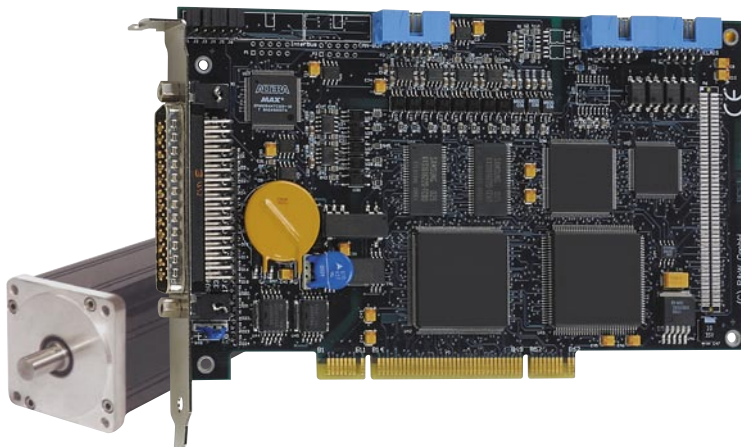


Motion control for servo or stepper motors



PCI 32-bit



Also for **CompactPCI™**
See CPCI-8004 page 136



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

The board APCI-8001 for the PCI-bus is used for the control of up to 8 servo or stepper motor axes through a PC. With this intelligent and flexible board, many control tasks from simple to complicated can be realised.

The board has three stepping/direction output channels (D/A channels, 16-bit). They are isolated from the digital current supply and are used for the control of commercially available power amplifiers connected as speed controlling devices or current regulators.

Incremental encoders, SSI encoders and EnDat encoders as well as end and reference switches can be connected to each axis channel.

Digital PID filters with forward compensation and optional Notch filters or Langham controllers are also involved in the axis control.

The "open" controlling concept of the APCI-8001 is intended in the first place for manufacturers of special-purpose machines and users which need a flexible integration as well as a CNC solution.

Features

Hardware/properties

- Intelligent board based on a 64-bit RISC processor
- Positioning of up to 3 axes either with servo or stepper motors. Mixed operating of servo and stepper motors possible. Up to 8 axes with slave board
- Interface for all commercially available power amplifiers
- All input and output channels are optically isolated
- A multiple-axis system can be realised by inserting several APCI-8001 in the same PC.

Software

- Linear, circular, helical, spline and CAD interpolation
- Point-to-point movement with independent control of each axis
- Function library for Pascal, C-Basic, Borland Delphi, Borland C++, Visual Basic, Visual C++
- Programming through a PC application software or stand-alone
- The operating program can be easily adapted to specific requirements using program modules supplied with the board

APCI-8001

For 3 servo or stepper motors

Onboard 64-bit RISC processor

Optical isolation

16-bit analog output channels

Can be extended to a total of 8 axes

Menu-driven test application

- User programs created with the compiler can be processed automatically
- Multitasking: the board can simultaneously process up to 4 user programs.

Applications

- CNC control
- Semi-conductor manufacturing
- Event counting
- Axis control
- Axis positioning
- Robots
- Stepper motor control
- Machine monitoring
- Research and development

Software

Drivers:

Windows XP/2000/NT 4.0: API as 32-bit DLL + SYS drivers.
Delphi 2.0 interface, Microsoft C Lib., Borland C Lib.

Windows 9x/Windows ME:

API als 32-bit DLL + VXD-Drivers.

Delphi 2.0 interface, Microsoft C Lib., Borland C Lib.

Windows Vista (32-bit)

Linux kernel version 2.4/2.6

Supplied with the board: Stand-alone program

Samples:

Example for Visual Basic 4.0 (32-bit version),
Visual C++, Borland Delphi

Motion control for servo or stepper motors

Specifications

APCI-8001

CPU system:	64-bit-RISC processor 150 MHz
RAM:	16 MB
Data exchange with the PC:	Through PCI bus
Controller software:	PIDF (PID filters with forward compensation)
Interpolation:	2D .. 3D linear, 2D circular, 3D circular, 3D helix, spline, asynchronous and synchronous interpolation with secondary axes. With OPMF-8001 all interpolations 2D..8D depending on the number of axes
Inputs for incremental encoders:	Diff. or TTL max. 2 MHz Word length: 32-bit with sign Optional max. 10 MHz (40 MHz after quadrupling)
Inputs for SSI encoders:	Up to 32-bit, gray / binary code, variable frequency 30 KHz to 2 MHz
Setpoint value outputs (Servo):	1 per channel, D/A converter, 16-bit resolution, ± 10 V
Pulse outputs (stepper motors):	1 stepper signal (RS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz
Isolated digital inputs:	16 inputs, 24 V, as end, reference switch or freely programmable
Isolated digital outputs:	8 channels, 24 V / 500 mA, for releasing the power amplifiers or freely programmable
Interrupts:	Through PCI BIOS
DMA:	Bus master
Auxiliary voltage:	24 V external for digital I/O

Safety

Optical isolation:	1000 V
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EMC – Electromagnetic compatibility

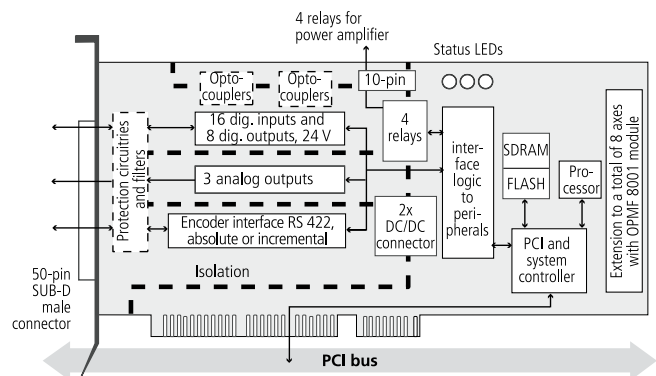
The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC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

Physical and environmental conditions

Dimensions:	175 x 106 mm
System bus:	PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISiG)
Space required:	Board APCI-8001: 1 PCI slot Slave board OPMF: 1 PCI slot Cable FB8001: 1 slot opening
Operating voltage:	+ 5 V and 3.3 V $\pm 5\%$ from the PC
Front connector APCI-8001:	Axis 1, 2, 3: 50-pin SUB-D male connector
Front connector OPMF-3001:	Axis 4, 5, 6: 50-pin SUB-D male connector
Ribbon cable FB8001:	Axis 7, 8: 50-pin SUB-D male connector
Temperature range:	0 to 60 °C (with forced cooling)

APCI-8001

Simplified block diagram



Pin assignment – 50-pin SUB-D male connector

Pin	Pin	Pin	Pin
34 Setpoint value 3 / step 3	18 Setpoint value 2 / step 2	34 18 1 Setpoint value 1 / step 1	1
35 Setpoint value 3 / step 3	19 Setpoint value 2 / step 2	35 19 2 True value 1 / step 1	2
36 True value 3	20 True value 2	36 20 3 True value 1	3
37 True value 3	21 True value 2	37 21 4 True value 1	4
38 True value 3	22 True value 2	38 22 5 True value 1	5
39 True value 3	23 True value 2	39 23 6 True value 1	6
40 True value 3 / step 3	24 True value 2 / step 2	40 24 7 True value 1 / step 1	7
41 True value 3 / step 3	25 True value 2 / step 2	41 25 8 True value 1 / step 1	8
42 Dig. input 9	26 Dig. output 1	42 26 9 Dig. input 1	9
43 Dig. input 10	27 Dig. output 2	43 27 10 Dig. input 2	10
44 Dig. input 11	28 Dig. output 3	44 28 11 Dig. input 3	11
45 Dig. input 12	29 Dig. output 4	45 29 12 Dig. input 4	12
46 Dig. input 13	30 Dig. output 5	46 30 13 Dig. input 5	13
47 Dig. input 14	31 Dig. output 6	47 31 14 Dig. input 6	14
48 Dig. input 15	32 Dig. output 7	48 32 15 Dig. input 7	15
49 Dig. input 16	33 Dig. output 8	49 33 16 Dig. input 8	16
50 0 V ext. for dig. I/O		50 33 17 + 24 V	17

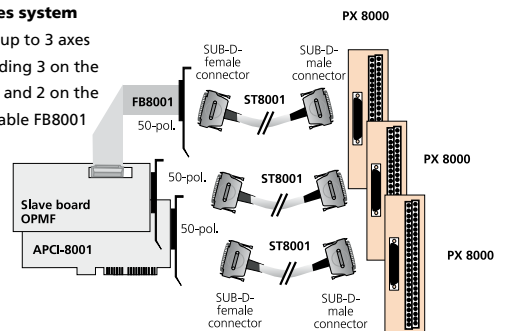
ADDI-DATA connection

Example for an 8-axes system

APCI-8001: Standard 1 up to 3 axes

OPMF/8A: 5 axes, including 3 on the

50-pin front connector and 2 on the connector for ribbon cable FB8001



Ordering information

APCI-8001

APCI-8001: Motion control board for servo or stepper motors. 16 dig. inputs and 8 dig. outputs, 24 V, optically isolated. Incl. technical description, software drivers.

APCI-8001-STP: Motion control board for stepper motors. 16 dig. inputs and 8 dig. outputs, 24 V, optically isolated. Incl. technical description and software drivers.

Options:

OPMF/4A (OPMF/4-STP):	4th axis – 8 inputs and 4 dig. outputs in addition
OPMF/5A (OPMF/5-STP):	5th axis – 16 inputs and 8 dig. outputs in addition
OPMF/6A (OPMF/6-STP):	6th axis – 16 inputs and 8 dig. outputs in addition
For the option OPMF/7 and more the FB8001 cable is required	
OPMF/7A (OPMF/7-STP):	7th axis – 24 inputs and 12 dig. outputs in addition
OPMF/8A (OPMF/8-STP):	8th axis – 24 inputs and 12 dig. outputs in addition
OPMF-AI12:	4 analog inputs (option available in single or double, max. 8 analog inputs).
OPMF-DIO:	8 digital inputs and 4 dig. outputs, optically isolated (option available up to 3 times, max. 24 dig. inputs and 12 outputs)
OPMF-AO:	1 analog output, option available up to 5 times (max. 8 analog outputs) (output is only free when the axis is not used)
OPT.INTERBUS-8001:	Master connection of the APCI-8001

FB-INTERBUS: Ribbon cable between OPMF and 9-pin SUB-D male connector with bracket for connecting the INTERBUS.

OPT.CAN-8001: CAN bus connection of the APCI-8001 (not CAN Open).

Accessories:

FB-CAN:	Ribbon cable between OPMF and 9-pin SUB-D male connector with bracket for connecting the CAN bus.
FB8001:	From the 7th axis on (OPMF/7, OPMF/8) or with option OPMF-AI12. Ribbon cable between OPMF and a 50-pin SUB-D male connector with bracket. On request with female connector.
FBRELAY:	For releasing the relays
FBRELAY-9:	Standard, 9-pin cable with bracket
FBRELAY-25:	more than 3 axes: 25-pin cable.
PX 8000:	Screw terminal panel with housing for DIN rail
ST8001:	Cable for connecting APCI-8001 and OPMF, 50-pin.