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ADDI-DATA GmbH
Dieselstraße 3
D-77833 OTTERSWEIER



Technical support:
+49 (0)7223 / 9493 - 0

Technical description

APCI-3501

Analog output board, optically isolated

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Product information

This manual contains the technical installation and important instructions for correct commissioning and usage, as well as production information according to the current status before printing. The content of this manual and the technical product data may be changed without prior notice. ADDI-DATA GmbH reserves the right to make changes to the technical data and the materials included herein.

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- CompactPCI is a registered trademark of PCI Industrial Computer Manufacturers Group.
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WARNING

In case of wrong uses and if the board is not used for the purpose it is intended:



◆ people may be injured,



◆ the board, PC and peripheral may be destroyed,



◆ the environment may be polluted

◆ **Protect yourself, the others and the environment!**

◆ **Read carefully the safety precautions (yellow leaflet).**

If this leaflet is not with the documentation, please contact us and ask for it.

◆ **Observe the instructions of the manual.**

Make sure that you do not forget or skip any step. We are not liable for damages resulting from a wrong use of the board.

◆ **Used symbols:**



IMPORTANT!

designates hints and other useful information.



WARNING!

It designates a possibly dangerous situation. If the instructions are ignored the board, PC and/or peripheral may be destroyed.

1	APPLICATION	7
1.1	Intended use	7
1.2	Limits of use.....	7
1.3	General description	7
2	USER	9
2.1	Qualification	9
2.2	Personal protection.....	9
3	HANDLING OF THE BOARD	10
4	TECHNICAL DATA.....	11
4.1	Electromagnetic compatibility (EMC)	11
4.2	Physical set-up of the board	11
4.3	Versions	12
4.4	Limit values.....	12
5	INSTALLATION OF THE BOARD	14
5.1	Opening the PC.....	14
5.2	Selecting a free slot	14
5.3	Plugging the board into the slot	15
5.4	Closing the PC	15
6	SOFTWARE	16
6.1	Board registration	17
6.1.1	Installation of a new board.....	17
	ADDevice Manager.....	18
6.1.2	Changing the registration of a board.....	19
	Description of the ADDIREG program	19
6.2	Questions and software downloads on the web.....	22
7	CONNECTING THE PERIPHERAL.....	23
7.1	Connector pin assignment of the analog outputs.....	23
7.2	Connector pin assignment of the digital I/O.....	24
7.3	Connection examples.....	25
7.3.1	Digital input and output channels	25
7.3.2	Connection to the screw terminal panel PX 901	25
8	FUNCTIONS OF THE BOARD	26

8.1 Overview..... 26

8.2 Watchdog..... 26

9 STANDARD SOFTWARE.....28

9.1 Software functions..... 28

9.2 Software samples..... 31

10 GLOSSARY32

11 INDEX34

Figures

Fig. 3-1: Correct handling..... 10

Fig. 5-1: PCI-3.3V/5V slot (32-/64-bit)..... 14

Fig. 5-2: Inserting the board..... 15

Fig. 5-3: Fastening the board at the back cover..... 15

Fig. 6-1: New inserted board 17

Fig. 6-2: ADDevice Manager 18

Fig. 6-3: ADDIREG registration program (example) 19

Fig. 7-1: 37-pin SUB-D male connector 23

Fig. 7-2: 16-pin ribbon cable connected to 37-pin SUB-D male connector
..... 24

Fig. 7-3: Position of pin 1 24

Fig. 7-4: Digital outputs 25

Fig. 7-5: Digital inputs 25

Fig. 7-6: Connection to the screw terminal panel PX 901 25

Tables

Table 8-1: Watchdog: Differences to other boards 27

Table 9-1: Supported software functions 28

Table 9-2: Supported software samples 31

Table 10-1: Glossary 32

1 APPLICATION

1.1 Intended use

The **APCI-3501** board must be inserted in a PC with PCI 5V/32-bit / PCI 3.3V/64-bit slots which is used as electrical equipment for measurement, control and laboratory pursuant to the norm EN 61010-1 (IEC 61010-1). The used personal computer (PC) must fulfil the requirements of IEC 60950-1 or EN 60950-1 and 55022 or IEC/CISPR 22 and EN 55024 or IEC/CISPR 24.

The use of the board **APCI-3501** in combination with external screw terminal panels requires correct installation according to IEC 60439-1 or EN 60439-1 (switch cabinet / switch box).

1.2 Limits of use

The **APCI-3501** board must not be used as safety related part (SRP).

The board must not be used for safety related functions, for example for emergency stop functions.

The **APCI-3501** board must not be used in potentially explosive atmospheres.

The **APCI-3501** board must not be used as electrical equipment according to the Low Voltage Directive 2006/95/EC.

1.3 General description

Data exchange between the **APCI-3501** board and the peripheral is to occur through a shielded cable. This cable must be connected to the 37-pin SUB-D male connector of the **APCI-3501** board

The board has up to 8 output channels for processing analog signals and 2 input channels and 2 output channels for processing digital 24 V signals.

The **PX 901** screw terminal panel allows the connection of the analog signals with a shielded cable.

The use of the board **APCI-3501** in combination with external screw terminal panels or relay boards is to occur in a closed switch cabinet.

The installation is to be effected competently. **Check the shielding capacity** of the PC housing and of the cable prior to putting the device into operation.

The connection with our standard cable ST010 complies with the specifications:

- metallized plastic hoods
- shielded cable
- cable shield folded back and firmly screwed to the connector housing.

The use of the board according to its intended purpose includes observing all advises given in this manual and in the safety leaflet.

Uses beyond these specifications are not allowed. The manufacturer is not liable for any damages which would result from the non-observance of this clause.

The use of the board in a PC could change the PC features regarding noise emission and immunity. Increased noise emission or decreased noise immunity could result in the system not being conform anymore.

The installation of the board APCI-3501 in sites lying under risk of explosion is excluded.

Make sure that the board remains in its protective blister pack **until it is used**.

Do not remove or alter the identification numbers of the board.
If you do, the guarantee expires.

2 USER

2.1 Qualification

Only persons trained in electronics are entitled to perform the following works:

- installation
- use,
- maintenance.

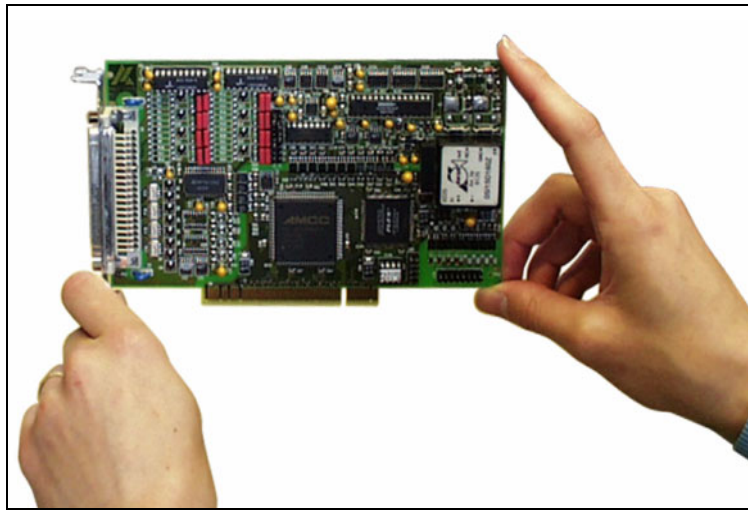
2.2 Personal protection

Consider the country-specific regulations about:

- the prevention of accidents
- electrical and mechanical installations
- radio interference suppression.

3 HANDLING OF THE BOARD

Fig. 3-1: Correct handling



4 TECHNICAL DATA

4.1 Electromagnetic compatibility (EMC)

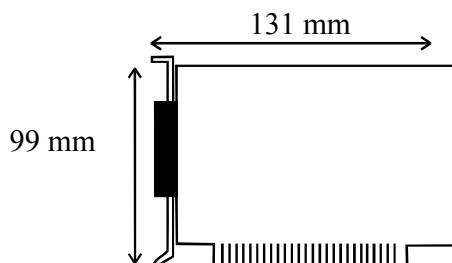
The board **APCI-3501** complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with.

The respective EMC test report is available on request.

4.2 Physical set-up of the board

The board is assembled on a 4-layer printed circuit card.

Dimensions:



Width: 19.2 mm
 Weight: approx. 115 g
 Installation in: 32/64-bit PCI slot 3.3V/5 V
 Connection to the peripheral: 37-pin SUB-D male connector

Connection possibilities to the peripheral:

- through a cable with twisted pairs directly to the analog signal transmitters
- or with our standard cable **ST010** to screw terminal panel **PX 901-AG**, **PX 901-A**.



WARNING!

The supply lines must be installed safely against mechanical loads.

4.3 Versions

The board **APCI-3501** is available in the following versions:

Version	Analog outputs	Digital inputs/outputs	Output current
APCI-3501-4	4	2 inputs and 2 outputs	±5 mA
APCI-3501-8	8	2 inputs and 2 outputs	±5 mA
APCI-3501-8-2P	8	2 inputs and 2 outputs	±10 mA

4.4 Limit values

Max. altitude: 2000 m
 Operating temperature: 0 to 60°C
 Storage temperature: -25 to 70°C

Relative humidity at indoor installation

50% at +40 °C
 80% at +31 °C

Minimum PC requirements:

PCI BIOS from Version 1.0

Bus speed: < 33 MHz
 Operating system: Windows NT, 98, 2000, XP, Linux

Energy requirements:

- Operating voltage of the PC: 5 V ± 5%
- Current consumption (without load): typ. see table ± 10%

APCI-3501	
+ 5 V from PC	375 mA*

Analog output channels:

Resolution: 14-bit bipolar / 13-bit unipolar
 Overvoltage protection: ± 12 V
 Number of output channels: 4/8
 Data transfer: The board is located in the I/O address space of the PC.
 The values are written on the board through 32-bit accesses and updated automatically.

* This value was measured at an **APCI-3501-4** board.

Settling time at 0,01 % FS, (FS = Full scale) with 2 kΩ & 100 pF load	30 μs typ. for a 20 V bounce at 25°C 50 μs typ. for a 20 V bounce above the temperature range
Output voltage ranges:	Unipolar: 0-10 V Bipolar: ± 10 V
Digital coding:	Unipolar: Straight binary coding Bipolar: Offset binary coding
Output current:	
APCI-3501-4, APCI-3501-8:	±5 mA max.
APCI-3501-8-2P:	±10 mA
Capacitive load:	500 pF max.
Short-circuit current:	
APCI-3501-4, APCI-3501-8:	±25 mA
APCI-3501-8-2P:	±35 mA
Integral non-linearity (INL):	± 1 LSB maximum above the temperature range
Differential non-linearity (DNL):	± 2 ½ LSB maximum above the temperature range
Monotony:	12-bit
Offset error:	± 2 mV max. unipolar ± 7 mV max. bipolar
Gain error:	± 0.05 % of FSR max.
Optical isolation to the PC:	500 VDC min.
Voltage after Reset:	0 V
Watchdog:	can be configured by software 4 different watchdog times are possible (μs, ms, s, mn)

Digital input channels:

Number:	2
Input current at 24 V:	3 mA typ.
Input voltage range:	0-30 V
Optical isolation:	1000 VAC
Logic "0" level:	0-5 V
Logic "1" level	10-30 V

Digital output channels:

Number:	2
Max. switch current:	5 mA typ.
Voltage range:	5-30 V
Optical isolation:	1000 VAC
Type:	Open Collector

5 INSTALLATION OF THE BOARD



IMPORTANT!

Do observe the safety precautions (yellow leaflet)!

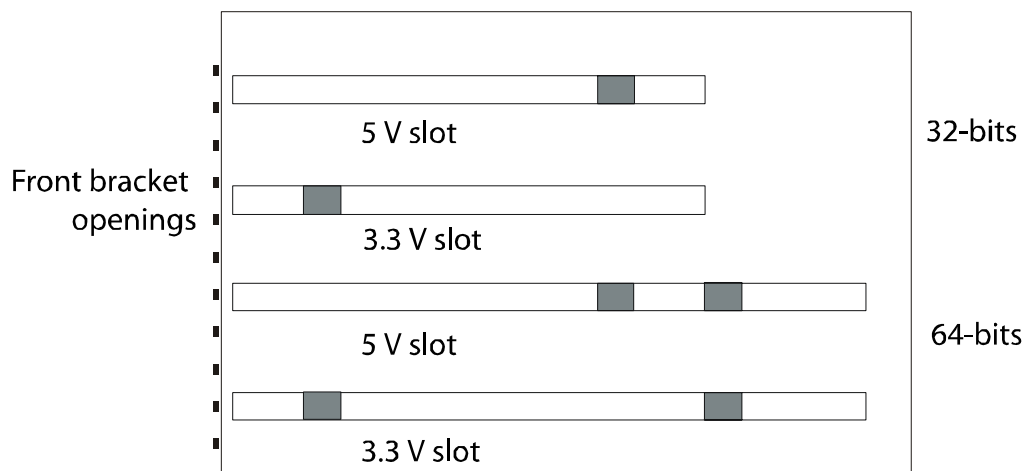
5.1 Opening the PC

- ◆ Switch off your PC and all the units connected to the PC
- ◆ Pull the PC mains plug from the socket.
- ◆ Open your PC as described in the manual of the PC manufacturer.

5.2 Selecting a free slot

Insert the board in a free PCI-3.3V/5V slot (32-/64-bit).

Fig. 5-1: PCI-3.3V/5V slot (32-/64-bit)



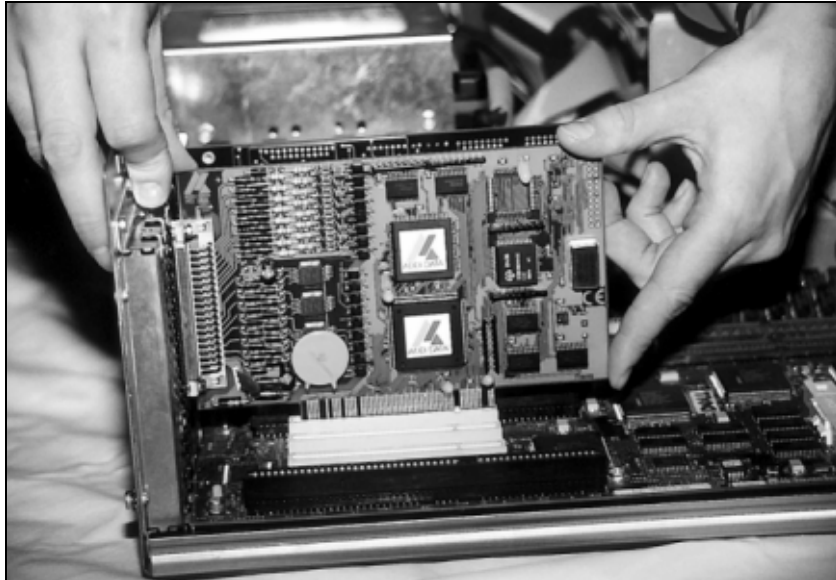
Remove the back cover of the selected slot according to the instructions of the PC manufacturer. Keep the back cover. You will need it if you remove the board

- ◆ Discharge yourself from electrostatic charges.
- ◆ Take the board out of its protective pack.

5.3 Plugging the board into the slot

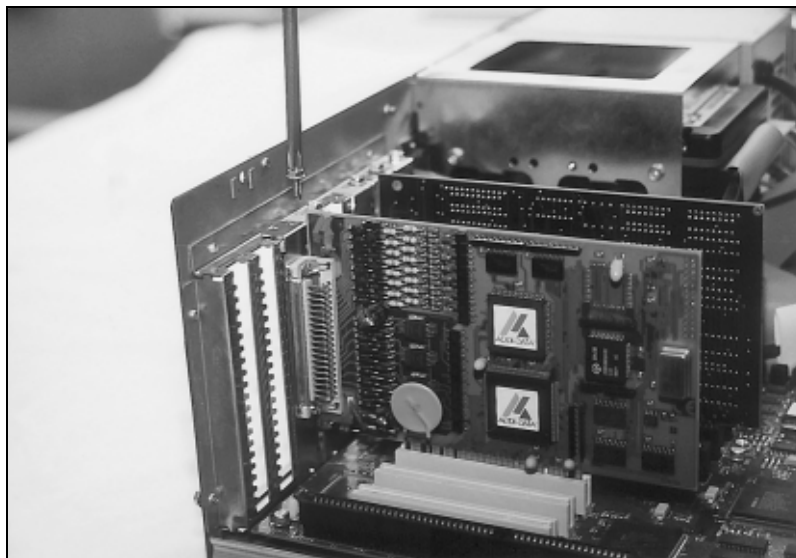
- ◆ Insert the board vertically into the chosen slot.

Fig. 5-2: Inserting the board



- ◆ Fasten the board to the rear of the PC housing with the screw which was fixed on the back cover.

Fig. 5-3: Fastening the board at the back cover



- ◆ Tighten all the loosen screws.

5.4 Closing the PC

- ◆ Close your PC as described in the manual of the PC manufacturer.

6 SOFTWARE

In this chapter you will find a description of the delivered software and its possible applications.



IMPORTANT!

Further information for installing and uninstalling the different drivers is to be found in the delivered description "**Installation instructions for the PCI and ISA bus**".

A link to the corresponding PDF file is available in the navigation pane (Bookmarks) of Acrobat Reader.



IMPORTANT!

The supported software functions for the APCI-3501 are listed in chapter 9.

The board is supplied with a CD-ROM containing the ADDIPACK software package for Windows NT 4.0 and Windows XP/2000/98.

ADDIPACK is composed of following programs:

- **ADDIREG:** The ADDIREG registration program is a 32-bit program for Windows NT 4.0 and Windows XP/2000/98. The user can register all hardware information necessary to operate the ADDI-DATA PC boards.
- **ADDIDRIVER** contains API functions to operate the ADDI-DATA boards in 32 bits.
- **ADDevice Manager** configures the resources of the ADDI-DATA virtual board (See below).
- **ADDI-DATA virtual board:**
ADDI-DATA software is based on the principle of a **virtual board**: it transposes the different functions (e.g. digital inputs, analog outputs, timer, ...) of all inserted ADDI-DATA boards as the functions of a single (virtual) board. The virtual board features a pool of functions, the functionality of which can be called up without calling a specific board.
- **ADDEVICE MAPPER** was specifically developed for the ADDIPACK boards to facilitate the management of the virtual board. With this program you can optimally adapt the virtual board to your application requirements.

IMPORTANT!

For some functions of the **ADDEVICE MAPPER** program the browser Internet Explorer 6 or higher has to be installed on your PC.

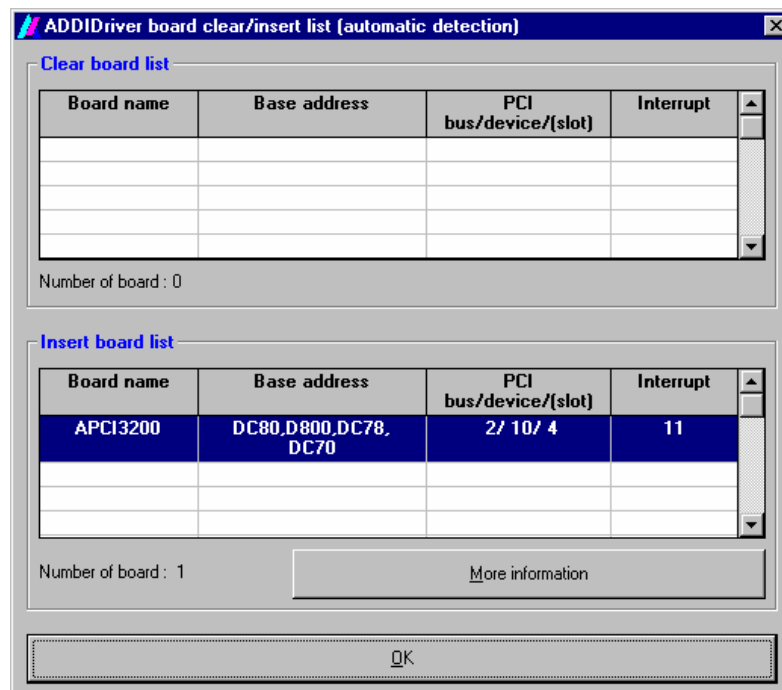
6.1 Board registration

When starting the set-up of ADDIREG, the **APCI-3501** is automatically recognised and registered.

6.1.1 Installation of a new board

If a new board is recognised, the following window is displayed:

Fig. 6-1: New inserted board



The boards which have been removed from the PC since the last ADDIREG start are listed in the upper table

The new inserted boards are listed in the lower table.

In case further information is required for the operation of the board, click on "More Information". ADDevice Manager is started.

ADDevice Manager

Fig. 6-2: ADDevice Manager

V : Virtual board R : Real board	Analog output	Timer	Watchdog	Temperature	Counter
APCI3200 Board Index : 0 Slot:67 IRQ: 10 Addr 0:DC80 Addr 1:D800 Addr 2:DC78 Addr 3:DC70	No	No	No	V - R Mod. 0 - Mod. 0: Nbr: 4 0 - 0 ... 3 - 3 V - R Mod. 1 - Mod. 1: Nbr: 4 4 - 0 ... 7 - 3 V - R Mod. 2 - Mod. 2: Nbr: 4 8 - 0 ... 11 - 3 V - R Mod. 3 - Mod. 3: Nbr: 4 12 - 0 ... 15 - 3	

Double-click to change the configuration of the APCI3200 Board Index : 0 Slot:67 IRQ: 10 Addr 0:DC80 Addr 1:D800 Addr 2:DC78

The following parameters are displayed for every inserted board:

First column:

- Board name
- Board index: Number allocated to the board when it is registered in ADDIREG.
- Slot number
- IRQ line
- Different addresses which are automatically allocated to the board by the BIOS.

Other columns:

The program distinguishes between the resources (Analog/digital input/output, watchdog, etc.) of the virtual board (**V**, software) and the real board (**R**, board).

The following parameters are listed

- Module number,
- Number of resources
- Index: The first index line represents the number of the first resource (left: virtual resource - right: real board) The second index line represents the number of the last resource (left: virtual resource - right: real board).
- Type (24 V/5 V, voltage/current, HS/OC - High-Side/Open collector).
- IRQ: if the input channels are interruptible, the program displays the number of the first and of the last input channel

By clicking twice within a column, the connection principle and the technical data of the resource are displayed. This function is only possible if a question mark appears with the cursor.

You can export the set configuration as a text file. Click on "file" and save the configuration as a .txt file with "Export information to file...". Then you can print the configuration or use it for other boards.

Once you have controlled the registration, you can quit the window of ADDevice Manager. The board is ready to operate.

6.1.2 Changing the registration of a board

You can change the current board configuration with ADDIREG

Description of the ADDIREG program

The program is automatically installed with ADDIPACK.
Start ADDIREG under Start/Programme/ADDIPACK/ADDIREG.



IMPORTANT!

First quit all the applications (programs) which use the board before starting the ADDIREG program.

In the main window of ADDIREG the fields "Insert" and "Clear" are not available for the board.

Fig. 6-3: ADDIREG registration program (example)

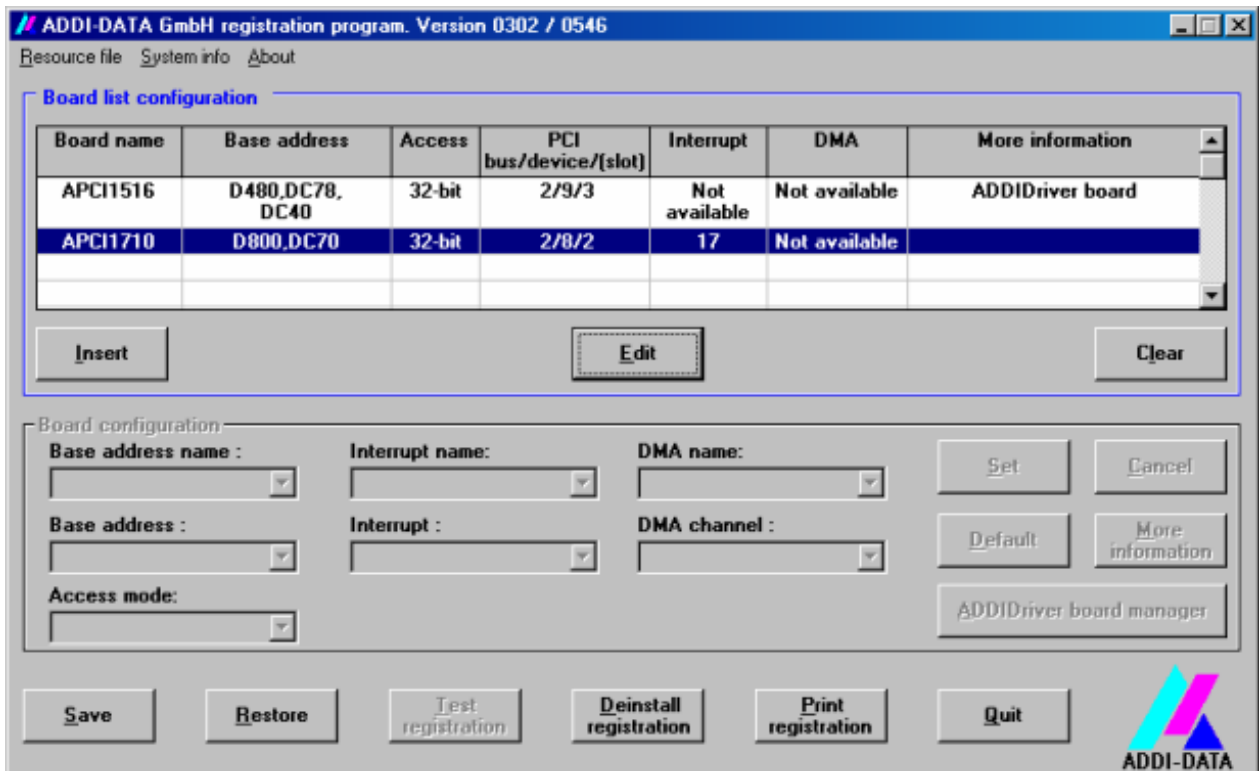


Table:**Board name:**

Names of the different registered boards (e.g.: APCI-3200).

Base address:

Selected base address of the board. For PCI boards the base address is allocated through BIOS.

Access:

Selection of the access mode for the ADDI-DATA digital boards.
Access in 8-bit or 16-bit or 32-bit mode.

PCI bus/device/(slot):

Number of the used PCI bus, slot, and device. If the board is no PCI board, the message "NO" is displayed.

Interrupt:

Used interrupt of the board. If the board supports no interrupt, the message "Not available" is displayed.

DMA:

Indicates the selected DMA channel or "Not available" if the board uses no DMA or if the board is no ISA board.

More information:

Additional information like the identifier string or the installed COM interfaces. It also displays whether the board is programmed with ADDIDRIVER.

Text boxes:**Base address name:**

Description of the used base addresses for the board. Select a name through the pull-down menu. The corresponding address range is displayed in the field below (Base address).

Interrupt name:

Description of the used IRQ lines for the board. Select a name through the pull-down menu. The corresponding interrupt line is displayed in the field below (Interrupt).

DMA name (for ISA boards only):

When the board supports 2 DMA channels, you can select which DMA channel is to be changed.

DMA channel (for ISA boards only):

Selection of the used DMA channel.

Buttons:**Edit:**

Selection of the highlighted board with the different parameters set in the text boxes.

Set:

Sets the parametered board configuration. The configuration should be set before you save it.

Cancel:

Reactivates the former parameters of the saved configuration.

Default:

Sets the standard parameters of the board.

More information (not available for the boards with ADDIPACK)

You can change the board specific parameters like the identifier string, the COM number, the operating mode of a communication board, etc...

If your board does not support these information, you cannot activate this button.

ADDIDriver Board Manager:

Under Edit/ADDIDriver Board Manager you can check or change the current settings of the board set through the ADDEVICE Manager.

ADDevice Manager starts and displays a list of all resources available for the virtual board.

Test registration:

Controls if there is a conflict between the board and other devices installed in the PC. A message indicates the parameter which has generated the conflict. If no conflict has occurred, "Test of device registration OK" is displayed.

Deinstall registration:

Deinstalls the registrations of all boards listed in the table and deletes the entries of the boards in the Windows Registry.

Print registration:

Prints the registration parameter on your standard printer.

Quit:

Quits the ADDIREG program.

Registration test

Under "Test registration" you can test if the registration is "OK".

This test controls if the registration is right and if the board is present. If the test has been successfully completed you can quit the ADDIREG program. The board is initialised with the set parameters and can now be operated.

In case the registration data is to be modified, it is necessary to boot your PC again. A message asks you to do so. When it is not necessary you can quit the ADDIREG program and directly begin with your application.

6.2 Questions and software downloads on the web

Do not hesitate to e-mail us your questions.

per e-mail: info@addi-data.de or
hotline@addi-data.de

Free downloads of standard software

You can download the latest version of the software for the **APCI-3501**.

<http://www.addi-data.com>



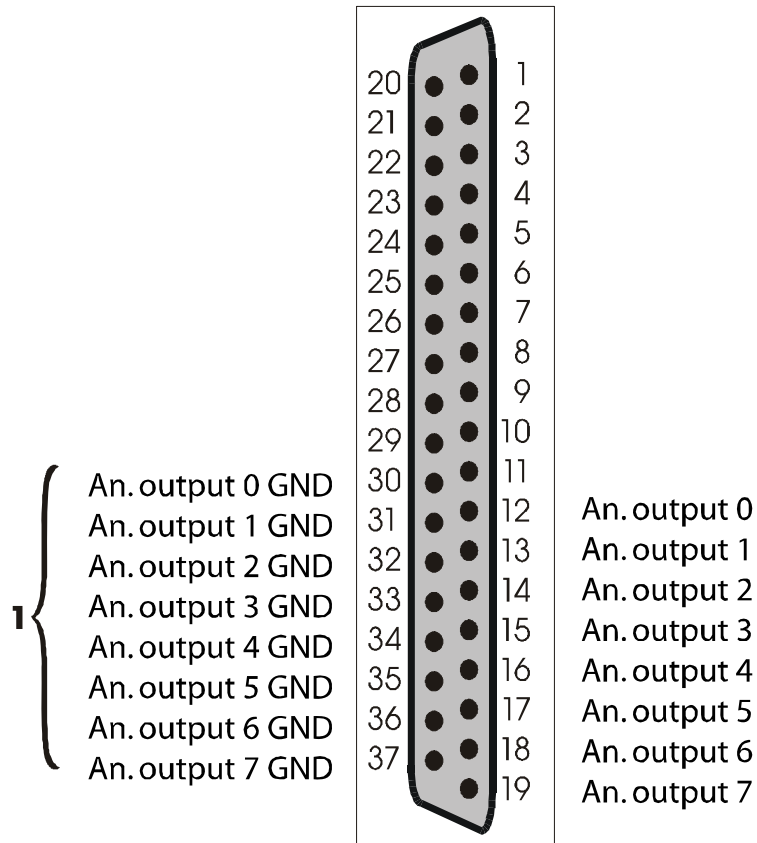
IMPORTANT!

Before using the board or in case of malfunction during operation, check if there is an update of the product (technical description, driver). The current version can be found on the internet or contact us directly.

7 CONNECTING THE PERIPHERAL

7.1 Connector pin assignment of the analog outputs

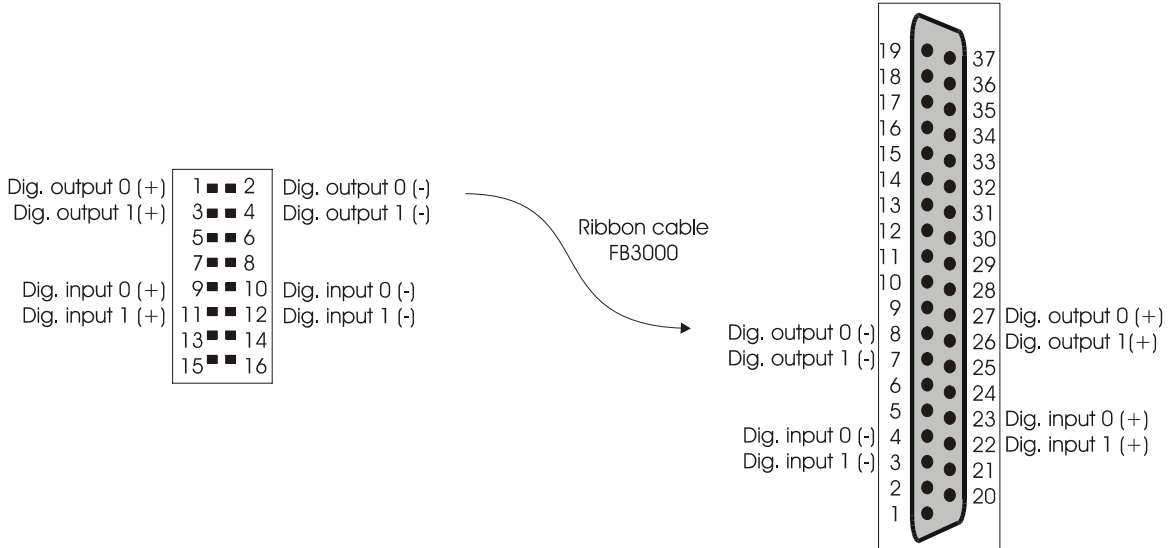
Fig. 7-1: 37-pin SUB-D male connector



1 Analog single ground for the outputs

7.2 Connector pin assignment of the digital I/O

Fig. 7-2: 16-pin ribbon cable connected to 37-pin SUB-D male connector

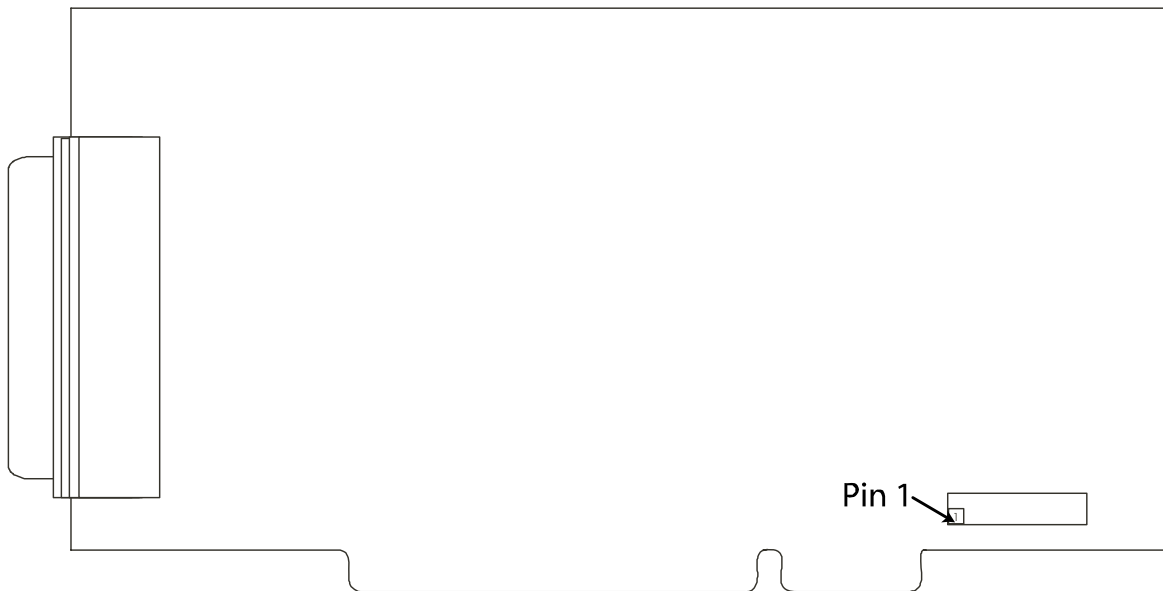


i

IMPORTANT!

Insert the FB3000 on the connector with the red cable lead on the side of the pin 1. See Fig. 7-6

Fig. 7-3: Position of pin 1



7.3 Connection examples

7.3.1 Digital input and output channels

Fig. 7-4: Digital outputs

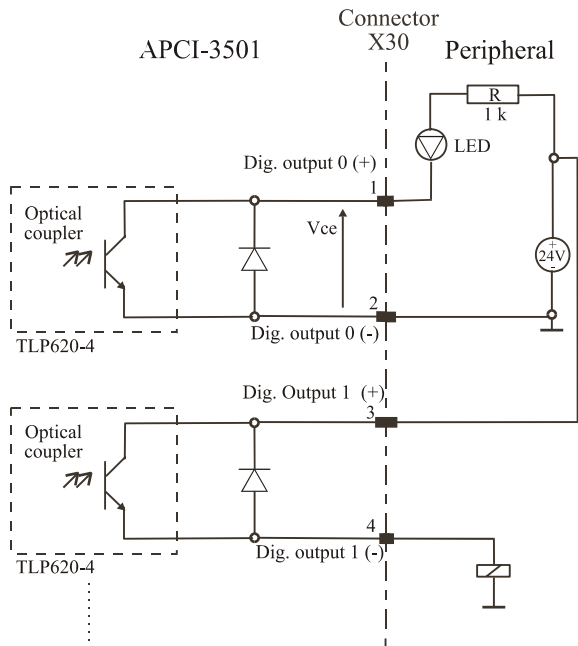
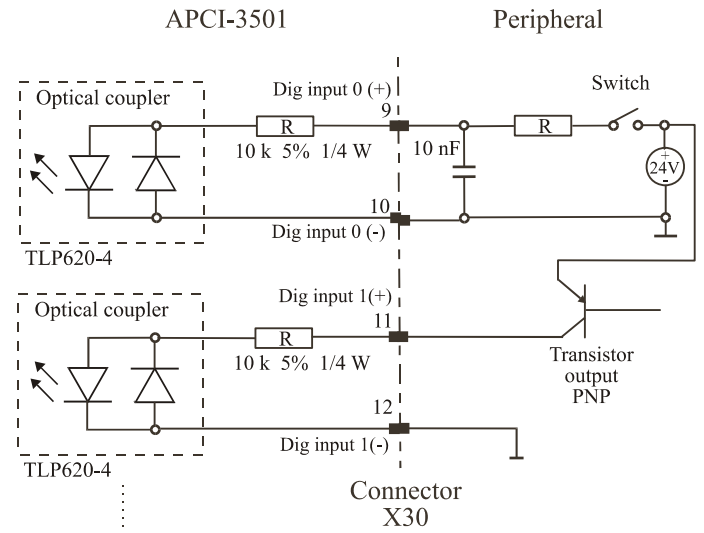
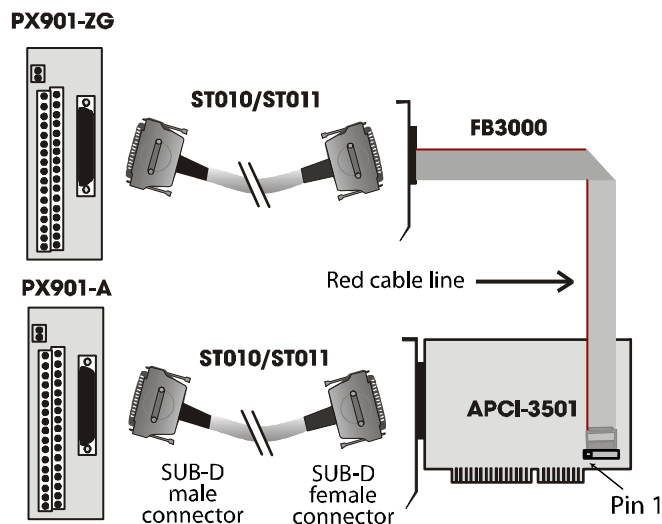


Fig. 7-5: Digital inputs



7.3.2 Connection to the screw terminal panel PX 901

Fig. 7-6: Connection to the screw terminal panel PX 901



IMPORTANT!

Insert the **FB3000** on the connector with the red cable lead on the side of the pin 1.

8 FUNCTIONS OF THE BOARD

8.1 Overview

There are up to 8 x 14-bit analog output channels on the board.

The analog output channels are set to a 0 V voltage value after Power-ON Reset of the PC.

The analog output channels are updated as follows:

- through 32-bit write operations on I/O addresses

8.2 Watchdog

A **watchdog function** (12-bit) is available for the analog output channels.

Triggering can be generated by writing on a defined address (software trigger: See ADDIPACK software description: **b_ADDIDATA_TriggerWatchdog**) or by writing on the analog outputs. However, the triggering of the analog outputs is firstly effective **after a release**. After the installation of ADDIPACK two Registry-files are available in the following directory:

C:\AddiData\32Bit\AddiPack\Option Registry

First Registry-file:

APCI3501_EnableAnaOutWatchdogTriggerByWriteValue.reg

→ Enables the triggering by writing on the analog outputs

Second Registry-file:

APCI3501_DisableAnaOutWatchdogTriggerByWriteValue.reg

→ Disables the triggering by writing on the analog outputs

How to enable these both options:

- ◆ **Start the Windows Explorer and double-click on the required file**

Further characteristics of the watchdog:

- As long as the analog outputs or the defined address (software trigger) are written, the outputs will not be reset
- The watchdog can generate also an interrupt
- The status of the watchdog can be read back
- 4 different clock signals can be used as time bases for the watchdog
- If the function of the watchdog is not required, it can be used as 12-bit timer

i **IMPORTANT!**
 Please do observe that the watchdog on the boards **APCI-3110**, **APCI-3116**, **APCI-/CPCI-3120**, **APCI-3122** and **APCI-3504** is different from the watchdog on the board **APCI-3501**.

Table 8-1: Watchdog: Differences to other boards

	APCI-3501	APCI-3110, APCI-3116, APCI-3120, CPCI-3120, APCI-3122, APCI-3504
Watchdog is triggered by:	Writing on a defined address or by writing on the analog outputs <p style="text-align: center;">and</p> release (by Registry-files).	Writing on a defined address or by writing on the analog outputs.

9 STANDARD SOFTWARE

9.1 Software functions

ADDIPACK supports the following functions for the **APCI-3501**.

Table 9-1: Supported software functions

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	b_ADDIDATA_CloseWin32Driver
Interrupt	b_ADDIDATA_SetFunctionalityIntRoutineWin32
	b_ADDIDATA_TestInterrupt
	b_ADDIDATA_ResetFunctionalityIntRoutine
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Timer	b_ADDIDATA_GetNumberOfTimers
	b_ADDIDATA_GetTimerInformation
	b_ADDIDATA_InitTimer
	<i>b_TimerMode Mode 2 available</i>
	<i>b_TimerTimeUnit 1: μs 2: ms 3: s 4: min</i>
	<i>dw_ReloadValue Min.: 0, max.: 4095</i>
	b_ADDIDATA_EnableDisableTimerInterrupt
	b_ADDIDATA_StartTimer
	b_ADDIDATA_StartAllTimers
	b_ADDIDATA_TriggerTimer
	b_ADDIDATA_TriggerAllTimers
	b_ADDIDATA_StopTimer
	b_ADDIDATA_StopAllTimers
	b_ADDIDATA_ReadTimerValue
b_ADDIDATA_ReadTimerStatus	
b_ADDIDATA_ReleaseTimer	

Functionality	Function name	
Watchdog	b_ADDIDATA_GetNumberOfWatchdogs	
	b_ADDIDATA_GetWatchdogInformation	
	b_ADDIDATA_InitWatchdog b_DelayTimeUnit 1: μ s 2: ms 3: s 4: min dw_DelayValue Min.: 0, max. 4095	
	b_ADDIDATA_EnableDisableWatchdogInterrupt	
	b_ADDIDATA_StartWatchdog	
	b_ADDIDATA_StartAllWatchdogs	
	b_ADDIDATA_TriggerAllWatchdogs	
	b_ADDIDATA_StopWatchdog	
	b_ADDIDATA_StopAllWatchdogs	
	b_ADDIDATA_ReadWatchdogStatus	
	b_ADDIDATA_ReleaseWatchdog	
	Analog outputs	b_ADDIDATA_GetNumberOfAnalogOutputs
		b_ADDIDATA_GetAnalogOutputInformation
b_ADDIDATA_Init1AnalogOutput b_VoltageMode 0 (Bipolar \pm 10V) 1 (Unipolar 0-10V) b_Polarity 2 (Mode 0) 1 (Mode 1)		
b_ADDIDATA_InitMoreAnalogOutputs <i>See b_ADDIDATA_Init1AnalogOutput()</i>		
b_ADDIDATA_Write1AnalogOutput dw_ValueToWrite Min.: 0 Max.: 16383 (Bipolar) ou 8191 (Unipolar)		
b_ADDIDATA_WriteMoreAnalogOutputs <i>See b_ADDIDATA_Write1AnalogOutput()</i>		
b_ADDIDATA_Release1AnalogOutput		
b_ADDIDATA_ReleaseMoreAnalogOutputs		

Functionality	Function name
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
Digital outputs	b_ADDIDATA_GetNumberOfDigitalOutputs
	b_ADDIDATA_GetDigitalOutputInformation
	b_ADDIDATA_SetDigitalOutputMemoryOn
	b_ADDIDATA_SetDigitalOutputMemoryOff
	b_ADDIDATA_Set1DigitalOutputOn
	b_ADDIDATA_Set1DigitalOutputOff
	b_ADDIDATA_Set2DigitalOutputsOn
	b_ADDIDATA_Set2DigitalOutputsOff
	b_ADDIDATA_Get1DigitalOutputStatus
	b_ADDIDATA_Get2DigitalOutputStatus

9.2 Software samples

Table 9-2: Supported software samples

Functionality	Sample number	Description
Analog outputs	SAMPLE01	Write 1 analog output value without synchronisation.
	SAMPLE02	Write more analog output values without synchronisation.
Digital inputs	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
Digital outputs	SAMPLE01	Test 1 digital output with/without output memory
	SAMPLE02	Test 2 digital outputs with/without output memory
Timer	SAMPLE01	Initialisation of 1 timer in mode2 without interrupt.
	SAMPLE02	Initialisation of 1 timer in mode2 with interrupt.
Watchdog	SAMPLE01	Initialise software-Trigger at key stroke. Start 1 watchdog. Read status, once the watchdog has run down. Reset the watchdog and quit the program.
	SAMPLE02	Initialise software-Trigger at key stroke. Start 1 watchdog with interrupt. Read status, once the watchdog has run down. Reset the watchdog and quit the program.

10 GLOSSARY

Table 10-1: Glossary

Term	Description
A/D converter	= <i>ADC</i> An electronic device that produces a digital output directly proportional to an analog signal output.
Acquisition	The process by which data is gathered by the computer for analysis or storage.
D/A converter	= <i>DAC</i> A device that converts digital information into a corresponding analog voltage or current.
Data acquisition	Gathering information from sources such as sensors and transducers in an accurate, timely and organized manner. Modern systems convert this information to digital data which can be stored and processed by a computer.
DC voltage	= <i>Direct current voltage</i> DC voltage means that the voltage is constant respecting the time. It will always fluctuate slightly. Especially at switching on and switching off the transition behaviour is of high significance.
Disturb signal	Interferences that occur during the transfer caused by reduced bandwidth, attenuation, gain, noise, delay time etc.
Driver	A part of the software that is used to control a specific hardware device such as a data acquisition board or a printer.
Gain	The factor by which an incoming signal is multiplied.
Ground	A common reference point for an electrical system.
Inductive loads	The voltage over the inductor is $U=L \cdot (dI/dt)$, whereas L is the inductivity and I is the current. If the current is switched on fast, the voltage over the load can become very highly for a short time.
Interrupt	A signal to the CPU indicating that the board detected the occurrence of a specified condition or event.
Limit value	Exceeding the limit values, even for just a short time, can lead to the destruction or to a loss of functionality.
Noise immunity	Noise immunity is the ability of a device to work during an electromagnetic interference without reduced functions.
Noise suppression	The suppression of undesirable electrical interferences to a signal. Sources of noise include the ac power line, motors, generators, transformers, fluorescent lights, CRT displays, computers, electrical storms, welders, radio transmitters, and others.
Operating voltage	The operating voltage is the voltage that occurs during the continuous operation of the device. It may not exceed the continuous limit voltage. Furthermore, any negative operation situations, such as net overvoltages over one minute at switching on the device must be taken in consideration.

Optical isolation	The technique of using an optoelectric transmitter and receiver to transfer data without electrical continuity, to eliminate high-potential differences and transients.
Output voltage	The nominal voltage output reading when shaft is rotated to full range, expressed in volts DC /Vo DC)
Parameter	The parameters of a control comprise all fort he control process required numeric values, e.g. for limit values and technological number.
PCI bus	PCI bus is a fast local bus with a clock rate up to 33 MHz. This bus is used for processing a great number of data. The PCI bus is not limited like the ISA and EISA systems.
Protective circuitry	A protective circuitry of the active part is done in order to protect the control electronic. The simplest protective circuitry is the parallel switching of a resistance.
Protective diode	At the input of the integrated MOS (Metal Oxide Semi-Conductor)-circuits used diodes, which operate at the permitted input voltages in the reverse range, but at overvoltage in the transition range and therefore protects the circuits against damage.
Resolution	The smallest significant number to which a measurement can be determined. For example a converter with 12-bit resolution can resolve 1 part in 4096.
Sensor	A device that responds to physical stimuli (heat, light, sound, pressure, motion, etc.) and produces a corresponding electrical output.
Short circuit	A short circuit of two clamps of an electric switch is when the concerning clamp voltage is zero.
Short circuit current	Short circuit current is the current between tow short-circuited clamps.
Signal delay	The change of a signal affects the following circuitries with finite velocity; the signal will be delayed. Besides the signal delay times that are not wanted, the signal delay can be extended by time switches and delay lines.
Timer	The timer allows the adaptation of program processes between processor and peripheral devices. It usually contains from each other independent counters and can be programmed for several operation types over a control word register.
Trigger	Internal trigger: A software generated event that starts an operation. External trigger: An analog or digital hardware event from an external source that starts an operation. Digital trigger: An event that occurs at a user-selected point on a digital input signal. The polarity and sensitivity of the digital trigger can often be programmed.

11 INDEX

A

ADDevice Manager 19
 ADDIPACK 17
 ADDIREG registration program 20
 Analog outputs
 Limit values 12

B

Board registration 18

C

Changing the registration of a board 20
 Component scheme 14
 Connection to the screw terminal panel PX 901
 25

D

Digital inputs
 Connection example 25
 Limit values 13
 Digital outputs
 Connection example 25
 Limit values 13
 Dimensions 11

E

EMC
 Electromagnetic compatibility 11
 Energy requirements 12

F

Functions of the board 26

G

Glossary 32

H

Handling of the board 10

I

Installation of a new board 18
 Installation of the board 15
 Intended use 7
 Internet 23

L

Limit values 12
 Limits of use 8

P

Personal protection
 User 9
 Physical set-up of the board 11
 Pin assignment 24

Q

Qualification
 User 9

R

Registration test 22

S

Slots 15
 Software 17
 Software download 23
 Software functions
 Standard software 28
 Software samples
 Standard software 31

T

Technical data 11

U

Update 23

V

Versions 12
 Virtual board 17

W

Watchdog
 Function description 26
 Weight 11
 Width 11