ADDI-DATA®
PARTNER FÜR PRÄZISION

TECHNICAL

DESCRIPTION

APCI-1710 and CPCI-1710

Multifunction counter board, optically isolated

DIN EN ISO 9001:2015 certified

Edition: 08.06-08/2017

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 state 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.

Warranty and liability

The user is not authorised to make changes to the product beyond the intended use, or to interfere with the product in any other way.
ADDI-DATA shall not be liable for obvious printing and phrasing errors. In addition, ADDI DATA, if legally permissible, shall not be liable for personal injury or damage to materials caused by improper installation and/or commissioning of the product by the user or improper use, for example, if the product is operated despite faulty safety and protection devices, or if notes in the operating instructions regarding transport, storage, installation, commissioning, operation, thresholds, etc. are not taken into consideration. Liability is further excluded if the operator changes the product or the source code files without authorisation and/or if the operator is guilty of not monitoring the permanent operational capability of working parts and this has led to damage.

Copyright

This manual, which is intended for the operator and its staff only, is protected by copyright.
Duplication of the information contained in the operating instructions and of any other product information, or disclosure of this information for use by third parties, is not permitted, unless this right has been granted by the product licence issued. Non-compliance with this could lead to civil and criminal proceedings.

ADDI-DATA software product licence

Please read this licence carefully before using the standard software. The customer is only granted the right to use this software if he/she agrees with the conditions of this licence.
The software may only be used to set up the ADDI-DATA products.
Reproduction of the software is forbidden (except for back-up and for exchange of faulty data carriers). Disassembly, decompilation, decryption and reverse engineering of the software are forbidden. This licence and the software may be transferred to a third party if this party has acquired a product by purchase, has agreed to all the conditions in this licence contract and the original owner does not keep any copies of the software.

Trademarks

- ADDI-DATA, APCI-1500, MSX-Box and MSX-E are registered trademarks of ADDI-DATA GmbH.
- Turbo Pascal, Delphi, Borland C, Borland C++ are registered trademarks of Borland Software Corporation.
- Microsoft .NET, Microsoft C, Visual C++, MS-DOS, Windows XP, Windows 7, Windows 8, Windows 10, Windows Server 2000, Windows Server 2003, Windows Embedded and Internet Explorer are registered trademarks of Microsoft Corporation.
- Linux is a registered trademark of Linus Torvalds.
- LabVIEW, LabWindows/CVI, DASYLab, DIAdem are registered trademarks of National Instruments Corporation.
- CompactPCI is a registered trademark of PCI Industrial Computer Manufacturers Group.
- VxWorks is a registered trademark of Wind River Systems, Inc.
- RTX is a registered trademark of IntervalZero.

Warning!

The following risks result from the improper implementation of the board and from use contrary to the regulations:

Personal injury

Damage to the board, the PC and peripherals

Pollution of the environment.

- Protect yourself, others and the environment!
- Read the safety precautions (yellow leaflet) carefully!

  If this leaflet is not enclosed with the documentation, please contact us and ask for it.
- Observe the instructions of this manual!

  Make sure that you do not forget or skip any step!
  We are not liable for damages resulting from the wrong use of the board.
- Pay attention to the following symbols:

NOTICE!
Designates hints and other useful information.

NOTICE!
Designates a possibly dangerous situation.
If the instructions are ignored, the board, the PC and/or peripherals may be **destroyed**.

WARNING!
Designates a possibly dangerous situation.
If the instructions are ignored, the board, the PC and/or peripherals may be **destroyed** and persons may be **endangered**.

Contents

Figures

Tables

Chapter overview

In this manual you will find the following information:

Chapter	Content
1	Important information on the application, the user and on handling the board
2	Brief description of the board (features, block diagrams)
3	Detailed information on the insertion of the board, connection of the accessories (including pin assignment) and driver installation **Tip:** Print out this chapter to have help at hand for inserting and installing the board.
4	Function description: Reference to function-specific manuals
5	Standard software: Information on the API software functions
6	Procedure for returning (repairing, etc.) or disposing of the board
7	List of technical data and limit values of the board
8	Appendix with glossary and index
9	Contact and support address

1 Definition of application, user, handling

1.1 Definition of application

1.1.1 Intended use

The board **APCI-1710** must be inserted in a PC with PCI slots which is used as electrical equipment for measurement, control and laboratory pursuant to the standard EN 61010-1 (IEC 61010-1).
The board **CPCI-1710** must be inserted in a CompactPCI/PXI computer with CompactPCI slots which is used as electrical equipment for measurement, control and laboratory pursuant to the standard EN 61010-1 (IEC 61010-1).

The used personal computer (PC) or CompactPCI/PXI computer must fulfil the requirements of IEC 60950-1 or EN 60950-1 and EN 55022 or IEC/CISPR 22 and EN 55024 or IEC/CISPR 24.

The use of the boards **APCI-1710** and **CPCI-1710** in combination with external screw terminal panels requires correct installation according to the series IEC 61439 or EN 61439 (Low-voltage switchgear and controlgear assemblies).

1.1.2 Usage restrictions

The boards **APCI-1710** and **CPCI-1710** must not be used as a safety-related part (SRP).

The boards **APCI-1710** and **CPCI-1710** must not be used for safety related functions, for example for emergency stop functions.

The boards **APCI-1710** and **CPCI-1710** must not be used in potentially explosive atmospheres.

The boards **APCI-1710** and **CPCI-1710** must not be used as electrical equipment according to the Low Voltage Directive 2014/35/EU.

1.1.3 Limits of use

All safety information and the instructions in the manual must be followed to ensure proper intended use.

Uses of the board beyond these specifications are considered as improper use. The manufacturer is not liable for damages resulting from improper use.

The board must remain in its anti-static packaging until it is installed.

Please do not delete the identification numbers of the board or the warranty claim will be invalid.

1.2 User

1.2.1 Qualification

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

- Installation
- Commissioning
- Use
- Maintenance.

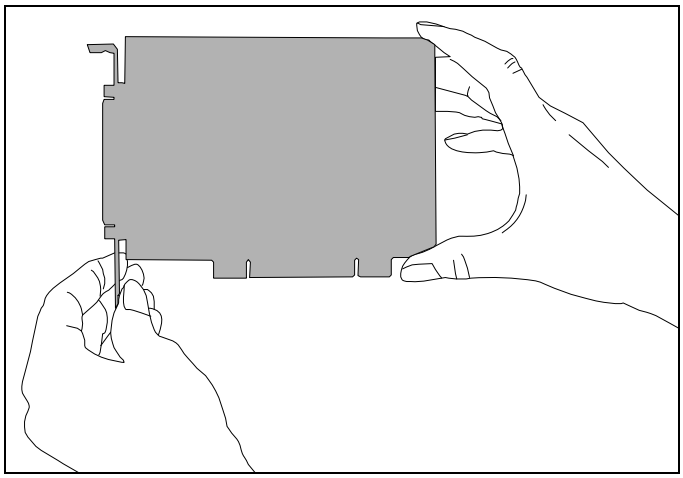
1.2.2 Country-specific regulations

Do observe the country-specific regulations regarding

- the prevention of accidents
- electrical and mechanical installations
- Electromagnetic compatibility (EMC).

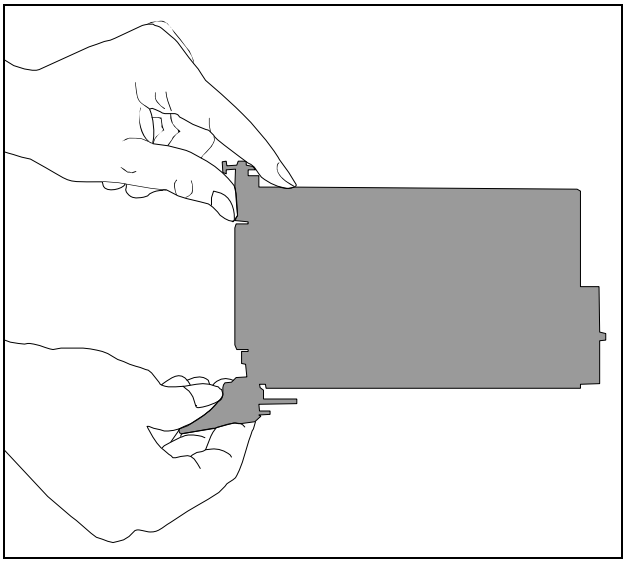
1.3 Handling of the board

Fig. 1-1: APCI-1710: Correct handling



Hold the board cautiously at the outer end and at the slot bracket. Do not touch the surface of the board!

Fig. 1-2: CPCI-1710: Correct handling



Hold the board cautiously at the outer end and at the front panel. Do not touch the surface of the board!

1.4 Questions and updates

If you have any questions, do not hesitate to call us or to send us an e-mail:

Phone: +49 7229 1847-0
E-mail: info@addi-data.com

Manual and software download from the Internet

The latest versions of the technical manual and the standard software for the board **APCI-1710** or **CPCI-1710** can be downloaded for free at: www.addi-data.com.

NOTICE!

Before using the board and in case of malfunction during operation, check if there is an update (manual, driver) available. Current data can be found on our website or contact us directly.

2 Brief description

The board **APCI-1710** or **CPCI-1710** is a fast multifunction and multi-channel counter board for the PCI or CompactPCI bus. It is equipped with four function modules that are assembled with four reprogrammable FPGAs.

The function modules are interconnected via an internal bus. They allow digital input and output signals to be linked and processed on a hardware basis, i.e. in real time, before these are passed on to the PC.

The digital signals are lead via the 50-pin D-Sub female connector to the function modules of the board. They are optically isolated from the PC through opto-couplers.
A 50-pin header is fitted to connect solely TTL signals of the "TTL I/O" function to the board. These signals are not optically isolated from the PC.

Each function module is permanently assigned eight digital inputs/outputs (Ax, Bx, Cx, Dx, Ex, Fx, Gx, Hx). x stands for the number of the function module (0 to 3). Depending on the board type and the programmed function, these are inputs or outputs of the type TTL, RS422 or 24 V (see Table 2-1).

Using the supplied software, each function module is individually programmed with a function. It is possible to assign the same function to all four function modules or to combine four various functions. In Table 2-2, you can find an overview of the available functions for each board version.

Table 2-1: Board versions: Number and type of inputs/outputs

Pin name	APCI-1710 CPCI-1710	APCI-1710-24V	APCI-1710-5V-I	APCI-1710-5V-I-O
A0-A3 B0-B3 C0-C3 D0-D3	16 RS422/TTL inputs/outputs	28 24 V inputs	16 RS422/TTL inputs/outputs	16 RS422/TTL inputs/outputs
E0-E3 F0-F3 G0-G3	12 24 V inputs		12 5 V inputs	12 5 V inputs
H0-H3	4 24 V outputs	4 24 V outputs	4 24 V outputs	4 5 V outputs

Ax, Bx, Cx and Dx are used as inputs or outputs, depending on the programmed function of each function module.

NOTICE!
With the 24 V board version, Ax, Bx, Cx and Dx are available only as 24 V inputs and not as outputs. For this reason, not every function can be used with the **APCI-1710-24V** board.

Table 2-2: Board versions: Available functions

Function	APCI-1710 CPCI-1710	APCI-1710-24V	APCI-1710-5V-I	APCI-1710-5V-I-O
Digital I/O	x	x[1]	x	x
ETM	x	x	x	x
Incremental counter	x	x	x	x
Pulse counter	x	x	x	x
PWM	x	x[2]	x	x
SSI	x	-	x	x
TTL I/O	x*	x	x	x
Counter/Timer	x	x[3]	x	x

[1] The inputs/outputs A and B can be used only as inputs.

[2] Only the digital 24 V output PWM0 (signal: DIG_OUT_H_x) is available. The maximum output frequency is load-dependent and limited by the 24 V output to 5 kHz.

[3] Pin Ax or Bx: Only a 24 V input is available, i.e., the output of counter/timer 0 or counter/timer 1 cannot be used.

* Only available with the **APCI-1710**

NOTICE!

To avoid the destruction of the board, the external connection must be made according to the board type and the programmed function.

Table 2-3: Overview of signal generators or functions

Function	Max. number of signal generators/ functions per FM	Max. number of FMs per board	Max. number of signal generators/ functions per board
Digital I/O*	8	4	32
ETM	2	4	8
Incremental counter	1 (32-bit) or 2 (16-bit)	4	4 or 8
Pulse counter	4	4	16
PWM*	2	4	8
SSI*	3	4	12
TTL I/O	24	1	24
Counter/Timer*	3	4	12

FM = Function module
* see Table 2-2

2.1 Block diagrams

Fig. 2-1: APCI-1710: Block diagram

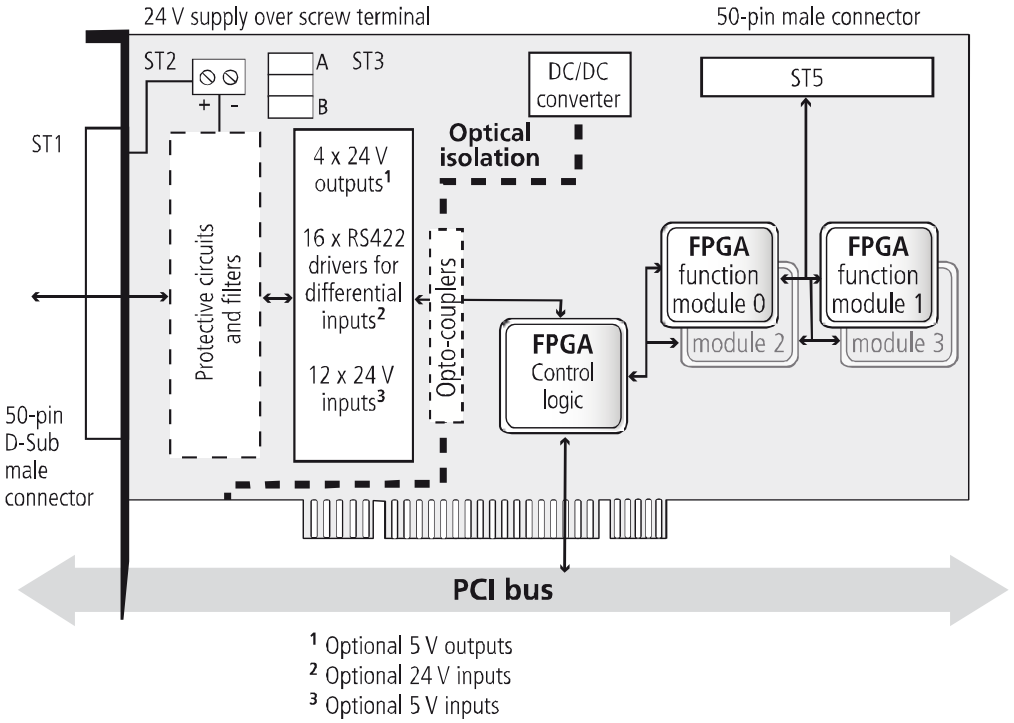
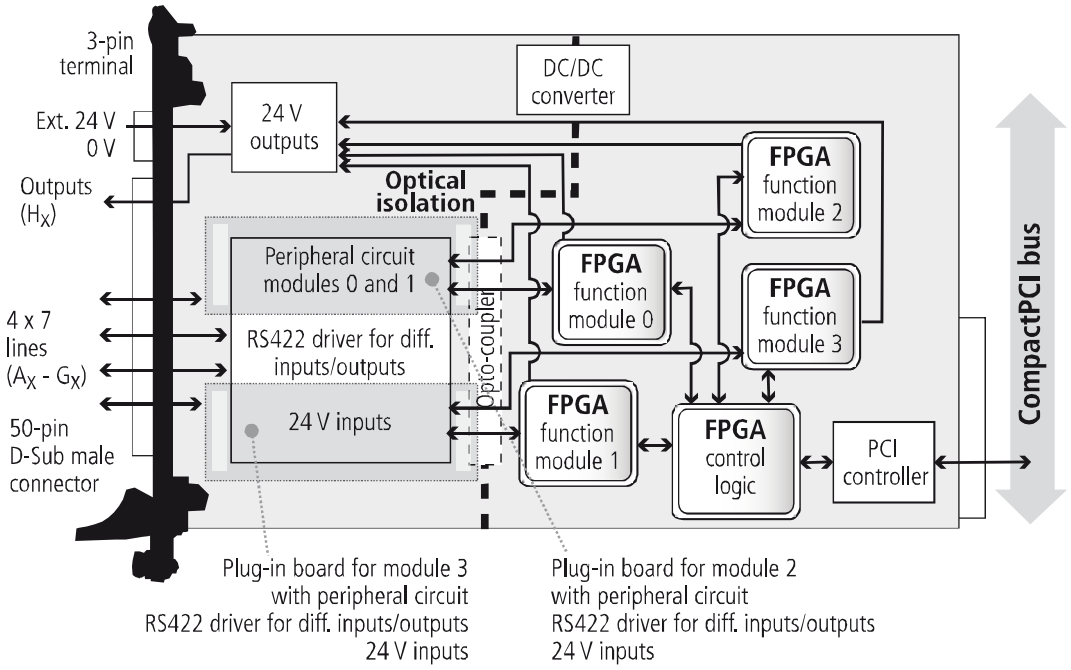


Fig. 2-2: CPCI-1710: Block diagram



3 Insertion and installation of the board

3.1 Insertion of the APCI board

Risk of injury!
Please follow the safety precautions! An improper handling of the board may cause property damage and injury.

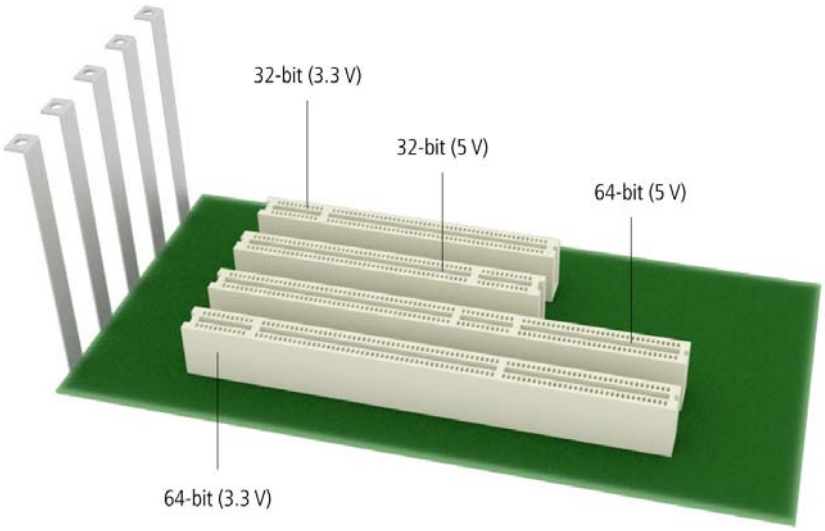
3.1.1 Opening the PC

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

3.1.2 Selecting a slot

- Select a free 32-/64-bit PCI slot (3.3 V or 5 V) for the board.

Fig. 3-1: PCI slot types

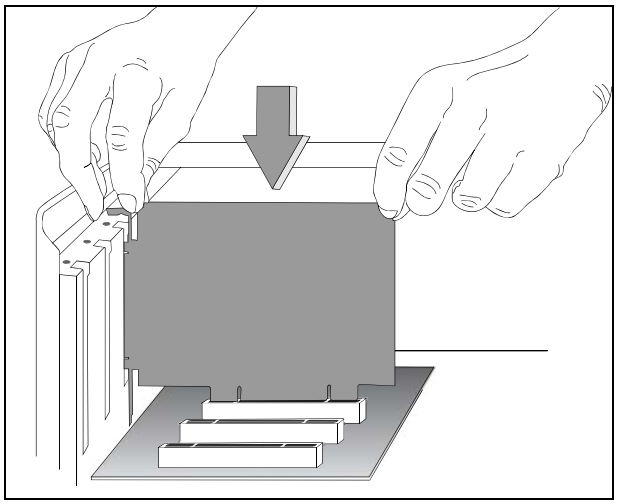


- Unscrew the back cover from the selected slot. For this, follow the operating instructions provided by the PC manufacturer!
  Keep the back cover in a safe place. You will need it if you remove the board.
- Provide for potential equalisation.
- Take the board out of its protective packaging.

3.1.3 Inserting the board

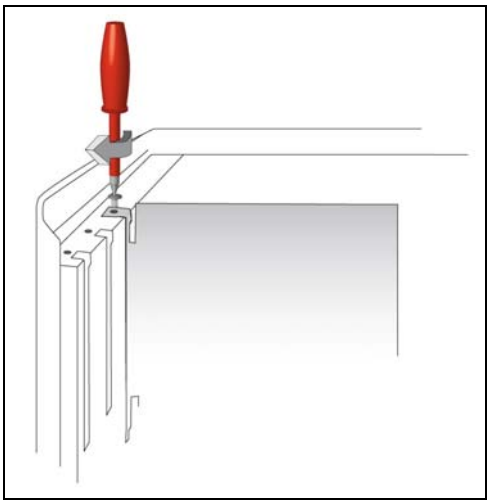
- Insert the board vertically from above into the selected slot.

Fig. 3-2: Slot: Insert the board



- Fasten the board to the rear of the PC housing using the screw which held the back cover in place.

Fig. 3-3: PC housing: Fasten the board



- Tighten all loose screws.

3.1.4 Closing the PC

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

3.2 Insertion of the CPCI board

Risk of injury!
Please follow the safety precautions! An improper handling of the board may cause property damage and injury.

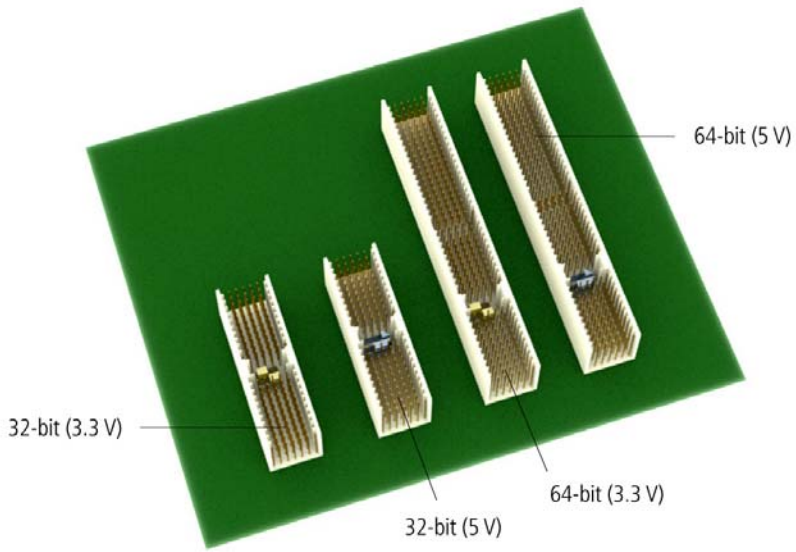
3.2.1 Opening the system

- Switch off the CompactPCI system and all the units connected to it.
- Pull the mains plug of the CompactPCI system from the socket.
- Remove the front cover from a free CompactPCI slot.

3.2.2 Selecting a slot

- Select a free 32-/64-bit CPCI slot (3.3 V or 5 V) for the board.

Fig. 3-4: CPCI slot types

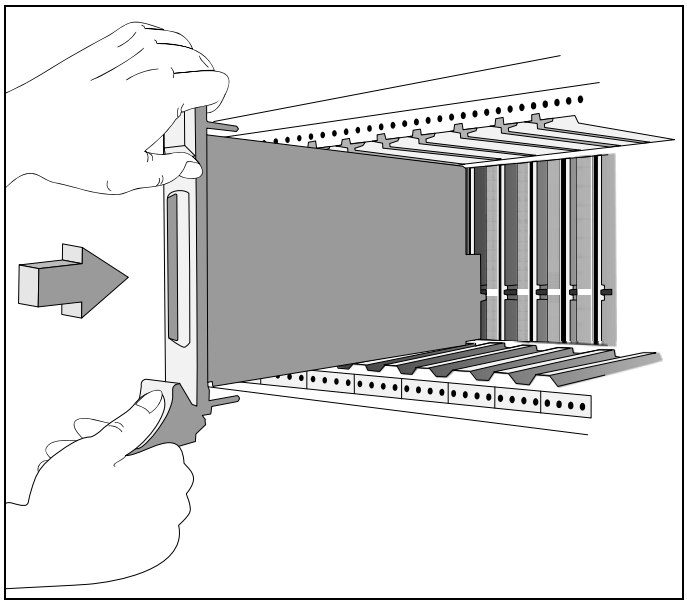


- Provide for potential equalisation.
- Take the board out of its protective packaging.

3.2.3 Inserting the board

- Insert the board into the guiding rails of the rack and push it forward to the rear of the housing. In order to plug it in, a slight resistance has to be overcome.

Fig. 3-5: Slot: Insert the board



- If there is a screw at the front panel of the board, fasten the board at the upper part of the housing with it.

NOTICE!

To pull the board out of the rack, the fold-away handle (if available) at the front panel has to be pushed slightly upwards. After that, you can pull out the board.

3.3 Connecting the accessories

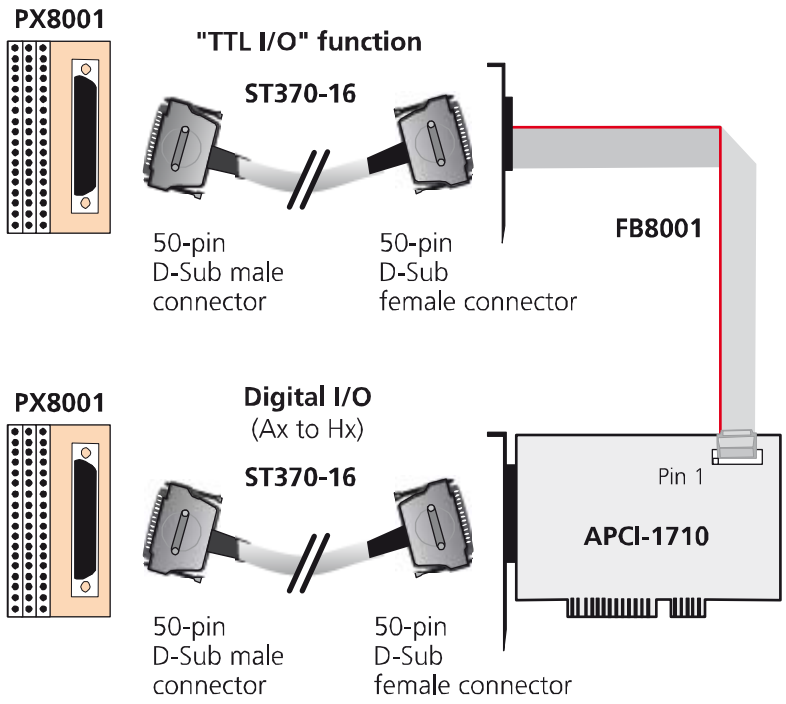
3.3.1 Connection of the screw terminal panels

Between the boards **APCI-1710** or **CPCI-1710** and the peripherals, digital signals are exchanged via the screw terminal panel **PX8001** and the cable **ST370-16**, which needs to be connected to the 50-pin D-Sub female connector of the board. In terms of electromagnetic compatibility (EMC), this cable has the following properties:

- Metallised connector housing
- Shielded cable
- Cable shield folded back over insulation and firmly screwed on both sides to the connector housing.

For the TTL inputs and outputs ("TTL I/O" function) of the **APCI-1710**, the ribbon cable **FB8001** is connected to the 50-pin header of the board. This ribbon cable has a 50-pin D-Sub male connector for the connection of the cable **ST370-16**, i.e. a second slot is required.

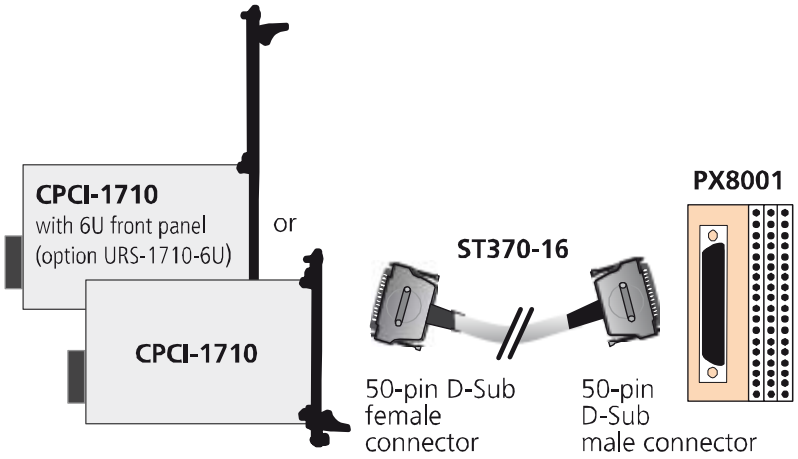
Fig. 3-6: APCI-1710: Connection of the screw terminal panels



NOTICE!

Plug the **FB8001** cable into the connector by inserting the red (or blue or black) cable line into pin 1.

Fig. 3-7: CPCI-1710: Connection of the screw terminal panels



3.3.2 Connection cables

NOTICE!

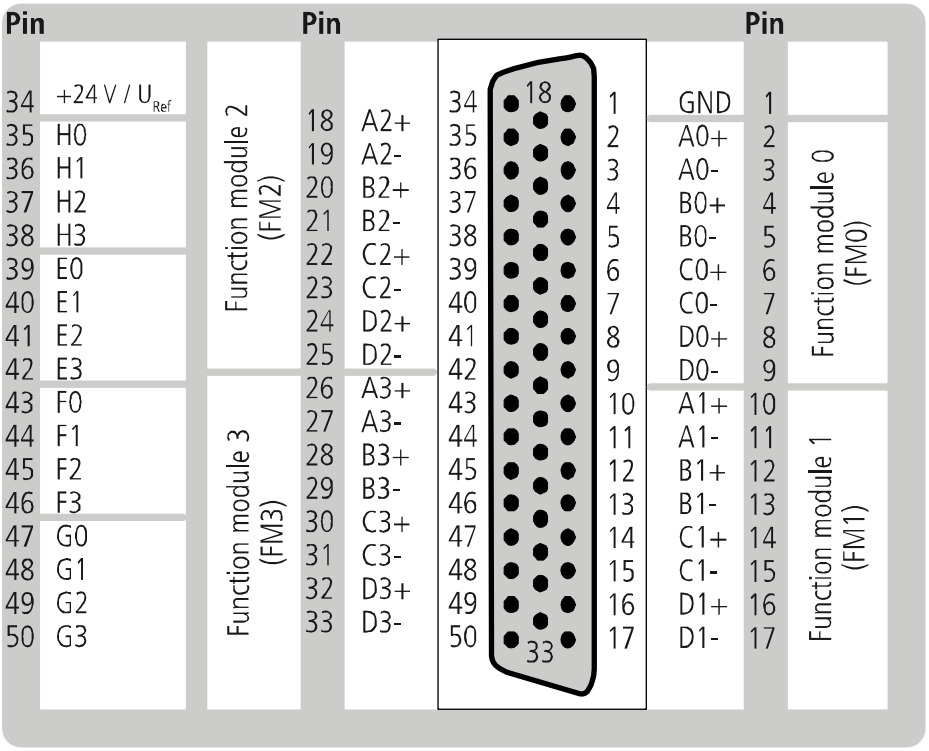
Interferences are emitted and spread through the connection cables. Therefore, a wrong cable might endanger the operating and functional safety of your system.

- Use the standard connection cables from ADDI-DATA.
- When installing the connection cables, observe the following: There should be sufficient distance to sensitive analog signals. The distance to potential sources of interference like frequency converters, power supply units, etc. should be as long as possible.
- If you operate the outputs with maximum load, you should install the connection cables freely or provide for good ventilation.

3.4 Pin assignment

3.4.1 50-pin D-Sub male connector

Fig. 3-8: APCI-1710: 50-pin D-Sub male connector (digital I/O)



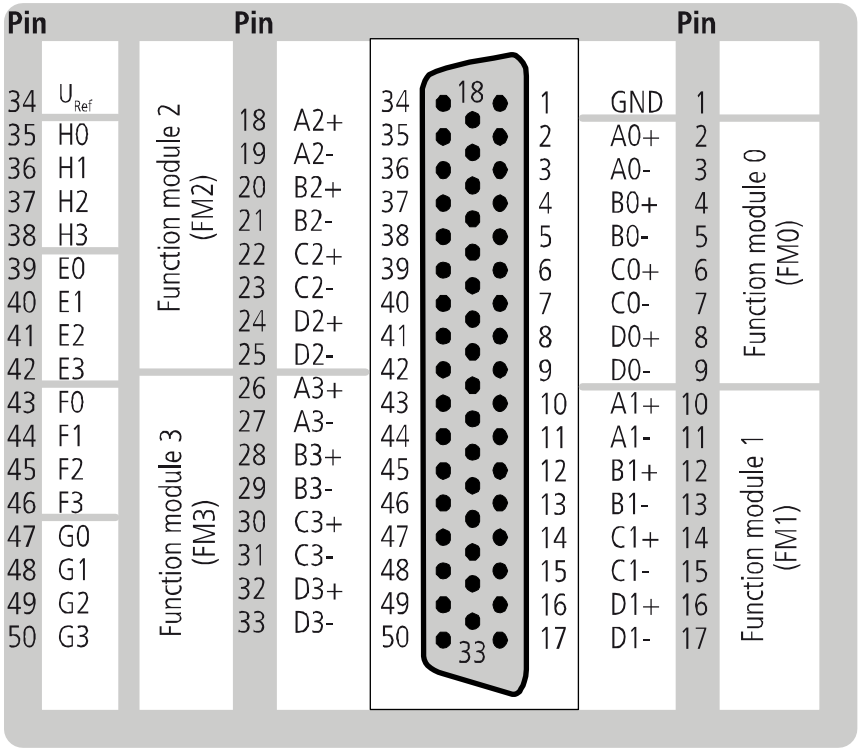
U_{Ref} = Reference voltage
GND = Reference potential for all inputs/outputs

NOTICE!
Please note that pin 34 is dual-wired. Over this pin, either +24 V for the outputs Hx or a reference voltage of approximately 1.4 V can be supplied.

The reference voltage of 1.4 V is required to connect a TTL signal to a differential RS422 input (see Chapter 3.5).

NOTICE!
If you do not connect pin 34 correctly, the board may be destroyed.

Fig. 3-9: CPCI-1710: 50-pin D-Sub male connector (digital I/O)



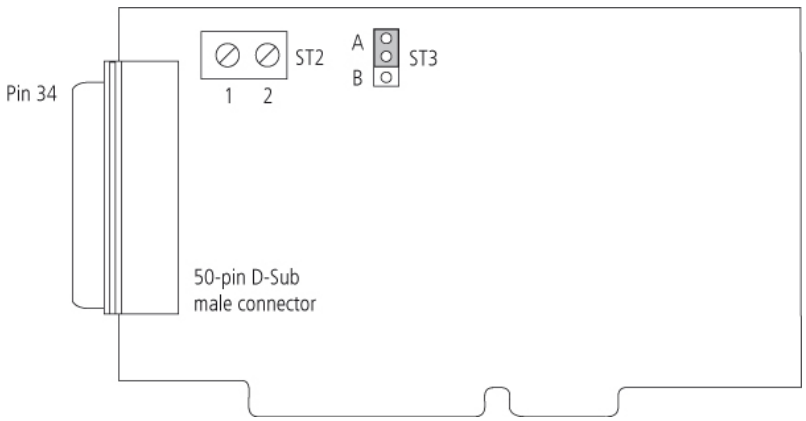
U_{Ref} = Reference voltage
GND = Reference potential for all inputs/outputs

3.4.2 24 V supply voltage of the 24 V outputs (channels Hx)

To use the 24 outputs Hx, the board must be supplied with a voltage of +24 V.

APCI-1710

Fig. 3-10: Terminal ST2 and jumper ST3: Position on the board



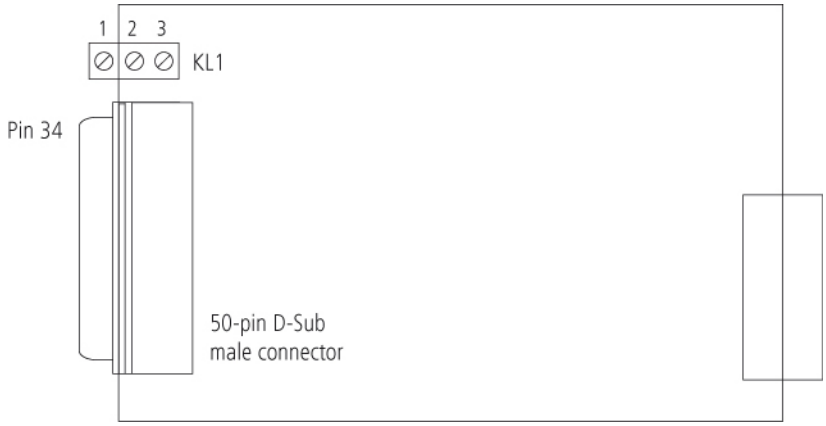
Terminal ST2:
Pin 1: 24 V voltage supply of the outputs Hx
Pin 2: GND (reference potential)

As already mentioned in Chapter 3.4.1, pin 34 of the 50-pin D-Sub male connector is dual-wired. According to the signal type connected to the RS422 inputs, jumper ST3 needs to be set as follows:

- **TTL signals:** As the 1.4 V reference voltage is required over pin 34, the 24 V voltage must be supplied over terminal ST2. For this, jumper ST3 has to be set to **position B**.
- **RS422 signals:** The 24 V voltage can be supplied over pin 34. For this, jumper ST3 has to be set to **position A**. If the 24 V voltage is to be supplied over terminal ST2, jumper ST3 has to be set to **position B**.

CPCI-1710

Fig. 3-11: Terminal KL1: Position on the board



Terminal KL1:
Pin 1: 24 V voltage supply of the outputs Hx
Pin 2: GND (reference potential)
Pin 3: 5 V voltage supply of external sensors (200 mA max.)

NOTICE!
Please note that pin 34 is **not** dual-wired.
The 24 V voltage supply must be connected to pin 1 of terminal KL1.

3.4.3 24 V inputs (channels Ax, Bx, Cx and Dx)

APCI-1710-24V

Ax-, Bx-, Cx- and Dx- are not connected. The 24 V signals must be connected to Ax+, Bx+, Cx+ and Dx+ relating to GND.

CPCI-1710 (24 V option)

The 24 V signals are converted into 5 V signals by means of an adaption circuit. Depending on the signal generator, the input circuit varies. For the connection of the 24 V signals to A+, B+, C+ and D+, a connection between A-, B-, C-, D- and pin 34 (U_{Ref}) of the 50-pin D-Sub connector must be established.

3.4.4 50-pin header ST5 (APCI-1710)

The TTL ports of the 50-pin header ST5 can be accessed with the “TTL I/O” function.

NOTICE!
The TTL ports are not optically isolated and therefore must be handled very cautiously. External voltage peaks may destroy the board.

Further information on the “TTL I/O” function can be found in the corresponding function description (see PDF link).

Fig. 3-12: Pin header ST5: Position on the board

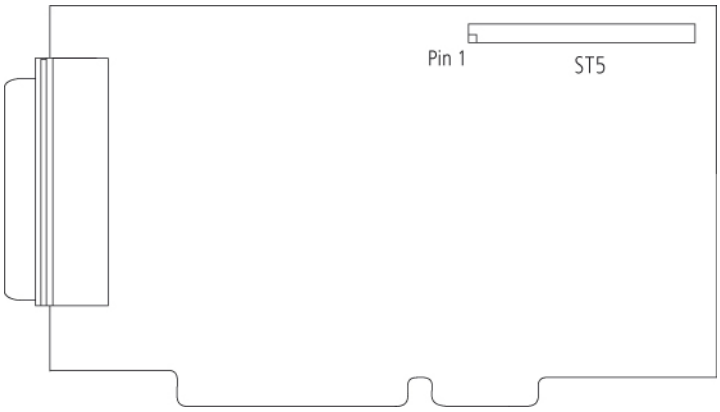


Fig. 3-13: 50-pin header ST5 (“TTL I/O” function)

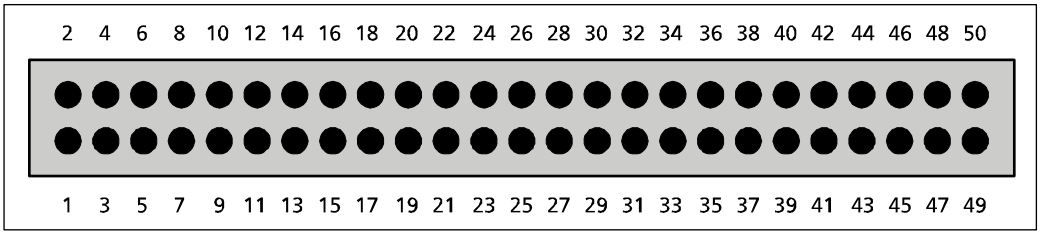


Table 3-1: Pin description ("TTL I/O" function)

	FB8001	Board	
Pin name	**Pin No. (50-pin D-Sub male connector)**	**Pin No. (50-pin header)**	**Pin description**
GND	34	2	PC GND, not optically isolated
GND	2	4	PC GND, not optically isolated
GND	19	6	PC GND, not optically isolated
GND	36	8	PC GND; not optically isolated
GND	4	10	PC GND, not optically isolated
GND	21	12	PC GND; not optically isolated
GND	38	14	PC GND; not optically isolated
GND	6	16	PC GND; not optically isolated
GND	24	21	PC GND, not optically isolated
GND	11	31	PC GND, not optically isolated
GND	47	41	PC GND, not optically isolated
I1[2]	17	49	TTL, input or output; after reset: output, FM0
I2[2]	49	47	TTL, input or output; after reset: output, FM1
I3[2]	48	44	TTL, input or output; after reset: output, FM2
I4[2]	31	42	TTL, input or output; after reset: output, FM3
J1[2]	50	50	TTL, input or output; after reset: output, FM0
J2[2]	33	48	TTL, input or output; after reset: output, FM1
J3[2]	32	45	TTL, input or output; after reset: output, FM2
J4[2]	15	43	TTL, input or output; after reset: output, FM3
K1	20	9	Please do not connect anything!
K2	37	11	Please do not connect anything!
K3	5	13	Please do not connect anything!
K4	22	15	Please do not connect anything!
PA0	39	17	TTL, input or output; after reset: input
PA1	23	18	TTL, input or output; after reset: input
PA2	7	19	TTL, input or output; after reset: input
PA3	40	20	TTL, input or output; after reset: input
PA4	8	22	TTL, input or output; after reset: input

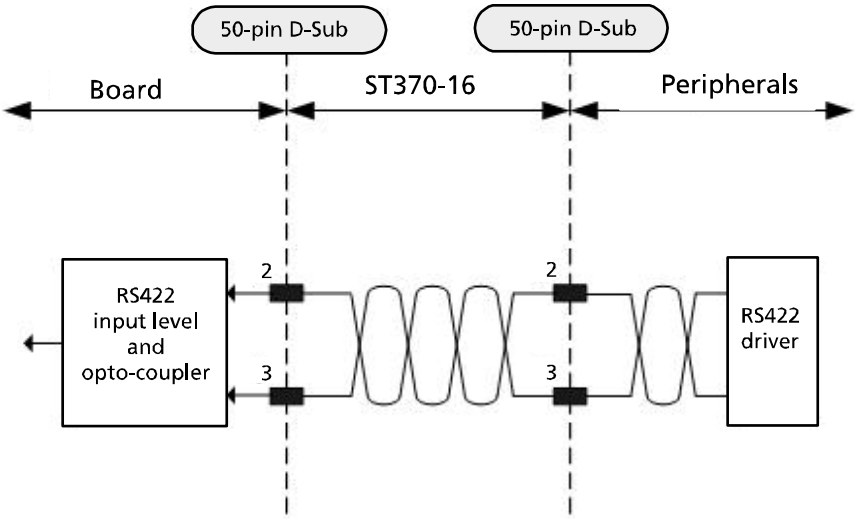
	FB8001	Board	
Pin name	**Pin No. (50-pin D-Sub male connector)**	**Pin No. (50-pin header)**	**Pin description**
PA5	41	23	TTL, input or output; after reset: input
PA6	25	24	TTL, input or output; after reset: input
PA7	9	25	TTL, input or output; after reset: input
PB0	26	27	TTL, input or output; after reset: input
PB1	10	28	TTL, input or output; after reset: input
PB2	43	29	TTL, input or output; after reset: input
PB3	27	30	TTL, input or output; after reset: input
PB4	44	32	TTL, input or output; after reset: input
PB5	28	33	TTL, input or output; after reset: input
PB6	12	34	TTL, input or output; after reset: input
PB7	45	35	TTL, input or output; after reset: input
PC0	13	37	TTL, input or output; after reset: input
PC1	46	38	TTL, input or output; after reset: input
PC2	30	39	TTL, input or output; after reset: input
PC3	14	40	TTL, input or output; after reset: input
PC4	3	7	TTL, input or output; after reset: input
PC5	35	5	TTL, input or output; after reset: input
PC6	18	3	TTL, input or output; after reset: input
PC7[1]	1	1	TTL, input or output; after reset: input
V.ext	29	36	+3.3 V PC voltage
V.ext	16	46	+3.3 V PC voltage
V.ext	42	26	+3.3 V PC voltage

[1] PA, PB and PC: Pull-up resistor to 3.3 V
[2] PD: Serial resistor 100 Ω

3.5 Connection examples of the inputs/outputs

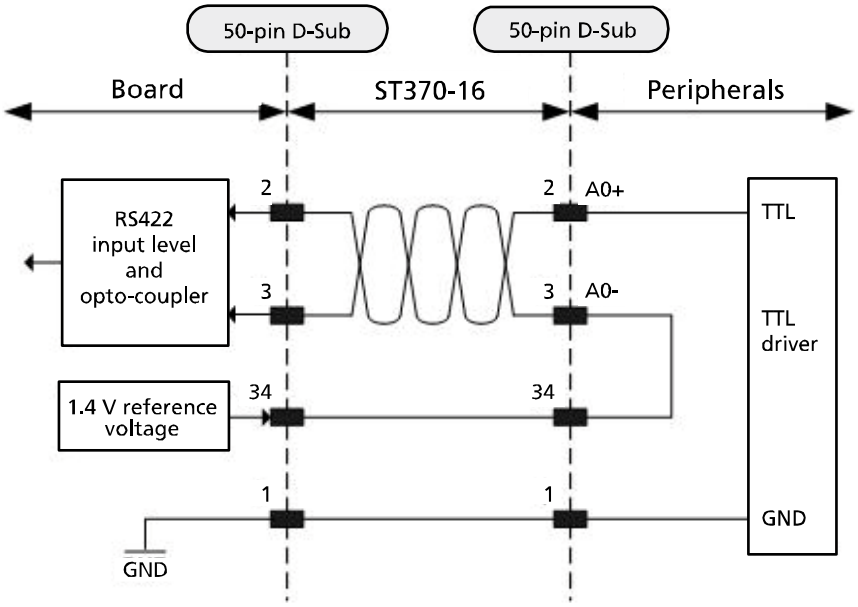
3.5.1 RS422 input A0 with RS422 signal

Fig. 3-14: Input A0 with RS422 signal



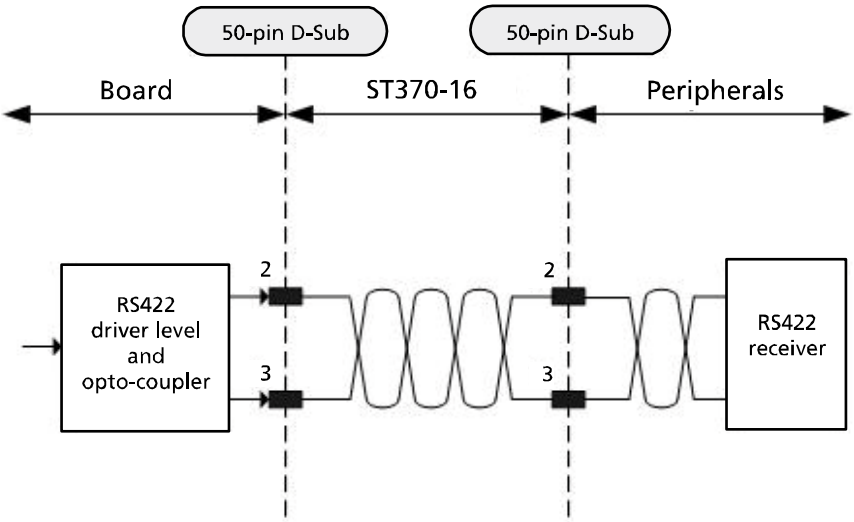
3.5.2 RS422 input A0 with TTL signal

Fig. 3-15: Input A0 with TTL signal



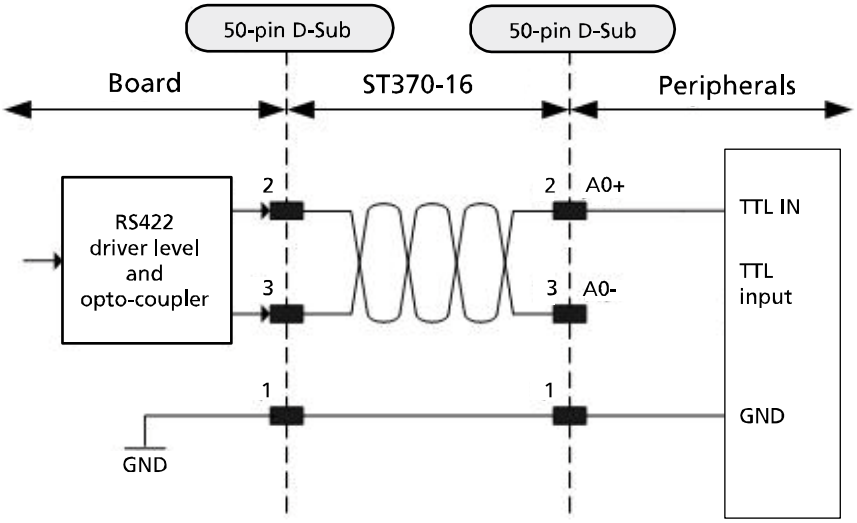
3.5.3 RS422 output A0 to RS422 driver

Fig. 3-16: Output A0 to RS422 driver



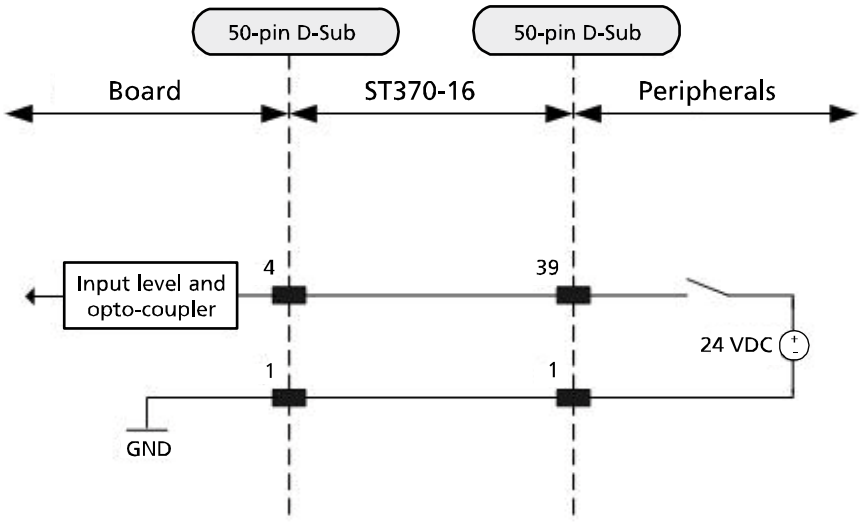
3.5.4 RS422 output A0 to TTL (5 V)

Fig. 3-17: Output A0 to TTL (5 V)



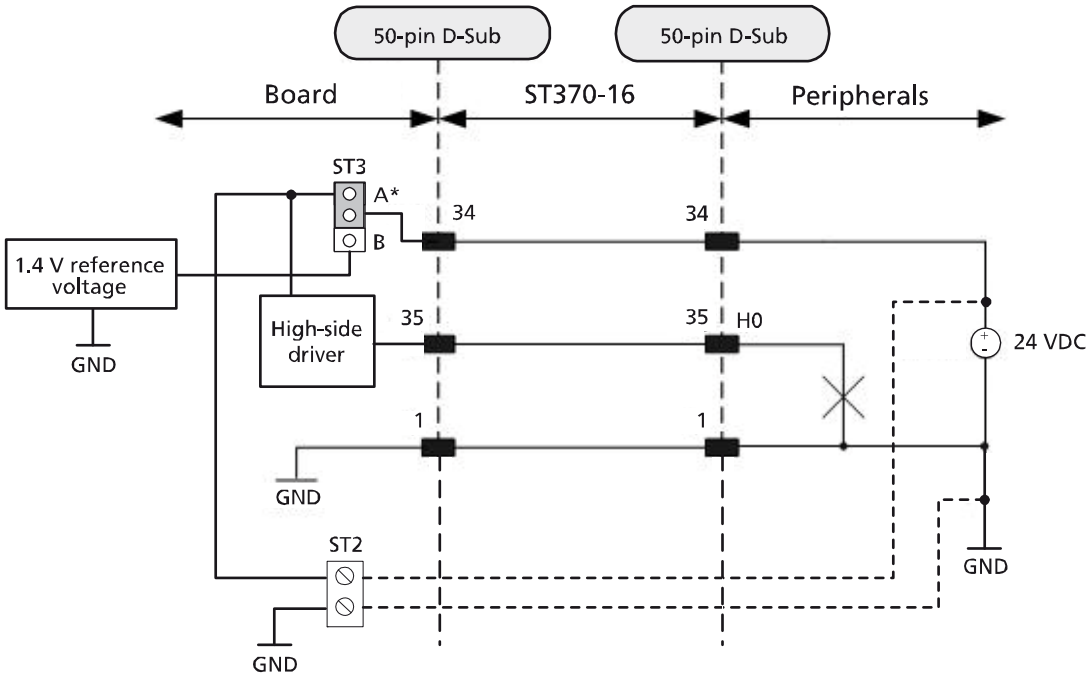
3.5.5 24 V input E0

Fig. 3-18: Input E0



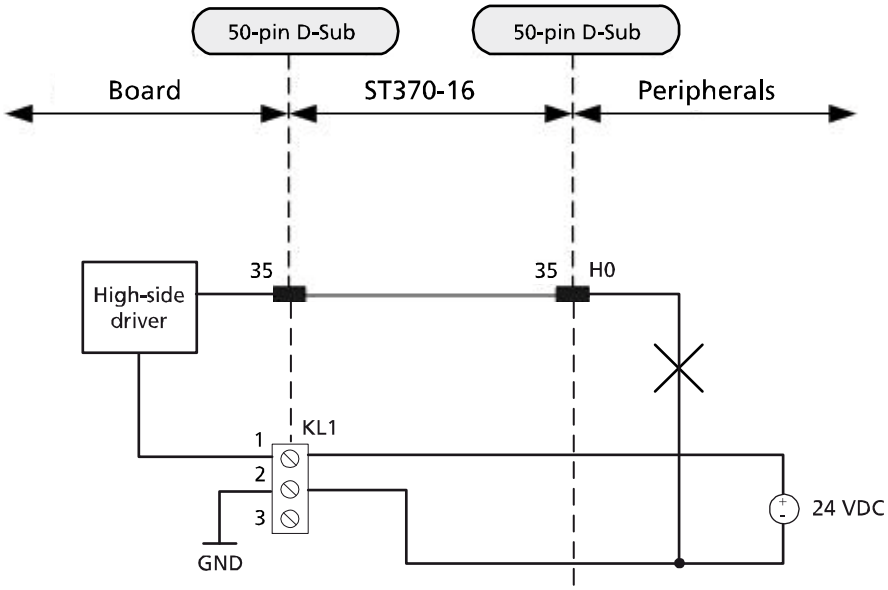
3.5.6 24 V output H0

Fig. 3-19: APCI-1710: Output H0



* Jumper set to position A: The 24 V voltage supply for the outputs Hx is connected to the board over pin 34 (see Chapter 3.4.2).

Fig. 3-20: CPCI-1710: Output H0



3.5.7 24 V input A0

Fig. 3-21: Input A0 (APCI-1710-24V)

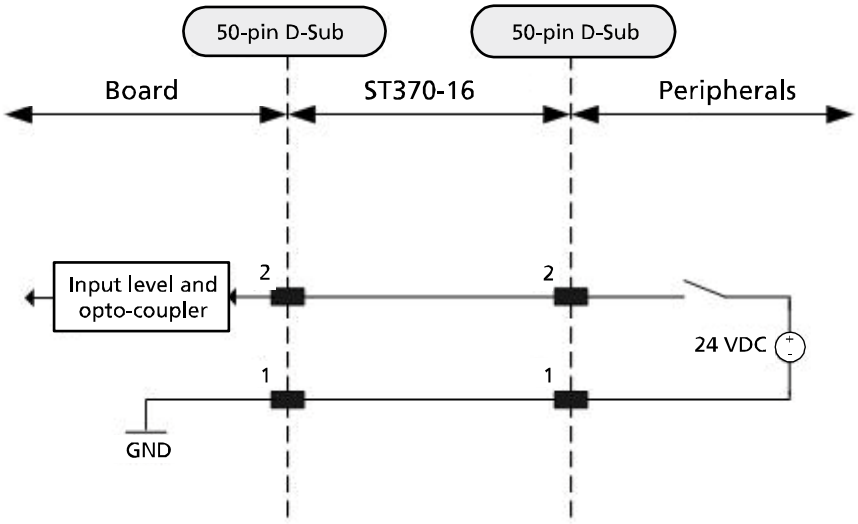
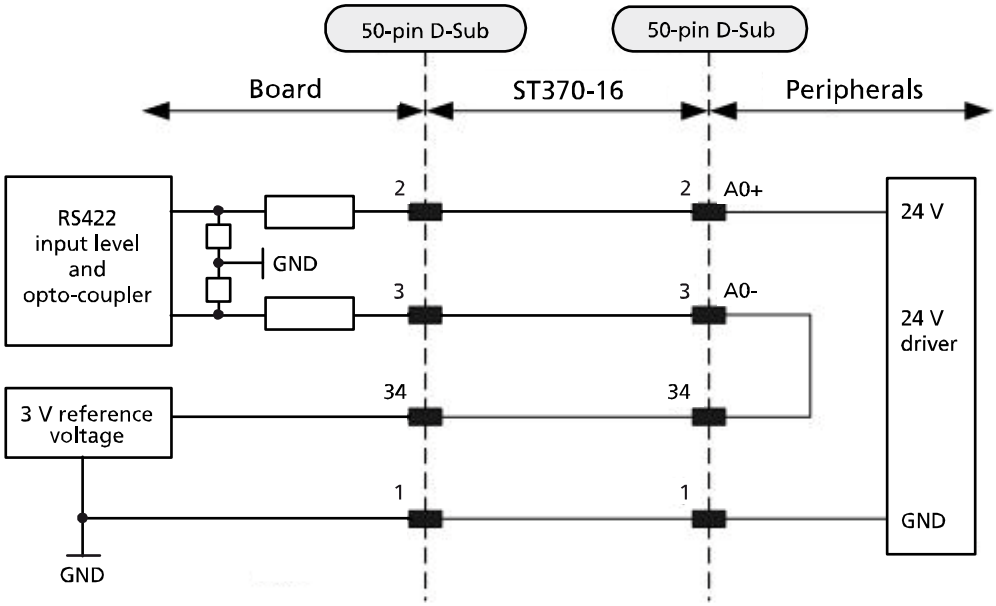
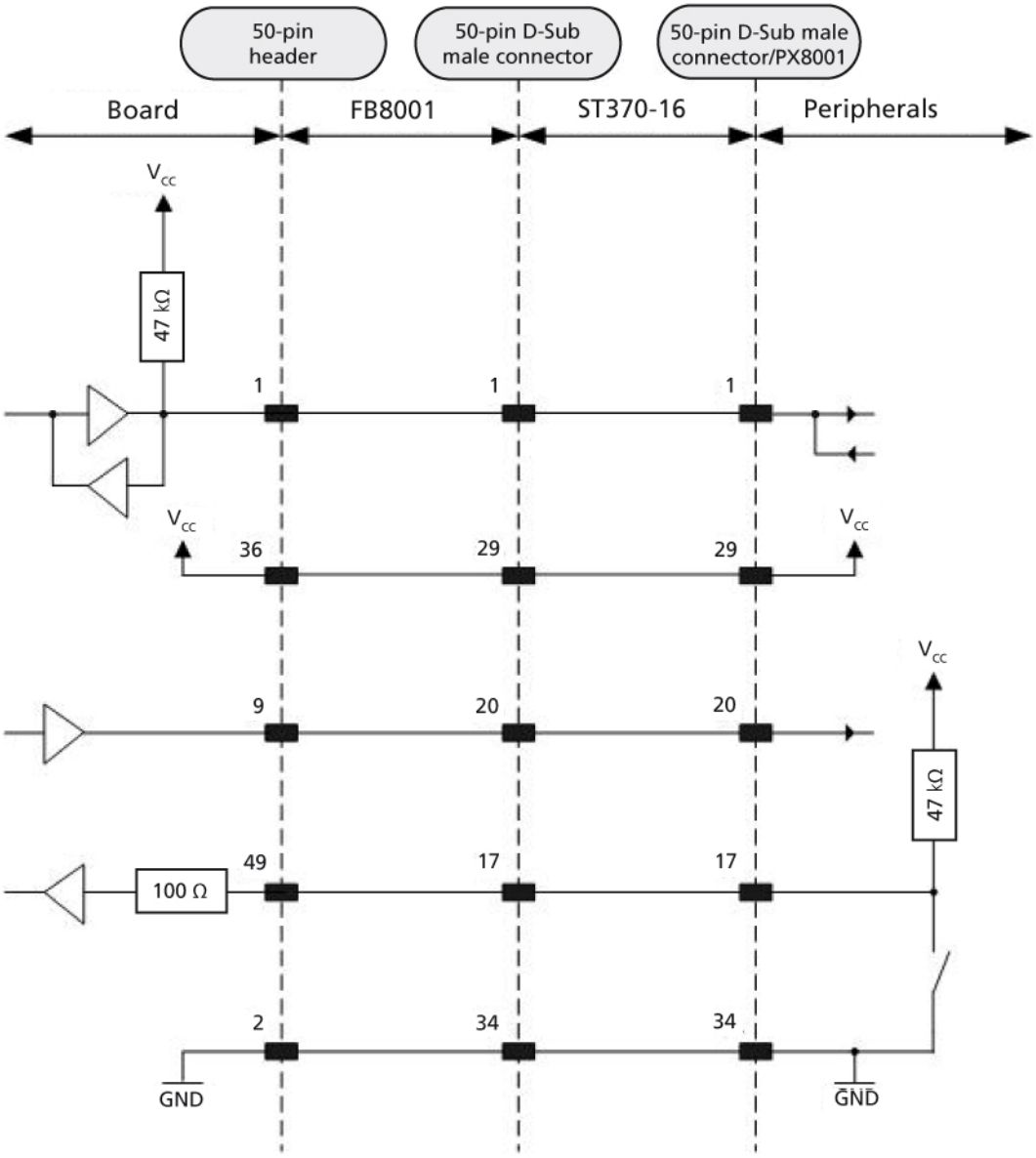


Fig. 3-22: CPCI-1710 with 24 V option: Input A0



3.5.8 TTL inputs/outputs

Fig. 3-23: TTL inputs/outputs



3.6 Driver installation

In the document “Quick installation PC boards” (see PDF link), you can get information on the selection of the appropriate driver and on the driver download.

The most important information on the installation of drivers of the type “ADDI-DATA Multi-architecture Device Drivers 32-/64-Bit for x86/AMD64” as well as on the installation of the corresponding samples is to be found in the installation instructions (see PDF link).

3.7 Software tool “ConfigTools”

The software tool **ConfigTools** allows you to configure the function modules of your board.

3.7.1 First steps

ConfigTools is to be found on the supplied CD Boards (“Drivers”). To install this software tool, proceed as follows:

- Insert CD Boards into the CD drive of your computer.

The CD browser interface is automatically displayed. If not, open the Windows Explorer, and in the CD Boards root directory, double-click on the file “AD-Boards.exe”.

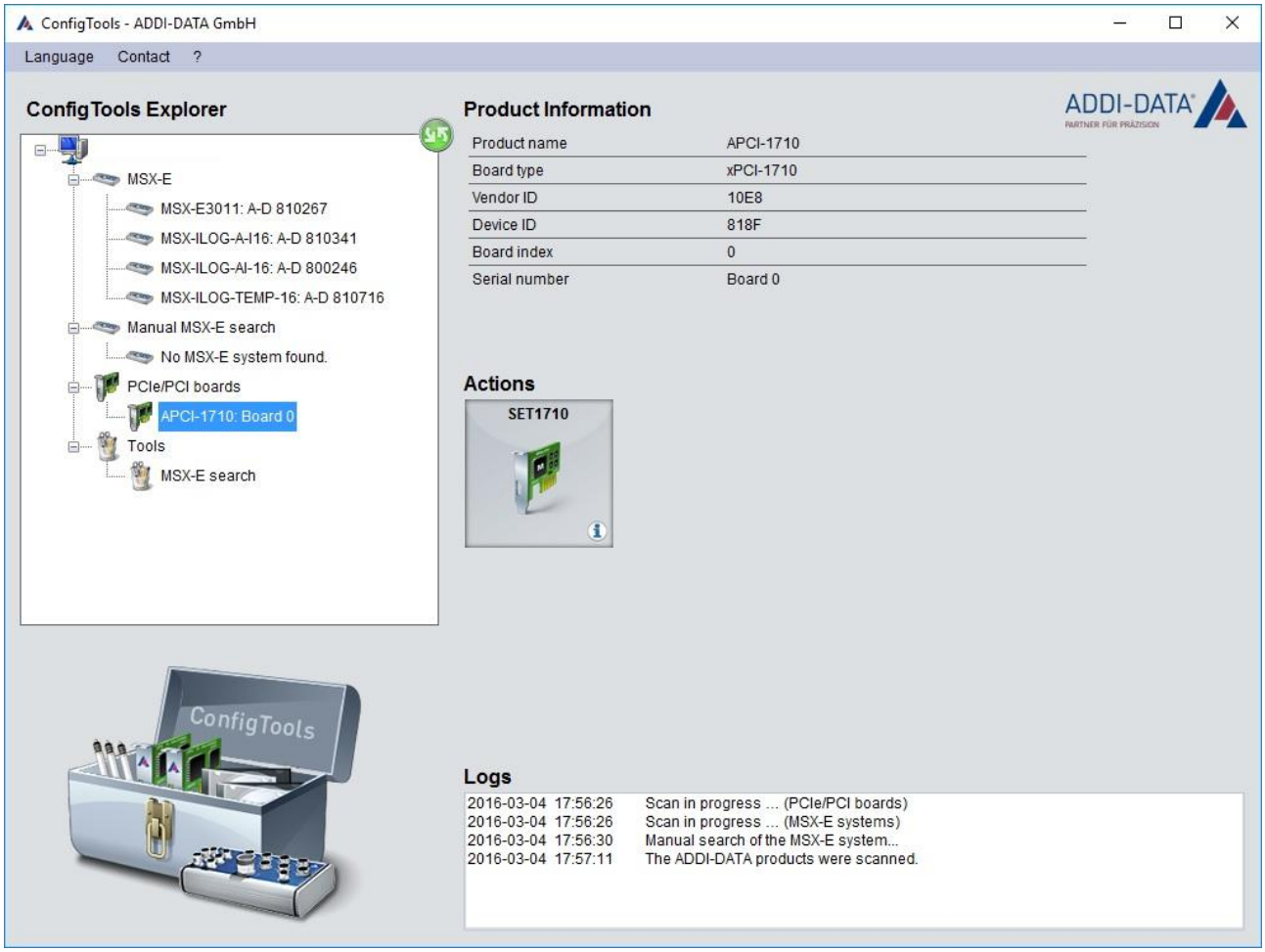
- Click on the “Drivers” button.
- Select the “English” language and click on “Start”.
- Click on the desired board, and after that, under “ConfigTools”, on the “Setup” button.
- Follow the instructions of the installation program.

As soon as you have started the installed software tool from your computer, the inserted boards are scanned.

Fig. 3-24: ConfigTools: Scan boards

3.7.2 Main window structure

Fig. 3-25: ConfigTools: Main window



The **ConfigTools** main window comprises the following areas:

- Menu bar
- ConfigTools Explorer
- Product information
- Actions
- Logs.

1) Menu bar

Via the menu bar, you can define the language of the user interface. Available languages are English, German, French and Chinese.
Moreover, you can view the contact data of ADDI-DATA GmbH, and under "? / About ConfigTools", the version of the software tool.

2) ConfigTools Explorer

After scanning, all inserted boards are listed in the ConfigTools Explorer.
When you click on the name of one of these boards, corresponding product information such as the serial number will be shown on the right side of the main window.

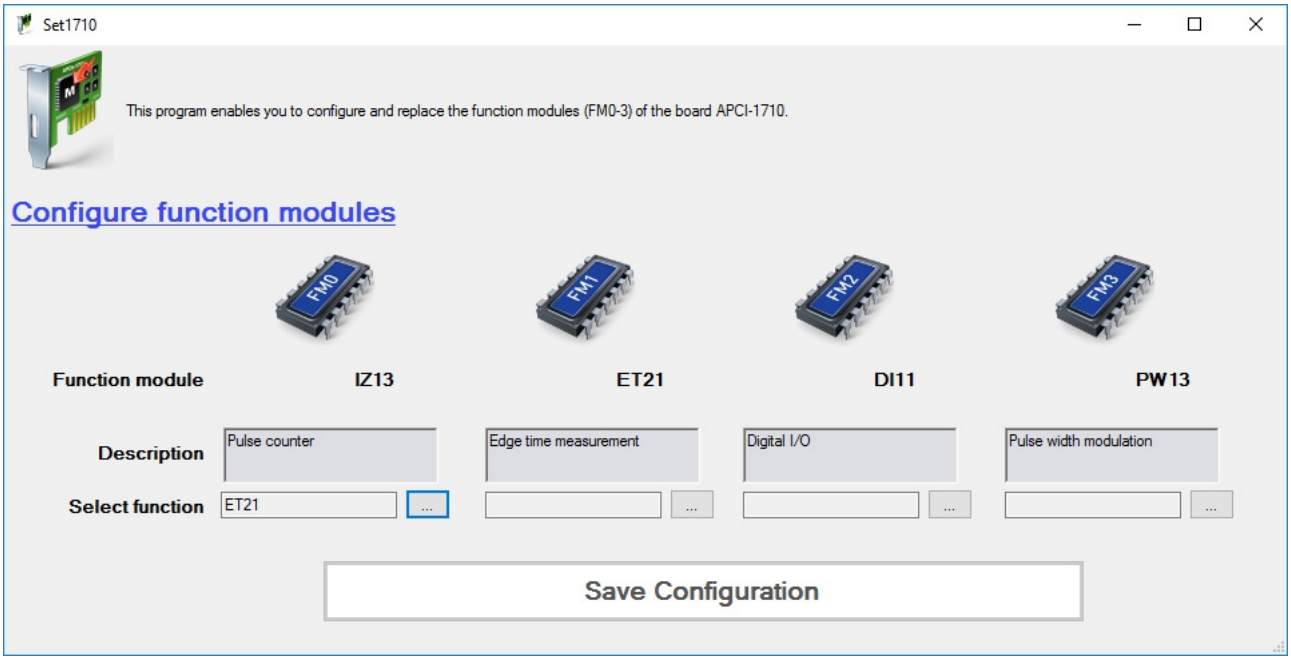
To scan the inserted boards once again, for example after inserting another board, you have to click on the green icon in the top right of the ConfigTools Explorer area.

3) Actions

Below the “Product Information” area, there is the “SET1710” button that enables you to change the settings of your board.

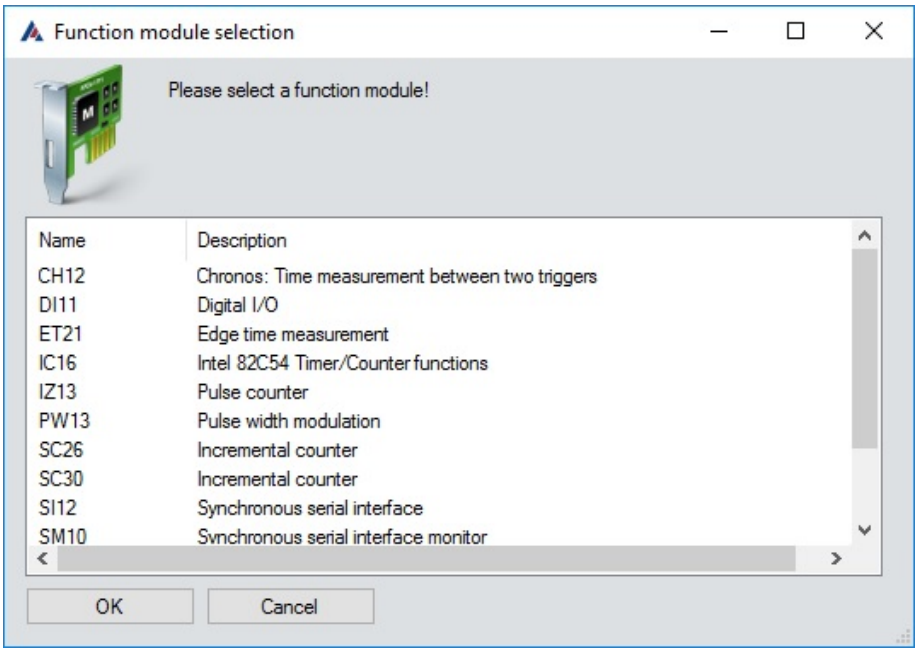
- Click on the “SET1710” button.

Fig. 3-26: ConfigTools: SET1710



In the “SET1710” window, the configuration of the function modules is displayed. It changes according to the function modules selected.

Fig. 3-27: SET1710: Function module selection



4 Function description

More detailed information on the different functions of the board can be found in the corresponding function descriptions (see PDF links).

5 Standard software

The API software functions supported by the board are listed in an HTML document. A description of how to access the respective file can be found in the document “Quick installation PC boards” (see PDF link), in the chapter “Standard software”.

6 Return or disposal

6.1 Return

If you need to return your board, you should read the following checklist before.

Checklist for returning the board:

- Specify the reason for returning your board (e.g. exchange, modification, repair), the serial number of the board, the contact person in your company including his/her telephone extension and e-mail address, as well as the mailing address for a potential new delivery.
  You do not have to indicate the RMA number.

Fig. 6-1: Serial number

- Note down the serial number of the board.
- Place the board in an ESD protective cover. Then pack it in a cardboard box so that it is well-protected for shipping. Send the packed board together with your details to:

  ADDI-DATA GmbH
  Airpark Business Center
  Airport Boulevard B210
  77836 Rheinmünster
  Germany
- If you have any questions, do not hesitate to contact us:

  Phone: +49 7229 1847-0
  E-mail: info@addi-data.com

6.2 Disposal of ADDI-DATA waste equipment

ADDI-DATA organises the disposal of ADDI-DATA products that were put on the German market after 13 August 2005.
If you want to return waste equipment, please e-mail your request to: rohs@addi-data.com.

Boards that were delivered after 13 August 2005 can be recognised by the following label:

Fig. 6-2: Disposal: Label

This symbol indicates the disposal of waste electrical and electronic equipment. It is valid in the European Union and in other European countries that have a separate collection system. Products carrying this symbol must not be treated as household waste.
For more detailed information on the recycling of these products, please contact your local citizens' office, your household waste collection service, the shop where you bought this product or the distributor you purchased this product from.

If you dispose of this product correctly, you will help to prevent damage that could be caused to the environment and to human health by inappropriate disposal. The recycling of materials will help to conserve our natural resources.

Disposal in other countries than Germany
Please dispose of the product according to the country-specific regulations.

7 Technical data and limit values

7.1 Electromagnetic compatibility (EMC)

The board **APCI-1710** or **CPCI-1710** is suited for installation in personal computers (PCs) or CompactPCI/PXI computers which comply with the European EMC directive.

The boards **APCI-1710** and **CPCI-1710** comply with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the standard 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.

7.2 Mechanical structure

Fig. 7-1: APCI-1710: Dimensions

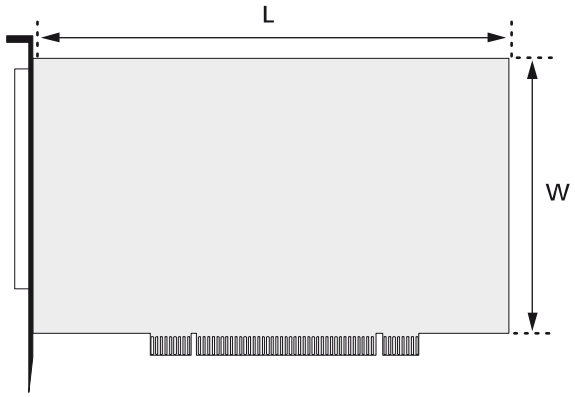


Fig. 7-2: CPCI-1710: Dimensions

Dimensions (L x W):	**APCI-1710:**	179 x 99 mm
	CPCI-1710:	160 x 100 mm
Weight:	**APCI-1710:**	approx. 150 g
	CPCI-1710:	approx. 200 g
Insertion into:	PCI or CompactPCI slot	

Connection to peripherals:		
Front connector:	50-pin D-Sub male connector (digital I/O)	
Additional connector:	**APCI-1710:** 50-pin header ST5 (“TTL I/O” function)	
Accessories:[1]	see Chapter 3.3	
for digital I/O:	Cable: Screw terminal panel:	**ST370-16** **PX8001**
for “TTL I/O” function **(APCI-1710):**	Cable: Screw terminal panel:	**FB8001, ST370-16** **PX8001**

NOTICE!
The connection lines must be installed in such a way that they are protected against mechanical loads.

7.3 Versions and options

The boards **APCI-1710** and **CPCI-1710** are available in the following versions:

Table 7-1: Versions

Version	Features
APCI-1710	Multifunction counter board, optically isolated
APCI-1710-24V	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
APCI-1710-5V-I	5 V inputs instead of 24 V inputs (E, F, G)
APCI-1710-5V-I-O	5 V inputs instead of 24 V inputs (E, F, G) 5 V outputs instead of 24 V outputs (H)
CPCI-1710	Multifunction counter board, optically isolated

The specific version name can be found on the type label at the slot bracket or front panel of your board.

Table 7-2: Options

Board	Option	Features
APCI-1710	**Opt. 5 V**	5 V outputs instead of 24 V outputs (H)
CPCI-1710	**Option 24V**	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
	Option 5V	5 V inputs instead of 24 V inputs (E, F, G)
	URS-1710-6U	6U front panel for mounting in 6U housing

[1] Not included in standard delivery.

7.4 Limit values

Height:	2000 m over NN
Operating temperature:	0-60 °C (with forced ventilation)
Storage temperature:	-25 °C to +70 °C
Relative air humidity at indoor installation:	 50 % at +40 °C 80 % at +31 °C
Minimum PC requirements:	
System bus:	PCI 32-bit or CompactPCI 32-bit
Bus speed:	< 33 MHz
Required space:	- digital I/O: 1 PCI slot or 1 CompactPCI slot - "TTL I/O" function: 1 PCI slot (for **FB8001** cable)
Operating system:	Windows 10/8/7/XP, Linux
Energy demand:	
Operating voltage from the PC:	5 V ± 5 %
Current consumption (without load) at external +24 V: at +5 V from the PC:	 10 mA ± 10 % **APCI-1710:** 1.15 A ± 10 % **CPCI-1710:** 877 mA ± 10 %

7.4.1 Digital inputs (RS422)

Number of inputs:	16 max. (differential: A, B, C, D)
Nominal voltage:	5 V
Optical isolation:	1000 V
Reference voltage U_{Ref}:	1.4 V
Common mode range:	-7 V to +12 V
Max. diff. voltage:	± 12 V
Input sensitivity:	200 mV
Input hysteresis:	50 mV
Input impedance:	12 kΩ
Terminating resistance:	150 Ω in series with 10 nF (typ.)
Max. input frequency (at nominal voltage):	 2.5 MHz
"Open Circuit Fail Safe Receiver Design":	 "1" = inputs open
ESD protection:	up to ± 15 kV

7.4.2 Digital inputs (24 V)

Number of inputs:	12 max. (GND-related: E, F, G) **APCI-1710-24V:** 28 max. (A, B, C, D, E, F, G)
Nominal voltage:	24 V
Optical isolation:	1000 V
Input voltage:	0-30 V
Input current (at nominal voltage):	 11 mA typ.

Max. input frequency (at nominal voltage):	1 MHz (with input filter)
Logic input levels:	UH_{max}: 30 V UH_{min}: 19 V UL_{max}: 15 V UL_{min}: 0 V

CPCI-1710 (24 V option)

Number of inputs:	16 max. (differential: A, B, C, D)
Nominal voltage:	24 V
Reference voltage U_{Ref}:	3 V
Max. input frequency:	10 kHz (“Incremental counter” function) 25 kHz (“Incremental counter” function: Direct mode; “Counter/Timer” function, “Digital I/O” function, “Pulse counter” function)
Logic input levels:	UH_{max}: 25 V UH_{min}: 15 V UL_{max}: 11 V UL_{min}: 0 V

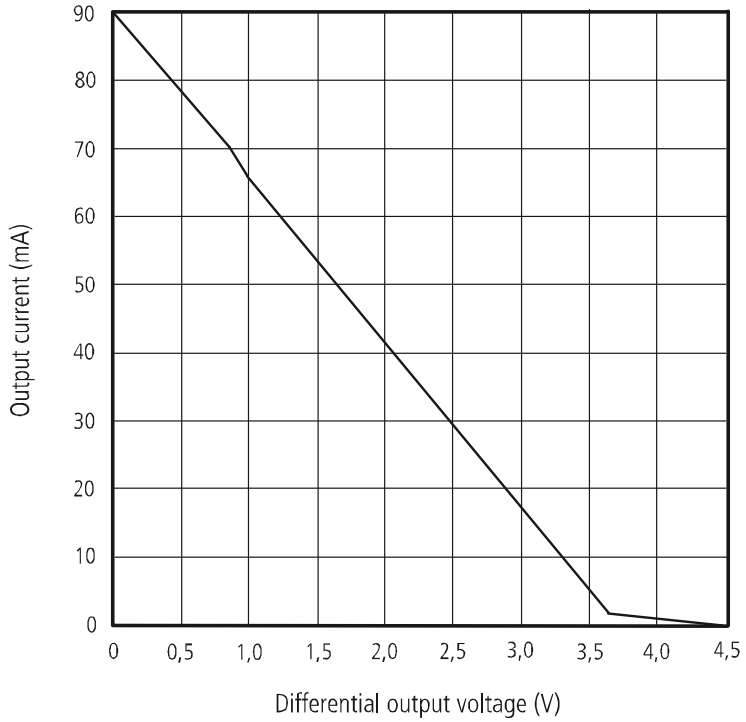
7.4.3 Digital inputs (5 V)

Number of inputs:	12 max. (GND-related: E, F, G)
Nominal voltage:	5 V
Optical isolation:	1000 V
Input voltage:	0-7 V
Input current (at nominal voltage):	10 mA typ.
Signal delay (at nominal voltage):	120 ns
Max. input frequency (at nominal voltage):	2.5 MHz
Logic input levels:	UH_{max}: 7 V UH_{min}: 2 V UL_{max}: 0.8 V UL_{min}: 0 V

7.4.4 Digital outputs (RS422)

Number of outputs:	8 max. (differential: A, B)
Output type:	RS422
Nominal voltage:	5 V
Optical isolation:	1000 V
Max. output frequency:	2.5 MHz

Fig. 7-3: Output current vs. differential output voltage



7.4.5 Digital outputs (24 V)

Number of outputs:	4 max. (H)
Output type:	24 V high-side (load to GND according to IEC 1131-2)
Nominal voltage:	24 V
Optical isolation:	1000 V
Max. output saturation voltage:	2 V
Supply voltage:	10-36 V
Max. current per output:	500 mA
Max. current for all 4 outputs:	2 A (to be limited by the voltage supply)
Short-circuit current per output (at 24 V, R_{Load} < 0.1 Ω):	1.5 A max. (output switches off)
R_{DS} ON resistance:	0.4 Ω max.
Undervoltage protection (effective at V_{ext} < 5 V):	all outputs switch off
Overtemperature:	170 °C (all outputs switch off)
Protection against overtemperature:	
Activation:	from approx. 150-170 °C (chip temperature)
Deactivation (automatic):	from approx. 125-140 °C (chip temperature)
Switching characteristics of the outputs:	V_{ext} = 24 V, T = 25 °C, ohmic load = 500 mA
Switch-on delay:	200 µs
Switch-off delay:	15 µs

7.4.6 Digital outputs (5 V)

Number of outputs:	4 max. (H)
Output type:	5 V (TTL)
Nominal voltage:	5 V
Optical isolation:	1000 V
Max. current per output:	10 mA
Max. output frequency:	2.5 MHz
Switching characteristics of the outputs:	T = 25 °C, TTL load
Switch-on delay:	0.06 µs
Switch-off delay:	0.02 µs

7.4.7 Reference clock source

Nominal frequency:	40 MHz
Frequency stability:	± 100 ppm (0-60 °C)

7.4.8 APCI-1710 "TTL I/O": Digital inputs and outputs (ST5 header)

NOTICE!

The TTL inputs and outputs are not optically isolated.
Please make sure that no signal from the peripherals is connected to the inputs and outputs when the PC system is switched off or being booted up or shut down. This can be realised by means of a relay or tri-state circuit between the peripherals and the TTL inputs and outputs.
Moreover, the TTL outputs must be protected against short-circuit through the connected signals.

Max. input voltage:	4.75 V (PC supply voltage = 5 V ± 5 %)
Max. output current:	25 mA (no short-circuit protection)
Signal thresholds:	
Input logic 1:	2 V min.
Input logic 0:	0.8 V max.
Output logic 1:	2.4 V min. (PC supply voltage ≥ 4.75 V)
Output logic 0:	0.45 V max. (PC supply voltage ≥ 4.75 V)

8 Appendix

8.1 Glossary

Counter
A counter is a circuit which counts pulses or measures pulse duration.

Driver
A driver is a series of software instructions written specifically to manage particular devices.

EMV
= Electromagnetic Compatibility

The definition of the VDE regulation 0870 states: Electromagnetic compatibility is the ability of an electrical installation to function satisfactorily within its electromagnetic environment without unduly affecting its environment and the equipment it contains.

ESD
= Electrostatic Discharge

On non-conductive surfaces, an electric charge is conducted away very slowly. If the dielectric strength is overcome, there is a fast potential equalisation between the surfaces involved.

The often very sudden equalisation process is referred to as electrostatic discharge (ESD). Currents of up to 20 A may occur in this process.

Hysteresis
Hysteresis is the difference between the start-up and shut-down voltage. In TTL circuits, it is typically 0.8 V; in CMOS circuits, it depends on the supply voltage.

Input impedance
The input impedance is the ratio of voltage to current at the input terminals when the output terminals are open.

Input level
The input level is the logarithmic ratio between two electrical values of the same type (voltage, current or power) at the signal input of any receiving unit.

This unit is often configured as a logical level related to the input of the circuit. The input voltage corresponding to logic “0” is between 0 V and 15 V and the voltage corresponding to logic “1” is between 17 V and 30 V.

Level
Logic levels are defined for processing and displaying information.
In binary switches, voltages are used for digital values. Here, the two voltage ranges H (high) und L (low) represent the information. The ‘H’ range is closer to plus infinity; the ‘H’ level corresponds to digital 1. ‘L’ denotes the range closer to minus infinity; the ‘L’ level corresponds to digital 0.

Limit value
Exceeding the limit values, even for a short time, can easily result in the destruction of the component or the (temporary) loss of functionality.

Operating voltage
The operating voltage is the voltage to the device in sustained operation. It must not exceed the maximum sustained voltage, and all unfavourable operating conditions, such as possible mains power surges for over a minute when the device is switched on, must be taken into account.

Optical isolation
Optical isolation means that there is no flow of electrical current between the circuit to be measured and the measuring system.

Protective circuit
A protective circuit is set up on the actuator side to protect the control electronics and provide adequate EMC safety. The simplest protective circuit involves connecting a resistor in parallel.

Short-circuit
A short-circuit exists between two terminals of an electric circuit if the relevant terminal voltage is zero.

Short-circuit current
A short-circuit current is the current between two short-circuited terminals.

8.2 Index

9 Contact and support

Do you have any questions? Write or call us:

Address: ADDI-DATA GmbH
Airpark Business Center
Airport Boulevard B210
77836 Rheinmünster
Germany

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222

E-mail: info@addi-data.com

Manual and software download from the Internet:

www.addi-data.com