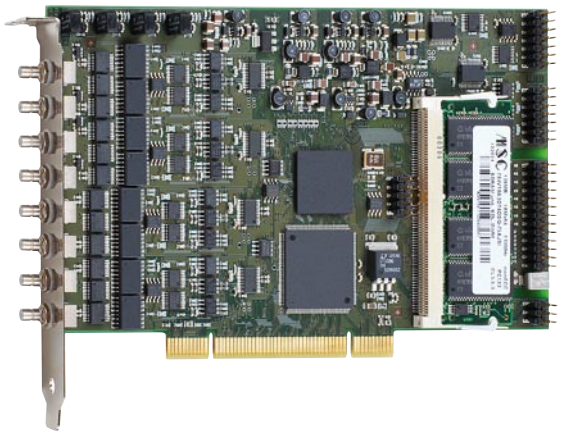
Noise and vibration measurement board, optically isolated, multifunction board, 8 analog inputs, 24-bit



APCI-3600, APCI-3600-L

8 SE/diff. (+/-) inputs, simultaneous sampling

Connection through SMB co-axial connectors

Onboard power supply for ICP™ sensors

4 chronometer inputs (RS485)

2 analog outputs

8 digital inputs, 8 digital outputs

Onboard SDRAM module

PCI 32-bit

Signed 64-bit drivers for Windows 7/XP

On request

Customer-tailored modifications designed to suit your needs.
Hardware and software, firmware, PLDs, ...
Contact us!

Acoustic processes in test applications are not limited to simple noise and vibration measurements.
The multifunction PCI board APCI-3600 by ADDI-DATA offers a PC-based solution to almost all additional measuring tasks which may arise thanks to its many functions.

- 8 analog input channels through SMB co-axial connectors
- Counter function: 4 chronometer inputs (up to 1 MHz 32-bit depth) allow applications in which precise coordinates must be determined.
- Current supply of the ICP™ sensors
- Synchronous mode (cascading) of several APCI-3600 through Master/Trigger
- Digital I/O
- SDRAM memory module allows transfer rates up to 24 MByte/s.

For a fast integration of the board in special test devices, the board is supplied with drivers and samples.

Features

Analog inputs (for all versions)

- 8 SE or diff. (+/-) inputs
- Sampling rate can be set between 2 and 200 kHz
- SNR (signal/noise ration) > 105 dB
- 24-bit resolution
- One A/D converter per channel: simultaneous acquisition on all analog inputs
- Gain 1 to 10, software-programmable
- Input coupling AC, DC, GND, software-programmable for each channel
- Antialiasing filter to avoid sampling errors
- Overvoltage protection

Current sources

- 8 current sources for the direct connection of ICP™ sensors (integrated circuit piezoelectric)
- 4 mA typ., 24 V max.

Chronometer inputs (only for version APCI-3600)

- 4 chronometer inputs, RS485, 32-bit for revolution counting
- 2 gate inputs

Analog outputs (only for version APCI-3600)

- 2 analog outputs: both outputs are started synchronously with the A/D converter. Arbitrary function generators can be programmed.
- Settling time: 5 µs
- 16-bit resolution
- Simultaneous sampling on both channels
- 13-bit accuracy
- DAC type: R-2R
- Output range: ± 10 V

Digital (only for version APCI-3600)

- 8 digital inputs, 24 V, optically isolated
- 8 digital outputs, 24 V, optically isolated

Onboard SDRAM module

- 128 MB (256 MB or 512 MB on request)

Applications

The following applications can be realised with the **APCI-3600**:

- Noise measurement with fault diagnosis on gear and drive over FFT:
  Encoders are connected to the chronometer inputs and microphones are connected to the analog inputs. Encoders measure the position of the drive and the analog inputs measure the noise of the system at a specific position. For this purpose the analog inputs and the chronometer inputs are controlled synchronously. To each analog sample belongs a position of the chronometer. The synchronisation results from a FFT.
- Measurement of the transfer function of a DUT ("Device Under Test").
- Noise analysis: Evaluation of a washing maschine, measurements in the automotive field, etc.

Software

Software drivers for:

- Linux (real-time), 32-bit drivers for Windows 7/Vista/XP/2000 (real-time) and signed 64-bit drivers for Windows 7/XP

Samples for the following compilers:

Visual C++ • Borland C

Driver download: www.addi-data.com, download menu

*Preliminary product information

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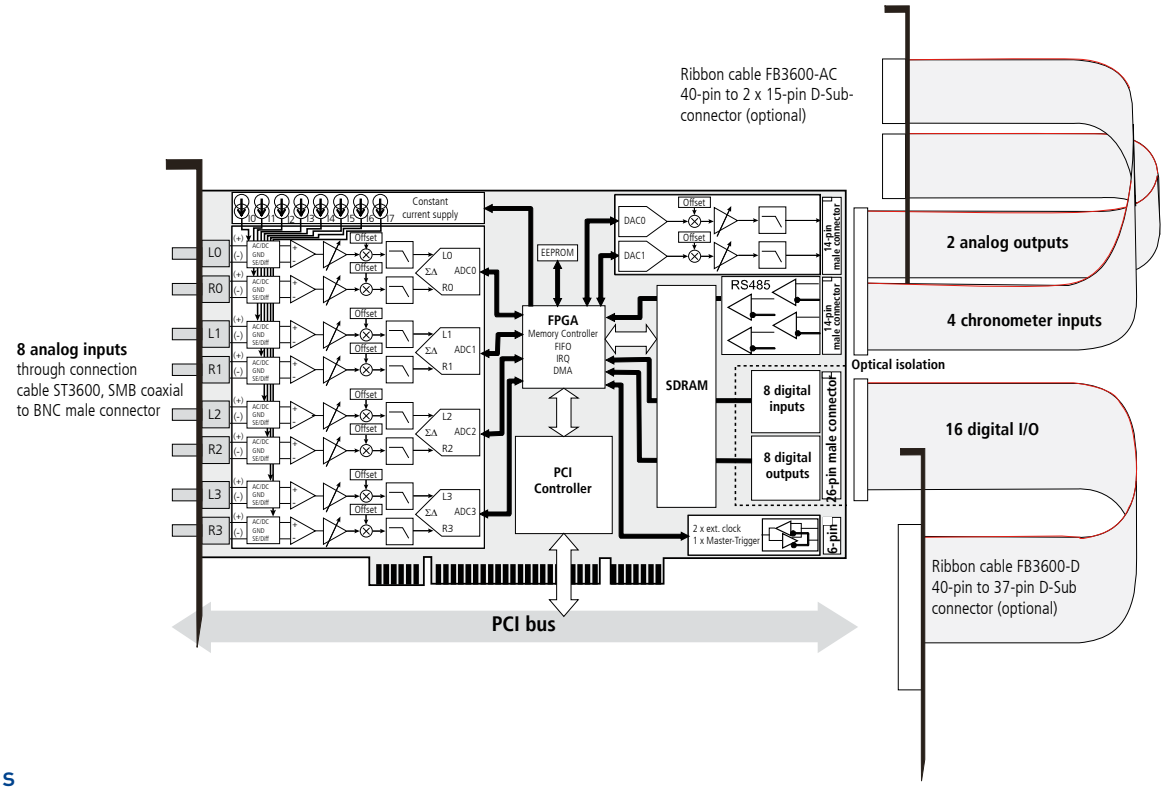
Simplified block diagram



Versions

	8 analog inputs	8 ICP power supply (current sources)	4 chronometer inputs	2 analog outputs	8 digital inputs, 24 V, optically isolated	8 digital outputs, 24 V, optically isolated	Onboard SD RAM
APCI-3600	✓	✓	✓	✓	✓	✓	✓
APCI-3600-L	✓	✓					✓

Specifications*

Analog inputs

Number:	8		
Input type:	Single-ended or differential through software		
resolution:	24-bit		
A/D Converter:	Delta-Sigma, 5th order, multibit Delta-Sigma modulator		
Gain:	x1, x10 software programmable		
Input ranges:	Gain x1	± 10 V single-ended	
	Gain x1	± 5 V differential	
	Gain x10	± 1 V single-ended	
	Gain x10	± 0.5 V differential	
Sampling rate f_s:	2 kHz ≤ f_s ≤ 200 kHz selectable through software		

Selectable frequencies:	2 kHz ≤ f_s ≤ 50 kHz	50 kHz ≤ f_s ≤ 100 kHz	100 kHz ≤ f_s ≤ 200 kHz
	50000 Hz	100000 Hz	200000 Hz
	40000 Hz	80000 Hz	160000 Hz
	33333 Hz	66667 Hz	133333 Hz
	25000 Hz	50000 Hz	100000 Hz
	20000 Hz		
	16667 Hz		
	12500 Hz		
	10000 Hz		
	8000 Hz		
	5000 Hz		
	4000 Hz		
	3333 Hz		
	2500 Hz		
	2000 Hz		

Oversampling:	64 x f_S (for sampling rate f_S)
Frequency precision:	± 50 ppm
FIFO depth:	128 DWORD, for the rigth and the left channel of the same ADC
Data transfer:	DMA, I/O, IRQ
Transmission ripple (rel. to 1 kHz), max., DC-coupled:	
2 kHz ≤ f_S ≤ 50 kHz:	-0.1dB, DC to 0.47 x f_S
50 kHz ≤ f_S ≤ 100 kHz:	-0.1dB, DC to 0.45 x f_S
100 kHz ≤ f_S ≤ 200 kHz:	-0.1dB, DC to 0.24 x f_S
-3 dB bandwidth:	
2 kHz ≤ f_S ≤ 50 kHz:	0.5 x f_S
50 kHz ≤ f_S ≤ 100 kHz:	0.5 x f_S
100 kHz ≤ f_S ≤ 200 kHz:	0.358 x f_S
Input coupling:	AC, DC, GND, selectable through software
AC -3dB limit frequency:	1.6 Hz
Overvoltage protection:	

R1-, L1-, R2-, L2-, L/R3+-, L/R4+-

Max. direct current:	± 12 V, ± 200 mA
Max. peak current (Impuls at 1 ms, 10% duty cycle):	± 12 V, ± 300 mA

R1+, L1+, R2+, L2+

Max. direct current:	± 36 V, ± 30 mA
Max. peak current (pulse at 1 ms, 10% duty cycle):	± 36 V, ± 70 mA
ESD protection:	> 2 kV, ESD protection through method 3015.17

* Preliminary product information

Specifications*

Analog inputs (continued)

Dynamic properties

2 kHz ≤ f_S ≤ 50 kHz:

Passband:	DC (0Hz) up to 0.47 x f_S, min. to max.
Stopband:	0.58 x f_S min
Stopband attenuation:	-95 dB min
Total group delay:	12/f_S s typical

50 kHz ≤ f_S ≤ 100 kHz:

Passband:	DC (0Hz) up to 0.45 x f_S, min. to max.
Stopband:	0,68 x f_S min
Stopband attenuation:	-92 dB min
Total group delay:	9/f_S s typical

100 kHz ≤ f_S ≤ 200 kHz:

Passband:	DC (0Hz) up to 0.24 x f_S, min. to max.
Stopband:	0.78 x f_S min
Stopband attenuation:	-97 dB min
Total group delay:	5/f_S s typical

Dynamic range SNR

2 kHz	≤ f_S ≤	50 kHz:	< -105 dB (short input gain x1)
			< -100 dB (short input gain x10)
			< -80 dB (open input gain x1)
			< -60 dB (open input gain x10)
50 kHz	≤ f_S ≤	100 kHz:	< -105 dB (short input gain x1)
			< -100 dB (short input gain x10)
			< -80 dB (open input gain x1)
			< -60 dB (open input gain x10)
100 kHz	≤ f_S ≤	200 kHz:	< -75 dB (short input gain x1)
			< -75 dB (short input gain x10)
			< -75 dB (open input gain x1)
			< -60 dB (open input gain x10)

Crosstalk

Between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3, Gain x1:

Short input at f_{in} = 100 Hz

2 kHz	≤ f_S ≤	50 kHz:	< -95 dB
50 kHz	≤ f_S ≤	100 kHz:	< -95 dB
100 kHz	≤ f_S ≤	200 kHz:	< -70 dB

Short input at f_{in} = 1 kHz

2 kHz	≤ f_S ≤	50 kHz:	< -95 dB
50 kHz	≤ f_S ≤	100 kHz:	< -95 dB
100 kHz	≤ f_S ≤	200 kHz:	< -70 dB

1 kΩ load at f_{in} = 100 Hz

2 kHz	≤ f_S ≤	50 kHz:	< -95 dB
50 kHz	≤ f_S ≤	100 kHz:	< -95 dB
100 kHz	≤ f_S ≤	200 kHz:	< -70 dB

1 kΩ load at f_{in} = 1 kHz

2 kHz	≤ f_S ≤	50 kHz:	< -95 dB
50 kHz	≤ f_S ≤	100 kHz:	< -95 dB
100 kHz	≤ f_S ≤	200 kHz:	< -70 dB

Phase error

between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3

At f_S = 200 kHz	0.3°	max.
	0.2°	at f_{in} = 10 kHz sinus signal
	0.02°	at f_{in} = 1 kHz sinus signal

Amplitude error ± 0,02 dB max., at f_{in} = 1 kHz sinus signal (Gain x1 and x10)

Offset error ± 200 µV, max. at f_S = 2 kHz

Analog outputs

Number of outputs:	2
Resolution / accuracy:	16-bit / 13-bit
DAC type:	R-2R
Output range:	± 10 V
Settling time: 10 V step, RL = 2 k , CL = 1500 pF	
± 0.1%:	5 µs typical
± 0.01%:	5.6 µs typical
Overvoltage protection:	± 12 V, 100 mA max. direct current
Short-circuit current:	± 45 mA typical
Output voltage after reset:	0 V
FIFO depth:	256 Word
Data transfer:	DMA, I/O, IRQ

Digital inputs

Number of inputs:	8
Filters/protective circuit:	Low-pass/transorb diode
Optical isolation:	1000 V
Nominal voltage:	24 V external
Input voltage:	0 up to 30 V
Input current:	7 mA at 24 VDC, typical
Logic input levels:	UH (max.): 30 V
	UH (min): 19 V
	UL (max.): 14 V
	UL (min): 0V
Input frequency (max.):	5 kHz at 24 V
Trigger input:	Digital input 0

Digital outputs

Number outputs:	8, open collector
Optical isolation:	1000 V
Nominal voltage:	24 V
Supply voltage:	5-30 V
Output current per output:	50 mA max.
Total current:	300 mA limited through PTC
Switch-on time:	0.25 µs typical
Switch-off time:	0.25 µs typical

Current sources

Number:	8 constant current sources for the power supply of the ICP™ sensors, 4 mA typical, 24 V max.

Chronometer

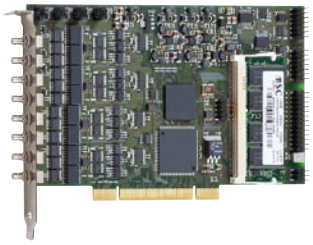
Number:	4 x chronometer, 2 x gate on chronos 1+2
Input type:	RS485
Max. speed:	1 MHz max.
Counting depth:	32-bit
Divisor:	From 2^0 to 2^{15} per chronometer
FIFO depth:	256 DWORD
Data transfer:	DMA, I/O, IRQ
Differential threshold voltage:	-200 mV min -50 mV max.
Input resistance:	120 differential
ESD protection:	±15 kV Human Body Model

EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

Physical and environmental conditions

Dimensions:	175 x 99 mm
System bus:	PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISiG)
Space required:	1 PCI slot for the analog inputs 1 slot opening for digital inputs and outputs 1 slot opening for chronometer and analog outputs
Operating voltage:	+5 V, ±5 % from the PC
Front connector:	8 SMB co-axial connector on bracket
Additional connector:	• 37-pin D-Sub connector for digital I/O • 15-pin D-Sub connector for chronometer inputs • 15-pin D-Sub connector for analog outputs
Temperature range:	0 to 60 °C (with forced cooling)



* Preliminary product information

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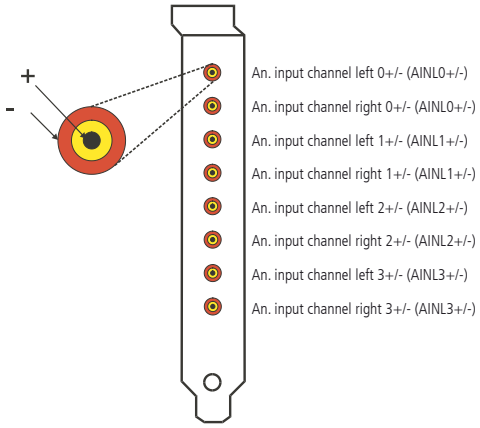
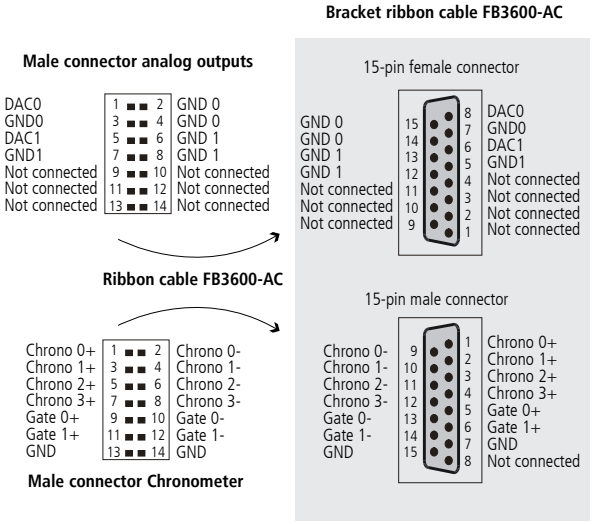
Connection of 8 analog inputs on front connector

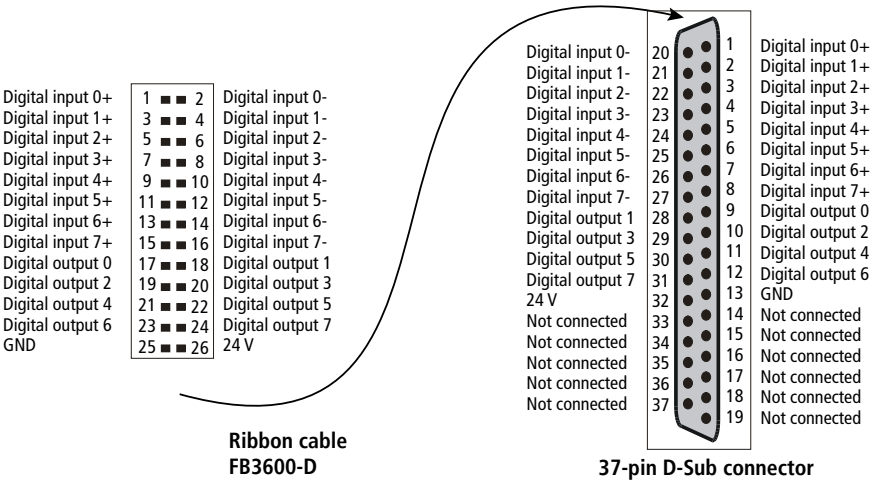


Pin assignment of the chronometer and analog outputs (ribbon cable FB3600-AC)



Pin assignment of the digital inputs and outputs

26-pin male connector on separate 37-pin D-Sub-male connector (ribbon cable FB3600-D)



Ordering information

APCI-3600

Noise and vibration measurement board, optically isolated, 24-bit, multifunction board, 8 analog inputs, 8 current sources..., antialiasing filter.
Incl. technical description and software drivers.

Versions

APCI-3600: 8 analog inputs,
8 current sources for connecting ICP™ sensors,
2 analog outputs, 4 chronometer inputs,
8 digital inputs, 8 digital outputs,
128 MBytes SDRAM

APCI-3600-L: 8 analog inputs,
8 current sources for connecting ICP™ sensors,
128 MBytes SDRAM

Accessories

ST3601: Connection cable, 2 m
SMB co-axial female connector on
BNC male connector

ST3600: Connection cable, 2 m (ST3600 = 8 x ST3601)

FB3600-D: Ribbon cable for connecting the digital I/O
on separate bracket, 30 cm

FB3600-AC: Ribbon cable for connecting the chronometer
and analog outputs on separate bracket,
30 cm