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.

Each package supports all active IP-based (Industry Pack modules, PCI carriers, & CompactPCI carriers) products. You do not need to order additional software for different models within the family.



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## Linux™ Libraries (I/O Function Routines)



The free software utility is available for download from Acromag's website.

### IPSW-API-LNX

Support for Industry Pack modules and PCI carrier cards.

### IPSW-VME-LNX

Support for Industry Pack modules and Acromag VME single board computers.

### PCISW-API-LNX

Support for PCI/CompactPCI boards and PMC modules.

## 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 supplies 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.

## Features

- Easy installation procedure
- Readme files with step-by-step instructions
- Programming tools for most Acromag I/O boards (excludes serial I/O)
- Demonstration program

## Benefits

- 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

```
Linux
Demonstration Program example
IP220 Library Demonstration

1. Exit this Program
2. Set Carrier Address
3. Set IP Slot Letter
4. Transparent Mode Select
5. Simultaneous Mode Select
6. Simultaneous Trigger
7. Read Calibration Coefficients and I.D.
8. Write Ideal Data To Output
9. Write Corrected Data To Output
10. Display Ideal/Corrected Data, Offset/Gain Coefficients
11. Clear All Data Buffers
12. Alter Offset/Gain Coefficients

Select:|
```

## 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.

## Ordering Information

NOTE: The free unsupported software is available ONLY by download from Acromag's website.

### IPSW-API-LNX

Linux example libraries for Industry Pack modules and PCI carrier cards.

### IPSW-VME-LNX

Linux example libraries for Industry Pack modules and Acromag XVME-6300 VME SBC.  
(does not support IP571 and IP serial modules IP500/1/2, IP511/2, IP520/1)

### PCISW-API-LNX

Linux example libraries for PCI, CompactPCI, and PMC modules.

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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-3 connectors 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.



Transition modules simplify I/O connections in the rear of a card cage. From left: TRANS-200, TRANS-C200.



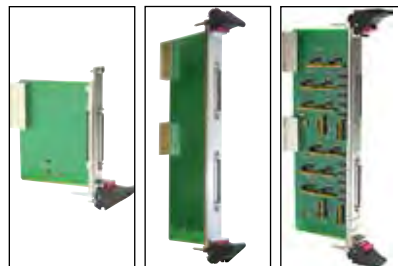
AVME9670 with TRANS-200, 5028-438, and 5028-378.



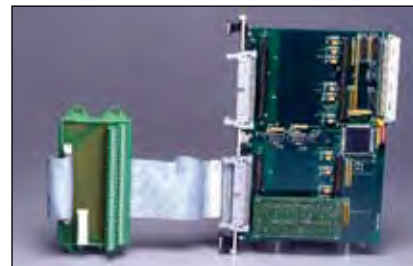
AcPC8625 with TRANS-C200, 5028-438, and 5028-378.



The 5025-552 termination panel and 5025-550 signal cable make field I/O connections to the APC8620 carrier easy.



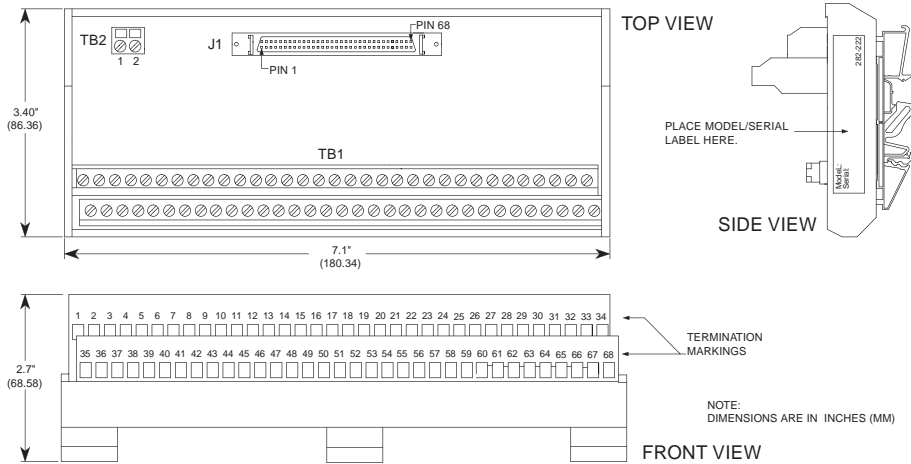
TRANS-C4610 and TRANS-C4620      TRANS-C5200/C5201



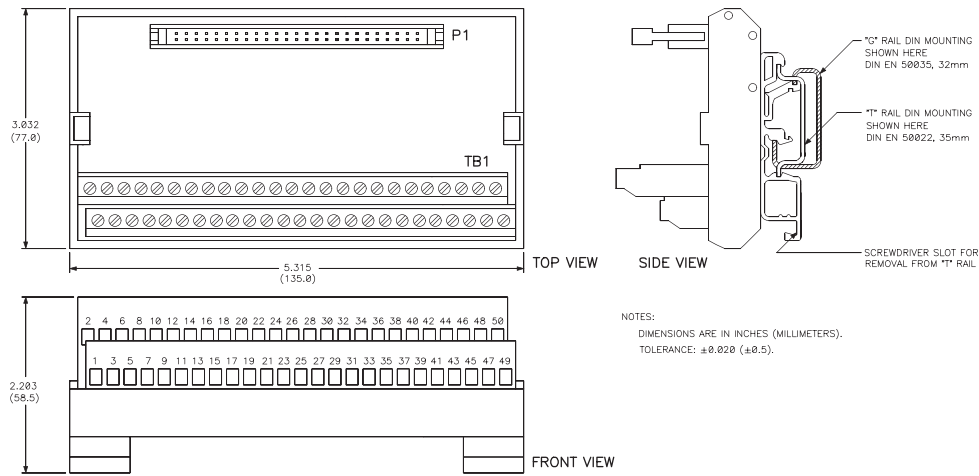
Attach up to four 5025-552 panels and 5025-550 cables to bring I/O connections out the front of an AVME9660 carrier.

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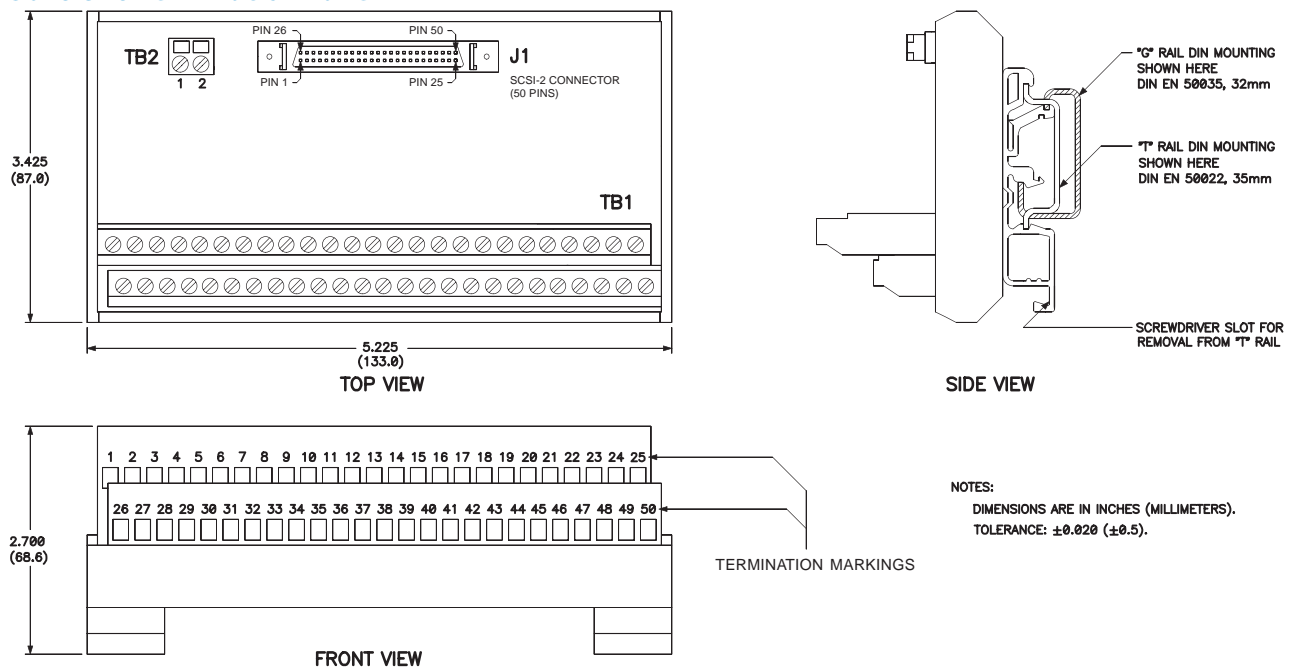
## 5025-288 Termination Panel



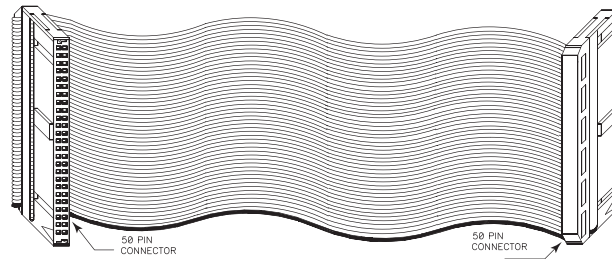
## 5025-552 Termination Panel



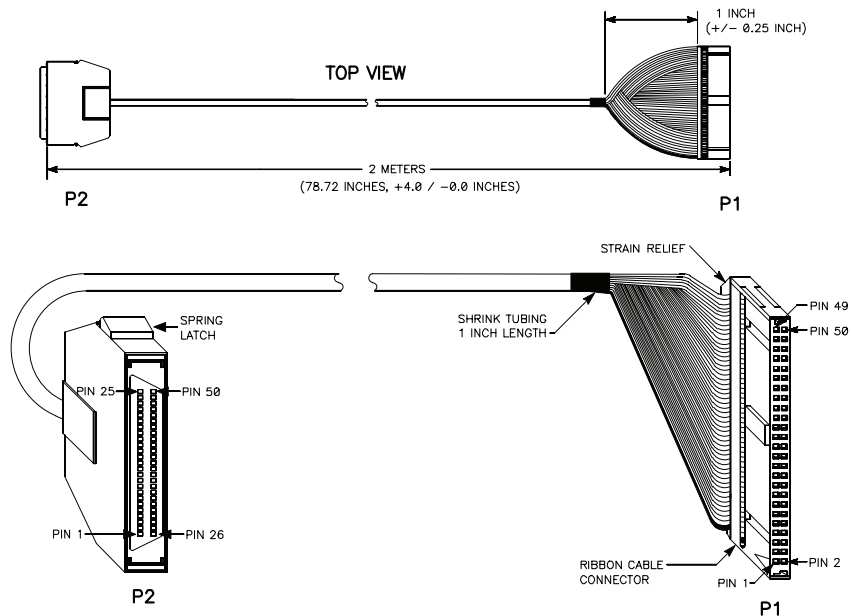
## 5028-378 Termination Panel



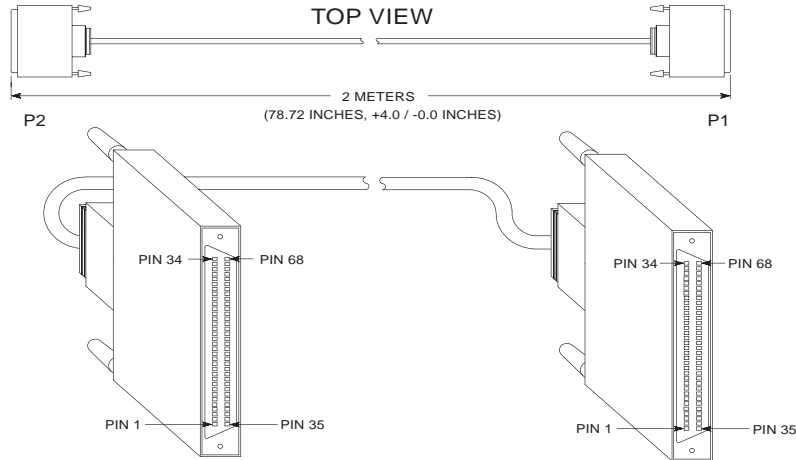
## 5025-550/551 Cable



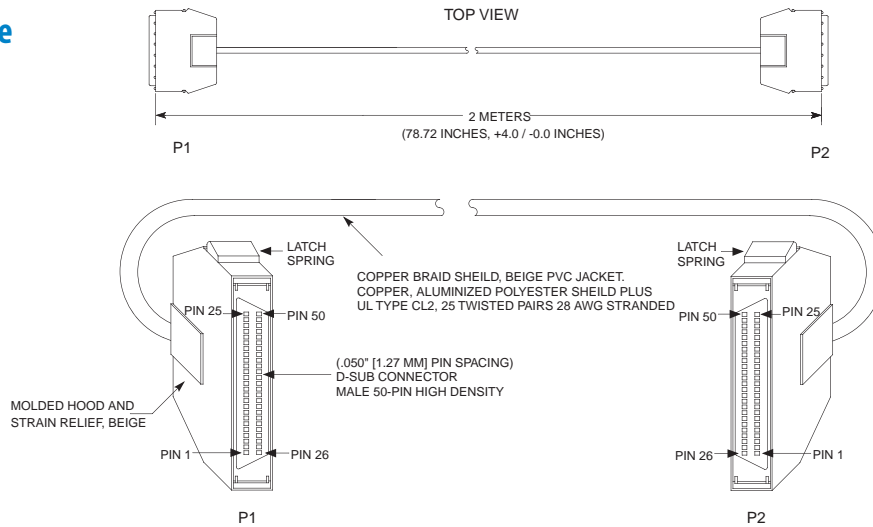
## 5028-187 Cable



## 5028-432 Cable



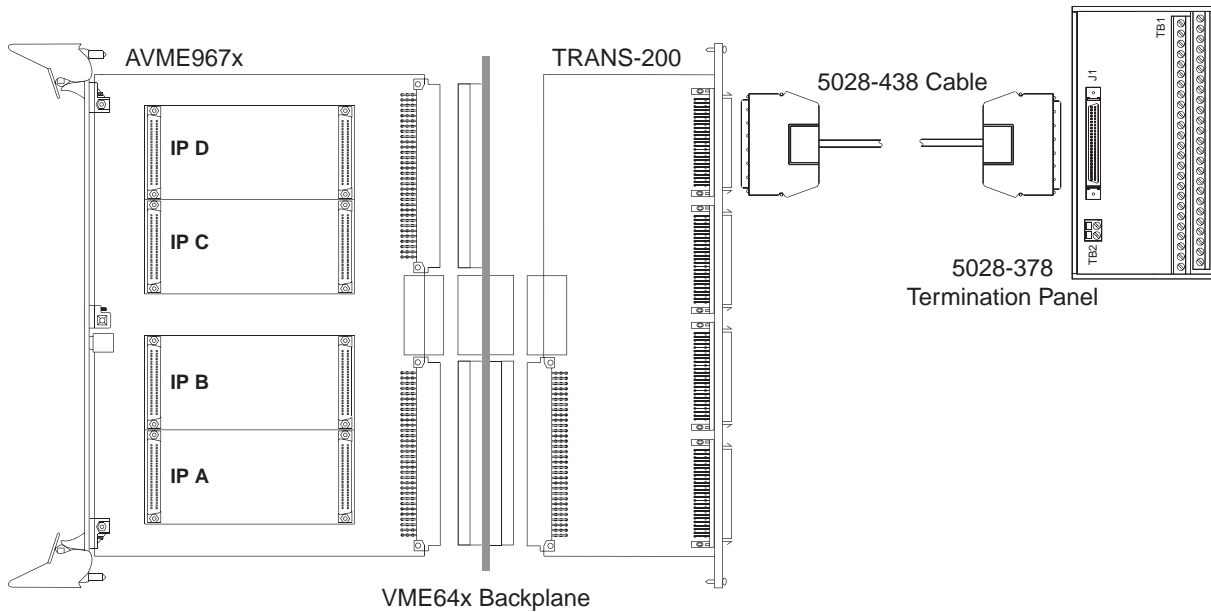
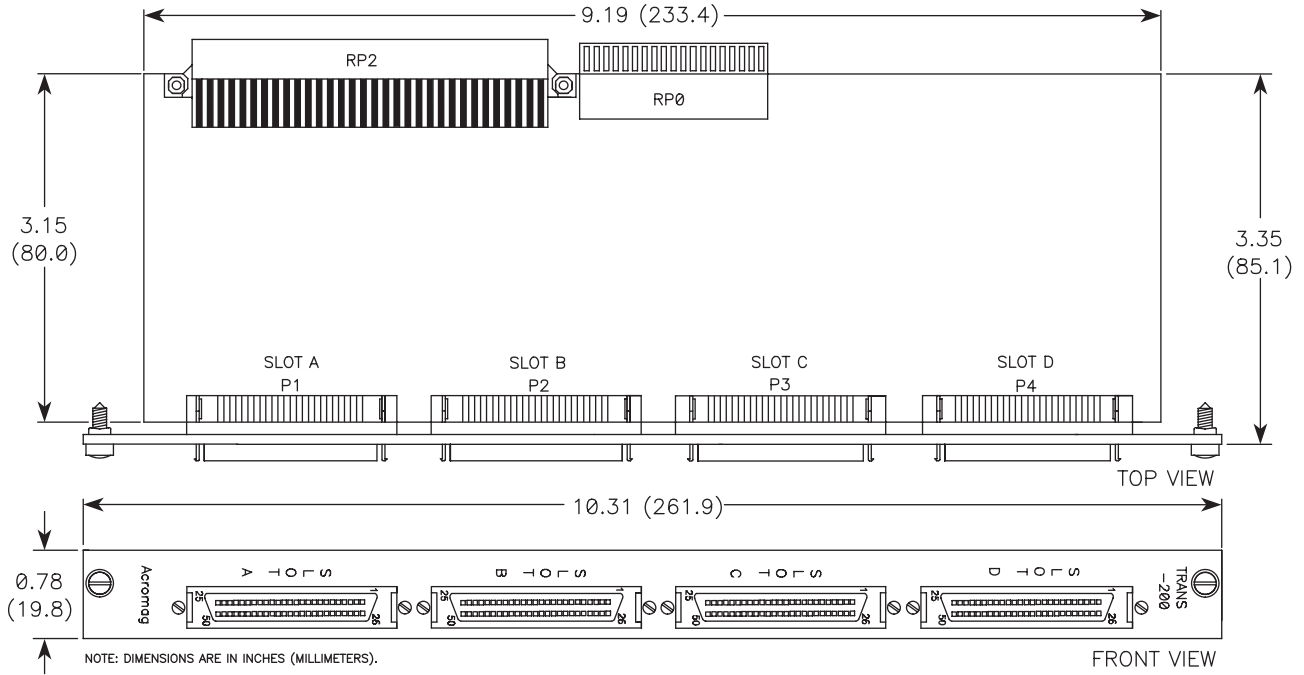
## 5028-438 Cable



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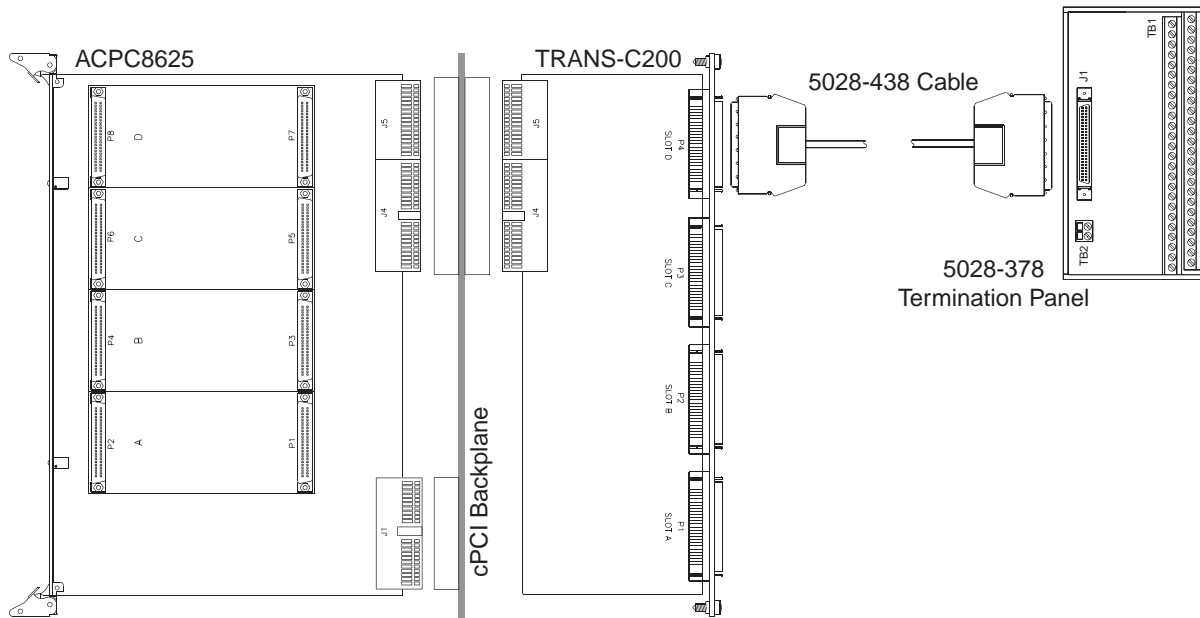
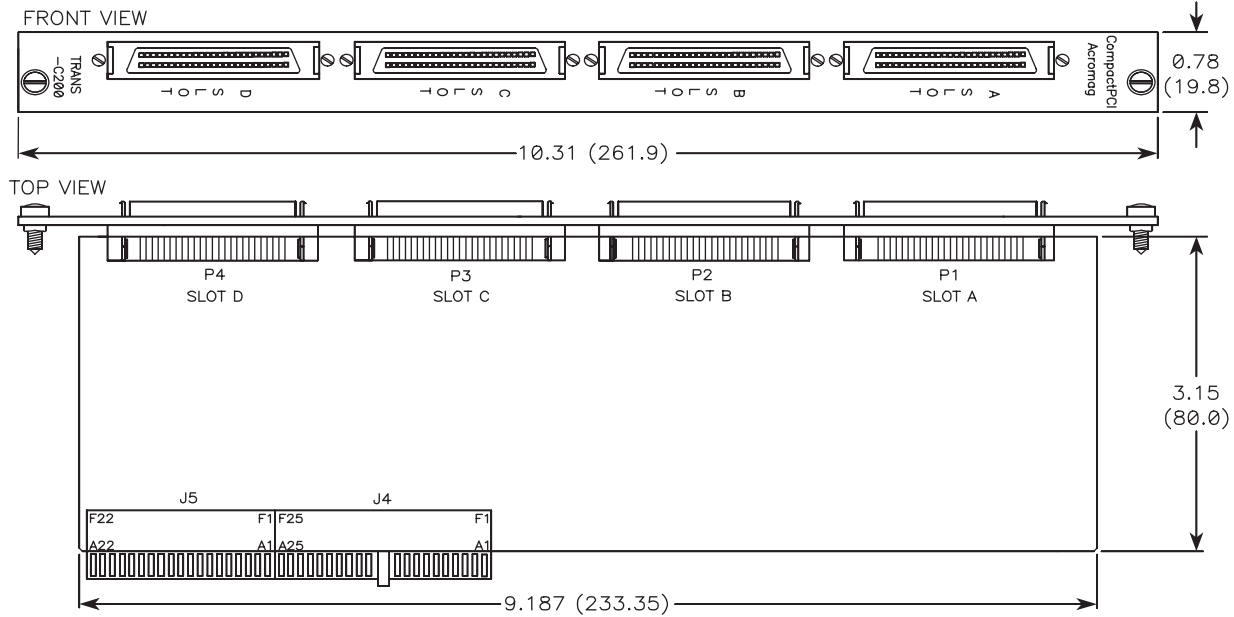
## TRANS-200

### Industry Pack Transition Module



## TRANS-C200

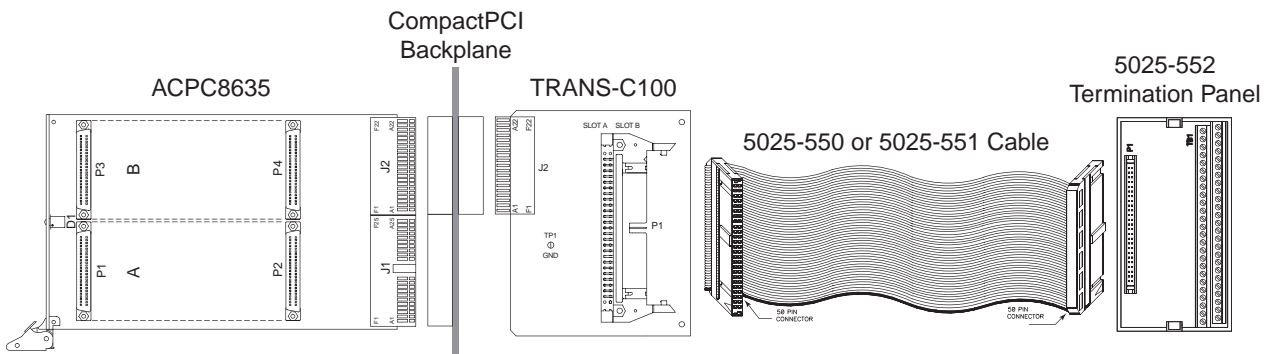
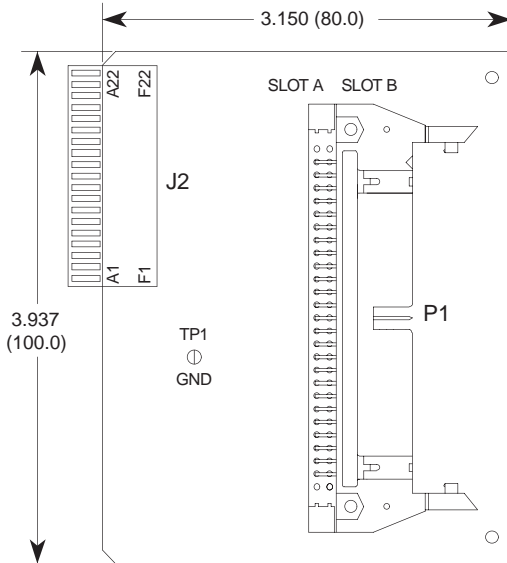
### Industry Pack Transition Module



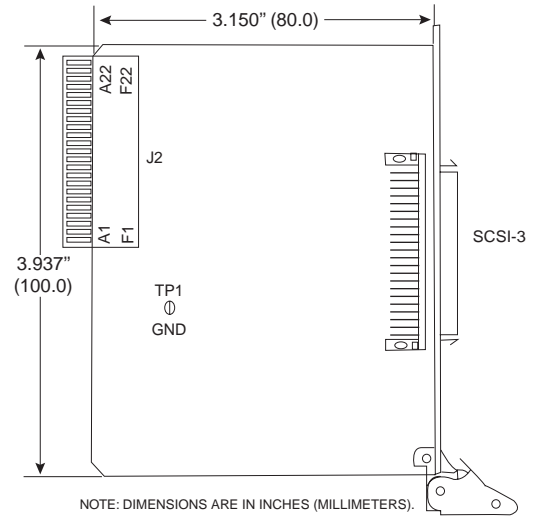
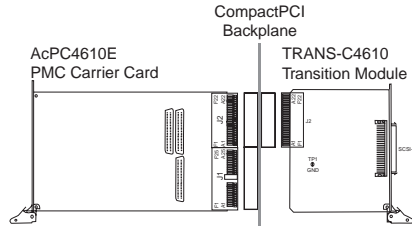
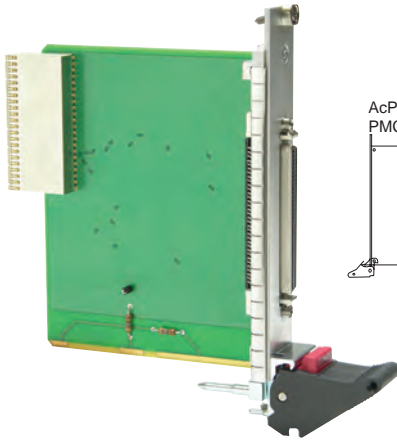
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## TRANS-C100

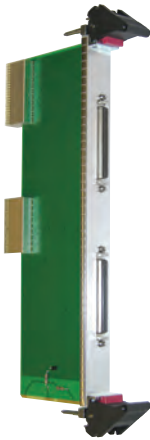
### Industry Pack Transition Module



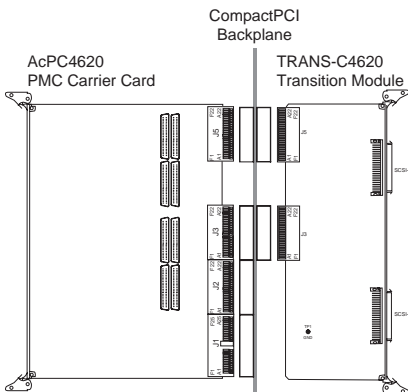
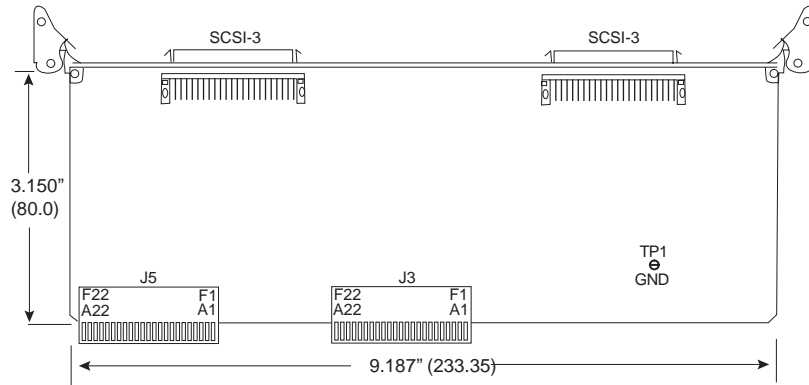
## TRANS-C4610 PMC Transition Module



## TRANS-C4620 PMC Transition Module

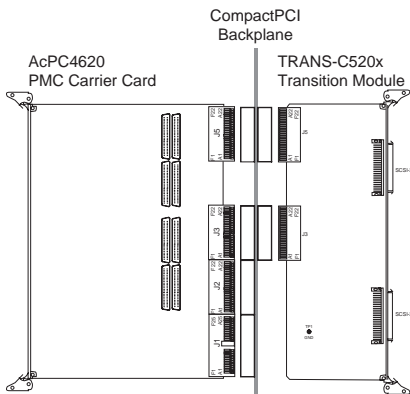
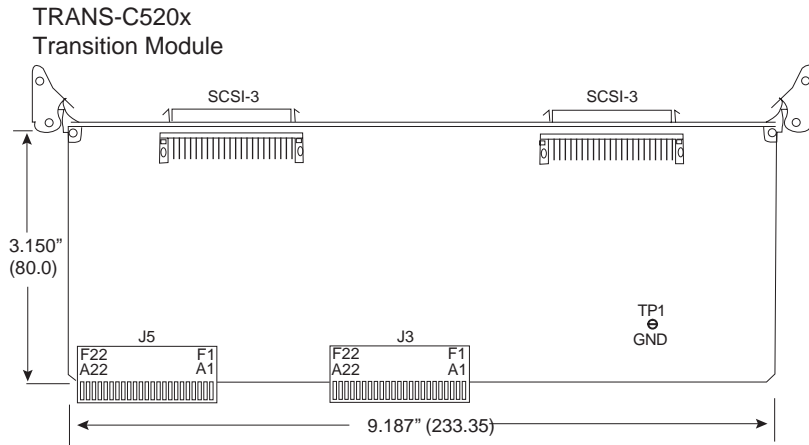


TRANS-C4620  
Transition Module

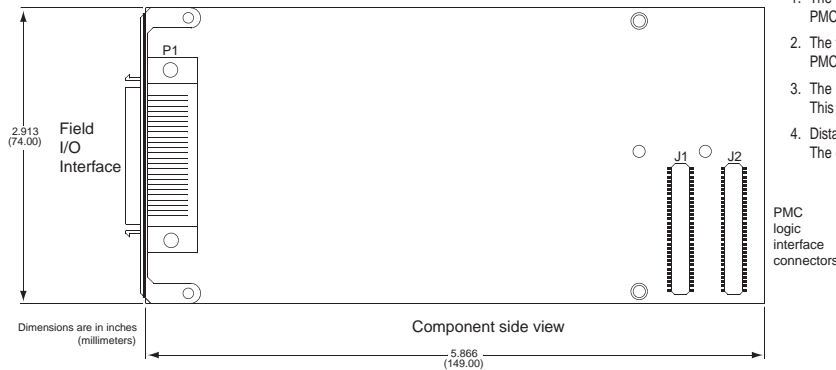
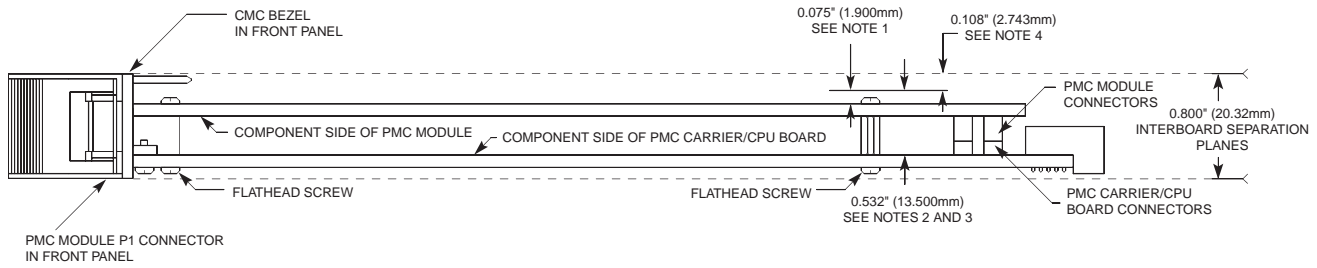




## TRANS-C5200/C5201 PMC Transition Module

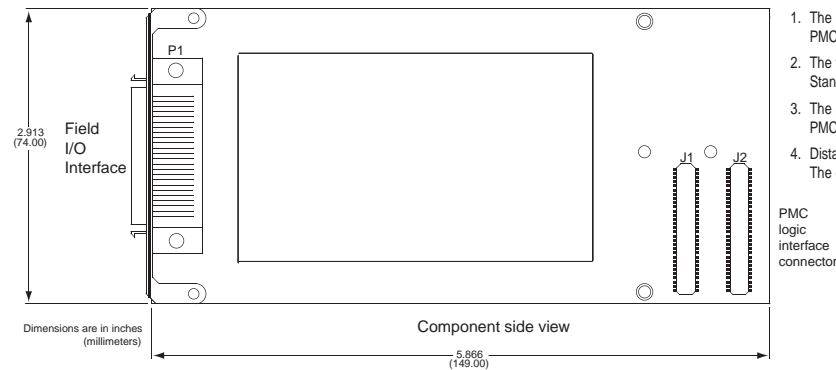
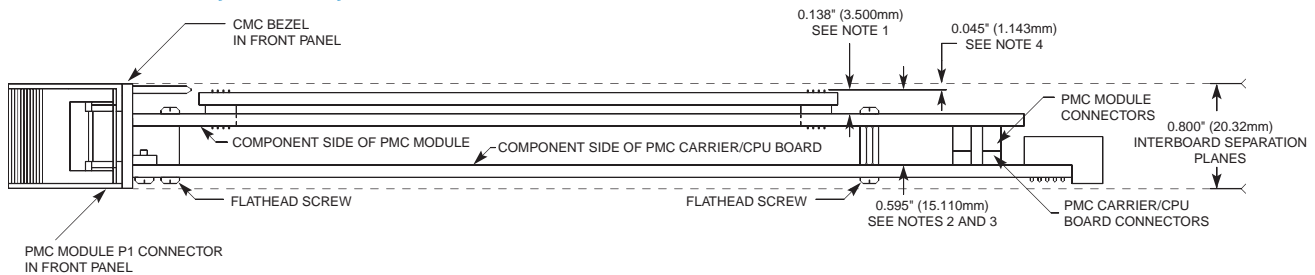


## Models PMC330, PMC341, PMC424, PMC464, PMC48x, PMC520, PMC521, PMC730, PMC-AXxxx, PMC-DXxxx



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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I/O Modules

Compact, fanless PC ♦ Intel Atom CPU ♦ Four plug-in I/O module slots ♦ Conduction-cooled chassis

### Description

Acromag's Industrial I/O Server is a rugged industrial PC with truly integrated support for user I/O. A built-in carrier card interfaces up to four plug-in I/O modules to the CPU. The embedded computer supports video, audio, Ethernet, serial, and USB devices. A wide variety of I/O modules provides mix and match flexibility, high channel density, and a clean cable interface.

The I/O Server's fanless design employs advanced thermal technology and high-performance components to accommodate a wide operating temperature range -30 to 75°C. Conduction cooling plates and thermal pads wick internal heat away to the aluminum enclosure where external cooling fins dissipate the heat.

Units are shock/vibration resistant and sealed to IP40 standards to ensure long term reliability in a variety of applications.

This combination of an industrial PC with fully integrated I/O offers a compact, yet powerful monitoring and control solution. Unlike many box PC systems that offer few I/O connection options or limit you to a single PC104 card, Acromag's I/O Server brings I/O modules inside the chassis. A tight footprint is maintained, four plug-in I/O modules of any mix are supported, and high density connectors provide clean signal wiring.

### Processor

Intel® Atom® N270 1.6GHz CPU

### PC Interface

Video: VGA up to 2048 x 1536 display

Audio: speaker out, microphone in

Memory-DRAM: 1GB DDR533

Memory-SSD: 2.5" 16GB solid-state drive option

Memory-removable: CompactFlash card slot

Serial ports: 1 x RS232, 1 x RS232/422/485

Ethernet ports: 2 x 10/100 BaseT (switched)

USB ports: 4 x USB 2.0 (2 with high retention)

### I/O Module Carrier

Capacity: Holds four I/O modules, 200 I/O lines

Connectors: 4 x 50 Pin SCSI-II

### I/O Modules (sold separately)

Analog I/O: A/D, D/A

Digital I/O: state, level, differential, counter, timer

Serial I/O: RS232, RS422, RS485 communication

FPGA: Altera® Cyclone®-II; TTL, LVDS, RS485 I/O

### Environmental

Power: 9 to 32V DC

Operating temperature: -30 to 75°C

### Approvals

CE

### Key Features & Benefits

- Rugged, industrial PC with fanless design delivers high-reliability operation
- 4 plug-in I/O module slots provide easy, low cost interface to instrumentation
- High-density, interchangeable I/O modules enable mix and match flexibility
- 20+ I/O modules available for a wide variety of analog, digital, and serial I/O functions
- Thermally-controlled chassis meets extreme operating temperature requirements
- Compact, shock and vibration-resistant design

### Applications

- Industrial machine control, factory automation
- Military and homeland security systems
- Aerospace, marine, and ground-based systems
- Transportation, mining, mobile servers
- Outdoor signage, kiosks, display systems
- Building management and control
- Test & measurement, data acquisition, SCADA
- Scientific research, simulation

## IOS-7400 Industrial PC with I/O Module Carrier Card

### Performance Specifications

#### Processor System

**CPU**  
Embedded Intel® Atom® N270 1.6GHz.

**System Memory**  
1GB installed. 200-pin SODIMM socket, DDR2 533MHz up to 2GB.

**System Chipset**  
Intel® 945GSE / ICH7M chipset 533MHz FSB.

**BIOS**  
AWARD™ 8Mbit Flash BIOS.

**Ethernet Chipset**  
Intel® 82562GZ 10/100Mbps Ethernet chip.

**Display Chipset**  
Intel® 945GSE.

**Display VRAM**  
DVMT 3.0 support up to 224MB.

**Display Resolution**  
Up to 2048 x 1536.

**Operating System**  
Supports Windows® XP Embedded and Linux.

#### Interface Connections

**Video**  
1 x VGA connector. Resolution CPU-dependent.

**Audio**  
1 x speaker out. 1 x mic in. AC97 2.3 compliant.

**Hard Disk Drive / Solid-State Drive**  
User-installed option, 2.5" HDD/SSD PATA.

**Removable Memory**  
1 x CompactFlash slot.

**Serial Ports**  
1 x RS232. 1 x RS232/422/485.

**USB Ports**  
4 x USB 2.0 compliant ports.

**Ethernet Ports**  
2 x 10/100 BaseT (unmanaged switch).

#### I/O Module Carrier

**I/O Slots**  
Holds up to four Acromag IOS I/O Modules.

**Thermal Control**  
Conduction-cooled I/O modules.

**Connectors**  
SCSI-II 50-pin connector for each I/O module.

#### Physical & Environmental

**Dimensions**  
Size: 11.8" x 3.0" x 7.3"  
(299.7mm x 76.2mm x 182.9mm).  
Weight: 5.95lbs (2.70kg).

**Operation and Storage Temperature**  
Operation: -30 to 75°C (-22 to 167°F)  
Storage: -40 to 85°C (-40 to 185°F).

**Operating Humidity**  
0% - 90% relative humidity, non-condensing.

**Shock Resistance**  
50g rms per IEC-68-2-27, half-sine, 11ms duration.

**Vibration Resistance**  
5g rms per IEC-68-2-64, random, 5-500MHz,  
1 oct/min, 1hr per axis.

**Power Requirements**  
Supply Voltage: 9 - 32V DC ±10% @ 60W max.  
Power Usage: Depends on configuration. 30W typical.

**Approvals**  
CE.

**FCC Compliance**  
FCC Part 15, Subpart B, Class A Digital Device.

**MTBF**  
Contact factory.

### Ordering Information

#### Industrial PCs

Each unit holds four I/O modules, sold separately.

#### IOS-7400

Industrial PC with Intel® Atom® N270 1.6GHz

#### IOS-7400-WIN

Same as above plus licensed Windows Embedded Standard 2009 image installed on CompactFlash card

#### I/O Modules

More than 20 models available, sold separately.  
See [www.acromag.com](http://www.acromag.com) for more information.

#### Software Support

See [www.acromag.com](http://www.acromag.com) for more information.

#### IOSSW-DEV-WIN

Windows® Win32 development package. Includes CD-ROM with API development software, example programs with source code, and Win32 DLL drivers

#### IOSSW-API-LINUX

Linux function libraries software for I/O Server

#### Accessories

See [www.acromag.com](http://www.acromag.com) for more information.

#### 5028-378

Termination Panel, DIN rail-mount, 50 screw terminals, SCSI-2 connector

#### 5028-438

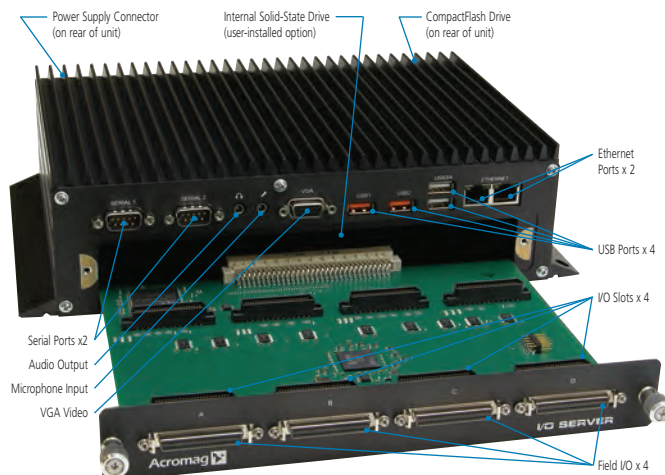
Round cable, shielded, SCSI-2 50-pin connectors, 6 ft.

#### PS5R-SD24

60W power supply, 24V DC @ 2.5A

#### PS5R-SE24

90W power supply, 24V DC @ 3.75A



ISO9001  
AS9100

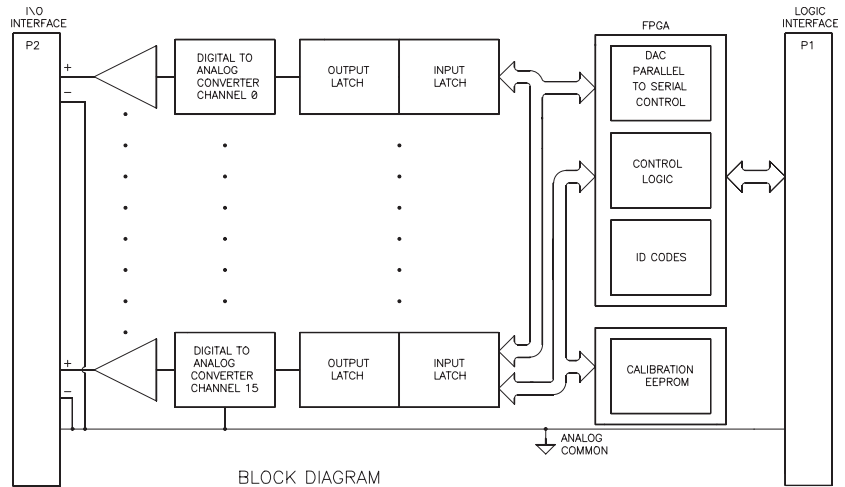


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# IOS Modules

## IOS-220 Analog Output Module



### 12-bit D/A ◆ 8 or 16 analog voltage output channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

The IOS-220 outputs analog voltage signals to drive up to 16 devices. 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.

#### Key Features & Benefits

- 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
- 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.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-220-8  
Eight voltage outputs

IOS-220-16  
Sixteen voltage outputs

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-220 Analog Output Module

### Performance Specifications

#### ■ Analog Outputs

Output configuration  
8 or 16 single-ended

D/A Resolution  
12 bits

Output range  
Bipolar, -10 to +10V

Settling time  
11 $\mu$ S

#### Maximum throughput rate

Outputs can be updated simultaneously or individually.  
One channel: 11 $\mu$ S/conversion.  
Sixteen channels simultaneously: 11 $\mu$ S/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

-2 to +2mA (maximum). This corresponds to a  
minimum load resistance of 5K ohms with a 10V  
output.

#### Short circuit protection

Indefinite at 25°C.

#### ■ Data Transfer

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.

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

Access Times (8MHz clock):

ID EEPROM read: 0 wait states (250nS cycle).

DAC channel data write: 1 wait state (375nS cycle).

DAC offset/gain coeff. read: 1 wait state (375nS cycle).

Control register access: 1 wait state (375nS cycle).

#### ■ Environmental

Operating temperature

-40 to 85°C

Storage temperature

-55 to 100°C.

Relative humidity

5 to 95% non-condensing

MTBF

4,094,686

Power

+5V: 33mA typical, 45mA maximum.

+12V from P1: 150mA typical, 200mA maximum.

-12V from P1: 133mA typical, 180mA maximum.

Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

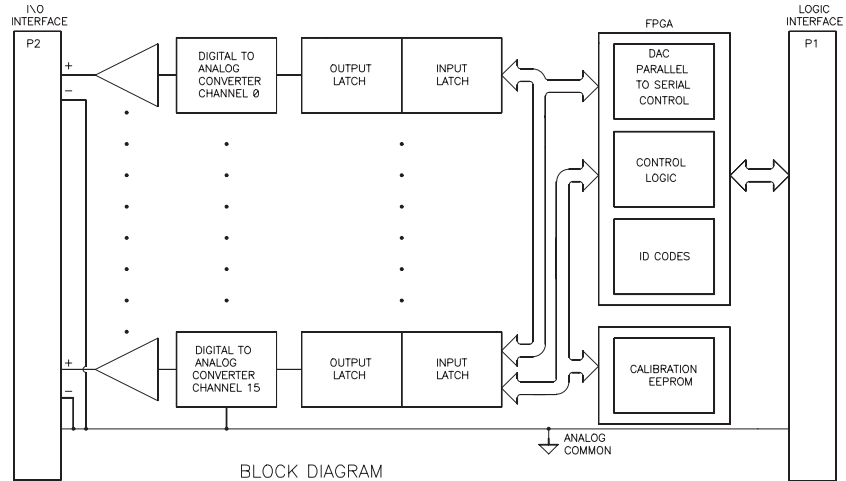
ISO9001  
AS9100   
MADE IN USA

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# IOS Modules

## IOS-231 Analog Output Module



### 16-bit D/A ♦ 8 or 16 analog voltage output channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

Each output channel on the IOS-231 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

- 8 or 16 analog voltage output channels
- Independent 16-bit D/A converters per channel with an 13.0µs settling time
- Bipolar voltage (non-isolated) outputs: -10 to +10 volts
- Double-buffered DACs
- High load capability (5mA output current)
- Built-in calibration coefficients
- 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.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-231-8  
Eight voltage outputs

IOS-231-16  
Sixteen voltage outputs

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-231 Analog Output Module

### Performance Specifications

#### ■ Analog Outputs

Output configuration  
8 or 16 single-ended.

D/A Resolution  
16 bits.

Output range  
Bipolar, -10 to +10V.

Settling time  
13 $\mu$ S.

Maximum throughput rate  
Outputs can be updated simultaneously or individually.  
One channel: 13 $\mu$ S/conversion.  
Sixteen channels simultaneously: 13 $\mu$ S/16 channels.

System accuracy  
0.0305% of 20V span maximum corrected error  
(i.e. calibrated) at 25°C with the output unloaded.

Linearity error  
 $\pm 2$  LSB (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.

#### ■ Data Transfer

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.

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

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  
-40 to 85°C.

Storage temperature  
-55 to 100°C.

Relative humidity  
5 to 95% non-condensing.

MTBF  
Consult factory.

Power  
+5V: 45mA.  
+12V: 200mA.  
-12V: 180mA.

Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

ISO9001  
AS9100   
MADE IN USA

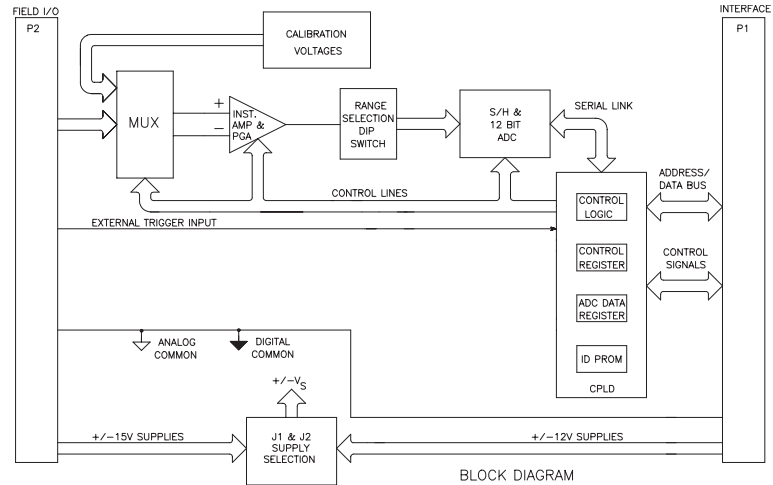
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# IOS Modules

## IOS-320 Analog Input Module



12-bit A/D ♦ 20 differential or 40 single-ended channels

### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

The IOS-320 monitors 20 differential or 40 single-ended input channels.

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.

### Key Features & Benefits

- 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
- 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.
- -40 to 85°C operating temperature range

### Ordering Information

#### IOS Modules

IOS-320  
Analog input, 12-bit A/D, 20D / 40SE channels

#### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-320 Analog Input Module

### Performance 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  $\pm 15V$  external power supply.  
Clipping occurs with  $\pm 12V$  supplies, typically to  $\pm 9V$ .

Maximum throughput rate  
200KHz (5 $\mu$ S/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.

Input Range	PGA Gain	ADC Range (volts)	Max. Error $\pm$ LSB (%span)
0 to 10	1	0 to 10	3.2 (0.078)
-5 to +5	1	-5 to +5	1.8 (0.044)
-10 to +10	1	-10 to +10	2.8 (0.069)

Data format (left-justified)  
Straight Binary.

Input overvoltage protection  
 $\pm 32V$  powered,  
-35 to +55 unpowered.

Common mode rejection ratio (60Hz)  
71dB.

Channel-to-channel rejection ratio (60Hz)  
71dB.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

Access Times (8MHz clock):  
All functions: 0 wait states (250nS cycle) except  
Control register write: 1 wait state (375nS cycle),  
Read ADC data: 2 wait states (500nS cycle).  
Conversion Request (write): 1 wait state (375nS cycle)

#### ■ Environmental

Operating temperature  
-40 to 85°C.

Storage temperature  
-55 to 105°C.

Relative humidity  
5 to 95% non-condensing

MTBF  
719,999 hours at 25°C, MIL-HDBK-217F, Notice 2

Power  
+5V: 210mA maximum.  
+12V from P1 or +15V from P2: 25mA maximum.  
-12V from P1 or -15V from P2: 25mA maximum.

Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

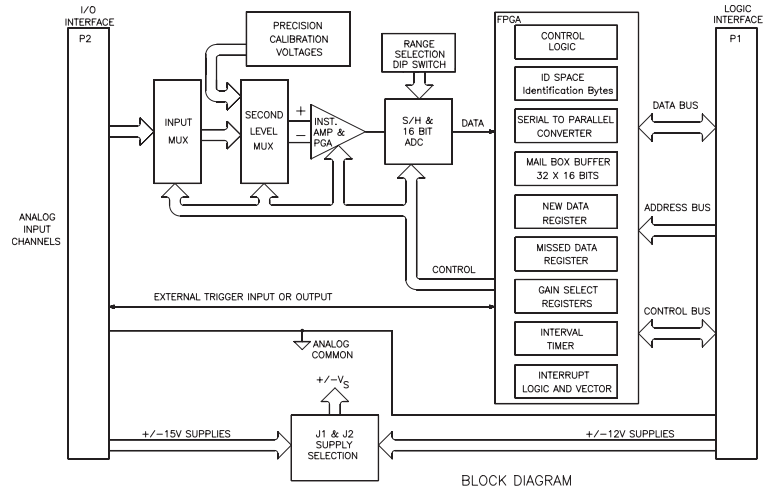
ISO9001   
AS9100 **MADE IN USA**

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# IOS Modules

## IOS-330 Analog Input Module



16-bit A/D ♦ 16 differential or 32 single-ended channels

### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-330 modules provide fast, high resolution A/D conversion.

The IOS-330 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.

### Key Features & Benefits

- 16-bit A/D converter (ADC)
- 5 $\mu$ s conversion time (200KHz)
- 16 differential or 32 single-ended inputs ( $\pm 5V$ ,  $\pm 10V$ , 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
- "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.
- -40 to 85°C operating temperature range

### Ordering Information

#### IOS Modules

IOS-330  
Analog input, 16-bit A/D, 16D / 32SE channels

#### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-330 Analog Input Module

### Performance Specifications

#### ■ Analog Inputs

Input configuration  
32 single-ended or 16 differential.

A/D Resolution  
16 bits.

Input ranges  
 $\pm 5V$ ,  $\pm 10V^*$ , 0-5V, and 0-10V\*.  
\* Requires  $\pm 15V$  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 (5 $\mu$ S/conversion).  
[66KHz (15 $\mu$ S/conversion) recommended]  
16 channels (differential): 4.2KHz (240 $\mu$ S/16 ch)  
32 channels (single-ended): 2.1KHz (480 $\mu$ S/32 ch).

Programmable gains  
1x, 2x, 4x, 8x.

A/D triggers  
External and software.

System accuracy  
2 LSB (0.0030%) typical  
(SW calibration, gain=1, 25°C).

Data format  
Straight binary or two's complement.

Input overvoltage protection  
 $V_{SS}$  -20V to  $V_{DD}$  40V with power on, -35V to 55V power off.

Common mode rejection ratio (60Hz)  
96dB typical.

Channel-to-channel rejection ratio (60Hz)  
96dB typical.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

Access times (8MHz clock)  
ID PROM read: 1 wait state (375nS cycle).  
I/O space read/write: 1 wait states.  
Interrupt select cycle read: 1 wait state.  
Mail box I/O read: 1 wait state. 3 wait states if ongoing internal mail box write.

#### ■ Environmental

Operating temperature  
-40 to 85°C.

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.

Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

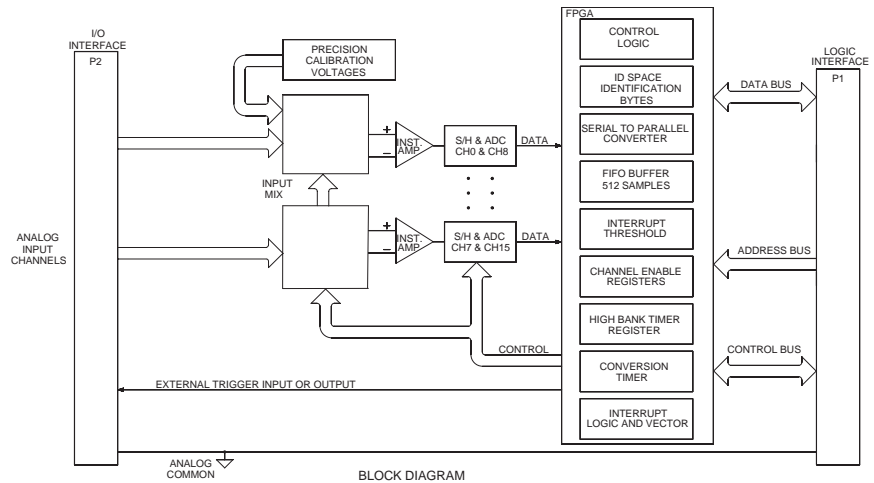
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# IOS Modules

## IOS-341 Analog Input Module



### 14-bit A/D simultaneous sample & hold ◆ 16 differential channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-341 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.

#### Key Features & Benefits

- 16 differential inputs ( $\pm 10V$  DC input range)
- Eight 14-bit A/D converters 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
- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.
- Programmable interrupts simplify data acquisition by providing greater control.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-341  
Analog input, 14-bit A/D simultaneous sample & hold, 16 differential channels

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-341 Analog Input Module

### Performance Specifications

#### ■ Analog Inputs

**Input configuration**  
16 differential.

**A/D Resolution**  
14 bits.

**Input ranges**  
±10V.

**Data sample memory**  
512 sample FIFO buffer.

**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 minimum 2.2K ohm source resistance).

**Data sample memory**  
512-sample FIFO memory buffer.

**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 with power on, ±40V with power off.

**Common mode rejection ratio (60Hz)**  
96dB typical.

**Channel-to-channel rejection ratio (60Hz)**  
96dB typical.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

**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**  
-40 to 85°C.

**Storage temperature**  
-40 to 125°C.

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

**MTBF**  
Contact Factory.

**Power**  
+5V: 76mA  
+12V from P1: 7mA.  
-12V from P1: -6mA.

**Approvals**  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

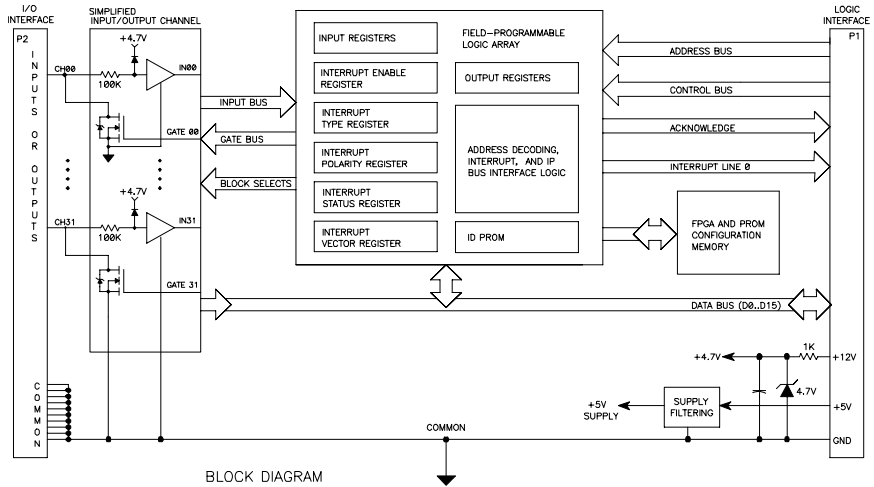
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# IOS Modules

## IOS-408 Digital I/O Module



### High voltage digital input/output ◆ 32 bi-directional channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

The IOS-408 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.

#### Key Features & Benefits

- 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)
- 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.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-408  
Digital input/output, 32 high-voltage bidirectional I/O

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-408 Digital I/O Module

### Performance Specifications

#### ■ Digital Inputs

##### Input channel configuration

32 non-inverting buffered inputs with a common connection. Input signal voltage range: 0 to 60V DC, maximum.

##### Input signal threshold

TTL compatible. 1.5V DC with 200mV of hysteresis, typical. Limited to TTL levels of 0.8V DC (maximum low level) and 2.0V DC (minimum high level).

##### Input response time

250nS minimum to 375nS maximum.

##### Interrupts

Change-of-state and level on channels 0-7.

#### ■ Digital Outputs

##### Channel configuration

32 open-drain DMOS MOSFETs with common source connection.

##### Output ON current range

0 to 1A DC, continuous per channel max. (10A total for all channels combined). No derating required at elevated ambients.

##### Turn on time

320nS typical (varies with load).

##### Turn off time

500nS typical (varies with load).

#### ■ Data Transfer

##### Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### 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

-40 to 85°C.

##### Storage

-55 to 125°C.

##### Relative Humidity

5 to 95% non-condensing

##### MTBF

Contact factory.

##### Power

+5V (±5%): 50mA max. +12V (±5%) from P1: 8.5mA max. -12V (±5%) from P1: 0mA (not used).

##### Approvals

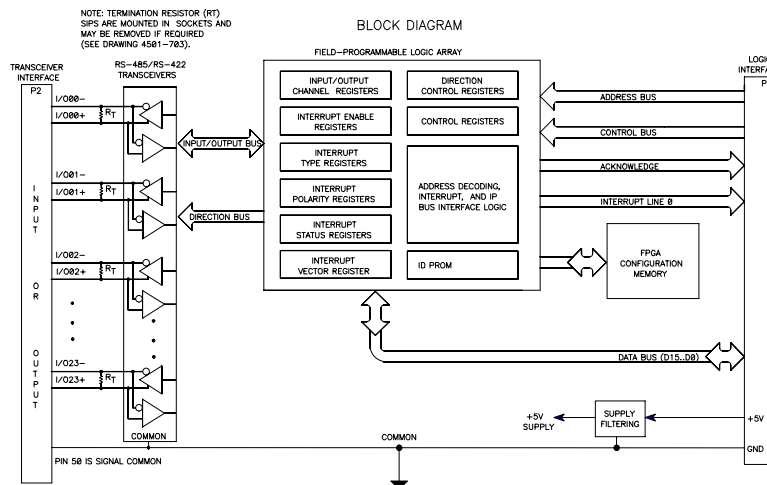
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.





# IOS Modules

## IOS-409 Digital I/O Module



Differential digital input/output ♦ 24 differential I/O channels

### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

The IOS-409 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.

### Key Features & Benefits

- 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
- All channels programmable as inputs or outputs.
- Differential data transmission is ideal for high-speed, long distance communication in noisy environments.
- -40 to 85°C operating temperature range

### Ordering Information

#### IOS Modules

IOS-409

Digital input/output, 32 differential bidirectional I/O

#### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-409 Digital I/O Module

### Performance 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.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

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  
-40 to 85°C.

Storage temperature  
-55 to 125°C

Relative Humidity  
5 to 95% non-condensing

Power  
+5V (±5%): 50mA maximum.  
±12V (±5%) from P1: Not used.

Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

MTBF  
Contact factory.

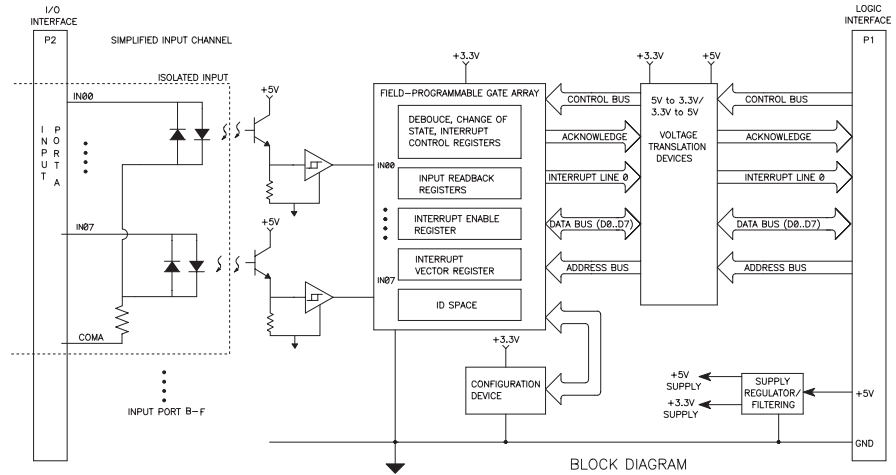
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# IOS Modules

## IOS-440 Digital Input Module



### Isolated digital input ♦ 32 port-isolated channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-440 I/O 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 IOS-440 in conjunction with Acromag's IOS-445 digital output module.

#### Key Features & Benefits

- 32 port-isolated input channels
- ±16 to ±40V DC or AC peak input range
- 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)
- Software configuration allows "on-the-fly" changes without removing modules.
- Pins are compatible with IOS-445 output module for loopback monitoring
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-440-2  
Digital input, 32 port-isolated channels

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-440 Digital Input Module

### 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 1500V AC dielectric strength test for one minute without breakdown).

#### Bipolar input voltage range

±16 to ±40V DC or AC peak.

#### Input low-to-high threshold

±6.8V 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.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

#### Access times (8MHz clock)

0 wait states (250nS cycle).

#### Updates

Requires four 8-bit reads to update all channels.

#### ■ Environmental

**Operating temperature**  
-40 to 85°C.

**Storage temperature**  
-55 to 150°C.

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

**MTBF**  
Contact the factory.

**Power**  
+5V (±5%): 150mA maximum, 65mA typical.  
±12V (±5%): 0mA (not used).

**Approvals**  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

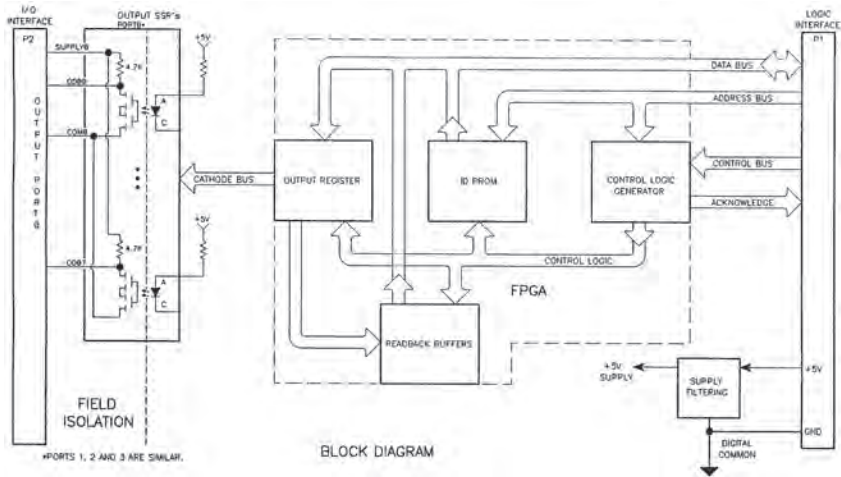
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# IOS Modules

## IOS-445 Digital Output Module



### Isolated digital output ♦ 32 port-isolated channels (solid-state relays)

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-445 modules provide 32 isolated solid-state relay outputs to safely control discrete devices.

A major IOS-445 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 IOS-445 with an IOS-440 input module.

#### 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 (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
- Unique ground reference points for each port permits AC and DC switching on one module.
- Pins are compatible with IOS-440 input module for loopback monitoring.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-445  
Digital output, 32 port-isolated channels (SSRs)

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-445 Digital Output Module

### 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. 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  $\pm 60$ V DC or peak AC.

##### Output ON current range

140mA maximum continuous (up to 1A total per port).

##### Turn on time

1mS typical, 2mS maximum.

##### Turn off time

1mS typical, 2mS maximum.

##### Output pull-up resistors

4.7K ohms, socketed.

#### ■ Data Transfer

##### Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### Access times (8MHz clock)

0 wait states (250nS cycle).

##### Updates

Requires four 8-bit writes to update all channels.

#### ■ Environmental

##### Operating temperature

-40 to 85°C.

##### Storage temperature

-40 to 125°C.

##### Relative humidity

5 to 95% non-condensing.

##### MTBF

Contact the factory.

##### Power

+5V ( $\pm 5\%$ ) all outputs on: 400mA maximum.

$\pm 12$ V ( $\pm 5\%$ ): 0mA (not used).

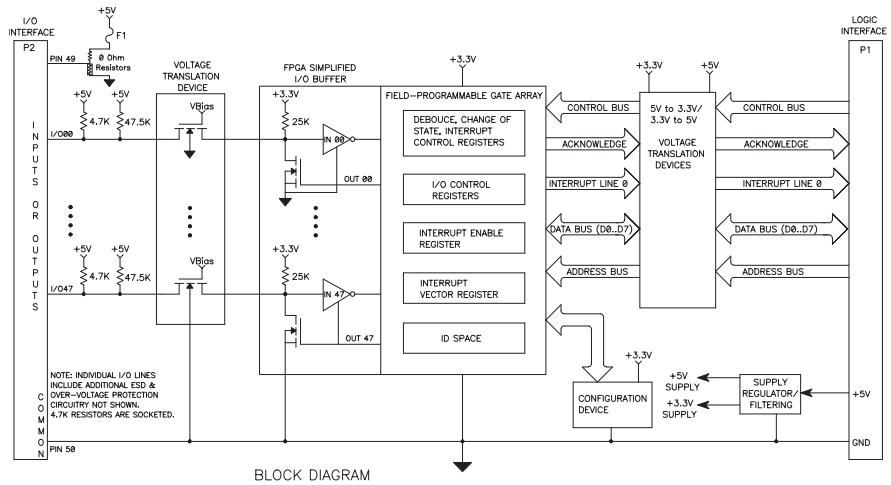
##### Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.



# IOS Modules

## IOS-470 Digital I/O Module



### TTL-level digital I/O ♦ 48 bi-directional channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-470 I/O Server modules provide 48 general-purpose, bi-directional 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.

IOS-470 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.

#### Key Features & Benefits

- 48 bi-directional 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
- 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.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-470  
48-channel digital I/O module.

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-470 Digital I/O Module

### Performance 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.

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

Access times (8MHz clock)  
0 wait states (250nS cycle).

Updates  
Requires six 8-bit read/writes to update all 48 channels.

#### ■ Environmental

Operating temperature  
-40 to 85°C.

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).

Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

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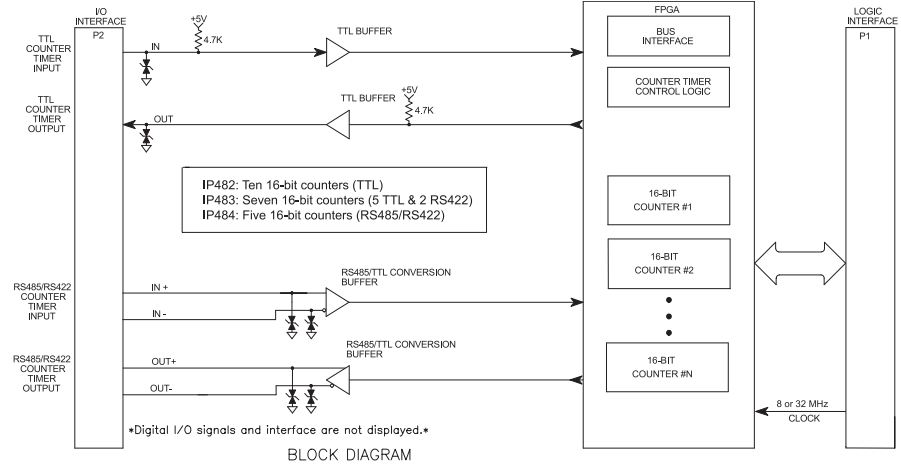
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# IOS Modules

## IOS-480 Counter/Timer Module



### 16-bit counter/timers ♦ TTL and RS422 channels

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-480 models, available in 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.

#### Key Features & Benefits

- Up to ten 16-bit counter/timers (IOS-482)
- Available with both TTL and RS422 driver interface (IOS-483 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
- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

- IOS-482  
Ten 16-bit counters – TTL
- IOS-483  
Five 16-bit counters – TTL,  
Two 16-bit counters – RS422
- IOS-484  
Five 16-bit counters – RS422

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-480 Counter/Timer Module

### Performance Specifications

#### Counter/Timers

##### Counter/timer configuration

IOS-482: Ten 16-bit counters – TTL

IOS-483: Five 16-bit counters – TTL

Two 16-bit counters – RS422

IOS-484: 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.

External clock: 2MHz maximum frequency.

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.

External clock: 8MHz maximum frequency.

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  $\pm 62$ nS.

Watchdog: Timeout occurs within  $\pm 1$  clock cycle.

Pulse/period measurement:  $\pm 1$  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

$V_{IH} = 2.0V$  and  $V_{IL} = 0.8V$ . inputs are buffered and include 4.7K pull-ups to +5V.

##### Counter output

Level is TTL or RS422 differential digital.

#### Data Transfer

Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### Access times (8MHz or 32MHz clock)

ID space read: 0 wait states (250nS cycle).

Registers read/write: 1 wait state (500nS cycle).

Interrupt read/write: 0 wait states (250nS cycle).

#### Environmental

Operating temperature

-40 to 85°C.

Storage temperature

-55 to 125°C

Relative humidity

5 to 95% non-condensing.

##### MTBF

Contact the factory.

##### Power

+5V ( $\pm 5\%$ ): 480mA maximum.

##### Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

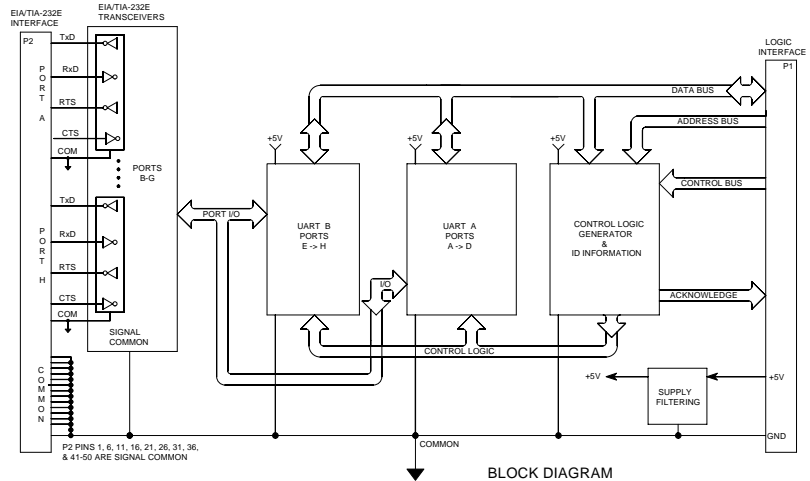
ISO9001   
AS9100 **MADE IN USA**

**Acromag**   
THE LEADER IN INDUSTRIAL I/O

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# IOS Modules

## IOS-520 Octal Serial 232 Communication Module



### High-density serial communication ♦ 8 EIA/TIA-232 ports

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-520 modules provide eight asynchronous serial communication ports from a single 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.

#### Key Features & Benefits

- Eight EIA232 ports
- 64-byte transmit FIFO buffers  
64-byte receive FIFO buffers
- Interrupts 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
- High-density design lowers per-port costs and saves 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.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-520  
Eight RS232 serial ports.

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-520 Octal Serial 232 Communication Module

### Performance Specifications

#### ■ EIA232 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.

##### Maximum 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).

#### ■ Data Transfer

Data transfer cycle types supported:  
Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### 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).

#### ■ Environmental

Operating temperature  
-40 to 85°C.

Storage temperature  
-55 to 125°C.

Relative humidity  
5 to 95% non-condensing.

Power  
+5V (±5%): 340mA maximum.

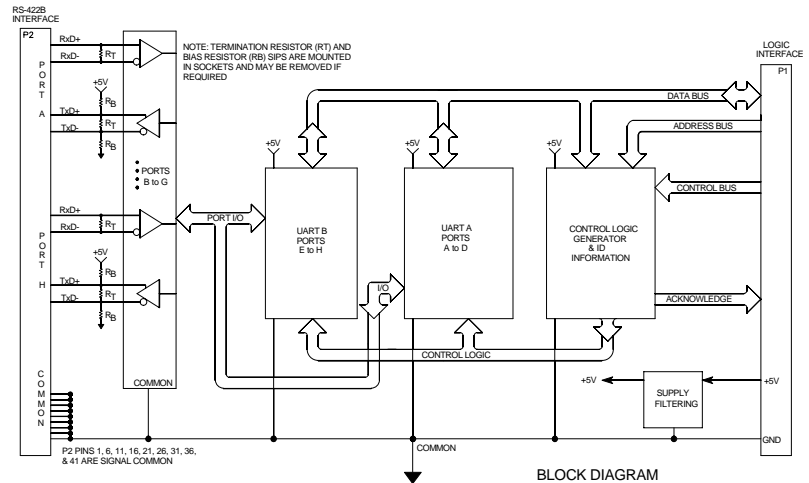
Approvals  
CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

MTBF  
Contact the factory.



# IOS Modules

## IOS-521 Octal Serial 422/485 Communication Module



### High-density serial communication ♦ 8 EIA/TIA-488/485 ports

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-521 modules provide eight asynchronous serial communication ports from a single 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.

#### Key Features & Benefits

- 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
- High-density design lowers per-port costs and saves carrier card slots for other functions.
- 64-byte FIFO buffers minimize CPU interaction for improved system performance.
- -40 to 85°C operating temperature range

#### Ordering Information

##### IOS Modules

IOS-521  
Eight RS422B serial ports.

##### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-521 Octal Serial 422/485 Communication Module

### Performance Specifications

#### ■ RS422B Serial Ports

##### Configuration

Independent, non-isolated serial ports with a common single return connection.

##### Data rate

20M bits/second, maximum.

##### Maximum 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.

#### ■ Data Transfer

Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### 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).

#### ■ Environmental

Operating temperature

-40 to 85°C.

Storage temperature

-55 to 125°C.

Relative humidity

5 to 95% non-condensing.

Power

+5V (±5%): 340mA maximum.

Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

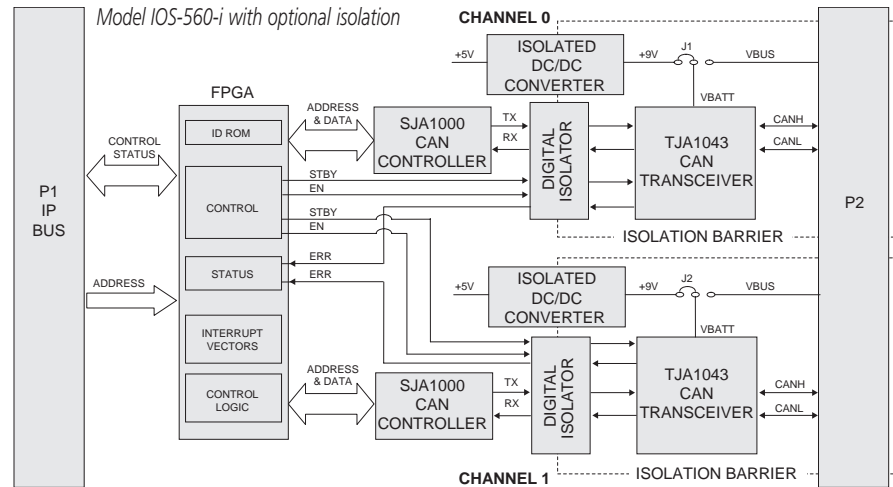
MTBF

Contact the factory..



# IOS Modules

## IOS-560 CAN Bus Interface Modules



### Two CAN bus channels with optional isolation ♦ NXP SJA1000 CAN controller with TJA1043 transceiver

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-560 modules provide two independent CAN bus interface channels. Each channel has a 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.

CAN is ideal for the following applications:

- Marine control and navigation systems
- Elevator control systems
- Defense vehicles
- Production line control systems
- Machine tools
- Large optical telescopes
- Medical systems
- Paper and textile production machinery
- Packaging machinery

#### 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 8MHz IP operation
- -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 VBATT
- Listen-only mode for node diagnosis and failure containment



# IOS Modules

## IOS-560 CAN Bus Interface Modules

### Performance Specifications

#### ■ CAN Bus

##### Configuration

Two independent CAN bus channels.  
NXP SJA1000 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

IOS-560: Non-isolated. Logic and field commons have a direct electrical connection.

IOS-560-i: 1kV DC isolation.

##### Maximum data rate

1Mb/s.

#### ■ Data Transfer

##### Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*), Interrupt Select (INTSel\*), Memory (MEMSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### 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).

#### ■ Environmental

##### Operating temperature

-40 to 85°C.

##### Storage temperature

-55 to 125°C.

##### Relative humidity

5 to 95% non-condensing.

##### Power

IOS-560/IOS-560E

+5V (±5%): 92 mA typical, 110 mA maximum.

+12 Volts (±5%): 0.12 mA typical, 0.2 mA maximum.

IOS-560-i/IOS-560E-i

+5V (±5%): 123 mA typical, 275 mA maximum.

##### Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

##### MTBF

Contact the factory.

### Ordering Information

#### IOS Modules

IOS-560

Dual-channel CAN bus interface module.

IOS-560-i

Dual-channel isolated CAN bus interface module.

#### I/O Servers

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.



IOS modules plug into an I/O Server's integrated carrier

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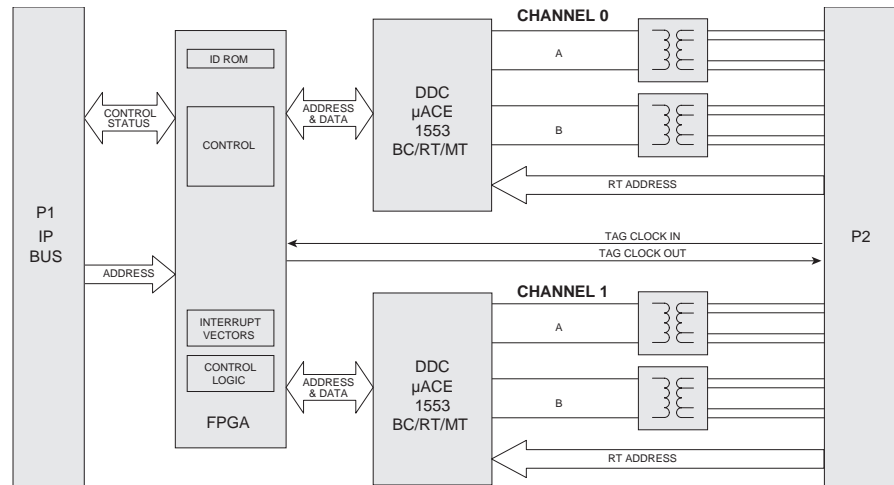
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# IOS Modules

## IOS-570 MIL-STD-1553 Bus Interface Modules



### One or two 1553 interface channels ♦ DDC Micro-ACE MIL-STD-1553 terminal

#### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

IOS-570 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 the 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 8 MHz 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 configurations with 64K RAM: bus controller, remote terminal, or bus monitor
- Supports 1553 Rev A/B Notice 2, 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



# IOS Modules

## IOS-570 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.

#### ■ Data Transfer

##### Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*), Interrupt Select (INTSel\*), Memory (MEMSel\*).

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

##### 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).

#### ■ Environmental

##### Operating temperature

-40 to 85°C.

##### Storage temperature

-55 to 125°C.

##### Relative humidity

5 to 95% non-condensing.

##### Power

###### IOS-571

+5V: 0.3A typical, 0.6A maximum.

+12V: 0A maximum.

-12V: 0A maximum.

###### IOS-572

+5V: 0.6A typical, 1.2A maximum.

+12V: 0A maximum.

-12V: 0A maximum.

##### Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

##### MTBF

Contact the factory.

### Ordering Information

#### IOS Modules

##### IOS-571

Single-channel MIL-STD-1553 bus interface module.

##### IOS-572

Dual-channel MIL-STD-1553 bus interface module.

#### I/O Servers

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.



IOS modules plug into an I/O Server's integrated carrier

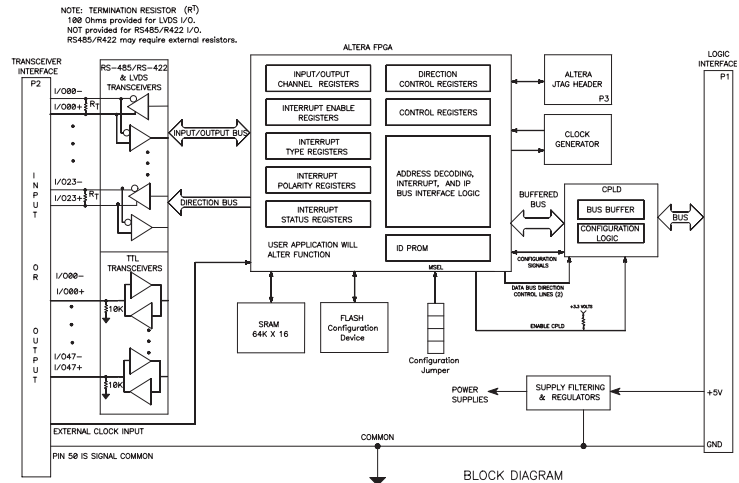
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# IOS Modules

## IOS-EP200 Re-configurable FPGA Module with Digital I/O



JTAG-reconfigurable Cyclone-II FPGA ◆ 48 TTL, 24 RS485, 24 TTL + 12 RS485, or 24 LVDS I/O lines

### Description

IOS Modules plug into the 4-slot carrier card that is integrated within the I/O Server. Different modules can mix or match in any combination to meet the I/O requirements.

The IOS-EP200 series of I/O modules provides a user-customizable Altera® Cyclone® II FPGA. 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 over TTL-switched lines, and analysis of acquired data using specialized mathematical formulas such as those developed with MathWorks MatLab® software.

The FPGA on Acromag's IOS-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 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 bus and the CPLD disables.

### Key Features & Benefits

- Altera Cyclone II EP2C20 FPGA
- Four models available:
  - IOS-EP201: 48 TTL I/O lines
  - IOS-EP202: 24 differential RS485 I/O lines
  - IOS-EP203: 24 TTL and 12 RS485 I/O lines
  - IOS-EP204: 24 LVDS I/O lines
- FPGA programmable via JTAG port or bus
- Local static RAM (64K x 16) under FPGA control
- LVTTTL external clock connected directly to the FPGA
- Supports 8MHz and 32MHz bus
- Programmable PLL-based clock synthesizer
- Example FPGA design code provided as VHDL
  - 8MHz bus interface
  - Digital I/O control register
  - others
- Hardware support for DMA and memory space
- -40 to 85°C operating temperature range

### Ordering Information

#### IOS Modules

- IOS-EP201  
48 TTL I/O lines
- IOS-EP202  
24 differential RS485 I/O lines
- IOS-EP203  
24 TTL and 12 RS485 I/O lines
- IOS-EP204  
24 LVDS I/O lines

#### Software Support

- IP-EP-EDK  
Engineering Design Kit (one kit required)

#### I/O Servers

See [www.acromag.com](http://www.acromag.com) for more information.



IOS modules plug into an I/O Server's integrated carrier



## IOS-EP200 Re-configurable FPGA Module with Digital I/O

### Performance Specifications

#### ■ FPGA

##### FPGA

Altera Cyclone II EP2C20.

##### FPGA configuration

Downloadable via JTAG port or bus.

##### Clock

Cypress CY22150 (or equivalent).

Generates frequencies from 250kHz to 100MHz.

##### Input/output signals

IOS-EP201: 48 TTL lines

IOS-EP202: 24 differential RS485 lines.

IOS-EP203: 24 TTL lines and 12 RS485.

IOS-EP204: 24 LVDS lines.

All models: LVTTTL external clock input.

##### 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 request levels.

##### DMA support

Wired to FPGA but not supported with example FPGA design firmware.

##### 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 bus interface to IO, ID, and INT space. Requires user proficiency with VHDL and Altera Quartus® II software tools. See Engineering Design Kit.

##### Data Rates

TTL: propagation time 6.3nS maximum.

EIA485: 20MB per second.

LVDS: 100MHz.

#### ■ Data Transfer

Data transfer cycle types supported:

Input/output (IOSel\*), ID read (IDSel\*)

Meets IP specifications per ANSI/VITA 4-1995 (R2002).

Access times (8MHz or 32MHz clock):

ID space read: 1 wait state (375nS cycle @ 8MHz).

Register read/write: 1 wait state (375nS cycle @ 8MHz).

Interrupt read/write: 1 wait state (375nS cycle @ 8MHz).

#### ■ Environmental

##### Operating temperature

-40 to 85°C.

##### Storage temperature

-55 to 125°C.

##### Relative humidity

5 to 95% non-condensing.

##### Approvals

CE; UL/cUL Class 1 Division 2 Groups A, B, C, D.

##### 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 IOS-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 IOSSW-DEV-WIN (Windows DLL driver package) or the IOSSW-API-LNX (Linux Libraries). These programs include important driver support programs to assist in transferring developer code between user's processor and EPC20 FPGA.

# IOS Modules

## IOSSW-API-LNX Linux™ Libraries (I/O Function Routines)



```
Command Prompt
IOS220 Library Demonstration Rev. A
1. Exit this Program
2. Set Carrier Address
3. Set IP Base Address
4. Transparent Mode Select
5. Simultaneous Mode Select
6. Simultaneous Trigger
7. Read Calibration Coefficients and I.D.
8. Write Ideal Data To Output
9. Write Corrected Data To Output
10. Display Ideal/Corrected Data, Offset/Gain Coefficients
11. Clear All Data Buffers
12. Alter Offset/Gain Coefficients
Select:
```

Application Programming Interface (API) ♦ Function routines and demo program ♦ C source code

### Description

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
- Demonstration Program
- Source code provided to ensure maximum flexibility in implementing your driver
- Verify operation of your I/O modules with a demonstration program to ensure proper hardware operation before attaching your application
- Software and manual provided on two CDs

### Ordering Information

#### Models

IOSSW-API-LNX  
Linux libraries for IOS modules



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## IOSSW-DEV-WIN IOS WIN32 Development Package



## Win32 DLL

```
C:\Program Files\Acromag\IO Server\demos\I408Demo.exe
Main menu
-----
1. Open carrier connection
2. Carrier Menu
3. I408 Menu
99. Exit
Enter selection: 3

I408 main menu
-----
1. Open I408 module
99. Return to main menu
Enter selection: 1
I408 opened in slot B

I408 main menu
-----
1. Open I408 module
2. Attach interrupt callback
3. Configure board
4. I/O commands
5. Access memory range
6. Access interrupt status information
99. Return to main menu
Enter selection: _
```

Application Programming Interface ♦ DLL drivers ♦ ActiveX controls ♦ C source example programs

### Description

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 line of IOS module products. In addition, "C" source demonstration programs provide easy-to-use tools to test the operation of the module.

This software is used to develop custom applications that interface with the IOS Carrier and IOS Modules. It should be installed on the Development System (rather than the I/O Server). After creating an application on the Development System, it is deployed to the I/O Server.

Applications interface with the IOS Carrier and IOS Modules through exported DLL functions. DLL functions use the Windows `_stdcall` calling convention and can be accessed from a number of programming languages. In addition to the DLLs, the software includes an ActiveX control for implementing interrupt notifications in programming environments that do not support the use of callback functions. Several example C, Visual Basic .NET and LabVIEW applications are provided with source code.

### Key Features & Benefits

- Easy installation procedure
- Help files with step-by-step instructions
- Support for all Acromag IOS modules
- Demonstration programs with C source code
- DLL driver level support for desktop and embedded Windows level programming environments
- Drivers and user manuals provided on two CDs
- Designed for use in conjunction with I/O Server IOS-7x00-WIN models that have pre-installed Windows Embedded package

### Ordering Information

#### Models

IOSSW-DEV-WIN  
IOS WIN32 Development Package