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THE LEADER IN INDUSTRIAL I/O

Embedded Computing & I/O Solutions

Industry Pack Series Brochure

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Digital I/O

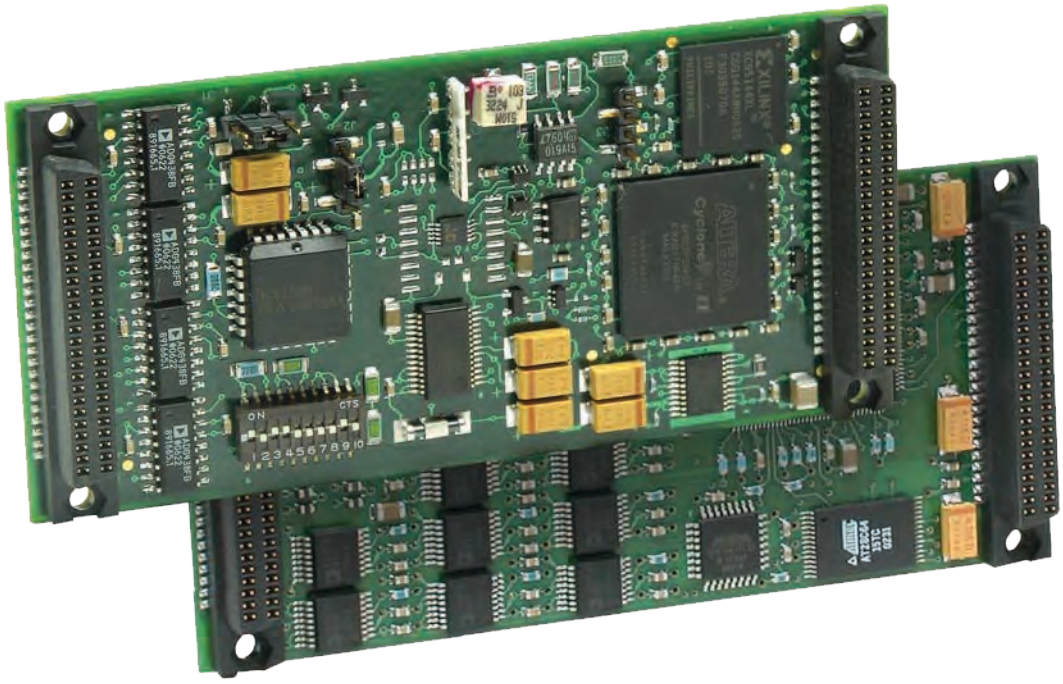
Counters/Timers

FPGAs

Communication

IP Carrier Cards

Software Support



Mix-and-match flexibility
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Depend on Acromag

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

Acromag: The I/O Leader

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

60+ Years of I/O Experience

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

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

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

Quality You Can Count On

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

Technical Support

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

Global Representation

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

Online Ordering

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

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MEMBER VITA Open Standards, Open Markets

COTS

Experience
Reliability
Extended Temperature
Extended Life Cycle

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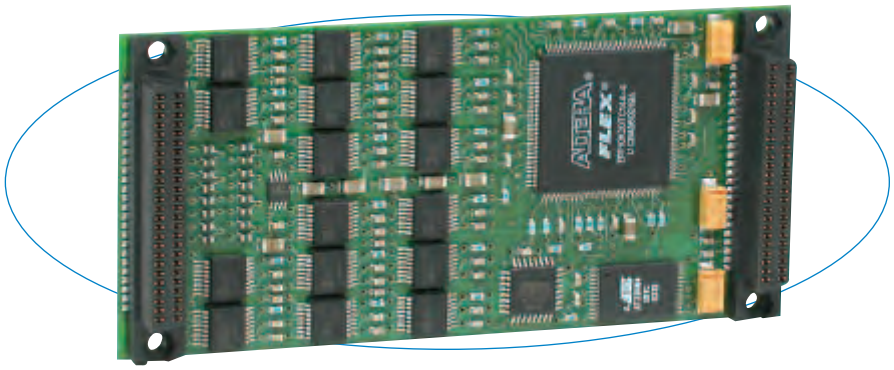
THE LEADER IN INDUSTRIAL I/O

RoHS Compliant

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



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

The IP220A outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds four IP modules, up to 64 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 12-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

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

Features

- 8 or 16 analog voltage output channels
- Independent 12-bit D/A converters per channel with an 11.0µS settling time
- Bipolar voltage (non-isolated) outputs: -10 to +10 volts
- Double-buffered DACs
- High load capability (5mA output current)
- Built-in calibration coefficients

Benefits

- Outputs reset to 0 volts.
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.

Specifications

Analog Outputs

Output configuration: 8 or 16 single-ended.

D/A Resolution: 12 bits.

Output range: Bipolar, -10 to +10V.

Settling time: 11µS.

Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 11µS/conversion.
Sixteen channels simultaneously: 17µS/16 channels.

System accuracy: 0.025% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.

Data format (left–justified): Bipolar Offset Binary.

Output at reset: 0 volts.

Output current: -5 to +5mA (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

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

Accessories

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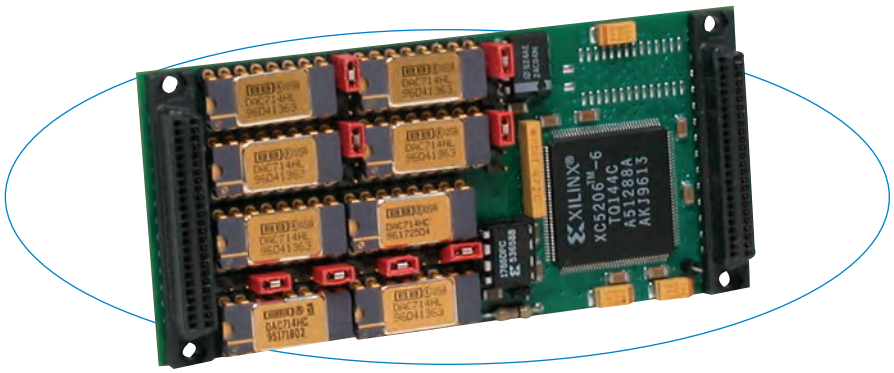
RoHS Compliant

IP230A-x 16-Bit D/A, Analog Output



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

IP230A modules have a 16-bit D/A converter (DAC) to provide highly-accurate analog voltage outputs.

Jumper-selectable output ranges give you the choice of unipolar or bipolar voltage output. And for greater flexibility, the IP230A module accepts conversion start triggers from software commands, or from external sources for synchronization to specific events.

Features

- IP230A-4: 4 analog voltage output channels
  IP230A-8: 8 analog voltage output channels
- Individual 16-bit D/A converters per channel
- 10µS settling time (100KHz throughput)
- Three output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable)
- Two trigger modes (software or external trigger)
- External trigger output
- Extended temperature option (-40 to 85°C)

Benefits

- High channel density saves card cage slots.
- Internally stored calibration coefficients ensure accuracy.
- Flexible output control allows single cycle updating of individual channels or all channels simultaneously.
- Hardware jumpers allow output range selection on an individual channel basis.

Specifications

Analog Outputs

Output configuration: 4 (IP230A-4/4E) or 8 (-8/8E).

D/A Resolution: 16 bits.

Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).

Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 100KHz (10µS/conversion)
Four channels (IP235A-4): 100KHz (10µS/4 ch)
Eight channels (IP235A-8): 100KHz (10µS/8 ch).

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

System accuracy: 0.0061% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.

Output at reset: 0V for bipolar output, 5V for unipolar.

Output current: -5 to +5mA (maximum).

Short circuit protection: Indefinite at 25°C.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

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

Access Times (8MHz clock):
All functions: 1 wait state (375nS cycle).

Environmental

Operating temperature: 0 to 70°C (IP230A-4/8) or -40 to 85°C (IP230A-4E/8E models).

Storage temperature: -55 to 125°C (all models).

Relative humidity: 5 to 95% non-condensing

Power: +5V (±5%): 200mA maximum.
±12V (±5%) from P1: 150mA maximum.

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

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

Accessories

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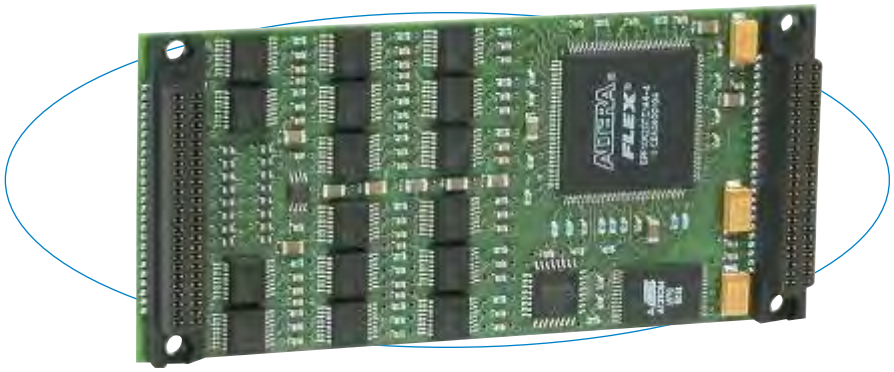
IP231-x
16-Bit D/A, Analog Output



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

The IP231 outputs analog voltage signals to drive up to 16 devices. When used with a carrier that holds four IP modules, up to 64 voltage outputs can be obtained from a single card cage slot.

Each output channel has its own 16-bit D/A converter (DAC). Individual DACs are faster, and they eliminate glitches typically caused by the re-acquisition process of sample and holds found on multiplexed output boards.

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

Features

- 8 or 16 analog voltage output channels
- Independent 16-bit D/A converters per channel with an 13µS settling time
- Bipolar voltage (non-isolated) outputs: -10 to +10 volts
- Double-buffered DACs
- High load capability (5mA output current)
- Built-in calibration coefficients

Benefits

- Outputs reset to 0 volts.
- Internally stored calibration coefficients ensure accuracy.
- Software provides easy selection of transparent or simultaneous output modes.
- Double-buffered DACs allow new data to be written to each channel before the simultaneous trigger updates the outputs.

Specifications

Analog Outputs

Output configuration: 8 or 16 single-ended.

D/A Resolution: 16 bits.

Output range: Bipolar, -10 to +10V.

Settling time: 13µS.

Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 13µS/conversion.
Sixteen channels simultaneously: 13µS/16 channels.

System accuracy: 0.00305% 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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

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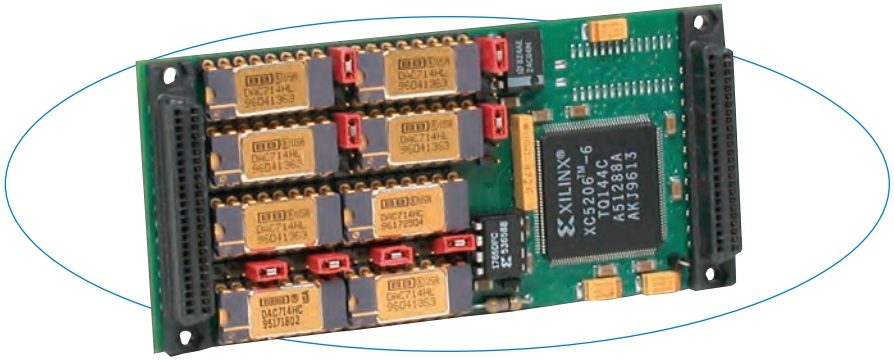
IP235A-8 16-Bit D/A Analog Output with RAM Buffer



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

IP235A-8 modules have a 16-bit D/A converter (DAC) to provide highly-accurate analog voltage outputs. An internal RAM buffer enhances control over the transfer of data to the DAC.

Each channel has a dedicated 2K sample RAM buffer. All channels share a global clock. A start trigger transfers digital values from the buffer to the DAC. Four modes offer several choices for the data transfer. Continuous mode simultaneously updates all the channels by cycling through the buffer until a software halt command is received. Single-cycle mode simultaneously updates all channels but only cycles through the buffer once for each start trigger.

Features

- 8 analog voltage outputs
- Individual 16-bit D/A converters per channel
- Waveform memory (2K samples/channel)
- Global timer for all channels supporting clock rates of up to 100KHz
- Software, external, or internal timer triggers
- Interrupt capability
- External trigger output
- User-programmable interval timer
- Extended temperature option (-40 to 85°C)

Benefits

- RAM buffer provides many options and generates waveform signals.
- Internally-stored calibration coefficients ensure accuracy.
- Flexible output control allows single cycle or continuous updating of individual channels or all channels simultaneously.

Specifications

Analog Outputs

Output configuration: 8

D/A Resolution: 16 bits.

Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).

Data sample memory: 2K sample RAM buffer on each channel.

Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 100KHz (10µS/conversion)
Eight channels: 100KHz (10µS/8 ch).

DAC programming: Immediate (transparently programmed to DAC output); simultaneous (input latches of 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 (±5%): 250mA maximum.
±12V (±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-API-LNX
Linux® support (website download only)

Accessories

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

The IP236-8A is ideal for generating waveforms. Large FIFO buffers reduce CPU interactions for increased overall performance.

IP236A-8 modules have 16-bit D/A converters (DAC) to provide highly-accurate analog voltage outputs. FIFO buffers enhance control over the transfer of data to the DAC and improve efficiency.

Each channel has a dedicated 128 sample FIFO buffer and its own clock. A start trigger transfers digital values from the buffer to the DAC. Three modes offer several choices for the data transfer on each channel. Continuous mode cycles data through the buffer for a given channel and is ideal for waveform generation. As new data loads into the FIFO, the output signal instantly updates without stopping the waveform. Single mode moves one value from the buffer to the converter for each trigger. External trigger mode synchronizes channel conversions to an event or other IP236A-8 modules.

Features

- 8 analog voltage outputs
- Individual 16-bit D/A converter on each channel
- Individual clock on each channel supporting rates of up to 100KHz
- FIFO memory buffers (128 samples/channel)
- Software, external, or internal timer triggers
- Interrupt capability
- External trigger output
- Extended temperature option (-40 to 85°C)

Benefits

- FIFO buffers enable "on-the-fly" changes to the output waveform as new data is received.
- Internally-stored calibration coefficients ensure accuracy.
- Independent control of each channel enables individual updates and unique conversion rates.

Specifications

Analog Outputs

Output configuration: 8.

D/A Resolution: 16 bits.

Output ranges: ±5V, ±10V, 0 to 10V (jumper-selectable).

Data sample memory: 128 sample FIFO buffer on each channel.

Maximum throughput rate:
Outputs can be updated simultaneously or individually.
One channel: 100KHz (10µS/conversion)
Eight channels: 100KHz (10µS/8 ch).

DAC programming: Independent. Input registers and FIFOs are directly loaded.

System accuracy: 0.0061% of 20V span maximum corrected error (i.e. calibrated) at 25°C with the output unloaded.

Output at reset: 0V for bipolar output, 5V for unipolar.

Output current: -5 to +5mA (maximum).

Short circuit protection: Indefinite at 25°C.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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 (±5%): 250mA maximum..
±12V (±5%) from P1: 210mA maximum.

MTBF: Consult factory.

Ordering Information

Industry Pack Modules

IP236A-8
Eight voltage output channels.

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

Accessories

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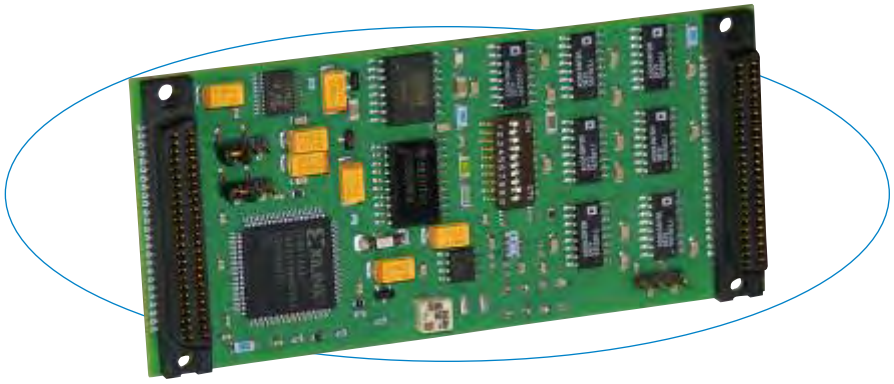
IP320A
12-Bit A/D, Analog Input



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

The IP320A monitors 20 differential or 40 single-ended input channels. When used with a carrier that holds four IP modules, up to 160 inputs can be obtained from a single card cage slot.

A jumper offers a choice of three input voltage ranges. Using the software programmable gain, you can easily customize the input voltage on an individual channel basis. The control register provides further flexibility with the option of single-ended or differential inputs and controlled channel selection. Software or external triggers enable synchronization of data acquisition to external events.

Features

- 20 differential or 40 single-ended inputs
- 12-bit, successive approximation A/D converter (ADC) with an 4.5µS conversion time
- 200K samples per second maximum system throughput rate
- Three dip switch-selectable input ranges: -5 to 5V, -10 to 10V, and 0 to 10V
- Programmable gains of 1, 2, 4, and 8
- Built-in calibration references

Benefits

- Software or external hardware inputs can trigger A/D conversions for synchronization to external events.
- On-board, precision voltage references enable accurate software calibration of the module without external instruments.
- The module supports both "wait" states (generated by the IP module) and "hold" states (generated by the carrier board).

Specifications

Analog Inputs

Input configuration: 40 single-ended or 20 differential.

A/D resolution: 12 bits.

Input ranges (dip switch-selectable):
Bipolar -5 to +5V, -10 to +10V (See Note 1), or
Unipolar 0 to +10V (See Note 1).

Note 1: Range requires ±15V external power supply. Clipping occurs with ±12V supplies, typically to ±9V.

Maximum throughput rate: 200KHz (5µS/conversion).
Only one channel updates at a time.

Programmable gains: x1, x2, x4, x8.

A/D triggers: External and software.

Maximum overall calibrated error at 25°C: See below.

Input Range (volts)	PGA Gain	ADC Range (volts)	Max.Error ±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: ±32V powered, -35 to +55 unpowered.

Common mode rejection ratio (60Hz): 71dB.

Channel-to-channel rejection ratio (60Hz): 71dB.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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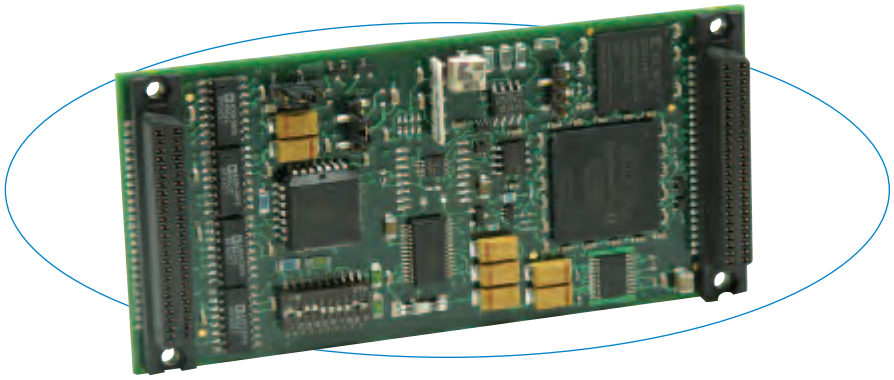
IP330A
16-Bit A/D
Analog Input



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

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)
- 5µS conversion time (200KHz)
- 16 differential or 32 single-ended inputs (±5V, ±10V, 0-5V, and 0-10V input ranges)
- Individual channel mailbox with one or two storage buffer registers per channel
- Programmable scan control
- Four scanning modes
- User-programmable interval timer
- External trigger input and output
- Programmable gain for individual channels
- Post-conversion interrupts

Benefits

- "Mailbox" memory eliminates scanning interruptions for optimum throughput.
- Data register indicates new and missed (overwritten) data values in the mail box.
- Programmable interrupts simplify data acquisition by providing greater control.

Specifications

Analog Inputs

Input configuration: 16 differential or 32 single-ended.

A/D resolution: 16 bits.

Input ranges: ±5V, ±10V*, 0-5V, and 0-10V*.
* Requires ±15V external supplies.

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

Maximum throughput rate:
Only one channel can be updated at a time.
One channel: 200KHz maximum (5µS/conversion)
[66KHz (15µS/conversion) recommended]
16 channels (differential): 4.2KHz (240µS/16 ch)
32 channels (single-ended): 2.1KHz (480µS/32 ch).

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

A/D triggers: External and software.

System accuracy: 2 LSB (0.0030%) typical (SW calib., gain=1, 25°C).

Data format: Straight binary or two's compliment.

Input overvoltage protection: Vss -20V to Vdd 40V with power on, -35V to 55V power off.

Common mode rejection ratio (60Hz): 96dB typical.

Channel-to-channel rejection ratio (60Hz): 96dB typical.

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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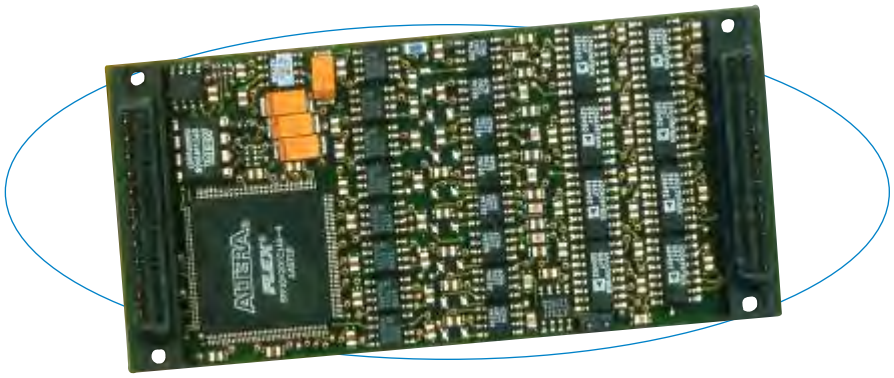
Acromag
THE LEADER IN INDUSTRIAL I/O

IP340 and IP341 Simultaneous A/D Conversion Analog Input



The IP340 is ideal for high-speed data acquisition. A large FIFO buffer reduces CPU interactions for increased overall performance

IP340/341 Industry Pack (IP) modules provide fast, high resolution, simultaneous A/D conversion of up to eight channels.

These modules have sixteen analog inputs which are sampled as two eight-channel banks. Eight A/D converters (ADCs) permit simultaneous conversion of all eight channels in a bank. A FIFO buffer holds the first bank's data while the second bank is converted. Conversion of each bank requires only 8µS, and all 16 channels can be sampled in just 16µs.

Flexible configuration options give you extensive control over the conversion process. The channels or bank to be converted, timing, scan mode, and other parameters are user-programmable. Interrupt support adds further control to flag a FIFO that is full or filled to a user-defined threshold level.

Features

- 16 differential inputs (±10V DC input range)
- Eight 12 or 14-bit A/D converters (IP340/341) with simultaneous multi-channel conversion
- 8µS conversion time (125KHz) for 8-channel bank
- FIFO buffer with 512 sample memory
- Programmable conversion timer
- Programmable channel conversion control
- External trigger input and output
- Continuous and single-cycle conversion modes
- Interrupt generation for FIFO threshold conditions
- Precision calibration voltages stored on-board

Benefits

- Simultaneous channel conversion and on-board memory enable megahertz throughput rates.
- Programmable interrupts simplify data acquisition by providing greater control.

Specifications

Analog Inputs

Input configuration: 16 differential.

A/D resolution: 12 bits (IP340), 14 bits (IP341).

Input range: ±10V.

Data sample memory: 512 sample FIFO buffer.

Max. throughput rate:
Eight channels can be simultaneously acquired.
One channel: 125KHz (8µS/conversion)
8 channels (same bank): 1MHz (8µS/8 channels)
16 channels (high & low banks): 1MHz (16µS/16 ch. at minimum 2.2K ohm source resistance).

Data sample memory: 512-sample FIFO memory buffer.

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

System accuracy:
IP340: 1.6 LSB (0.039%),
IP341: 2.4 LSB (0.014%).

Data format: Binary two's compliment.

Input overvoltage protection: ±25V with power on, ±40V with power off.

Common mode rejection ratio (60Hz): 96dB typical.

Channel-to-channel rejection ratio (60Hz): 96dB typical.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

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

Access times (8MHz clock):
ID space read: 0 wait states (250ns cycle).
FIFO buffer read: 2 wait states maximum (500nS), 1 wait state typical (375nS).
Registers read/write: 0 wait states (250ns cycle).
Interrupt read/write: 0 wait states (250ns cycle).

Environmental

Operating temperature: 0 to 70°C (IP340/341) or -40 to 85°C (IP340E/341E models).

Storage temperature: -40 to 125°C (all models).

Relative humidity: 5 to 95% non-condensing.

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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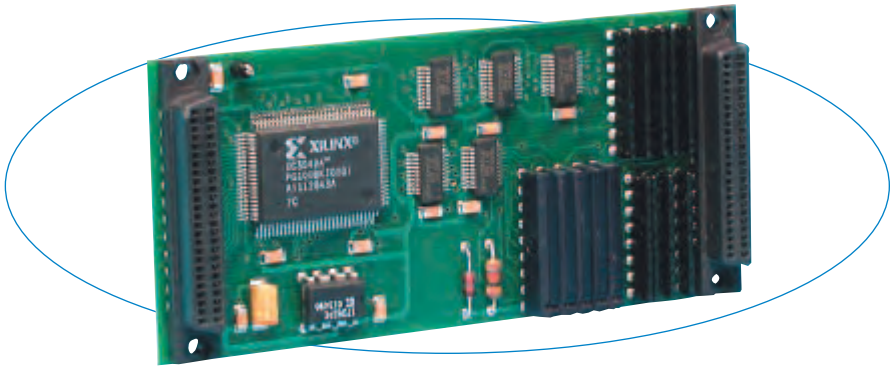
Acromag
THE LEADER IN INDUSTRIAL I/O

IP400
High Voltage Digital Input



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

The IP400 can monitor the on/off (high/low) status of up to 40 devices.

Loopback monitoring of critical control signals is easily accomplished with the IP400 by reading the output states of Acromag's IP405 Output Module. The two modules share the same field interface pinouts for direct loopback compatibility.

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

Features

- 40 digital inputs
- 0 to 60V DC input range
- TTL input threshold with hysteresis
- Change-of-state/level interrupts (up to 12 channels)
- Loopback monitoring of output states (with IP405)

Benefits

- Buffered inputs include hysteresis for increased noise immunity.
- Interrupts can be generated for change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.
- High impedance inputs minimize loading of the input source and input current.
- Faster data processing is achieved because only one "wait" state is required for a read or a write operation.

Specifications

Digital Inputs

Input channel configuration: 40 noninverting buffered inputs with a common connection. For DC voltage applications only, observe proper polarity.

Input voltage: 0 to 60V DC, maximum.

Input signal threshold: TTL compatible. 1.5V DC with 200mV of hysteresis, typical. Thus, Low-to-High threshold is 1.6V DC High-to-Low is 1.4V DC, typical. Limited to TTL levels of 0.8V DC (maximum Low level) and 2.0V DC (minimum High level).

Input resistance time: 100K ohms, typical.

Interrupts: Change-of-state and level on channels 0-11.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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Acromag
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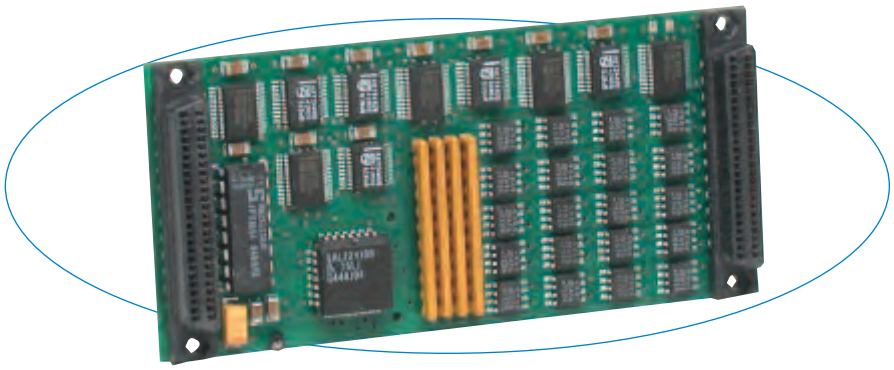
IP405
High Voltage Digital Output



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

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.

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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Acromag
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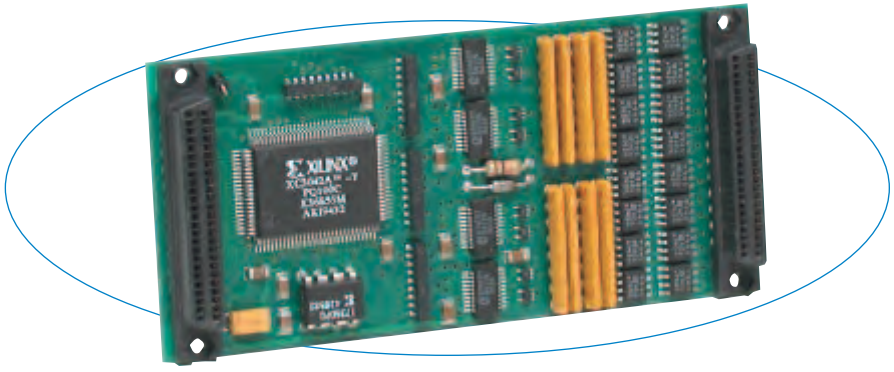
IP408
High Voltage
Digital Input/Output



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

The IP408 monitors or controls the on/off (high/low) status of up to 32 devices. Each channel can be used as an input or output.

Input channels can be configured with interrupts for a change of state or level detection of any bit on up to 8 channels. The TTL input threshold includes hysteresis for increasing noise immunity.

In order to ensure safe, reliable control under all conditions, output operation is "fail-safe." That is, the outputs are always off upon power-up and are automatically cleared following a software reset.

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

Features

- 32 digital input and/or output channels
- 0 to 60V DC input range, 60V DC low-side switch outputs
- Outputs sink up to 1A per channel
- TTL-compatible input threshold with hysteresis
- Change-of-state/level interrupts (up to 8)

Benefits

- Buffered inputs include hysteresis to increase noise immunity.
- Interrupts are software-programmable for a change of state or level detection.
- Loopback monitoring enables self-test and fault diagnostics to detect open output switches or shorts.
- High impedance inputs prevent loading of the input source and minimize current.
- Individual outputs sink up to 1A DC continuous. No deration of output current required at elevated temperatures.

Specifications

Digital Inputs

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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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Acromag
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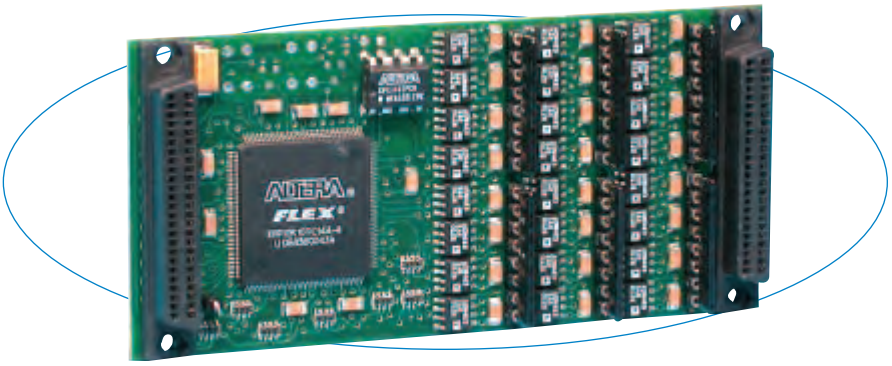
IP409
Differential
Digital Input/Output



The IP409 has 24 channels with interrupts for reliable, high-speed serial or parallel data transfer across noisy environments.

The IP409 provides 24 differential I/O channels with interrupts. Each channel is programmable as an input or an output on a bit basis, in any combination. All channels can generate change-of-state (COS), low, or high level transition interrupts.

Each channel uses a robust RS485/422A transceiver that supports bi-directional data transfer in one direction at a time (half-duplex). Differential data transmission enables reliable, high speed communication across distances of up to 4000 feet, even through noisy environments. Differential transmission nullifies the effects of ground shifts and noise signals which appear as common-mode voltages on the line.

Features

- 24 digital input and/or output channels
- Output channels support readback monitoring
- Socketed termination resistors
- Ruggedized RS422A/485 transceivers
- Interrupt support on all channels
  - change-of-state
  - high or low level transition
- Positive and negative current limiting
- Parallel I/O for up to 24 bits

Benefits

- All channels programmable as inputs or outputs.
- Differential data transmission is ideal for high-speed, long distance communication in noisy environments.

Specifications

RS485 Transceivers

Bus common mode range: -7 to 12V.

Channel configuration: 24 independent, non-isolated RS485/422A serial ports with a common signal return connection.

Data rate: 250K bits/second, maximum.

Cable length: 4000 feet, maximum. Use of a signal repeater can extend transmission distances.

Termination resistors: 120 ohm resistors installed in board sockets at network endpoints only.

Differential output voltage: 5V, maximum. 1.5V minimum (with 27 ohm load).

Common mode output voltage: 3V, maximum.

Output short circuit current: 250mA, maximum.

Rise/fall time: 250nS, minimum, 800nS, typical. 2000nS, maximum.

Receiver input impedance: 12K ohms.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported: Input/output (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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentatin for additional information.

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Acromag
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RoHS Compliant

IP440A-x
Isolated Digital Input

IP440A Industrial I/O Pack (IP) modules provide 32 optically isolated inputs to safely monitor a wide range of digital input voltage levels.

Isolation protects your computer system from noise, transient signals, and field wiring faults. The inputs are grouped into four 8-channel ports. Ports are isolated from the logic and each other.

Change-of-state interrupts are supported using paired channels. Debounce eliminates spurious interrupts from noise and switching transients for error-free edge detection.

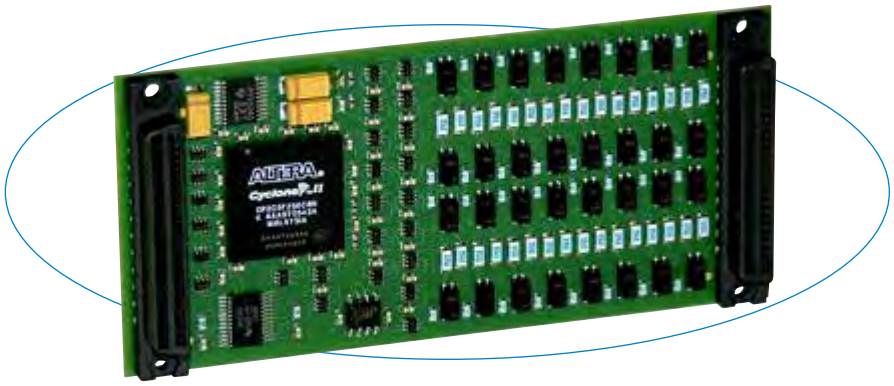
Closed-loop monitoring of critical control signals is easily accomplished using the IP440A in conjunction with Acromag's IP445 digital output module.

Features

- 32 port-isolated input channels
- Three input ranges (different models):
  IP440A-1: ±4 to ±18V DC or AC peak
  IP440A-2: ±16 to ±40V DC or AC peak
  IP440A-3: ±38 to ±60V DC or AC peak
- Interrupt support for each channel
- High speed processing (0 wait states)
- Programmable polarity of event interrupts (low-to-high or high-to-low transitions)
- Programmable debounce
- Input hysteresis
- Reverse polarity protection
- Software configuration (no jumpers or switches)

Benefits

- Software configuration allows "on-the-fly" changes without removing modules.
- Pins are compatible with IP445 output module for loopback monitoring
- Loopback monitoring enables self-test and fault diagnostics to detect open switches or shorts.



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: ±4 to ±18V DC or AC peak.
IP440A-2: ±16 to ±40V DC or AC peak.
IP440A-3: ±38 to ±60V DC or AC peak.

Input low-to-high threshold:
IP440A-1: ±2V typical.
IP440A-2: ±6.8V typical.
IP440A-3: ±13.75V typical.

Input response time:
On to off: 15µS typical.
Off to on: 10µS typical.

Interrupts: 32 channels configurable as below.
High-to-low transitions
Low-to-high transitions
Change-of-state (two inputs required)

Debounce: Selectable for 4µS, 64µS, 1mS, or 8mS.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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 (±5%): 150mA maximum, 65mA typical.
±12V (±5%): 0mA (not used).

Ordering Information

Industry Pack Modules

IP440A-1
Digital input, ±4 to ±18V input range

IP440A-1E
Same as IP440A-1 plus extended temperature range

IP440A-2
Digital input, ±16 to ±40V input range

IP440A-2E
Same as IP440A-2 plus extended temperature range

IP440A-3
Digital input, ±38 to ±60V input range

IP440A-3E
Same as IP440A-3 plus extended temperature range

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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Acromag
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RoHS Compliant

IP445A
Isolated Digital Output

IP445A modules provide 32 isolated solid-state relay outputs to safely control discrete devices.

A major IP445A advantage is its flexibility. The module supports wide range bipolar (AC or DC) voltage switching. Each port can be configured for high or low-side switches. The outputs are TTL-compatible when configured as low-side switches using on-board socketed pull-up resistors.

Isolation protects your computer system from noise, transient signals, and field wiring faults. Outputs are grouped into four 8-channel ports. Ports are isolated via solid-state relays from the logic and from each other.

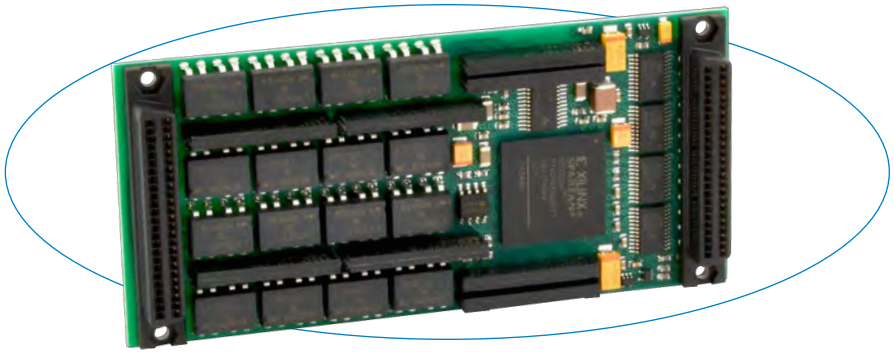
Readback buffers simplify output status monitoring. And for easy closed-loop monitoring of critical control signals, use the IP445A with an IP440A input module.

Features

- 32 bipolar solid state relays
- High/low-side switch configuration
- Port-isolated output channels
- ±60V AC/DC voltage range
- High speed processing (0 wait states)
- TTL-compatible
- Failsafe power-up and system reset
- Output readback function
- Socketed pull-up resistors for low-side switching applications
- Current-limited solid-state relays

Benefits

- Unique ground reference points for each port permits AC and DC switching on one module.
- Pin are compatible with IP440A input module for loopback monitoring.



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 ±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 (±5%) all outputs on: 200mA maximum.
±5V (±5%) all outputs off: 8mA maximum.

Ordering Information

Industry Pack Modules

IP445A
Digital output module.

IP445AE
Same as IP445A plus extended temperature range.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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Acromag
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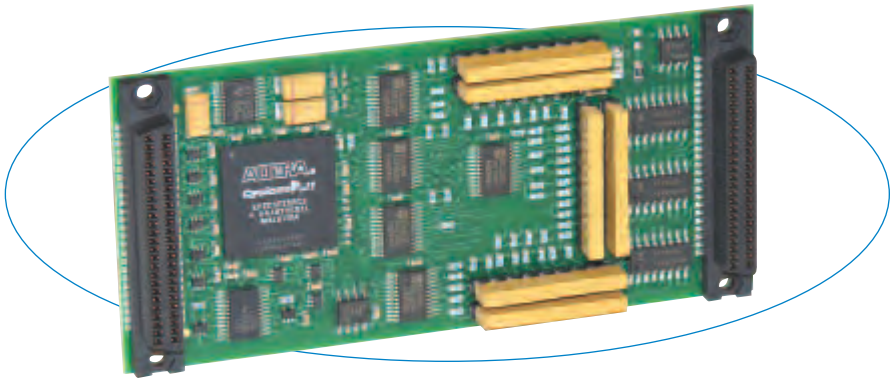
RoHS Compliant

IP470A TTL Level Digital I/O



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

IP470A Industrial I/O Pack (IP) modules provide 48 general-purpose, bidirectional I/O points to economically monitor and control a large quantity of digital devices.

Each channel has interrupt capability for detecting low-to-high or high-to-low transitions. Change-of-state interrupts are supported using paired channels. Debounce eliminates interrupts from noise and switching transients for error-free edge detection.

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

Features

- 48 bidirectional input/output channels
- TTL-compatible inputs
- CMOS-compatible open-drain outputs
- Interrupt support for each channel
- Input debounce
- Electronic overvoltage protection on individual channels
- Open drain outputs with socketed pull-ups
- Output readback registers

Benefits

- Output readback capability eliminates the need for additional input channels to verify the output channel state.
- Pinouts are compatible with industry-standard isolated I/O racks.
- Output channels do not "glitch" after a power-up/reset to eliminate false alarms.

Specifications

Digital Inputs

Input channel configuration: 48 buffered inputs.

Input voltage range: 0 to 5V DC.

Input signal threshold: 1.5V typical.

Input response time: 135nS.

Digital Outputs

Output channel configuration: 48 open-drain CMOS outputs.

Output voltage range: 0 to 5V DC.

Output "ON" current range: 0 to 15mA DC.

Output pull-ups: 4.7K ohms pull-ups installed in board sockets. With pull-ups removed, integrated 47.5K ohms nominal pull-ups are present.

Turn on time: 125nS, typical.

Turn off time: 3µS, typical.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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 *(see software documentation for details)*

IPSW-API-VXW
Deluxe Library (I/O function routines for VxWorks® 6.x 32-bit, x86, PowerPC, and other RTOS environments), CD-ROM

IPSW-API-WIN
64-bit and 32-bit Windows® DLL driver and demonstration software for Industry Pack Modules, PCI, and cPCI carriers.

IPSW-API-LNX
Linux example libraries for Industry Pack modules and PCI/CompactPCI carrier cards.

See accessories documentation for additional information.

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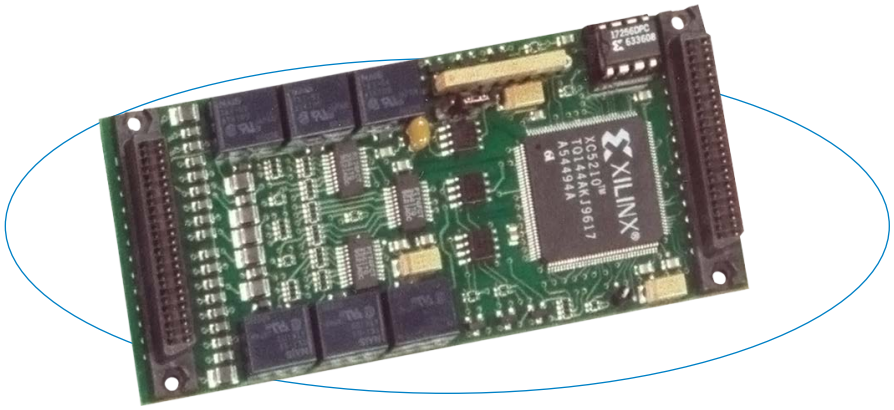
IP480 Counter/Timer

IP480 modules provide up to six 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.



The IP480 is very flexible and available in several varieties to accommodate a broad range of counter/timer applications.

Features

- IP480-6: Six 16-bit (three 32-bit) counter/timers
  IP480-2: Two 16-bit (one 32-bit) counter/timers
- Event counters
- Output waveform generator
  - continuous pulse
  - single pulse
  - continuous square waveforms
- Pulse-width or periodic rate monitor
- Watchdog timer with isolated relay output
- Interrupt support:
  - watchdog timeout
  - event count complete
  - pulse-width or rate measurement complete
  - pulse wave complete
  - successive waveform generation
- Extended temperature option (-40 to 85°C)

Benefits

- Most configuration is handled by a single register which minimizes programming.
- Timer outputs support high voltage/currents.
- Built-in clamp diodes provide added protection when driving inductive loads.
- Pullups are socketed for easy adjustment.

Specifications

Counter/Timers

Counter/timer configuration:
IP480-6: Six 16-bit counter/timer function groups.
IP480-2: Two 16-bit counter/timer function groups.
Any two 16-bit counters may be combined together to create a 32-bit counter.

Speed (with 8MHz internal clock):
Max. output pulse/square wave freq.: 4MHz.
Minimum event pulse width: 130nS.
Minimum pulse width measurement: 250nS.
Minimum period measurement: 250nS.

Mode accuracy (with external clocking):
Waveform generation: Period is ±62nS.
Watchdog: Timeout occurs within ±1 clock cycle.
Pulse/period measurement: ±1 clock cycle.

Internal clocks: Programmable 1, 4, or 8MHz.

External clocks: Separate clock input for each counter supports frequencies up to 7MHz.

Counter trigger: External inputs for triggering counter functions. Input level is TTL or CMOS compatible. Vih=2.0V, Vil=0.8V. Inputs are buffered and include 4.7K ohm pull-ups to +5V.

Input voltage range: 0 to 5V.

Input requirements: 2.0V DC minimum high level, 0.8V DC maximum low level, 10µA maximum current.

Output: Non-isolated open drains of N-channel mosfets with socketed 4.7K ohms pull-up resistor SIP. Drains protected to 60V DC and sink up to 250mA each.

Output range (low side switch): 0 to 5V with internal supply. 0 to 60V with pull-ups to external supply.

Output open drain pull-ups: A 4.7K ohms pull-up resistor SIP. Power limited to 0.15W/resistor.

Output relays:SPDT (Form C) electromechanical relays (one per counter) controlled in watchdog timer mode. Contacts rated to 125V AC, 1A.

IP Compliance (ANSI/VITA 4)

Meets all written IP specs per ANSI/VITA 4-1995.

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

Access times (8MHz clock):
Read/write cycles: 0 wait states (250ns cycle); 1 wait state (375nS cycle) to read the counter readback register.

Environmental

Operating temperature: 0 to 70°C (IP480-2/6) or -40 to 85°C (IP480-2E/6E).

Storage temperature: -55 to 125°C (all models).

Relative Humidity: 5 to 95% non-condensing.

MTBF: Consult factory.

Power: +5V (±5%): 255mA max. (-6), 110mA (-2).
±12V (±5%) from P1: 0mA max. (not used).

Ordering Information

Industry Pack Modules

IP480-2*
Two 16-bit (one 32-bit) counter/timers

IP480-2E*
Same as IP480-2 plus extended temperature range

IP480-6
Six 16-bit (three 32-bit) counter/timers

IP480-6E*
Same as IP480-6 plus extended temperature range

View Industry Pack Carrier Cards.

*Consult factory for long-term availability.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

View accessories.

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IP482/483/484 Counter/Timers

- IP482: Ten 16-bit counters – TTL
- IP483: Five 16-bit counters – TTL, and Two 16-bit counters – RS422
- IP484: Five 16-bit counters – RS422

Several models with a variety of configurations provide up to ten counter/timer channels for counting events, generating waveform control signals, measuring pulse-widths or periodic rates, and monitoring operations.

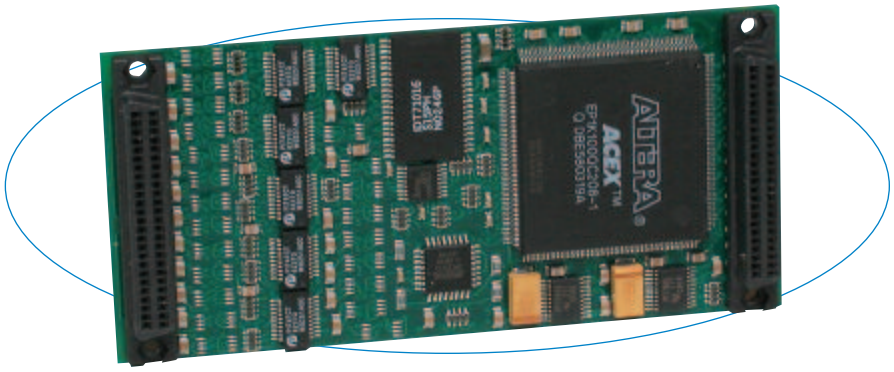
Support for internal or external triggering simplifies the synchronization of operations to specific events. Counter functions can use internally generated clocks or an externally supplied clock.

Features

- Up to ten 16-bit counter/timers (IP482)
- Available with both TTL and RS422 driver interface (IP483 only)
- 8 or 32MHz clock time base
- Single counter/timer modes:
  - Event counting
  - Frequency measurement
  - Period/pulse-width measurement
  - Quadrature position measurement
  - Square wave/pulse train generation
  - Time/period interrupter
  - Pulse width generation
- Extended temperature option (-40 to 85°C)

Benefits

- Most configuration is handled by a single register which minimizes programming.
- Pullups are socketed for easy adjustment.



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:
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 ±62nS.
Watchdog: Timeout occurs within ±1 clock cycle.
Pulse/period measurement: ±1 clock cycle.

Interrupts: Supported for watchdog timer time-out, event count complete, pulse width or periodic rate measurement complete, pulse wave complete (one-shot mode), successive waveform generation (continuous).

Triggering/gate: Programmable via register write or external trigger. Minimum pulse width 125nS. Line may be used for gating of counter.

Counter trigger: Interface for triggering counter functions. Input level is TTL or RS422 differential digital.

Counter input: Interface for events and pulse/period measurements. Also triggers load of watchdog timer register. Level is TTL or RS422 differential digital.

TTL compatibility: V_{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 *(see software documentation for details)*

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

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

See accessories documentation for additional information.

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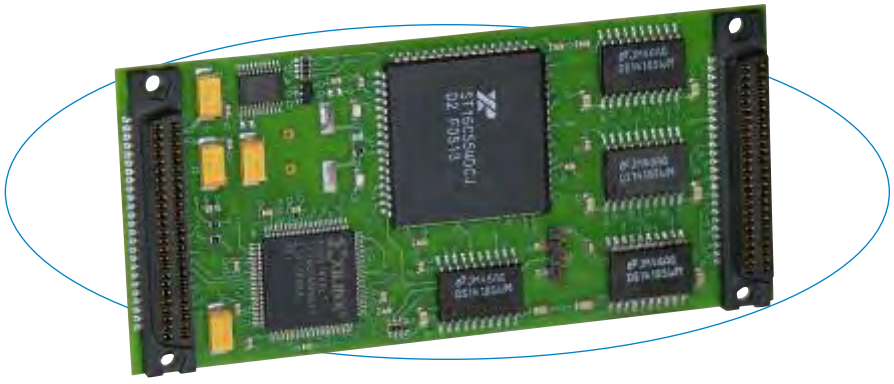
IP500A Serial 232 Communication



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

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.

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.

Customized Industry Pack Modules

† 4860-x
Modified IP500A 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 oder of two units.

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-WIN
Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries for Industry Pack modules and PCI/CompactPCI carrier cards.

See accessories documentation for additional information.

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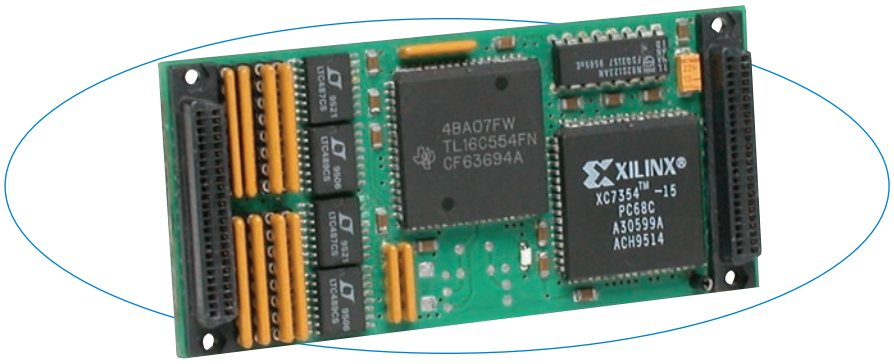
IP501-x Serial 422/485 Communication



Large, 64-byte FIFO buffers reduce the processing burden on the CPU to increase the overall system performance.

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 or 64-character FIFO buffers on the transmit and receive lines.

Features

- Four asynchronous, full-duplex RS422B serial ports (full-duplex RS485)
- 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)
- Handshake control signals (RTS, CTS) for each channel
- Extended temperature option (-40 to 85°C)
- Industry-standard 16C550 family UART includes software-compatible 16C450 mode

Benefits

- Failsafe receivers guarantee a high output state when the inputs are left open or floating.
- Internal diagnostics help detect faults.
- FIFO buffers minimize CPU interaction for improved system performance.

Specifications

RS422B Serial Ports

Configuration: Four independent, non-isolated RS422B serial ports with a common single return connection.

Data rate: Programmable up to 512K bits/second using internal baud rate generator. Consult factory for custom baud rates up to 1M baud.

Interface: Asynchronous serial only.

Character size: 5 to 8 bits, software-programmable.

Parity: Odd, even, or no parity; software-programmable.

Stop bits: 1, 1-1/2, or 2 bits; software-programmable.

Interrupts: Receiver line status (overrun error, parity error, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter holding register empty; or modem status (CTS). Multiple ports share the 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.

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) or -40 to 85°C (IP501-16E/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

IP501-16E:* Four serial ports with 16-byte FIFOs plus extended temp. range

IP501-64:* Four serial ports with 64-byte FIFOs

Acromag offers a wide selection of Industry Pack Carrier Cards.

*Consult factory for long-term availability.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN32
32-bit Windows® DLL driver software support package

IPSW-API-WIN64
64-bit Windows® DLL driver software support package

Accessories

See www.acromag.com for more information

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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 with16-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 (overrun error, parity error, framing error, or break interrupt); received data available (FIFO level reached) or character time-out; transmitter holding register empty. Multiple ports share the IntReq0 line according to a shifting priority scheme based on the last interrupting port serviced.

UART

UART: Texas Instruments TL16C554FN.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
32-bit & 64-bit Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries for Industry Pack modules and PCI/CompactPCI carrier cards.

Accessories

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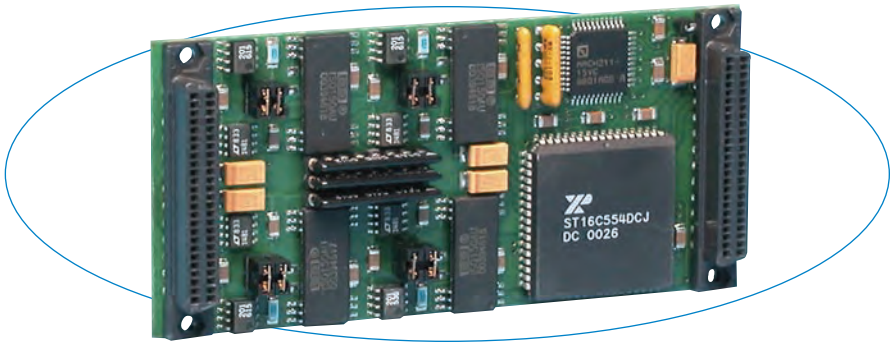
IP511-x
Isolated Serial 422 Communication



Large, 64-byte FIFO buffers reduce the processing burden on the CPU to increase the overall system performance.

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.

Specifications

Serial Ports

Configuration: 4 independent, isolated, full-duplex, RS422B ports.

Interface: Asynchronous serial only.

Data rate: Programmable to 512K bits/second. Consult factory for custom baud rates up to 1M baud.

Character size: Programmable 5-8 bits.

Parity: Programmable odd, even, or no parity.

Stop bits: Programmable 1, 1-1/2, or 2 bits.

Data register buffers: Double-buffered (16C450 mode) or 16/64-byte FIFO buffered,

Interrupts: Receiver Line Status, Received Data Available or Character Timeout, Transmitter Holding Register Empty. IP511-64 includes interrupts for received XOFF signal/special character.

Receiver input resistance: 12K ohms minimum.

Differential input threshold: ±0.2V.

Bias resistors: Not required (driver always enabled).

Output short circuit current: 250mA maximum.

Termination resistors 120 ohms, socketed.

Maximum cable length: 1200m (4000 ft.).

Port power requirements: Isolated +5V ±5%, 5mA typical, each port.

UART

IP511-16: Texas Inst. TL16C554FN or equivalent.

IP511-64: Startech ST16C654CJ68.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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 (±5%): 160mA maximum.
±12V (±5%): 0mA (not used).

MTBF: Consult factory.

Ordering Information

Industry Pack Modules

IP511-16
Four RS422B ports with 16-byte FIFOs.

IP511-64
Four RS422B ports with 64-byte FIFOs.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries

Accessories

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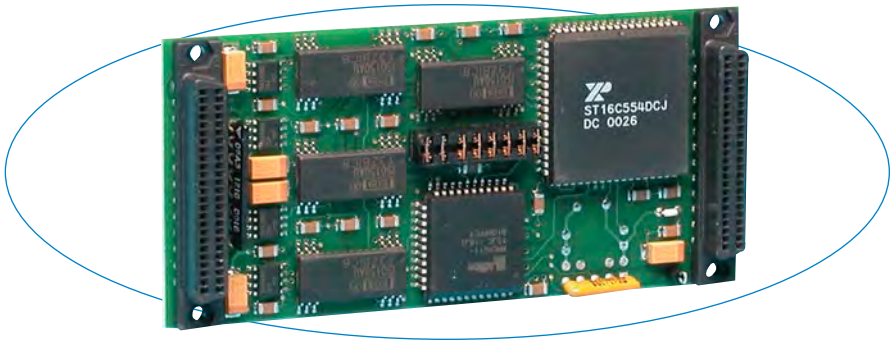
IP512-x
Isolated Serial 485 Communication



Large 64-byte FIFO buffers reduce the processing burden on the CPU to increase the overall system performance.

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

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

Features

- Four asynchronous RS485 serial ports
- Isolated serial ports
- 16 or 64-byte FIFO buffers
- Software-programmable baud rate (up to 512Kbps)
- Individually controlled interrupts (unique vectors for each port)
- Line break generation and detection
- False start bit detection
- Industry-standard 16C550 UART including software compatible 16C450 mode

Benefits

- Isolation protects computer system from ground loops and transient signals.
- FIFO buffers minimize CPU interaction for more efficient data processing.
- Internal diagnostics help detect communication faults.
- Priority shifting scheme prevents continuous interrupts from blocking other ports.

Specifications

Serial Ports

Configuration: 4 independent, isolated, RS485 ports.

Interface: Asynchronous serial only.

Data rate: Programmable to 512K bits/second using internal baud rate generator.

Character size: Programmable 5-8 bits.

Parity: Programmable odd, even, or no parity.

Stop bits: Programmable 1, 1-1/2, or 2 bits.

Data register buffers: Double-buffered (16C450 mode) or 16/64-byte FIFO buffered,

Interrupts: Receiver Line Status, Received Data Available or Character Timeout, Transmitter Holding Register Empty.

Receiver input resistance: 12K ohms minimum.

Differential input threshold: ±0.2V.

Bias resistors: 560 ohms pull-ups.

Output short circuit current: 250mA maximum.

Termination resistors 120 ohms. Installed in board sockets (removable).

Port power requirements: Isolated +5V ±5%, 15mA maximum, each port.

Maximum cable length: 1200m (4000 ft.).

UART

IP512-16: Texas Inst. TL16C554FN or equivalent.

IP512-64: Startech ST16C654CJ68.

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported:
Input/output (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 (±5%): 160mA maximum.
±12V (±5%): 0mA (not used).

MTBF: Consult factory.

Ordering Information

Industry Pack Modules

IP512-16
Four RS485 ports with 16-byte FIFOs.

IP512-64
Four RS485 ports with 64-byte FIFOs.

Acromag offers a wide selection of Industry Pack Carrier Cards.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries

Accessories

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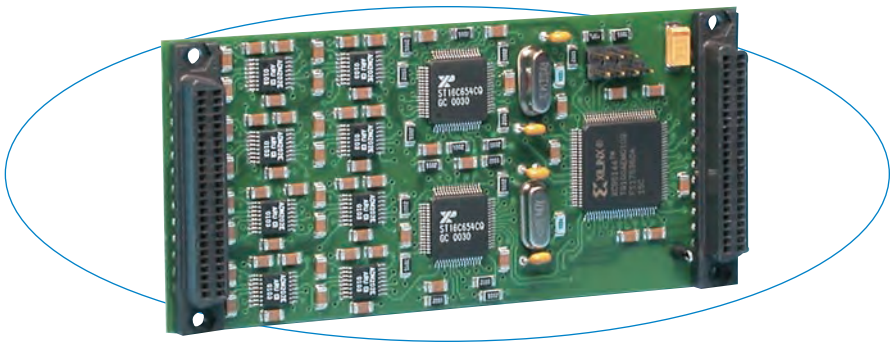
IP520
Octal Serial 232 Communication



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

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.

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.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries

Accessories

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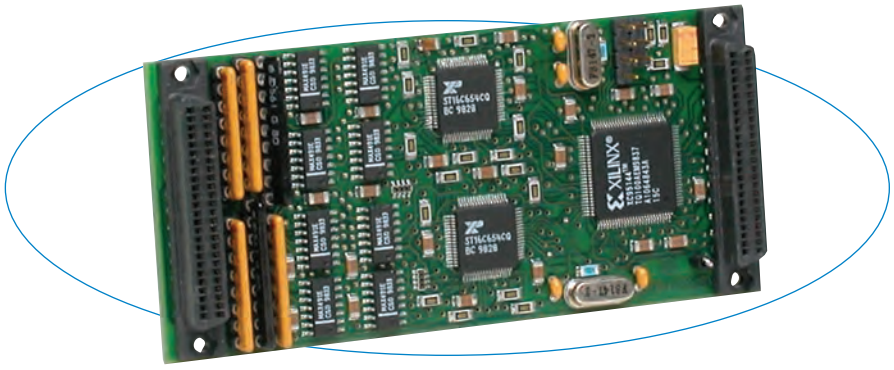
IP521
Octal Serial 422/485 Communication



With eight serial ports per module, the IP521 provides a high-density solution to reduce costs and use fewer card slots.

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.

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.

Software

IPSW-API-VXW
VxWorks® software support package

IPSW-API-WIN
Windows® DLL driver software support package

IPSW-API-LNX
Linux example libraries

Accessories

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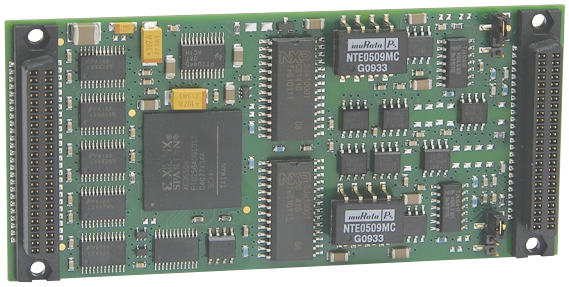
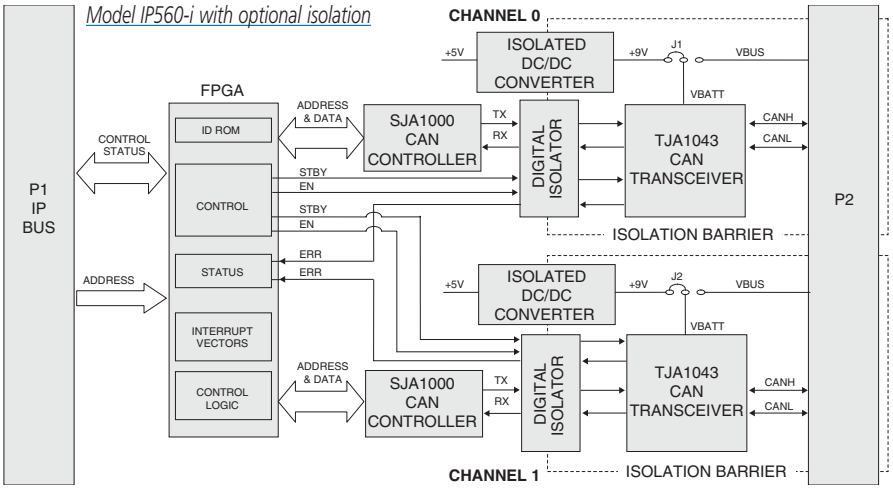
Industry Pack Modules

IP560 CAN Bus Interface Modules

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 VBAT
- Listen-only mode for node diagnosis and failure containment

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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)

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).

Interrrupt 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).

Interrrupt Select Read: 1 wait state (94nS cycle).

Memory Space Read: 5 wait state (250nS cycle).

Memory Space Write: 2 wait state (156nS cycle).

Environmental

Operating temperature
0 to 70°C or -40 to 85°C (E models).

Storage temperature
-55 to 125°C.

Relative humidity
5 to 95% non-condensing.

Power
IP560/IP560E
+5V (±5%): 92 mA typical, 110 mA mA maximum.
+12 Volts (±5%): 0.12 mA typical, 0.2 mA maximum.

IP560-i/IP560E-i
+5V (±5%): 123 mA typical, 275 mA maximum.

MTBF
Contact the factory.

Ordering Information

IP Modules

Go to on-line ordering page >

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.

**Consult factory for long-term availability.*

Carrier Cards

See www.acromag.com for more information.

Software development tools

See www.acromag.com for more information.

ISO9001
AS9100
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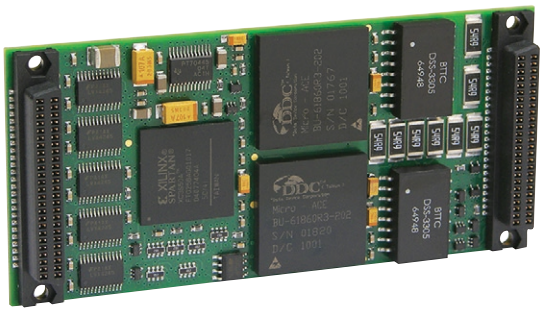
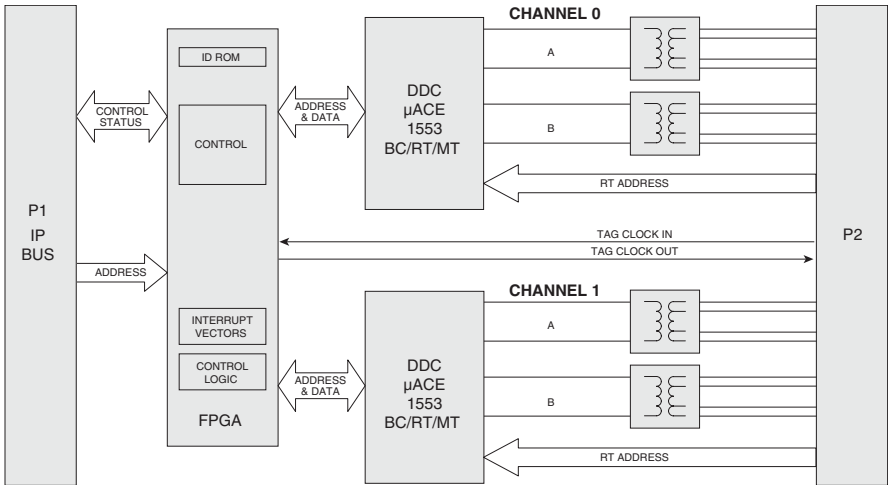
Industry Pack Modules

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).

Interrrupt 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).

Interrrupt 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

Go to on-line ordering page >

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.

*Consult factory for long-term availability.

Accessories

IP-IOS570-EDK*
Engineering Design Kit (one kit required). Contains 1553 library to allow interface to standard Acromag drives.

*Consult factory for long-term availability.

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 for more information.

ISO9001
AS9100
MADE IN USA

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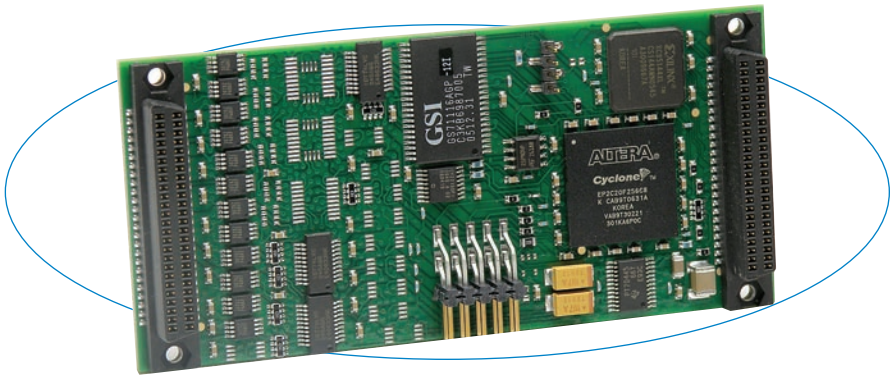
IP-EP200 JTAG-Reconfigurable Cyclone™ II FPGA Digital I/O Modules



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
- LVTTL external clock connected directly to the FPGA
- Supports 8MHz and 32MHz IP bus
- Programmable PLL-based clock synthesizer
- Example FPGA design code provided as VHDL
  - 8MHz IP bus interface
  - Digital I/O control register
  - others
- Hardware support for DMA and memory space

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: LVTTL external clock input

IP bus clock frequency: Supports 8 and 32MHz clocks.

ID space: 8-bit data.

I/O space: 8 or 16-bit data.

Memory space: Wired to FPGA but not supported with example FPGA design firmware.

Interrupt support: Two IP request levels.

DMA support: Wired to FPGA but not supported with example FPGA design firmware.

IP logic interface: CPLD maintains ID space and two locations in IO space for FPGA configuration. Remaining IO space and INT space are defined by the configured FPGA.

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

IP Compliance (ANSI/VITA 4)

Meets IP specifications per ANSI/VITA 4-1995.

IP data transfer cycle types supported: Input/output (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.
*Consult factory for long-term availability.

Software (see software documentation for details) **IPSW-API-VXW:** VxWorks® software support package **IPSW-API-WIN:** Windows® DLL driver software support pkg. **IPSW-API-LNX:** Linux™ support (website download only) See accessories documentation for additional information.

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Industry Pack Carriers

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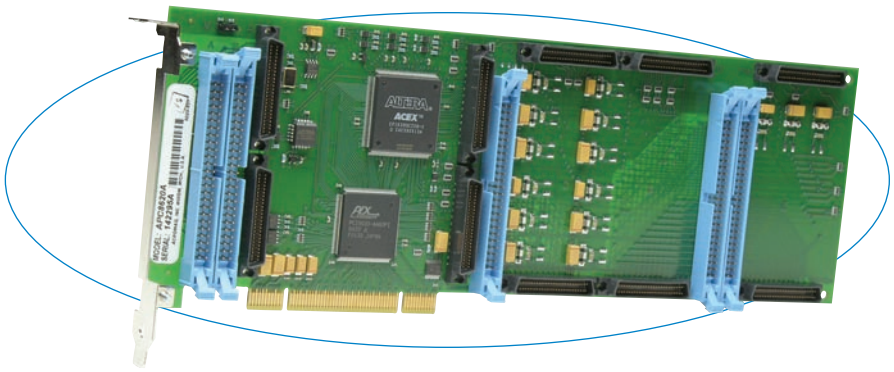
Industry Pack Carriers

APC8620A PCI Bus IP Carrier Card



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

This board interfaces industry-standard Industrial I/O Pack (IP) modules to a PCI bus on a PC-based computer system.

Five IP module slots give you the freedom to mix a variety of I/O functions (A/D, D/A, digital in, digital out, serial I/O, etc.) on a single board. Or, combine modules of the same type for hundreds of channels on a single card. Either way, the APC8620A saves your precious card slots and reduces your costs.

Select I/O modules from Acromag's offering of more than forty models or use any third-party IP mezzanine ANSI/VITA 4 modules.

Features

- Five industry-standard IP module slots
- Board resides in memory space
- Supports IP module I/O, ID, INT, and MEM spaces
- Plug-and-play carrier configuration and interrupt support
- Two interrupt channels per IP module
- Supervisory circuit reset generation
- Individually filtered and fused power

Benefits

- Quickly create custom I/O boards by mixing and matching I/O functions.
- Conveniently configure and control the I/O modules through software with full IP module register/data access.
- Easily integrate IPs with your software using RTOS VxWorks, QNX, Linux, or Win DLL for Windows® 2000/XP/Vista/7 32-bit systems.

Specifications

IP Module Compliance (ANSI/VITA 4)

Meets or exceeds all written IP specifications per ANSI/VITA 4-1995 for 8MHz or 32MHz operation.
Supports Type I and Type II ID space formats.

Electrical/mechanical interface: Supports five single-size IP modules (A-E), or two double-size and one single-size IP module.

IP module I/O space, ID space, INT, and MEM space supported.

IP module I/O space: 16 and 8-bit; supports 128 byte values per IP module.

IP module ID space: 16 and 8-bit; Supports Type I 32 bytes per IP (consecutive even byte addresses) and Type II 32 words per IP via D16 data transfers.

IP module memory space: 16 and 8-bit; supports up to 8M bytes of memory space per IP module.

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

PCI Bus Compliance

This device meets or exceeds all written PCI local bus specifications per rev. 2.2 dated December 1998.

System base address: This board operates in PCI memory space. It requires 1K of memory space for mapping the carrier controls, and IP module ID, INT, and I/O space. An optional 64MB of PCI memory space is required to use IP module memory space.

Data transfer bus: Slave with 32, 16, and 8-bit data transfer operation. 32-bit read or write accesses implemented as two 16-bit transfers to IP modules.

Interrupts (PCI bus INTA# interrupt signal):
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.

Storage temperature: -55 to 100°C.

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.

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

Accessories

5025-550: Cable, unshielded, 50-pin header both ends

5025-552: Termination panel, 50-pin connector, 50 screw terminals

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Industry Pack Carriers

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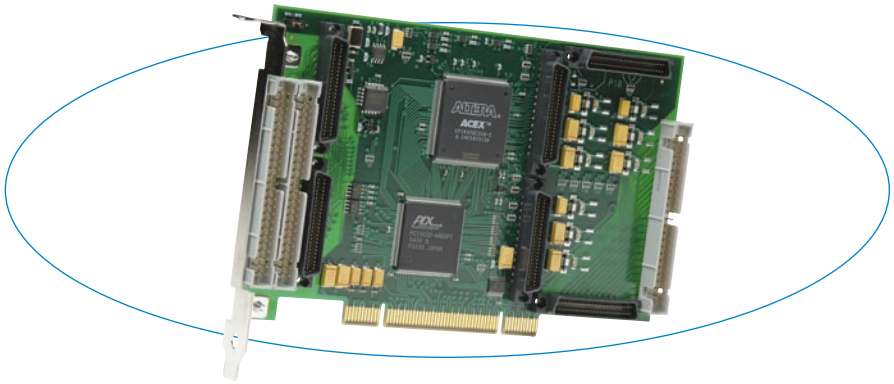
Industry Pack Carriers

APC8621A
PCI Bus Half-Length
IP Carrier Card



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

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.

Storage temperature: -55 to 100°C.

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.

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

Accessories

5025-550: Cable, unshielded, 50-pin header both ends

5025-552: Termination panel, 50-pin connector, 50 screw terminals

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Support Software

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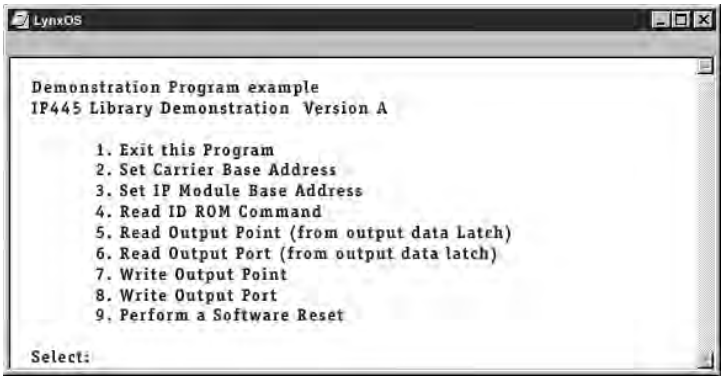
Linux® Libraries I/O Function Routines



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

Simplify interfacing between Acromag I/O boards and your software ◆ Demonstration Program

Description

IPSW-API-LNX
Support for Industry Pack modules and carriers

PCISW-API-LNX
Support for PCI/CompactPCI boards and PMC modules

APSW-API-LNX
Support for AcroPack® modules and carriers

Application Programming Interface (API)

Acromag's software development tools greatly simplify the interface between the I/O boards and your software application program. The Linux libraries are supplied as "C"source code. These libraries provide easy-to-use function routines that quickly integrate with your application. Function routines are ready for use "as-is," but they are also easily customized for your unique application.

Demonstration Program
This powerful program lets you fully exercise the libraries and your hardware before running the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration program steps you through the exact functions that are called in your application.

Key Features & Benefits

- Easy installation procedure
- Readme files with step-by-step instructions
- Programming tools for most Acromag I/O boards (excludes serial I/O and VME products)
- Demonstration program
- Downloadable at no charge from the Acromag website
- Source code provided to ensure maximum flexibility in implementing your driver
- Verify operation of your I/O modules and carrier cards with a demonstration program to ensure proper hardware operation before attaching your application

Ordering Information

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

IPSW-API-LNX
Linux example libraries for Industry Pack modules and PCI/CompactPCI carrier cards

PCISW-API-LNX
Linux example libraries for PCI, CompactPCI, and PMC modules.

APSW-API-LNX
Linux example libraries for AcroPack® modules and carriers.

IPSW-VME-LNX
Linux example libraries, works with TSI148 chipset for models XVME-6300, XVME-6400, Industry Pack modules, and VME carriers.

IPSW-A7VME-LNX
VxWorks® 7.0 64-bit, software support package for Acromag Series XVME6500 and XVME6700 SBC when used with Industry Pack modules and VME carriers. Supplied on CD-ROM.

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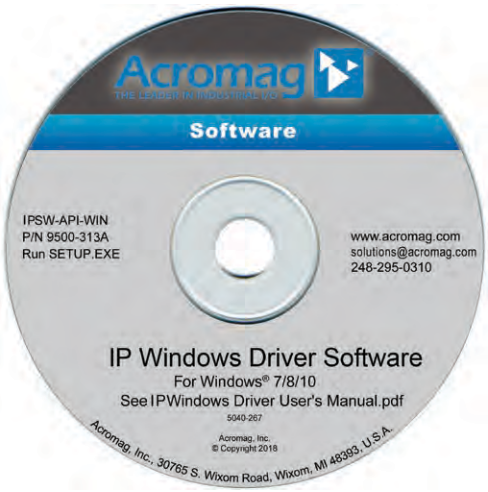
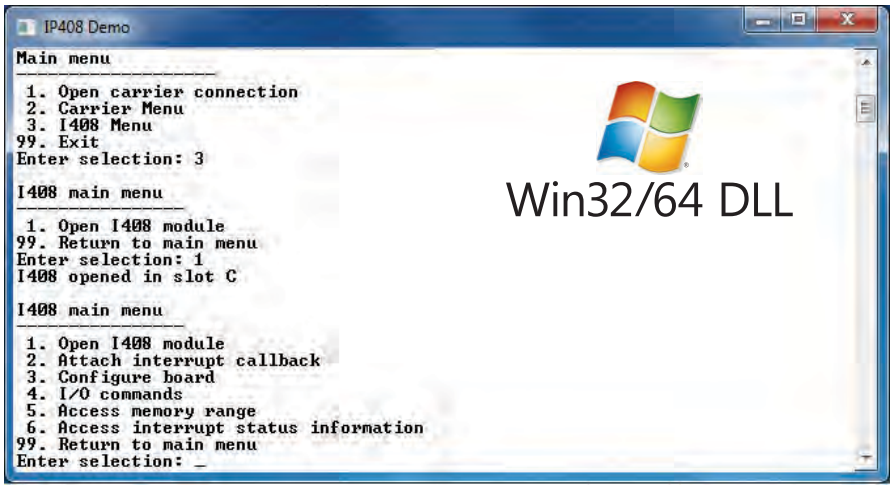
Software Support

IPSW AcroPack® and Industry Pack Driver Software for Windows® Operating Systems





For Windows 10 / 8 / 7 ◆ Supports Acromag AcroPack & Industry Pack modules & carriers ◆ 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. These packages provide DLL driver level support for Acromag's line of Industry Pack products. In addition, "C" source demonstration programs provide easy-to-use tools to test the operation of the module.

Demonstration Programs

Powerful programs let you fully exercise your hardware before developing the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration programs step you through the exact functions that are called in your application.

Windows Embedded Standard

Microsoft Visual Studio

Key Features & Benefits

- Easy installation procedure
- Documentation with step-by-step instructions
- Support for active Acromag Industry Pack I/O and Industry Pack FPGA modules and carriers
- Support for 32-bit and 64-bit systems
- Demonstration Programs
- Driver level support for desktop and embedded Windows level programming environments
- Compatible with Windows Embedded Standard applications
- Verifies operation of your I/O boards with a demonstration program to ensure proper hardware performance before attaching your application

User-Friendly Licensing

Acromag's PCI Windows driver software is provided with a full site license. This allows anyone at your location to use this software without any additional charges. No run-time license is required.

You do not need to order additional software for different models within the family.

Ordering Information

Software

For more information, see www.acromag.com.

APSW-API-WIN
64-bit and 32-bit Windows® DLL driver and demonstration software for AcroPack Modules and PCIe carriers on CD ROM.

IPSW-API-WIN
64-bit and 32-bit Windows® DLL driver and demonstration software for Industry Pack Modules, PCI, and cPCI carriers.

IPSW-VME-WIN
64-bit and 32-bit Windows® driver software package for Industry Pack modules with DLLs and demonstration programs for VME carrier models . Works with TSI148 chipset including the XVME-6300 and XVME-6400. Supplied on CD-ROM.

IPSW-A7VME-WIN
64-bit and 32-bit Windows software package for Industry Pack modules and VME carriers . Works with Acromag Series XVME6500 and XVME6700 SBCs. Supplied on CD-ROM.

NOTE: For PMC, XMC, PCI, and cPCI modules and carrier cards support software, please refer to PCISW-API-WIN.

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Support Software

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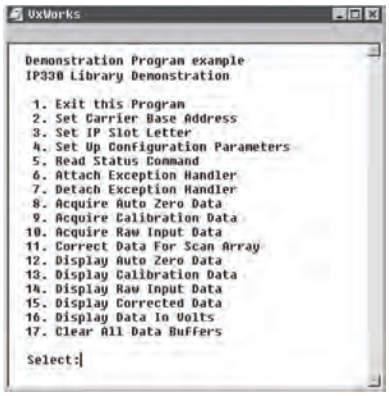
VxWorks® Libraries I/O Function Routines

VxWorks®

WIND™



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

Supports any CPU target with quick modification ◆ API easily convertible for any operating system

Description

Application Programming Interface (API)

Acromag's software development tools greatly simplify the interface between the I/O boards and your software application program. VxWorks libraries are supplied as "C" source code. These libraries provide easy-to-use function routines that quickly integrate with your application. Function routines are ready for use "as-is," but they are also easily customized for your unique application.

This powerful program lets you fully exercise the libraries and your hardware before running the actual application. These diagnostics will save you hours troubleshooting and debugging your applications. You can set addresses, set up registers, read real-world inputs, or drive outputs. The demonstration program steps you through the exact functions that are called in your application.

Target any CPU

Acromag provides direct support for VxWorks when using PowerPC, x86 and 68000 CPU boards. The VxWorks C Library includes support for x86 PCI, MV167 and MV2700 CPU boards. Each library contains detailed information on integrating with the CPU's Board Support Package (BSP). The libraries also include instructions for implementing this software with other manufacturer's CPU board BSPs. Use with Industry Pack carriers from third-party board vendors is also supported.

The IPSW-API-VXW library package offers support for Acromag carriers. Other carriers are compatible, but require some minor modifications. Acromag uses a very innovative modular programming technique. This allows new carrier files to be created without affecting any of the complex IP module files or interrupt service routines.

User-Friendly Licensing

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

The VxWorks software libraries include support for the full family of boards or modules, not just certain models unless otherwise noted.

Key Features & Benefits

- Easy installation procedure
- Readme files with step-by-step instructions
- Quickly creates libraries
- Targeted support for Power PC, x86, and 68000 series CPUs
- Supports any CPU target with quick modification
- API easily convertible for any operating system
- Source code provided to ensure maximum flexibility in implementing your application
- Ability to verify operation of your modules and carriers with a demonstration program to ensure proper hardware operation before attaching your application

Ordering Information

APSW-API-VXW
VxWorks software support package for AcroPack modules and carriers.

IPSW-A7VME-VXW
VxWorks software support package for Acromag VME SBC Series XVME6500 and XVME6700 when used with Industry Pack modules.

IPSW-API-VXW
VxWorks software support package for Industry Pack modules and carriers.

PMCSW-API-VXW
VxWorks software support package for XMC, PMC, PCI, and CompactPCI products (supports all Acromag PMC modules and PCI or cPCI boards except IP carriers).

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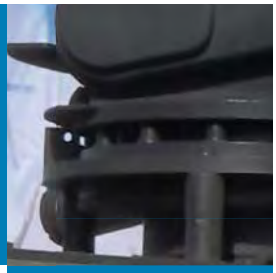

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