



**DIN EN ISO 9001: 2000
certified**



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Technical description

**APCI-1016,
APCI-1516, APCI-2016**

Digital I/O boards, optically isolated

Edition: 05.07 - 01/2008

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 DEFINITION OF APPLICATION

1.1 Intended use

The **APCI-1016**, **APCI-1516** and **APCI-2016** board must be inserted in a PC with PCI 5V/32-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-1016**, **APCI-1516** and **APCI-2016** 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 Usage restrictions

The **APCI-xx16**¹ 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-xx16** board must not be used in potentially explosive atmospheres.

The **APCI-xx16** board must not be used as electrical equipment according to the Low Voltage Directive 2006/95/EC.

1.3 General description of the board

Data exchange between the **APCI-xx16** boards 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-xx16** boards

The boards are used for acquiring digital 24 V signals.

- The board APCI-1016 has 16 digital inputs,
- the board APCI-1516 has 8 digital inputs and 8 digital outputs,
- the board APCI-2016 has 16 digital outputs.

An external 24 V supply voltage is necessary to run the output channels.

The screw terminal panel **PX 901** and the relay board **PX 8500** allow connecting the 24 V supply voltage through a shielded cable

The installation is to be effected competently.

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

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

¹ Common name for the APCI-1016, APCI-1516 and APCI-2016 in the manual

The functions of the boards are to be used according to their intended purpose.

Outputs channels:

They can be read back at any time per software.

In case of overtemperature, undervoltage, overloading, time-out or voltage loss, the output channels switch off. The use without malfunction is ensured through an appropriate cabling and an adapted program control.

Watchdog:

The watchdog function is particularly recommended when the output channels execute control functions. Make sure with a control program that the output channels are updated minimum once before timeout occurs.

Diagnostic (pin 19):

The diagnostic is meaningful when the output channels are used for controlling. The diagnostic signals must especially be analysed in case of an increasing temperature of the site, of important charges or of charges with high starting currents. The diagnostic function is not supported by the software.

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.

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

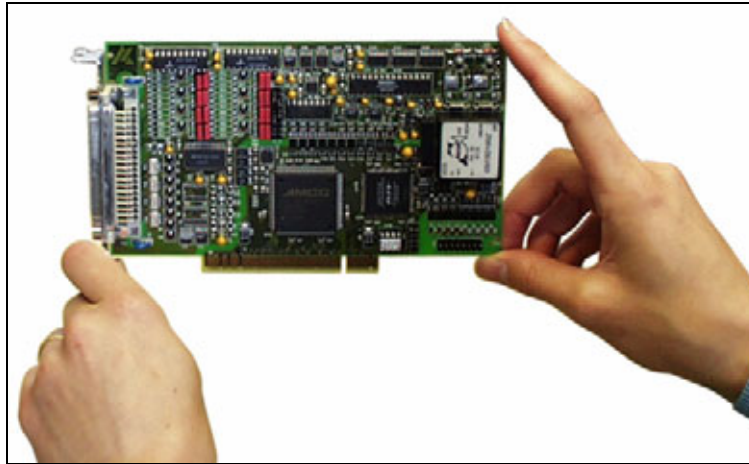
2.2 Country-specific regulations

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-xx16** 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.



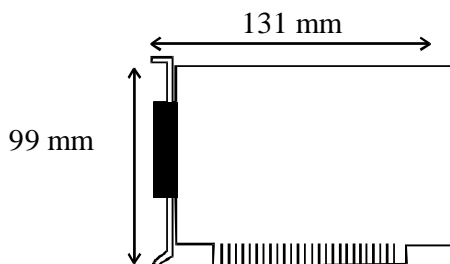
WARNING !

The EMC tests have been carried out in a specific appliance configuration. We guarantee these limit values only in this configuration.²

4.2 Physical set-up of the board

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

Dimensions:



Weight:	approx. 160 g
Installation in:	32/64-bit PCI slot 5 V
Connection to the peripheral:	37-pin SUB-D male connector
Accessories ³ :	
Standard cable:	ST010
Screw terminal panel:	PX 901
Relay output board:	PX 8500



WARNING!

The supply lines must be installed safely against mechanical loads.

² The used configuration is at your disposal on request.

³ Not included in the standard delivery.

4.3 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 \pm 5%
- Current consumption (without load): typ. see table \pm 10%

	APCI-1016	APCI-1516	APCI-2016
+ 5 V from PC	216 mA	220 mA	233 mA

24 V digital input channels (APCI-1016, APCI-1516)

Input type: common ground according
to IEC1131-2

Number of input channels: 16 for the **APCI-1016**
8 for the **APCI-1516**

Nominal voltage: 24 VDC

Input current at nominal voltage: 6 mA

Logic input level: $U_H^{1)}$ max.: 30 V

$$U_H \text{ min.: } 19 \text{ V}$$
$$U_{I \text{ 2) max.}}: 14 \text{ V}$$
$$U_{L, \min.}: \quad 0 \text{ V}$$

Signal delay: 70 μ s (at nominal voltage)

Maximum input frequency: 5 kHz (at nominal voltage)

24 V digital output channels (APCI-1516, APCI-2016)

Output type: high side (load at ground)

Number of output channels: 8 for the **APCI-1516**
16 for the **APCI-2016**

Nominal voltage: 24 VDC

Range of the supply voltage: 10 V to 36 VDC
(over 24 V ext. pins)

¹ U_H: input voltage (= logic "1")

² U_I : input voltage (= logic "0")

Max. output current for all output channels:	3 A typ. (fused through PTC resistors)
Max. output current / output channel:	500 mA
Short-circuit current / output channel at 24 V, $R_{load} < 0.1 R$:	1.5 A max. (switches off the output channel)
ON-resistor of the output channel (R_{DS} ON resistor):	0.4 R max.
Overtemperature:	170°C (switches off the component i.e. the 4 outputs)
Temperature hysteresis:	20°C
Switch ON time at 24 V, R_{load} 500 mA: ...	100 μ s typ.
Switch OFF time at 24 V, R_{load} 500 mA: .	60 μ s typ.

Safety (all boards)

Optical isolation (DIN VDE 0411-100):	1000 V (from the PC to the external peripheral).
Logic:	positive

APCI-1516 and APCI-2016:

24 V loss or drop under 5 V min.:	the output channels are switched off.
Watchdog:	resets all the output channels, if no software trigger has happened. Times from 20 ms to 5 s in steps of 20 ms are available.
Diagnostic:	the transistor output switches off by overtemperature or overload

4.4 Component scheme

Fig. 4-1: Component scheme of the APCI-1016

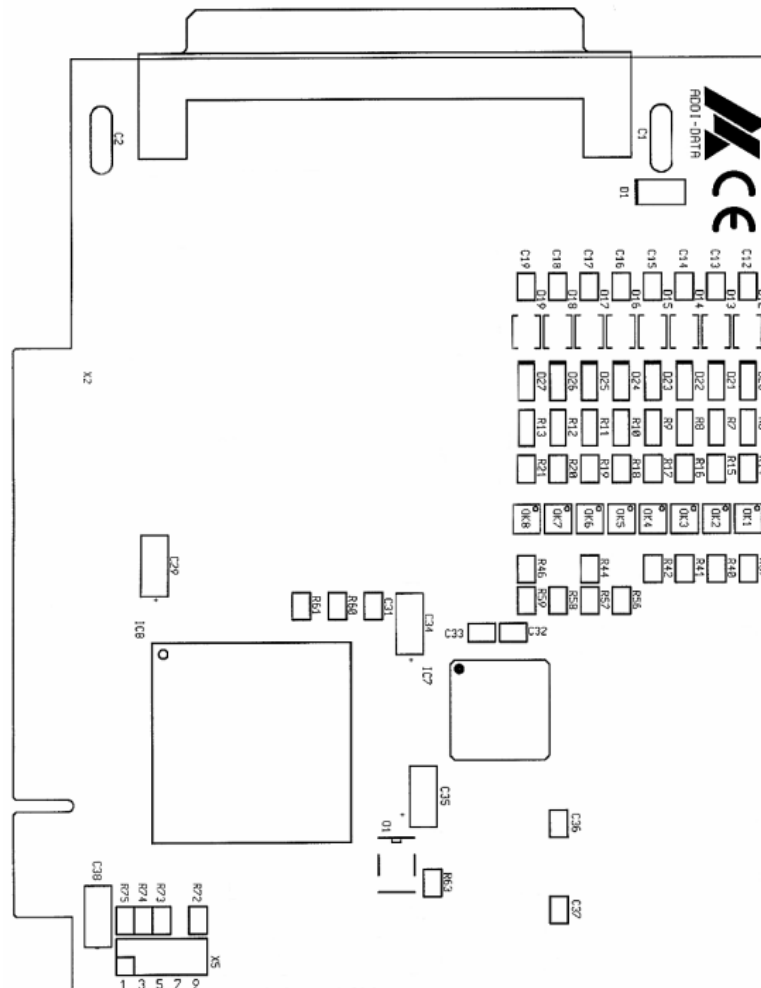
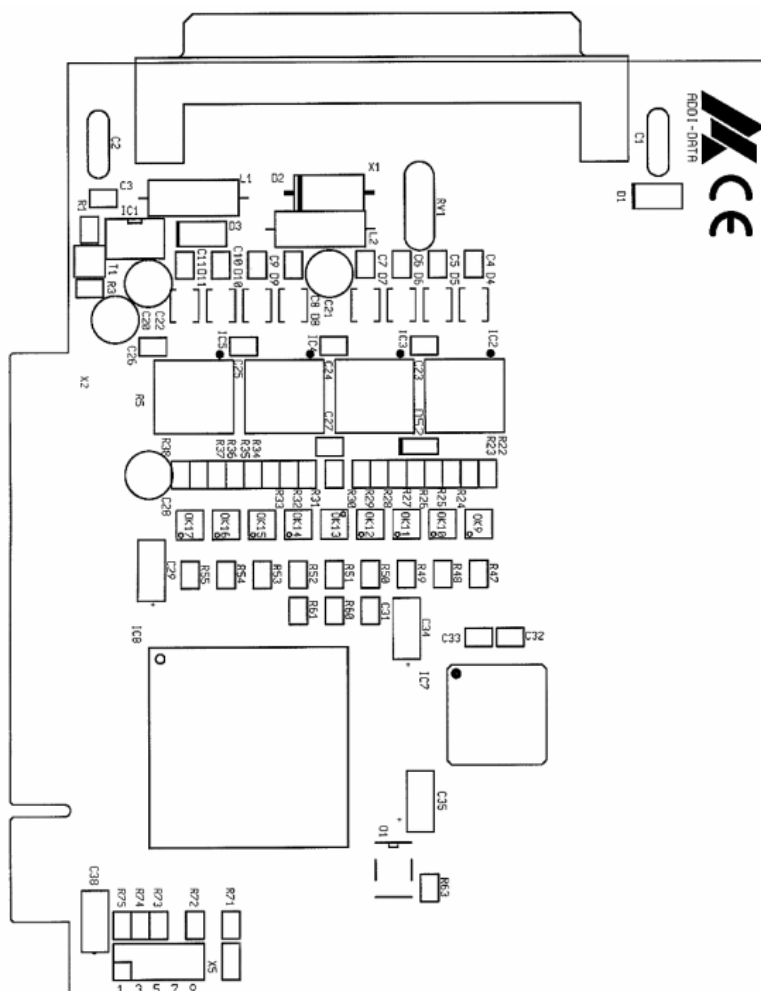


Fig. 4-3: Component scheme of the APCI-2016



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

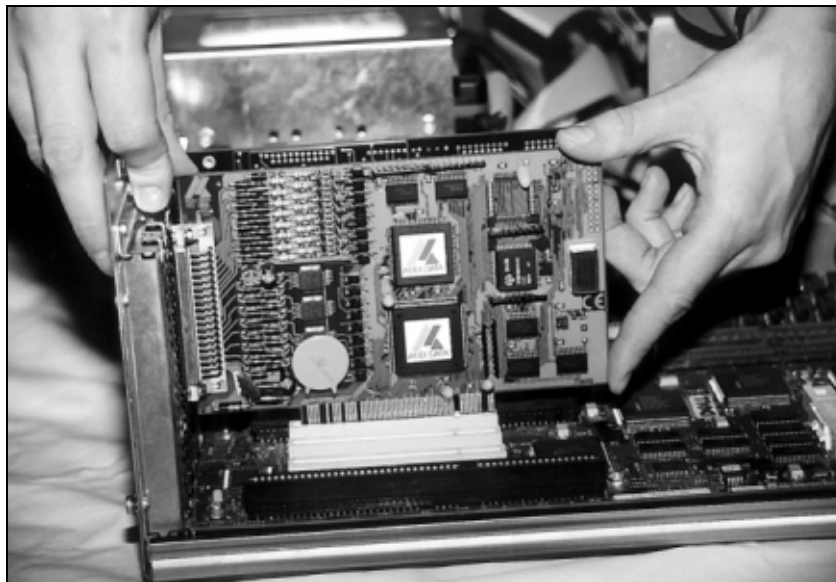
Discharge yourself from electrostatic charges.

Take the board out of its protective pack.

5.3 Plugging the board into the slot

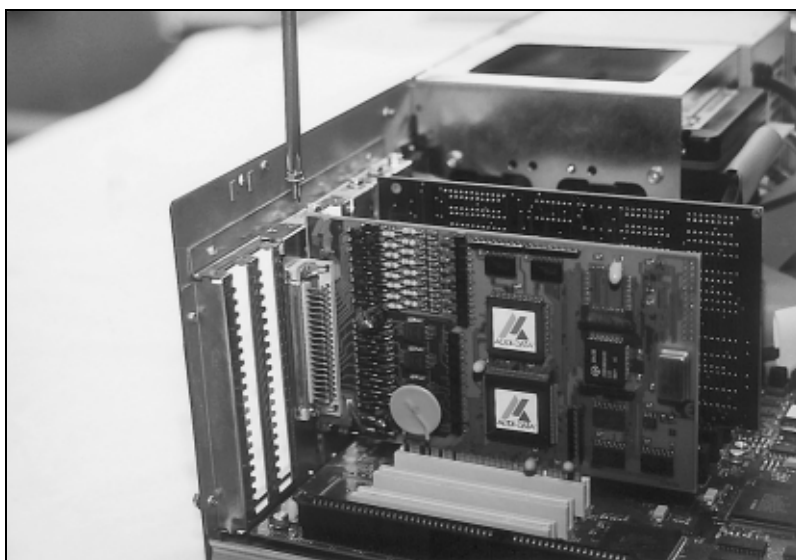
- ◆ Insert the board vertically into the chosen slot.

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.

i **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.

i **IMPORTANT!**
The supported software functions for the **APCI-xx16** are listed in chapter 9.

The board is supplied with a Driver CD-ROM (CD1) 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.

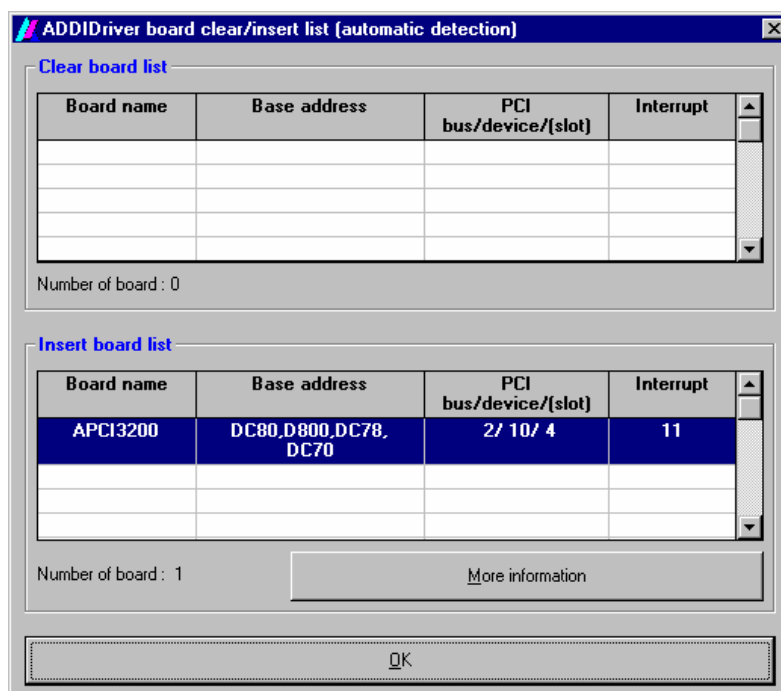
6.1 Board registration

When starting the set-up of ADDIREG, the **APCI-xx16** 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



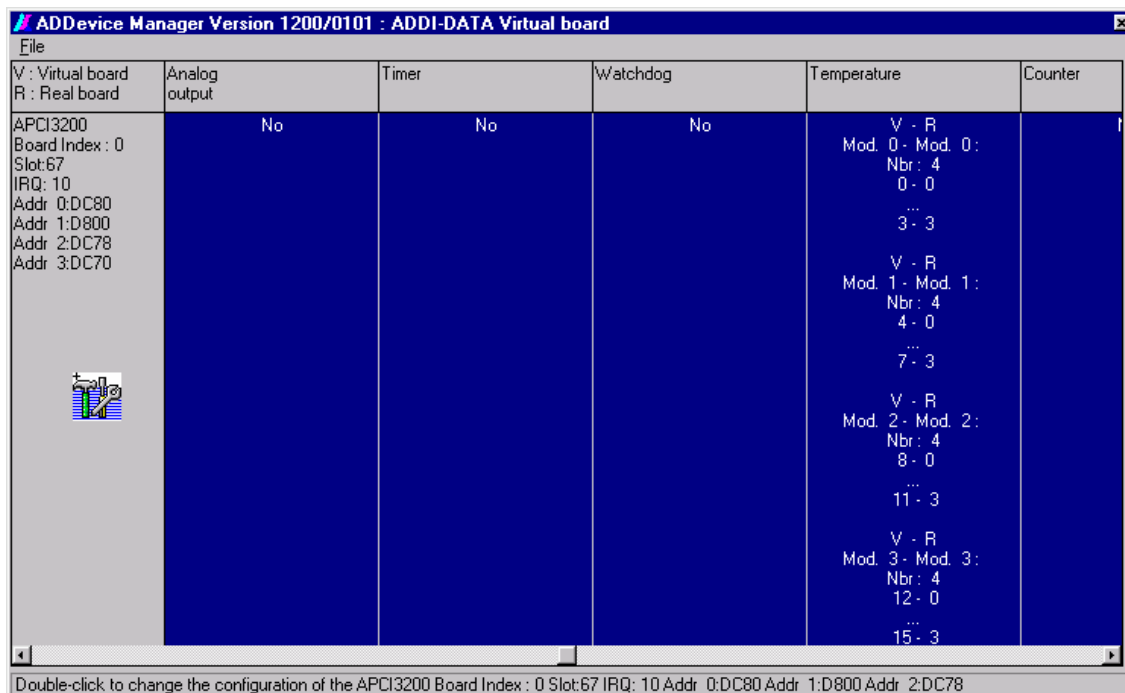
The boards which have been removed from the PC since the last ADDIREG start are listed in the upper table

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



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)

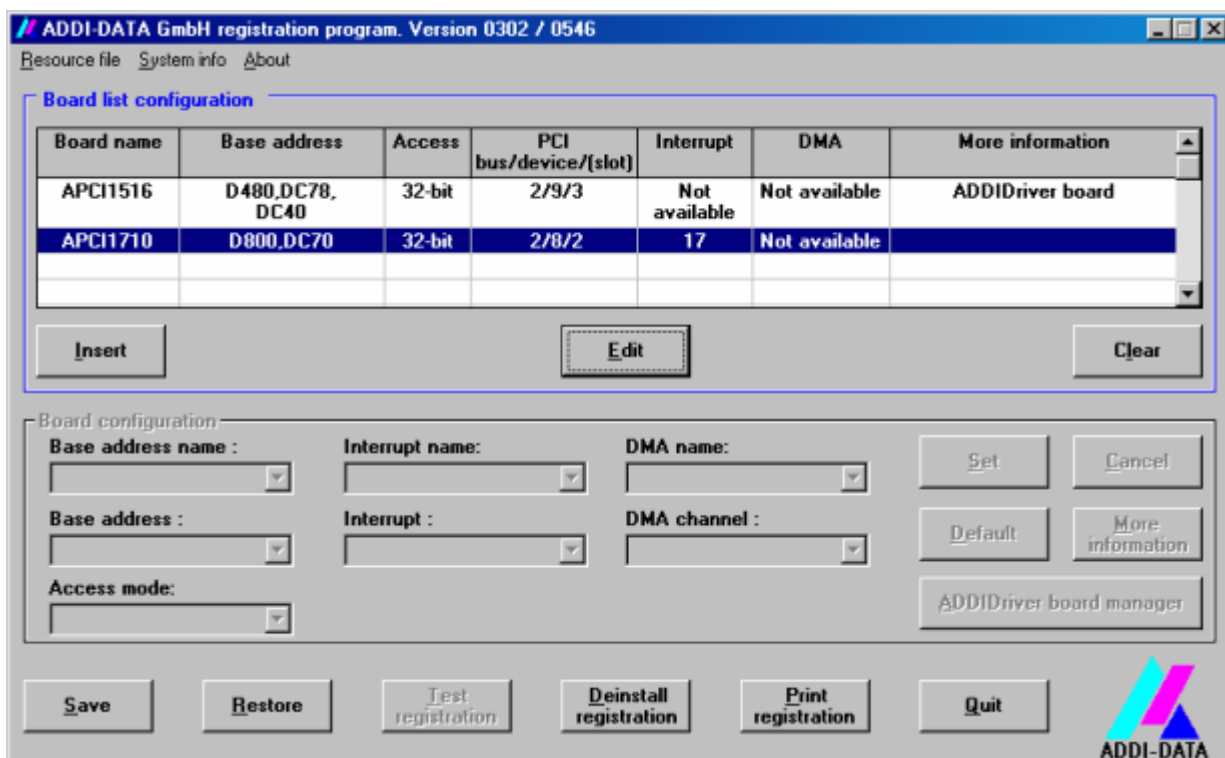


Table:**Board name:**

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 boards
APCI-xx16.

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

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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 assignments

Fig. 7-1: Connector pin assignment of the board APCI-1516

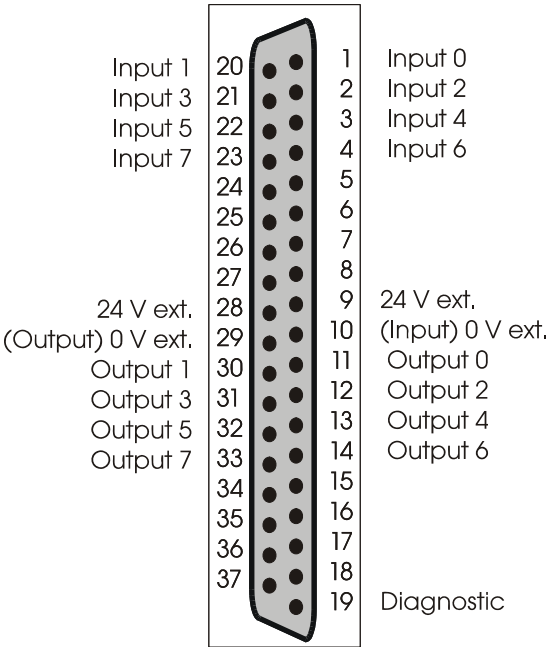
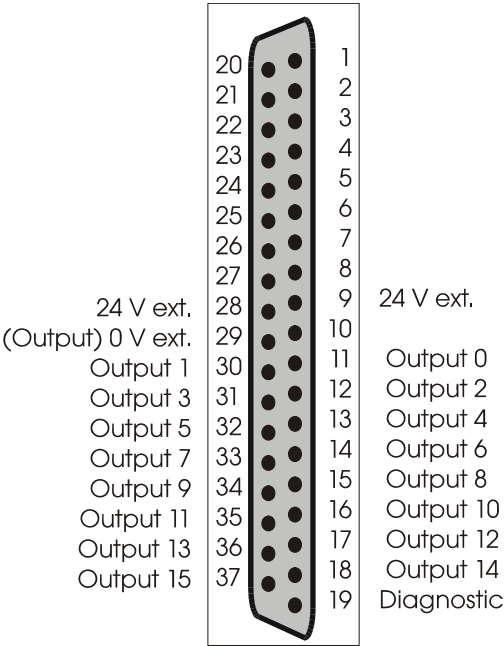
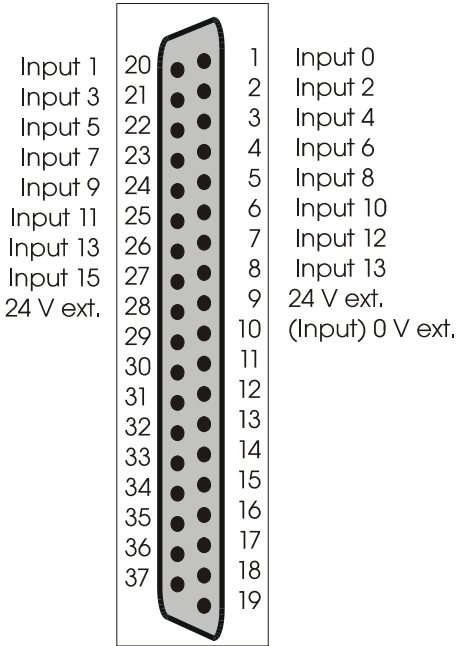


Fig. 7-2: Connector pin assignment of the board APCI-1016

Fig. 7-3: Connector pin assignment of the board APCI-2016



7.2 Connection principle

Fig. 7-4: Connection principle of the digital inputs

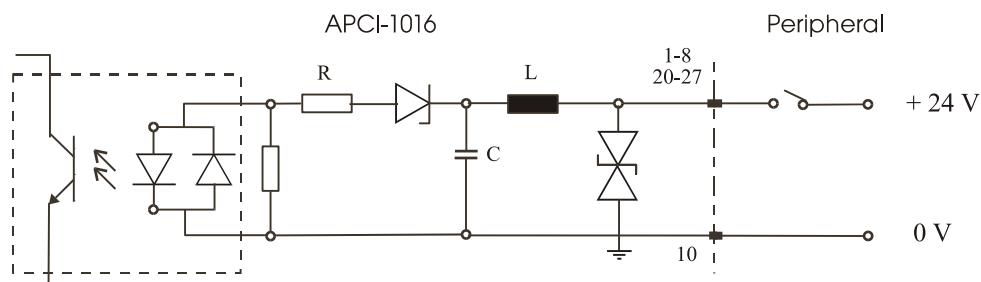


Fig. 7-5: Connection principle of the digital inputs and outputs

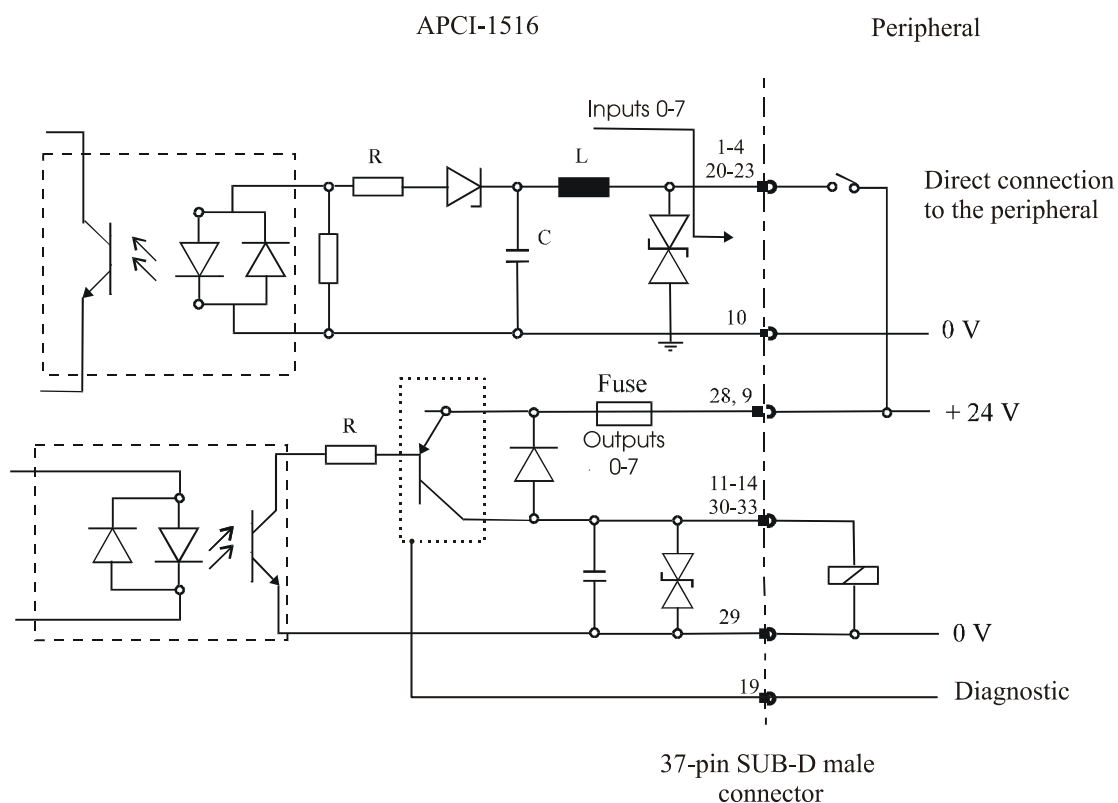
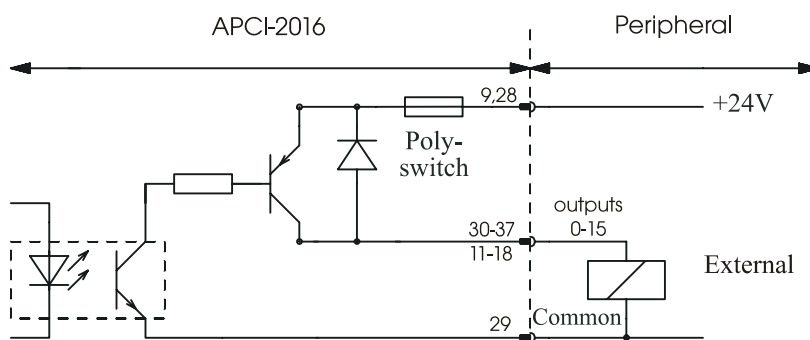
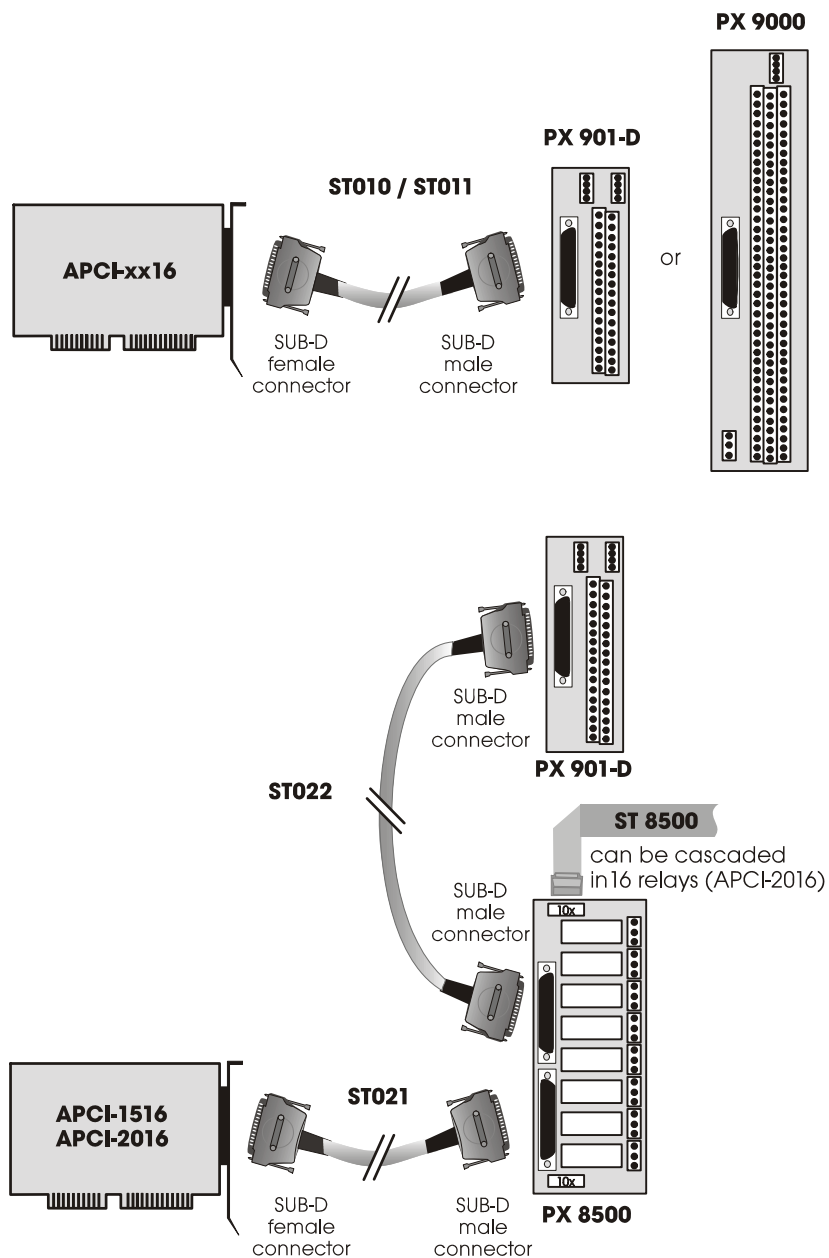


Fig. 7-6: Connection principle of the digital outputs



7.3 Connection examples

Fig. 7-7: Connection examples



8 FUNCTIONS OF THE BOARDS

8.1 Description of the boards

8.1.1 Block diagrams

Fig. 8-1: Block diagram of the APCI-1016

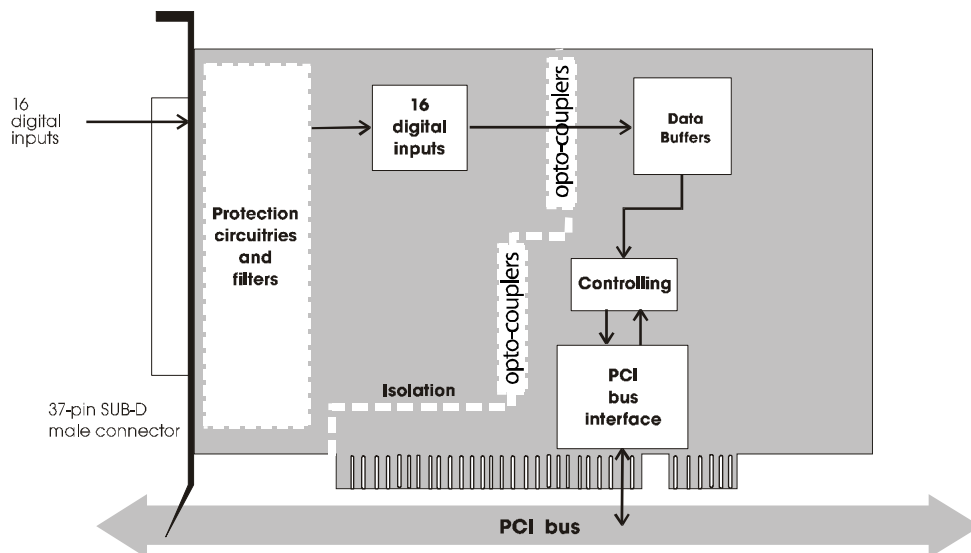


Fig. 8-2: Block diagram of the APCI-1516

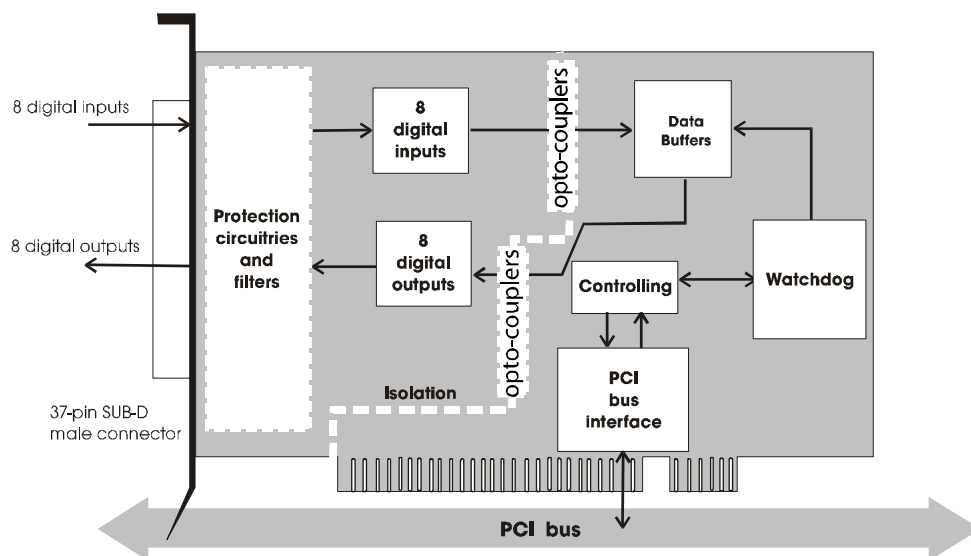
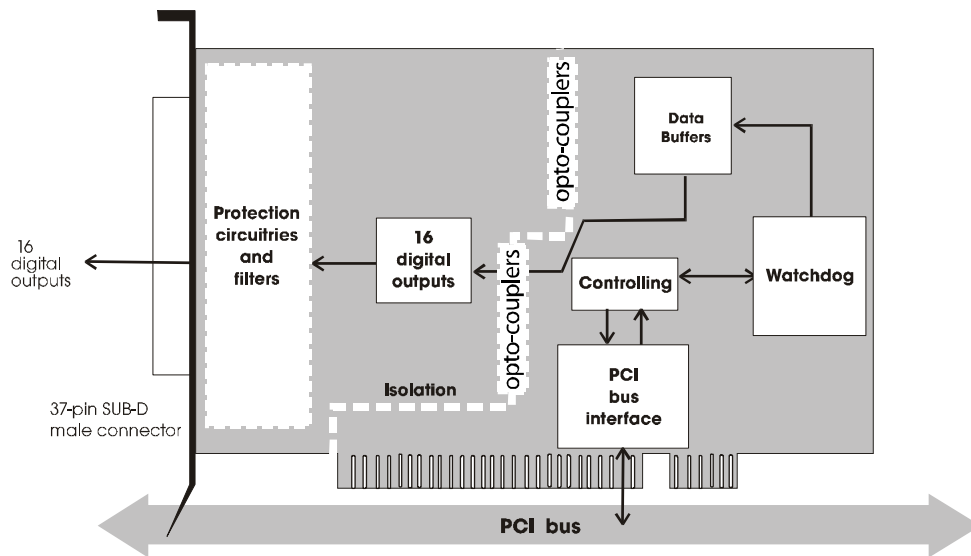


Fig. 8-3: Block diagram of the APCI-2016



8.1.2 Description

The boards are intended for parallel input (**APCI-1016** and **APCI-1516**) and/or parallel output (**APCI-1516** and **APCI-2016**) for digital signals in 24 V industrial environment. The peripheral and the system have a simultaneous optical isolation.

On the **APCI-1016** are available:

- 16 digital inputs.

On the **APCI-1516** are available:

- 8 digital inputs
- 8 digital outputs; can be read back:
- short-circuit current against load
- protection against overtemperature
- small ON-resistor
- wide supply voltage range
- diagnostic and watchdog (16-bit access) for the output channels.

On the **APCI-2016** are available:

- 16 digital outputs, can be read back
- short-circuit current against load
- protection against overtemperature
- small ON-resistor
- wide supply voltage range
- diagnostic and watchdog (16-bit access)

For the 3 boards:

The base address and the interrupt lines are automatically set through the BIOS.

EMC: design in accordance with CE regulations.

8.2 Functions

8.2.1 Digital inputs

The board **APCI-1016** supplies 16 optically isolated inputs and the board **APCI-1516** supplies 8 isolated inputs.

The inputs comply with the 24 V industry standard (IEC1131-2):

- logic "1" corresponds to an input voltage > 19 V
- logic "0" corresponds to an input voltage < 14 V.

All the inputs have a common current ground:

0V Ext. (inputs), pin 10 of the 37-pin SUB-D male connector.

The current input is at 6 mA with a nominal voltage of 24 V.



WARNING !

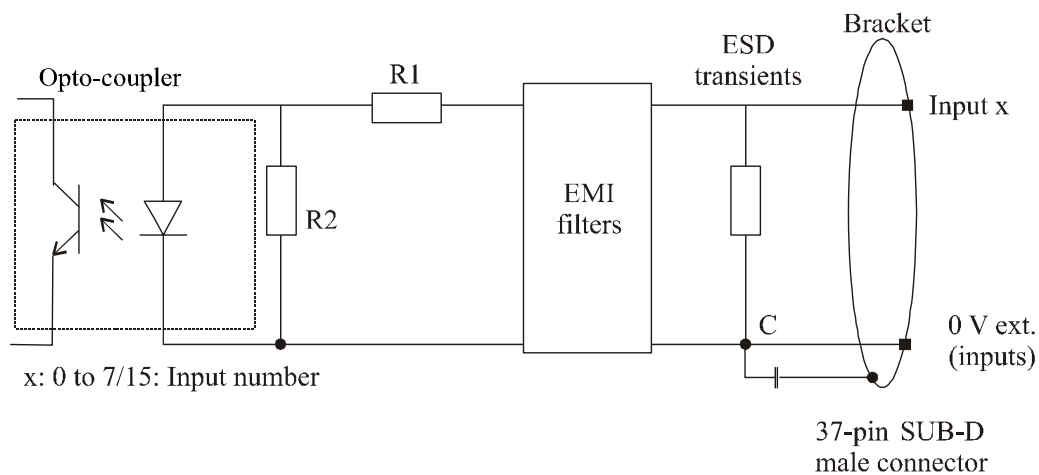
If you operate all inputs with the same voltage supply, the voltage supply must deliver at least $16 \times 6 = 96$ mA.

The maximum input voltage is 30 V.

Transil diodes, Z diodes, C filters and opto-couplers protect the system bus from noise emitted by the peripheral. The effects of inductive and capacitive noise are thus reduced.

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

Fig. 8-4: Protection circuitry for the inputs



8.2.2 Digital outputs

The board **APCI-1516** supplies 8 optically isolated outputs and the board **APCI-2016** 16 isolated outputs. The outputs comply with the 24 V industry standard (IEC1131-2)

The positive logic is used

- logic "1": sets the output by software (switch ON),
- logic "0": resets the output (switch OFF).

The outputs switch the **+24V ext.** outside to the load. One end of the load is connected with the ground of 0V EXT (outputs).

All outputs have a common ground: 0V ext. (outputs) pin 29 of the 37-pin SUB-D male connector.



WARNING !

If you use all outputs with the same voltage supply, the voltage supply must deliver at least the power required for your application.

The maximum supply voltage is 36 V. Each output can switch 500 mA current. But the current is limited for all the outputs on approx. 3 A by a self-resetting fuse.

Features of the outputs:

- Short-circuit current. Outputs are switched off.
- Protection against overtemperature: shut-down logic. Each group of 4 outputs is switched off: 0 to 3, 4 to 7, 8 to 11, 12 to 15.
- The outputs are switched off if the supply voltage drops.
- Diagnostic report in case of short-circuit or overtemperature.

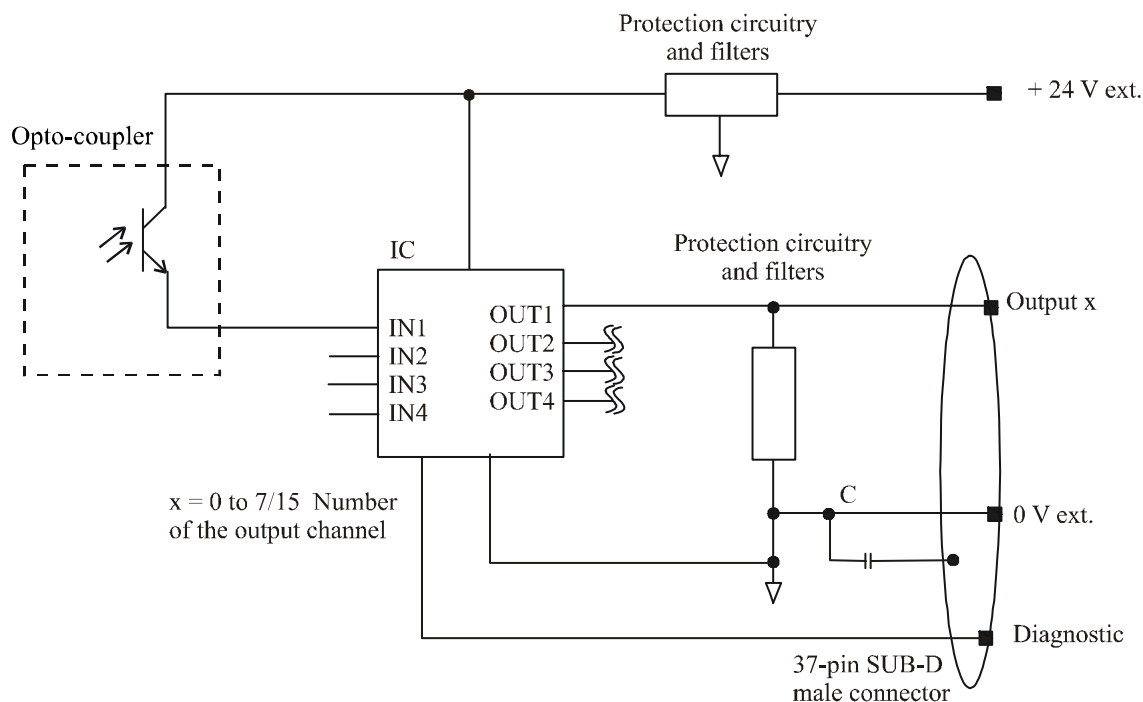
Transorb diodes, C filters and opto-couplers filter noise from the peripheral to the system bus. Thus the effects of inductive and capacitive noise are reduced. Possible noise emissions are also reduced by C filters.

The board requires no initialisation to output the 24V digital information. You can program the outputs immediately after successful power ON reset

State after power ON reset: all the outputs are reset (switch on OFF).

Diagnostic function:

There is a diagnostic function at pin 19 of the boards **APCI-2016** and **APCI-1516** (not via software). At short-circuit or overtemperature at pin 19 a clocked 24 V voltage is output (approx. 400 Hz). The sampling ratio depends from the time of overload.

Fig. 8-5: Protection circuitry of the outputs

8.2.3 Watchdog

The watchdog is a downward counter which resets the digital outputs after timeout.

3 different states are available for the watchdog.

- "OFF" The watchdog is switched off. It has no influence on the outputs.
- "ON" The watchdog is switched on by trigger (software trigger or function "b_ADDIDATA_SetxxDigitalOutputsOn").
- "Alarm" After running down of the watchdog (timeout), the watchdog sets alarm by resetting all outputs.

The states can be read back through software.

9 STANDARD SOFTWARE

9.1 APCI-1016

9.1.1 Software functions

ADDIPACK supports the following functions for the **APCI-1016**.

Table 9-1: Supported software functions of the APCI-1016

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	i_ADDIDATA_GetLocalisation
	b_ADDIDATA_CloseWin32Driver
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
	b_ADDIDATA_Read4DigitalInputs
	b_ADDIDATA_Read8DigitalInputs
	b_ADDIDATA_Read16DigitalInputs

9.1.2 Software samples

Table 9-2: Software samples for the board APCI-1016

Functionality	Sample number	Description
Digital inputs	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
	SAMPLE03	Read 4 digital inputs
	SAMPLE04	Read 8 digital inputs
	SAMPLE05	Read 16 digital inputs

9.2 APCI-1516

9.2.1 Software functions

ADDIPACK supports the following functions for the **APCI-1516**.

Table 9-3: Supported software functions of the APCI-1516

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	i_ADDIDATA_GetLocalisation
	b_ADDIDATA_CloseWin32Driver
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
	b_ADDIDATA_Read4DigitalInputs
	b_ADDIDATA_Read8DigitalInputs
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_Set4DigitalOutputsOn
	b_ADDIDATA_Set4DigitalOutputsOff
	b_ADDIDATA_Set8DigitalOutputsOn
	b_ADDIDATA_Set8DigitalOutputsOff

Functionality	Function name
	b_ADDIDATA_Get1DigitalOutputStatus
	b_ADDIDATA_Get2DigitalOutputStatus
	b_ADDIDATA_Get4DigitalOutputStatus
	b_ADDIDATA_Get8DigitalOutputStatus
Watchdog	b_ADDIDATA_GetNumberOfWatchdogs
	b_ADDIDATA_GetWatchdogInformation
	b_ADDIDATA_GetWatchdogInformationEx
	b_ADDIDATA_InitWatchdog
	b_DelayTimeUnit 2: ms
	dw_Delayvalue Min.: 20 Max.: 5100
	b_ADDIDATA_StartWatchdog
	b_ADDIDATA_StartAllWatchdogs
	b_ADDIDATA_StopWatchdog
	b_ADDIDATA_StopAllWatchdogs
	b_ADDIDATA_ReadWatchdogStatus
	b_ADDIDATA_ReleaseWatchdog

9.2.2 Software samples

Table 9-4: Software samples for the board APCI-1516

Functionality	Sample number	Description
Digital inputs	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
	SAMPLE03	Read 4 digital inputs
	SAMPLE04	Read 8 digital inputs
Digital outputs	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
Watchdog	SAMPLE01	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.

9.3 APCI-2016

9.3.1 Software functions

ADDIPACK supports the following functions for the **APCI-2016**.

Table 9-5: Supported software functions of the APCI-2016

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	i_ADDIDATA_GetLocalisation
	b_ADDIDATA_CloseWin32Driver
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
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_Set4DigitalOutputsOn
	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

Functionality	Function name
	b_ADDIDATA_Get16DigitalOutputStatus
Watchdog	b_ADDIDATA_GetNumberOfWatchdogs
	b_ADDIDATA_GetWatchdogInformation
	b_ADDIDATA_GetWatchdogInformationEx
	b_ADDIDATA_InitWatchdog
	b_DelayTimeUnit 2: ms
	dw_Delayvalue Min.: 20
	Max.: 5100
	b_ADDIDATA_StartWatchdog
	b_ADDIDATA_StartAllWatchdogs
	b_ADDIDATA_StopWatchdog
	b_ADDIDATA_StopAllWatchdogs
	b_ADDIDATA_ReadWatchdogStatus
	b_ADDIDATA_ReleaseWatchdog

9.3.2 Software samples

Table 9-6: Software samples for the board APCI-2016

Functionality	Sample number	Description
Digital outputs	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
Watchdog	SAMPLE01	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 APPENDIX

10.1 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.
Analog	Continuous real time phenomena
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.
Clock	A circuit that generates time and clock pulses for the synchronisation of the conversion
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.
FIFO	= <i>First In First Out</i> The first data into the buffer is the first data out of the buffer.
Gain	The factor by which an incoming signal is multiplied.
Ground	A common reference point for an electrical system.
Impedance	The reciprocal of admittance. Admittance is the complex ratio of the voltage across divided by the current flowing through a device, circuit element, or network.

Inductive loads	The voltage over the inductor is $U=L.(dI/dt)$, 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.
Input impedance	The measured resistance and capacitance between the high and low inputs of a circuit.
Input level	The input level is the logarithmic relation of two electric units of the same type (voltage, current or power) at the signal input of any receive device. The receive device is often a logic level that refers to the input of the switch. The input voltage that corresponds with logic “0” is here between 0 and 15 V, and the one that corresponds with logic “1” is between 17 and 30 V.
Instrumentation amplifier	$= IA$ Instrumentation amplifiers (IA) are precise measuring amplifiers with high input impedance, low output impedance, significantly high common-mode suppression and adjustable gain with high continuity respecting the time.
Interrupt	A signal to the CPU indicating that the board detected the occurrence of a specified condition or event.
Level	Logic levels are defined in order to process or show information. In binary circuits voltages are used for digital units. Only two voltage ranges represent information. These ranges are defined with H (High) and L (Low). H represents the range that is closer to Plus infinite; the H level is the digital 1. L represents the range that is closer to Minus infinite; the L level is the digital 0. The rising edge is the transition from the 0-state to the 1-state and the falling edge is the transition from the 1-state to the 0-state.
Limit value	Exceeding the limit values, even for just a short time, can lead to the destruction or to a loss of functionality.
MUX	$= Multiplexer$ An array of semiconductor or electromechanical switches with a common output used for selecting one of a number of input signals.
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.
PLD	= <i>Programmable Logic Device</i> Prorammmable logic circuitry
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.
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.
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.
Synchronous	In hardware, it is an event that occurs in a fixed time relationship to another event. In software, it refers to a function that begins an operation and returns to the calling program only when the operation is complete.
Throughput rate	The maximum repetitive rate at which data conversion system can operate with a specified accuracy. It is determined by summing the various times required for each part of the system and then by taking the inverse of this time.
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.
Diagnostic program	A utility program used to isolate hardware malfunctions on-board, or software malfunctions in the program.

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