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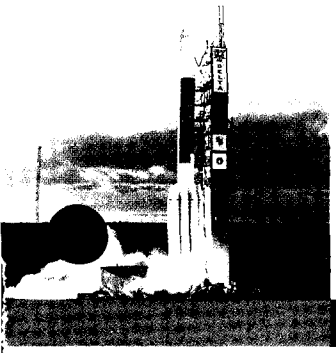
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Find the *Acromag PMC-LX40* at our website: ***Click HERE***

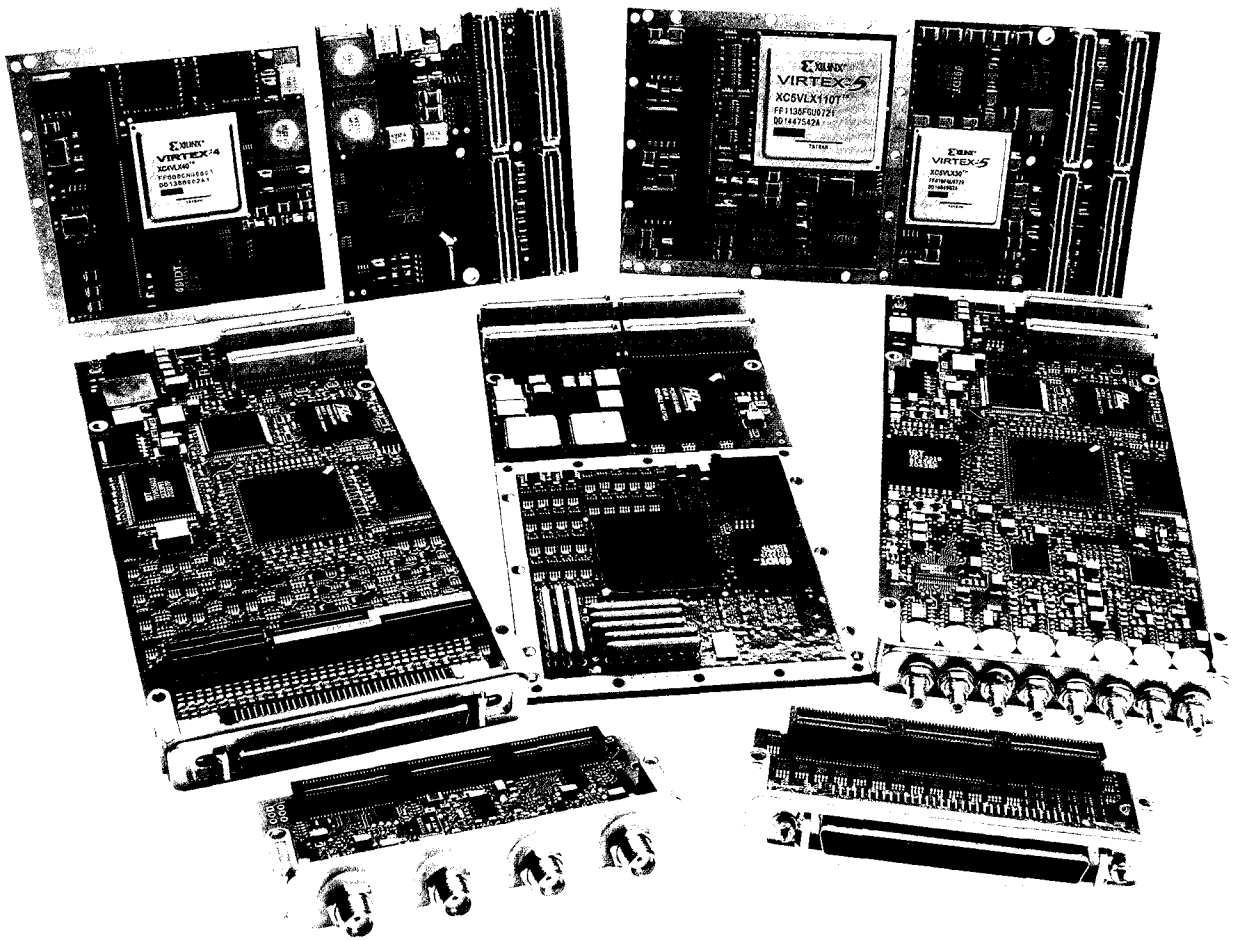


# FPGA I/O Solutions

**Flexibility**

**Capability**

**Reliability**




## User-configurable FPGAs for custom signal processing

8400-467c

Acromag®
THE LEADER IN INDUSTRIAL I/O

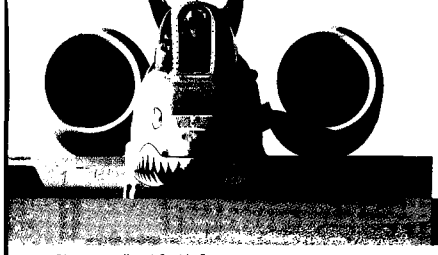
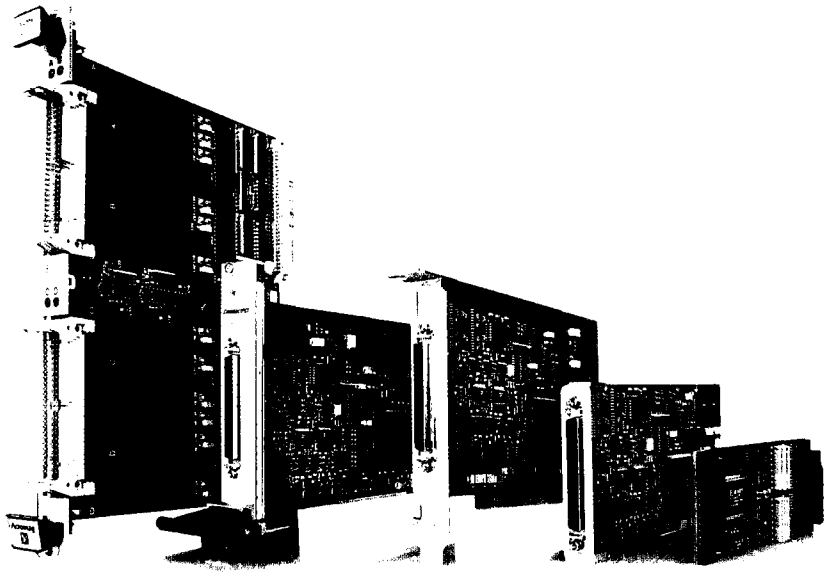


Photo credit: U.S. Air Force

# Depend on Acromag I/O



*Experience counts – especially when engineering the right FPGA solution. And with more than 50 years of experience, Acromag can help you reduce your costs and increase your productivity.*

## Acromag: The I/O Leader

Acromag is a customer-driven manufacturer focused on developing embedded I/O products that provide the best long term value in the industry. Compare and you'll find that Acromag products offer an unmatched balance of price, performance, and features.

### 50 Years of I/O Experience

With 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 many applications.

Acromag I/O boards are commonly used in the following industries:

- military/defense
- aerospace
- transportation
- manufacturing
- semiconductors
- medical devices
- communication
- astronomy
- utilities/energy
- research labs

### Quality You Can Count On

We take every measure to guarantee you dependable operation. State-of-the-art manufacturing with industrial and commercial-grade components adds extra ruggedness. Multi-level inspections and specialized testing further ensure that Acromag I/O boards perform at or beyond their rated specifications.

### Technical Assistance

Drawing on our wealth of industrial I/O experience, our application engineers are well qualified to help you design and develop your I/O system. Our sales staff is highly experienced in recommending products for applications ranging from simulators to machine control and countless other industrial processes.

### 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

For your convenience, we provide full product documentation and pricing information online. You can get quotes and even order directly on our website.

VMEbus International Trade Association

ISO 9001:2001
AS9100
BUREAU VERITAS
Certification

COTS

**Experience**
**Reliability**
**Extended Temperature**
**Extended Life Cycle**



Call 877-295-7092 or 248-295-0310 for technical assistance.

# PMC and Industry Pack FPGA Modules

## Custom Embedded Computing with Re-Configurable FPGAs on Off-the-Shelf Mezzanine Modules

Acromag's line of user-configurable FPGA I/O modules in PMC and Industry Pack formats offer the ability to create custom I/O boards. Just download your own instruction sets into the I/O module's FPGA. You can use your own application program to control the module's analog or digital I/O channels for simulation, communication, diagnostics, image processing and other applications.

### Faster and easier development

To help you develop custom programs, Acromag offers an Engineering Design Kit. This kit provides utilities to help you load VHDL into the FPGA and to establish DMA transfers between the FPGA and the CPU. Kits include a compiled FPGA file and example VHDL code for the local bus interface, read/writes, and change-of-state interrupts to the bus.

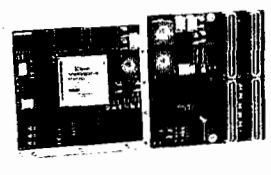
## Virtex-5 FPGAs with Plug-in I/O




Acromag's top-of-the-line PMC-VLX and PMC-VSX FPGA models offer Xilinx® Virtex™-5 FPGAs optimized for logic or digital signal processing. The base card offers 32 LVDS I/O lines and conduction cooling. AXM plug-in I/O interface modules provide additional I/O processing capabilities.

**Page 4**

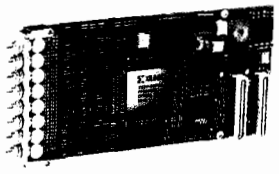
## Virtex-4 FPGA with Plug-in I/O



PMC-LX and PMC-SX models offer Xilinx Virtex-4 FPGAs. The base card offers 32 LVDS I/O lines. AXM plug-in I/O interface modules extend I/O processing capabilities.

**Page 8**

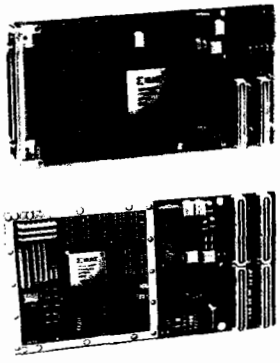
## Virtex-II FPGA with Analog I/O



PMC-AX models provide the capability to implement custom analog I/O solutions. These modules are ideal for high-speed, high-resolution A/D and D/A functions

**Page 10**

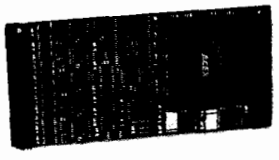
## Virtex-II FPGA with Digital I/O



PMC-DX (air-cooled) and PMC-CX (conduction-cooled) models facilitate the implementation of customized digital I/O solutions. They are ideal for TTL and differential RS422/485 I/O functions.

**Page 12**

## Spartan-3 FPGAs with Digital I/O



Industry Pack FPGA modules provide economical custom digital I/O solutions. Models feature Altera® Cyclone-II or Acex 1K FPGAs.

**Page 16**

## Software Tools

Acromag's line of software development tools save you time and effort.

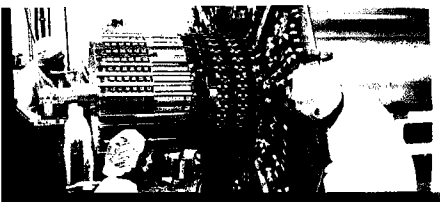
**Page 18**

Acromag

**Engineering Design Kit PMC-VLX**

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*Cover photo credit: U.S. Air Force.*

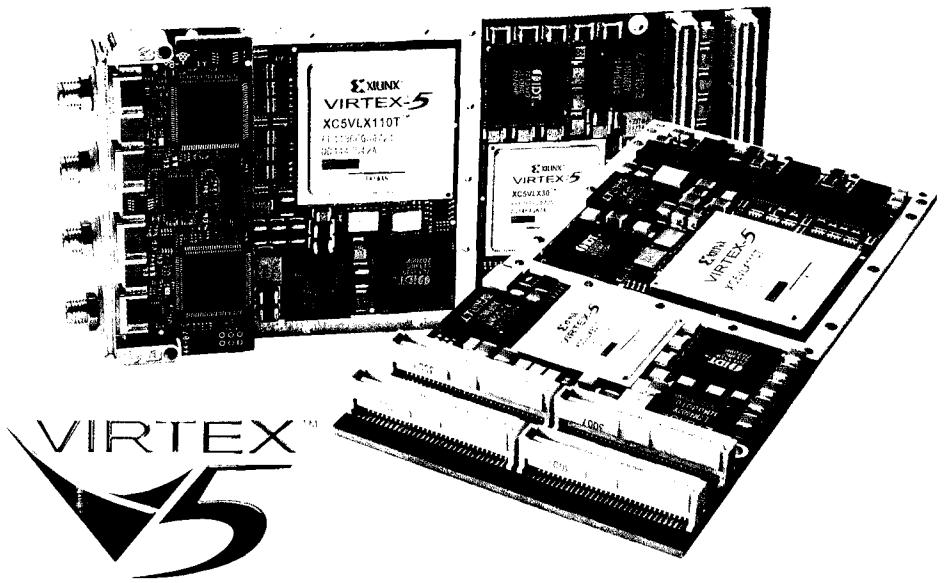
Visit www.acromagembedded.com or e-mail us at solutions@acromag.com



# User-configurable Virtex™-5 FPGAs

Photo credit: CERN

*Acromag's newest PMC modules feature user-configurable FPGAs with higher density and higher performance.*




### High-Performance FPGA-based Embedded Computing Made Simple

Only Acromag wraps a reconfigurable Virtex™-5 FPGA with just the features you need for fast, easy implementation. We add a high-speed I/O interface and plenty of memory for efficient data handling. High-performance FPGA computing is now within reach for many applications.

### Xilinx® Virtex™-5 FPGA

These boards offer a choice of Virtex-5 FPGAs (LXT, SXT, or FXT) optimized for logic, DSP, or co-processor applications. This lets you match the FPGA's resources and capabilities to your requirements.

### High-Performance Memory

Large, high-speed buffers rapidly move data in and out of the FPGA. Two banks of DDR2 SDRAM memory receive data from the I/O ports for the FPGA. Dual-port SRAM routes the processed data for high-speed DMA transfer to the PCI bus.

### High-Speed PCI-X Interface

Our high-bandwidth PCI-X interface ensures fast data throughput. The PCI-X interface supports 133MHz, 100MHz, and 66MHz PCI bus modes.

### AXM Plug-in I/O Interface Cards

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.

- 16-bit A/D
- RS485 differential I/O
- LVDS I/O
- CMOS/RS485 combo
- Custom

### Typical Applications

Applications for these FPGA modules are unlimited. Common uses include DSP acceleration, simulation, communication, imaging, and co-processing. The Virtex-5 FPGA is ideal for offloading of intensive computations or complex logic routines. Optional conduction cooling enables use in hostile environments. A ChipScope™ Pro interface is supported to provide further flexibility and convenience.

### Engineering Design Kit

Acromag provides software utilities and example source code to simplify your programming tasks and get you started quickly. A JTAG interface allows you to perform on-board VHDL simulation.



Call 877-295-7092 or 248-295-0310 for technical assistance.

# PMC FPGA with Plug-in I/O Extension Modules

## Logic



**PMC-VLX85/110/155**
These PMC modules use the VLXT versions of the Virtex-5 FPGA. Optimized for high-performance logic, they offer a choice of FPGA sizes to match your performance needs.

- Real 6-input LUTs for fewer logic levels
- Up to 1.64Mb internal RAM

Typical uses include hardware simulation, communication processing, military servers, in-circuit diagnostics, and signal intelligence.

## DSP



**PMC-VSX95**
This model uses the VSXT type Virtex-5 FPGA. It is optimized for high-performance digital signal processing. The DSP48E slice supports over 40 dynamically controlled operating modes, including: multiplier, 3-input adder, barrel shifter, wide bus multiplexers, wide counters, and comparators.

- 640 XtremeDSP™ slices
- 352 GMACs at 550MHz

Common applications include sonar and radar processing.

## PowerPC®

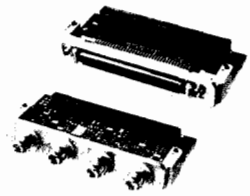


**PMC-VFX70**
This model's VFXT FPGA has an embedded PowerPC to handle the most complex and memory-intensive computing applications. Offload CPU-intensive operations such as video and 3D data processing or floating-point math for superior system performance.

- PowerPC 440, 32-bit RISC processor hard core

Typical applications include subsystem co-processors and custom hardware acceleration.

## I/O Interface



**AXM Extension I/O**
These I/O cards plug into the FPGA base card to interface additional I/O signal types.

**AXM-A30**
2 chan. of 105MHz 16-bit A/D

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

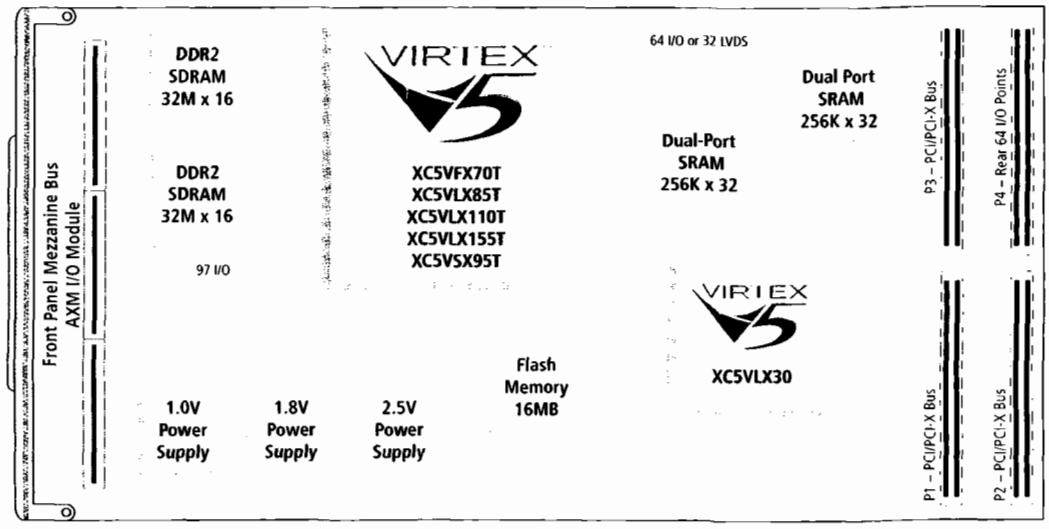
**AXM-D03**
16 CMOS and 22 RS485 I/O

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

**AXM-??**
Custom I/O configuration

**PMC User-Configurable FPGA Comparison**

| Model | FPGA | Logic Cells | DSP | Memory | Temperature Range |
|---|---|---|---|---|---|
| PMC-VLX85 | XC5VLX85T | 82,944 | 48 DSP48E slices | Two 32M x 16-bit DDR2 SDRAM, Two 256K x 32-bit dual-port SRAM | Conduction-cooled or -40-85°C |
| PMC-VLX110 | XC5VLX110T | 110,592 | 64 DSP48E slices | Two 32M x 16-bit DDR2 SDRAM, Two 256K x 32-bit dual-port SRAM | Conduction-cooled or -40-85°C |
| PMC-VLX155 | XC5VLX155T | 155,648 | 128 DSP48E slices | Two 32M x 16-bit DDR2 SDRAM, Two 256K x 32-bit dual-port SRAM | Conduction-cooled or -40-85°C |
| PMC-VSX95 | XC5VSX95T | 94,208 | 640 DSP48E slices | Two 32M x 16-bit DDR2 SDRAM, Two 256K x 32-bit dual-port SRAM | Conduction-cooled or -40-85°C |
| PMC-VFX70 | XC5VFX70T | 71,680 | 128 DSP48E slices | Two 32M x 16-bit DDR2 SDRAM, Two 256K x 32-bit dual-port SRAM | Conduction-cooled or -40-85°C |



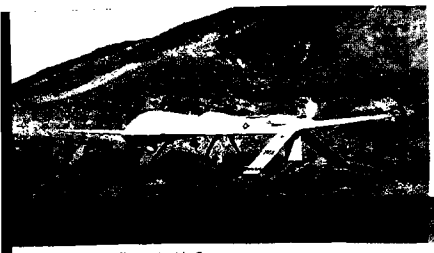
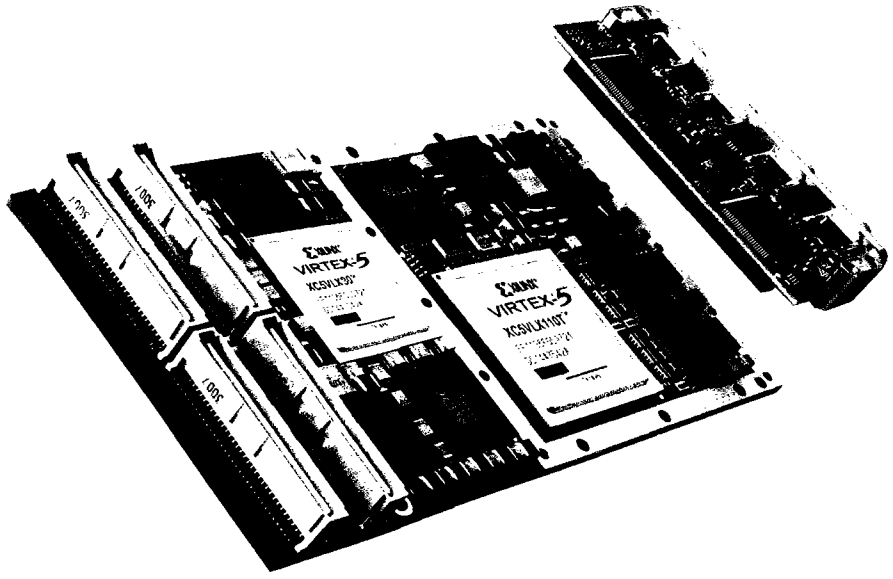


Photo credit: U.S. Air Force

# Plug-in I/O Extension Modules

*Plug-in I/O modules provide a convenient method for direct connection of the I/O to the FPGA with optimal performance.*




**AXM Plug-in I/O Interface Cards**
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.

**Analog I/O: 16-bit A/D**
Plug-in analog input modules provide 105MHz 16-bit A/D signal processing. External clock and trigger sources are supported 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 enables distribution of multiple integer-related and phase-adjusted copies of a reference to multiple system components.

**Digital I/O: Differential RS485**
Digital I/O extension modules can interface up to 30 differential I/O signals to the FPGA base card. Data direction, input or output, on each channel is independently controlled. Eight of the channels support programmable change-of-state interrupts.

**Digital I/O: CMOS**
One AXM module provides an interface for both CMOS logic and RS485 differential signals. Data direction, either input or output, on each channel is independently controlled. Eight of the channels support programmable change-of-state interrupts.

**Digital I/O: LVDS**
Low voltage differential signal processing is also available on an AXM module. Each channel is independently configured for I/O direction. Interrupts are programmable on eight of the channels for any bit change of state or level.

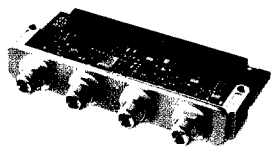
**Custom I/O functions**
Call the factory to discuss the development of custom AXM modules to meet your unique application.



Call 877-295-7092 or 248-295-0310 for technical assistance.

# Front Panel I/O Mezzanine Cards

## Analog I/O

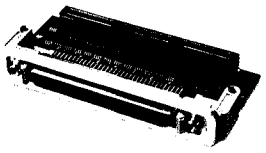


**AXM-A30**
This module provides high-speed A/D conversion. An external clock and trigger can be used to control sampling.

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

Common applications include sonar and radar processing.

## Differential I/O

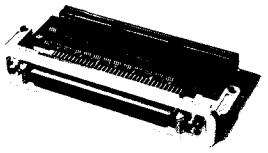


**AXM-D02**
This module performs RS485 differential I/O signal processing. Data direction (input or output) on each channel is independently controlled.

- 30 RS485 differential I/O
- 8 change-of-state interrupts

Typical uses include hardware simulation, communication processing, and in-circuit diagnostics.

## CMOS & RS485 I/O

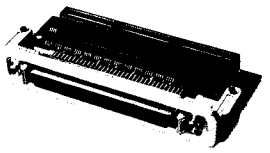


**AXM-D03**
This module processes both CMOS and RS-485 differential I/O. Data direction (input or output) on each channel is independently controlled.

- 16 CMOS I/O
- 22 RS485 differential I/O
- 8 change-of-state interrupts

Typical uses include hardware simulation, communication processing, and in-circuit diagnostics.

## LVDS or LVTTL I/O



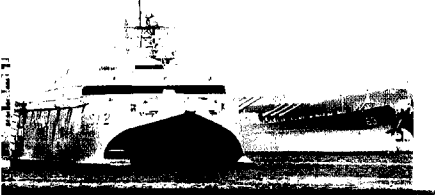
**AXM-D04**
This module interfaces low voltage differential signaling with independently configured direction.

- 30 LVDS I/O
- 8 change-of-state interrupts

Typical uses include hardware simulation, communication processing, and in-circuit diagnostics.

### I/O Extension Modules for [illegible]

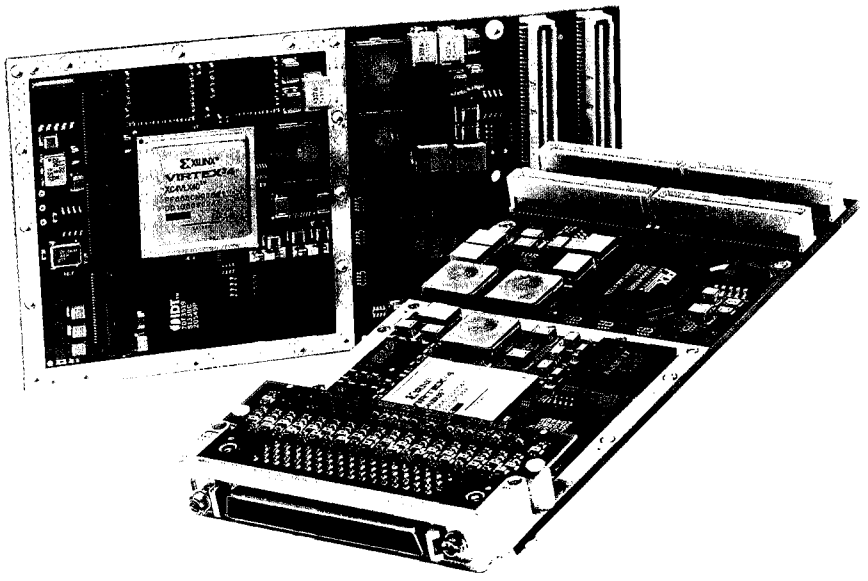
| Model | Analog I/O | Digital I/O | Compatible PMC FPGA Modules | Temperature Range |
|---|---|---|---|---|
| AXM-A30 | Two channels of 16-bit A/D | - - | PMC-LX, PMC-SX, PMC-VLX, PMC-VSX | -40 to 85°C |
| AXM-D02 | - - | 30 RS485 differential I/O lines | PMC-LX, PMC-SX, PMC-VLX, PMC-VSX | -40 to 85°C |
| AXM-D03 | - - | 16 CMOS and 22 RS485 differential I/O lines | PMC-LX, PMC-SX, PMC-VLX, PMC-VSX | -40 to 85°C |
| AXM-D04 | - - | 30 LVDS I/O lines | PMC-LX, PMC-SX, PMC-VLX, PMC-VSX | -40 to 85°C |
| AXM-??? | Acromag can develop custom I/O function modules. Consult factory for details. | | | |
| AXM-EDK | Test board with JTAG port. Included with VIrtex-5 and Virtex-4 Engineering Design Kits (EDK). | | | |



# User-configurable Virtex™-4 FPGAs

Photo credit: U.S. Navy

*These PMCs deliver high-speed I/O signal processing and many of the features found on the Virtex-5 FPGA models but at a more attractive price point.*



**High-Performance FPGA Technology**
These PMC modules offer breakthrough performance with a Xilinx Virtex-4 FPGA, but maintain a relatively low price point compared to our Virtex-5 FPGA boards. They provide more logic cells, DSP slices, and memory than our Virtex-II solutions plus a more flexible I/O interface.

**Xilinx® Virtex™-4 FPGA**
These boards offer a choice of Virtex-4 FPGA versions (LX or SX) optimized for logic or DSP. Three models let you match the FPGA's resources and capabilities to your requirements.

**High-Speed Memory**
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 dual port is attached to the FPGA and the other to the local bus.

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

**AXM Plug-in I/O Interface Cards**
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.

- 16-bit A/D
- RS485 differential I/O
- LVDS I/O
- CMOS/RS485 combo
- Custom

**Typical Applications**
Although there is no limit to the uses for Acromag's FPGA I/O boards, several applications are ideal for this new technology. Common uses include military servers, telecommunication, and digital signal processing. Take advantage of the optional conduction cooling for use in hostile environments.

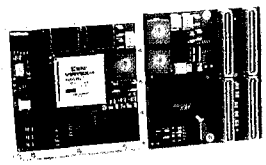
**Engineering Design Kit**
Acromag provides software utilities and examples to simplify your programming and get you started quickly. A JTAG interface enables on-board VHDL simulation.



Call 877-295-7092 or 248-295-0310 for technical assistance.

# PMC FPGA with Plug-in I/O Extension Modules

## Logic

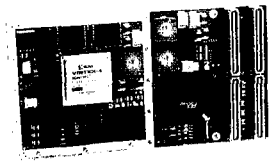


**PMC-LX40/LX60**
These PMC modules use the LX versions of the Virtex-4 FPGA. They are optimized for high-performance logic.

- High logic-to-feature ratio
- High I/O-to-feature ratio

Typical uses include hardware simulation, communication processing, and in-circuit diagnostics.

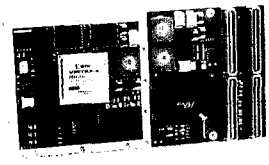
## Signal Processing



**PMC-SX35**
This model uses the SX type Virtex-4 FPGA. It is optimized for high-performance digital signal processing. Build custom pre/post/co-processing hardware. Build high-performance filters.Create over 40 different functions (MACs, multipliers, adders, and muxes).

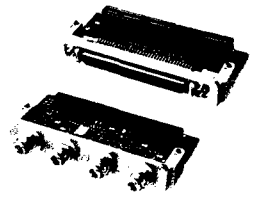
Common applications include sonar and radar processing.

## Conduction-Cooled



PMC-LX and PMC-SX boards can be used in standard mode (0 to 70°C) or in conduction-cooled applications. These boards are well-suited for use in military, aerospace, and other demanding operations. Conduction cooling provides efficient heat dissipation in environments where there is inadequate cooling air flow.

## I/O Interface



**AXM Extension I/O**
These I/O cards plug into the FPGA base card to interface additional I/O signal types.

**AXM-A30**
2 chan. of 105MHz 16-bit A/D

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

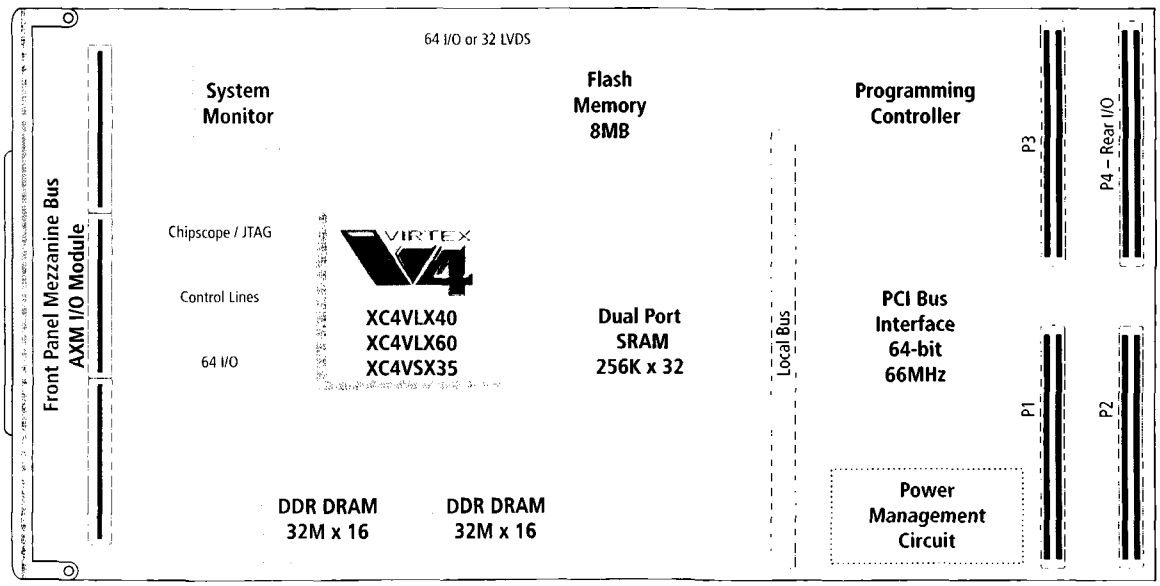
**AXM-D03**
16 CMOS and 22 RS485 I/O

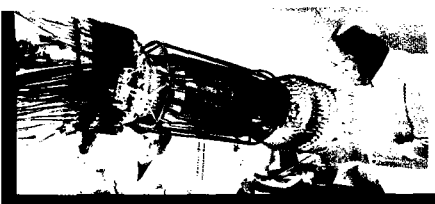
**AXM-D04**
30 LVDS I/O

**AXM-??**
Custom I/O configuration

**PMC User-Configurable FPGA Computing**

| Model | FPGA | Logic Cells | DSP | Memory | Temperature Range |
|---|---|---|---|---|---|
| PMC-LX40 | Xilinx Virtex-4 | 41,472 | 64 XtremeDSP™ slices | 32Mb x 32-bit DDR DRAM, 256Kb x 36-bit dual-port SRAM | Conduction-cooled or 0-70°C |
| PMC-LX60 | Xilinx Virtex-4 | 59,904 | 64 XtremeDSP™ slices | 32Mb x 32-bit DDR DRAM, 256Kb x 36-bit dual-port SRAM | Conduction-cooled or 0-70°C |
| PMC-SX35 | Xilinx Virtex-4 | 34,560 | 192 XtremeDSP™ slices | 32Mb x 32-bit DDR DRAM, 256Kb x 36-bit dual-port SRAM | Conduction-cooled or 0-70°C |

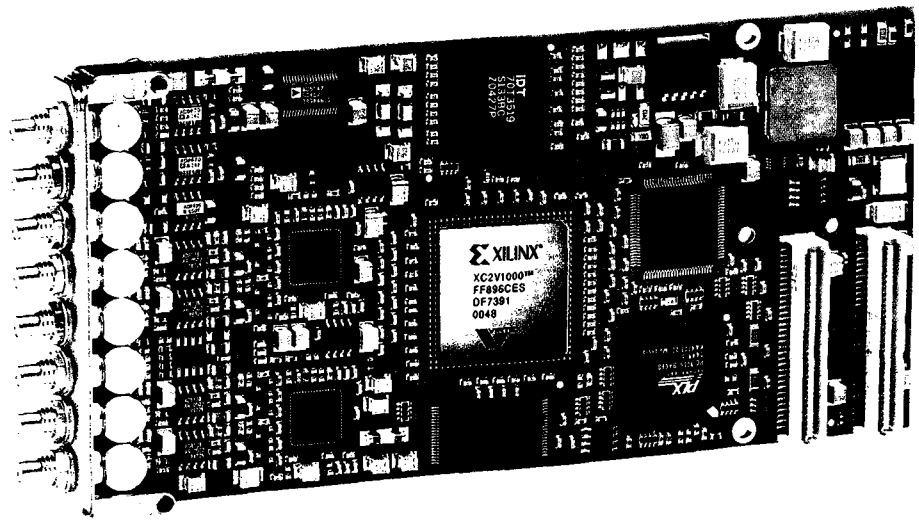




# Virtex™-II FPGAs with Analog I/O

*Photo credit: Peter Ginter, Stanford Linear Accelerator Center*

*PMC analog I/O with a user-configurable FPGA provides an affordable solution for applications requiring custom signal processing.*




### Cost-effective FPGA Computing

Acromag FPGA modules with analog I/O provide the ability to quickly implement customized solutions. Application-specific signal processing routines and algorithms can be downloaded into the on-board reconfigurable FPGA to control operation of the I/O channels.

These modules are ideal for high-speed, high-resolution A/D and D/A functions. Inputs are sampled at up to 64 MSPS and processed by the FPGA without CPU intervention. Using the FPGA, these modules are able to generate recipe-based responses to input stimulus and apply user-defined transfer functions.

Powerful and versatile, these modules are designed around a re-configurable FPGA, the Xilinx® Virtex-II. You can select either the 11k, 24k, or 32k logic cell versions of the FPGA. Each of these DSP-capable FPGAs features versatile logic resources, large on-chip memories, and a high-speed interface.

The PCI bus interface is handled by a PLX™ PCI 9056 device which provides 32-bit 66MHz bus mastering with dual-channel DMA support.

### Typical Applications

Although there is no limit to the uses for Acromag's FPGA I/O boards, several applications are ideal for this technology. Common uses include sonar, radar, hardware simulation, automated test equipment, and in-circuit diagnostics.

### Xilinx Virtex-II FPGA

- Up to 3 million system gates
- Up to 1Mb of on-chip block RAM
- Up to 56 18 x 18 embedded multipliers (Up to 0.5 Tera MACs)

### Engineering Design Kit

Acromag provides software utilities and examples to simplify your programming and get you started quickly.

### I/O Capabilities

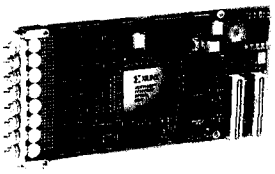
- 14-bit A/D (four 20MHz or 64MHz channels)
- 16-bit D/A (two 900KHz channels)



Call 877-295-7092 or 248-295-0310 for technical assistance.

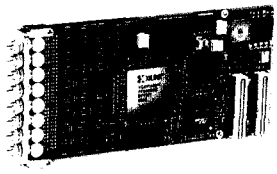
# High-speed A/D and D/A Conversion

## PMC A/D & D/A, 11k Logic Cells



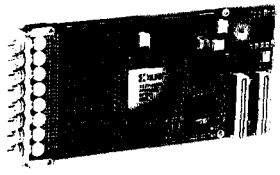
**PMC-AX1020/1065**
These models feature an FPGA with 11,000 logic cells to help you develop custom analog I/O solutions. With high-speed, high-resolution A/D and D/A converters, they are ideal for many analog I/O functions. Two version provide 20 or 65MSPS sampling.

## PMC A/D & D/A, 24k Logic Cells



**PMC-AX2020/2065**
These models feature an FPGA with 24,000 logic cells to help you develop custom analog I/O solutions. With high-speed, high-resolution A/D and D/A converters, they are ideal for many analog I/O functions. Two version provide 20 or 65MSPS sampling.

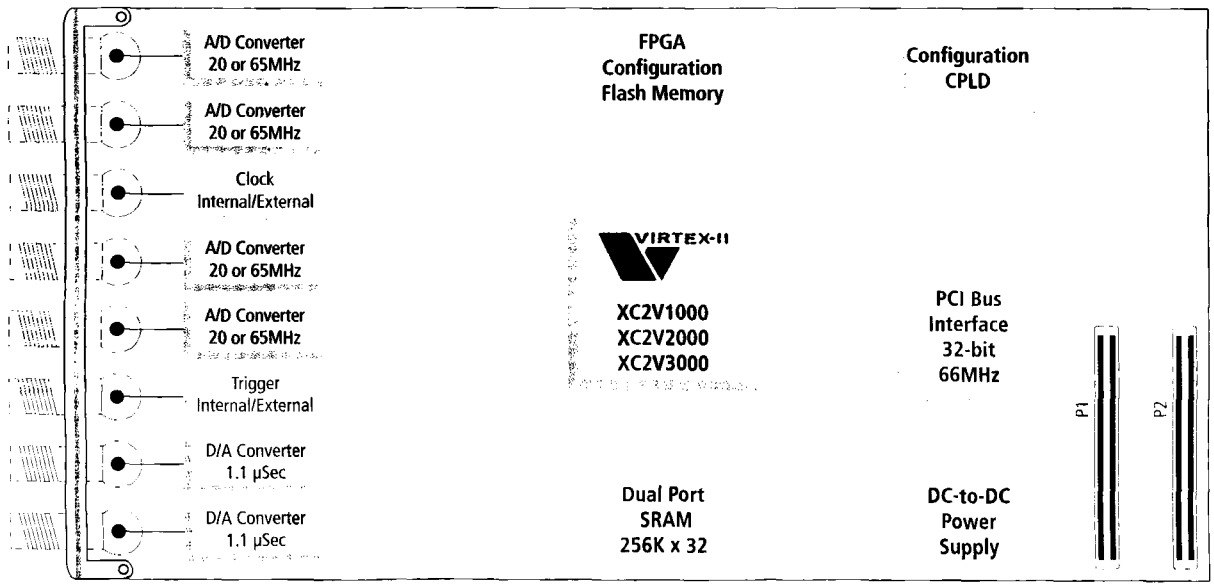
## PMC A/D & D/A, 32k Logic Cells



**PMC-AX3020/3065**
These models feature an FPGA with 32,000 logic cells to help you develop custom analog I/O solutions. With high-speed, high-resolution A/D and D/A converters, they are ideal for many analog I/O functions. Two version provide 20 or 65MSPS sampling.

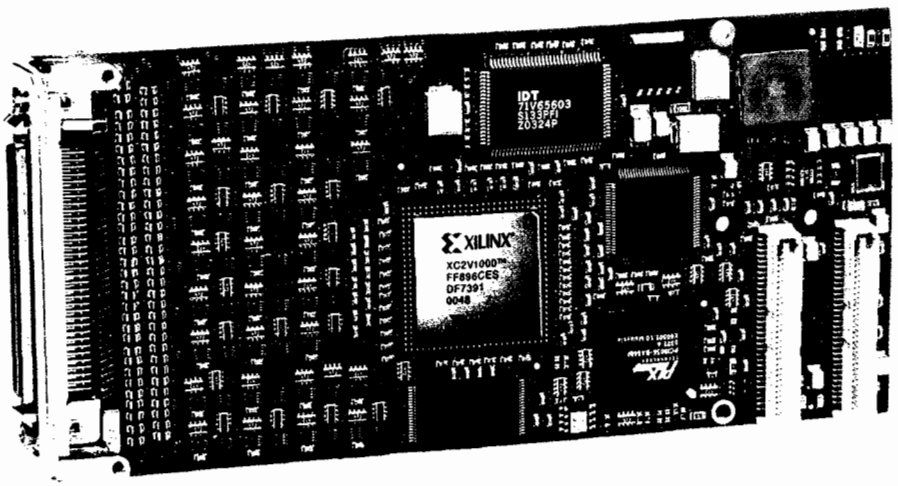
**PMC User-Configurable FPGA with Analog I/O**

| Model | FPGA | Logic Cells | Analog Inputs | Analog Outputs | Dual-Ported Memory | Extended Temp. Range |
|---|---|---|---|---|---|---|
| PMC-AX1020 | Xilinx Virtex-II | 11,520 | four 20MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-AX1065 | Xilinx Virtex-II | 11,520 | four 65MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-AX2020 | Xilinx Virtex-II | 24,192 | four 20MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-AX2065 | Xilinx Virtex-II | 24,192 | four 65MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-AX3020 | Xilinx Virtex-II | 32,256 | four 20MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-AX3065 | Xilinx Virtex-II | 32,256 | four 65MHz 14-bit A/D | two 900KHz 16-bit D/A | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |



# Virtex™-II FPGAs with Digital I/O

*PMC digital I/O with a user-configurable FPGA provides an affordable solution for applications requiring custom signal processing.*




**Cost-effective FPGA Computing**

Acromag FPGA modules with digital I/O provide the ability to implement complex, customized I/O board solutions. Application-specific logic routines and algorithms can be downloaded into the on-board reconfigurable FPGA to control operation of the I/O channels.

These modules are ideal for advanced TTL and differential I/O functions. Using the FPGA, the modules are able to generate recipe-based responses to input stimulus and to translate communication protocols.

Powerful and versatile, these modules are designed around a re-configurable FPGA, the Xilinx® Virtex-II. All I/O functions are available with either the 6,912 or 24,192 logic cell versions of the FPGA. Both DSP-capable FPGAs feature versatile logic resources, large on-chip memories, and a high-speed interface.

The PCI bus interface is handled by a PLX® PCI 9056 device which provides 32-bit 66MHz bus mastering with dual-channel DMA support.

**Typical Applications**

Although there is no limit to the uses for FPGA I/O boards, several applications are ideal for this new technology. Common uses include automated test equipment, hardware simulation, protocol conversion, and in-circuit diagnostics.

**Xilinx Virtex-II FPGA**

- Up to 3 million system gates
- Up to 1Mb of on-chip block RAM
- Up to 56 18 x 18 embedded multipliers (Up to 0.5 Tera MACs)

**Engineering Design Kit**

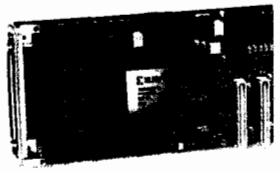
Acromag provides software utilities and examples to simplify your programming and get you started quickly.

**I/O Capabilities**

- TTL I/O
- RS422 I/O
- LVDS I/O
- TTL/RS422 combo

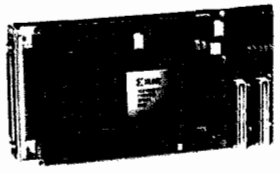
# Desktop PC Cards

## PMC TTL I/O



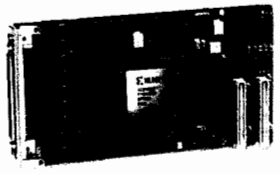
**PMC-DX501/DX2001**
Ideal for advanced TTL I/O functions, these PMC modules provide users with the ability to implement customized digital I/O solutions. Two versions are available with either 7k or 24k logic cells.

## PMC Diff. I/O



**PMC-DX502/DX2002**
These PMC modules are well-equipped to handle advanced differential RS422 digital I/O functions using custom signal processing routines. Two versions are available with either 7k or 24k logic cells.

## PMC TTL & Diff.



**PMC-DX503/DX2003**
These modules combine TTL and differential RS422 I/O channels on a single module. The FPGA implements your signal processing algorithms. Two versions are available with 7k or 24k logic cells.

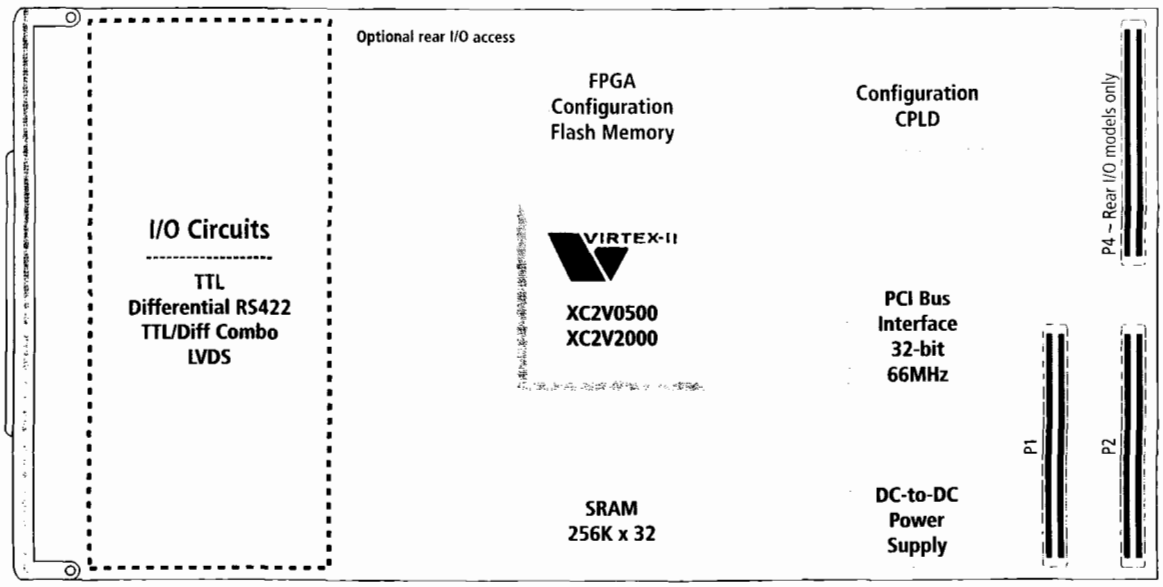
## PMC LVDS I/O



**PMC-DX504/DX2004**
These modules are ideal for custom LVDS I/O functions. Program the FPGA for recipe-based response to input stimuli or for high-speed communication processing. Select 7k or 24k logic cells.

**PMC User-Configurable FPGA with Digital I/O**

| Model | FPGA | Logic Cells | TTL I/O | Differential I/O | LVDS I/O | Rear I/O | Memory | Extended Temp. Range |
|---|---|---|---|---|---|---|---|---|
| PMC-DX501 | Xilinx Virtex-II | 6,912 | 64 | | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX2001 | Xilinx Virtex-II | 24,192 | 64 | | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX502 | Xilinx Virtex-II | 6,912 | | 32 RS422 | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX2002 | Xilinx Virtex-II | 24,192 | | 32 RS422 | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX503 | Xilinx Virtex-II | 6,912 | 16 | 24 RS422 | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX2003 | Xilinx Virtex-II | 24,192 | 16 | 24 RS422 | | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX504 | Xilinx Virtex-II | 6,912 | | | 32 | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |
| PMC-DX2004 | Xilinx Virtex-II | 24,192 | | | 32 | optional | 1MB RAM, 256K x 36-bit SRAM | optional -40 to 85°C |



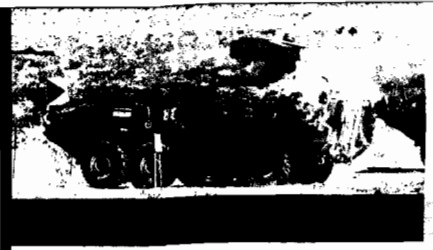
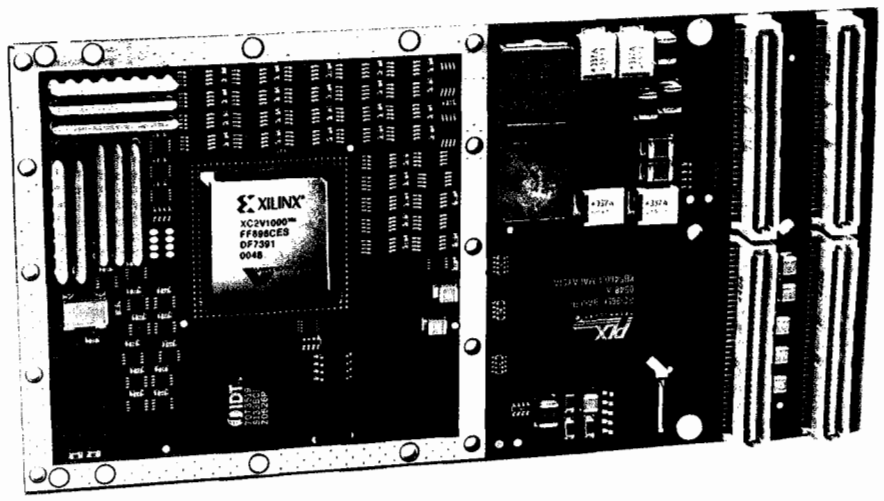


Photo credit: U.S. Army

# Conduction-Cooled Virtex™-II FPGAs

*Conduction cooling provides thermal management of the circuit board for avionics and other applications without an adequate flow of cooling air.*




**Conduction-cooled FPGA Computing**

These conduction-cooled modules provide the ability to implement complex, customized digital I/O solutions in hostile environments. Application-specific logic routines and algorithms can be downloaded into the on-board reconfigurable FPGA to control operation of the I/O channels.

All models are ideal for advanced differential RS422/485 I/O functions. The modules are able to generate recipe-based responses to input stimulus and to translate communication protocols.

Powerful and versatile, these modules are designed around a reconfigurable FPGA, the Xilinx® Virtex-II. Two versions are available with either 12k or 24k logic cells. Both DSP-capable FPGAs feature adaptable logic resources, large on-chip memories, and a high-speed interface. Dual-port memory is provided for DMA.

Conduction cooling or the standard -40 to 85°C operating temperatures are supported.

**Typical Applications**

Although there is no limit to the uses for Acromag's FPGA I/O boards, several applications are ideal for this new technology. Typical uses include manned and unmanned vehicles, battleground SIGINT and communications systems, deployment on tanks or torpedoes, or any system where ambient or forced air can't provide adequate cooling.

**Xilinx Virtex-II FPGA**

- Up to 2 million system gates
- Up to 1Mb of on-chip block RAM
- Up to 56 18 x 18 embedded multipliers (Up to 0.5 Tera MACs)

**Engineering Design Kit**

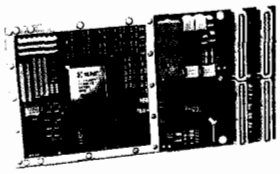
Acromag provides software utilities and examples to simplify your programming and get you started quickly.

**I/O Capabilities**

- Bi-directional CMOS I/O
- Bi-directional RS422/485 differential I/O

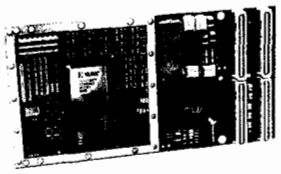
# Ready for use in extreme conditions

## Differential I/O



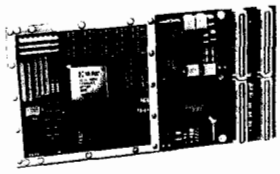
**PMC-CX1002**
This module provides high-density RS422/485 differential I/O signal processing under control of a user-configurable Xilinx Virtex-II FPGA. CX1002 models use the 12k logic cell version of the Virtex-II FPGA. Conduction cooling enables use in applications without sufficient cooling air flow.

## Differential I/O



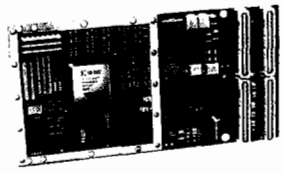
**PMC-CX2002**
This model is nearly identical to the CX1002 model except that it has a larger version of the Virtex-II FPGA providing 24k logic cells and more on-chip memory.

## CMOS, RS422/485



**PMC-CX1003**
This module provides both CMOS and differential I/O channels. The Virtex-II FPGA (12k logic cells) processes signals according to custom instructions. Conduction-cooled, this unit is ideal for airborne systems and others with advanced thermal management requirements.

## CMOS, RS422/485



**PMC-CX2003**
This model is nearly identical to the CX1003 model except that it has a larger version of the Virtex-II FPGA providing 24k logic cells and more on-chip memory.

| Model | FPGA | Logic Cells | CMOS I/O | Differential I/O | Rear I/O | Memory | Extended Temp. Range |
|---|---|---|---|---|---|---|---|
| PMC-CX1002 | Xilinx Virtex-II | 11,520 | - - | 32 RS422/485 | yes | 1MB RAM, 256K x 36-bit SRAM | Conduction, -40 to 85°C |
| PMC-CX2002 | Xilinx Virtex-II | 24,192 | - - | 32 RS422/485 | yes | 1MB RAM, 256K x 36-bit SRAM | Conduction, -40 to 85°C |
| PMC-CX1003 | Xilinx Virtex-II | 11,520 | 16 | 24 RS422/485 | yes | 1MB RAM, 256K x 36-bit SRAM | Conduction, -40 to 85°C |
| PMC-CX2003 | Xilinx Virtex-II | 24,192 | 16 | 24 RS422/485 | yes | 1MB RAM, 256K x 36-bit SRAM | Conduction, -40 to 85°C |

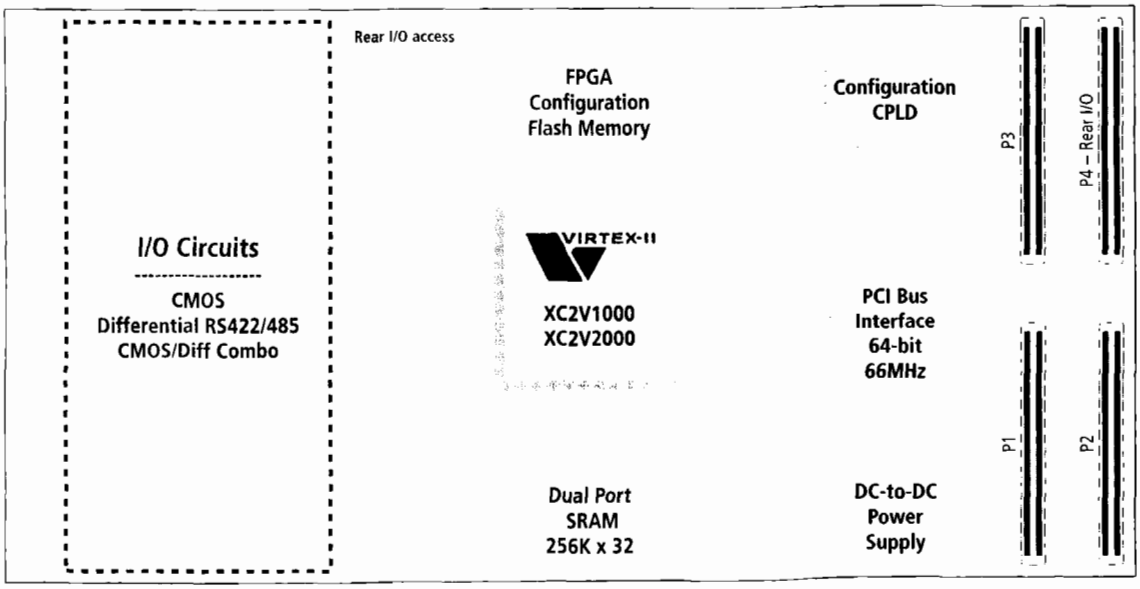
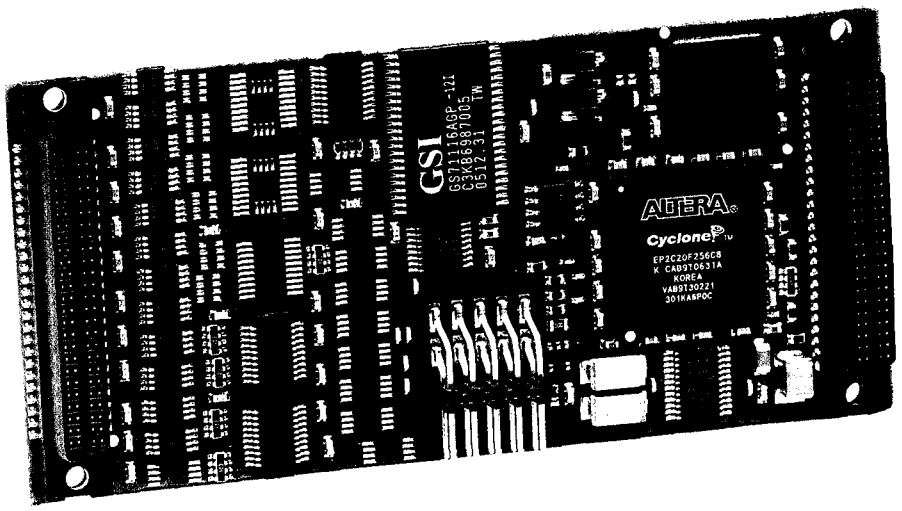




*Photo credit: Peter Ginter, Stanford Synchrotron Radiation Laboratory*

# Industry Pack FPGA Modules

*Acromag's Industry Pack FPGA modules provide a low-cost method to apply custom logic routines and signal processing algorithms to digital I/O signals.*




**Entry-level FPGA Computing**

Acromag's Industry Pack FPGA modules feature a user-customizable Altera® Cyclone®-II or Acex™ 1K100 FPGA. These modules allow users to develop and store their own instruction sets in the FPGA for a variety of adaptive computing applications.

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.

**Typical Applications**

Common FPGA applications include specialized communication systems over RS422/485 networks, test fixture simulation of signals over TTL-switched lines, and analysis of acquired data using advanced mathematical formulas such as those developed with MathWorks® MatLab™ software.

**Altera Cyclone-II FPGA**

- 18,752 logic elements
- 239,616 distributed RAM bits
- 52 4Kb block RAMs
- 26 18 x18 embedded multipliers
- 4 digital PLL clock managers

**Altera Acex EP1K100 FPGA**

- 4,992 logic elements
- 49,152 RAM bits
- 12 embedded array blocks (EAB)

**Engineering Design Kit**

Acromag provides software utilities and examples to simplify your programming and get you started quickly.

**I/O Capabilities**

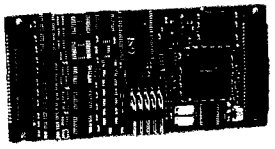
- Bi-directional TTL I/O
- Bi-directional RS485 differential I/O
- Combination TTL and differential I/O
- Bi-directional LVDS I/O



Call 877-295-7092 or 248-295-0310 for technical assistance.

# Re-configurable Cyclone®-II or Acex® 1K FPGAs

## Altera Cyclone-II, JTAG-configured



**IP-EP200 Series**
The Cyclone-II FPGA on these 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. Application code is downloaded through the JTAG port or via the IP bus directly into the FPGA.

## Altera ACEX 1K, bus-configured



**IP-1K110 Series**
The Acex 1K FPGA on these modules can control up to 48 TTL or 24 RS485 I/O signals or a mix of both types. User application programs are downloaded through the IP bus directly into the FPGA.

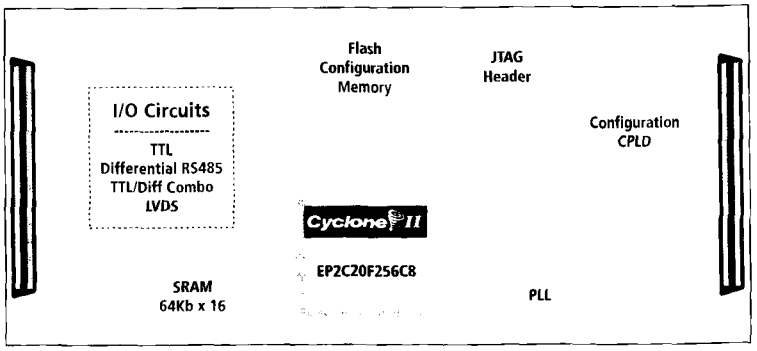
## Altera ACEX 1K, JTAG-configured

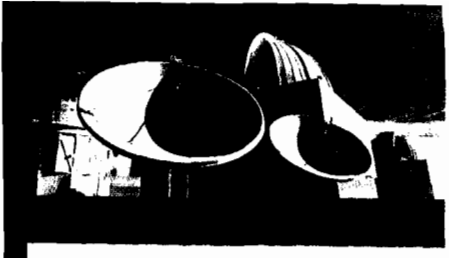


**IP-1K125 Series**
These modules are very similar to the IP1K110 series with the exception that application programs are downloaded through the JTAG port directly into the FPGA.

**Industry Pack User-Configurable FPGA with Digital I/O**

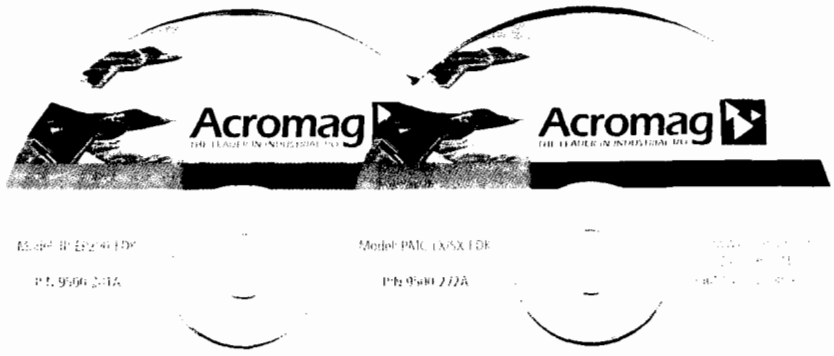
| Model | FPGA | Logic Cells | TTL I/O | Differential I/O | LVDS I/O | Memory | Extended Temperature Range |
|---|---|---|---|---|---|---|---|
| IP1K110-0024 | Acex EP1K100 | 4992 | -- | 24 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP1K110-2412 | Acex EP1K100 | 4992 | 24 | 12 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP1K110-4800 | Acex EP1K100 | 4992 | 48 | -- | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP1K125-0024 | Acex EP1K100 | 4992 | -- | 24 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP1K125-2412 | Acex EP1K100 | 4992 | 24 | 12 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP1K125-4800 | Acex EP1K100 | 4992 | 48 | -- | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP-EP201 | Cyclone II EP2C20 | 18,752 | 48 | -- | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP-EP202 | Cyclone II EP2C20 | 18,752 | -- | 24 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP-EP203 | Cyclone II EP2C20 | 18,752 | 24 | 12 RS485 | -- | 64K x 16 RAM | optional -40 to 85°C |
| IP-EP204 | Cyclone II EP2C20 | 18,752 | -- | -- | 24 | 64K x 16 RAM | optional -40 to 85°C |





# Engineering Design Kit

*Acromag's software design kits simplify the process of developing custom FPGA programs.*




**Engineering Design Kit IP-EP200**

**Engineering Design Kit PMC-LX/SX**

## EDK Software

One key to the success of your FPGA project is how quickly you learn to control the capabilities of the FPGA and its interaction with other components on the module. To save time in this stage, Acromag provides extensive example VHDL code covering all of the major functions of the FPGA module. This code is provided as both source code and as compiled code in the Engineer Design Kit.

Additionally, example code is pre-loaded into flash memory on the FPGA module. This lets you exercise the module and all of its functionality immediately out of the box.

The Engineering Design Kit provides the basic information required to develop a custom FPGA program for download to the FPGA. Utilities help you load VHDL into the FPGA and establish DMA transfers between the FPGA and the CPU. It is recommended that users be familiar with Xilinx® or Altera® development tools.

**Engineering Design Kit includes:**

- Parts list and location
- Schematics
- Compiled FPGA file
- Example VHDL code (provided as selectable blocks of code)
  - » Local Bus: example of interface between PCI accelerator and FPGA
  - » SRAM: example for read and write transfers to SRAM
  - » SDRAM: example for read, write and refresh to SDRAM
  - » 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
  - » Pin definitions: configuration file defining all user I/O pins communicating with the FPGA

**Models**

**For Virtex-5 FPGAs**
PMC-VLX-EDK
PMC-VSX-EDK
PMC-VFX-EDK
Engineering design kits for PMC-VLX/VSX/VFX Modules. Includes AXM-EDK test board.

**For Virtex-4 FPGAs**
PMC-LX-EDK
PMC-SX-EDK
Engineering design kits for PMC-LX/SX FPGA Modules. Includes AXM-EDK test board.

**For Virtex-II FPGAs**
PMC-AX-EDK
PMC-CX-EDK
PMC-DX-EDK
Engineering design kits for PMC-AX/CX/DX Modules.

**For Cyclone-II FPGAs**
IP-EP200-EDK
Engineering design kit for IP-EP200 FPGA Modules.

**For Acex FPGAs**
IP-1K110-EDK
IP-1K125-EDK
Engineering design kits for IP-1K110/1K125 Modules.



Photo credit: Peter Ginter, Fermilab

# Software Support

*Acromag software development tools for your OS save you time and effort.*

VxWorks®

Linux™

QNX®

Win32 DLL

## Function Routine C Libraries

These software development tools simplify the integration of Acromag I/O boards with your application programs.

Acromag offers a library of function routines targeted for VxWorks™ and QNX® operating systems. These routines and the example programs help you develop the interface between Acromag I/O boards and your application program. C source code is included for easy customization.

DLL drivers 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, PCI and CompactPCI products. Also, the C source code demonstration programs provide easy-to-use tools to test operation of your I/O modules.

A free example application programming interface is available for download on Acromag's website to assist Linux™ users. This software provides I/O function routines for Industry Pack modules and carriers. Includes C source code.

**VxWorks**

IPSW-API-VXW
For Industry Packs

PMCSW-API-VXW
For PMC, PCI, Compact PCI

90SW-API-VXW
For VMEbus I/O boards

**QNX**

IPSW-API-QNX
For Industry Packs

PCISW-API-QNX
For PMC, PCI, Compact PCI

**Windows DLL**

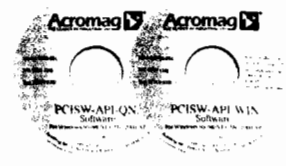
IPSW-API-Win
For Industry Packs

PCISW-API-Win
For PMC, PCI, Compact PCI

**Linux**

IPSW-Linux
For Industry Packs

PCISW-Linux
For PMC, PCI, Compact PCI



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