



**DIN EN ISO9001:2000  
certified**



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**Technical description**

**APCI-2200**

**Relay 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.
- VxWorks is a registered trademark of Wind River Systems Inc.

# 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.

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# 1 APPLICATION

## 1.1 Intended use of the board

The board **APCI-2200** is the interface between an industrial process and a personal computer (PC). It is to be used in a free PCI 5V/32-bit slot. The PC is to comply with the EU directive 89/336/EEC and the specifications for EMC protection.

Products complying with these specifications bear the CE mark.

The board has up to 8 inputs and up to 16 relay outputs for processing digital 24 V signals.

The use of the board **APCI-2200** in combination with external screw terminal panel 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 cables **ST010** and **ST370-16** complies with the specifications:

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

**Relay outputs** convert data bus information into open or closed switching positions. The required data bus information is transmitted to the corresponding controlling function of the driver as a numerical value.

**Input channels** acquire external signal states as follows:  
the input information is loaded through the corresponding software function as a numerical value in a memory cell of the PC.

Please only use the board:

- in conditions providing absolute security
- in a closed housing which is adequately protected against environmental influences
- **with the accessories** we recommend

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.

## 1.2 Limits of use

**The APCI-2200 board is not to be used as safety related part for securing emergency stop functions.**

The emergency stop functions are to be secured separately.  
This securing must not be influenced by the board or the PC.



### **WARNING!**

The EMC tests have been carried out in a specific appliance configuration. We guarantee these limit values **only** in this configuration

The tested appliance configuration is at your disposal on request.

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-2200 in sites lying under risk of explosion is excluded.**

The board is not to be used as electrical equipment as defined by the low-voltage directive 73/23/EEC.

If you exceed the limit values of the relays (chapter 4.3), the board could fall within the application range of the low-voltage directive, in which case the compliance to CE cannot be guaranteed anymore.

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

The **APCI-2200** board operates on currents which can cause electric shocks. A basic knowledge in electronics is required to work with the board.

If the board is to work with high currents up to 1 A, the knowledge of necessary protective measures and mechanisms is required.

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

- installation
- use,
- maintenance.

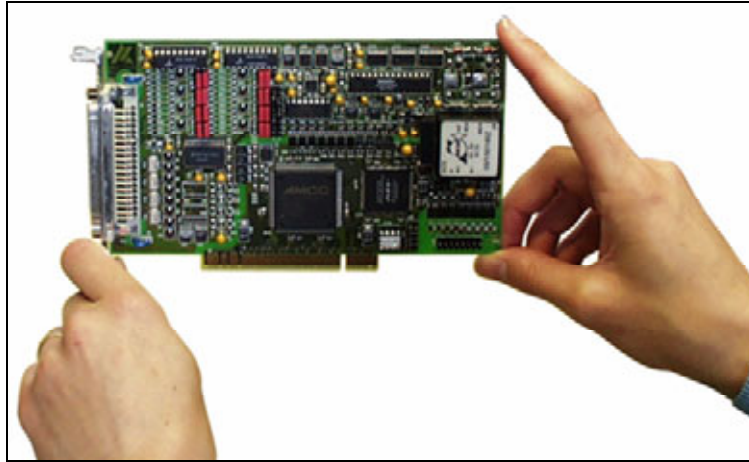
### 2.2 Personal protection

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)

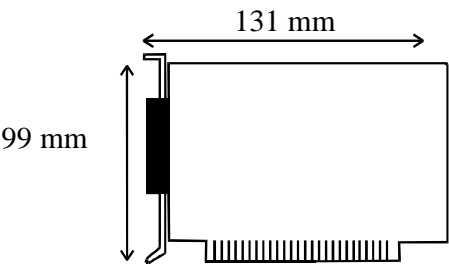
The board has been subjected to EMC tests in an accredited laboratory. The board complies with the limit values set by the norm EN61326 as follows:

	True value	Set value
ESD (Discharge by contact/air) .....	4/8 kV	4/8 kV
Fields .....	10 V/m	10 V/m
Burst .....	4 kV	2 kV
Conducted radio interferences .....	10 V	10 V

### 4.2 Physical set-up of the board

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

**Dimensions:**



Weight: .....	approx. 150 g
Installation in: .....	32/64-bit PCI slot 5 V
Connection to the peripheral: .....	50-pin SUB-D male connector 37-pin male connector for ribbon cable

**Accessories<sup>1</sup>:**

Standard cable: .....	<b>ST370-16, ST010/ST011</b>
Ribbon cable: .....	<b>FB2200-3</b> for the digital inputs
Screw terminal panel: .....	<b>PX 901-ZG</b>
Relay output board: .....	<b>PX 8000</b>



**WARNING!**

The supply lines must be installed safely against mechanical loads.

<sup>1</sup> Not included in the standard delivery.

## 4.3 Versions

The relay board **APCI-2200** is available in the following versions:

Version	Full version	Partial assembly	Relay outputs	Inputs
APCI-2200-16-8	✓		16	8
APCI-2200-16		✓	16	-
APCI-2200-8		✓	8	-
APCI-2200-8-8		✓	8	8

## 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

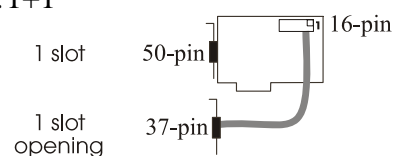
### Energy requirements:

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

	APCI-2200-16-8	APCI-2200-8-8	APCI-2200-16	APCI-2200-8
+ 5 V from PC	510 mA	290 mA	480 mA	264 mA

### Required slots

**APCI-2200-16-8:** ..... 1+1



**APCI-2200-8-8, APCI-2200-16,**

**APCI-2200-8:** ..... 1

### Addressing

Data bus access: ..... 8-bits  
 required address ranges: ..... 4 bytes (1 Dword)  
 ..... 32 bytes (8 Dword)



**Creeping distance and corresponding voltage values**

according to DIN VDE 0110, with stain degree 1 (clean board)

Between the coil and the contacts and

between the contacts: ..... 800 V

between the contacts: ..... 200 V

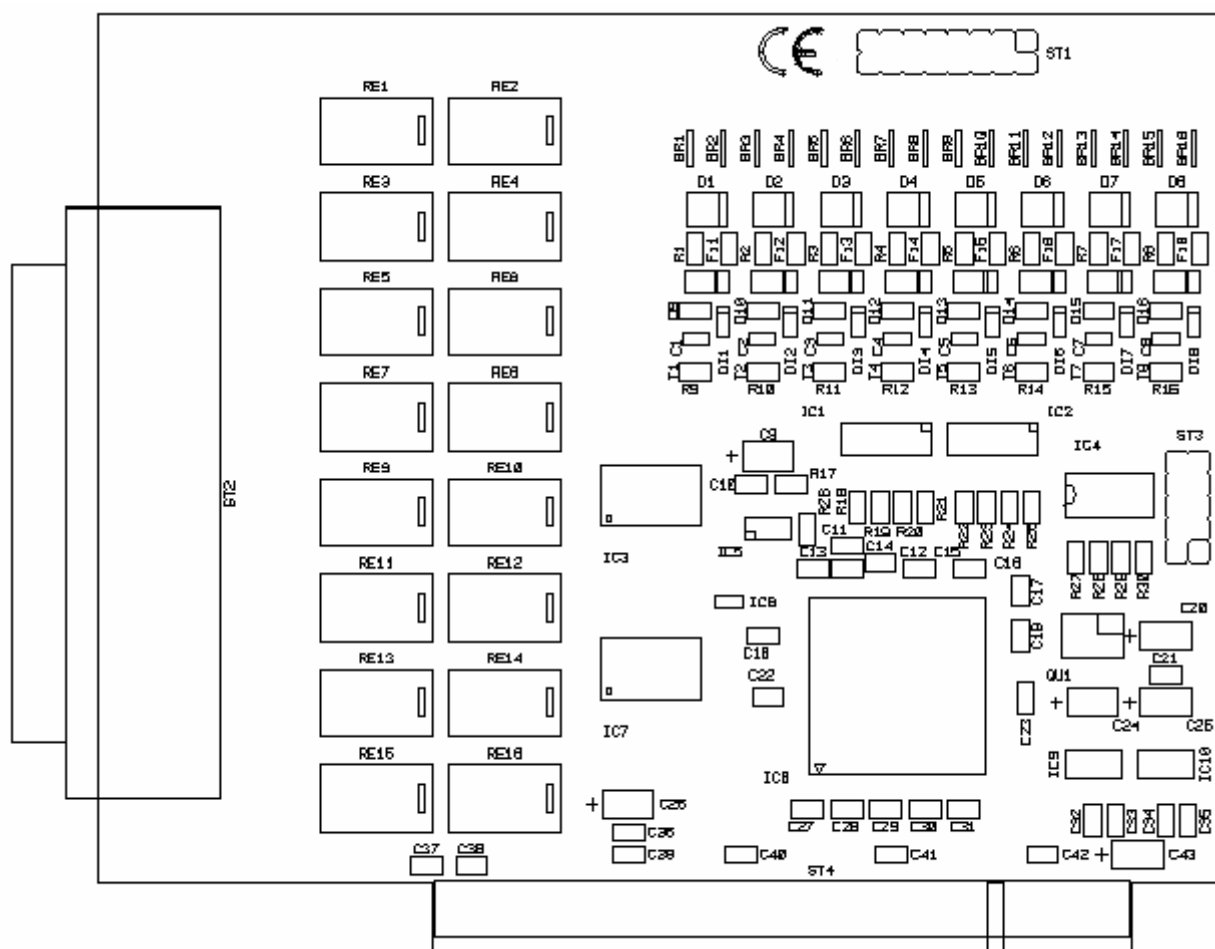
**Test voltage for the relays**

1000 VAC, 50/60 Hz 1 minute between the coil and the contacts

400 VAC, 50/60 Hz 1 minute between the open contact

## 4.5 Component scheme

Fig. 4-1: Component scheme



**Remark:** The relay 1 is designed with "RE1" on the component scheme.

## 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-5V slot (32-bit).

**Fig. 5-1: PCI-5V slot (32-bit)**



**32 bits**

**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

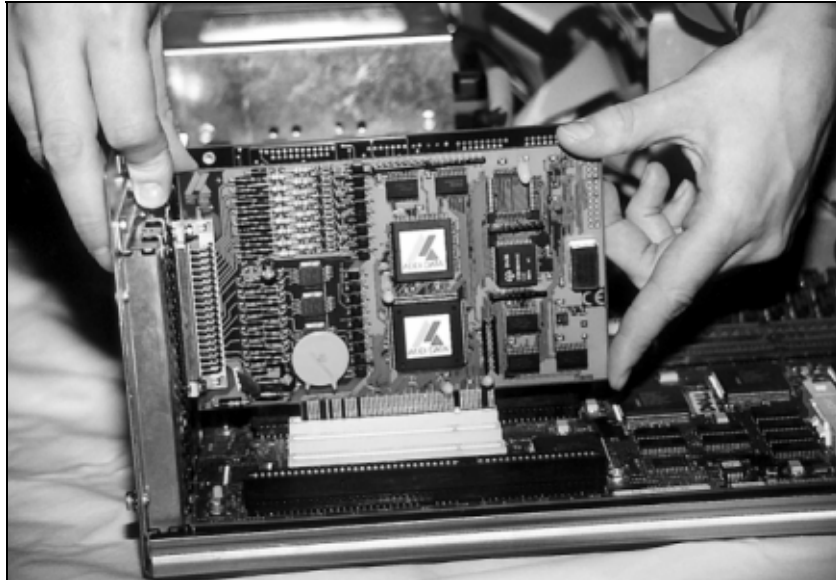
**Discharge yourself from electrostatic charges.**

**Take the board out of its protective pack.**

### 5.3 Plugging the board into the slot

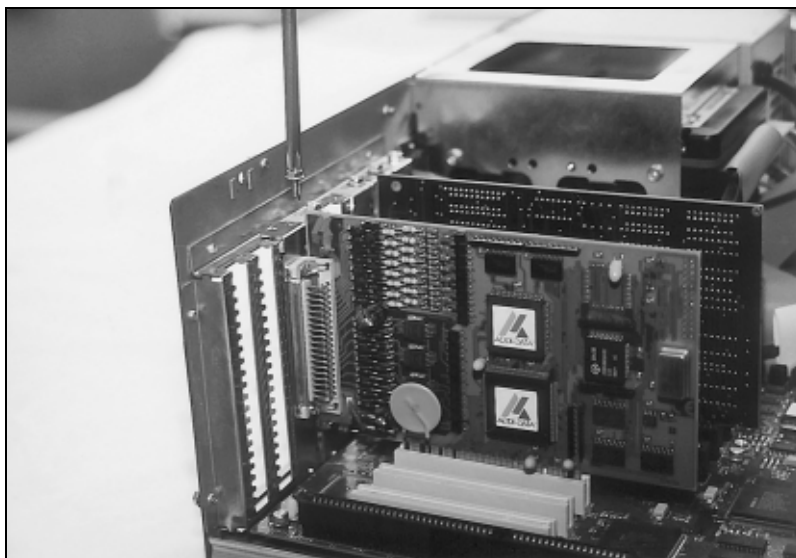
- ◆ Insert the board vertically into the chosen slot.

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-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-2200** 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.

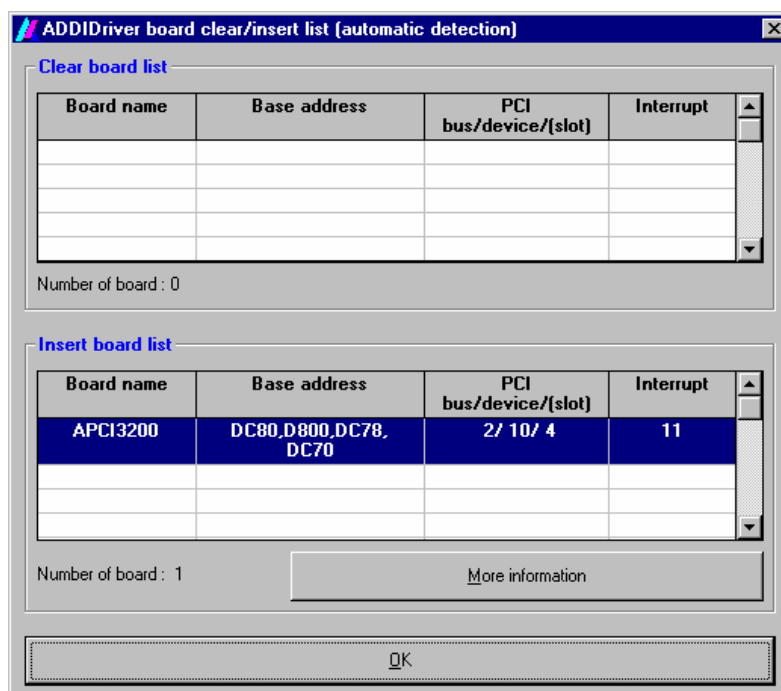
## 6.1 Board registration

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

### 6.1.1 Installation of a new board

If a new board is recognised, the following windows 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

ADDevice Manager Version 1200/0101 : ADDI-DATA Virtual board					
File					
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, ...) 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...". You can then 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.

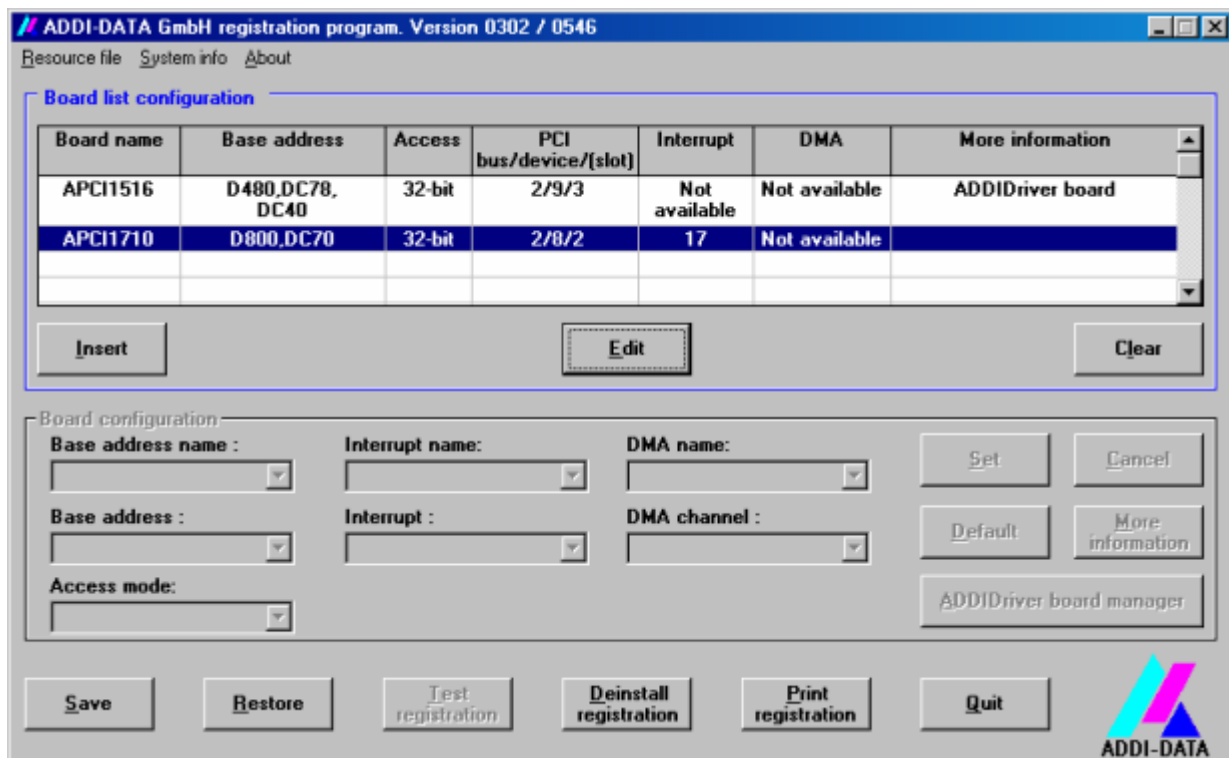
**i**

#### 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-2200**.

Visit us at

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

**i**

### **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



**WARNING!**  
The relay board can operate on high currents. A wrong use can cause mortal injury.

- ◆ Turn off the mains supply.
- ◆ Pull the mains plug.
- ◆ Disconnect all cables to external devices.

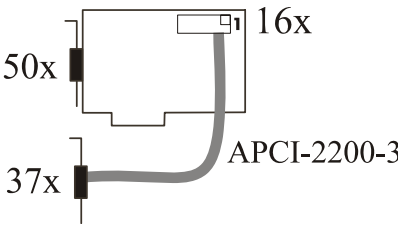
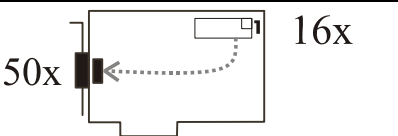


**IMPORTANT!**  
Make sure that the wire cross section of the connection cable accepts the operating current.

7.1 Possible connections

**Version 16-8:** for cabling the inputs to the peripheral, the ribbon cable **FB2200-3** is necessary.

Table 7-1: Cabling and corresponding connector for the digital inputs

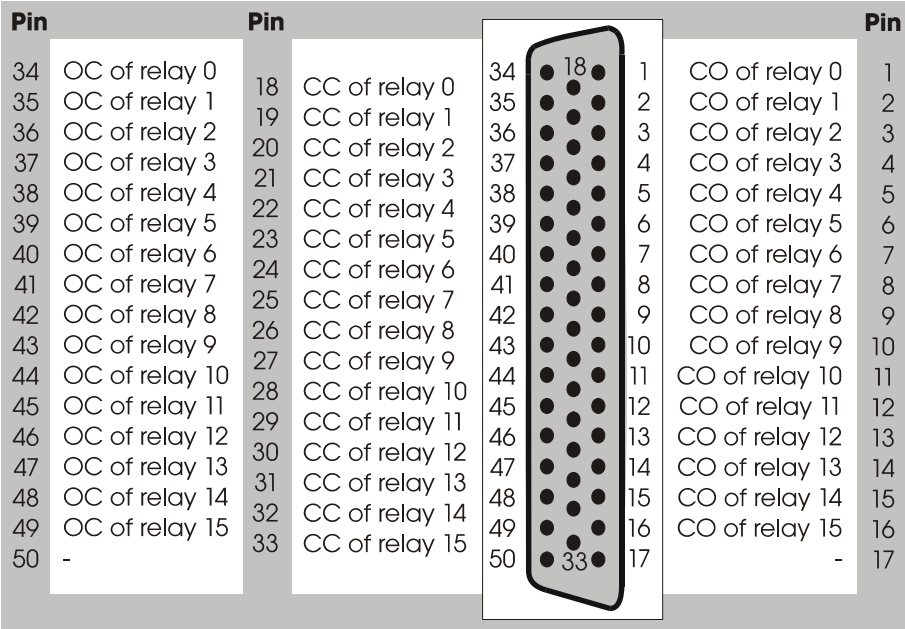
Version APCI-2200-16-8	Cabling possibilities
You can connect the inputs to a 37-pin SUB-D male connector through the optional ribbon cable <b>FB2200-3</b> for example to connect an ADDI-DATA screw terminal panel	
Version APCI-2200-8-8	Cabling possibilities
The inputs are internally driven to the 50-pin SUB-D connector (See Fig. 7-3) through bridge.	



7.2 Connector pin assignment

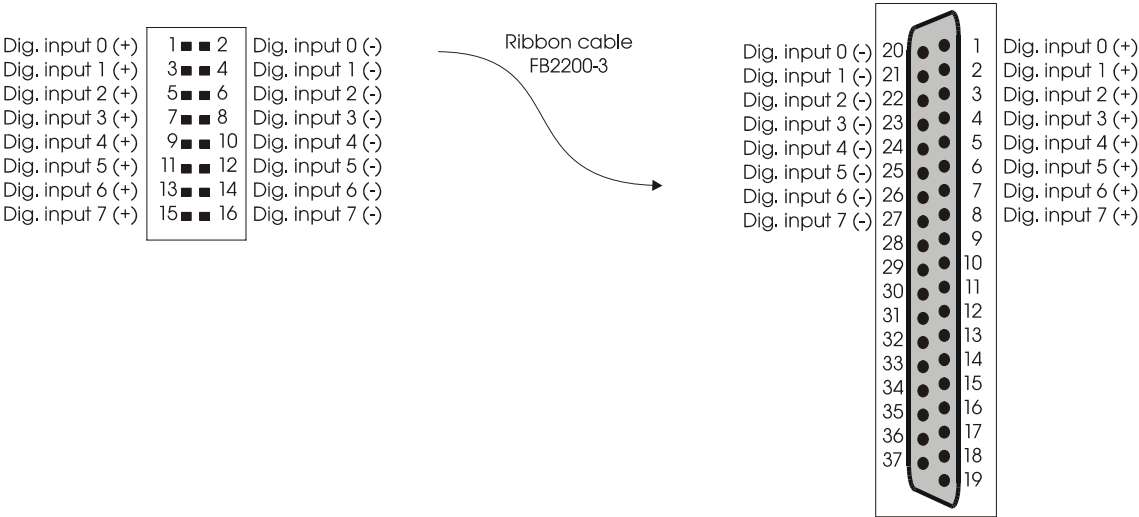
7.2.1 Version APCI-2200-16-8

Fig. 7-1: Connection of the relay outputs through the front connector



OC: Opening contact  
CC: Closing contact  
CO: Change-over contact

Fig. 7-2: Connection of the inputs through the ribbon cable FB2200-3



7.2.2 Version APCI-2200-8-8

Fig. 7-3: Connection of the digital I/O through the front connector

Pin		Pin				Pin	
34	OC of relay 0	18	CC of relay 0	34	18	1	CO of relay 0
35	OC of relay 1	19	CC of relay 1	35		2	CO of relay 1
36	OC of relay 2	20	CC of relay 2	36		3	CO of relay 2
37	OC of relay 3	21	CC of relay 3	37		4	CO of relay 3
38	OC of relay 4	22	CC of relay 4	38		5	CO of relay 4
39	OC of relay 5	23	CC of relay 5	39		6	CO of relay 5
40	OC of relay 6	24	CC of relay 6	40		7	CO of relay 6
41	OC of relay 7	25	CC of relay 7	41		8	CO of relay 7
42	Digital input 0 (+)	26	-	42		9	Digital input 0 (-)
43	Digital input 1 (+)	27	-	43		10	Digital input 1 (-)
44	Digital input 2 (+)	28	-	44		11	Digital input 2 (-)
45	Digital input 3 (+)	29	-	45		12	Digital input 3 (-)
46	Digital input 4 (+)	30	-	46		13	Digital input 4 (-)
47	Digital input 5 (+)	31	-	47		14	Digital input 5 (-)
48	Digital input 6 (+)	32	-	48		15	Digital input 6 (-)
49	Digital input 7 (+)	33	-	49		16	Digital input 7 (-)
50	-			50	33	17	-

OC: Opening contact  
CC: Closing contact  
CO: Change-over contact

7.3 Connecting the relay outputs

Fig. 7-4: Switching principle of the relay outputs

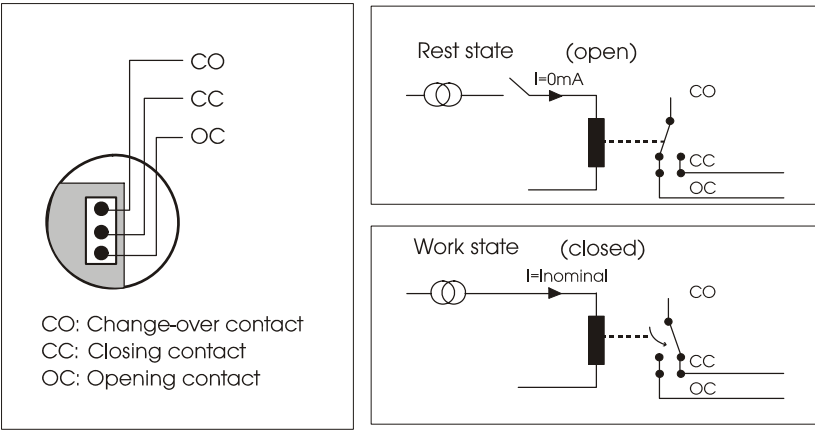
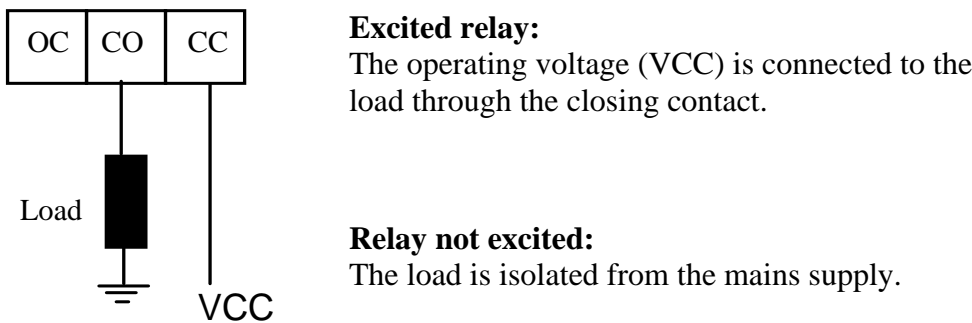


Fig. 7-5: Connecting the relay outputs (example)



7.4 Protection circuitry on the load (example)

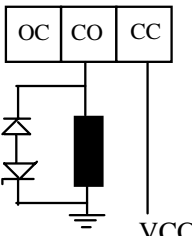
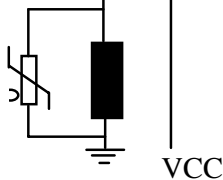


**WARNING!**  
Overloading the relays by connecting ohmic, inductive or capacitive loads without protection circuitry can damage a relay or cause a premature wear-out.

Table 7-2: Protection circuitry on the load (example)

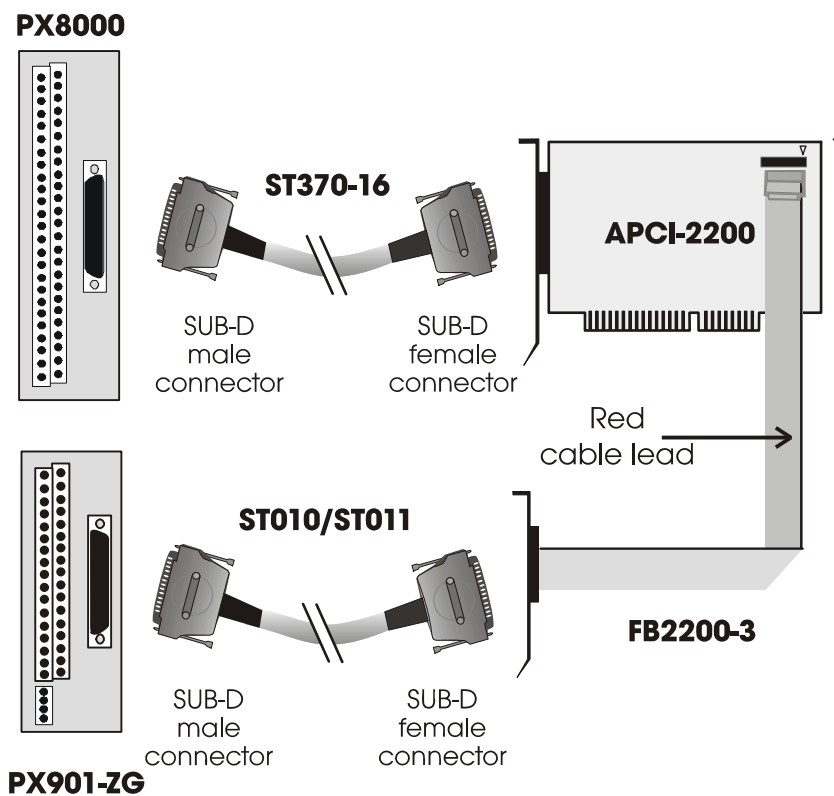
	Use	Remark
	<ul style="list-style-type: none"><li>- a <b>resistor R</b></li><li>- a <b>capacitor C</b></li></ul> <p><u>Typical value</u></p> <p>R = 0,5 to 1 Ω per 1 V contact voltage</p> <p>C = 1 to 0,5 μF per 1 A contact current</p>	<p>The values depend from the features of the load and may not always correspond to the typical values</p> <ul style="list-style-type: none"><li>• <b>Find out</b> the typical values experimentally</li></ul> <p><b>Capacitor C:</b> suppresses the charge with opening contacts.</p> <p><b>Resistor R:</b> limits the current flow on the next closing of the contacts.</p>
	<p>A <b>diode</b> with</p> <ul style="list-style-type: none"><li>- an <b>off-stage voltage</b>, supporting more than 10 times the switching voltage</li><li>- a <b>conducting state current</b> higher than the load current.</li></ul>	<p>By switching off the load, the energy stored in the coil (inductive load) creates a current flow through the diode connected parallel to the coil.</p> <p>With this type of circuitry, the delay in the release time is longer than in a RC circuit.</p>

Table 7-3: Protection circuitry on the load (continued)

	Use	Remark
	<p>- a <b>Zener diode</b></p> <p>The off-state voltage should correspond to the mains voltage</p>	<p>This circuitry shortens the release time for applications in which the release time of the protection circuitry with diode would be too slow.</p>
	<p>- a <b>varistor</b></p>	<p>The constant voltage effect of the varistor does not allow high voltages at the contacts.</p> <p>With this protection circuitry, the release time is only slightly delayed.</p>

## 7.5 Connection examples

Fig. 7-6: Connection to the screw terminal panel and relay output boards



**i**

### IMPORTANT!

Plug the FB2200-3 on the connector with the red cable lead on the side of the pin 1.

## 8 FUNCTIONS OF THE BOARD

### 8.1 Relay outputs

The switching position of the relays 0-7 or 8-15 can be parallelly modified as long as the watchdog is not in alarm state.

### 8.2 Watchdog

The watchdog is a downward counter, which resets the digital outputs after the reload value has run down (timeout).

The watchdog can have 3 different status:

**"OFF":** The watchdog is switched off and has no influence on the relays.

**"ON":** The watchdog has been switched on by software trigger.  
It is supervising the program course and monitoring the status of the relays by timeout.

**"Alarm":** The watchdog signals an alarm by resetting all outputs.

The watchdog status can be read back at any time through software.  
Time intervals can be programmed from 20 ms to 5s in 20 ms steps.

### 8.3 Digital inputs (option)

This function is available for the versions APCI-2200-16-8 and APCI-2200-8-8.

The inputs acquire the status of external signals: the input information is stored through software as a value in the memory cell of the PC. This value is converted to give the status of the input signals.

#### **24 V isolated inputs (IEC1131-2):**

- logic "1" corresponds to an input voltage  $> 8\text{ V}$
- logic "0" corresponds to an input voltage  $< 6\text{ V}$ .

The required current per input is 6 mA at nominal voltage.



#### **WARNING!**

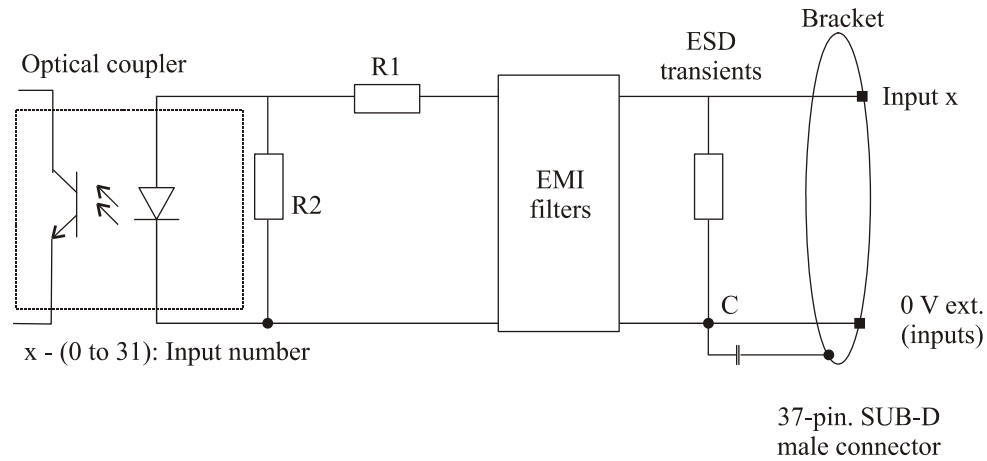
**If you operate all inputs with the same voltage supply, the voltage supply must deliver at least  $32 \times 6 = 192\text{ mA}$  at  $V_{cc\text{ ext.}} = 24\text{ V}$ .**

The maximum input voltage is 30 V / 7 mA typical.

The input signals are filtered by transil diodes, Z diodes, LC filters and optical couplers. The effects of inductive and capacitive noise are thus reduced.

The board requires no initialisation to read the 24 V digital input information. After successful power ON, data is immediately available on the board.

**Fig. 8-1: Protection circuitry for the inputs**



## 9 STANDARD SOFTWARE

### 9.1 Software functions

ADDIPACK supports the following functions for the APCI-2200.

**Table 9-1: Supported software functions**

Functionality	Function name
<b>Common functions</b>	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	b_ADDIDATA_CloseWin32Driver
<b>Interrupt</b>	b_ADDIDATA_SetFunctionalityIntRoutineWin32
	b_ADDIDATA_TestInterrupt
	b_ADDIDATA_ResetFunctionalityIntRoutine
<b>Error</b>	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
<b>Digital inputs</b>	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
	b_ADDIDATA_Read4DigitalInputs
	b_ADDIDATA_Read8DigitalInputs
<b>Digital outputs</b>	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_Set4DigitalOutputsOn



Functionality	Function name
<b>Digital outputs</b>	b_ADDIDATA_Set4DigitalOutputsOff
	b_ADDIDATA_Set8DigitalOutputsOn
	b_ADDIDATA_Set8DigitalOutputsOff
	b_ADDIDATA_Set16DigitalOutputsOn
	b_ADDIDATA_Set16DigitalOutputsOff
	b_ADDIDATA_Get1DigitalOutputStatus
	b_ADDIDATA_Get2DigitalOutputStatus
	b_ADDIDATA_Get4DigitalOutputStatus
	b_ADDIDATA_Get8DigitalOutputStatus
<b>Watchdog</b>	b_ADDIDATA_GetNumberOfWatchdogs
	b_ADDIDATA_GetWatchdogInformation
	b_ADDIDATA_GetWatchdogInformationEx
	b_ADDIDATA_InitWatchdog
	b_ADDIDATA_StartWatchdog
	b_ADDIDATA_StopWatchdog
	b_ADDIDATA_ReadWatchdogStatus
	b_ADDIDATA_TriggerWatchdog
	b_ADDIDATA_ReleaseWatchdog

## 9.2 Software samples

Table 9-2: Supported software samples

Functionality	Sample number	Description
<b>Digital inputs</b>	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
	SAMPLE03	Read 4 digital inputs
	SAMPLE04	Read 8 digital inputs
<b>Digital outputs</b>	SAMPLE01	Test 1 digital output with/without output memory
	SAMPLE02	Test 2 digital outputs with/without output memory
	SAMPLE03	Test 4 digital outputs with/without output memory
	SAMPLE04	Test 8 digital outputs with/without output memory
	SAMPLE05	Test 16 digital outputs with/without output memory
<b>Watchdog</b>	SAMPLE01	Initialise and release software-trigger by mouse click. Start 1 watchdog. Read status once the watchdog has run down. Reset the watchdog and quit the program.
	SAMPLE05	b_ADDIDATA_GetWatchdogInformationEx() is used. Initialise and release software trigger at key stroke. Start 1 watchdog. 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.
Bus	The group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are PCI, PC Card (PCMCIA), ISA (AT), and EISA bus.
Capacitor	a device used to store an electric charge, consisting of one or more pairs of conductors separated by an insulator.
Clock	A circuit that generates time and clock pulses for the synchronisation of the conversion
Counter	A circuit that counts pulses or measures pulse duration.
Creeping distance	In order to avoid the danger of the effects of electrical voltages and currents for electrical-mechanical components, it is required to keep minimum isolation distances. The creeping distance is the shortest distance alongside of an isolation surface between two reference points (contact elements).
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.
Digital signal	A signal which has distinct states. Digital computers process data as binary information having either 1 or 0 states.
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.
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.
Opto-coupler	With an opto-coupler direct current voltage can be transferred. The advantage is the small size.
Output current	The maximum amount of current the sensor can supply across the output signal, expressed as amps DC (A DC).
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.
Reference voltage	Reference voltages are stable voltages that are used as reference unit. From them voltages can be derived that are required for example in current supplies and in other electronic circuitries.
Relay	An electrical device, typically incorporating an electromagnet, which is activated by a current or signal in one circuit to open or close another circuit
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.
Settling time	The time required, after application of a step input signal, for the output voltage to settle and remain within a specified error band around the final value. The settling time of a system includes that of all of the components of the system.
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.
Varistor	A semiconductor diode with resistance dependent on the applied voltage

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